

M3 Junction 9 Improvement

Scheme Number: TR010055

6.3 Environmental Statement Appendix 9.1 - Phase 1 Ground Conditions Assessment Part 1 of 2

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Procedure) Regulations 2009**

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6.3 ENVIRONMENTAL STATEMENT - APPENDIX 9.1: PHASE 1 GROUND CONDITIONS ASSESSMENT

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1 Introduction

1.1 Preamble

- 1.1.1 Stantec UK Limited (Stantec) has been commissioned by VolkerFitzpatrick Limited and National Highways (the Client) to undertake a Phase 1 Ground Conditions Assessment for additional areas to be included in the Indicative Application Boundary for the proposed M3 Junction 9 (M3 J9) improvement works (the Scheme). The additional areas are proposed to be used as construction compound and deposition¹ sites required for the placement of soil material arising from earthworks. The discrete sites have been grouped into three site areas for ease of description within this report (Site 1, Site 2a-e and Site 3).
- 1.1.2 The Scheme is located approximately 1.1km to the north east of Winchester, although the additional areas, subject of this report, are located up to approximately 5km to the north of Junction 9 of the M3.
- 1.1.3 This report presents a Phase 1 ground condition assessment comprising a desk study, Tier 1 (preliminary) qualitative contamination risk assessment, and a preliminary ground stability appraisal.

1.2 Objective

- 1.2.1 This report has been prepared in a planning context and aims to address the requirements of the National Planning Policy Framework (NPPF) (MHCLG, 2019) for the proposed development of the additional areas. The remaining parts of the main site are the subject of previous reports prepared by other parties in support of a Development Consent Order application for the Proposed Scheme.
- 1.2.2 The National Planning Policy Framework (NPPF) (MHCLG, 2019) stipulates that planning policies and decisions should ensure that “a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation)”; and that “after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990; and adequate site investigation information, prepared by a competent person, is available to inform these assessments”.

¹ Note at the time this report was drafted the Scheme was anticipated to generate surplus spoil. Therefore, the Application Boundary included areas to permanently deposit excess spoil. Following updates to the preliminary design these permanent deposition areas are no longer required as part of the Scheme.

1.2.3 The objective of the assessment is to review published and readily available information to identify the likely ground conditions at the site and immediate surrounding land and to assess whether there are significant land contamination risks, and ground and slope stability risks associated with the ground conditions that may require management (remediation or mitigation).

1.2.4 The scope of work for the study comprises:

- i. A desk study review of readily available information including: geological, hydrogeological and aquifer vulnerability maps; and historical Ordnance Survey (OS) maps supplemented where possible and available by reference to early maps and other historical records; together with ground investigation data; and previous drawings and reports;
- ii. A walkover survey to examine the current condition of the sites and surrounding area
- iii. A qualitative assessment of geological hazards, and ground and slope stability hazard to identify the potential risk, if any, arising from artificial cavities; natural cavities; and other potential adverse foundation conditions
- iv. A qualitative Tier 1 preliminary contamination risk assessment utilising a Conceptual Site Model to identify 'source-pathway-receptor' linkages to assess the potential risk and hazards, if any, associated with existing contamination in the ground

1.2.5 It should be noted that the Phase 1 is a land condition assessment and does not purport to be an agricultural soil quality, ecological, flood risk or archaeological survey.

1.2.6 Attention is drawn to the Essential Guidance for Report Readers included after the text of this report.

1.3 Methodology and report format

Assessment of ground conditions – contamination

1.3.1 UK legislation on the contamination of land from historical activities is principally contained in Part 2A of the Environmental Protection Act, 1990 (which was inserted into the Act by Section 57 of the Environment Act 1995).

1.3.2 The Regulations and Statutory Guidance that accompanied the Act, including the Contaminated Land (England) Regulations 2006, have been revised with the issue of the Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263) and the Contaminated Land Statutory Guidance for England 2012.

1.3.3 Under the NPPF (2019), the broad approach, concepts and principles behind land contamination management advocated by the Part 2A regime are applied

to the determination of planning applications. The Land Contamination: Risk Management (LC:RM) (Environment Agency, 2020) guidance, which is based on and supersedes the Model Procedures for the Management of Contaminated Land (CLR11) (Environment Agency, 2004) provides references to established technical and procedural practice.

1.3.4 This Phase 1 Ground Condition Assessment complies with the requirements of a Preliminary Investigation as detailed in BS ISO 18400-104:2018.

1.3.5 The methodology for ground condition assessment (contamination) is presented in **Appendix A**.

Assessment of ground conditions – instability

1.3.6 Planning Authorities are required (NPPF paragraphs 178 and 179) to consider if land instability poses a potentially unacceptable risk to development. In paragraph 178, the requirement to take account of potential hazards arising from natural hazards (such as natural cavities) or former activities such as mining is outlined.

1.3.7 The preliminary ground stability assessment methodology adopted follows the guidance on preliminary land stability assessment given in the Planning Practice Guidance for Land Stability published by the Department for Communities and Local Government (MHCLG, 2014).

1.3.8 The desk-based study comprises a review of existing readily available published sources of geological, geomorphological, hydrogeological and/or mining information for the site and its surroundings and a historical review including mapping and aerial imagery, if appropriate.

1.3.9 The preliminary stability assessment includes for example, where relevant, a review of geological hazards for the site such as natural and man-made (mining) cavities, collapsible and compressible soils, running sand, and subsidence and heave due to volumetric change in the ground.

1.4 Source of information

1.4.1 The following sources of information were used in the preparation of this report:

- A walkover inspection to confirm current land use was undertaken by a geotechnical engineer on 27 November 2020 – selected photographs are presented in **Appendix B**
- An environmental data search was commissioned from Groundsure (GS) (copies of the Groundsure reports are presented in **Appendix C**)

- Review of historical aerial photography held by Historic England and made available online through Britain From Above Project, <https://britainfromabove.org.uk>
- Review of risk map records of Regional Unexploded Bomb Risk held by Zetica UXO and located at <https://zeticauxo.com/downloads-and-resources/risk-maps/>
- Information published by the British Geological Survey (BGS) from 1:50,000 scale geological maps.
- Borehole Logs held by the BGS as accessed via their website, www.bgs.ac.uk/data/boreholescans/home.html
- Borehole logs contained within a Factual Ground Investigation Report produced by Soils Limited (Soils, 2020)
- Ground stability information obtained from the Natural Cavity and Artificial non-coal (underground) mining cavity databases managed and enhanced
- A search of the project database to identify any ground condition reports near the Site (within 250m)
- Review of the MAGIC (Multi-Agency Geographic Information for the Countryside) website, <http://www.magic.gov.uk>. The MAGIC website provides authoritative geographic information about the natural environment from across government. The information covers rural, urban, coastal and marine environments across Great Britain. It is presented in an interactive map which can be explored using various mapping tools

2 Land use information

2.1 Introduction

- 2.1.1 This section presents a summary of the historical and current land uses on and immediately adjacent to the site areas.
- 2.1.2 Current land use information is based on a walkover survey undertaken by a geotechnical engineer on the 27 November 2020. This has also been supplemented by a review of Google Earth imagery (reviewed October 2020).
- 2.1.3 The historical land use information is based on historical Ordnance Survey (OS) maps and plans provided by Groundsure (GS, 2020) presented in **Appendix C** and supplemented by a review of historical aerial photography.
- 2.1.4 For ease of reference the various parcels of land have been designated as being Sites 1, 2(a-e) and 3. A Site Location Plan is presented as **Figure 1**.

2.2 Site location and description

Site 1

- 2.2.1 The site is located to the north of Winchester, approximately 5.0km north-northwest of Junction 9 of the M3. The site is centred at approximate National Grid Reference SU 463 339
- 2.2.2 The site comprises a plot of land that is broadly rectangular in shape and occupies an area of 3.06 hectares (ha). The eastern part of the site comprises an off-road motorsport track, and the western part appears to be used as an informal car park. The site has been landscaped to create jumps associated with the track, and a soil mound/bund is present in the north of the site. Broken / spare parts associated with motorbikes were locally noted across the site area. Aerial photography shows that the configuration of the track has been periodically altered, covering greater and lesser parts of the site, together with the re-arrangement of the locations of the earth jumps and stockpiles. The site is bounded to the south by a larger off-road motorsport track, to the north and east by agricultural land, and to the west by the A34. The layout of the site is indicated on **Figure 2**.
- 2.2.3 Topographically, natural ground levels appear to slope gently south-westwards, with an approximate elevation of 94m above ordnance data (m AOD) in the northeast, falling to approximately 90m in the southern boundary. As discussed above, levels have been locally altered with earth bunds around 2.0m in height present to create the motorsport track.
- 2.2.4 The majority of the site comprises the southern part of a larger arable field, with an open boundary to the north. The westernmost part of the site comprises the northwest-southeast aligned Christmas Hill (road).

Site 2

- 2.2.5 The site is located to the northeast of Winchester, approximately 1.6km northeast of Winchester Cathedral. The site is centred at approximate National Grid Reference SU 499 309. Site 2 is subdivided into five sub-areas (2A – 2E), these subareas are indicated on **Figure 2**.
- 2.2.6 The combined Site 2 area occupies an area of approximately 55 hectares (ha). The areas are generally bounded by agricultural land to the north and east and by road infrastructure to the west. St Swithun’s School is located approximately 50m to the south.

Table 2.1: Site 2 Subareas

Designation	Area (ha)	Topography	Current site use
Area 2A	5.8	Generally flat valley base at an approximate elevation of 40m AOD, with localised depressions present in the ground surface.	The western part of the area is wooded, with the southward flowing River Itchen present. The eastern part of the area comprises open grass land.
Area 2B	6.4	This area lies on the southern slope of the Itchen valley with levels falling steeply, generally northwards towards the river, from a highpoint at the southern boundary of approximately 80m AOD, to a low point in at the northern boundary of approximately 56m AOD.	The area forms part of a larger arable field.
Area 2C	19	The area lies on the northern slope of a dry valley, that itself falls towards the River Itchen. The highest point of the site in the north has an approximate elevation of 70m AOD, falling southwards to a low point of approximately 50m AOD in the south of the area.	The site comprises a large arable field. A towable generator and fuel bowser were present on the western boundary of the area at the time of the walkover. The generator was noted to be running during the walkover inspection and it is assumed that these

Designation	Area (ha)	Topography	Current site use
			were powering the adjacent (off-site) mobile phone mast.
Area 2D	6	The area slopes south/south-westwards in accordance with the surrounding area, with levels falling from a highpoint of approximately 70m AOD on the northern boundary to a low point of approximately 60m AOD at the southern boundary	The area forms part of a larger arable field. An un-named east-west trending track forms the southern boundary of the area.
Area 2E	14	The area is part of a dry valley falling westwards towards the River Itchen, with levels on site broadly falling in accordance with surrounding topography. The highpoint of the area is located in the northeast with an approximate elevation of 72m AOD, falling towards a low point on the western boundary of approximately 55m AOD.	The area forms part of a larger arable field. An un-named east-west trending track forms the northern boundary of the area.

Site 3

- 2.2.7 The site is located to the north of Winchester, approximately 1.3km southeast of Junction 9 of the M3. The site is centred at approximate National Grid Reference SU 502 290.
- 2.2.8 The site comprises a plot of land that is broadly rectangular in shape and occupies an area of 14.65 hectares (ha). The site is bounded by the A31 to the north, Kings Lane to the east, agricultural land to the west and agricultural land/sports playing field to the south. The layout of the site is indicated on **Figure 2**.

2.2.9 Topographically the site lies at the base of a dry valley that falls westwards towards the River Itchen. The valley sides are steeply sloping. The highest point of the site is situated towards the centre of the southern boundary with an approximate elevation of 72m AOD, falling to a low point in the northwest of approximately 53m AOD.

2.3 Historical land use

2.3.1 **Appendix D** contains a tabulated review of available historical Ordnance Survey (OS) mapping which indicates the most pertinent features present both on site and within the surrounding area. A summary of that information is presented below.

Site 1

2.3.2 Site 1 remained undeveloped agricultural land from earliest available OS mapping (1870) through to the 1980s, at which time as a result of reconfiguration of the adjacent A34 an unnamed road was constructed through the northwest of the site. Aerial photography shows the site has been used as an off-road motorsport track since about 2005.

2.3.3 The surrounding area is similarly rural in setting, generally comprising agricultural fields punctuated with farms and occasional small chalk pits. In the 1930s Worthy Down Camp was constructed 750m north of the site; this appears to comprise a relatively small army barracks with mostly residential units seemingly present. In the 1960s the A34 was constructed to the immediate south and west of the site.

Site 2

2.3.4 Earliest available OS mapping dating from the 1870s showed the Site 2 areas to generally comprise agricultural fields interspersed by farms with occasional small chalk pits noted in the wider area. A railway was constructed to the west of the site in the later 19th century.

2.3.5 Site 2 is indicated to have historically been and remains largely as undeveloped land, with area 2A containing several braids of the River Itchen.

2.3.6 A small chalk pit was present in the north of area 2C from approximately 1910 through to 1930.

2.3.7 In around 1960 the River Itchen was realigned to its current layout within area 2A, with several of the braided channels no longer present. A gantry over the river was also constructed around this time; the purpose of this gantry is not clear.

