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Environmental Protection & Nuisance
Reading Borough Council
Civic Offices
Bridge Street
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Dear Ross

Former Gas Works, Gas Works Road, Reading RG1 3EQ – Summary of Remediation Strategy

The purpose of this letter is to provide a summary of the remediation strategy for the Former Gas Works, Gas Works Road, Reading RG1 3EQ (“the site”).

Background

It is proposed to redevelop the site for residential use with gardens. Wardell Armstrong (WA) has prepared the following reports to enable assessment of the suitability of the site for residential development:

- Phase 1 Geo-Environmental Desk Study report dated August 2017 (ref. LO10488/RPT-001);
- Phase 2 Interpretative Site Investigation Report dated December 2017 (ref. LO10488/RPT-002);
- Detailed Quantitative Risk Assessment and Remediation Strategy Report dated February 2018 (ref. LO10488/RPT-003).

A conceptual site model summarising the source-pathway-receptor linkages for human health and controlled water receptors was developed based on the results of desk study research and intrusive site investigations.

Human Health

Contaminants of Concern (COC) for human health identified in soils at the site were chromium, lead, mercury, TPH (aromatics >EC10-EC12, >EC12-EC16, >EC16-EC21, >EC21-



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EC35) and PAH (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene). Detailed quantitative risk assessment (DQRA) for human health indicated that a clean cover pathway break, with imported clean soil used in all landscaped areas of the site and the single private garden, could be used to effectively sever the identified pathways.

Gas risk assessment identified a low risk to the proposed development and future occupiers from ground gas that will require mitigation in the form of gas protection measures.

Controlled Waters

COC identified in groundwater at the site were mercury, ammonium, cyanide, benzene, TPH (aliphatics >C12-C16, >C16-C21, >C21-C35, Aromatics >EC5-EC7, >EC7-EC8, >EC8-EC10, >EC10-EC12, >EC12-EC16, >EC16-EC21) and PAH (benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, acenaphthene, anthracene). The DQRA undertaken indicated that the majority of the COCs identified do not pose a significant risk to the key controlled water receptor (i.e. the River Kennet adjacent to the site). There is a potential for leaching of mercury, ammonium and cyanide from soils and mitigation in the form of betterment is recommended.

Remediation Strategy

Following the DQRA for human health and controlled waters a remediation strategy was developed for the site. As identified in the Detailed Quantitative Risk Assessment and Remediation Strategy Report, the following main works elements required in order to remediate the site for redevelopment will be:

- Where applicable careful removal of buried floor slabs (including the floor slabs to buildings to be retained), areas of concrete hardstanding and substructures;
- Processing by crushing with appropriate management controls of suitable materials generated from the removal of floor slabs etc. to a 6F1 / 6F2 grade aggregate for reuse during reinstatement and in the future development at the site;
- Additional testing of materials beneath the former slab areas etc., as necessary, that exhibit olfactory or visual evidence of contamination;
- Grossly impacted materials may require removal and treatment;
- Establishment of appropriate environmental monitoring;
- Site controls and safe working procedures to limit release of contaminated dust that could include asbestos fibres during earthworks and minimise the risk to site workers and the wider public;



- Pumping out and treatment of any perched water within excavations required to remove substructures and / or contamination;
- Monitoring of existing boreholes during remediation works;
- Placement of a clean cover pathway break incorporating a low permeability layer to reduce infiltration in areas of landscaping and gardens;
- Installation of gas protection measures within the building footprint;
- Instigation of a watching brief to identify areas of previously unidentified contamination.

These elements of work are outlined below. A remediation specification with details of the exact methods to be employed to remediate the soils and groundwater will be produced by the specialist remediation contractor once the proposed remediation strategy has been agreed with the Local Authority.

Removal of Substructures

Redevelopment works will include the removal of buried floor slabs (including the floor slabs to buildings to be retained), areas of concrete hardstanding and other substructures. If during these works materials are encountered that exhibit olfactory or visual evidence of contamination additional testing of the materials will be undertaken. Grossly impacted materials may require removal and treatment (see “Excavation of Unexpected Contamination” below).

Pump and Treat (Perched Water within Excavations)

Any perched water encountered within excavations required to remove substructures and / or unexpected contamination will be pumped from the excavation utilising submersible pumps. The water will be treated through an on site treatment plant as required. Free phase product can be removed through a series of oil/water separation systems and dissolved contaminants can be removed from the water using filtration media or by chemical methods. The treated water could then be disposed of either to sewer or re-infiltrated into the ground.

Clean Cover Pathway Break

This involves the placement of an uncontaminated material (clean cover) over the surface of the contaminated materials therefore breaking the pathway between the source and the site end-users. Clean cohesive materials sourced from an off-site source, will be used to construct the clean cover pathway break which will be at least 300mm thick with a maximum permeability of $1 \times 10^{-7} \text{m/s}$.

The clean cover will be used in all landscaped areas of the site and the single private garden to effectively mitigate against risks to end users from contamination within the soils. The



clean cover pathway break will comprise low permeability materials to reduce infiltration in areas of landscaping and gardens providing additional protection to groundwater.

Gas Protection Measures

The ground gas assessment included in the Detailed Quantitative Risk Assessment and Remediation Strategy Report identified that the site lies within Characterisation Situation 2 (CS2). This characteristic situation is typical of made ground, and will require low level gas protection measures. The composition and arrangement of the gas protection measures would be subject to detailed design by the foundation engineers and separate approval by the Local Authority.

Excavation of Unexpected Contamination

A watching brief will be instigated to identify areas of previously unidentified contamination. If materials are encountered that are suspected of being grossly impacted, via visual or olfactory assessment, these materials will either be removed and treated as grossly impacted or tested so that they can be classified for appropriate re-use on the site.

Where identified, soils grossly impacted with TPH will be excavated under the supervision of a suitably experienced environmental engineer. Impacted soils will be excavated until the contamination has been removed based on visual / olfactory evidence which can be aided by the use of a PID (Photo-Ionisation Detector). Validation samples will then be collected to illustrate that the remedial targets have been achieved. The remedial target for TPH will be set at the SSACs defined in the Detailed Quantitative Risk Assessment and Remediation Strategy Report. Excavations required to remove unexpected contamination could also be treated with chemical oxidation compounds, where appropriate.

It will be necessary to reinstate all excavations completed as part of remediation works together with other voids created by the removal of substructures, obstructions etc. by backfilling works. Secondary aggregate, produced from the crushing of concrete, together with uncontaminated soils from reprofiling could be used for reinstatement of excavations and voids.

Environmental Monitoring and Validation Reporting

The remediation contractor will be responsible for undertaking environmental monitoring throughout the remediation works including monitoring of existing boreholes. Records will need to be maintained for all the environmental monitoring activities undertaken throughout the works. Upon completion of the remediation works a validation report will be produced for the approval of the regulators.

**Conclusion**

Following DQRA for human health and controlled waters a remediation strategy was developed for the site. The remediation strategy is outlined above and a detailed remediation specification will be produced by the specialist remediation contractor once the proposed remediation strategy has been agreed with the Local Authority.

You have indicated in our recent discussions, that submission of our Detailed Quantitative Risk Assessment and Remediation Strategy report plus the summary of the remediation scheme described herein, should allow you to provide a partial discharge of Condition 6. The remaining parts of condition 6 (timetable of works and site management procedures) can be provided once the approach to remediation has been approved by you.

Yours sincerely

for Wardell Armstrong LLP

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