Widnes 3MG Biomass Combined Heat Power (CHP) Plant

Widnes, Halton
Burmeister and Wain Scandinavian Contractor A/S (BWSC)

Environmental Statement
Chapter 12
Ground Conditions & Hydrogeology
Chapter 12 Contents

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Appendix 1 Remediation Strategy
12 Ground Conditions & Hydrogeology

12.1 Introduction

12.1.1 This chapter of the ES assesses the effects that may arise from the Proposed Development due to the current ground conditions, geology, hydrogeology and land contamination. The chapter describes the assessment methodology; the baseline conditions currently existing at the Application Site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

12.2 Legislation and Policy Context

12.2.1 Environmental legislation implemented as either Acts or Regulations provides separate legislative drivers to manage contamination. Whilst the environmental legislation is separate to National Planning Policy Framework (NPPF) (Ref. 12.1) it generally incorporates consistent requirements. The main legislative drivers for managing risks to human health and the environment from land contamination, are:

- Part IIA of the Environmental Protection Act (1990) (Ref. 12.2);
- Contaminated Land (England) Regulations (2006) (Ref. 12.3);
- Groundwater Regulations, 1998 (Ref. 12.4);
- Water Resources Act (1991) (Ref. 12.5);
- Environment Act (1995) (Ref. 12.6); and

12.2.2 In general terms the legislation advocates the use of a risk assessment approach to assessing contamination and remedial requirements. The Building Act 1984 (Ref. 12.8) and the Building Regulations 2000 (Ref. 12.9) are the two key legislative drivers when considering structural and design aspects of a development in terms of geotechnical properties of the ground and the presence of ground gas.

National Policy and Legislation

National Planning policy Framework (2012)

12.2.3 The National Planning Policy Framework sets out the Governments planning policies for England and how these are expected to be applied. The document was published in March 2012 and replaces all of the Planning Policy Statements (PPS’S) and Planning Guidance Notes (PPG’s), with the exception of PPS10 (Planning for Sustainable Waste Management) which will be replaced by the National Waste Plan for England which will be published later this year.

12.2.4 With respect to pollution and contamination Paragraph 109 states that the planning system should contribute to and enhance the natural and local environment by:

- Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and
• Remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

12.2.5 Paragraph 111 states that planning policies and decisions should encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value.

12.2.6 Paragraph 120 states that to prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

12.2.7 Paragraph 121 states Planning policies and decisions should also ensure that:

• the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;

• after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and

• adequate site investigation information, prepared by a competent person, is presented.

Local Policy and Legislation

Halton Unitary Development Plan

12.2.8 The Halton Unitary Development Plan (2nd deposit) was published in 2008 (Ref. 12.23).

12.2.9 The Halton Unitary Development Plan includes a number of policies that relate to ground conditions and contamination. The key policies are:

• Policy S6: Re-use and remediation of previously used or contaminated land, states that "the reclamation of derelict, contaminated and previously used land for safe and appropriate beneficial afteruses will be positively encouraged and permitted".

• Policy PR6: Land Quality, states that development will not be permitted if it is likely to cause contamination of the soil or sub-soil on a development site or on surrounding land uses as a result of pollution. This includes consideration of:
  o The unacceptable effects of deposits and emissions.
  o Whether development, through its potential to pollute, is likely to have a serious impact upon investment confidence.
  o The risk of damage to health.

• Policy PR13 Vacant and Derelict Land(?), states that development and reclamation of derelict and vacant land will not be permitted unless reclamation/ decontamination works are carried out to ensure the safety and health of people and the environment on and around the land.
Policy PR14 Contaminated Land, states that before determining any planning applications for development on or adjacent to land which is known or suspected to be contaminated, the applicant will be required to satisfy all of the following:

- Submit details to assess the nature and degree of contamination (type, degree and extent of contamination).
- Identify remedial measures required to deal with any hazard to safeguard future development and neighbouring uses.
- Submit details of a programme of implementation for the roll out and completion of mitigation measures to be agreed with the Council.
- The requirement to undertake the above work will be controlled by either planning conditions or, when necessary, by planning obligations.