2.3.8 The area surrounding the Site 2 areas sees little substantial change during the early part of 20th century. In the wider area, the Winchester by-pass was constructed in around 1960; at around this time the railway line to the west of

the Site is also dismantled. The M3 was constructed during the 1980s with associated minor layout changes to surrounding roads.

Site 3

2.3.9 Earliest available OS mapping from the 1870s shows the site to comprise agricultural land present in a rural setting east of Winchester. An east-west aligned road passes through the northwest of the site at this time. Few significant changes are noted on site or in the surrounding area until the mid 20th century when a new (un-named) road is constructed passing through the northwest of the site, together with urban expansion of Winchester to the west of the site. In the 1960s a sports ground is developed to the south of the site. In the 1980s the broadly north-south aligned M3 is constructed some 100m to the west. In the late 1990s/early 2000s the road present in the north west of the site is realigned to its current route and is labelled as the A31 (Petersfield Road).

2.4 Proposed Scheme

2.4.1 It is proposed that the additional areas will be used as a mixture of construction compounds and to provide permanent deposition areas for materials arising from the earthworks associated with the proposed works. Upon completion of the proposed works it is understood that the sites will be either restored to previous use, predominantly agricultural land or as improved chalk grass land.

2.4.2 A plan produced by Volker Fitzpatrick showing the proposed uses during the works is presented as **Appendix E**.

3 Environmental setting

3.1 Introduction

3.1.1 Introduction

3.1.2 Information on the environmental setting of the site is presented in this section and the data is used to inform the stability assessment in Section 5 and the preliminary environmental risk assessment in **Section 4**.

3.2 Published geology

3.2.1 The published geology of the sites is based on the 1:500 scale Solid and Drift Geological Map of the area, Sheet 299, Winchester, published by the British Geological Survey (BGS, 2002). The description of the superficial and solid geology, based on the BGS records, is presented in the sections below. It is expected that the sites may contain localised and limited thicknesses of made or reworked ground, as a result of historical land use.

3.3 Superficial deposits

Site 1

3.3.1 Although not indicated by the BGS data to be present on the site, Head Deposits are recorded off-site adjacent to the western boundary of Site 1 and therefore may also be present beneath the site. According to the BGS records these deposits typically comprise clay, silt, sand and gravel.

Site 2

3.3.2 Alluvium is indicated to be present across area 2A and is described by the BGS as deposits of clay, silt, sand and gravel. Head Deposits are shown across the majority of area 2B, with only a portion of the centre of the site mapped as being underlain directly by bedrock. Clay-with-Flints deposits are mapped across the eastern third of area 2C. Head Deposits are locally indicated in the north of area 2D, towards Easton Lane and also along the northern boundary of area 2E; in Area 2E narrow swathes of Head Deposits are also mapped across the eastern half of the area.

Site 3

3.3.3 Head Deposits are recorded along the northern boundary of Site 3, described by the BGS as comprising clay, silt, sand and gravel.

3.4 Solid geology

Site 1

3.4.1 The Seaford Chalk Formation is recorded at surface and underlying the superficial deposits at Site 1. The BGS describes the strata as a firm white chalk with conspicuous semi-continuous nodular and tabular flint seams.

Site 2

3.4.2 Site 2 is mapped as being underlain by bedrock of Seaford Chalk Formation, locally overlain by superficial deposits. The overlying Newhaven Chalk Formation is mapped as being present above the Seaford Chalk Formation on higher ground present in the southeast of Area 2B and the east of Area C. The BGS describes the Newhaven Chalk Formation as a soft to medium hard, smooth white chalks with numerous marl seams and flint bands.

Site 3

3.4.3 BGS mapping shows that Site 3 is underlain by the New Pit Chalk Formation, which is itself overlain by the Holywell Nodular Chalk Formation on higher ground present in the south of the site. The BGS describes the New Pit Chalk Formation as a principally blocky, white firm to moderately hard chalk with numerous marls or paired marl seams and the Holywell Nodular Chalk Formation as a generally hard nodular chalk with thin flaser marls and significant proportions of shell debris in part.

3.5 Historical borehole records

3.5.1 The BGS archives contain records from a number of exploratory holes and water wells surrounding each of the Sites. No records are held specifically within each of the subject areas. Where freely available to view online copies of selected BGS records obtained from the BGS Geology Viewer are reproduced in **Appendix F**. The locations of these records are as follows:

Site 1

3.5.2 There are records of water abstraction wells for Down Farm and Littleton Farm located approximately 100m to the southeast and southwest respectively. Three trial pits for a site in Southampton are also erroneously plotted in this area and have been discounted.

Site 2

3.5.3 BGS records are available for two window sample boreholes present approximately 50m north of Area 2a. Two water well records are located 50m north of Area 2b. Two borehole records are present to the west of Area 2c associated with the construction of the M3, with a further two water wells located to the east of Area 2c. Nine borehole records are present associated

with the motorway junction to the west of Area 2d. Two borehole records relating to the earlier construction of the M3 are present proximal to Area 2e with a further water well located in Winnall Down farm some 50m west of the area.

Site 3

3.5.4 Two records are present for boreholes sunk some 50m east of the site; these records do not contain any relevant information and have been discounted from this assessment

3.6 Previous ground investigations

3.6.1 The ground conditions around Junction 9 of the M3 and for the adjacent A34 were investigated by Soils Limited (SL, 2019) to provide specific ground condition information for the proposed Junction 9 improvements.

3.6.2 The scope of the investigation comprised the sinking of 32 Rotary Core Boreholes, 7 window sample boreholes and 11 trial pits, together with geotechnical and geochemical analysis of selected soil samples along with the testing of groundwater samples for a range of potential contaminants. None of these exploratory hole locations fall within the current site of interest.

3.6.3 A plan showing the locations of the exploratory hole positions is presented in the Factual Ground Investigation Report (SL, 2019), and reference should be made to that document where required.

3.7 Anticipated ground conditions

3.7.1 The anticipated ground conditions based upon BGS mapping, historical boreholes and previous ground investigations undertaken in the wider area indicated in the tables below. The locations of historical boreholes and previous ground investigation locations are indicated on **Figure 3**.

Table 3.1: Anticipated ground conditions (Site 1)

Strata	Depth to base of strata (m bgl)	Thickness (m)	Anticipated composition
Chalk	>60.00 – >70.50	>60.00 – >69.50	White chalk with flints

Table 3.2: Anticipated ground conditions (Site 2)

Strata	Depth to base of strata (m bgl)	Thickness (m)	Anticipated composition
Alluvium	2.15 – 9.15	1.85 – 8.2	Soft to firm brown silty sandy clay; locally gravelly or clayey gravel. Peat bands may be present
Head Deposits	0.27 - >7.00	0.20 – 6.00	Soft to firm brown slightly sandy, slightly gravelly clay.
Chalk	>1.05 - >30.45	>0.27 - >30.05	Low to medium density white chalk with rare black specks and/or orange brown staining. CIRIA grade A3 - Dm

Table 3.3: Anticipated ground conditions (Site 3)

Strata	Depth to base of strata (m bgl)	Thickness (m)	Anticipated composition
Head Deposits	unknown – site specific data unavailable	unknown – site specific data unavailable	Clay, silt, sand and gravel formed during the Quaternary Period
Chalk	unknown – site specific data unavailable	unknown – site specific data unavailable	Firm, pale grey to off-white block chalk with subordinate marls and marly chalk

3.8 Radon

3.8.1 Whilst not strictly applicable to the proposed development, which does not include new dwellings or enclosed structures, the UK radon maps (Public Health England, 2020) indicate that the three site areas are in the lowest band of radon potential where less than 1% of homes are above the radon Action Level. Therefore, no radon protection measures would be required in the

construction of any new structures should they be required within any of the areas used for compounds.

3.9 Controlled waters – groundwater

3.9.1 In general, all the combined site areas are underlain by chalk deposits (of varying formations) all of which are classified as a Principal aquifer by the Environment Agency (GS, 2020a). Principal aquifers are defined as geology of high intergranular and / or fracture permeability providing a high level of water storage and may support water supply / river base flow on a strategic scale

3.9.2 The Chalk aquifer is also identified as being of high vulnerability (GS 2020a) to pollutants discharged at surface. This is defined as areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.

3.9.3 Further additional information specific to each Site is present as follows:

Site 1

3.9.4 There are no recorded groundwater abstractions on site or within 250m of the site. The site does not fall within a Source Protection Zone (SPZ).

Site 2

3.9.5 The superficial Alluvium deposits are classified by the Environment Agency as a Secondary A Aquifer (GS, 2020b). The Head Deposits are generally classified as a Secondary Undifferentiated Aquifer, with localised areas of 'unproductive' Head Deposits present in the south east of Area 2B and east of Area 2C (GS, 2020b).

3.9.6 The Head Deposits classified as Secondary A Aquifers are also noted as being highly vulnerable.

3.9.7 Secondary A Aquifers are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers (GS, 2020b). Secondary Undifferentiated Aquifers are assigned where it is not possible to attribute either Category A or B to a rock type (GS, 2020b). Unproductive strata are of low permeability and have negligible significance to water supply or base river flow (GS, 2020b).

3.9.8 Potable groundwater abstractions operated by Southern Water Services Limited are present 75m and 170m north of Area 2b and 220m northwest of Area 2b (GS, 2020b); these abstractions are understood to be drawing from the chalk aquifer. Associated with these abstractions are groundwater Source Protection Zones. The inner catchment (Zone 1) covers the entirety of Area 2b and the northern part of Area 2c. The outer catchment (Zone 2) extends

broadly northwest/southeast away from Zone 1, which includes a small portion of the site located in the north of Area 2c.

- 3.9.9 Historical groundwater abstractions associated with agricultural supply are recorded to the immediate east of Area 2c, the immediate north of Area 2d and 180m east of Area 2e. It is not clear if these are still active.

Site 3

- 3.9.10 The Head Deposits are classified by the Environment Agency as a Secondary Undifferentiated Aquifer. The aquifer is classified as being highly vulnerable to pollutants released at ground level (GS, 2020c).

- 3.9.11 There are no recorded groundwater abstractors present within 250m of the site, and the site does not fall within a Source Protection Zone (GS, 2020c).

3.10 Controlled water – surface water

- 3.10.1 There are no recorded surface water features present on or near Sites 1 or 3. The Groundsure report states that there is negligible risk of surface water flooding occurring at these sites.

- 3.10.2 A braid of the River Itchen flows southwards along the western boundary of Site 2 Area 2a. The Groundsure report states that the River Itchen is of 'Good' quality with respect to both ecological and chemical ratings.

- 3.10.3 Land immediately adjacent to the River Itchen is classified as being at high risk of flooding (GS, 2020), becoming medium risk as you move away from the channel. The remaining areas of Site 2 are not shown as being in an area susceptible to flooding.

3.11 Industrial setting

- 3.11.1 Information on the industrial setting of each site is presented in the respective Groundsure reports and reproduced in **Appendix C**. The results of the database search are summarised in the following table and discussed in the following sections:

Table 3.4: Summary of environmental and industrial setting

Site	Site 1		Site 2		Site 3	
	Number present on site ⁽¹⁾	Number within 250m of the site ⁽¹⁾	Number present on site ⁽¹⁾	Number within 250m of the site ⁽¹⁾	Number present on site ⁽¹⁾	Number within 250m of the site ⁽¹⁾
Waste regulation						
Landfill Sites	0 (0)	0 (0)	0 (2)	0 (0)	0 (0)	0 (0)
Licensed Waste Management Facilities	0 (0)	0 (0)	0 (0)	0 (1)	0 (0)	0 (0)
Statutory permits/authorisations						
Pollution Prevention and Control (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Registered Radioactive Substances	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Planning Hazardous Substance Consents	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
COMAH Sites (3) and NIHHS Sites (4)	0 (0)	0 (0)	0 (0)	0 (1)	0 (0)	0 (1)
Potential Contaminative Uses						
Fuel Stations	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	0 (0)
Discharge Consents	0 (0)	0 (0)	0 (0)	0 (27)	0 (0)	0 (0)
Pollution Records						
Contaminated Land Register Entries and Notices	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pollution Incidents to Controlled Waters	0	0	0	1	0 (0)	0 (0)

Note:

- 1) Numbers in brackets denotes number of authorisations, licences or permits that are lapsed, revoked, cancelled, superseded, defunct, surrendered, not applicable, withdrawn or not yet started.
- 2) Includes Integrated Pollution Controls, Integrated Pollution Prevention and Control, Local Authority Integrated Pollution Prevention and Control and Local Authority Pollution Prevention and Control permits.
- 3) COMAH denotes Control of Major Accident Hazards
- 4) NIHHS denotes Notification of Installations Handling Hazardous Substances

Landfill sites

3.11.2 Two historical landfills are recorded within Site 2:

- The 'Land Adjacent to Winchester Bypass, Abbots Worthy, Hampshire' landfill comprises the majority of Area 2A and is recorded as accepting inert waste from 1967 through to 1968. The licence holder is listed as D Hewestson-Brown. The recorded operational period broadly corresponds with the widening of the Winchester Bypass and construction of a gantry crossing the River Itchen. It is considered that landfill may therefore have been used to accept earthworks arisings from that scheme. The precise nature of the materials deposited in this area would require confirmation via further intrusive investigation.
- The second landfill known as 'Spitfire Link, Easton Lane, Winchester' is located across the northern part of Area 2D, extending off-site westwards beneath the motorway junction. No further details relating to this landfill are recorded within the Groundsure report. Part of this area to the immediate west of the current area of interest was investigated by Soils Limited (SL, 2020) with six exploratory holes undertaken within or immediately adjacent to the mapped extents of the landfill. No evidence of waste or Made Ground was indicated on those exploratory hole records. As such the presence and extent of any deposited materials and its composition is unknown. Based on visual inspections undertaken during the site walkover it is considered likely that deposition to this area is either absent or limited in nature. This should be confirmed through further ground investigation.

