Cornwall Contaminated Land Services Ltd

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WESTERN POWER DISTRIBUTION DEPOT
SOWTON INDUSTRIAL ESTATE, EXETER

PHASE I DESK STUDY AND PRELIMINARY RISK ASSESSMENT

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1. INTRODUCTION

1.1.1 Cornwall Contaminated Land Services Ltd (CCLS) has been appointed by Brownfield Investments Limited to undertake a Phase I Contaminated Land Desk Study and Preliminary Risk Assessment of the Western Power Distribution Depot on the Sowton Industrial Estate, Exeter ('the site'). A site location plan is provided as Figure 1 and a site boundary plan is provided as Figure 2.

1.1.2 This report has been prepared by CCLS solely for the benefit of Richard Walker Developments Limited. It shall not be relied upon or transferred to any third party without the prior written authorisation of CCLS.

2. SCOPE AND OBJECTIVES

2.1.1 The Objective of this Desk Study is to examine past and present site conditions to identify any potential risk of contamination resulting from historical and contemporary site usage. In this assessment this usual desk based information has been supplemented by ground investigation data from a previous assessment. Any recommendations for further works have been made as deemed appropriate, based upon the findings of the investigation.

2.1.2 This assessment has been undertaken with guidance from BS10175:2011[(1)] and Environment Agency report CLR11[(2)], and as such represents a Phase I Desk Study / Qualitative Risk Assessment.

3. INFORMATION SOURCES

3.1.1 This assessment has been based upon mapping and information obtained from a number of trusted third party sources. Although we only use information from trusted sources, CCLS cannot accept any responsibility for any inaccuracy of third party information. The sources used in this assessment are listed below:

- Groundsure EnviroInsight Report (Ref: GS-2701996), dated 25th January 2016;
- Groundsure GeoInsight Report (Ref: GS-2701997), dated 25th January 2016;
- Groundsure Map Insight Report (Ref: GS-2701998), dated 25th January 2016;
- Mapping available on the Environment Agency website, accessed 1st February 2016; and
- Online geological mapping available on British Geological Survey (BGS) website, accessed 1st February 2016.

3.1.2 Desk study and ground investigation data from a report produced by Clarke Bond Geoenvironmental Ltd[(3)] has also been included in this assessment.

1 BS 10175:2011 'Investigation of Potentially Contaminated Sites – Code of Practice'.
2 Environment Agency, 2004. Contaminated Land Report 11 - Model Procedures for the Management of Land Contamination.
3 Clarke Bond, July 2007. Phase 1 and 2A Geoenvironmental Assessment, Moor Lane, Exeter. Ref: EE0864/R1.

4. SITE LOCATION

4.1.1 The site is located approximately 4.3kilometer (km) to the East of the centre of Exeter. The site is approximately centred on National Grid Reference E296570 N92010 and is approximately 4.0 Hectares in area (excluding the substation to be retained in the centre of the site).

5. SURROUNDING AREA

5.1.1 The site is located in an area of mixed commercial and light industrial activities. The A30 borders to the site to the North and Moor Lane borders the site to the West. A Highways Depot is adjacent to the South and a large retail unit is adjacent to the East. A large electricity substation that is in the centre of the site will remain and is therefore not part of the development site.

6. PROPOSED DEVELOPMENT

6.1.1 It is proposed to redevelop the site to support retail premises, with associated car parking and limited soft landscaping. A proposed site layout plan is provided as Figure 3.

7. SITE WALKOVER SURVEY

7.1.1 A site walkover survey was undertaken on 24th January 2016. Photographs from the walkover survey are provided as Figure 4 and a photograph location plan provided as Figure 5.

7.1.2 The site is spread over two levels. The Southern area of the site is on a slightly lower level from the majority of the site. The site is accessed from a single entrance on the Western boundary.

7.1.3 A small building, previously used for battery storage, is present in the South-western corner of the site. To the North of this, inside the Western boundary, are a number of buildings that include a former Fitters Workshop and former Engineering Tools Store. In this area of the site was also observed numerous transformers being stored on the tarmac, with evidence that transformer oil had leaked onto the ground, and a spoil heap in the North-western corner.

