Appendix F – Detailed Report Review

F1 A detailed review of the reports available

Table E1-1 Review of available reports

Report title	Date	Location	Summary of scope/findings
Fugro Engineering Services (FES) East Luton Corridor Improvements for Luton Borough Council	2003	Exploratory holes located along A1081 (Airport Way) alignment.	Site investigation for road improvement works. The testing undertaken was for geotechnical purposes and no contamination analysis was undertaken. However, the report does describe Made Ground encountered in the area as granular fill, clay fill or chalk fill.
Burks Green. Foundation work risk assessment report	2004	Northwestern edge of the former landfill	This report provides a foundation risk assessment for Hangar 202. An investigation was undertaken at Hangar 202 site by RSA Geotechnics in 2004. The investigation encountered thicknesses of landfill waste between 4.4m-9.9m. Landfill waste encountered included: • Commercial and industrial wastes comprising metal, plastic, cloth, glass, wire, paper, fibreglass insulation, wood, glass bottles, ash, asbestos cement, polythene sheeting; • Domestic refuse comprising black plastic bags with varying proportions of paper, plastic, food tins, plastic and glass bottles, wood, cardboard and newspapers (dated 1974); • Construction and ashy waste- comprising bricks, ash, clinker and wood. Ground gas monitoring was undertaken as part of the investigation which indicated methane levels up to 46.6% v/v and carbon dioxide up to 6.7% v/v. Burke Green report used the information from the RSA Geotechnics report to assess the likely foundations required for the hangar, apron and taxiway. The proposed solution was precast concrete piles driven into the chalk for the hangar. For the apron and taxiway ground improvement techniques such as stone columns interested the depth of the landfill or dynamic compaction were proposed. A methane gas barrier and passive ventilation system was also proposed to be installed below the foundation.
Terrence O'Rourke Hangar 202, Apron and Taxiway Link London, Luton Airport Planning Support Statement	2004	Northwestern edge of the landfill site	This planning support document, provides an overview of proposed development and potential environmental issues, including those posed by the former landfill. It advises solutions via construction methods to limit contamination migration, which were agreed with consultation with Environment Agency.

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Wardell Armstrong, Southside and City Developments Ltd. Vauxhall Motors Site, Luton, Bedfordshire. Initial Phase Site Investigations, Preliminary Hydrogeological Assessment	2004	Former Vauxhall Motor Works	This report provides information relating to groundwater contamination conditions at the site of the Vauxhall Motor works. The report details that site investigation work was undertaken in 2004 trial pits, window samples and boreholes. This indicated that the groundwater direction was to the south west, however some uncertainty around this flow direction was highlighted. Made Ground was noted to be over 5m thick in places, with some hydrocarbon odours noted.
Wardell Armstrong Southside and City Developments Ltd. Vauxhall Motors Site, Luton, Bedfordshire. Preliminary Review of Available Data	2004	No plan available within the report but considered to relate to the Former Vauxhall Motor Works	Review of previous reports and published information for the former Vauxhall Motors site. The report details that there is published literature on groundwater quality in the area, which is affected by chlorinated solvents and hexavalent chromium as a result of the industrial history of Luton. Previous investigations reported various concentrations of organic contaminants, however these were concluded as unlikely to represent a significant source of contamination.
RSA Geotechnics Limited, Harrods Aviation, LLA Hangar and Taxiway Extension at Luton Airport, Preliminary Factual Report	2004	Northwestern edge of the landfill site	This preliminary Investigation was undertaken to inform the foundation risk assessment it comprised of the following: • 14 No. boreholes; • 10 No. trial pits; and • 10 No. dynamic probe locations. Landfill waste was encountered with thicknesses between 4.5 m-9.9 m landfill waste was encountered as: • Commercial and industrial wastes comprising metal, plastic, cloth, glass, wire, paper, fibreglass insulation, wood, glass bottles, ash, asbestos cement, polythene sheeting; • Domestic refuse comprising black plastic bags with varying proportions of paper, plastic, food tins, plastic and glass bottles, wood, cardboard and newspapers (dated 1974); • Construction and ashy waste- comprising bricks, ash, clinker and wood. Ground gas monitoring was undertaken as part of the investigation which indicated methane levels up to 46.6% v/v and carbon dioxide up to 6.7% v/v.

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Casella Stanger. Review of Environmental Reports LLA 202, Apron & Taxiway Link. Report No:C03607	2004	Northwestern edge of the former landfill	This report reviews previous environmental reports relating to the construction of Hangar 201. This review was to inform future development plans for a second hangar (202). The report refers to 7 reports and summarises each of them, key points relating to the landfill were as follows: • Fill materials overlie a dry valley in which chalk and possibly Dry Valley Deposits originally cropped out; • Previous investigations have indicated that the base of the landfill is underlain by Clay with Flints ranging from 5m thickness at the western side to 1m thickness at the eastern boundary; • The landfilled material ranged in depth between 5 and 13.5m; • The upper 1-3m of the landfilled area was thought to represent some form of capping material comprising soft to firm orange/brown silty clay with fragments of brick, ash and clinker and some fragments of paper, plastic, glass, metal, textile, straw wood and wire; • Groundwater was not encountered in the landfill area and that data from monitoring wells located in the vicinity of the airport indicated that the landfill was not having a significant effect on the quality of groundwater in the area.; • Methane and carbon dioxide were detected at elevated concentrations with a maximum of 73% v/v and 20% v/v respectively, in general gas flow rates were less than 1 l/hr; and • Gas protection measures were installed within Hangar 201 due to elevated concentrations of landfill gases. As part of the report, the data from the previous site investigations was reviewed and assessed against the then current Soil Guideline Values (SGVs) and other relevant assessment criteria. Concentration of cyanide and total PAHs were found to exceed, with significantly elevated concentrations tending to be located at depth within the fill material. Groundwater samples indicated exceedances of dissolved hydrocarbon above drinking water standard (DWS) limits. Previous groundwater sampling events also highlighted exceedances in the concentrations of Iron, Manganese and Total Petroleum Hydrocarbon. This was however attributed to borehole construction materials and spillages into the drainage system.
Wardell Armstrong, Southside and City Developments Ltd. Vauxhall Motors Site, Luton, Bedfordshire. Ground Investigation Report	2005	Former Vauxhall Motor Works	Summary report of ground investigations undertaken in 2004 and 2005. The soil and groundwater chemistry indicated elevated concentrations of Diesel Range Organics (DRO). The report concluded remedial treatment of the soils was required but not active remediation of the groundwater.

Report title	Date	Location	Summary of scope/findings
Wardell Armstrong, Southside and City Developments Ltd. Vauxhall Motors Site, Luton, Bedfordshire. Supplementary Ground Investigation Report (Existing Vehicle Release Facility)	2005	Former Vauxhall Motor Works	The report covers supplementary investigation undertaken at the former Vauxhall Motor Works, which was not accessible in previous investigations. The findings of the investigation were consistent with the previous investigations and it was concluded that no additional remediation was required.
WSP Environmental Limited. Phase 1 Environmental Assessment (Project Odyssey) London Luton Airport. Project Number 12220076/001	April 2006	Long stay car park -western edge of the former landfill.	A Phase 1 Environmental Site Investigation on the airport undertaken by WSP for 'Project Odyssey'. This includes extension of Car Park E which is the long stay car park which is situated on the western edge of the former landfill. The report provides a summary of previous site investigation reports. The following points of note were identified from the review: • Terrasearch undertook a site investigation in the western edge of the former landfill, which indicated that the waste extends to at least 8 m bgl. Lead concentrations were particularly elevated with a maximum concentration of 35,599 mg/kg; • An investigation into the former landfill was undertaken in 1991, WSP were only provided with an interpretation of the logs, with the actual report not reviewed. It indicated fill extended to depths of 21m bgl. It also noted contamination in the groundwater below and outside the former landfill, phenols, nitrate, chloride, sulphate and mineral oils. It was also stated that groundwater in the bedrock was being impacted by the landfill. WSP concur with an appraisal by Stanger, that the presence of clay with flints has prevented metals within the landfill leaching from the site.
Vertase F.L.I Contract Completion Report. Napier Park, Luton	2006	Former Vauxhall Motor Works	The report details that free product was found during redevelopment works, therefore Vertase F.L.I undertook further investigation to assess whether additional remediation was required. It was concluded that residual free product had become entrained in the chalk but that no further remediation was warranted.
Wardell Armstrong, Explore Investments Ltd. Napier Park, Kimpton Road, Luton. Groundwater Risk Assessment.	2007	Former Vauxhall Motor Works	The report details additional groundwater boreholes, monitoring and risk assessment modelling undertaken as part of the development of the former Vauxhall Motor Works (Napier Park). Additional assessment was required as during the reclamation works a zone of chalk which was heavily contaminated with DROs was revealed. Groundwater risk assessment modelling was undertaken which indicated that there was no risk to the River Lee and no additional remediation of the groundwater was warranted