Licensed waste management facilities

3.11.3 A waste management facility known as M3 – J9 Recycling Facility is present some 70m to the west of Site 2 - Area 2d. A historical waste management facility was also present at this location relating to "highways waste". It is considered that these are likely the same operation operating under a

renewed or altered permit. It is considered unlikely that these entries have had an adverse impact on ground beneath the current site of interest.

COMAH sites and NIHHS sites

3.11.4 RH Stubbings & Co Limited formerly lodged a NIHHS with the Health and Safety Executive relating to a premises 230m west of Site 2 - Area 2d. This entry is noted as historical, but no further information is given. It is considered unlikely that this entry had an adverse impact on ground beneath the current site of interest.

3.11.5 Kingdons Calor Centre formerly lodged a NIHHS with the Health and Safety Executive relating to a premises 160m west of Site 3. This entry is noted as historical, but no further information is given. It is considered unlikely that this entry had an adverse impact on ground beneath the current site of interest.

Fuel stations

3.11.6 Three historic fuel stations are recorded to the north of the site, the closest of which was approximately 175m to the north of Site 2 - Area 2a. It is considered unlikely that these entries have had an adverse impact on ground beneath the current site of interest.

Discharge consents

3.11.7 There are 27 historical discharge consents recorded within 250m of the site. The closest of these is located approximately 25m east of Site 2 - Area 2c where a residential property was permitted to discharge treated sewage effluent to ground. The licence was issued in 2004 with no revocation date listed; and whilst listed as historical within the Groundsure Report it is considered likely that discharge associated with the dwelling is on-going. None of the discharge consents listed are considered likely to have adversely impacted upon soils beneath the current site of interest.

Pollution incidents to controlled waters

3.11.8 A single pollution incident to controlled waters is recorded within the Groundsure report. The incident took place 160m west of Site 2 - Area 2c and occurred in 2001 when 'food and drink' caused a Category 3 (minor) incident. It is considered unlikely that this event has adversely impacted upon ground waters present beneath the site.

3.12 Ecological systems

3.12.1 The information presented below provides a summary of that contained within the relevant Groundsure report and identified following a review of the governments MAGIC website (www.magic.gov.uk). This does not purport to be an ecological risk assessment.

3.12.2 There are no recorded Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), nature reserves or areas of ancient woodland recorded on or within 250m of any of the three sites (GS, 2020a).

3.12.3 It is however noted that each of the sites falls within a SSSI Impact Risk zone. This designation was developed to allow rapid initial assessment of the potential risk to SSSIs posed by the development proposals, they define zones around a SSSI which reflect the particular sensitivities of that feature and indicates the types of development that might have adverse impacts. The proposed development does not fit any of the developments listed as requiring consultation.

3.12.4 In addition, the River Itchen which flows through Site 2 is designated as a SSSI and a SAC on account of the aquatic flora and fauna present.

3.12.5 All three sites lie within a Nitrate Vulnerable Zone for the protection of surface water receptors.

4 Tier 1 preliminary risk assessment

4.1 Introduction

4.1.1 The methodology developed and adopted for the assessment of ground conditions is presented in **Appendix A**. In accordance with guidance presented in LC:RM (Environment Agency, 2020) we adopt a staged approach to risk assessment and this report presents a Tier 1 preliminary risk assessment or first stage.

4.1.2 The underlying principle to ground condition assessment is the identification of pollutant linkages to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences.

4.2 Conceptual site model

4.2.1 The Tier 1 Preliminary Risk Assessment includes the development of a preliminary Conceptual Site Model (CSM). The CSM describes the types and locations of potential contamination sources, the identification of potential receptors and the identification of potential transport/migration pathways.

4.2.2 For a pollutant linkage to be identified, a connection between all three elements (source-pathway-receptor) is required.

4.2.3 Potential pollutant linkages have been identified using the information on potential sources (hazards), receptors and exposure pathways

4.3 Potential sources (hazards) and contaminants of concern

4.3.1 For the purposes of Hazard identification, all three sites can be broadly split into two categories: undeveloped agricultural land or land underlain by landfill.

4.3.2 On this basis two risk assessments based on those broad categories will be undertaken:

- **Areas underlain by landfill.** Comprising Site 2 Area 2A and western part of Site 2 Area 2D
- **Areas not underlain by Landfill.** Comprising Sites 1, 3 and the remainder of Site 2 (Area 2b, 2c, part of 2d and 2e)

Areas underlain by landfill

4.3.3 As discussed above, it is considered likely that the landfill waste present in Site 2 - Area 2a may comprise natural arisings originating from nearby road construction, albeit inclusions of other materials may be locally encountered.

4.3.4 With respect to Site 2 - Area 2d, off-site investigation undertaken by others within the wider mapped landfill extents did not encounter waste material, and

therefore it is considered plausible that deposited waste materials is also absent beneath Area 2d.

4.3.5 In both instances the above assumptions should be confirmed via intrusive investigation. In summary therefore the potential for contamination in these areas has been assessed as follows:

- On Site: The contamination potential for land underlain by landfill is considered to be Low (Hazard classification score of 2 out of 5 in Table 1, **Appendix A**). This classification considers that the waste is expected to comprise largely inert naturally occurring materials but recognises that in the absence of site specific data there is also potential for locally slightly elevated concentrations of contaminants.
- Off Site: Significant off-site hazards have not been identified.

Table 4.1: Potential sources of contamination (PSC) and contaminants of potential concern (COPC) for Site 2 - Areas 2a and western section of Area 2d

Location of source	PSC Reference	Description	COPC
On-Site	1	Inert Landfill - Infilled ground	Composition assumed to be naturally occurring arisings from road construction; but possible localised slightly elevated general industrial contaminants should be considered including metals, hydrocarbons, PAHs and asbestos.

Areas not underlain by landfill

4.3.6 On Site: The contamination potential for these areas is considered to be Very Low (Classification score of 1 out of 5 in **Table 1, Appendix A**).

4.3.7 Off Site: Significant off-site hazards have not been identified.

Table 4.2: Potential sources of contamination (PSC) and contaminants of potential concern (COPC) for agricultural land

Location of source	PSC Reference	Description	COPC
On-site	1	Agricultural Usage (area wide)	Agri-chemicals (residual at point of use – not bulk storage)

Location of source	PSC Reference	Description	COPC
	2	Roads (locally at site access points)	Hydrocarbons, PAHs from localised spills and leaks.
	3	Motorsport track	Hydrocarbons, PAHs from localized spills and leaks

4.4 Potential receptors and sensitivity score

4.4.1 The receptors considered as part of this land contamination assessment are summarised in **Table 4.1** to **Table 4.3**, and based on the information reviewed, either eliminated from further consideration or allocated a sensitivity score in accordance with the Methodology. The sensitivity score informs the consequence element of the risk estimation process, definitions of which can be found in **Table 2** of **Appendix A**.

Table 4.3: Potential receptors and sensitivity score

Receptor type	Comment	Sensitivity Score
Human Health – Current	Ad-hoc access by agricultural workers and potential informal access by public (dog walkers etc.)	4
Human Health – Future	Ad-hoc access by agricultural workers and potential informal access by public (dog walkers etc.)	4
Human Health - Neighbors	Residential	5
Human Health – Construction / Maintenance Workers	Sites with regular access will be temporarily converted to compounds, this will likely include the deposition of gravel based accessible areas	4
Groundwater	The site is underlain by a Principal chalk aquifer, which is abstracted for potable supply. Proximal to this (including within agricultural land) this is a very high sensitivity receptor, elsewhere high	4 / 5

Receptor type	Comment	Sensitivity Score
Surface Water	Adjacent to the River Itchen (2a, landfill) 4. Elsewhere N/A	4 / NA
Property - Buildings	No buildings of 'local value' identified	1
Property - Animal or Crop Effect	Site will be restored to agricultural land	1
Ecological Systems	River Itchen adjacent to site 2a (landfill) is a SSSI, the remaining areas have no ecological designation	4 / 1

4.5 Risk estimation

- 4.5.1 When there is a pollutant linkage (and therefore some measure of risk) it is necessary to determine whether the risk is significant and therefore whether further action is required.
- 4.5.2 Risk estimation involves predicting the likely consequence (what degree of harm might result) and the probability that the consequences will arise (how likely the outcome is).
- 4.5.3 Based on the information available, the estimated risks have been designated with further comments in the sections below. The outcomes of the risk assessments are presented in **Appendix G** giving an assessment of consequence and probability.
- 4.5.4 A summary of the worst-case risk estimation for the site, based on localised potential hazards is presented in **Table 4.4**.

Table 4.4: Worst case risk estimation

Receptor	Risk estimation	
	Site underlain by landfill	Site areas comprising undeveloped agricultural land
Human Health – Current	Low	Very Low
Human Health – Future	Low	Very Low
Human Health - Neighbors	Low	Very Low

Receptor	Risk estimation	
	Site underlain by landfill	Site areas comprising undeveloped agricultural land
Human Health – Construction / Maintenance Workers	Low	Very Low
Groundwater	Moderate	Very Low
Surface Water	Moderate	Very Low
Property – Buildings	Very Low	Very Low
Property - Animal or Crop Effect	Very Low	Very Low
Ecological Systems	Very Low	Very Low

4.6 Risk evaluation

- 4.6.1 Possible pollutant linkages are determined using professional judgement. If a linkage is considered possible, it is considered that this represents a potentially ‘unacceptable risk’ and therefore requires further consideration. This may be through remediation or mitigation or through further tiers of assessment.
- 4.6.2 Possible pollutant linkages relating to have been identified for human health, ground water, surface water, ecology and property/buildings.
- 4.6.3 The level of risk identified in areas of the site occupied by undeveloped agricultural land is determined to be **Very Low**.
- 4.6.4 The level of risk identified for areas underlain by landfill was determined to vary generally between **Very Low** to **Low**, but with a potential Moderate risk determined for controlled waters receptors.
- 4.6.5 The identified risks are defined in **Table 7** of **Appendix G**.

Areas underlain by landfill

- 4.6.6 For Moderate risks it is considered possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already

undertaken) is normally required to clarify the risk and to determine the potential liability.

- 4.6.7 It is understood that Site 2 Area 2A may be set aside upon completion for 'ecological balance'. On this basis it is believed that Site 2 Area 2A would not be utilised as either a compound or a material deposition zone (either temporary or permanent) during the proposed junction improvements. On this basis the area will not be altered during the works, and on the assumption no other works are planned within Site 2 Area 2A to disturb ground conditions, it is considered that the Moderate risks to controlled waters could be reduced to Very Low as a result of the probability/likelihood reducing to unlikely. If any works, including the stockpiling or storage of materials is proposed for Site 2 Area 2A then further investigation and assessment should be undertaken to assess the risks posed by the proposed usage.
- 4.6.8 A limited number of exploratory holes, undertaken as part of a wider ground investigation, were undertaken within the Spitfire Link, Easton Lane, Winchester landfill, adjacent to Site 2 Area 2D. The exploratory holes did not identify the presence of waste and there is doubt about whether there is any waste within this historical landfill area. If deposition of waste materials did not take place in this area then the can be reduced to Very Low. This would require confirmation via additional intrusive investigation. If waste is however encountered, further risk assessment should be undertaken to assess the potential risks to receptors.

Construction workers

- 4.6.9 The risk to Construction Workers working in areas underlain by landfill has been assessed as Low. This classification is associated with the potential for localised slightly elevated contamination present within buried waste. The risk estimation has been derived from the associated risk of potential ingestion, inhalation and dermal absorption via direct contact with soil.
- 4.6.10 It is considered that in order to reduce the risk to Construction Workers to **Very Low** the provision of appropriate personal protective clothing and equipment to be worn by site workers should be provided, together with the adoption of good standards of hygiene to prevent prolonged skin contact, inhalation and ingesting of soils during construction. The specific nature of the potential risks will require confirmation by ground investigation.
- 4.6.11 There are likely to be appropriate mitigation measures available to reduce the risk to Very Low, but the exact nature of these will need to be confirmed by intrusive ground investigation and assessment at the appropriate time.

4.7 Data Gaps and Uncertainty

- 4.7.1 It is considered that there is a reasonable level of confidence that the information presented in this report provides a good understanding of the

potential ground conditions and enables identification of potential risks. However, further work is recommended to refine the Conceptual Site Model and reduce uncertainty particularly in relation to the precise ground conditions at the subject site areas where landfill areas have been recorded.