7.1.4 A workshop building and the area of the former travelling crane, in the North-eastern region of the site, were inaccessible. At the time of the site visit this area of the site was in use by a road haulage company for the storage and maintenance of vehicles. The raised platform inside the Northern boundary, to the West of the Workshop, was largely overgrown. However, the tar spillage and corroded drums observed during the Clarke Bond site visit were not observed. None of the waste drums observed during the Clarke Bond site visit were observed during this walkover survey.

7.1.5 The largest building on the site is a vehicle maintenance building, in the centre. This was closed at the time of the site visit, but the external areas appeared to be in reasonable condition, in terms of contamination risk. The adjacent vehicle wash was out of service and appeared to have been abandoned.

7.1.6 The above ground diesel storage tank, observed during the Clarke Bond site visit to the South of the vehicle maintenance building, was no longer present. A number of lockable lids were observed to the West of the former diesel tank location. The information provided by Devon County Council Petroleum Officer, and presented within the Clarke Bond report, indicates this to be a Specialist Sump Drain. The three stage interceptor and lids to the underground fuel tanks were observed, as was the redundant refuelling island.

7.1.7 The vehicle inspection pits located to the East of the vehicle maintenance building were still filled with rubbish, and much rubbish had been deposited in the area around them as well. A spoil heap of waste soil had also been deposited in the area.

7.1.8 Treated telegraph poles were stored along the Southern boundary inside the site entrance, and in the Southern region of the site. The poles were stored on gravel, and staining of the ground was evident. Waste transformers were also being stored in the Southern area of the site.

7.1.9 The surface water that is shown in mapping along the Eastern boundary was observed to have been recently altered. When it emerges from a culverted section it had a ‘milky’ appearance. It then flowed towards the South, through a number of turns, and into a wooded area. At the point where it flowed into the wooded area, no more than 30 metres from where it had emerged from the culvert, its appearance had improved and was no longer milky.

8. SITE HISTORY

8.1 Historical Map Review

8.1.1 An historic map search was carried out for the site using Ordnance Survey maps dating back to 1887, provided as Appendix B. Our review of the historic mapping is summarised below.

8.1.2 Earliest available mapping from 1887 shows that the site is undeveloped, comprising woodlands in the South-eastern region and open fields across the remainder of the site. An area of marshland is adjacent to the east of the woodland, extending within the site boundary. The site is labelled as the Upper Moor Plantation. The surrounding area is open fields. An old sand pit and the Pinhoe Sand Pit are shown approximately 200metres North of the site.

8.1.3 Two unmarked buildings are shown inside the Western boundary of the site in mapping of 1933. Much of the central areas of the site are now shown as marshland. Mapping of 1961 shows two additional large buildings inside the site's Northern boundary. The Clarke Bond report refers to these both as Workshops.

8.1.4 The Mapping of 1966 shows that further development of the Western two-thirds of the site and is labelled as an Electricity Maintenance Works and Store. Two residential properties are now shown inside the North-western boundary of the site. Numerous 'Issues', 'Sinks' and unnamed watercourses are shown across the site.

8.1.5 The electricity substation that is to be retained is first shown in mapping of 1987. The same mapping now also shows development of the area of the South of the site, which is now a highways depot. A surface watercourse is shown flowing from the East and then turning to the South, forming the South-eastern site boundary. The surface water features within the site boundary are no longer shown, with the exception of a single watercourse that rises and sinks again to the East of the residential properties.

8.1.6 One of the two large buildings, first shown in mapping of 1961, is no longer shown in mapping of 1990. Instead, the existing vehicle maintenance building, together with a small electricity substation, is shown. The demolished workshop would have stood off of the North-eastern corner of the existing building. The site format shown in mapping of 1990 is largely that which is present at the time of writing – this is with the exception of the travelling crane, which is no longer present.

8.1.7 Subsequent mapping shows little change to the site. The surrounding area show significant development, including an industrial retail unit to the East, and an industrial unit and two large tanks to the South-west. This unit is currently an office building for Devon County Council.

8.1.8 No other information of potential significance to the proposed development is shown in the available historical mapping.

9. OTHER REPORTS

9.1.1 A report produced by Clarke Bond Geoenvironmental Ltd has been provided by the client. This report included a desk study and initial ground investigation into the potential for ground contamination at the site. Information from the Clarke Bond report has been used throughout this assessment, and therefore a separate review is not necessary.

