

H2Teesside Project

Environmental Statement

Volume III – Appendices

Appendix 10B: Contaminated Land Conceptual Site Model

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The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended)

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(a)



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10B.0 CONTAMINATED LAND CONCEPTUAL SITE MODEL

10B.1 Introduction

10B.1.1 This appendix identifies possible risks, if any, arising from substances used or deposited at the Proposed Development Site, or from other sources of land contamination. Both past and current potentially contaminative land uses have been considered.

10B.2 Assessment Framework

10B.2.1 Current legislation relating to contaminated land in the UK is contained within Part 2A of the Environmental Protection Act 1990 (Defra, 1990), which was inserted by Section 57 of the Environment Act 1995 (HM Government, 1995) and by Section 86 of the Water Act 2003 (HM Government, 2003) and elaborated within the Contaminated Land (England) Regulations 2006 [S.I. 2006/1380] (amended 2012 [S.I. 2012/263]) (HM Government, 2012).

10B.2.2 The “suitable for use” approach is adopted for the assessment of contaminated land. Remedial measures are only undertaken where unacceptable risks to human health or the environment are realised, taking into account the use (or proposed use) of the land in question and the environmental setting.

10B.2.3 Current best practice recommends that the determination of health hazards due to contaminated land is based on the principle of risk assessment, as outlined in Part 2A of the Environmental Protection Act 1990 (Defra, 1990).

10B.2.4 The risk assessment process for the environmental contaminants is based on a source-pathway-receptor analysis. These terms can be defined as follows:

- source: Hazardous substance that has the potential to cause adverse impacts;
- pathway: Route whereby a hazardous substance may come into contact with the receptor. Examples include ingestion of contaminated soil and leaching of contaminants from soil into watercourses; and
- receptor: Target that may be affected by contamination. Examples include human occupants / users of Sites, water resources (surface waters or groundwater), or structures.

10B.2.5 For a risk to be present, there must be a viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

10B.2.6 The following sections detail the conceptual site model, which has been developed for the Proposed Development Site with the view to assessing the potential risks during construction and upon completion of the proposed new development.

10B.3 Potential Sources of Contamination

10B.3.1 This section highlights those former/current onsite and off-site activities that have been identified as potential sources of contamination. These activities may have in turn impacted on soil, soil leachate, and groundwater. A summary of the potential

sources of contamination is presented in Table 10B-1 based on the findings of the Summary Report (Environmental Statement (ES) Volume III, EN070009/APP/6.3).

Table 10B-1: Potential Sources of Contamination

SOURCE	DESCRIPTION	ASSOCIATED CONTAMINANTS OF POTENTIAL CONCERN
Main Site		
Made Ground associated with historical land use (onsite / offsite)	Former iron and steel works including coke making, steel making, casting and rolling and finishing, tramway, railway, sidings, tanks (ammonia liquor, tar), infilled ground, slag, substations, refuse tips, sand pit potential fill material, infilled tar pit.	Heavy metals and inorganics including sulphate, pH, Total Petroleum Hydrocarbon (TPH), Polycyclic Aromatic Hydrocarbons (PAH), Semi Volatile Organic Compounds (SVOCs), Volatile Organic Compounds (VOCs), Polychlorinated biphenyls (PCBs), phenols, coal tar, clinker, ash, alkalis, acids asbestos, and Asbestos Containing Materials (ACMs).
Made Ground associated with current land use (onsite / offsite)	Construction and demolition works, and bulk materials storage.	Heavy metals and inorganics including sulphate, pH, TPH, PAH, SVOCs, VOCs, phenols, coal tar, clinker, ash, alkalis, acids asbestos, and ACMs.
Bulk Soil Gases	Methane and carbon dioxide generated from Made Ground and natural deposits.	Methane, carbon dioxide, hydrogen sulfide and VOCs.
Connection Corridors		
Made Ground associated with historical land uses (on / offsite)	Unspecified Heaps, Tramways Sidings, Unspecified Tanks, Slag and Tar Macadam Works, Railway Sidings, Oxygen Works, Unspecified Warehouses, Corporation Yards, Unspecified Factories, Chimneys, Old Clay Pits, Cuttings, Brick Works, Electricity Substations, Salt Works, Power Station, Engine Shed, Fire Station, Mortuary, Disused Brine Wells, Oil Storage Depot, Cemetery, Smithy, Bedding Works, Rifle Ranges, Telephone Exchange, Electricity Switch House, Gas Handling Station, Tunnel, Oil Refinery, Oil Terminal, Oil Supply Terminal, Slag Wool Works, Dock, Transit Shed and Terminal.	Heavy metals and inorganics including sulphate, pH, Total Petroleum Hydrocarbons (TPH), Semi-volatile organic compounds (SVOCs), Volatile Organic Compounds (VOCs), asbestos and asbestos containing materials (ACMs).