5 Preliminary land stability appraisal

5.1 Introduction

5.1.1 In accordance with the requirements of the National Planning Policy Framework (DCLG, 2019), the potential for the proposed development to contribute to or to be adversely affected by land instability has been assessed. Accordingly, consideration is given below to the potential risk of land instability arising from naturally occurring geological hazards, artificial cavities, natural cavities, slope instability and potential adverse foundation conditions arising from existing ground conditions across the site, as identified by the desk study.

5.1.2 The potential for land instability at each of the sites has been considered, in relation to;

- Naturally occurring geological hazards
- Natural cavity hazards
- Mining cavity hazards
- Stability of excavations

5.2 Naturally occurring geological hazards

5.2.1 An assessment of potential geological hazards that may give rise to instability or adverse construction conditions as supplied by the BGS from their National Geoscience Information Service (NGIS) are presented in the Groundsure report reproduced in **Appendix C**. The generic assessment is generated automatically based on digital geological maps and the scope and the accuracy is limited by the methods used to create the dataset and is therefore only indicative for the search area.

5.2.2 The information contained in the report has been reviewed and where considered necessary reassessed considering the specific information available for the site. The modified assessment of the potential for geological hazards to be present at the site is summarised in **Table 5.1**.

Table 5.1: Summary of geological hazards

Hazard	BGS-NGIS assessed hazard potential on-site			Assessment and commentary
	Site 1	Site 2	Site 3	
Coal Mining Affected Areas	Not Affected	Not Affected	Not Affected	Agrees with this assessment
Non-Coal Mining Areas of Great Britain	See comments	See comments	See comments	The Groundsure report states that all three sites are in an area where 'sporadic underground mining of restricted extent' is possible. A number of historical chalk pits have been identified both on and proximal to the site. Non-coal related mining activity is discussed further in section 5.5 below.
Potential for Collapsible Ground Stability Hazards	Very Low	Very Low to Low	Very Low	The Alluvium is mapped as being at negligible risk of being impacted by collapsible ground. The remainder of the site is considered to be at very low risk.
Potential for Compressible Ground Stability Hazards	Negligible	Negligible to moderate	Negligible	The alluvium present beneath Site2 area 2A is assessed as being a moderate hazard with respect to compressible ground, likely on account of the potential for organic rich silt and peat to be present. The remainder of the sites is underlain by soils assessed as being of negligible susceptibility to compressible ground hazards.
Potential for Ground Dissolution Stability Hazards	Very Low	Very Low to Moderate	Very Low	The risks associated with the potential for ground dissolution are considered in Sections 5.3 and 5.4 below.

Hazard	BGS-NGIS assessed hazard potential on-site			Assessment and commentary
	Site 1	Site 2	Site 3	
Potential for Landslide Ground Stability Hazards	Negligible	Very Low to Low	Negligible to Very Low	The chalk is mapped as being at negligible risk of being impacted by landslide hazards. The superficial deposits are generally classified as being at very low risk, with localized areas of low risk present towards the center of Site 2 Area 2B.
Potential for Running Sand Ground Stability Hazards	Negligible	Negligible to Low	Negligible to Very Low	The alluvium mapped beneath Site 2 Area 2A has been identified as low risk hazard with respect to running sands. Head Deposits are locally assessed as presenting a very low hazard with respect to running sands.
Potential for Shrinking or Swelling Clay Ground Stability Hazards	Negligible	Negligible to Low	Negligible to Very Low	The chalk is identified as being at negligible risk of being impacted by shrink / swell. With the exception of a small area present in the east of Site 2 area 2C, Head Deposits mapped beneath the site have been identified as being a very low hazard with respect to shrink swell clays. The aforementioned Head Deposits present in the east of Site 2 Area 2C are mapped as a low hazard.

5.3 Natural and mining cavity

5.3.1 A Cavities Occurrence Assessment (COA) for the wider M3 J9 improvement scheme has been undertaken. This is a desk-based assessment that includes preliminary cavity hazard mapping and a review of the National Natural and Mining (non-coal) Cavities Databases, maintained and updated. A search was

conducted with a 1.0km of the boundaries of each of the sites. The findings of the COA are summarised below, for further details reference should be made the original document.

5.4 Natural cavity records

5.4.1 Site 1: A search of the Natural Cavities Database indicates that there are no recorded natural cavity locations within 1km of the site boundary. Owing to the geology of Site 1 the likelihood for solution features to develop is considered to be **Very Low**.

5.4.2 Site 2: A search of the Natural Cavities Database indicates that there are two recorded natural cavity locations within 1km of the site boundary as shown in Table 5.2 below Owing to the geology in the site of Site 1 the likelihood for solution features to develop is considered to be **Very Low** to **Moderate**.

Table 5.2: Natural cavities database records

Approximate NGR	Approximate distance from site boundary	Recorded location	Geology	Natural Cavity Details	Source
SU 491 315 SU 488 310 SU 484 305	190 (W)	Course of River Itchen, Winchester, Hampshire	Superficial: Alluvium River Terrace Deposits Bedrock: Chalk Group	10 x Solution Pipes	Winchester City Council
SU 513 317	780 (E)	South of Easton, Hampshire	Superficial: Clay with Flints Bedrock: Chalk Group	1 x Solution Pipe	Osbourne-White, H.J. 1912. The geology of country around Winchester and Stockbridge. HMSO, London. British Geological Survey Memoir (Sheet 299)

5.4.3 **Site 3:** A search of the Natural Cavities Database indicates that there are no recorded natural cavity locations within 1km of the site boundary. Owing to the geology of Site 3 the likelihood for solution features to develop is considered to be **Very Low** to **Moderate**.

5.5 Mining Cavity Records

5.5.1 Site 1: A search of the Mining Cavities Database (non-coal) indicates that there are no recorded natural cavity locations within 1km of the site boundary. Owing to the geology of Site 1 the likelihood for solution features to develop is considered to be **Low**.

5.5.2 Site 2: A search of the Mining Cavities Database (non-coal) indicates that there are no recorded natural cavity locations within 1km of the site boundary. Owing to the geology of Site 2 the likelihood for solution features to develop is considered to be generally **Low**, with areas of Very High hazard potential recorded across Site 2 Area 2A as well as in the north of Site 2 Area 2B and the west of Site 2 Area 2C. The increased hazard rating is associated with chalk being mapped at shallow depth in an area where mining has historically been recorded.

5.5.3 Site 3: A search of the Mining Cavities Database (non-coal) indicates that there are no recorded natural cavity locations within 1km of the site boundary. Owing to the geology of Site 3 the likelihood for solution features to develop is considered to be **Low**.

5.6 Potential stability of excavations

5.6.1 Due to the potential localised presence of infilled materials in areas shown to be landfills together with localised mapped superficial strata of potentially low strength and high compressibility, it is considered that any excavations in areas underlain by such material may require temporary support measures.

5.6.2 Shallow groundwater is expected near the River Itchen, together with the potential for shallow perched water contained within superficial deposits. It is therefore likely that in addition to excavation support, excavations may require groundwater control measures to allow working in dry conditions.

5.7 Unexploded ordnance

5.7.1 An unexploded ordnance (UXO) hazard and risk mitigation map prepared by Zetica Ltd was obtained as part of the PSSR undertaken by WSP in 2018 for the wider development. The map indicates that the majority of the scheme is assessed as Low, excluding the southern western portion of the wider scheme. However, all the three sites are included within the Low assessment of the map.

5.7.2 A detailed UXO assessment for the wider scheme was undertaken by Zetica in 2018 prior to the start of the ground investigation. The detailed UXO

assessment designated the wider scheme to be in the Low classification for excavations at the site.

6 Conclusions and recommendations

6.1 Contamination appraisal conclusions

- 6.1.1 The sites and surrounding area predominantly comprise undeveloped agricultural land. Whilst historical landfills are indicated to be present within Site 2 - Area 2a and in the western part of Site 2 Area 2D, ground investigation undertaken within the wider landfill extents, adjacent to Site Area 2D did not encounter waste materials. Site 2Area 2A is considered likely to have been used as a deposition area for surplus inert material arising from adjacent highway widening works. In the absence of site specific ground investigation information there remains a potential for localised areas of slightly elevated contaminants within such materials. In areas affected by landfill deposition the potential hazard classification has been assessed as Moderate.
- 6.1.2 In site areas comprising undeveloped agricultural land the potential hazard classification is considered to be Very Low.
- 6.1.3 Using the methodology potential pollutant linkages have been identified. The risks for undeveloped agricultural land have been assessed as Very Low. Where land has been affected by landfill deposition the assessed risk varies generally lies between Very Low and Low, with the risk to controlled waters being increased to Moderate. should the absence of contaminants within such materials be demonstrated the risks would reduce to Very Low to Low.
- 6.1.4 It is considered therefore the potential risks identified could be further mitigated through further work (see recommendations below) and through the adoption of readily available risk management options including the adoption of good practice measures during construction such as the implementation of hygiene controls for construction staff.

6.2 Preliminary stability appraisal conclusions

- 6.2.1 The natural ground conditions beneath the site are mapped as comprising chalk locally overlain by superficial Head Deposits, with Alluvium also mapped in Site 2 Area 2A. The majority of hazards relating to ground stability have been assessed as Negligible to Low.
- 6.2.2 A Moderate hazard potential has been identified with respect to compressible ground where identified, relating to the Alluvium mapped beneath Site 2 Area 2A. Compressible ground may also be present in that area associated with landfill waste.
- 6.2.3 A Very Low to Moderate hazard potential has been identified with respect to the potential presence of natural occurring cavities. A Low to Very High hazard potential has been identified with respect to the potential presence of mining cavities.

- 6.2.4 There is potential for perched and / or shallow ground water to be present across the site and groundwater control measures may therefore be required if excavations are undertaken.
- 6.2.5 Notwithstanding the above it should be possible to undertake the proposed works, provided that areas with moderate risks selected for material deposition are investigated, so that appropriate mitigation measures and engineering solutions can be adopted if appropriate.

6.3 Recommendations

- 6.3.1 The ground condition data used in this report is predominately qualitative, and as such there is a degree of uncertainty regarding the actual ground conditions present as well as the associated soil and ground water chemistry present across the sites, particularly in the areas of potential former landfilling activity.
- 6.3.2 It is recommended that an intrusive investigation be undertaken to further investigate the potential hazards identified within this report.

7 Essential guidance for report readers

- 7.1.1 This report has been prepared within an agreed timeframe and to an agreed budget that will necessarily apply some constraints on its content and usage. The remarks below are presented to assist the reader in understanding the context of this report and any general limitations or constraints. If there are any specific limitations and constraints, they are described in the report text.
- 7.1.2 The opinions and recommendations expressed in this report are based on statute, guidance, and best practice current at the time of its publication. Stantec does not accept any liability whatsoever for the consequences of any future legislative changes or the release of subsequent guidance documentation, etc. Such changes may render some of the opinions and advice in this report inappropriate or incorrect and we will be pleased to advise if any report requires revision due to changing circumstances, especially those over one year old. Following delivery of any report Stantec has no obligation to advise the Client or any other party of such changes or their repercussions.
- 7.1.3 Some of the conclusions in this report may be based on third party data. No guarantee can be given for the accuracy or completeness of any of the third-party data used. Historical maps and aerial photographs provide a “snapshot” in time about conditions or activities at the site and cannot be relied upon as indicators of any events or activities that may have taken place at other times.
- 7.1.4 The conclusions and recommendations made in this report and the opinions expressed are based on the information reviewed and/or the ground conditions encountered in exploratory holes and the results of any field or laboratory testing undertaken. There may be ground conditions at the site that have not been disclosed by the information reviewed or by the investigative work undertaken. Such undisclosed conditions cannot be taken into account in any analysis and reporting.
- 7.1.5 Unless specifically stated to the contrary, this report does not purport to be a “Geotechnical Design Report” as defined in Clause 2.8 of Eurocode 7 (Geotechnical Design BS EN 1997-1:2004). Some of the data contained herein and used to support any geotechnical assessment presented in this report may be historical or for other reasons not fully compliant with the requirements of that code.
- 7.1.6 It should be noted that groundwater levels, groundwater chemistry, surface water levels, surface water chemistry, soil gas concentrations and soil gas flow rates can vary due to seasonal, climatic, tidal and manmade effects.
- 7.1.7 If the report indicates that asbestos has been identified within the ground, any work that involves, or is likely to involve, contact with asbestos must be undertaken in accordance with the Control of Asbestos Regulations 2012, particularly in regard to risk assessment, licencing and training. Risk assessment should be carried out prior to any activities that could lead to the

disturbance of asbestos materials, either buried or on the ground surface and should include appropriate mitigation measures, such as damping down to prevent the spread of asbestos, air monitoring and minimum PPE and/or RPE requirements for the work proposed.

- 7.1.8 This report has been written for the sole use of the Client stated at the front of the report in relation to a specific development or scheme. The conclusions and recommendations presented herein are only relevant to the scheme or the phase of project under consideration. This report shall not be relied upon or transferred to any other party without the express written authorisation of Stantec. Any such party relies upon the report at its own risk.
- 7.1.9 The interpretation carried out in this report is based on scientific and engineering appraisal carried out by suitably experienced and qualified technical consultants based on the scope of our engagement. We have not taken into account the perceptions of, for example, banks, insurers, other funders, lay people, etc, unless the report has been prepared specifically for that purpose. Advice from other specialists may be required such as the legal, planning and architecture professions, whether specifically recommended in our report or not.
- 7.1.10 Public or legal consultations or enquiries, or consultation with any Regulatory Bodies (such as the Environment Agency, Natural England or Local Authority) have taken place only as part of this work where specifically stated.

