

9.6 Plausible Sources and Pathways and Remediation option appraisal

Re-evaluation of the conceptual site model has revealed that plausible pollutant linkages may remain after the risk assessment. Measures should be taken to protect human health for contaminant encountered around TP1, WS1 and TP2/WS2.

Elevated concentrations of determinants identified indicated an unacceptable risk to the end-users, and remediation must be undertaken.

9.7 Remedial Objective

The objective of the remediation for the site is to ensure site clean-up removes any unacceptable risk to the identified receptors of demolition/construction workers, service maintenance workers, groundwater, public and future site occupiers i.e. home owners.

The preceding assessment must be achieved using a risk based approach that considered the circumstances of the site, such as its location and intended use, engineering considerations and the need to ensure suitable amenities for any development.

In essence the remedial objective should sever any source-pathway-receptor pollutant linkages that have been established for the site in Section 9.7 of this report. Once this has been achieved, by whatever means, there can theoretically be no risk.

Tier 1 Quantitative risk assessment established that there was risk to the human health receptors of end users, construction workers or future maintenance workers due to the presence of lead and mercury each of the samples tested for the case of lead and in one of the samples tested for mercury.

Given the level of the contamination found in the Made Ground, remediation would be required to protect the end-users.

The proposed development comprises the demolition of the existing building and construction of a new six storey building with a two level basement. The basement level is to be approximately 8m below existing ground (street) level. The current proposal for the new building is to construct a concrete frame from the first floor slab down to the basement and a lightweight steel framed structure from first to roof level. It was intended to be of mix usage; with upper floors from roof to second for residential and first floor to basement for commercial/office usage, with no areas of soft landscaping.

Given that the proposed redevelopment would have basement and no areas of soft landscaping, it was considered unlikely that the end-users would come into contact with the impacted soil, and therefore no remediation was required except protection for the groundworkers.

Any soil, which is to be imported onto the site, must undergo chemical analysis to permit classification prior to its importation and placement in order to ascertain its status with specific regard to contamination, i.e. to prove that it is suitable for the purpose for which it is intended.

Any Made Ground material excavated should either be classified and removed from site to a suitably licensed facility or alternatively, can be used to raise ground levels under areas of

permanent hardstanding.

Made Ground excavated from foundation excavations and service excavations should be dealt with using the same method of disposal or re-use under areas of hardstanding. Service excavations must be over-dug and must be backfilled with certified clean material unless they can be shown to be passing through clean ground.

Excavated Made Ground material must be stockpiled on a waterproof polythene sheet with raised edges to avoid mixing with clean soils and to prevent leachate run-off.

In respect to the groundworkers and site operatives, it is understood that in order to minimise the effect of dust inhalation and dermal contact as exposure pathways, a good standard of personal hygiene must be adopted, as discussed in detail in Section 9.12.

9.8 Validation Strategy

All remedial works considered must be inspected and independently validated by a suitable person.

All remedial excavations will need to be inspected and photographed. The imported subsoil and/or Topsoil will also need to be verified prior to placement.

9.9 Excavated Material

All waste going to landfill must be subjected to "basic characterisation", which includes up to 3 steps as listed below.

The three steps of Basic Characterisation

1. Initial description and physical/chemical testing of the solids,
2. A risk-based hazard assessment based on the chemical testing
3. If hazardous, leachability testing to check compliance with Waste Acceptance Criteria (WAC).

Basic characterisation is the responsibility of the waste producer and compliance checking is generally the responsibility of the landfill operator. Therefore landfill operators will be unlikely to accept waste that does not meet the Waste Acceptance Criteria for their class of site.

There is an obligation to 'treat' all soils destined for landfill, including non-hazardous waste. This treatment must now be documented and presented to the landfill operator or waste may be refused entry. Note that all liquids are banned from landfill. For the purposes of legal compliance, 'treatment' must comprise three things (the 'three-point test'):

1. It must be a physical, thermal, chemical or biological process.
2. It must change the characteristics of the waste.
3. It must do so in order to:
 - (a) reduce its volume, or
 - (b) reduce its hazardous nature, or

(c) facilitate its handling, or enhance its recovery.