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URS, East Luton Corridor Improvements, Geotechnical Report for Luton Borough Council	2007	Exploratory holes located along A1081 (Airport Way) alignment.	Geotechnical interpretation of a site investigation for road improvement works including geotechnical testing data.
Mott Macdonald, Veolia Water Projects, London Luton Airport, Surface Water Drainage, Asset Management Plan Report	2008	London Luton Airport land	This report inventories existing surface water drainage assets, which are reviewed for condition and performance. With potential solutions along with maintenance strategy outlined. Highlighting works required with vary degrees of urgency.
Wardell Armstrong, Stirling Place – (Former Kimpton distribution centre), Kimpton Road Luton, Bedforshire	2008	Adjacent to Luton Parkway Station	The report provides information relating to when the site was developed in 1995 as distribution depot. Remediation was undertaken for hydrocarbon contamination in the groundwater through pump and treat. Wardell Armstrong undertook an investigation in 2007. Chemical analysis indicated the presence of asbestos (chrysotile).Analysis also indicated that concentrations of polyaromatic hydrocarbons (PAHs) and hydrocarbons were elevated but not above remediation targets agreed with the Environment Agency (EA) for the neighbouring site (Napier Park).
Wardell Armstrong, Various validation reports for Zones 1-6 of Napier Park	2008-2012	Former Vauxhall Motor Works	Various reports for areas of the Napier Park site validating the work to remove localised areas of soil contamination in the area of the former Motor Works.
Wardell Armstrong, Letter report to Environment Agency on Groundwater Monitoring at Napier Park and Stirling Place.	2012	Former Vauxhall Motor Works	The groundwater monitoring data for six borehole at Napier Park and one borehole at Stirling Place are detailed within the report. It also details the results of a passive hydrocarbon removal trial within Napier Park to achieve groundwater betterment. It is detailed within the report that the groundwater flow gradients are minimal and variable, with some more southerly flow noted in previous studies. The report indicates that although the site is underlain by a Principal Aquifer, there is poor background water quality in the area and the nearest sensitive receptor was considered to be the River Lea. It concludes that Total Petroleum Hydrocarbon (TPH) concentrations at Sterling Place (BH RC5) were below detection limit and therefore it was not being affected by contaminant migration from Napier Park.
AECOM Phase 1 Geotechnical and Geo-Environmental Desk Study Report	May 2012	Former Eaton Green Landfill	Desk Study focussing on a development comprising of a cargo hangar and a fixed base operation (FBO) area, reviewing various sources of material. The southeast corner of the cargo hangar lies partially within the extent of the former landfill. The report reviewed previous investigations undertaken at Luton airport and its surrounds, including reports on the former landfill.

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AECOM. Geotechnical and Geo-environmental interpretative report	Sept 2012	Former Eaton Green Landfill	AECOM reviewed two sites within Luton Airport, comprising of a cargo hangar and a fixed base operation (FBO). The southeastern corner of the cargo hangar lies site lies within the boundary of the former landfill. A limited investigation was undertaken comprising of: • 5 No. boreholes; and • 10 No. window sample locations. Up to 3.35 m of made ground encountered at the cargo hangar site, no mention is made of landfill waste being encountered. A possible dissolution feature noted within the chalk. Localised asbestos was encountered within the made ground.
Delta Simmons Environmental Consultants Limited. Preliminary Site Investigation for proposed Taxiway Foxtrot	Aug 2012	Former Eaton Green Landfill	A preliminary site investigation was undertaken within the extent of the former landfill for Taxiway Foxtrot. The Investigation found waste to be predominantly well decomposed, with some parts of the landfill waste comprising more granular materials suggesting construction & demolition rather than household waste in those areas. Occasional visual/olfactory evidence of hydrocarbon contamination was encountered. No groundwater or leachate was encountered during the investigation; however, the landfill waste was described as damp/moist in some locations. The report also identifies two stands of Japanese knotweed totalling an area of around 30-40 m^2
RSK Environment Limited, RPS Group Limited, Ocean Sky Jet Building, Luton Airport, Geoenvironmental and Geotechnical Ground Investigation	2012	400m west of former Eaton Green Landfill	The report covers an extension to an existing office building, it comprises of a geo-environmental preliminary risk assessment, A review of an investigation comprising a single 10m borehole bored to confirm ground conditions and validate conceptual site model. The included geo-environmental GQRA, with comparison to CLEA GAC's for relevant receptors, it concludes soils at the site do not pose a risk to further development. It also includes a geotechnical risk assessment of potential hazards, noting presence of made ground, shrinkable clay soils, and existing services.
Waterman, Napier Park and Sterling Place. Environmental Statement	2013	Adjacent to Luton Parkway Station	Environmental Statement (ES) reviewed previous investigations undertaken at both the Sterling Place and Napier Park. These reports are presented in the appendices of the report and are discussed above (3-11). The ES concludes that there is the potential for residual groundwater contamination associated with the former Motor Works but that there is no evidence of significant source of contamination at Stirling Place. The report recommended additional groundwater monitoring to inform an updated DQRA and if necessary further remediation.
Ivy House Materials Management & Remediation Verification	Dec 2013	Former Eaton Green Landfill	The report details the remediation activities to develop a new fixed base operation (FBO) within the boundary of the former landfill. It details segregation of materials dependant on material waste

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Report. Signature FBO, Luton Airport			category. Subsequent verification was undertaken to ensure no significant risk to controlled waters or human health remained.
Crossfield Consulting. New Ramp, Adjacent to Stand 80, Luton Airport, Phase 1 Desk Study Report	2013	Adjacent to Stand 80, within the existing airport site	Desk based assessment of a site approximately 150 m west of the former landfill. The report acknowledges the presence of the former landfill, but no other additional information is provided.
Mott MacDonald London Luton Airport Surface Water Drainage Strategy	2014	Airport wide assessment	This report evaluates historical water monitoring with results assessed against water quality standards (WQS). The report identified 27 'contaminants of concern' (CoC) which exceeded WQS. These were selected for proposed monitoring as part of the strategy. It also identifies a number of potential risks, based upon processes and historical usage. It assesses the quality of existing measures to protect water quality, and proposes methods to manage future pollution events. It outlines a series of actions to be undertaken including monitoring, engagement with authorities and further assessment of certain possible solutions.
Mott MacDonald. London Luton Airport Expansion. Contamination Risk Assessment Report- Phase 1 Development.	2015	London Luton Airport land	Mott MacDonald completed a Contamination risk assessment for Phase One Development Area (which comprises the terminal building, aircraft hangars, car parks, road ways/roundabouts and associated soft landscaping. The assessment included a discussion of the historical development of the airport site but includes some reference to the former landfill and the areas surrounding it. The fire training ground to the south of the former landfill is recorded as comprising a fuel tank with a capacity of 1000 litre and several containers of firefighting foam Petroseal- Film Forming Fluoro Protein (FFFP). In addition, there are two balancing ponds located in this area. The surface run off from this area is collected in two lined ponds which are regularly emptied by tankers. In addition, the area to the south of the long stay car park (which is located on the western edge of the former landfill) is noted to be a concrete and asphalt works. The report also indicates that data from a groundwater quality monitoring programme by Veolia in 2006-2007 indicated the groundwater levels in the White Chalk subgroup beneath the airport decrease from approximately 120m AOD (25 mbgl) in the centre of the airport to 101m AOD (approximately 60m bgl) at the western boundary. It also indicated that during historical groundwater monitoring across the airport, elevated concentration of lead, aluminium, iron, manganese, arsenic, mercury, selenium, nitrate, sodium, chloride and pesticides were noted.