8 References

BGS (2002) Winchester, England and Wales Sheet 299. Bedrock and Superficial Deposits, 1 to 50,000 scale. British Geological Survey, Keyworth.

BGS (2020) Geology of Britain Viewer, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> [Accessed 06/10/2020]

Environment Agency (2004) CLR 11 Model procedures for the management of contaminated land. Department of the Environment Contaminated Land Report.

Environment Agency (2019) Land Contamination: Risk Management, LCRM. Environment Agency. June 2019

Environment Agency (2020) Flood Map for Planning, Environment Agency, Available from: <https://flood-map-for-planning.service.gov.uk/> [Accessed 04/06/2020]

Google Earth (2020) Historical aerial photography, available from Google Earth Pro [accessed 06/10/2020].

GS (2020a) Groundsure Report No GS-7137910 dated 7th October 2020. Groundsure.

GS (2020b) Groundsure Report No GS-7137934 dated 7th October 2020. Groundsure.

GS (2020c) Groundsure Report No GS-7137936 dated 7th October 2020. Groundsure.

MAGIC (2020) Available from: <http://www.magic.gov.uk/website/magic/> [Accessed: 07/10/2020].

MHCLG (2019) National Planning Policy Framework. Department for Communities and Local Government, London.

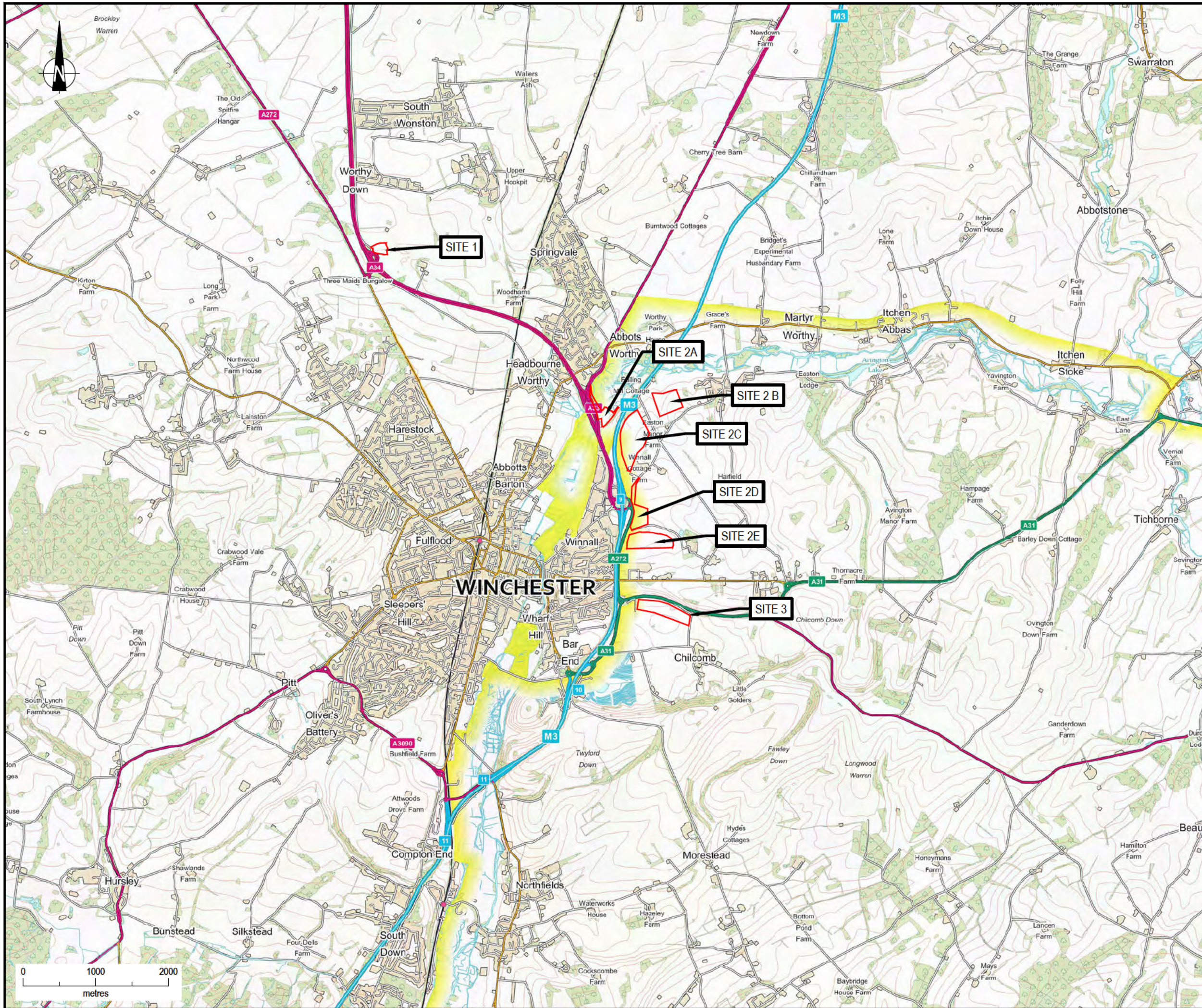
Public Health England (2020) UK Maps of Radon [accessed 06/10/2020]

Soils (2020) Factual Ground Investigation Report at M3 Junction 9 Improvement. Report reference 17486/FGIR/Rev1.02 dated July 2020. Soils Limited, Tadworth, Surrey

WSP (2018) M3 Junction 9 Improvement Scheme – PCF Stage 2 - Preliminary Sources Study Report. Report reference HE551511-WSP-GEN-M3J9PCF2-RP-CE-00019

Zetica (2020) Unexploded Bomb risk map, <https://zeticauxo.com/downloads-and-resources/risk-maps/> [accessed 14/10/2020]





NOTES
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REV	DATE	REVISION NOTE	ORIG	CHK'D	APP'D
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DESIGNER



CONTRACTOR



CLIENT



PROJECT TITLE

M3 JUNCTION 9 IMPROVEMENT SCHEME

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

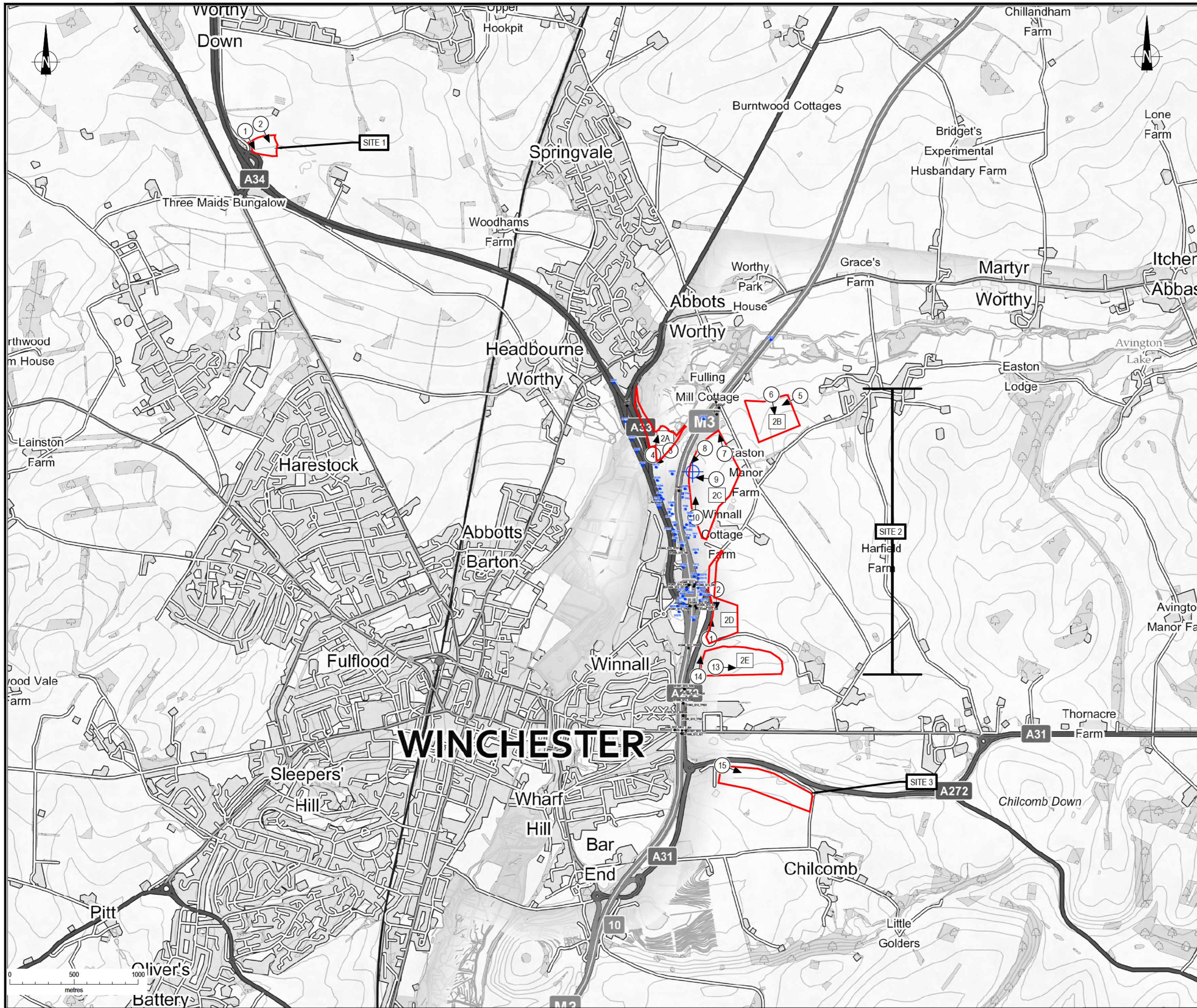
SITE LOCATION PLAN
 FIGURE 1
 APFP REGULATION 5(2)(a)

SUITABILITY




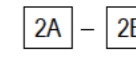
APPLICATION SUBMISSION

SHEET SIZE: A3 SCALE: 1:50 000 STATUS: REV 0

DOCUMENT REFERENCE
 HE551511-VFK-EGT-X_XXXX_XX-DR-LE-0102



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- KEY:
-  PHOTO MARKERS
 -  SITE AREAS
 -  APPROXIMATE LOCATION OF GENERATOR AND FUEL BOWSER
 -  SITE 2 SUB TITLES