10. PLANNING RECORDS

10.1.1 A search of Cornwall Council's online planning records was undertaken on 6th October 2015.

10.1.2 A Desk Study undertaken for the adjacent B&Q retail site (Planning Ref: 15/1065/01) referred to a record of Made Ground at the adjacent site. This is the only risk identified by the Desk Study that has not already been identified as part of this assessment.

10.1.3 No other planning applications in close proximity to this site contained information pertinent to this assessment.

11. ENVIRONMENTAL SETTING

11.1 Surface water

11.1.1 The nearest surface water feature to this site is the unnamed watercourse that flows along the Eastern boundary and continues to the South.

11.1.2 The 2009 River Basin Management Plan for the South-west has been reviewed and the nearest watercourse that is being monitored as part of this programme is referred to as the Clyst, approximately 1kilometre (km) to the South-east of this site. The Ecological Quality of this river is classified as Moderate. It does not require monitoring for chemical quality under the River Basin Management Plan.

11.1.3 There are two licensed discharges to surface water within 500m of the site recorded in the Groundsure EnviroInsight report. The closest refers to a license (revoked in 1999) for the discharge of 'Mine/Groundwater as Raised' into the watercourse adjacent to the Southern boundary of the site. The other license (revoked in 2002) was for the discharge of stormwater overflow adjacent to the North-western boundary.

11.1.4 There are no licensed surface water abstractions recorded within 500m of the site in the Groundsure EnviroInsight report.

11.2 Geology

11.2.1 Online geological mapping published on the British Geological Survey website (viewed 3rd February 2016) shows that the site is underlain by Head Deposits, comprising Sand with Clay and Gravel, over the Dawlish Sandstone Formation.

The ground investigation undertaken by Clarke Bond in 2007 recorded Made Ground across the whole site, over layers of sandy silt, clayey sand and sandy clay. The maximum depth of investigation was 4.0m bgl (metres below ground level) and the base of the Superficial Deposits was not conclusively proven. It is possible that in a number of window sampler boreholes the

highly weathered layers of the Dawlish Sandstone Formation was encountered. Groundwater, when encountered, was stuck at depths ranging from 2.0m bgl to 3.6m bgl.

11.3 Groundwater

11.3.1 Online mapping published by the Environment Agency shows that the Superficial Deposits that underlie the site are classified as a Secondary A Aquifer. A Secondary A aquifer is permeable but only such that it is able to support local water supply. It is therefore considered to be of moderate environmental sensitivity. The Bedrock that underlies this is classified as a Principal Aquifer. Principal Aquifers have high permeability and can therefore be used for water supply abstraction or support surface water courses. This is therefore considered to be a highly sensitive environmental receptor.

11.3.2 The River Basin Management Plan for the South West classifies that the current quantitative quality of the groundwater, which is the degree to which it is under pressure from abstractions and discharges, is Good. The current chemical quality, however, is classed as Poor.

11.3.3 Given the local topography and the nearby surface water courses, the groundwater flow direction is inferred to be to the South.

11.3.4 There is one licensed discharge to groundwater recorded in the Groundsure EnviroInsight report to be within 500m of the site. This is approximately 410metres to the North of the site and refers to the discharge of treated sewage effluent (non-Water Company) to a soakaway.

11.3.5 There are two licensed groundwater abstractions, both of which refer to a borehole abstraction at the Met Office site, approximately 450m to the North of the site. This is not down inferred groundwater gradient of the site and therefore not considered to be a viable receptor for the purposes of this assessment.

11.3.6 The site is not located within an Environment Agency defined Source Protection Zone. The nearest SPZs are associated with two potable water abstractions, over 800metres to the South-west of the site. Source Protection Zones are used to delineate sensitive groundwater bodies, typically based upon the locations of public drinking water boreholes.

11.4 Radon

11.4.1 The site is located in an area where the Health Protection Agency Radon Atlas for England and Wales[4] shows that 1% and 3% of homes have radon concentrations above the action level of 200 Bq/m3. The site is therefore not located within a radon affected area and advice given in BR211[5] is that no radon protection measures are required for new buildings.

4 Health Protection Agency, 2007. Indicative Atlas of Radon in England and Wales. HPA-RPD-033.
5 Building Research Establishment, 2007. BR 211. Radon Protection Measures for New Buildings

11.5 Other environmental information

Waste

11.5.1 One landfill site is recorded within 500metres of the site, which is present in the South-east of this site. The landfill site is referred to as Osprey Road, but no other information about is is available.