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			Site investigation was undertaken by Mott MacDonald which comprised 10 boreholes to a maximum depth of 60m and 4 boreholes to a maximum depth of 6m across the area for groundwater and gas monitoring purposes. In addition, 26 trial pits were undertaken across the area. Gas monitoring exercises reported depleted oxygen concentrations in some of the boreholes and elevated carbon dioxide concentrations. These monitoring locations were not adjacent to the former landfill. They were no reported methane concentrations in the gas monitoring exercise.
Concept Site Investigations, Luton Airport Terminal Extension, Site Investigation Report	2015	London Luton Airport land	Concept Site Investigations undertook an intrusive site investigation as part of works for a potential terminal extension, comprising of the following: • 6 No. Cable Percussion Boreholes to a maximum depth of 30 m; • 3 No. Rotary Follow on Boreholes to a maximum depth of 60 m; • 1 No. Rotary Borehole to a depth of 60.0 m; • 4 No. Windowless sampler boreholes to a maximum depth of 6.0 m; and • 27 No. hand excavated trial pits to a maximum depth of 2.3 m. With 14 No. groundwater monitoring standpipes installed. The investigation encountered made ground with thickness of up to 1.75m, underlain by natural strata.
Mott MacDonald Contamination Risk Assessment Report, Phase 2 and 3 Development	March 2017	London Luton Airport land	Mott Macdonald undertook a contamination risk assessment for the area of the Terminal 1 expansion works, this included Area D. The report summarised the findings of an earlier desk study (Mott MacDonald (2014) Luton Airport Operations Limited, Phase 1 Geotechnical and Geoenvironmental Desk Study). Potential sources of contamination identified in Area D included fuel tanks and cement and asphalt works, an electrical substation and fuel tank to the south of the fire training ground and a fuel tank and fire fighting foam containers in the fire training ground. Off-site in the wider area, numerous de-icing tanks are noted as well as further fuel tanks. Site investigation was undertaken, and the results interpreted. The report identified minimal contamination of the materials for excavation, comprising cohesive made ground materials derived from the underlying Clay with Flints Formation, but concluded that there were no significant contamination risks to human health or controlled waters associated with the material when compared to current assessment criteria. The reports were considered sufficient for the discharge of the condition by the Local Planning Authority.

Report title	Date	Location	Summary of scope/findings
Concept Site Investigations, Geo-environmental GI Site Investigation Report	2017	London Luton Airport land	Concept site Investigations carried out an intrusive site investigation comprised of the following: • 5 No. rotary boreholes to a maximum depth of 70.0 m; • 4 No. dynamic sampling boreholes to a maximum depth of 6.0 m; and • 11 No. hand excavated trial pits to a maximum depth of 1.5 m All rotary boreholes were installed with groundwater standpipes. Made ground was encountered with a thickness between 0.25 m and 3.32 m
Structural Soils Access Road Factual Report on Ground Investigation	June 2017	Linear strip of land adjacent to Luton Airport	This is a factual site investigation report undertaken for the access road was undertaken by Structural Soils for Pell Frischmann in 2016. Locations were located along the proposed road alignment which crosses the north of the former landfill, and through WVP core area in Areas B. 10 No. boreholes and 4 No. trial trenches were undertaken within the landfill.
Structural Soils Century Park Factual Report on Ground Investigation	June 2017	Agricultural land to the east of the Former Eaton Green Landfill	This is a factual GI report undertaken on the land situated east of the former landfill (within Area B), to inform the Century Park development. This was a preliminary site investigation based on the findings of the Arup PRA (2017). The GI comprised of: • 13 No. Cable Percussion Boreholes to a depth of between 1.9 m bgl and 15.5 m bgl; • 38 No. Cable Percussion Boreholes extended by rotary drilling, to a depth of between 1.9 and 15.5 m bgl extended to a depth of between 39.0 and 53.7 m bgl; • 52 No. Trial Pits excavated to depths of up to 4.5 m bgl; • Geotechnical and environmental soil sampling and laboratory testing; and • 9 No. groundwater and gas monitoring standpipes. The GI encountered made ground, south of the former landfill up to 6 m in thickness on existing airport land. Across the wider Century Park development, the investigation found clay with flints with varying thickness between 0.3 m and 8.2 m overlying chalk to depth the clay with flints was absent in the base of the dry valley.
Arup, Century Park Development, Contamination Preliminary Risk Assessment – Former Eaton Green Landfill	2017	Agricultural land to the east of the Former Eaton Green Landfill	This report assessed the risk posed by the former Eaton Green Landfill, it utilises existing sources of information to produce an interpreted 3D ground model. The key findings are summarised as follows: • Former landfill has been filled from 1940's to the late 1980's; • Due to the age of the landfill it is likely to be 'dilute and disperse', therefore unlined with leachate migrating and diluting within the groundwater;

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			• The landfill lies within a dry valley, formed by periglacial process. The upper slopes have cohesive strata which would act as a barrier to downward migration where it is present. However the lower parts and base of the valley are fluvial deposits and exposed chalk which are permeable, as such contamination will migrated downwards more readily; • Historical information suggests a range of waste present within the landfill, including wastes from car scrap yard, aircraft manufacturing facility, local industry (such as Laporte Chemical works) and household waste; • Groundwater level may be depressed due to abstraction in the area, with a possibility that if abstraction cease groundwater levels would rise, resulting in water emerging in the currently dry valley; • The infilled waste is unsored and uncompacted, there is evidence of settlement noted during the site walkover; • The chalk aquifer underlying the site is highly protected as I is the main source of public water in the region, the nearest abstraction for public water supply is located 3km northeast; • Groundwater levels from previous investigations suggested groundwater is not present within the landfill. As the investigations indicated that wastes were generally dry. This may mean the leachate production potential of the waste is limited; • 3D interpretive model estimates 4.5million m3 of waste is present within the landfill; • Limited information on contamination is available, restricted to the western boundary, where development has already been undertaken; • Identified a number potential pollutant linkages (PPLs) which may pose a risk to future development, including risks from ground gases/vapours and risks to the underlying Chalk Aquifer; and • A number of physical conditions on site likely to present potential risk to any development, such as large obstructions, settlement, aggressive ground conditions and solution features. It recommended comprehensive site investigation to determine the geo-environmental and geotechnical risks, further risk assessment to quantify this risk.
Structural Soils Landfill Factual Report on Ground Investigation	June 2017	Agricultural land to the east of the	This is a factual GI report undertaken on the landfill to inform the Century Park development. This was a preliminary site investigation based on the findings of the PRA (2017). The GI comprised of: • 18 No. resonance (sonic) boreholes drilled to a depth of between 6.00 m bgl and 60.00 m bgl;

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		Former Eaton Green Landfill	• 2 No. Cable Percussion Boreholes extended with rotary drilling. Boreholes to a depth of between 6.45m bgl – 9.00 m bgl with rotary follow on to a depth of 58.50 m bgl; • 9 No. permeability tests in boreholes; • 26 No. Dynamic Probe Penetrometer tests; • Geotechnical and environmental soil sampling and laboratory testing; and • 17 No. groundwater and gas monitoring standpipes. The GI recorded landfilled wastes up to 20m thickness over the landfilled area. This was underlain by Clay with Flints (sides of valley only) highly plastic clay containing flint gravel, thickness was generally 3 m but up to 15 m in places. Structureless Chalk was noted beneath the superficial deposits recovered as sandy very silty gravel or sandy gravelly silt, in some places, at the base of the landfill, wastes were placed directly onto the chalk. No evidence of a basal 'liner' layer to the landfill was noted.
Arup Century Park Development, Landfill Area Contamination Quantitative Risk Assessment.	Sept 2017	Former Eaton Green Landfill	The aim of this report was to build on the findings of the Preliminary Risk Assessment (PRA) to inform the Century Park development. It presents a quantitative contamination risk assessment relating to human health, ground gas and groundwater. The main findings of this report were as follows: • Characterisation of the waste was undertaken which indicated the main categories were construction and demolition, industrial waste, old domestic and recent domestic waste. Industrial type wastes were only encountered in a few locations associated with older eras of waste. • Testing did not suggest a significant variation in chemistry between the different eras of filling. Visual and olfactory evidence of contamination were identified, including; clinker, ash, black staining, hydrocarbon odours. Daily cover materials were encountered and classified as non-chalky or chalky both with limited waste content and encountered at variable depths. Significant depth of 'cover' material was noted but not considered to be an engineered cap. • Perched waters were not recorded during the investigations. Post fieldwork groundwater levels measured in the boreholes were typically around 110 mAOD (40 mbgl) and ranged between 22 m – 38 m below the base of the landfill. • Limited quantities of leachate were recorded. Comparison of leachate analysis results against typical compositions of leachate depending on stage of decomposition (Stages 1-4) suggested the landfill is approaching an aged state between stages 3/4 with low gassing and leachate potential. • The results of the gas monitoring indicated methane and carbon dioxide concentrations were higher in the northern part of the landfill (although limited data across the central area). Maximum