**Halton Borough Council Contaminated Land Inspection Strategy**

12.2.10 The Halton Borough Council Contaminated Land Inspection Strategy (Ref 12.10) was created in 2003. The aims of the strategy include:

- to approach land contamination issues in a rational ordered and efficient manner, with planned and appropriate allocation of resources;
- to assess land within Borough for the purpose of identifying potentially contaminated sites;
- to identify any land where contamination is causing an unacceptable risk to human health and/or the environment;
- to return land identified as having an unacceptable risk to a condition where such unacceptable risk no longer exists;
- to ensure that land is made suitable for any new use i.e. planning permission has been granted;
- to assist in the "recycling" of previously developed land;
- to ensure that adequate arrangements exist to liaise internally and externally with appropriate stakeholders and regulatory bodies; and
- to ensure that the best practicable techniques are employed to return land to a condition where identified unacceptable risks no longer arise.

**Discussion**

12.2.11 Various policies and legislation provide an overall drive toward the investigation and remediation of potentially contaminated land through development. The assessment of any contamination is to be undertaken using a risk assessment approach consistent with the nature of the proposed end use. Contamination is addressed at the site such that after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990. There is the requirement to consider ground stability issues such that it can be demonstrated that a site is suitable for its intended use.

12.2.12 Redevelopment of previously developed land must:

- Take into account the regulatory context of a site and proposed development;
• Provide information that is fit for purpose; and

• Be in accordance with UK legislation, policy and guidance.

12.2.13 An environmental assessment of the condition of a site should not only consider the potential receptors (i.e. human health and controlled waters) but, in line with best practice, also includes a review of the relevant legislation and planning policy that applies to the site and surrounding environment.

12.3 Assessment Methodology

Relevant Guidance

12.3.1 The assessments undertaken in relation to the Assessment Site have taken consideration of best practice guidance, including but not limited to:

• BS10175:2011 Code of Practice for Investigation of Potentially Contaminated Sites (Ref. 12.11);

• Model Procedures for the Management of Contaminated Land, Contaminated Land Report 11, Environment Agency, 2004 (Ref. 12.12);

• Contaminated Land Exposure Assessment (CLEA) Guidelines (Ref. 12.13).

• The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd Edition), July 2009 (Ref. 12.14); and

• Surface water Environmental Quality Standards (EQS), UK Drinking Water Standards (Ref. 12.15).

Consultations

12.3.2 To support the assessments undertaken by RPS a formal scoping process was undertaken to obtain feedback from the regulators. Details of the formal scoping are presented below.

The Formal Scoping Process

12.3.3 An Environmental Impact Assessment Scoping Report (Ref 12.16) was issued by RPS in February 2012 to the relevant regulators.

12.3.4 In relation to ground conditions, the scoping report suggested an assessment of baseline conditions and impact on these conditions based on a review of available data. There are numerous reports characterising the ground conditions of the wider area but the creation of a Summary Report with data specific to the site was suggested. Where this Report suggested further site investigation was required to gain further understanding of ground conditions this should be undertaken.

12.3.5 In relation to hydrology, the scoping report suggested a desk top study, a site walkover, conceptual surface water drainage strategy and flood risk assessment should be undertaken.

Responses

12.3.6 Responses to the scoping report were received from the Environment Agency and Halton Borough Council.

12.3.7 The Contaminated Land Officer from the Council commented on a need to include all relevant information relating to the site. This is the case with any further work on site forming part of the remedial strategy proposed.
12.3.8 The planning liaison officer from the Environment Agency commented on a need to follow the CLR11 methodology for risk management and the Environment Agency Guiding Principles for Land Contamination. The following is presented with these comments in mind.

**Methodology**

12.3.9 Determination of the baseline conditions at the Assessment Site have been established through:

- RPS Summary Report February 2012 (Ref. 12.17) which summarised the findings of the following investigation and assessments:
  - Fairhurst, January 2012. Environmental Statement, Expansion of Stobart Park / 3MG, Widnes. Reference: 89429 (Ref. 12.18);

12.3.10 In addition to the above information, a remedial strategy was produced by Earth and Marine Environmental (EAME) Limited in 2012, titled Remediation Strategy, In accordance with CL:AIRE Industry Code of Practice, Proposed CHP Biomass, Stobart Park, Widnes was considered (Ref 12.21 – Appendix 12.1). This document details further targeted intrusive investigation undertaken at the Assessment Site. This Remedial Strategy covers all other site assessments and should be considered the key reference document.

12.3.11 The previous site investigations have by their nature necessitated the collection of soil, groundwater and surface water samples over many years to build up a detailed knowledge of the wider site conditions.