11.5.2 The only other waste site recorded within 500metres of this site is a Waste Transfer Station approximately 480metres to the South of this site. This is therefore not considered to represent an unacceptable risk to this site.

Protected Locations - Environmentally Sensitive Receptors

11.5.3 The North-western half of this site is located within a Nitrate Vulnerable Zone, but this is not of particular relevance to this assessment. The site is not within any other designated environmentally sensitive areas.

Pollution Incidents

11.5.4 Two pollution incidents have been recorded within 500m of this site in the Groundsure EnviroInsight report. The closest is approximately 50metres North of the site and occurred in 2006. It is recorded to have been a Category 2 'Significant' Impact to water, involving contaminated water. It is possible that this may have migrated beneath the subject site. The second incident is recorded approximately 170metres to the South of the site and is therefore unlikely to have impacted upon this site.

Industrial Land Uses

11.5.5 The site is within an area of predominantly commercial/retail activities. The site adjacent to the South, which is a Highways Depot (including fuel storage and tar storage), and the subject site itself, are the exceptions to this.

Part 2A Designated Contaminated Land Sites

11.5.6 There are no Contaminated Land sites, as designated under Part 2A of the Environmental Protection Act 1990, within a 500metre radius of this site.

12. QUALITATIVE RISK ASSESSMENT

12.1 Definitions of Contaminated Land and Land Contamination

12.1.1 The assessment of risk from land contamination draws upon a number pieces of legislation and guidance that have been published by different government bodies, and by specific Acts of Parliament.

12.1.2 The most relevant Act of Parliament is Part 2A of the Environmental Protection Act 1990, which provides the basis for the assessment of land contamination. This Act defines that Contaminated Land is:

> *"any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:*
>
> *(a) significant harm is being caused or there is a significant possibility of such harm being caused; or*
> *(b) pollution of controlled waters is being, or is likely to be, caused."*

12.1.3 A site can only be designated as Contaminated Land, by the Local Authority, if a plausible pollutant linkage can be identified. This comprises of a source of contamination, a sensitive receptor that is or is likely to be affected, and a pathway of transmission between the two.

12.1.4 Contaminated Land in the context of Part 2A of the Environmental Protection Act 1990 specifically deals with sites that require immediate remediation. However, the assessment of land contamination draws upon the same principals. A site can therefore be affected by land contamination, but not be deemed to be Contaminated Land, which is determined via specific tests of significance.

12.2 Initial Conceptual Site Model

12.2.1 This desk study has been undertaken to characterise the site and identify whether any plausible pollutant linkages might be present. These plausible pollutant linkages together form a Conceptual Site Model.

12.2.2 This conceptual site model has been undertaken with due regard to guidance provided in BS10175:2011 and CLR11. The risks posed by the each pollutant linkages identified are assessed qualitatively, in general accordance with guidance published in CIRIA C552[6]. The risk posed is a combination of the probability of the pollutant linkage existing, and the severity of potential harm if it did. If an unacceptable level of risk is identified, this must be mitigated or remediated (breaking of the pollutant linkage) before the development can be allowed to proceed.

6 CIRIA, 2001. CIRIA 552 - Contaminated land risk assessment. A guide to good practice.

12.3 Contaminant sources

12.3.1 Based upon the review of desktop study information the most likely sources of ground contamination, and associated contaminants, are:

On-Site

- Transformer Storage (Southern area of site);
- Transformer Storage (North-western area of site);
- Underground fuel tanks and refuelling island;
- Above ground Diesel Tank;
- Three stage interceptor;
- Inspection Pits;
- Various Workshops, past and present;
- Tar spillage (West of existing workshop building);
- Tar spillage (North-east of former travelling crane);
- Treatment and storage of telegraph poles;
- Corroded Drums (Eastern end of former travelling crane);
- Corroded Drums (North-eastern corner of site);
- Corroded Drums (East of existing workshop building);
- Corroded Drums (adjacent to underground fuel tanks);
- Various spoil heaps and other waste on site;
- Travelling Crane;
- Natural Geology – Radon Gas; and
- Landfill

Off-site

- Electricity Substation;
- Battery Storage;
- Highways Depot

12.4 Pathways

12.4.1 Based on our understanding of the environmental setting of this site, the proposed development and the contaminants that may be present beneath the site, the following pathways are possible:

- Dermal contact;
- Soil and dust inhalation and ingestion;
- Intrusion of vapour and gases into confined spaces and inhalation;
- Leaching and groundwater migration.