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0	NOV 22	-	CS	MRG	-

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PROJECT TITLE
M3 JUNCTION 9 IMPROVEMENT SCHEME

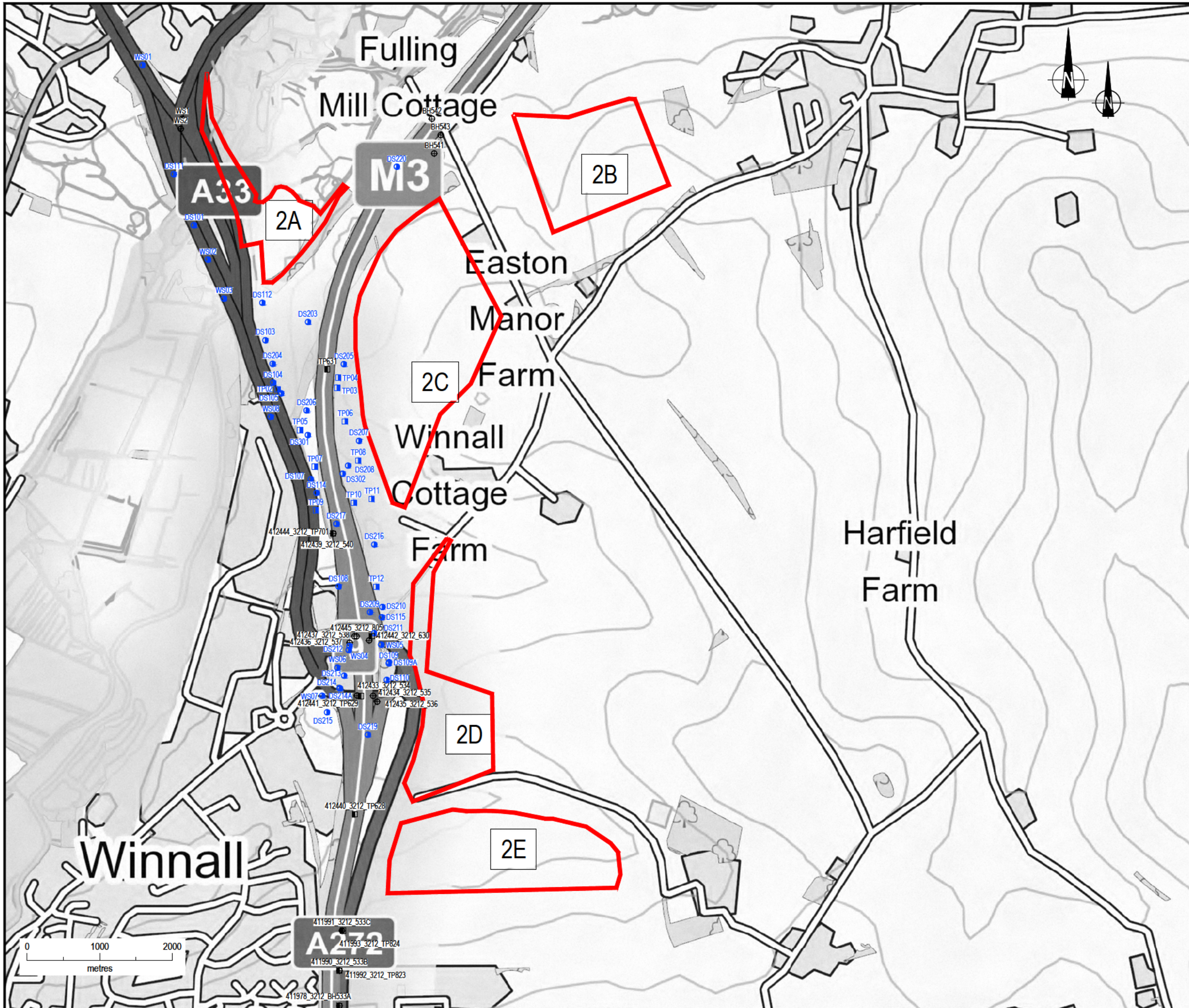
PROJECT STAGE
 PCF STAGE 3

DRAWING TITLE
**SITE LOCATION PLAN
 FIGURE 2
 APFP REGULATION 5(2)(a)**

SUITABILITY
 APPLICATION SUBMISSION

SHEET SIZE: A2 SCALE: 1:20 000 STATUS: Rev 0

DOCUMENT REFERENCE
 HE551511-VFK-EGT-X_XXXX_XX-DR-LE-0103



- NOTES
 1. This drawing has been produced using CAD software, therefore all dimensions are shown in meters unless shown otherwise.
- KEY:
- SITE AREAS
 - 2A 2E SITE 2 SUB TITLES
 - BOREHOLES; SOILS LIMITED 2019
 - TRIAL PITS; SOILS LIMITED 2019
 - ⊕ BOREHOLES; HISTORICAL GROUND INVESTIGATION LOCATIONS
 - TRIAL PITS; HISTORICAL GROUND INVESTIGATION LOCATIONS

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DESIGNER


CONTRACTOR


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PROJECT TITLE
M3 JUNCTION 9 IMPROVEMENT SCHEME

PROJECT STAGE
PCF STAGE 3

DRAWING TITLE
SITE 2 LAYOUT PLAN SHOWING HISTORICAL EXPLORATORY HOLE LOCATIONS FIGURE 3 APFP REGULATION 5(2)(a)

SUITABILITY
APPLICATION SUBMISSION

SHEET SIZE: A3 SCALE: 1:10 000 STATUS: REV 0

DOCUMENT REFERENCE
 HE551511-VFK-EGT-X_XXXX_XX-DR-LE-0104

Appendix A Methodology

Stantec Guide: Methodology for Assessment of Land Contamination (England)

1 INTRODUCTION

This document defines the approach adopted by Stantec in relation to the assessment of land contamination in England. The aim is for the approach to (i) be systematic and objective, (ii) provide for the assessment of uncertainty and (iii) provide a rational, consistent, transparent framework.

When preparing our methodology, we have made reference to various technical guidance documents and legislation referenced in Section 7 of which the principal documents are (i) Contaminated Land Statutory Guidance (Defra 2012), (ii) online guidance Land Contamination: Risk Management (LC:RM) accessed from GOV.UK which is expected to replace Contaminated Land Research (CLR) Report 11: Model Procedures for the Management of Contamination (EA 2004). It should be noted that LCRM is currently due to be revised following consultation and CLR 11 is archived, (iii) Contaminated land risk assessment: A guide to good practice (C552) (CIRIA 2001) (iv) National Planning Policy Framework (NPPF, 2019) (v) BS 10175 Investigation of potentially contaminated sites - Code of Practice (BSI 2017) and (vi) The series of British Standards on Soil Quality BS 18400.

2 DEALING WITH LAND CONTAMINATION

Government policy on land contamination aims to prevent new contaminated land from being created and promotes a risk-based approach to addressing historical contamination. For historical contamination, regulatory intervention is held in reserve for land that meets the legal definition and cannot be dealt with through any other means, including through planning. Land is only considered to be “contaminated land” in the legal sense if it poses an unacceptable risk.

UK legislation on contaminated land is principally contained in Part 2A of the Environmental Protection Act, 1990 (which was inserted into the 1990 Act by section 57 of the Environment Act 1995). Part 2A was introduced in England on 1 April 2000 and provides a risk-based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment.

The Model Procedures for the Management of Land Contamination (CLR 11), were developed to provide the technical framework for applying a risk management process when dealing with land affected by contamination. The process involves identifying, making decisions on, and taking appropriate action to deal with land contamination in a way that is consistent with government policies and legislation within the UK. The approach, concepts and principles for land contamination management promoted by LC:RM (and its predecessor CLR 11) are applied to the determination of planning applications. The

guidance given in LC:RM follows the same principles.

Other legislative regimes may also provide a means of dealing with land contamination issues, such as the regimes for waste, water, environmental permitting, and environmental damage. Further, the law of statutory nuisance may result in contaminants being unacceptable to third parties whilst not attracting action under Part 2A or other environmental legislation.

2.1 Part 2A

The Regulations and Statutory Guidance that accompanied the Act, including the Contaminated Land (England) Regulations 2006, has been revised with the issue of The Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263) and the Contaminated Land Statutory Guidance for England 2012.

Part 2A defines contaminated land as “*land which appears to the Local Authority in whose area it is situated to be in such a condition that, by reason of substances in, on or under the land that significant harm is being caused, or there is a significant possibility that such significant harm (SPOSH) could be caused, or significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution (SPOSP) being caused*”.

Harm is defined as “*harm to the health of living organisms or other interference with the ecological systems of which they form part, and in the case of man, includes harm to his property*”.

Part 2A provides a means of dealing with unacceptable risks posed by land contamination to human health and the environment, and under the guidance enforcing authorities should seek to find and deal with such land. It states that “*under Part 2A the starting point should be that land is not contaminated land unless there is reason to consider otherwise. Only land where unacceptable risks are clearly identified, after a risk assessment has been undertaken in accordance with the Guidance, should be considered as meeting the Part 2A definition of contaminated land*”. Further, the guidance makes it clear that “*regulatory decisions should be based on what is reasonably likely, not what is hypothetically possible*”.

The overarching objectives of the Government’s policy on contaminated land and the Part 2A regime are:

- “(a) *To identify and remove unacceptable risks to human health and the environment.*
- (a) *To seek to ensure that contaminated land is made suitable for its current use.*
- (b) *To ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of*

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sustainable development".

The enforcing authority may need to decide whether and how to act in situations where decisions are not straight forward, and where there is uncertainty. *"In so doing, the authority should use its judgement to strike a reasonable balance between: (a) dealing with risks raised by contaminants in land and the benefits of remediating land to remove or reduce those risks; and (b) the potential impacts of regulatory intervention including financial costs to whoever will pay for remediation, health and environmental impacts of taking action, property blight, and burdens on affected people"*.

The authority is required to *"take a precautionary approach to the risks raised by contamination, whilst avoiding a disproportionate approach given the circumstances of each case"*. The aim is *"that the regime produces net benefits, taking account of local circumstances"*.

The guidance recognises that *"normal levels of contaminants in soils should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise"*. Normal levels are quoted as:

- "a) natural presence of contaminants' such as from underlying geology that have not been shown to pose an unacceptable risk to health and the environment*
- b) ...low level diffuse pollution, and common human activity..."*

Similarly the guidance states that significant pollution or significant possibility of significant pollution of controlled waters is required for land to be considered contaminated and the *"fact that substances are merely entering water"* or *"where discharge from land is not discernible at a location immediately downstream"* does not constitute contaminated land.

To help achieve a more targeted approach to identifying and managing contaminated land in relation to the risk (or possibility) of harm to human health, the revised Statutory Guidance presented a new four category system for considering land under Part 2A, ranging from Category 4, where there is no risk that land poses a significant possibility of significant harm (SPOSH), or the level of risk is low, to Category 1, where the risk that land poses a significant possibility of significant harm (SPOSH) is unacceptably high.

For land that cannot be readily placed into Categories 1 or 4 further assessment is required. If there is sufficient concern that the risks could cause significant harm or have the significant possibility of significant harm the land is to be placed into Category 2. If the concern is not met land is considered Category 3.

The technical guidance clearly states that the currently published Soil Guidance Values (SGV's) and Generic Assessment Criteria (GAC's) represent *"cautious estimates of level of contaminants in soils"* which should be considered *"no risk to health or, at most, a minimal risk"*. These values do not represent the boundary between categories 3 and 4 and *"should be considered to be comfortably within Category 4"*.

At the end of 2013 technical guidance in support of Defra's revised Statutory Guidance (SG) was published and then revised in 2014 (CL: AIRE 2014) which provided:

- A methodology for deriving C4SLs for four generic land-uses comprising residential, commercial, allotments and public open space; and
- A demonstration of the methodology, via the derivation of C4SLs for six substances – arsenic, benzene, benzo(a)pyrene, cadmium, chromium (VI) and lead.

For controlled waters, the revised Statutory Guidance states that the following types of pollution should be considered to constitute significant pollution of controlled waters:

- "(a) Pollution equivalent to "environmental damage" to surface water or groundwater as defined by The Environmental Damage (Prevention and Remediation) Regulations 2009, but which cannot be dealt with under those Regulations.*
- (b) Inputs resulting in deterioration of the quality of water abstracted, or intended to be used in the future, for human consumption such that additional treatment would be required to enable that use.*
- (c) A breach of a statutory surface water Environment Quality Standard, either directly or via a groundwater pathway.*
- (d) Input of a substance into groundwater resulting in a significant and sustained upward trend in concentration of contaminants (as defined in Article 2(3) of the Groundwater Daughter Directive (2006/118/EC)".*

The guidance also states that, in some circumstances, significant concentrations at a compliance point (in groundwater or surface water) may constitute pollution of controlled waters.

As with SPOSH for human health, the revised Statutory Guidance presents a four-category system for Significant Pollution of controlled waters. Category 1 covers land where there is a strong and compelling case for SPOSP, for example where significant pollution would almost certainly occur if no action was taken to avoid it. Category 4 covers land where there is no risk or the risk is low, for

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example, where the land contamination is having no discernible impact on groundwater or surface water quality. Category 2 is for land where the risks posed to controlled waters are not high enough to consider the land as Category 1 but nonetheless are of sufficient concern to constitute SPOSP, Category 3 is for land where the risks posed to controlled waters are higher than low but not of sufficient concern to constitute SPOSP.

2.2 Planning

The Local Planning Authority (LPA) is responsible for the control of development, and in doing so it has a duty to take account of all material considerations, including contamination.

The principal planning objective is to ensure that any unacceptable risks to human health, buildings and other property and the natural and historical environment from the contaminated condition of the land are identified so that appropriate action can be considered and taken to address those risks.

The National Planning Policy Framework (NPPF, 2019), includes the following.

Paragraph 118 states that planning policies and decisions should “(c) give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land.”

Paragraph 179 states “Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner”.

Paragraph 170 states “planning policies and decisions should contribute to and enhance the natural and local environment by:

- (e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and
- (f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.”

Paragraph 178 describes the policy considerations the Government expects LPA's to have in regard to land affected by contamination when preparing policies for development plans and in taking decisions on applications.

Paragraph 178 states “planning policies and decisions should ensure that:

- (a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);
- (b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and
- c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.”

Paragraph 183 states “The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”

The Glossary in Annex 2 provides the following:

Brownfield land registers: Registers of previously developed land that local planning authorities consider to be appropriate for residential development, having regard to criteria in the Town and Country Planning (Brownfield Land Registers) Regulations 2017. Local planning authorities will be able to trigger a grant of permission in principle for residential development on suitable sites in their registers where they follow the required procedures.

Competent person (to prepare site investigation information): A person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of pollution or land instability, and membership of a relevant professional organisation.

Previously developed land: Land which is or was occupied by a permanent structure, including the curtilage of the developed land (although it should not be assumed that the whole of the curtilage should be developed) and any associated fixed surface infrastructure. This excludes: land that is or was last occupied by agricultural or forestry buildings; land that has been developed for minerals extraction or waste disposal by landfill, where provision for restoration has been made through development management procedures; land in built-up areas such as residential gardens, parks, recreation grounds and allotments; and land that was previously developed but where the

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remains of the permanent structure or fixed surface structure have blended into the landscape.

Site investigation information: *Includes a risk assessment of land potentially affected by contamination, or ground stability and slope stability reports, as appropriate. All investigations of land potentially affected by contamination should be carried out in accordance with established procedures (such as BS10175 Investigation of Potentially Contaminated Sites – Code of Practice).*

Stantec adopt the principle that a Preliminary Investigation (Desk Study and Site Reconnaissance) and Preliminary Risk Assessment (see below) is the minimum assessment requirement to support a planning application.