SOURCE	DESCRIPTION	ASSOCIATED CONTAMINANTS OF POTENTIAL CONCERN
Waste and Landfill (onsite / offsite)	Active or recently closed landfill (under EA regulation) taking special waste, historical landfills and various licensed waste management facilities.	Heavy metals, Polycyclic Aromatic Hydrocarbons (PAH), TPH, SVOCs, VOCs, acids, alkalis, inorganics (e.g. sulphate), pH, asbestos, landfill gases, ACMs and contaminated leachate.
Made Ground associated with current land use (onsite / offsite)	Construction and demolition works, and bulk materials storage. (Areas in and around South Tees Development Corporation (STDC)).	Heavy metals and inorganics including sulphate, pH, TPH, PAH, SVOCs, VOCs, phenols, coal tar, clinker, ash, alkalis, acids asbestos, and ACMs.

10B.4 Potential Receptors

10B.4.1 Table 10B-2 lists the potential receptors at the Main Site and Connection Corridors.

Table 10B-2: Potential Receptors

POTENTIAL RECEPTOR	DESCRIPTION
Main Site	
Onsite Human Health	Construction Workers
Onsite Human Health	Future Site Users – Trespassers and Site Visitors
Onsite Human Health	Future Site Users – Workers / Maintenance
Offsite Human Health	Adjacent Site Users i.e. during excavation / remediation / earthworks
Onsite Controlled Waters (Superficial Aquifers)	Secondary A Aquifer (Tidal Flat Deposits (Sand and Silt) and Glaciolacustrine Deposits (Silt))
Onsite Controlled Waters (Superficial Aquifers)	Secondary Undifferentiated Aquifer (Till and Tidal Flat Deposits (Sand, Silt and Clay))
Onsite Controlled Waters (Superficial Aquifers)	Unproductive Aquifer (Glaciolacustrine Deposits (Clay))
Onsite Water Environment (Bedrock Aquifers)	Secondary B Aquifer (Mercia Mudstone Group and the Penarth Group)
Onsite Controlled Waters (Bedrock Aquifers)	Secondary Undifferentiated Aquifer (Redcar Mudstone Formation and Penarth Group)
Onsite / Offsite Controlled Waters (Surface Water)	Ponds (onsite and >250 m north)
Offsite Controlled Waters	River Tees and North Sea
Onsite / Offsite Flora	Plants, trees and soft landscaping
Offsite Fauna	Fish or microbial life in the Streams
Onsite Buildings and Infrastructure: Concrete	Future proposed services at the Site may be impacted by contamination in the ground. In particular, any existing concrete foundations if the groundwater has high sulphate levels.
Onsite Buildings and Infrastructure: Structures	Proposed structures may be impacted by accumulations of ground gases.
Onsite Buildings and Infrastructure: Services	Potable water supply pipes and other services.
Connection Corridors	
Onsite Human Health	Construction and Maintenance Workers (All Corridors)

POTENTIAL RECEPTOR	DESCRIPTION
Onsite Human Health	Future Site Users – Trespassers (All Corridors)
Onsite Human Health	Future Site Users – Workers / Maintenance (All Corridors)
Off-site Human Health	Adjacent Site Users i.e., during excavation/ remediation/ earthworks (All Corridors)
Onsite Water Environment: Superficial Aquifers	Secondary Undifferentiated Aquifer (Alluvium) (Hydrogen Connection Corridor, north of river Tees only)
Onsite Water Environment: Superficial Aquifer	Secondary Undifferentiated (Devensian Till) (Main Site, Water Connection Corridor, Electrical Connection Corridor, Hydrogen Pipeline Corridor, CO ₂ Export Corridor, Natural Gas Connection Corridor)
Onsite Water Environment: Superficial Aquifer	Secondary A Aquifer (Blown Sand) (Possible presence in some corridors south of river Tees only)
Onsite Water Environment: Superficial Aquifer	Secondary A Aquifer (Tidal Flat Deposits (Sand and Silt)) (All Corridors)
Onsite Water Environment: Superficial Aquifer	Secondary A Aquifer (Tidal Flat Deposits (Sand, Silt and Clay)) (Oxygen and Nitrogen Corridor)
Onsite Water Environment: Superficial Aquifers	Secondary Undifferentiated Aquifer (Tidal Flat Deposits/Estuarine Deposits) (All Corridors)
Onsite Water Environment: Superficial Aquifers	Unproductive Aquifer (Glaciolacustrine Deposits) (All Corridors)
Onsite Water Environment: Bedrock Aquifers	Principal Aquifer (Sherwood Sandstone Group) (All Corridors)
Onsite Water Environment: Bedrock Aquifers	Secondary B Aquifer (Mercia Mudstone Group) (All Corridors)
Onsite Water Environment: Bedrock Aquifers	Secondary B Aquifer (Penarth Group) (All Corridors)
Onsite Water Environment: Bedrock Aquifers	Secondary Undifferentiated (Penarth Group) (All Corridors)
Onsite Water Environment: Bedrock Aquifers	Secondary Undifferentiated (Redcar Mudstone Formation) (All Corridors)
Offsite Water Environment: Surface Waters	River Tees and North Sea (All Corridors)
Onsite / Offsite Water Environment: Surface Waters	Various small water courses/bodies (e.g. Ponds, streams, reservoirs) (All Corridors)