12.5 Receptors

12.5.1 Potential receptors/targets at the site and in the area in which the site is located include:

- Construction workers;
- Future site users; and
- Controlled Waters.

12.6 Initial Conceptual Site Model Matrix

12.6.1 All of the potential pollutant linkages, and the assessed risk, are presented and discussed in the matrix below.

Potential Source	Contaminants of Concern	Potential Pathway	Sensitive Receptor	Probability	Consequence	Risk	Comment
Transformer Storage (Southern area of site)	PCB containing Transformer Oils	Dermal contact, soil and dust ingestion and inhalation; Leaching and groundwater migration	Future site users; controlled waters	High	Medium	High	Evidence of transformer oil spillage on site (North-western area) confirms the high likelihood of transformer oils leaching into soil and groundwater beneath this site. However, whether sufficient volumes have been discharged to have an unacceptable impact upon the groundwater beneath the site requires quantitative investigation.
Transformer Storage (North-western area of site)	PCB containing Transformer Oils			High	Medium	High	
Underground fuel tanks and refuelling island	Petroleum Hydrocarbons	Dermal contact, soil and dust ingestion and inhalation; Intrusion of vapour and gases into confined spaces and inhalation; Leaching and groundwater migration	Future site users; controlled waters	High	Severe	Very High	It is considered likely that the historic fuel storage and dispensing activities at this site will have resulted in contamination of the soil and groundwater beneath. Quantitative investigation will be required in order to ascertain the nature and scale of the risk to future site users and the environment.
Above ground Diesel Tank	Diesel fuel			High	Severe	Very High	
Three stage interceptor	Petroleum Hydrocarbons			High	Severe	Very High	
Inspection Pits	Various	Dermal contact, soil and dust ingestion and inhalation; Intrusion of vapour and gases into confined spaces and inhalation; Leaching and groundwater migration	Future site users; controlled waters	Low	Medium	Moderate / Low	Although the pits are full of waste, none of the waste material appeared to be of the type that would leach though the concrete pits and impact on the surrounding soil and groundwater. Investigation of this should be undertaken to confirm this.
Various Workshops, past and present	Petroleum hydrocarbons, VOCs and SVOCs			Likely	Mild	Moderate / Low	
Tar spillage (West of existing workshop building)	Petroleum hydrocarbons, heavy metals and creosote.	Dermal contact, soil and dust ingestion and inhalation; Intrusion of vapour and gases into confined spaces and inhalation; Leaching and groundwater migration	Future site users; controlled waters	High	Medium	High	Spillages of tar were observed during a visit to the site by Clarke Bond in 2007. Tar is composed of predominantly heavier fractions of hydrocarbons that therefore have a relatively ow mobility. The impacted area is therefore likely to be limited.
Tar spillage (North-east of former travelling crane)	Petroleum hydrocarbons, heavy metals and creosote.			High	Medium	High	

Potential Source	Contaminants of Concern	Potential Pathway	Sensitive Receptor	Probability	Consequence	Risk	Comment
Treatment and storage of telegraph poles	Petroleum hydrocarbons, heavy metals and creosote.	Dermal contact, soil and dust ingestion and inhalation; Intrusion of vapour and gases into confined spaces and inhalation; Leaching and groundwater migration	Future site users; controlled waters	High	Medium	High	Impact to the ground surface was noted during the site walkover survey and therefore impact to the underlying soil is highly likely. Given the length of time that the site has been in operation, this is likely to amount to a relatively large volume of wood treatment products that have been allowed to soak into the ground. Quantitative risk assessment will be required.
Corroded Drums (Eastern end of former travelling crane)	Unknown – Petroleum hydrocarbons, solvents (VOCs and SVOCs)	Dermal contact, soil and dust ingestion and inhalation; Intrusion of vapour and gases into confined spaces and inhalation; Leaching and groundwater migration	Future site users; controlled waters	High	Severe	Very High	The risk posed will be dependent upon what the drums contained. None were present at the time of the CCLS walkover survey. Intrusive investigation will therefore be required to quantify the risk.
Corroded Drums (North-eastern corner of site)				High	Severe	Very High	
Corroded Drums (East of existing workshop building)				High	Severe	Very High	
Corroded Drums (adjacent to underground fuel tanks)				High	Severe	Very High	
Various spoil heaps and other waste on site.	Various	Dermal contact, soil and dust ingestion and inhalation; Intrusion of vapour and gases into confined spaces and inhalation; Leaching and groundwater migration	Future site users; controlled waters	Likely	Medium	Moderate	If the spoil is to be retained on site after Western Power Distribution has relinquished the site, it will need to be tested and disposed of off-site. However, this will not be required if it is made a condition of the land sale that the all waste material is removed from site.
Travelling Crane	Various, including those associated with timber treatment (Petroleum hydrocarbons, heavy metals and creosote)	Dermal contact, soil and dust ingestion and inhalation; Intrusion of vapour and gases into confined spaces and inhalation; Leaching and groundwater migration	Future site users; controlled waters	Likely	Medium	Moderate	It is likely that the travelling crane had been used for moving