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			recorded concentrations were 62.1% v/v for methane and 53.1% v/v for carbon dioxide with a maximum positive flow rate of 3.6l/hr. This is consistent with this area being filled more recently and the waste being less degraded than the southern part of the landfill. • Low levels of methane (<0.1 v/v) were detected outside the landfill boundary, maximum carbon dioxide was 9.7v/v, maximum flow was 0.6l/hr. • Asbestos was identified at 3No. borehole locations, chrysotile fibres were identified below the limit of detection <0.001%. • The results indicated the chemistry of the landfill presents a low risk to future site users assuming a clean cover system to remove potential pathways and protect the development from odours and the poor physical properties of the waste. • Comparison of groundwater quality analysis results from below the landfill and area to the east, against generic guidance values (UK DWS, EU DWS, EQS) identified several contaminants which exceeded the guidelines. Detailed modelling was undertaken. This concluded that overall there is little evidence that the landfill is causing significant contamination of the groundwater. This suggests that providing appropriate techniques are used during construction to prevent downward migration of contaminants, it is unlikely that the new development will result in significant contamination of the groundwater. Recommendations were made for further site investigation of the landfill area, including groundwater and gas monitoring to confirm the findings of the assessment and refine the CSM.
Arup. Luton Airport Mass Passenger Transit System. Land Contamination Preliminary Risk Assessment	Januar y 2017	Adjacent to areas Luton Parkway Station and existing airport land.	This report is a desk-based assessment of the contamination risks associated with the route of the Mass Passenger Transit (MPT) System which runs from Luton Parkway Station to Terminal 1 at Luton Airport. A conceptual site model (CSM) was produced identifying potential pollutant linkages (PPLs) which may pose a risk to future development, including risks from ground gases/vapours and risks to the underlying Chalk Aquifer. Potential geotechnical constraints/risks to the development were identified. A comprehensive site investigation was recommended to determine the geoenvironmental and geotechnical risks and inform the design of the development.
Structural Soils. London Luton Airport Mass People Transfer Ground Investigation Phase 1: Factual Report on Ground Investigation.	2017	Adjacent to areas Luton Parkway Station and existing airport land.	This is a factual GI report undertaken along the proposed MPT route. This was a preliminary site investigation based on the findings of the PRA (2017). This was a preliminary GI and consisted of 16 cable percussion boreholes, 7 of which were extended by rotary drilling, 1 rotary cored borehole, 8 trial pits, 1 hand dug pit and 3 hand dug trial trenches. The GI recorded Made Ground of variable composition along the route, with the thick deposits encountered near to Luton Parkway Station up to 7.5m. Clay with Flint deposits were absent in the area of Parkway Station, where the Made Ground is

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			directly underlain by the Chalk bedrock. However, in the area of the existing airport Clay-with-Flint deposits overly the Chalk and are present up to 8m in thickness.
Arup. Luton Airport Mass Passenger Transit System. Land Contamination Quantitative Risk Assessment.	June 2017	Adjacent to areas Luton Parkway Station and existing airport land.	The aim of this report was to build on the findings of the Preliminary Risk Assessment (PRA) to inform the MPT development. It presents a quantitative contamination risk assessment relating to human health, ground gas and groundwater, as well as characterisation of the waste and analysis of leachate, soil and groundwater quality. The following was noted: • There were no exceedances in the soil or groundwater when compared to the relevant human health GACs. Therefore no remediation is required at the site with respect to human health. • No asbestos fibres were detected in the soil samples submitted to the laboratory for testing. • Assessment of the ground gas results indicated a low risk according to CIRIA C665. The worst case measurement resulted in a classification of CS1 conditions. However, it was recommendation that consideration was given to possible preferential pathways associated with the former Eaton Green landfill 90 m east of the existing airport; • Concentrations of several contaminants in soils and groundwater exceeded the generic controlled waters criteria. Therefore, further assessment of these contaminants was required by undertaking a DQRA. • The controlled waters DQRA was undertaken using the Environment Agency remedial targets worksheet. Overall the quantitative risk assessment indicated that the identified potential pollutant linkages were low risk and no remediation was required at the site with respect to contamination.
Arup, Century Park, Airport Way, Play and Skate – Contamination Desk Study	2018	Wigmore Valley Park	This report was undertaken to assess potential contamination issues which could affect the proposed playground. It noted the following: • No previous contaminative uses on site; • A number of off-site contaminative uses such as made ground, allotment and landfill; and • Potential pollutant linkages of very low to low risk were identified, which could be mitigated by design. It recommended suitable supervising to appropriately manage any unforeseen contamination, and the production of an Materials Management Plan, if material is
Arup London Luton Airport Expansion Ground Investigation Strategy	2018	Former Eaton Green Landfill	This report sets out the strategy for further ground investigation of the landfill. The GI strategy was based on the findings of the Arup (2017) DQRA report for the New Century Park development. The report set out the requirements for investigation of the potential pollutant linkages (PPLs) identified in the DQRA.

Report title	Date	Location	Summary of scope/findings
AECOM Luton Hangar 24 Ground Investigation. Factual Ground Investigation Report	Feb 2018	Area of Tidy Tip and TUI car park, northwestern corner of the former landfill	This is a factual GI report undertaken to inform the construction of a new maintenance facility comprising garage space, offices and workshops. The GI comprised: • 2 No. Cable Percussion Boreholes (BH101-BH102) drilled to 20.00m and 21.00m bgl; • 3 No. Cable Percussion boreholes (BH104-BH106) drilled to between 4.50 m and 4.95 m bgl; • 5 No. Windowless Sampling Boreholes (WS101-WS105) drilled to between 4.80 m and 6.00 m bgl; • 5 No. Machine Excavated Trial Pits (TP102 and TP104-TP107) excavated to between 2.90 m and 4.50 m bgl; Geotechnical and environmental soil sampling and laboratory testing; • 2 No. Falling Head Permeability Tests, and; • 3 No. groundwater and gas monitoring standpipes. In addition, the following was undertaken in an area south of the site to inform on the design for a new entry roadway into the Eaton Green Civic Amenity Site 'Tidy Tip' to the south of the site: • 1 No. Cable Percussion Borehole (BH103) drilled to 4.50 m bgl. • 1 No. Machine Excavated Trial Pit (TP101) excavated to 4.00m bgl.1 No. Machine Excavated Trial Pit (TP101) excavated to 4.00 m bgl.
Arup, Proposed Airport Potential Parking Sites, Review of Ground and Construction Issues	2018	Two parcels of land close to Luton Parkway Station	This desk-based report assessed land contamination and geotechnical issues. A summary of its findings are as follows: • A number of historical sources of contamination on and off site, e.g. former motor works, rifle range, sewage works and railway and railway sidings; • Significant uncharacterised material imported for fill to produce development platforms, which poses a geo-environmental and geotechnical risk; • A conceptual site model identifying potential pollutant linkages (PPLs); and • A lack of previous geotechnical or geoenvironmental investigation. The report made the following recommendations: • Site investigation to characterise material present on site; and • Revised risk assessment to revise and PPLs.