Any soil, which is to be imported onto the site, must undergo chemical analysis to permit classification prior to its importation and placement in order to ascertain its status with specific regard to contamination, i.e. to prove that it is suitable for the purpose for which it is intended.

Any Made Ground material excavated should either be classified and removed from site to a suitably licensed facility or alternatively, can be used to raise ground levels under areas of permanent hardstanding.

Made Ground excavated from foundation excavations and service excavations should be dealt with using the same method of disposal or re-use under areas of hardstanding. Service excavations must be over-dug and must be backfilled with certified clean material unless they can be shown to be passing through clean ground.

Excavated Made Ground material must be stockpiled on a waterproof polythene sheet with raised edges to avoid mixing with clean soils and to prevent leachate run-off.

9.9.1 Risk Based Hazard Assessment of Waste

Software such as the HazWasteOnline produced **Hazardous Waste Classification Tool**, enables soils 'total' chemical testing data to be used to identify the classification of waste soils in accordance with Environment Agency guidance. The HazWasteOnline Hazardous Waste Classification Tool was designed primarily for the classification of soil wastes as identified by the European Waste Catalogue (EWC) Chapter 17 - Construction and demolition wastes (including contaminated soils).

The classification of waste as either **hazardous or non-hazardous** must be conducted in accordance with the 2003 Environment Agency publication Interpretation of the Definition and Classification of Hazardous Waste (Technical Guidance WM2). This establishes the regulatory framework and allows classification of wastes based on their various risk phrases. Additional guidance provided by the 2007 Environment Agency publication How To Find Out if Waste Oil and Wastes that Contain Oil are Hazardous (HWR08) provides further clarification on the classification methodology for hydrocarbon contamination.

As part of the **Hazardous Waste Classification** process, contaminant compounds are selected based on historical and contemporary land-use. The inclusion of such data on the input form enables the correct waste classification to be determined. For example, in cases of land associated with former gasworks, the classification of coal-tar contaminated soils can be partially determined using total PAH concentrations as opposed to TPH concentrations as coal-tar may be deemed a "substance". Hazardous (HWR08) provides further clarification on the classification methodology for hydrocarbon contamination.

The analysis results of the chemical laboratory testing undertaken as part of report, prepared by QTS Environmental Ltd were used for the **Hazardous Waste Classification** process.

Full results of the laboratory analysis and hazardous waste classification tool are given in Appendix C.

9.9.2 Waste Acceptance Criteria Testing

Where a risk based hazard assessment shows that the waste is not inert then Waste Acceptance Criteria Testing (WAC 2-stage leachate testing) is required to decide whether contaminated soil either:

Meets WAC limits for hazardous landfill – so is acceptably insoluble/non-degradable and can be disposed therein,

or

Fails hazardous WAC – is so mobile, or degradable that it would breach the operator's Permit, so cannot even go to hazardous landfill without treatment.

Two combined samples (Sample A and B) were submitted by Soils Limited for two-stage leachate WAC tests. The test certificates are presented in Appendix C.

It **must** be mentioned that the WAC results provide an indication for off-site disposal at the suitable landfill however the responsibility regarding the acceptance of waste at a landfill site lies entirely with landfill operator.

Where naturally occurring soils need to be disposed off-site then these soils can be classified as 'listed' **inert** waste.

9.10 Reuse of Excavated Material On-Site

The re-use of on-site soils may be undertaken either under the Environmental Permitting Regulations 2007 (EPR), in which case soils other than uncontaminated soils are classed as waste, or under the CL:AIRE Voluntary Code of Practice (CoP) which was published in September 2008 and is accepted as an alternative regime to the EPR.

Under the EPR, material that is contaminated but otherwise suitable for re-use is also classified as waste and its re-use should be in accordance with the Environmental Permitting Regulations 2007 (EPR). Environmental Permit Exemptions (EPE) are for the re-use of non-hazardous or inert waste only; hazardous waste cannot be re-used under a permit exemption. EPE apply only to imported inert waste materials; inert material arising on site and recovered on site is not classified as waste and does not require an exemption. It is possible that materials arising on-site will be classified as inert and would not need an exemption.