**Assessment of Significance**

12.3.12 After establishing the baseline conditions, the likely significance of effects of the Proposed Development in relation to ground conditions were determined from:

- Evaluation of the potential effects of the Proposed Development and the effect these could have on the baseline conditions;
- Evaluation of the significance of these effects through consideration of the sensitivity of conditions, and determination of the magnitude of the effects (adverse and beneficial);
- Identification of measures to mitigate against any potential adverse effects resulting from the Proposed Development; and
- Identification of residual effects following the implementation of mitigation measures.

12.3.13 In order to assess the significance of the impacts the following definitions of potential significance have been assumed as follows:

- Neutral - No significant effects
- Minor - Not noteworthy or material – impacts are of low magnitude and frequency
- Moderate - Noteworthy, material – impacts are of moderate magnitude and frequency
- Major - Impacts are likely to be of high magnitude and frequency with quality standards being exceeded at times
- Substantial - Impacts will be of a consistently high magnitude and frequency.

**Cumulative Impacts**

12.3.14 Cumulative effects relating to adjacent developments have been considered with the assessment, where they are considered to impact hydrogeology and or ground conditions.

**Context of the Assessment**

12.3.15 The assessment is based on the information available at the time of production and relies on a number of reports. The assessment of impacts presented, subsequent mitigation and residual impacts are assessed on the basis that the methodology presented within the EAME Limited in 2012 report (Ref. 12.21) will be implemented at the site addressing the risks to controlled waters and human health.

**12.4 Baseline Conditions**

12.4.1 The baseline conditions at the Assessment Site are detailed within the Remediation Strategy report (12.21) and are represented below.

**Site Description**

12.4.2 A full description of the Assessment Site is presented within Chapter 2. This section presents the details relevant to the assessment of ground conditions.

12.4.3 The Biomass Site was previously used for storage and distribution uses which have now been cleared.

**Geology**

12.4.4 The geological map for the area (BGS Sheet 97, Ref. 12.22) indentifies that the Assessment Site is directly underlain by Marine and Estuarine Alluvium, with the tidal zone of the River Mersey within this area. The published records further identify that the Superficial Deposits are underlain by bedrock of the Wilmslow Sandstone Formation (formerly known as the Upper Mottled Sandstone) of the Triassic Sherwood Sandstone Group.

12.4.5 Although not represented on the geological maps, it is considered likely that fluvio-glacial deposits underlie the Tidal Flat Deposits. These comprise glacial clay with sand horizons being present.

12.4.6 Historical site investigation works have identified Made Ground above the Alluvium and Glacial Till and Glacial Sand and Gravels between the Alluvium and Sandstone bedrock in the areas adjacent to the Application Site. The investigation works within the Application Site have confirmed this sequence at one location within the Application Site.

**Hydrology**

12.4.7 The nearest surface water feature is Steward’s Brook which is located adjacent to the western and north western boundaries of the Assessment Site.

12.4.8 Steward’s Brook combines with Ditton Brook to the south of the Assessment Site, as it flows towards the River Mersey to the south.

12.4.9 The Mersey Estuary, south of the Assessment Site, is designated as a Site of Special Scientific Interest.
Hydrogeology

12.4.10 The Environment Agency (EA) classifies the Tidal Flat Deposits as a secondary (undifferentiated) aquifer with soils of high leaching potential. The underlying bedrock, the Wilmslow Sandstone Formation, is classified as a Principal aquifer.

12.4.11 There are no groundwater Source Protection Zones identified within the Assessment Site area.

12.4.12 There is a groundwater abstraction borehole on the West Bank Dock Estate for Other Industrial/Commercial/Public Services and General Use. It is unclear whether this abstracts water from the sandstone or superficial deposits.