POTENTIAL RECEPTOR	DESCRIPTION
Offsite Sensitive Land Uses (Environmentally designated sites)	Teessmouth and Cleveland Coast SSSI (within 1 km all Corridors, on site Hydrogen Pipeline Corridor)
Onsite / Offsite Ecosystems: Flora	Plants, Trees, and Soft Landscaping
Onsite / Offsite Ecosystems: Fauna	Livestock, Birds, Fish and Microbial Life in the Streams (All Corridors)
Onsite Buildings and Infrastructure: Concrete	Future proposed services at the site may be impacted by contamination in the ground. In particular any existing concrete foundations if the groundwater has high sulphate levels. (All Corridors)
Onsite Buildings and Infrastructure: Services	Potable water supply pipes and other services (All Corridors)

10B.5 Potential Pathways

10B.5.1 This section provides a summary of the potential pathways for the Main Site and Connection Corridors by which the identified sources may come into contact with receptors. A summary of the potential pathways is provided in Table 10B-3.

Table 10B-3: Potential Pathways

LOCATION	RECEPTOR	DESCRIPTION
Main Site		
Onsite	Human Health: People	Direct Pathway: Direct contact, dermal absorption or ingestion of soil.
Onsite	Human Health: People	Indirect Pathway: Inhalation of soil particulates derived from soils.
Onsite	Human Health: People	Indirect Pathway: Inhalation of soil vapour derived from soils
Onsite	Human Health: People	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata into confined spaces (asphyxiation/ explosion)
Onsite	Groundwater	Indirect Pathway: Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow and/ or deep groundwater
Offsite	Groundwater	Indirect Pathway: Lateral migration of impacted shallow groundwater off-Site towards Surface Water Features (Ponds, river Tees and North Sea)

LOCATION	RECEPTOR	DESCRIPTION
Onsite	Groundwater	Indirect Pathway: Vertical migration of impacted shallow groundwater to the deeper Secondary B Aquifer.
Offsite	Groundwater	Indirect Pathway: Lateral migration of impacted deeper groundwater present in the Secondary A aquifer towards Surface Water Features (Ponds, river Tees and North Sea)
Onsite	Flora	Direct Pathway: Direct contact with contaminated soils
Onsite	Flora	Indirect Pathway: Leachate / Groundwater entering surface waters
Onsite	Flora	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata
Onsite	Buildings and Infrastructure: Concrete	Direct Pathway: Direct contact of buried concrete with contaminated soils (i.e., hydrocarbons) and aggressive ground conditions (pH and sulphate).
Onsite	Buildings and Infrastructure: Structures	Direct Pathway: Direct contact of services and supply pipes with contaminated soils.
Onsite	Buildings and Infrastructure: Services	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches
Connection Corridors		
On Site	Human Health / Fauna: People (Human Health) and Animals (Fauna)	Direct Pathway: Direct contact, dermal absorption or ingestion of soil
On Site	Human Health / Fauna: People (Human Health) and Animals (Fauna)	Indirect Pathway: Inhalation of soil particulates derived from soils
On Site	Human Health / Fauna: People (Human Health) and Animals (Fauna)	Indirect Pathway: Inhalation of soil vapour derived from soils
Off Site	Surface Water	Direct Pathway: Spillage/loss/run off from surface direct to receiving water
On Site	Groundwater	Indirect Pathway: Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow and/ or deep groundwater

LOCATION	RECEPTOR	DESCRIPTION
On Site	Groundwater	Indirect Pathway: Vertical migration of impacted shallow groundwater to the deeper Principal aquifer
Off Site	Groundwater	Indirect Pathway: Lateral migration of impacted shallow groundwater Off Site towards surface water features
On Site	Flora	Direct Pathway: Direct contact with contaminated soils
On Site	Flora	Indirect Pathway: Uptake via root system
On Site	Flora	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata
On Site	Fauna	Leachate/groundwater entering surface waters
On Site	Buildings and Infrastructure: Concrete	Direct Pathway: Direct contact of buried concrete with contaminated soils (i.e. hydrocarbons) and aggressive ground conditions (pH and sulphate)
On Site	Buildings and Infrastructure: Supply Pipes	Direct Pathway: Direct contact of services and supply pipes with contaminated soils

10B.6 References

- Department for Environment Food and Rural Affairs (Defra) (1990). *Environmental Protection Act 1990: Part 2A - Contaminated Land Statutory Guidance (1990)*.
- HM Government (1995). *The Environment Act 1995*.
- HM Government (2003). *The Water Act 2003*.
- HM Government (2012). *The Contaminated Land (England) (Amendment) Regulations 2012*.