11. Land Quality

11.1 Introduction

11.1.1 This chapter has been prepared by HAL to present the assessment of potential effects of the infrastructure works required to allow the implementation of full runway alternation during easterly operations, as described in Chapter 3, on land quality. The assessment has considered effects that could result from both the construction and operational phases of the proposed development.

11.2 Legislative And Policy Context

Legislative Context

11.2.1 Key legislative drivers relating to land quality that have been considered in this study include the following:

- Control of Pollution Act 1974;
- Part 2A of the Environmental Protection Act (EPA), 1990 - Contaminated Land (England) Regulations 2006.
- Groundwater Regulations 1998;
- Water Act 2003; and
- Water Framework Directive (2000/60/EC).

Policy Context

11.2.2 **Table 11.1** lists policy guidance and policies relevant to the assessment of the effects on land quality, on both quality and quantity, and the issues included in these policies/guidance that have been considered in this assessment.

Table 11.1 Policy issues to be considered in preparing the ES

Policy reference	Policy issue
National planning policies	
National Planning Policy Framework (NPPF) (March 2012)	The NPPF replaced the Planning Policy Statement 23: Planning and Pollution Control in March 2012 The NPPF provides an overview of the contaminated land regime in England. Provides a requirement of consideration for development on land affected by contamination. Local Planning Authorities must be satisfied that planning permission can be granted on land use grounds taking full account of environmental impacts. It is the developer's responsibility to ensure that a development is safe and that the land is suitable for the use intended, or can be made so through remediation. NPPF Para 121 states: "After remediation under planning, as a minimum, land should not be capable of being determined as contaminated land under Part2A of the Environmental Protection Act 1990." It also states that: "Adequate site investigation information, prepared by a competent person, is presented."
Regional planning policies	
The London Plan, GLA (2011)	Policy 5.21 Contaminated Land requires that appropriate measures are taken to ensure that development on previously contaminated land does not activate or spread contamination. Policy 7.20 Geological Conservation requires that development proposals be resisted where they have significant adverse impact on sites with existing or proposed European or national designations. Locally important geological sites (LIGS) and regionally important geological sites (RIGS) should be given the level of protection commensurate with their importance.
Local planning policies	
Hillingdon Unitary Development Plan (UDP), London Borough of Hillingdon (1998) (Saved policies as of 2007)	Policy OL22 requires proposals relating to damaged, derelict and otherwise degraded land to be accompanied by an assessment of its current condition and of any adverse effects on adjacent land. Such an assessment should also indicate, as far as is practicable, measures that would negate or contain the causes of the land's unsatisfactory condition of the land. Policy OE11 states that planning permission will not be granted for proposals which involve an increase in the use by the public of contaminated land which is to remain untreated.
Land Contamination Supplementary Planning Guidance (SPG) (adopted January 2004)	The SPG identifies those circumstances when a contaminated land assessment will be required to accompany a development proposal; provides guidance on the process of contaminated land assessment; and provides guidance on the circumstances when contaminated land conditions and planning obligations will be sought.
Hillingdon Local Plan: Part 1 – Strategic Policies (Adopted November 2012), London Borough of Hillingdon	Policy EM8 requires that proposals for development on contaminated land provide mitigation strategies that reduce the impacts on surrounding land uses. Major development proposals will be expected to demonstrate a sustainable approach to remediation that includes techniques to reduce the need to landfill. The Council will also seek to safeguard and improve ground water quality and surface including Principal Aquifers, and Source Protection Zones.

11.3 Data Gathering Methodology

11.3.1 HAL have undertaken a search of available documentary sources listed below:

- BAA Heathrow Airport Runway Resilience factual report on ground conditions, February 2011, Scott Wilson (see **Appendix S**);
- Preliminary Risk Assessment, Enabling Works for the Implementation of Full Runway Alternation (Ending of the Cranford Agreement) Heathrow Airport, August 2010, RSK Group plc;

- Scheme Works Areas and Historic Ponds and Borrow Pits, BAA Drawing ref. 10000-XX-SK-100-000006, produced by the BAA Pavement and Infrastructure Team, July 2011;
- Terminal 5 Ground Investigations – Assessment of Contamination, Mott MacDonald, 16 March 2001;
- Heathrow Airport fuel hydrant network plans;
- Geological maps;
- Flood Risk Assessment, AMEC, March 2013 (see **Appendix U**);
- HAL Operational Safety Instruction OSI/25/10; and
- Remediation strategies and sentinel monitoring well data from known contamination plumes:
  - Detailed Quantitative Risk Assessment Report: Stand 124 Hydrant Leak Investigation, Terminal 1, Heathrow Airport. Subadra, January 2009;
  - Interim Quantitative Risk Assessment and Remedial Action Plan: Perry Oaks Storage Terminal Wessex Road, Heathrow Airport. Subadra, July 2003;
  - BAA MSCP West, Heathrow, Soil and Groundwater Contamination Report Volume 1: Factual Information. Buro Happold, August 2004;
  - BAA MSCP West, Heathrow, Soil and Groundwater Contamination Report Volume 2: Groundwater Risk Assessment. Buro Happold, July 2004.