Potential Source	Contaminants of Concern	Potential Pathway	Sensitive Receptor	Probability	Consequence	Risk	Comment
Landfill	Various	Dermal contact, soil and dust ingestion and inhalation; Intrusion of vapour and gases into confined spaces and inhalation; Leaching and groundwater migration	Future site users; controlled waters	Likely	Medium	Moderate	The current proposed layout of the site does not include any development in this area of the site. The majority of the historic landfill is off-site. Therefore any remediation undertaken to mitigate third-party risk would be of no benefit unless undertaken as part of a cross boundary scheme.
	Ground gas	Intrusion of vapour and gases into confined spaces and inhalation		Likely	Medium	Moderate	Ground gas monitoring is required to quantify the risk to proposed site buildings.
Natural Geology	Radon Gas	Intrusion of gas into confined spaces and inhalation		Low	Mild	Low	Published advice is that no radon-specific gas protection measures are required.
Off-site							
Electricity Substation	PCB containing transformer oils	Leaching to groundwater followed by migration beneath this site	Controlled waters	Likely	Severe	High	Given the inferred groundwater flow direction, it is likely that only the Southern area of the site would be affected by this pollutant linkage. This would need investigation if the proposed layout changed to include the Southern corner of the site. However, given that the primary receptor for this potential source if controlled waters, the impact to the proposed development specifically would only be if the proposed foundations interacted with the contamination.
Battery Storage	Metals		Controlled waters	Low	Medium	Moderate / Low	Again, given the inferred groundwater flow direction, this pollutant linkage would only affect the Southern area of the site. However, the contaminants of concern and the volumes that may have been discharged to ground mean that the likelihood is low.
Highways Depot	Petroleum Hydrocarbons; solvents	Leaching to groundwater followed by migration beneath this site and volatilisation	Future site users and controlled waters	Unlikely	Severe	Moderate / Low	Given the inferred groundwater direction it is considered unlikely that this potential source will affect this site.

13. INITIAL GROUND INVESTIGATION FINDINGS

13.1.1 The ground investigation data, acquired by Clarke Bond during their 2007 investigation, has been interpreted with regards to the potential sources of contamination identified by this Desk Study.

13.1.2 A revised Conceptual Site Model, using the available ground investigation, is presented below. The risk ratings for each potential source and/or pollutant linkage has been reassessed based upon the ground investigation data. In the absence of ground investigation data, the risk ratings have remained the same. This does not constitute a full quantitative risk assessment.