Report title	Date	Location	Summary of scope/findings
Arup London Luton Airport Limited, Hangar 24 Ground Investigation Interpretative Report	July 2018	Area of Tidy Tip and TUI car park, northwestern corner of the former landfill	The interpretive report was based on the Aecom GI undertaken in 2017. • Works comprised 2No. deep boreholes to 20.0m and 21.0m bgl and 3No. shallow boreholes to 4.5 to 4.95m bgl, windowless sampling boreholes upto 6.0m bgl and machine excavated trial pits, geotechnical and environmental soil sampling and laboratory testing. Standpipes for gas monitoring in the made ground were installed, with monitoring completed on 6 occasions between October 2017 and January 2018. • The GI did not encounter any landfilled wastes, made ground was recorded to depths upto 3.0m thickness underlain by Clay with Flints/Glacial Till overlying Holywell Nodular Chalk Formation and New Pit Chalk Formation. Chalk was classified as CIRIA Grade Dm to approximately 9.5m bgl grading onto CIRIA Grade B. • Groundwater was not encountered during drilling; perched water was recorded in the made ground during monitoring works. • No chemical contaminants in exceedance of guideline values were identified in car park area or evidence of asbestos containing materials/fibres. Lead and dibenz[ah]anthracene were detected at concentrations above Arup assessment levels in soil samples taken from the bunds around the Tidy Tip. Asbestos was also found in samples taken from the bunds. The identified contaminants were not considered a risk to human health, and remediation works were not considered necessary, however it was recommended suitable control measures be adopted during site preparation and construction works. • No risk to groundwater was identified from the recorded contamination. • Ground gas assessment based on a peak concentration of CO_2 at 2.9% and maximum average flow indicated a Characteristic Situation 2 would be applicable, and basic gas protection measures would be required for the new building. The potential for gas migration from the adjacent landfill was identified and precautionary measures were proposed such as continuous trenching around the proposed building to detect any potential pathways e.g. old land drains/service trenches. • Geotechnical recommendations were for traditional spread pad foundations in the Glacial Till/Clay with Flints or driven piles with ground bearing floor slab. The use of soakaways was not considered feasible • The report concluded that there is no evidence that the area currently occupied by the TUI car park was ever part of the former landfill. The ground investigation found that there is a limited

Report title	Date	Location	Summary of scope/findings
			thickness of Made Ground beneath the majority of the car park and that what was found was typical of the formation of a hardstanding. • Historical maps and other records suggest that the Tidy Tip site was a 'scrapyard' within the landfill area and that the bunds that form part of the Hangar 24 site were formed when the scrapyard was cleared and levelled to form the tip site. • Based on the proposed development no remediation of the site was considered to be required with respect to human health or controlled water.
GL Hearn, Environmental Statement (Volume 1: Non-Technical Summary) New Century Park Luton and Volume 2: Environmental Statement – Addendum, Land Adjacent to Luton Airport: New Century Park	2018	Covers a proposed road scheme along boundary of Luton Airport and business park within Former Eaton Green Landfill	The Environment Statement reports the findings of the Environmental Impact Assessment (EIA) undertaken to identify the likely significant effects arising from the Proposed Development. The ES covers Ground Conditions and Contamination along the route of the proposed access road and the business park. Assessment of the former landfill area is based on Arup (2017) Century Park Development, Landfill Area Contamination Quantitative Risk Assessment (described in detail above). Other areas of contamination noted were as follows: • Localised asbestos contamination within the Made Ground; and • Substantial Made Ground deposit were encountered in the vicinity of Airport Way The ES concluded following suitable mitigation there were no significant effects.
AECOM Luton Airport Landfill Main Ground Investigation Factual Report	2019	Former Eaton Green landfill	This is a factual GI report undertaken to inform the works associated with the expansion of the airport based on the Arup (2018) Ground Investigation Strategy. Investigation locations were more closely spaced since this was a main GI, with some off-site locations included to assess off-site conditions. No interpretation of this GI has been undertaken yet. Preliminary findings, where relevant, have been included in this report.

Appendix G – Preliminary Risk Assessment

G1 Area A

Table F1 Area A Conceptual Site Model and PPLs

PPL No.	Source	Pathway	Receptor	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
On-site						
1	Ground gases from former landfill e.g. methane	Migration into future buildings and build-up of gases	Users of future development – public/airport operatives/ New Century Park users	Very High	The preliminary assessment undertaken as part of the Arup NCP QRA indicated elevated concentrations of methane and carbon dioxide but low flow rates. Overall the measurements typically indicated CS2 or CS3 scenario with CS4 encountered on one occasion. Further detailed assessment is required to understand the gassing conditions after work is undertaken to remodel the landfill. However, it is considered likely that any future development will require gas protection measures.	Yes
2		Migration off-site through preferential pathways	Adjacent site users (e.g. residential housing and other buildings on Luton Airport, WVP Community Centre/ pavilion)	Moderate	Further detailed assessment is required to understand the gassing conditions after work is undertaken to remodel the landfill. However, it is considered likely that any future development will require gas protection measures. Mitigation measures will be required to treat existing pathways e.g. Thames Valley Drain and install control measures e.g. vent trench.	Yes

PPL No.	Source	Pathway	Receptor	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
3	Volatile radionuclides occupying buildings overlying radioactive land contamination	Migration into future buildings and build-up of gases	Users of future development – public/airport operatives/ New Century Park users	Low/ moderate	The recent GI included testing for radionuclides, which indicated levels observed were consistent with background levels.	No
4		Migration off-site through preferential pathways	Adjacent site users (e.g. residential housing and other buildings on Luton Airport, WVP Community Centre/ pavilion)	Low/ moderate	The recent GI included testing for radionuclides, which indicated levels observed were consistent with background levels.	No
5	Waste in former landfill	Direct contact e.g. dermal contact, soil ingestion	Construction worker	Low	Construction workers may be exposed to areas of landfill waste during excavation/construction. This can be reduced by adoption of appropriate site management protocols and PPE.	No
6			Future maintenance workers	Low/ moderate	Maintenance workers may be exposed to areas of landfill waste during future excavation . This can be reduced by placing of services in a clean cover system and adoption of appropriate site management protocols and PPE.	No
7			Users of future development –	Low	The GI completed to date indicates the risk to future users of the new airport development is likely to be	No

PPL No.	Source	Pathway	Receptor	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
			public/airport operatives/ New Century Park users		low, most contaminants were below their respective GAC. However, further assessment will be required of the most recent GI data and the land use scenarios associated with the proposed airport expansion. The future development will comprise buildings & hardstanding and likely include an engineered cover layer, therefore there is unlikely to be any contact with landfilled wastes.	
8		Direct or indirect contact with radionuclides – incurring radiation dose by indirect dose received from ingestion of radium (or other alpha emitting contaminated material) or direct risk from contact with beta emitters such as Carbon-14 or Caesium-137	Construction workers	Low/ Moderate	Potential for radioactive materials to be present within the earlier waste which was deposited prior to the introduction of the Radioactive Substances Act in 1963. Potential for arisings from piling and foundation activities to encounter such materials. The recent GI included testing for radionuclides, which indicated levels observed were consistent with background levels. Procedures during construction should be in place to detect any radionuclides which may be encountered.	Yes
9			Future maintenance workers	Low	Potential for radioactive materials to be present within the earlier waste which was deposited prior to the introduction of the Radioactive Substances Act in 1963. Potential for maintenance workers to be exposed to areas of landfill waste during future excavation. This can be reduced by placing of services in a clean cover system and adoption of appropriate site management protocols and PPE. The recent GI included testing for radionuclides. Assessment of this data is required to inform the risks from this PPL.	No

PPL No.	Source	Pathway	Receptor	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
10			Users of future development – public/airport operatives/ New Century Park users	Low	Radioactive material (if present) will be limited to the earlier waste in the landfill – new development unlikely to be in contact with older waste. The future development will comprise buildings & hardstanding and likely include an engineered cover layer, therefore there is unlikely to be any contact with landfilled wastes. The recent GI included testing for radionuclides, which indicated levels observed were consistent with background levels.	No
11		Inhalation of vapours	Construction worker	Low	The risk assessment suggests there are not significant concentrations of volatile contaminants present within the landfill soils/groundwater. The recent GI included testing for vapours. Assessment of this data is required to inform the risks from this PPL.	No
12			Future maintenance workers	Low		No
13			Users of future development – public/airport operatives/ New Century Park users	Low	The assessment of the monitoring results undertaken as part of the 2016 Structural Soils GI works indicated that levels of soil vapours did not pose a risk to future users of the Proposed Development (Hazard Index <1.0). The recent GI included testing for vapours. Assessment of this data is required to inform the risks from this PPL.	No
14		Inhalation of airborne contaminants/ dust/	Users of future development – public/airport operatives/ New Century Park users	Low	The future development will be buildings and hardstanding and likely include an engineered cover layer, therefore there is unlikely to be any exposure of landfilled waste at the surface which could generate dusts etc.	No