12.4.13 Table 12-1 below summarises the groundwater bodies at the Site identified by intrusive investigations.

<table>
<thead>
<tr>
<th>Table 12-1 Groundwater Bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Body</td>
</tr>
<tr>
<td>I – Perched Water</td>
</tr>
<tr>
<td>II – Sand/Silt Lenses (alluvial)</td>
</tr>
<tr>
<td>III – Glacial Till Water</td>
</tr>
<tr>
<td>IV – Sherwood Sandstone Aquifer</td>
</tr>
</tbody>
</table>

Potential Contamination Sources

12.4.14 Potential sources of contamination at the Assessment Site that are considered to have the potential to have lead to noteworthy contamination are detailed within Table 12-2 below.
**Table 12-2 Summary of Potential Contamination Sources**

<table>
<thead>
<tr>
<th>Potential Source</th>
<th>Potential Contamination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Made Ground comprising galligu chemical waste,</td>
<td>Metals (including arsenic and lead), PAHs, TPH, sulphate, sulphide, asbestos and ground gas</td>
</tr>
<tr>
<td>black ash, slag and other waste materials.</td>
<td></td>
</tr>
<tr>
<td>Historical use of Above Ground Oil Storage Tanks</td>
<td>Various oils including diesel, transmission oil, Castrol GTX, nitromethane.</td>
</tr>
<tr>
<td>Historical storage of drums and containers</td>
<td>Various oils including diesel, transmission oil, Castrol GTX. Chemicals.</td>
</tr>
<tr>
<td>Historical use of heavy goods vehicles</td>
<td>Leakage of oils, e.g. diesel from vehicles.</td>
</tr>
<tr>
<td>Marine and Estuarine Alluvium</td>
<td>Ground gas</td>
</tr>
</tbody>
</table>

**Summary**

12.4.15 The summary of the information present on the site has revealed that the site has a significant amount of made ground and that this predominantly comprises galligu. Testing of the galligu has indicated that this is contaminated to varying degrees with some inorganic parameters, (sulphur compounds, high pH, arsenic and lead predominantly). Additionally ground gas monitoring has identified elevated gas concentrations with limited flows, consistent with the identified gas sources (made ground materials and the marine and estuarine alluvium).

12.4.16 Groundwater sampling and monitoring has shown that the same compounds, with the exception of lead, are present within the water at concentrations that are above screening values. In addition, ammonium and cyanide compounds are present within the water at concentrations greater than the screening values, with other metal compounds (mercury, nickel and chromium) encountered.

12.4.17 The groundwater shows a similar pattern of contamination to the soils. It is also noted that there are multiple groundwater bodies and there may be interactions between these and the local surface waters (including the Mersey Estuary).

**12.5 Identification and Evaluation of Key Impacts**

**Site Construction**

12.5.1 The likely significance of effects that may arise on-site through construction activities are outlined below. All construction works have the potential to generate the following potential effects relevant to this assessment:

- Exposure of construction workers to widespread soil contamination;
- Mobilisation of any existing contamination through piling and excavation works;
- Creation of new areas of contamination e.g. through spillage; and
- Alteration of groundwater flow regime.

*Exposure of Construction Workers*

12.5.2 During construction, workers at the Assessment Site may be exposed to contaminants in soils and groundwater through ingestion, dermal contact or inhalation of volatiles or dust particles. Elevated concentrations of contaminants (arsenic and lead) above current screening criteria have been identified within soils at five locations at the Site to date. As is always the case, in the development of a site there is...
potential for areas of previously unidentified contamination to be present. Without mitigation the likely significance of effect is considered to be moderate.

*Mobilisation of Existing Contamination*

12.5.3 Construction activities at the Assessment Site may lead to the generation of dust that may be inhaled and ingested by construction workers and adjacent site users, as it migrates offsite. Due to the levels of contaminants at the Assessment Site, dust generated from ground disturbance during construction is unlikely to be harmful and therefore the likely significance of the effect is considered minor.

12.5.4 Construction activities may result in the mobilisation of contaminants within the soil and the creation of a pathway for contaminants to migrate to underlying groundwater and subsequent migration into surface water. An initial review of the ground conditions suggests that some structures will have piled foundation that may mobilise contamination that is present within the made ground and underlying deposits. The groundwater regime at the site is complicated and piled foundations are likely to extend through the shallow Secondary Aquifer and into the deep Principal Aquifer. When considered together the likely significance of this effect is considered moderate without appropriate mitigation.

*Creation of New Areas of Contamination*

12.5.5 During any construction works there is the potential for accidental spillage. The main source of potential spillages is considered to be from construction plant (including fuelling, maintenance, breakdown etc) and the storage of construction materials on site. The magnitude of the effect on the land, surface waters, and groundwater due to accidental spillage of contaminated materials will be dependant on the nature, frequency and size of the spillage and the sensitivity of the receptor. The superficial geology beneath the Assessment Site is classified as a secondary (undifferentiated) aquifer with soils of high leaching potential. The underlying bedrock, the Wilmslow Sandstone Formation, is classified as a Principal aquifer. Given the nature of the development it is considered that only small volumes of potentially hazardous material will be stored onsite at any one time during construction, minimising the potential for a significant contamination event. Consequently, the likely significance of the effect is therefore considered to be minor to moderate.