The level at which contamination is deemed to be unacceptable, or, gives rise to adverse effects under a planning context has not been identified but is envisaged to be more precautionary than the level required to determine land as contaminated under Part 2A.

2.3 Building Control

The building control department of the local authority or private sector approved inspectors are responsible for the operation and enforcement of the Building Regulations (DCLG 2010) to protect the health, safety and welfare of people in and around buildings. Approved Document C requires the protection of buildings and associated land from the effects of contamination, to be applied (non-exclusively) in all changes of use from commercial or industrial premises, to residential property.

3 APPROACH

As with CLR11 the guidance given in LC:RM presents three stages of risk management: -

- (a) Stage 1 - Risk Assessment;
- (b) Stage 2 - Options Appraisal; and
- (c) Stage 3 - Remediation.

Each stage has three tiers. The three tiers of Stage 1 Risk Assessment are: -

- Tier 1 - Preliminary Risk Assessment (PRA) - first tier of RA that develops the outline conceptual model (CM) and establishes whether there are any potentially unacceptable risks.
- Tier 2 - Generic Quantitative Risk Assessment (GQRA) - carried out using generic assessment criteria and assumptions to estimate risk.
- Tier 3 - Detailed Quantitative Risk Assessment (DQRA) - carried out using detailed site-specific information to generate Site Specific

Assessment Criteria (SSAC) as risk evaluation criteria.

For each tier of a Stage 1 - Risk Assessment you must:

1. Identify the hazard - establish contaminant sources.
2. Assess the hazard - use a source-pathway-receptor (S-P-R) pollutant linkage approach to find out if there is the potential for unacceptable risk.
3. Estimate the risk - predict what degree of harm or pollution might result and how likely it is to occur.
4. Evaluate the risk - decide whether a risk is unacceptable.

A Stantec Preliminary Investigation report normally comprises a desk study, walkover site reconnaissance and preliminary risk assessment (PRA). The project specific proposal defines the actual scope of work which might include review of ground investigation data in which case the report includes a GQRA.

Risk estimation involves identifying the magnitude of the potential consequence (taking into account both the potential severity of the hazard and the sensitivity of the receptor) and the magnitude of the likelihood i.e. the probability (taking into account the presence of the hazard and the receptor and the integrity of the pathway). This approach is promoted in current guidance such as R&D 66 (NHBC 2008).

For a PRA, Stantec's approach is that if a pollution linkage is identified then it represents a potentially unacceptable risk which either (1) remediation / direct risk management or (2) progression to further tiers of risk assessment (GQRA and GQRA) requiring additional data collection and enabling refinement of the CM using the site specific data.

4 IDENTIFICATION OF POLLUTANT LINKAGES AND DEVELOPMENT OF A CONCEPTUAL MODEL (CM)

For all Tiers of a Stage 1 Risk Assessment, the underlying principle to ground condition assessment is the identification of *pollutant linkages* in order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences. A pollutant linkage consists of the following three elements: -

- A source/hazard – a substance or situation which has the potential to cause harm or pollution;
- A pathway – a means by which the hazard moves along / generates exposure; and
- A receptor/target – an entity which is vulnerable to the potential adverse effects of the hazard.

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The *Conceptual Model* identifies the types and locations of potential contaminant sources/hazards and potential receptors and potential migration/transportation pathway(s). The CM is refined through progression to further tiers of risk assessment (GQRA and GQRA) requiring additional data collection.

4.1 Hazard Identification

A hazard is a substance or situation that has the potential to cause harm. Hazards may be chemical, biological or physical.

In a PRA the potential for hazards to be present is determined from consideration of the previous or ongoing activities on or near to the site in accordance with the criteria presented in the **Table 1**.

Based on the land use information Contaminants of Potential Concern (COPC) are identified. The COPC direct the scope of the collection of site-specific data and the analytical testing selected for subsequent Tiers.

At Tier 2 the site-specific data is evaluated using appropriate published assessment criteria (refer to Stantec document entitled Rationale for the Selection of Evaluation Criteria for a Generic Quantitative Risk Assessment (GQRA)). In general, published criteria have been developed using highly conservative assumptions and therefore if the screening criterion is not exceeded (and if enough samples from appropriate locations have been analysed) then the COPC is eliminated as a potential Hazard. It should be noted that exceedance does not necessarily indicate that a site is contaminated and/or unsuitable for use only that the COPC is retained as a potential Hazard. Published criteria are generated using models based on numerous and complex assumptions. Whether or not these assumptions are appropriate or sufficiently protective requires confirmation on a project by project basis. Manipulation of the default assumptions would normally form part of a Tier 3 Detailed Quantitative Risk Assessment (DQRA).

When reviewing or assessing site specific data Stantec utilise published guidance on comparing contamination data with a critical concentration (CL:AIRE/CIEH 2008) which presents a structured

¹ International or nationally designated sites (as defined in the statutory guidance (Defra Circular 04/12)) "*in the local area*" will be identified as potential ecological receptors. A search radius of 1, 2 or 5km will be utilised depending on the site-specific circumstances (see also pathway identification). The Environment Agency has published an ecological risk assessment framework (EA 2008) which promotes (as opposed to statutorily enforces) consideration of additional receptors to include locally protected sites and protected or notable species. These additional potential receptors will only be considered if a Phase 1 habitat survey, undertaken in accordance with guidance (JNCC 1993), is commissioned and the data provided to Stantec. It should be noted that

process for employing statistical techniques for data assessment purposes.

4.2 Receptor and Pathway Identification

For all Tiers the potential receptors (for both on site and adjoining land) that will be considered are:

- Human Health – including current and future occupiers, construction and future maintenance workers, and neighbouring properties/third parties;
- Ecological Systems; ¹
- Controlled Waters ² – Under section 78A(9) of Part 2A the term "pollution of controlled waters" means the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter. The term "controlled waters" in relation to England has the same meaning as in Part 3 of the Water Resources Act 1991, except that "ground waters" does not include waters contained in underground strata but above the saturation zone.
- Property - Animal or Crop (including timber; produce grown domestically, or on allotments, for consumption; livestock; other owned or domesticated animals; wild animals which are the subject of shooting or fishing rights); and
- Property - Buildings (any structure or erection, and any part of a building including any part below ground level, but does not include plant or machinery comprised in a building, or buried services such as sewers, water pipes or electricity cables including archaeological sites and ancient monuments).

If a receptor is taken forward for further assessment it will be classified in terms of its sensitivity, the criteria for which are presented in **Table 2**. Table 2 has been generated using descriptions of environmental receptor importance/value given in various guidance documents including R&D 66 (NHBC 2008), EA 2017 and Transport Analysis Guidance (based on DETR 2000). Human health and buildings classifications have been generated by Stantec using the attribute description for each class. Surface water sensitivity is classified using the Water Framework Directive (WFD) status for the River Basin obtained from:

[REDACTED]

without such a survey a Land Contamination risk assessment may conclude that the identification of potential ecological receptors is inconclusive (refer to Stantec Specification for a Preliminary Investigation (Desk Study and Site Reconnaissance)).

² The definition of "pollution of controlled water" was amended by the introduction of Section 86 of the Water Act 2003. For the purposes of Part 2A groundwater does not include waters above the saturated zone and our assessment does not therefore address perched water other than where development causes a pathway to develop.

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The exposure pathway and modes of transport that will be considered are presented in **Table 3**.

4.3 Note regarding Ecological Systems

The Environment Agency (EA) has developed an ecological risk assessment framework which aims to provide a structured approach for assessing the risks to ecology from chemical contaminants in soils (EA 2008). In circumstances where contaminants in water represent a potential risk to aquatic ecosystems then risk assessors will need to consider this separately.

The framework consists of a three-tiered process: -

- Tier 1 is a screening step where the site soils chemical data is compared to a soil screening value (SSV)
- Tier 2 uses various tools (including surveys and biological testing) to gather evidence for any harm to the ecological receptors
- Tier 3 seeks to attribute the harm to the chemical contamination

Tier 1 is preceded by a desk study to collate information about the site and the nature of the contamination to assess whether pollutant linkages are feasible. The framework presents ten steps for ecological desk studies and development of a conceptual model as follows.

1. Establish Regulatory Context
2. Collate and Assess Documentary Information
3. Summarise Documentary Information
4. Identify Contaminants of Potential Concern
5. Identify Likely Fate Transport of Contaminants
6. Identify Potential Receptors of Concern
7. Identify Potential Pathways of Concern
8. Create a Conceptual Model
9. Identify Assessment and Measurement Endpoints
10. Identify Gaps and Uncertainties

The information in a standard PRA report covers Steps 1 to 4 inclusive. Step 5 considers fate and transport of contaminants and it should be noted that our standard report adopts a simplified approach considering only transport mechanisms. A simplified approach has also been adopted in respect of Steps 6 and 7 receptors (a detailed review of the ecological attributes has not been undertaken) and pathways (a food chain assessment has not been undertaken). Step 9 is outside the scope of our standard PRA report.

It should be noted that the PRA report will present an assessment for ecological systems (where identified as a receptor for a land contamination assessment) considering the viability of the mode of transport given the site-specific circumstances and not specific pathways. The PRA may conclude that the risk to potential ecological receptors is inconclusive.

4.4 Note regarding controlled waters

Controlled waters are rivers, estuaries, coastal waters, lakes and groundwaters, but not perched waters.

The EU Water Framework Directive (WFD) 2000/60/EC provides for the protection of sub-surface, surface, coastal and territorial waters through a framework of river basin management. The EU Updated Water Framework Standards Directive 2014/101/EU amended the EU WFD to update the international standards therein; it entered into force on 20 November 2014 with the requirements for its provisions to be transposed in Member State law by 20 May 2016. Other EU Directives in the European water management framework include:

- the EU Priority Substances Directive 2013/39/EU;
- EU Groundwater Pollutants Threshold Values Directive 2014/80/EU amending the EU Groundwater Directive 2006/118/EC; and
- EU Biological Monitoring Directive 2014/101/EU.

The Ground Water Daughter Directive (GWDD) was enacted by the Groundwater Regulations (2009), which were subsumed by the Environmental Permitting Regulations (2010) which provide essential clarification including on the four objectives specifically for groundwater quality in the WFD: -

Achieve 'Good' groundwater chemical status by 2015, commonly referred to as 'status objective';
Achieve Drinking Water Protected Area Objectives;
Implement measures to reverse any significant and sustained upward trend in groundwater quality, referred to as 'trend objective'; and

Prevent or limit the inputs of pollutants into groundwater, commonly referred to as 'prevent or limit' objectives

The Water Act 2003 (Commencement No.11) Order 2012 amends the test for 'contaminated land' which relates to water pollution so that pollution of controlled waters must now be "significant" to meet the definition of contaminated land.

The Water Framework Directive (WFD) requires the preparation, implementation and review of River Basin Management Plans (RBMP) on a six-year cycle. River basins are made up of lakes, rivers, groundwaters, estuaries and coastal waters, together with the land they drain. River Basin Districts (RBD) and the WFD Waterbodies that they comprise are important spatial management units, regularly used in catchment management studies. River Basin Management Plans (RBMP) have been developed for the 11 River Basin Districts in England and Wales.

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These were released by Defra in 2009 (Defra 2009) and updated in 2015.

These RBMP's establish the current status of waters within the catchments of the respective Districts and the current status of adjoining waters identified. As part of a Tier 2 risk assessment water quality data is screened against the WFD assessment criteria. Comparison with the RBMP's current status of waters for the catchment under consideration would form part of a Tier 3 assessment.

5 RISK ESTIMATION

Risk estimation classifies what degree of harm might result to a receptor (defined as consequence) and how likely it is that such harm might arise (probability).

At Tier 1 the consequence classification is generated by multiplying the hazard classification score and the receptor sensitivity score. This approach follows that presented in the republished R&D 66 (NHBC 2008).

The criteria for classifying probability are set out in **Table 4** and have been taken directly from Table 6.4 CIRIA C552 (CIRIA 2001). Probability considers the integrity of the exposure pathway.

The consequence classifications detailed in **Table 5** have been adapted from Table 6.3 presented in C552 and R&D 66 (Annex 4 Table A4.3).

The Tier 1 risk classification is estimated for each pollutant linkage using the matrix given in **Table 6** which is taken directly from C552 (Table 6.5).

Subsequent Tiers refine the CM through retention or elimination of potential hazards and pollutant linkages.

6 RISK EVALUATION

Evaluation criteria are the parameters used to judge whether harm or pollution needs further assessment or is unacceptable. The evaluation criteria used will depend on:

- the reasons for doing the RA and the regulatory context such as Part 2A or planning;
- the CM and pollutant linkages present;
- any criteria set by regulators;
- any advisory requirements such as from Public Health England;
- the degree of confidence and precaution required;
- the level of confidence required to judge whether a risk is unacceptable;
- how you've used or developed more detailed assessment criteria in the later tiers of RA;
- the availability of robust scientific data;
- how much is known - for example, about the pathway mechanism and how the contaminants affect receptors; and

- any practical reasons such as being able to measure or predict against the criteria.

In order to put the Tier 1 risk classification into context the likely actions are described in **Table 7** which is taken directly from Table 6.6 of C552 (CIRIA 2001).