PPL No.	Source	Pathway	Receptor	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
15		asbestos fibres and microorganisms	Adjacent site users (e.g. residential housing, Luton Airport visitors and operatives, users of WVP)	High	Future works will require significant movement of waste i.e. for waste processing/re-engineering, therefore there is the potential for generation of airborne contaminants, which could affect adjacent site users. Good site management practices, monitoring and mitigation measures would reduce the potential risk. Any future works should have appropriate Environmental Management Plans in place to include perimeter monitoring, with adoption of additional control measures as necessary.	Yes
16			Construction workers	Moderate	Construction workers are likely to be exposed to areas of landfill waste during future excavation. Any excavation work would adopt appropriate site management protocols and PPE to include personal monitoring and protection against airborne asbestos fibres as necessary based on outcome of risk assessments.	Yes
17		Driving of contaminants downward during any future piling	Principal aquifer in Chalk	Moderate	The quantitative risk assessment [8] has indicated that based on current data there is low likelihood that groundwater would be impacted by contaminants in the landfill. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL. However, care will be required during construction not to create a pathway. Risk from piling and construction can be mitigated by completion of piling risk assessment report to determine appropriate assessment for pile design and construction.	Yes

PPL No.	Source	Pathway	Receptor	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
18		Direct contact of foundations of future development	Foundations of future buildings	Moderate	Presence of landfill waste in contact with building foundations may cause damage to foundations through aggressive ground conditions. Site investigation data will be considered in the design of the foundation. Risk can be mitigated by appropriate design to select suitable foundation materials/concrete classification.	Yes
19	Japanese Knotweed	Direct contact with rhizomes on floor slabs, external pavement and drainage	Floor slabs/drainage /pavement	Moderate/ Low	Japanese Knotweed has been identified in WVP, this can cause damage to buried infrastructure/buildings and pavement through growth of rhizome. Risk can be mitigated through application of remedial works; treatment with herbicide/removal/on-site burial/containment.	Yes
20	Leachate in former landfill	Direct contact e.g. dermal contact	Construction workers	Moderate/ Low	Construction workers may be exposed to landfill leachate during future excavation works. he previous GI undertaken indicates there is likely to be limited leachate present. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL. Any excavation work would adopt appropriate site management protocols and PPE.	Yes
21			Future maintenance workers	Moderate/ Low	Maintenance workers may be exposed to areas of landfill leachate during future excavation, dependent upon the remediation scheme. The previous GI undertaken indicates there is likely to be limited leachate present. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL.	Yes

PPL No.	Source	Pathway	Receptor	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
					Any future excavation work would adopt appropriate site management protocols and PPE.	
22			Users of future development – public/airport operatives/ New Century Park users	Low	The previous GI undertaken indicates there is likely to be limited leachate present. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL. However, the future development will be buildings and hardstanding and is likely to include an engineered cover layer and leachate control system, therefore there is limited potential for contact with any leachate in the landfill.	No
23		Downward migration of leachate	Principal aquifer in Chalk	Moderate/ Low	The previous GI undertaken indicates there is likely to be limited leachate present. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL. The groundwater monitoring data from beneath the landfill and outside the boundary does not suggest a significant leachate plume affecting the aquifer.	Yes
24		Direct contact with foundations of future development	Foundations of future buildings	Moderate/ Low	Presence of leachate in contact with building foundations may cause damage to foundations through aggressive ground conditions. The previous GI undertaken indicates there is likely to be limited leachate present. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL	Yes
25		Leachate breakout and plant uptake	Areas of Landscaping in the airport	Low	No evidence of leachate breakout currently occurring. The previous GI undertaken indicates there is likely to be limited leachate present. Further detailed risk	Yes

PPL No.	Source	Pathway	Receptor	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
			and New Century Park developments/ WVP allotments		assessment of the recent GI data is required to inform the risks from this PPL. A clean cover system with suitable depth of growth medium will further reduce this risk.	
26	Contaminants in perched water	Driving of contaminants downward during any future piling	Principal aquifer in Chalk	Low	The GI indicated the waste was relatively dry and no evidence of significant perched water in the landfill was encountered. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL. Risk from piling and construction can be mitigated by completion of piling risk assessment report to determine appropriate assessment for pile design and construction.	Yes
27		Migration of contaminants via preferential pathways e.g. drainage	Principal aquifer in Chalk	Moderate	Survey and assessment of purpose of drain passing through landfill to be undertaken.	Yes
28	Contaminants in Made Ground (car park, capping material)	Direct contact e.g. dermal contact, soil ingestion	Construction workers	Moderate/ Low	Construction workers will likely be exposed to areas with contaminated Made Ground during excavation. Any excavation work would adopt appropriate site management protocols and PPE.	Yes
29			Future maintenance workers	Moderate/ Low	Maintenance workers may be exposed to areas with contaminated Made Ground during future excavation. Any future excavation work would adopt appropriate site management protocols and PPE. The risk can be	Yes

PPL No.	Source	Pathway	Receptor	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
					further reduced by placement of services in a clean cover system.	
30			Users of future development – public/ airport workers/users of New Century Park	Low	The GI indicated the risk to future occupants of the development is likely to be low. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL. The future development will incorporate hardstanding and/or include an engineered cover layer therefore there is unlikely to be any contact with contaminants in the Made Ground.	Yes
31		Inhalation of soil derived dusts/asbestos fibres	Construction workers	Moderate	Construction workers will be exposed to made ground during excavation. Any excavation work would adopt appropriate site management protocols, air monitoring, personal monitoring and PPE.	Yes
32			Future maintenance workers	Moderate/ Low	Maintenance workers may be exposed to made ground during future excavation where buried infrastructure is placed adjacent such materials. Any future excavation work would adopt appropriate site management protocols, and PPE. Where possible services should be placed in clean cover layer.	Yes
33			Users of future development – public/ airport workers/users of New Century Park	Low	The future development will be predominately buildings and hardstanding and likely include an engineered cover layer, therefore there is unlikely to be any exposure of Made Ground at the surface which could generate dusts etc.	No

PPL No.	Source	Pathway	Receptor	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
34			Adjacent site users (e.g. residential housing, Luton Airport, WVP)	Moderate/ Low	There is the potential for soil derived dusts which contain contaminants to be generated during construction works. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL. Good site management practices and mitigation measures would reduce the potential risk, to include perimeter monitoring.	Yes
35		Inhalation of vapours	Construction worker	Low	Risk to construction workers and future maintenance workers is considered to be lower than future users as exposure is likely to be in outdoor air and therefore vapours will be diluted. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL.	Yes
36			Future maintenance workers	Low		Yes
37			Users of future development – public/ airport workers/users of New Century Park	Moderate/ Low	Volatile contaminants may accumulate within indoor air in future buildings. The Arup NCP QRA assessment suggests that there are not significant concentrations of volatile contaminants presented within the made ground (HI <1.0). Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL.	Yes
38			Adjacent site users (e.g. residential housing, Luton Airport, WVP Buildings)	Low	The 2016 Structural Soils GI indicated levels of volatile contaminants in the made ground are not significantly elevated . Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL.	Yes

PPL No.	Source	Pathway	Receptor	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
39		Storage pond	Principal aquifer in Chalk	Very low risk	Thames Water compound storage pond present in the north of Area A will remain in place during the Proposed Development. The storage pond does not infiltrate into the chalk. Appropriate site management and construction techniques will be required during the development construction process in the vicinity of the current pond to reduce the risk.	No
40	Contaminants in groundwater (dissolved phase)	Lateral migration of contaminants in groundwater	Controlled waters (including potable water groundwater abstraction)	Moderate	Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL.	Yes
41	Unexploded Ordnance	Driving of piles impact UXO	Construction workers/public/ terminal buildings	High/ Moderate	Based on Detailed UXO Risk Assessment 'Very High' probability of UXO on-site. Low risk where works are to be undertaken within post war fill material – correct detection and monitoring procedures will be required during site works to mitigate risks.	Yes