Environmental Permit Exemptions are only allowed for certain activities, placing controls on the quantities that can be stored and re-used. The re-use of waste shall be within areas and levels defined in planning applications and permissions for the development. An EPE requires a site specific risk assessment for the receptor site to demonstrate that the materials are suitable for use, i.e. that they will not give rise to harm to human health or pollution of the environment.

Under the CL:AIRE voluntary code of practice (CoP) materials excavated on-site are not

deemed contaminated if suitable for re-use at specified locations or generally within the site.

Material that may have been classified as hazardous waste under the EPR may be re-used. The CoP regime requires that a 'Qualified Person' as defined under the CoP reviews the development of the Materials Management Plan, including review of Risk Assessments and Remediation Strategy/Design Statement together with documentation relating to Planning and Regulatory issues, and signs a Declaration which is forwarded to the Environment Agency and which confirms compliance with the CoP.

Should it be necessary to import materials from another site where materials are excavated and which is not material from a quarry or produced under a WRAP protocol, then an EPE would be necessary for the imported material whether the work was managed under the CoP or the EPR.

9.11 Imported Material

Any soil which is to be imported onto the site must undergo chemical analysis to permit classification prior to its importation and placement in order to ascertain its status with specific regard to contamination, i.e. to prove that it is suitable for the purpose for which it is intended.

The Topsoil must be fit for purpose and to BS3882:2007 and must either be supplied with traceable chemical laboratory test certificates or be tested, either prior to placing or after placing, to ensure that the human receptor cannot come into contact with any compounds that could be detrimental to human health. The compounds that are to be tested for are those given Assessment Criteria, which can be viewed in Appendix D of this report.

9.12 Duty of Care

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

To prevent exposure to airborne dust by both the general public and construction personnel the site should be kept damp during dry weather and at other times when dust were generated as a result of construction activities.

The site should be securely fenced at all times to prevent unauthorised access. Washing facilities should be provided and eating restricted to mess huts.

9.13 Discovery Strategy

There may be areas of contamination not identified during the course of the investigation. Such occurrences may also be discovered during the demolition and construction phases for the redevelopment of the site.

Care should be taken during excavation works especially to investigate any soils, which appear by eye (e.g. such as fibrous materials, large amounts of ash and unusual discolouration), odour (e.g. fuel, oil and chemical type odours or unusual odours such as sweet odours or fishy odours) or wellbeing (e.g. light headedness and/or nausea, burning of

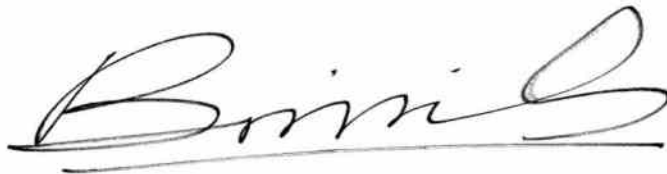
nasal passages and blistering or reddening of skin due to contact with soil) to be contaminated or of unusual and/or different character to standard soils or those analysed.

In the event of any discovery of potentially contaminated soils or materials, this discovery should be quarantined and reported to the most senior member of site staff or the designated responsible person at the site for action. The location, type and quantity must be recorded and the Local Authority, and a competent and appropriate third party Engineer/Environmental consultant notified immediately. An approval from the Local authority must be sought prior to implementing any proposed mitigation action.

The discovery strategy must remain on site at all times and must demonstrate a clear allocation of responsibility for reporting and dealing with contamination. A copy of the strategy must be placed on the health and safety notice board and /or displayed in a prominent area where all site staff are able to take note of and consult the document at any time. Any member of the workforce entering the site to undertake any excavation must be made aware of the potential to discover contamination and the discovery strategy.

The following appendices complete this report:

- Appendix A- Field Work-Logs
 - Appendix B- Geotechnical Laboratory Analysis
 - Appendix C- Chemical Laboratory Analysis
 - Appendix D- Human Health Assessment Criteria
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