11.3.2 These reports and information were reviewed to collate baseline data on land quality at Heathrow Airport, including those areas that will be directly affected by the proposed infrastructure works.

Survey Work

11.3.3 The wider site has been subject to several site investigations (as detailed in RSK's Preliminary Risk Assessment) however, most are not pertinent to the new sections of taxiway. Thus, a project specific ground investigation was conducted by Scott Wilson on behalf of Morgan Sindall; who were commissioned by HAL in 2011 to undertake ground investigations in the areas of the airfield where the new sections of taxiway are planned. The Scott Wilson Report is provided in **Appendix S**. The investigation was to inform an assessment of ground conditions as part of a wider geotechnical investigation and comprised 28 machine excavated trial pits to a maximum depth of 2.1m. A chemical analysis was performed on soil samples taken at each trial pit location. The analysis performed focussed on general land quality indicators and the common pollutants associated with airports that would present a risk to land quality. Analysis included the following determinants:

- Total Petroleum Hydrocarbons (TPH)
- Metals (arsenic, cadmium, copper, chromium, lead, mercury, nickel, selenium, zinc)
- Sulphate
- pH
- Sulphate
- Organic matter

Consultations

11.3.4 The Scoping Opinion provided by LBH (**Appendix E** to this ES) included comments related specifically to land quality. In addition the Environment Agency provided a response to LBH related to land quality to inform their Scoping Opinion. The key issues arising from this consultation advice were considered to be the following:

- LBH consider the approach to be adopted is suitable for the ES;
- The Environment Agency requires further consideration of groundwater effects within the ES.

11.4 Baseline Conditions

Topography

11.4.1 The Heathrow Airport site is an operational airfield and as such has a generally flat topography. It is situated between the River Colne to the west and the River Crane to the East. The 'Twin Rivers' (the Duke of Northumberland River and the Longford River) flow in culverts adjacent to the western and southern perimeter of the Heathrow Airport site.

Geology, Hydrogeology and Hydrology

Geology

11.4.2 Heathrow Airport is underlain by a thin layer of superficial deposits (up to a maximum of 8m), which comprise the Taplow Gravel formation (sands and gravels). The London Clay formation, which is recorded at the Airport as being between 50 and 60m in thickness, sits beneath the Taplow Gravel and above the Lambeth Group Beds, which are made up of variable sand and clay formations. The Lambeth Group is recorded to be underlain by the Upper Chalk Formation.

11.4.3 Made Ground is present across the site to varying depths within the Taplow Gravels, where sand and gravel aggregate has historically been excavated for aggregates and where there have been historic ponds. The voids have subsequently been backfilled with heterogeneous, low permeability reworked natural non-degradable material. These voids are not present in the vicinity of the areas of the airfield where new infrastructure will be constructed, and are generally located to the north and north-east of the southern runway.

Hydrogeology

11.4.4 The site is underlain by a Principal Aquifer of high leaching potential associated with the Taplow Gravels. The Environment Agency describes Principal Aquifers as providing significant quantities of water for people and which may also sustain rivers, lakes and wetlands. The underlying Chalk Formation is also designated as a Principal Aquifer. Due to the presence of the London Clay which acts as an effective aquaclude, it is considered most unlikely that contaminated groundwater within the Taplow Gravels would impact on the Chalk Aquifer.

11.4.5 A previous site assessment report[1] indicated that shallow groundwater (i.e. in the Taplow Gravels) is likely to be encountered at depths ranging between approximately 1.7 and 4.5 metres below ground level (bgl). The study involved drilling 11 boreholes on the airfield all of which penetrated the Taplow Gravels. The strata encountered demonstrated that the area is underlain by uniformly thin Made Ground, less than 0.7m thick, and depth to ground water is typically greater than 3.5m below ground level.

11.4.6 The direction of groundwater flow in the Taplow Gravels is generally in a south/south-east direction (this is generally notionally following the topography and the southerly flow of the nearest river). However, the groundwater flow is interrupted in certain areas due to deep building foundations, tunnels and groundwater pumping (e.g. from the London Underground tunnels).