G2 Area B

Table F2 Area B Conceptual Site Model and PPLs

PPL No.	Source	Pathway	Receptor	Qualitative assessment of risk	Justification of risk	PPL requires further assessment/ consideration
On-Site						
1	Contaminants in Made Ground (including proposed fill material)	Direct contact e.g. dermal contact, soil ingestion	Construction workers	Very Low	Very little Made Ground present within Area B. Previous ground investigation has not identified any evidence of soil contamination in exceedance of generic guidance for public open space within the existing site materials. Fill material used on-site will be suitable for use and will not present a risk to human health or controlled waters.	No
2			Future maintenance workers	Very Low		No
3			Users of future development – public/ airport workers	Very Low		No
4		Inhalation of soil derived dusts	Construction workers	Very Low	Very little Made Ground present within Area B. Previous ground investigation has not identified any evidence of soil contamination in exceedance of generic guidance for public open space within the existing site materials. Fill material used on-site will be suitable for use and will not present a risk to human health or controlled waters. Areas of hardstanding will further reduce the creation of dusts.	No
5			Future maintenance workers	Very Low		No
6			Users of future development- public/ airport workers	Very Low		No
7			Adjacent site users (e.g.	Very Low		No

PPL No.	Source	Pathway	Receptor	Qualitative assessment of risk	Justification of risk	PPL requires further assessment/ consideration
			residential housing, Luton Airport)			
8		Inhalation of vapours	Construction worker	Very Low	Very little Made Ground present within Area B. Ground investigation data indicates levels of volatile contaminants in the made ground are not significantly elevated. Fill material used on-site will be suitable for use and will not present a risk to human health or controlled waters.	No
9			Future maintenance workers	Very Low		No
10			Users of future development- public/ airport workers	Very Low		No
11			Adjacent site users (e.g. residential housing, Luton Airport)	Very Low		No
12		Leaching of contaminants in soil to groundwater	Principal aquifer in the Chalk	Very low	Previous ground investigation has not identified any evidence of soil contamination across the area which is considered to pose a risk to groundwater. Fill material used on-site will be suitable for use and will not present a risk to human health or controlled waters.	No
13	Contaminated Groundwater	Lateral migration in	Principal Aquifer	Moderate/ Low	Contaminants have been recorded in groundwater beneath Area B, which exceed generic guidance. Subsequent to groundwater monitoring ammoniacal	Yes

PPL No.	Source	Pathway	Receptor	Qualitative assessment of risk	Justification of risk	PPL requires further assessment/ consideration
		groundwater off-site			nitrogen has been identified as a contaminant which could impact off-site receptors. However, it may be representative of general groundwater quality in the area due to agricultural land uses. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL.	
14	Ground gases from made ground e.g. methane, carbon dioxide	Migration into buildings and build-up of gases	Users of future development – public/airport operatives	Very low	Ground gases may be produced where a significant thickness of made ground is present. Very little Made Ground present within Area B. Low levels of ground gas currently recorded. Further detailed risk assessment of the recent GI data is required to inform the risks from this PPL. Fill material used on-site will be suitable for use and will not present a risk to human health or controlled waters.	Yes
15	Unexploded Ordnance	Driving of piles impact UXO	Construction workers/public/ airport buildings	Low	Based on Dynasafe Explosive Ordnance Desktop Threat Assessment, Low Risk of UXOs . Adopt appropriate site protocols.	No

G3 Area C

Table F3 Area C Conceptual Site Model and PPLs

PPL No.	Source	Pathway	Receptor	Qualitative assessment of risk	Justification of risk	PPL requires further assessment/ consideration
On-Site						
1	Contaminants in Made Ground	Direct contact e.g. dermal contact, soil ingestion	Users of future development- public/ airport workers/	Very Low	No previous historical contaminative use of this Area. Site is considered a greenfield site and no source of contamination. Therefore no PPL exists.	No
2			Construction workers	Very Low		No
3			Future maintenance workers	Very Low		No
4		Inhalation of soil derived dusts	Construction workers	Very Low	No previous historical contaminative use of this Area. Site is considered a greenfield site and no source of contamination. Therefore no PPL exists.	No
5			Future maintenance workers	Very Low		No
6			Users of future development- public	Very Low		No
7			Adjacent site users e.g.	Very Low		No

PPL No.	Source	Pathway	Receptor	Qualitative assessment of risk	Justification of risk	PPL requires further assessment/ consideration
On-Site						
			residential housing,			
8		Inhalation of vapours	Construction worker	Very Low	No previous historical contaminative use of this Area. Site is considered a greenfield site and no source of contamination. Therefore no PPL exists.	No
9			Future maintenance workers	Very Low		No
10			Users of future informal parkland-public	Very Low		No
11		Leaching of contaminants in soil to groundwater	Principal aquifer in the Chalk	Very low	No previous historical contaminative use of this Area. Site is considered a greenfield site and no source of contamination. Therefore no PPL exists.	No
12	Contaminated Groundwater	Lateral migration in groundwater off-site	Principal Aquifer	Moderate/ Low	No previous historical contaminative use of this Area. Site is considered a greenfield site and no source of contamination. Therefore no PPL exists.	Yes
13	Unexploded Ordnance	Excavation of chalk in the southern area	Construction workers/public	Low/ Moderate	No previous historical contaminative use of this Area. Site is considered a greenfield site and no source of contamination. Therefore no PPL exists.	No

G4 Area D

Table F4 Area D Conceptual Site Model and PPLs

PPL No.	Sources	Pathways	Receptors	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
On-site						
1	Contaminants in Made Ground (including stockpiled materials)	Direct contact e.g. dermal contact, soil ingestion	Construction workers	Moderate/ Low	Construction workers will likely be exposed to areas with contaminated Made Ground during excavation/construction. Any future excavation work would adopt appropriate site management protocols and PPE.	Yes
2			Future maintenance workers	Moderate/ Low	The area is likely to undergo some filling during the development. However, maintenance workers may be exposed to areas with contaminated Made Ground during future excavation. Any future excavation work would adopt appropriate site management protocols and PPE. The risk can be further reduced by placement of services in a clean cover system.	Yes
3			Users of future development – public/ airport workers/	Low	The future development will incorporate hardstanding and/or include an engineered cover layer therefore there is unlikely to be any contact with contaminants in the Made Ground.	No
4		Inhalation of soil derived dusts/asbestos fibres	Construction workers	Moderate	Construction workers will be exposed to made ground during excavation/construction. Anecdotal evidence of ACMs within stockpiles. Any excavation work would adopt appropriate site management protocols, air monitoring, personal monitoring and PPE.	Yes

PPL No.	Sources	Pathways	Receptors	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
5			Future maintenance workers	Low	The area is likely to undergo some filling during the development. However, maintenance workers may be exposed to areas with contaminated Made Ground during future excavation. Any future excavation work would adopt appropriate site management protocols and PPE. The risk can be further reduced by placement of services in a clean cover system.	Yes
6			Users of future development – public/ airport workers	Low	The future development will be predominately buildings and hardstanding and likely include an engineered cover layer, therefore there is unlikely to be any exposure of Made Ground at the surface which could generate dusts etc.	No
7			Adjacent site users (e.g. Luton Airport, WVP)	Moderate/ Low	There is the potential for soil derived dusts which contain contaminants to be generated during construction works. The 2016 Structural Soils GI indicated that the levels of contaminants in the made ground are not significantly elevated although asbestos fibres have been recorded in stockpiled soils. Further risk assessment of the recent GI data is required to inform the risks from this PPL. Good site management practices and mitigation measures would reduce the potential risk, to include perimeter monitoring.	Yes
8		Inhalation of vapours	Construction worker	Low	The Arup NCP QRA assessment suggests that there are not significant concentrations of volatile contaminants presented within the made ground (HI <1.0). Risk to construction workers and future maintenance workers is considered to be lower than future users as exposure is likely to be in outdoor air	Yes
9			Future maintenance workers	Low		Yes