REFERENCES

BSI 2017 BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of Practice

BSI 2019 BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

CIRIA 2001: Contaminated land risk assessment – a guide to good practice C552.

CIRIA 2008: Assessing risks posed by hazardous ground gases to buildings C655

CL: AIRE/CIEH 2008 Guidance on Comparing Soil Contamination Data with a Critical Concentration. Published by Contaminated Land: Applications in Real Environments (CL: AIRE) and the Chartered Institute of Environmental Health (CIEH)

CL: AIRE 2013 SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report published by Contaminated Land: Applications in Real Environments (CL: AIRE) 20th December 2013

DCLG 2010 Building Regulations 2010 Approved Document C Site preparation and resistance to contaminants and moisture.

DETR 2000 Methodology for Multi Modal Studies. Volume 2 Section 4. The Environmental Objective.

DEFRA 2012 Environmental Protection Act 1990: Part 2A. Contaminated Land Statutory Guidance. Department for Environment, Food and Rural Affairs

DEFRA, 2006 The Contaminated Land (England) Regulations 2006.

DEFRA, 2012 The Contaminated Land (England) (Amendment) Regulations 2012 (SI2012/263).

DEFRA, 2012 Environmental Protection Act 1990: Part 2A. Contaminated Land Statutory Guidance. April 2012.

DEFRA, 2013 Environmental Damage (Prevention and Remediation) Regulations 2009: Guidance for England and Wales

Defra '2009 Water for Life and Livelihoods. River Basin Management Plan. (11 Districts: Anglia, Dee, Humber, Northumbria, Northwest, Severn, Solway

Stantec Guide: Methodology for Assessment of Land Contamination (England)

and Tweed, Southeast, Thames, Western Wales)
December 2009

EA 2004: Contaminated Land Research (CLR)
Report 11: The Model Procedures for the
Management of Land Contamination CRL 11 by the
Environment Agency (EA).

EA 2008 Ecological Risk Assessment Science
Report Series SC070009 published by the
Environment Agency (EA).

EA 2017 New groundwater vulnerability mapping
methodology in England and Wales Report –
SC040016/R Environment Agency (EA) September
2017

JNCC 1993 Handbook for Phase 1 Habitat Survey
– A Technical for Environmental Audit prepared by
the Joint Nature Conservancy Council (JNCC)

NHBC/EA/CIEH 2008: R&D Publication 66
Guidance for the safe development of housing on
land affected by contamination.

National Planning Policy Framework (February
2019 revised), published by the Ministry of Housing,
Communities and Local Government (MHCLG) at:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

Stantec Methodology for Assessment of Land Contamination (England)

Table 1: Criteria for Classifying Hazards / Potential for Generating Contamination

Classification/Score	Potential for generating contamination/gas based on land use
Very Low 1	Land Use: Residential, retail or office use, agriculture Contamination: Limited. Gas generation potential: Soils with low organic content
Low 2	Land Use: Recent small scale industrial and light industry Contamination: locally slightly elevated concentrations. Gas generation potential: Soils with high organic content (limited thickness)
Moderate 3	Land Use: Railway yards, collieries, scrap yards, engineering works. Contamination: Possible widespread slightly elevated concentrations and locally elevated concentrations. Gas generation potential: Dock silt and substantial thickness of organic alluvium/peat
High 4	Land Use: Heavy industry, non-hazardous landfills. Contamination: Possible widespread elevated concentrations. Gas generation potential: Shallow mine workings Pre 1960s landfill
Very High 5	Land Use: Hazardous waste landfills, gas works, chemical works, Contamination: Likely widespread elevated concentrations. Gas generation potential: Landfill post 1960

“Greenfield” is land which has not been developed and there has been no use of agrochemicals

Table 2: Criteria for Classifying Receptor Sensitivity/Value

Classification	Definition
Very Low 1	Receptor of limited importance <ul style="list-style-type: none"> Groundwater: Unproductive strata (Strata with negligible significance for water supply or river baseflow) (previously Non-aquifer), Secondary B (water-bearing parts of non-aquifers), Secondary undifferentiated (previously minor or non-aquifer, but information insufficient to classify as secondary A or B) Surface water: WFD Surface Water status Bad Ecology: No local designation Buildings: Replaceable Human health: Unoccupied/limited access
Low 2	Receptor of local or county importance with potential for replacement <ul style="list-style-type: none"> Groundwater: Secondary A aquifer Surface water: WFD Surface Water status Poor Ecology: local habitat resources Buildings: Local value Human health: Minimum score 4 where human health identified as potential receptor
Moderate 3	Receptor of local or county importance with potential for replacement <ul style="list-style-type: none"> Groundwater: Principal aquifer Surface water: WFD Surface Water status Moderate Ecology: County wildlife sites, Areas of Outstanding Natural Beauty (AONB) Buildings: Area of Historic Character Human health: Minimum score 4 where human health identified as potential receptor
High 4	Receptor of county or regional importance with limited potential for replacement <ul style="list-style-type: none"> Groundwater: Source Protection Zone 2 or 3 Surface water: WFD Surface Water status Good Ecology: SSSI, National or Marine Nature Reserve (NNR or MNR) Buildings: Conservation Area Human health: Minimum score 4 where human health identified as potential receptor
Very High 5	Receptor of national or international importance <ul style="list-style-type: none"> Groundwater: Source Protection Zone (SPZ) 1 Surface water: WFD Surface Water status High Ecology: Special Areas of Conservation (SAC and candidates), Special Protection Areas (SPA and potentials) or wetlands of international importance (RAMSAR) Buildings: World Heritage site Human health: Residential, open spaces and uses where children are present

Stantec Methodology for Assessment of Land Contamination (England)

Table 3: Exposure Pathway and Modes of Transport

Receptor	Pathway	Mode of transport
Human health	Ingestion	Fruit or vegetable leaf or roots
		Contaminated water
		Soil/dust indoors
		Soil/dust outdoors
	Inhalation	Particles (dust / soil) – outdoor
		Particles (dust / soil) - indoor
		Vapours – outdoor - migration via natural or anthropogenic pathways
		Vapours - indoor - migration via natural or anthropogenic pathways
	Dermal absorption	Direct contact with soil
		Direct contact with waters (swimming / showering)
Irradiation		
Groundwater	Leaching	Gravity / permeation
	Migration	Natural – groundwater as pathway Anthropogenic (e.g. boreholes, culverts, pipelines etc.)
Surface Water	Direct	Runoff or discharges from pipes
	Indirect	Recharge from groundwater
	Indirect	Deposition of windblown dust
Buildings	Direct contact	Sulphate attack on concrete, hydrocarbon corrosion of plastics
	Gas ingress	Migration via natural or anthropogenic paths
Ecological systems	See Notes	Runoff/discharge to surface water body
	See Notes	Windblown dust
	See Notes	Groundwater migration
	See Notes	At point of contaminant source
Animal and crop	Direct	Windblown or flood deposited particles / dust / sediments
	Indirect	Plants via root up take or irrigation. Animals through watering
	Inhalation	By livestock / fish - gas / vapour / particulates / dust
	Ingestion	Consumption of vegetation / water / soil by animals

Table 4: Classification of Probability

Classification	Definition
High likelihood	There is a pollution linkage and an event either appears very likely in the short-term and almost inevitable over the long-term, or there is already evidence at the receptor of harm / pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter-term.
Unlikely	There is a pollution linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.

Stantec Methodology for Assessment of Land Contamination (England)

Table 5: Classification of Consequence (score = magnitude of hazard and sensitivity of receptor)

Classification Score	Examples
Severe 17-25 (3 out of 25 outcomes)	Human health effect - exposure likely to result in "significant harm" as defined in the Defra (2012) Part 2A Statutory Guidance ¹ . Controlled water effect - short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Equivalent to EA Category 1 incident (persistent and/or extensive effects on water quality leading to closure of potable abstraction point or loss of amenity, agriculture or commercial value. Major fish kill. Ecological effect - short-term exposure likely to result in a substantial adverse effect. Catastrophic damage to crops, buildings or property
Medium 10-16 (7 out of 25 outcomes)	Human health effect - exposure could result in "significant harm" ¹ . Controlled water effect - equivalent to EA Category 2 incident requiring notification of abstractor Ecological effect - short-term exposure may result in a substantial adverse effect. Damage to crops, buildings or property
Mild 5-9 (7 out of 25 outcomes)	Human health effect - exposure may result in "significant harm" ¹ . Controlled water effect - equivalent to EA Category 3 incident (short lived and/or minimal effects on water quality). Ecological effect - unlikely to result in a substantial adverse effect. Minor damage to crops, buildings or property. Damage to building rendering it unsafe to occupy (for example foundation damage resulting in instability).
Minor 1-4 (8 out of 25 outcomes)	No measurable effect on humans. Protective equipment is not required during site works. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects to crops, buildings or property. The loss of plants in a landscaping scheme. Discolouration of concrete.

¹ Significant harm includes death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. The local authority may also consider other health effects to constitute significant harm such as physical injury; gastrointestinal disturbances; respiratory tract effects; cardio-vascular effects; central nervous system effects; skin ailments; effects on organs such as the liver or kidneys; or a wide range of other health impacts. Whether or not these would constitute significant harm would depend on the seriousness of harm including impact on health, quality of life and scale of impact.

Table 6: Classification of Risk (Combination of Consequence Table 5 and Probability Table 4)

Probability	Consequence			
	Severe	Medium	Mild	Minor
High likelihood	Very high	High	Moderate	Low
Likely	High	Moderate	Moderate/	Low
Low likelihood	Moderate	Moderate	Low	Very low
Unlikely	Low	Low	Very low	Very low

Stantec Methodology for Assessment of Land Contamination (England)

Table 7: Description of Risks and Likely Action Required

Risk Classification	Description
<i>Very high risk</i>	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation is likely to be required in the short term.
<i>High risk</i>	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
<i>Moderate risk</i>	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
<i>Low risk</i>	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
<i>Very low risk</i>	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Appendix B **Site walkover photographs**



Plate 1 – View from northern boundary showing soil mound



Plate 2 – General View Across Area 1



 <p>Caversham Bridge House, Waterman Pl, Reading, RG1 8DN Tel 0118 950 0761</p>	<p>Client</p> 	<p>M3 Junction 9 Improvement – Proposed Deposition and Compound Areas</p>	Date	03/12/2020
			Scale	-
			Drawn	MG
			Checked	PJ
			Appendix	B



Plate 3 – View looking southwards across Area 2a



Plate 4 – View looking northwards across Area 2a



 <p>Caversham Bridge House, Waterman Pl, Reading, RG1 8DN Tel 0118 950 0761</p>	<p>Client</p> 	<p>M3 Junction 9 Improvement – Proposed Deposition and Compound Areas</p>	Date	03/12/2020
			Scale	-
			Drawn	MG
			Checked	PJ
			Appendix	B



Plate 5 – View looking eastwards across Area 2b



Plate 6 – View looking south-westwards across Area 2b



	Client	M3 Junction 9 Improvement – Proposed Deposition and Compound Areas	Date	03/12/2020
			Scale	-
			Drawn	MG
			Checked	PJ
			Appendix	B
Caversham Bridge House, Waterman Pl, Reading, RG1 8DN Tel 0118 950 0761				



Plate 7 – View looking north-eastwards across Area 2c



Plate 8 – View looking south-westwards across Area 2c showing generator and fuel bowser in background



 <p>Caversham Bridge House, Waterman Pl, Reading, RG1 8DN Tel 0118 950 0761</p>	<p>Client</p> 	<p>M3 Junction 9 Improvement – Proposed Deposition and Compound Areas</p>	Date	03/12/2020
			Scale	-
			Drawn	MG
			Checked	PJ
			Appendix	B



Plate 9 – Photograph showing towable fuel bowser and generator



Plate 10 – View looking northwards across Area 2c



 <p>Caversham Bridge House, Waterman Pl, Reading, RG1 8DN Tel 0118 950 0761</p>	<p>Client</p> 	<p>M3 Junction 9 Improvement – Proposed Deposition and Compound Areas</p>	Date	03/12/2020
			Scale	-
			Drawn	MG
			Checked	PJ
			Appendix	B



Plate 11 – Photograph looking northward across area 2d



Plate 12 – Photograph looking southward across area 2d



 Caversham Bridge House, Waterman Pl, Reading, RG1 8DN Tel 0118 950 0761	Client	M3 Junction 9 Improvement – Proposed Deposition and Compound Areas	Date	03/12/2020
			Scale	-
			Drawn	MG
			Checked	PJ
			Appendix	B



Plate 13 – View looking eastwards across Area 2e



Plate 14 – View looking northwards across Area 2e





 <p>Caversham Bridge House, Waterman Pl, Reading, RG1 8DN Tel 0118 950 0761</p>	<p>Client</p> 	<p>M3 Junction 9 Improvement – Proposed Deposition and Compound Areas</p>	Date	03/12/2020
			Scale	-
			Drawn	MG
			Checked	PJ
			Appendix	B



Plate 15 – Photograph view eastwards across Area 3

	Client 	M3 Junction 9 Improvement – Proposed Deposition and Compound Areas	Date	03/12/2020
			Scale	-
Caversham Bridge House, Waterman PI, Reading, RG1 8DN Tel 0118 950 0761			Drawn	MG
			Checked	PJ
			Appendix	B