11.4.7 The Environment Agency has designated Source Protection Zones (SPZ) around groundwater sources for public water supply. According to the information provided on the Environment Agency's web-site, there are no SPZs present on the site or within one kilometre of the site. The nearest SPZ is approximately 1.9 kilometres to the northwest of the site and relates to an abstraction from the Upper Chalk Principal Aquifer.

Hydrology

11.4.8 There are no surface water features within 300m of the nearest works. The nearest surface water features include:

- River Crane – 2000m
- River Colne – 500m
- Duke of Northumberland River – 200m
- Longford River – 200m

[1] Entec (June 2008), EIA Heathrow East Phase 1 Terminal (HET) Building.

Existing Potential Contaminants

11.4.9 The chemical soil analysis for the range of determinants listed in paragraph 11.3.3 showed low or background levels at all locations. The soils results have been assessed against generic assessment criteria for human health, and there were no exceedences. Based on this, the soils in the proposed areas of development are not considered to contain a level of contamination that would present a risk to land quality receptors and would be considered commensurate with the end land use, i.e. the soils are suitable for use (human health) and are unlikely to result in the pollution of controlled waters. A Technical Note prepared by AMEC, considering this in more detail can be found in **Appendix U**.

11.4.10 Surface water drainage infrastructure is extensive throughout airfield pavement areas to capture surface water runoff and prevent flooding. De-icing fluids applied to aircraft and pavement areas, primarily during winter months are captured by the surface water drainage system for containment and treatment in the Heathrow Airport pollution control system. This type of contamination is not thought to present a risk to land quality and has not been considered as a likely contaminant.

11.4.11 Several areas of hydrocarbon contamination have been identified within the wider Heathrow Airport site boundary following specific incidents or during development projects. An underground hydrant network is used to supply fuel directly to aircraft stands from where it is pumped as required to refuel aircraft. The system is monitored by a leak detection system which identifies when unaccounted for fuel is lost from the system. A leak from the hydrant in the Central Terminal Area (Stand 124 at Terminal 1) was notified to the Environment Agency in 2007. The underground hydrant network is therefore a potential source of contamination although in the proposed areas of development the majority of the hydrant network has been installed as part of either the Terminal 4 or Terminal 5 construction, so is more modern than the older sections of hydrant installed within the Central Terminal Area. The majority of the proposed development area does not sit within 10m of the hydrant network and is not likely to extend to the depth of the hydrant network. All intrusive works are subject to HAL's strict Permit to Work system, which includes stringent protection and service clearance for Heathrow Airport site services. The possibility of the works damaging the network is considered very unlikely.

11.4.12 Historically the Heathrow Airport site has been used for aggregate quarrying and there are a number of historic ponds. The gravel pits and ponds have subsequently been filled with material forming so called 'borrow pits'. The backfill material typically comprises reworked inert material. Whilst there is the potential for unidentified backfill material to pose a risk to land quality receptors, there is no evidence from previous site investigation findings that encompass 'borrow pits' that material is present that would give rise to significant quantities of ground gas.

11.5 Previous Remediation Works

11.5.1 There has been extensive ongoing redevelopment at Heathrow Airport including the construction of the Terminal 5 campus in the west of the site, between the Northern and Southern runways. A new eastern campus is currently under construction, which comprises a main terminal building, a satellite pier, associated aprons and taxiways and underground

services including new fuel hydrant. There have also been extensive airfield works during the past 10 years.

11.5.2 The potential for contamination is always considered at the planning and design stage of any development on the airfield and robust processes are used to identify and manage contamination should it be discovered during the construction phase of development projects. This has historically resulted in the removal of contamination from the Heathrow Airport site.

11.5.3 A number of large scale remediation works have been undertaken in consultation with the Environment Agency and LBH.

- Following extensive ground investigations as part of the Terminal 5 project which incorporated the former Perry Oaks Sewage treatment area, a remediation strategy was agreed with the London Borough of Hillingdon and completed as part of the Terminal 5 construction project.

- Remediation strategies have been agreed with the Environment Agency for the following known areas of contamination:

  - the former Perry Oaks Fuel Farm Storage Terminal;

  - fuel plume resulting from Heathrow Hydrant Operating Company (HHOpCo) stand 124 Hydrant Leak; and

  - multi storey car park, Terminal 3 (MSCP3).

11.6 Environmental Measures Incorporated into the Scheme

11.6.1 No specific environmental measures have been incorporated into the scheme related to land quality.

11.7 Scope of the Assessment

11.7.1 The scope of the assessment has been determined through a review of the baseline information and relevant technical reports, and through the scoping process.

Potential Receptors

11.7.2 **Table 11.2** lists the potential land quality receptors that have been identified and the rationale for their inclusion.