*Alteration of Groundwater Flow Regime*

12.5.6 During construction at the Assessment Site it is possible that the groundwater regime may be altered affecting groundwater flows and surrounding surface water features. Minor ground alterations during the construction phase may be associated with construction of foundations proposed at the Application Site. Additionally the placement of hardstanding will limit infiltration. There are a number of surface water features in close proximity to the Assessment Site that may be affected if the groundwater levels are impacted by the Proposed Development. These include Stewards Brook and Ditton Brook as ‘main river’ watercourses and the River Mersey that within this section is not designated as a ‘main river’. Groundwater flow beneath the Assessment Site is complicated as it is tidally influenced and is also affected by a sheet piled wall along the length of Stewards Brook. Groundwater flow is likely to be affected by the construction but the likely significance of the effect is considered to be minor.

*On Completion*

12.5.7 Effects likely to arise on-site during operation are outlined below:

- Exposure of occupants and site visitors to any contamination;
- Exposure of occupants and visitors to ground gas;
- Impact to controlled waters from contamination; and
- Alteration of Groundwater Flow Regime.
Exposure of Occupants and Site Visitors to Contamination

12.5.8 There is a potential for end users to be exposed to contamination that may be present at the Assessment Site through incidental soil ingestion, dermal contact, inhalation of volatiles and dust particles. The magnitude of this effect will be dependent on the severity of contamination that is present at the Assessment Site and the proposed end use. The Proposed Development comprises a biomass plant development site. This is considered a low sensitivity end use with hardstanding present over the majority of the site. Consequently the likely significance of effect is considered to be minor to moderate.

Exposure of occupants and visitors to ground gas

12.5.9 During occupation of the Assessment Site end users may be exposed to ground gases that may accumulate in buildings, and in exceptional circumstances lead to a risk of explosion (methane) on asphyxiation (carbon dioxide). An assessment of the identified flow rates and concentrations has concluded that mitigation measures are required for the Proposed Development with regard to gas. Based upon the findings of the ground investigation, the significance of effect without mitigation is considered to be moderate.

Impact on Controlled Waters

12.5.10 Contamination present at the Assessment Site has the potential to impact upon controlled waters. The magnitude of this effect will be related to the severity of contamination at the Assessment Site, its proximity to sensitive controlled waters receptors and pathways that may be introduced as a result of the redevelopment. As previously stated the Assessment Site is contaminated. Advancement of piled foundations will create pathways to groundwater, especially the deeper Principal Aquifer. When considered together with the nearby controlled water receptors the significance of this effect is considered to be moderate.

Alteration of Groundwater Flow Regime

12.5.11 The Proposed Development may alter the groundwater movements through construction of underground structures and through increases / decreases in hardstanding at the Assessment Site. The magnitude of this effect is related to the ground conditions at the Assessment Site, proximity of water features and extent of below ground structures (pavements / foundations etc) and increases in hardstanding affecting infiltration. There are a number of small surface water features in close proximity to the Assessment Site that may be affected if the groundwater levels are impacted by the Proposed Development. The Proposed Development will lead to an increase in hardstanding reducing infiltration that may slightly alter groundwater levels and piles will create pathways to groundwater. The likely significance of the effect is therefore considered as minor.

Cumulative Impacts

12.5.12 Following this assessment, any identified requirement for remediation should be completed prior to the start of, or as a justified part of, the construction phase. Accepting that the land proposed for site development is adequately assessed, remediated and mitigated as proposed in the Remedial Strategy, it is considered that there will be no measurable adverse cumulative effects. The scheme forms part of a larger redevelopment of the West Bank Dock estate in Widnes that includes mitigation of controlled waters risk through delivery of a remediation scheme. Delivery of the overall scheme will have a net beneficial impact leading to an improvement in groundwater.

12.6 Design Response and Mitigation

12.6.1 The mitigation measures relating to the identified potential effects are discussed in relation to the construction and operational phases of the Proposed Development.