Potential Source	Contaminants of Concern	Investigation Locations	Comments on Contaminants of Concern	Other Comments	Probability	Consequence	Risk	Further Investigation Required
Onsite Sources								
Transformer Storage (Southern area of site)	PCB containing Transformer Oils	TP6	PCBs not analysed in soil.	Poor coverage of this area. No groundwater data.	High	Medium	High	Yes – soil and groundwater sampling for PCBs required.
Transformer Storage (North-western area of site)	PCB containing Transformer Oils	TP1, WS10	Concentrations of PCBs in soil below detection	Elevated Lead and PAH concentrations recorded in soil. Poor coverage in this area. No PCB analysis of groundwater	Low	Medium	Moderate / Low	Yes – better coverage for soil investigation and sampling of groundwater for PCB required.
Underground fuel tanks and refuelling island	Petroleum Hydrocarbons	WS4	Concentrations of petroleum hydrocarbons not considered to represent gross contamination.	Sample location does not cover the refuelling island. Unclear whether it is adequately targeted the underground tanks.	High	Severe	Very High	Yes – targeted soil analysis and down-gradient groundwater sampling.
Above ground Diesel Tank	Diesel fuel	WS2	Concentrations in groundwater below detection and those recorded in soil not representative of gross contamination	No down-gradient groundwater sampling	High	Medium	High	Yes – soil sampling from the footprint now possible. Down gradient groundwater analysis required.
Three stage interceptor	Petroleum Hydrocarbons	WS3 and WS4	Soil concentrations not indicative of gross contamination Concentrations in groundwater elevated above environmental standard, but not indicative of gross contamination		High	Medium	High	Yes – confirmatory sampling of groundwater required
Inspection Pits	Various	TP3	Relatively low concentrations of petroleum hydrocarbons in a shallow soil sample.		Low	Medium	Moderate / Low	Yes – confirmative investigation should be undertaken. This would most efficiently be undertaken as part of the site demolition.
Various Workshops, past and present	Petroleum hydrocarbons, VOCs and SVOCs	WS1 – Existing maintenance building	Relatively low concentrations of petroleum hydrocarbons and polycyclic aromatic hydrocarbons. No groundwater sample analysed.		Likely	Mild	Moderate / Low	Yes – better coverage required. This would most efficiently be undertaken as part of the site demolition.
		TP2 – Demolished workshop	Concentrations of metals and PAHs were low. All concentrations of petroleum hydrocarbons, VOCs and SVOCs below detection. No groundwater sample analysed.		Low	Mild	Low	No - A Discovery Strategy must be in place during the development in case localised contamination is discovered.
		WS5 and WS6 – Workshop in North-east area of site.	Concentrations of metals and PAHs were low. All concentrations of petroleum hydrocarbons and VOCs below detection. The only SVOC recorded above detection was Bis(2-ethylhexyl)phthalate, but this was a low concentration. No groundwater sample analysed.		Low	Mild	Low	No - A Discovery Strategy must be in place during the development in case localised contamination is discovered.

Potential Source	Contaminants of Concern	Investigation Locations	Comments on Contaminants of Concern	Other Comments	Probability	Consequence	Risk	Further Investigation Required
Tar spillage (West of existing workshop building)	Petroleum hydrocarbons, heavy metals and creosote.	SS1, WS5	Highly elevated concentrations of petroleum hydrocarbons in shallow soil sample (SS1). Elevated concentrations of petroleum hydrocarbons in groundwater. VOCs not analysed		High	Severe	Very High	Yes – Trial pitting to delineate area of impacted soil. Groundwater sampling will also be required
Tar spillage (North-east of former travelling crane)	Petroleum hydrocarbons, heavy metals and creosote.	WS7 and SS3	Some elevated concentrations of petroleum hydrocarbon in soil at WS7, but not indicative of gross contamination. All VOC and SVOCs below detection, with exception of Bis(2-ethylhexyl)phthalate in WS7, but this was still a low concentration. Elevated concentrations of petroleum hydrocarbons in groundwater sampled from WS7.		High	Severe	Very High	Yes - Trial pitting required to delineate soil impact. Down gradient groundwater analysis to quantify the potential for significant migration.
Treatment and storage of telegraph poles	Petroleum hydrocarbons, heavy metals and creosote.	TP6	Elevated concentrations of Polycyclic Aromatic Hydrocarbons recorded	Near surface sample not analysed for metals	High	Medium	High	Yes - Trial pitting required for better coverage.
Corroded Drums (Eastern end of former travelling crane)	Unknown – Petroleum hydrocarbons, solvents (VOCs and SVOCs)	WS7	Petroleum hydrocarbons in soil recorded, but not indicative of gross contamination. All VOC and SVOCs below detection, with exception of Bis(2-ethylhexyl)phthalate. Elevated concentrations of petroleum hydrocarbons in groundwater		High	Severe	Very High	Yes –Soil and groundwater delineation.
Corroded Drums (North-eastern corner of site)		BH3	No Sample Data		High	Severe	Very High	Yes – Trial pitting. If soil impact identified groundwater sampling will be required.
Corroded Drums (East of existing workshop building)		WS6	Petroleum Hydrocarbons below detection. All VOC and SVOCs below detection, with exception of Bis(2-ethylhexyl)phthalate (Note 1)		Low	Medium	Moderate / Low	No – A Discovery Strategy must be in place during the development in case localised contamination is discovered.
Corroded Drums (adjacent to underground fuel tanks)		WS4	Soil concentrations not indicative of gross contamination. Concentrations in groundwater elevated above environmental standard, but not indicative of gross contamination		Low	Medium	Moderate /Low	No - A Discovery Strategy must be in place during the development in case localised contamination is discovered.
Travelling Crane	Various, including those associated with timber treatment (Petroleum hydrocarbons, heavy metals and creosote)	BH2, TP4, TP5 WS7, WS8, SS3	Relatively low concentrations of metals, PAHs and petroleum hydrocarbons in soil and groundwater. Contamination of soil and groundwater recorded in SS3 and WS7, this is considered to be associated with the tar spillage in this area of this site.		High	Severe	Very High	Yes – delineation of the hydrocarbon impacted soil and groundwater.