Table 11.2 Land Quality Receptors

Potential receptor	Effect pathway
Groundwater quality in the underlying Principal Aquifer (Taplow Gravel)	Mobilisation of contaminants present within Made Ground underlying hardstanding. Rainwater ingress causes vertical leaching creating a pathway to the groundwater held in the Taplow Gravel. Excavation extending to groundwater depth provides a direct pathway for contamination.
Future End Users	Inhalation, ingestion or dermal contact with contaminants present in the ground, following construction.
Construction workers	Inhalation, ingestion or dermal contact with contaminants present in the ground within the work site.
Neighbouring sites	Mobilisation of contaminants that would affect neighbouring sites through airborne emissions, vapours, odours or transmission by groundwater.
Hardstanding & Services	Chemical attack or explosion

11.8 Effects Requiring Further Consideration

11.8.1 It is considered that as a result of the proposed construction and operation of the Project, there are not likely to be any significant effects on the receptors identified in **Table 11.2**. Thus, no further consideration is deemed required as part of this assessment.

11.9 Effects Not Requiring Further Consideration

11.9.1 For the reasons set out below, the following potential effects are not likely to be significant and are therefore not considered further in this ES.

- Historic borrow pits at Heathrow Airport have been identified and mapped during successive airfield and general airport development works over a number of years. The maps show that the breakout areas and areas of new on-airfield infrastructure are located away from all known borrow pits. There are no borrow pits in the T5 catchment and so the works associated with the northern runway would not encounter historic landfilled material.

- HAL has conducted large scale development over recent years particularly the T5 campus which includes the Terminal 5A, 5B and 5C buildings as well as the associated aircraft stands, taxiways, hydrant network and the Perry Oaks Fuel Farm. Extensive remediation of the T5 campus was carried out under a remediation plan agreed with LBH. A separate remediation strategy for the Perry Oaks Fuel Farm was agreed with the Environment Agency, which included remedial targets. Other identified hydrocarbon plumes have been investigated and action taken in consultation with relevant regulatory authorities to mitigate risk to receptors.

- The ground investigations have provided indicative results of the background quality of soil in the sites where development will take place. Spatial distribution of trial pits covered all the major areas of airfield development planned and extended to a maximum ground depth of

2.1m. For each of the 28 trial pits which were excavated, soil analysis results did not return levels of contamination which would present a significant risk to receptors.

- Construction of the proposed noise barrier will consist of modifying and replacing the existing timber noise barrier located alongside Wright Way and installing a new barrier along the existing perimeter fence line of the T5 business car park. There will be no change to the existing ground penetration depth of the foundations and existing foundations will be utilised where possible. Therefore, it is considered that there will be no land quality effects associated with construction of the noise wall.

- It is unlikely that excavation works will extend to depths where groundwater is encountered except localised specific areas where services such as surface water drainage are installed. There is little risk of direct discharge or indirect ingress into surface water drainage systems from the construction activity.

- In areas of hardstanding, there will be a reduction in infiltration from rain water, which will reduce the generation of leachate (however, there is an absence of contamination, thus leachate is unlikely to be a significant issue).

- Hardstanding and shallow noise barrier foundations will be designed so that any concrete used will be the correct BRE Digest sulphate class – this is detailed in AMEC's Technical Note provided in **Appendix U**. There are no buildings associated with the works. Contamination or ground gas has not been identified, thus the likelihood of significant chemical attack or explosion, respectively, affecting hardstanding or services is considered as very low.

- Effects will be mitigated through the use of appropriate Personal Protective Equipment (PPE) and best practice working methods. Likely effects will be assessed prior to construction and incorporated within the Construction Environmental Management Plan (CEMP) which is a HAL requirement for all construction contractors to complete. (An outline CEMP is provided as **Appendix C**).

- Procedures are put in place with all HAL contractors which cover the identification of contamination during the design and construction process. A detailed remediation plan is required by Heathrow Airport to mitigate the risk to receptors. Standard procedures are set out by HAL for screening potential environmental and sustainability impacts associated with any works. This process is conducted prior to any work taking place and requires contractors to outline how the effects would be mitigated. In addition, contractors are required to suspend work following identification of contamination and produce a remediation plan in consultation with HAL.

11.10 Potentially Significant Effects

11.10.1 No potentially significant effects have been identified associated with the planned works.

11.11 Cumulative Effects

11.11.1 Works to resurface the Northern runway will run concurrently with the Project. However, this will not result in significant land quality effects.

11.12 Summary of Significance Evaluation

11.12.1 As it has been assessed that no potentially significant effects will be associated with the works, effects relating to land quality can be regarded as not significant.