Site Preparation
Exposure of Construction Workers to Contamination

12.6.2 The potential effect associated with the exposure of construction workers to contamination will be mitigated through:

- Use of Personal Protective Equipment (PPE);
- Establishment of appropriate washing and welfare facilities for construction workers;
- Appropriate briefing of site staff;
- Implementation of personal hygiene protocols;
- Damping down of exposed formations and stockpiles during dry conditions;
- Restriction of works which are likely to generate dusts during windy conditions; and
- Wheel washing of vehicles leaving the site.

12.6.3 Should previously unidentified contamination be encountered during the construction work the contamination will be characterised such that safe system of work (SSoW) can be developed and implemented to ensure construction workers are adequately protected. The SSoW will include task based risk assessment and method statements.

Mobilisation of existing contamination

12.6.4 The potential effect associated with the mobilisation of contaminated dusts during construction, and their effect upon adjacent land users and surface water will be mitigated through the following:

- Damping down of exposed formations and stockpiles during dry conditions;
- Appropriate location of stockpile away from sensitive receptors;
- Restriction of works which are likely to generate dusts during windy conditions;
- Wheel washing of vehicles leaving the site; and
- Creation of temporary haul roads away from sensitive receptors.

12.6.5 The potential effect associated with the mobilisation of contaminated soils and groundwaters during construction effecting controlled waters or across contamination of materials will be mitigated through:

- The control of waters entering any excavation;
- The pumping and disposal of any groundwater entering deep excavations to foul sewer or to surface water following appropriate treatment with the appropriate consent in place, if required;
- The periodic inspection of excavations to identify significant water build up and the implementation of measures to prevent water flow from excavations;
- Periodic inspection of excavations to identify contamination, and allow its removal prior to deepening of excavations;
- Stockpiling of materials (contaminated or otherwise) away from watercourses; and
• Covering of stockpiles to prevent leaching of contaminants, where this is evidence that the stockpiles may contain contaminated material.

*Creation of new areas of contamination*

12.6.6 The potential effect associated with the accidental spillage of site process materials will be mitigated through appropriate storage and handling of materials in designated areas, with appropriate infrastructure and drainage systems in place. Any chemical and material storage on the Application Site will be undertaken in accordance with the Environment Agency guidance in order to avoid pollution.

12.6.7 The potential effect associated with accidental spills from vehicles and construction material will be minimised through the following control measures:

• Regular servicing and inspection of vehicles used on-site; and

• The restriction of refuelling of vehicles to bunded areas underlain by hardstanding, or other impermeable materials.

*Operation*

12.6.8 The mitigation measures relating to the identified potential effects are discussed in relation to the operational phase of the Proposed Development

*Exposure of Future Site Users to Contamination*

12.6.9 The potential effect associated with the exposure of site users and visitors to contamination that may be present within soils and groundwater will be mitigated through implementation of the Remediation Strategy prepared by Earth and Marine Environmental (EAME) Limited in 2012. The strategy will comprise:

• A Materials Management Plan (MMP), developed in accordance with the CL:AIRE CoP, and which forms part of the remediation strategy;

• A Verification Plan, which forms part of the remediation Strategy, to identify how the placement of materials to be recorded and the quantity of material to be used;

• A discovery Strategy;

• Soil excavation, stock piling and redeposition/disposal;

• Galligu stabilisation and re-use;

• Excavation and treatment/disposal of hydrocarbon contaminated materials (if present);

• Groundwater abstraction/control/treatment/discharge;

• Surface water management/control/treatment/discharge;

• Confirmatory monitoring / reporting for the remedial works; and

• Production of a Verification Report upon completion.

12.6.10 For full details of the Remediation Strategy reference should be made to Appendix 12.1.
Exposure of end users to ground gas

12.6.11 Mitigation is required to protect end users from the risks posed by ground gas on completion of the development. Gas protective measures consistent with the CIRIA 665 Guidance relating to Characteristic Situation 4 should be implemented on site.

Impact to Controlled Waters.

12.6.12 The potential impacts on controlled waters will be mitigated through the measures outlined in the Remediation Strategy (see paragraph 12.6.9) that includes a piling risk assessment that determines the appropriate piling methodology to prevent the creation of vertical pathways.

12.7 Residual Impact

Construction

Exposure of Construction Workers

12.7.1 Following implementation of the proposed mitigation measures it is considered that the significance of effect relating to the exposure of construction workers to contamination will be neutral.