Potential Source	Contaminants of Concern	Investigation Locations	Comments on Contaminants of Concern	Other Comments	Probability	Consequence	Risk	Further Investigation Required
Landfill	Various	BH4	No soil or groundwater analysis		Low	Medium	Moderate /Low	No - See comment in Section 12.6.
	Ground gas	BH4	Low level Carbon Dioxide recorded. No flow		Low	Mild	Low Risk	Yes - Confirmatory gas monitoring in areas of proposed buildings.

Notes:

1 Bis(2-ethylhexyl)phthalate is used in dielectric fluid

14. GENERAL COMMENTS ON GROUND INVESTIGATION

14.1.1 None of the samples screened were found to contain asbestos fibres.

14.1.2 None of the soil samples analysed for PCBs recorded concentrations above detection. However, if PCBs were discharged to ground they are likely to leach into the groundwater without much dispersion in the soil. It is therefore possible that the sampling to date has missed hotspots of soil contamination. Groundwater analysis for PCBs was not undertaken.

14.1.3 Two samples of surface water were taken and analysed. These did not record concentrations of metals or petroleum hydrocarbons that would be considered representative of contamination – the concentrations of petroleum hydrocarbons were all below the limits of detection. Although polycyclic aromatic hydrocarbons were recorded, the total PAH concentration was below relevant environmental thresholds. No PCB analysis of the surface water samples was undertaken.

15. CONCLUSIONS AND RECOMMENDATIONS

15.1 Conclusions

15.1.1 This Desk Study and qualitative risk assessment has identified a number of potential sources of contamination, both on and off-site. Although some ground investigation has already been undertaken at the site, this has not been enough to confirm and quantify the presence of various risks, or rule them out.

15.1.2 Two areas of contamination have been identified, associated with the spillage of tar from corroded drums. It is possible that this contamination is limited in extent, due to volumes involved and the relatively low mobility of tar related contaminants. A third area where corroded drums were identified by the 2007 site walkover requires further investigation of the shallow soil.

15.1.3 Low level contamination has been identified around the fuel tanks and refuelling island, but more investigation is required to quantify this risk. Two areas of telegraph pole storage have not been sufficiently investigated, nor have two areas were waste transformers have been identified on site.

15.1.4 The proposed development of the site is to a retail/commercial end-use, with car parking and limited soft landscaping. The potential for exposure to the future site users is therefore limited. The majority of potential risks to future site users that may be identified could be mitigated through design – breaking the pathways of transmission. However, if any risks are identified that may impact upon the wider environment, these will need to be remediated.

15.1.5 The investigation should target the plausible pollutant linkages identified in Section 12.

15.2 Recommendations

It is recommended that further investigation is undertaken to quantify the risks identified in this Desk Study. Details of this further investigation are provided in Figure 5.

16. CONDITIONS

- *Unless otherwise expressly stated, nothing in this report shall create or confer any rights or other benefits pursuant to the Contracts (Rights of Third Parties) Act 1999 in favour of any person other than the person commissioning this report.*
- *This report is concerned only with the property, as defined in Section 1. It must not be used in connection with nearby properties*
- *This report has gathered Information from a number of third party sources. While every effort is made to ensure the accuracy of this information and data, we do not accept any liability for inaccuracies in it.*
- *This report is not an asbestos inspection that may fall within the control of Control of Asbestos Regulations 2006.*

Appendix A

Site Walkover Photographs

Appendix B

EnviroInsight Report

GeoInsight Report

Appendix C

Groundsure Map Insight Report