PPL No.	Sources	Pathways	Receptors	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
					and therefore vapours will be diluted. Further risk assessment of the recent GI data is required to inform the risks from this PPL.	
10			Users of future development – public/ airport workers/users of New Century Park	Low	Volatile contaminants may accumulate within indoor air in future buildings. The Arup NCP QRA assessment suggests that there are not significant concentrations of volatile contaminants presented within the made ground (HI <1.0). Further risk assessment of the recent GI data is required to inform the risks from this PPL.	Yes
11			Adjacent site users (e.g. residential housing, Luton Airport, WVP Buildings)	Low	The 2016 Structural Soils GI indicated levels of volatile contaminants in the made ground are not significantly elevated . Further risk assessment of the recent GI data is required to inform the risks from this PPL.	Yes
12		Leaching of contaminants in soil to groundwater	Principal aquifer in Chalk	Moderate/ Low	Further risk assessment of the recent GI data is required to inform the risks from this PPL.	Yes
13		Driving of contaminants downward during any future piling	Principal aquifer in Chalk	Moderate/ Low	Care will be required during construction not to create a pathway. Risk from piling and construction can be mitigated by completion of piling risk assessment report to determine appropriate assessment for pile design and construction. Further risk assessment of the recent GI data is required to inform the risks from this PPL.	Yes

PPL No.	Sources	Pathways	Receptors	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
14		Soakaways/ storage ponds	Principal aquifer in Chalk	Moderate/ Low	Soakaways and storage ponds present within Area D will be removed during the Proposed Development. However, soakaways currently provide a pathway to the chalk. Appropriate site management and construction techniques will be required during the development construction process to reduce the risk.	Yes
15	Contaminants in groundwater (dissolved phase)	Lateral migration	Controlled waters (including groundwater abstraction)	Low	Further risk assessment of the recent GI data is required to inform the risks from this PPL. Source unlikely to be within Area D. However, it is thought that the groundwater in the area would be similar chemically to that within Area D.	Yes
16	Unexploded Ordnance	Driving of piles impact UXO	Construction workers/public/ terminal buildings	High	Based on Detailed UXO Risk Assessment covering part of this area – Very High . Low Risk – where works are to be undertaken within post war fill material/made ground . Correct detection and monitoring procedures will be required during site works to mitigate risks.	Yes

G5 Area E and Area F

Table F5 Area E and Area F Conceptual Site Model and PPLs

PPL No.	Sources	Pathways	Receptors	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
On-site						
1	Contaminants in Made Ground	Direct contact e.g. dermal contact, soil ingestion	Construction workers	Moderate/ Low	The areas are likely to undergo some reprofiling during the development. Construction workers will likely be exposed to areas of Made Ground during excavation/construction. Ground investigation and testing is required to identify any contaminants present.	Yes
2			Future maintenance workers	Moderate/ Low	The sites will predominantly be covered in hardstanding, therefore there is unlikely to be contact with underlying soils. Any future excavation work would adopt appropriate site management protocols and PPE. The risk can be further reduced by placement of services in a clean cover system. Ground investigation and testing is required to identify any contaminants present.	Yes
3			Users of future development – public/ airport workers/	Low	The future development will incorporate hardstanding therefore there is unlikely to be any contact with contaminants in the Made Ground. Further risk assessment of the recent GI data is required to inform the risks from this PPL.	Yes
4		Inhalation of soil derived	Construction workers	Moderate	The area is likely to undergo some reprofiling during the development. Construction workers will be exposed to made ground during	Yes

PPL No.	Sources	Pathways	Receptors	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
		dusts/asbestos fibres			excavation/construction which may contain ACMs. Any excavation work would adopt appropriate site management protocols, air monitoring, personal monitoring and PPE. Ground investigation and testing is required to identify any contaminants present.	
5			Future maintenance workers	Moderate/ Low	The future development will be predominantly hardstanding, however, maintenance workers may be exposed to areas with contaminated Made Ground during future excavation. Any future excavation work would adopt appropriate site management protocols and PPE. The risk can be further reduced by placement of services in a clean cover system. Ground investigation and testing is required to identify any contaminants present.	Yes
6			Users of future development – public/ airport workers	Low	The future development will be predominately hardstanding and therefore there is unlikely to be any exposure of Made Ground at the surface which could generate dusts etc. Ground investigation and testing is required to identify if any contaminants present.	No
7			Adjacent site users (e.g. Luton Airport)	Moderate/ Low	There is the potential for soil derived dusts which contain contaminants to be generated during construction works. Good site management practices and mitigation measures would reduce the potential risk, to include perimeter monitoring. Ground investigation and testing is required to identify any contaminants present.	Yes

PPL No.	Sources	Pathways	Receptors	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
8		Inhalation of vapours	Construction worker	Low	Presence of vapours is unknown. Risk to construction workers and future maintenance workers is considered to be low as exposure is likely to be in outdoor air and therefore vapours will be diluted.	No
9			Future maintenance workers	Low		No
10			Users of future development – public/ airport workers/users of New Century Park	Low		No
11			Adjacent site users (e.g. residential housing, Luton Airport, WVP Buildings)	Low		No
12		Leaching of contaminants in soil to groundwater	Principal aquifer in Chalk	Moderate	Ground investigation and risk assessment should be undertaken to inform the potential risk to the groundwater from contaminants in the soil.	Yes
13		Migration of contaminants through preferential	River Lea	Low	The River Lea is 400 m south of Area E and 250 m southwest of Area F. The distance for contaminants to travel means it is unlikely that significant concentrations are reaching the watercourse from the site. Appropriate methods should be taken during site	No

PPL No.	Sources	Pathways	Receptors	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
		pathways e.g. drainage			works to locate previous drainage and utility trenches and remove the possible pathway to any construction works should have mitigation measures for managing drains encountered during the works.	
14		Driving of contaminants downward during any future piling	Principal aquifer in Chalk	Moderate/ Low	Care will be required during construction not to create a pathway. Risk from piling and construction can be mitigated by completion of piling risk assessment report to determine appropriate assessment for pile design and construction. Ground investigation and assessment required to confirm risk.	Yes
15	Contaminants in groundwater (dissolved phase)	Lateral migration of contaminants through preferential pathways i.e. drainage	River Lea	Low	Area E is 400 m from the River Lea, as such there is a minimal chance of pathways present to surface waters. Area F is closer being 250 m from the River Lea, as such appropriate measures should be taken during site works to locate previous drainage and utility trenches and remove possible pathway. New service runs should be designed appropriately to ensure no migration of contamination.	No
16		Migration of contaminants through preferential pathways i.e. piling	Principal aquifer	Moderate	Potential for the construction to require piles. Care will be required during construction not to create a pathway. Risk from piling and construction can be mitigated by completion of piling risk assessment report to determine appropriate assessment for pile design and construction. Ground investigation and assessment required to confirm risk.	No

PPL No.	Sources	Pathways	Receptors	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
17		Inhalation of vapour	Construction workers	Low	Potential for vapours to be present from, however, site to be open therefore limited potential for build up of vapours. Suitable site protocols and PPE required.	No
18			Future maintenance workers	Low	Proposed use of car park has little potential for enclosed buildings. Confirmation of the volatile contaminant is required.	Yes
19			Future users of car park	Low	Absence of enclosed buildings/spaces or volatile build up. Further ground investigation required to note this.	Yes
20	Unexploded Ordnance	Driving of piles impact UXO	Construction workers/public/ terminal buildings	Low/ Medium	Nearby UXO assessment suggests Low to Medium risk of UXO. Further UXO assessment required.	No

G6 Off-site

Table F6 Off-site Conceptual Site Model and PPLs

PPL No.	Sources	Pathways	Receptors	Qualitative Assessment of Risk	Justification of Qualitative Assessment of Risk	PPL requires further assessment/ consideration
1	Contaminants in groundwater associated with wider Luton area	Lateral migration in groundwater onto site	Principal aquifer in Chalk	Moderate	Contaminants in groundwater from the around the site may migrate onto site. Groundwater beneath the development area may be affected by the low level 'halo' of chlorinated solvents which is present in the Luton and Dunstable area. Further risk assessment of the recent GI data is required to inform the risks from this PPL.	Yes
2	Contaminants in adjacent land (e.g. motor works, railway land, sewage works etc.) - adjacent to Areas E and F	Lateral migration of contaminants in groundwater	Principal aquifer	Moderate/ Low	Potential for contaminants to migrate on-site should be confirmed during the ground investigation works Further risk assessment of the recent GI data is required to inform the risks from this PPL.	No
3		Inhalation of vapour	Future maintenance workers/users of the site	Low	Potential for permeable horizons or services which may run between the two sites to provide a preferential pathway for migration of vapours. Further risk assessment of the recent GI data is required to inform the risks from this PPL.	No