Mobilisation of Existing Contamination

12.7.2 Following implementation of the proposed mitigation measures it is considered that the significance of effect relating to mobilisation of contamination will be minor.

Creation of New Areas of Contamination

12.7.3 Following implementation of the proposed mitigation measures it is considered that the significance of effect relating to the creation of new areas of contamination will be neutral.

Operation

Exposure of Future Site Users and Site Visitors

12.7.4 Following implementation of the proposed mitigation measures it is considered that any unacceptable levels of contamination at the site will have been remediated and as such the significance of effect relating to the exposure of future site users to contamination will be neutral.

Exposure of occupants and visitors to ground gas

12.7.5 Following implementation of the proposed mitigation measures it is considered that the risk associated with gas at the site will have mitigated such the significance of effect will be minor adverse.

Impact to Controlled Waters

12.7.6 Following implementation of the proposed mitigation measures it is considered that any unacceptable levels of contamination at the site will have been remediated and as such the significance of effect relating to the impact upon controlled waters will be minor beneficial.
12.8 Conclusion

12.8.1 Without appropriate mitigation measures the significance of effects during construction and on completion of construction on site should be considered as minor to moderate. A range of mitigation measures have been identified that address the potential identified effects. The identified mitigation measures are well established and accepted methods of mitigating the potential effects. Following implementation of the mitigation measures it is considered the significance of effect is neutral to minor.

12.8.2 Accepting that the land proposed for site development is adequately assessed, remediated and mitigated as stated in the Remedial Strategy, it is considered that there will be no measurable adverse cumulative effects. The delivery of a remediation scheme of the wider West Bank Dock Estate will have a net beneficial impact leading to an improvement in groundwater.

12.8.3 Table 12-3 contains a summary of the likely significant impacts of the proposed development.

Table 12-3 Summary of Residual Impacts

<table>
<thead>
<tr>
<th>Resource Phase</th>
<th>Nature of Effect</th>
<th>Significance</th>
<th>Magnitude of Impact</th>
<th>Duration</th>
<th>Mitigation/ Enhancement</th>
<th>Residual Impact</th>
<th>Geographical Level of Importance of Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Exposure of construction workers</td>
<td>Moderate Adverse</td>
<td>Short term</td>
<td>Use of PPE, appropriate hygiene practices and welfare facilities</td>
<td>Neutral</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>Mobilisation of existing contamination</td>
<td>Moderate Adverse</td>
<td>Short term</td>
<td>Covering of stockpiles, damping down, wheel washing and control of waters within excavations.</td>
<td>Minor Adverse</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>Creation of new areas of contamination</td>
<td>Minor Adverse</td>
<td>Short term</td>
<td>Appropriate storage of materials, creation of hardstanding areas with drainage and servicing of vehicles</td>
<td>Neutral</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>Alteration of groundwater flow regime</td>
<td>Minor Adverse</td>
<td>No mitigation required</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Operation</td>
<td>Exposure of future site users and visitors</td>
<td>Minor Adverse</td>
<td>Long Term</td>
<td>Implementation of remedial strategy</td>
<td>Neutral</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>Impact to controlled waters</td>
<td>Moderate Adverse</td>
<td>Long Term</td>
<td>Implementation of remedial strategy</td>
<td>Minor Beneficial</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>alteration of groundwater flow regime</td>
<td>minor adverse</td>
<td>no mitigation required</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>exposure of site users to ground gas</td>
<td>moderate adverse</td>
<td>long term</td>
<td>implementation of CIRIA guidance gas protection measures</td>
<td>minor adverse</td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key: I: International  N: National  R: Regional  D: District  L: Local
12.9 References

12.1 National Planning Policy Framework (NPPF) 2012
12.2 Part IIA of the Environmental Protection Act (1990)
12.3 Contaminated Land (England) Regulations (2006)
12.4 Groundwater Regulations, 1998
12.5 Water Resources Act (1991)
12.6 Environment Act (1995)
12.7 Groundwater Directive 2006/118/EC
12.8 The Building Act 1984
12.9 Building Regulations 2000
12.11 BS10175:2011 Code of Practice for Investigation of Potentially Contaminated Sites
12.13 Contaminated Land Exposure Assessment (CLEA) Guidelines
12.15 Surface Water Environmental Quality Standards, UK Drinking Water Standards
12.17 RPS Summary Report. February 2012
12.23 The Halton Unitary Development Plan (2nd deposit), 2008