13.0 Ground Conditions

13.1 Introduction

13.1.1 This Chapter of the Environmental Statement (ES) comprises an assessment of the potential effects on the geology and ground conditions arising as a consequence of the Proposed Development both during construction and when the Proposed Development is operational.

13.1.2 The Site is located at land off Shaftesbury Road, south of Gillingham, Dorset. The British National Grid Reference of the eastern/ western sections of the site are 381517, 125387/ 382314, 125825, respectively, and the (nearest) postcode is SP8 5NG.

13.1.3 The Site comprises two irregular-shaped areas of agricultural land located to the east and west of Shaftesbury Road (B3081) situated in a predominantly rural area. Both areas of the site, as well as the surrounding topography, are gently undulating and predominantly comprise pastoral fields separated by hedgerows.

13.2 Methodology and Scope

Policy Background

13.2.1 Paragraphs 109 and 110 of the National Planning Policy Framework (NPPF) state:

"109. The planning system should contribute to and enhance the natural and local environment by:

- protecting and enhancing valued landscapes, geological conservation interests and soils;…
- preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and
- remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

110. In preparing plans to meet development needs, the aim should be to minimise pollution and other adverse effects on the local and natural environment. Plans should allocate land with the least environmental or amenity value, where consistent with other policies in this Framework."

Key Legislation

13.2.2 Part 2A of the Environmental Protection Act (EPA) 1990 provides a regime for the identification and remediation of contaminated land. This is implemented by the Contaminated Land (England) Regulations 2006 (which consolidate the provisions of the Contaminated Land (England) Regulations 2000 and subsequent amendments) and further amended by The Contaminated Land (England) (Amendment) Regulations 2012. This regime is designed to provide an effective, acceptable and statutory framework for the remediation of contaminated land and is based on a number of principles including the 'suitable for use' approach and the assessment of contamination by a risk-based approach.

13.2.3 Section 78A of the EPA (1990) defines contaminated land as land that is in such a condition that:

- Significant harm is being caused or there is a significant possibility of such harm being caused; or
- Pollution of controlled waters is being or is likely to be caused.

13.2.4 The guidance defines 'risk' as the combination of:

- The probability, or frequency, of occurrence of a defined hazard (for example, exposure of a person to a substance with the potential to cause harm); and
- The magnitude (including the seriousness) of the consequences.

13.2.5 Part 2A of the EPA was introduced specifically to address the historical legacy of land contamination. It applies where there is unacceptable risk, based on current site use and is not intended to be applied when assessing risks in relation to a future use of the land that would require a specific grant of planning permission. This is primarily a task for the planning system, which aims to control development and land use in the future.

13.2.6 The Water Framework Directive (WFD) and Groundwater (England & Wales) Regulations 2009 are relevant as they define the current status of waterbodies, which is useful to explain in terms of the baseline description and the expected target status of waterbodies; this can be used as a test of whether impacts from the Proposed Development are significant or not in water quality terms.

Scoping Assessment Stage

13.2.7 No scoping assessment stage was undertaken prior to this assessment.

Assessment Methodology

13.2.8 Potential geological, ground conditions and hydrogeological condition aspects which could be affected by the Proposed Development include:

- Construction workers/ future site users;
- Surrounding site users;
- Controlled waters;
- Vegetation and wildlife;
- Agricultural soils; and
- Mineral resources.

13.2.9 Potential land contamination impacts and associated risks to human health have been assessed in the Phase 1: Preliminary Geotechnical and Contamination Assessment (ES Volume 3, Technical Appendix 13.1) using a methodology based upon the CLR11 Model Procedures for the Management of Land Contamination (Environment Agency, 2011). The method is specifically tailored to assess the impacts and risks that may arise from exposure to ground contamination and ground gases.

13.2.10 The results of the risk assessment on environmental receptors such as soils, surface water, groundwater, vegetation and wildlife are taken into account in this Chapter using EIA terminology resulting in the determination of significance.

Receptor Sensitivity

13.2.11 Environmental receptors can demonstrate different sensitivities to changes in their environment. It is also recognised that environmental impacts can operate over a range of geographical areas and therefore a geographical scale should be taken into account in the scale/ magnitude of the impact, as well as the receptor. The sensitivity of the receptor also takes into account the long- or short-term exposure of the receptor.

13.2.12 For the purpose of this assessment, sensitivity is determined as very high, high, medium and low as detailed in Table 13.1, below.

Table 13.1 - Methodology for Assessing Sensitivity of a Receptor

Sensitivity	Criteria	Example Criteria
Very High	Attribute has a high quality and/or rarity on a regional or national scale.	• Sites of Special Scientific Interest (SSSIs) with geological/ geomorphological qualifying interest; • Groundwater aquifers currently used, or likely to be suitable for use as, public potable supplies (e.g. Principal Aquifers, Source Protection Zone for potable groundwater supplies). • Groundwater that is providing baseflow to 'very good' WFD status quality surface waters; • Soils with a very high likelihood of readily transmitting contaminants to nearby sensitive receptors or over a large distance (e.g. granular deposits in saturated zone or in continuity with river systems etc.). H1 soils as defined by the Environment Agency groundwater vulnerability classification system; • Agricultural land use / soil quality (based on Agricultural Land Classification (ALC) Grades 1, 2 and 3a (the 'best and most versatile')); and • Human population (e.g. local residents and site construction workers etc.).
High	Attribute has a high quality and/or rarity on local scale.	• Regionally Important Geological Sites (RIGS); • Groundwater aquifers currently used for, or likely to be suitable for, providing non-potable supplies or limited domestic supplies (e.g. Secondary Aquifers for domestic supplies or industrial abstractions); • Groundwater that is providing baseflow to 'good' WFD quality status surface waters; • Soil sensitivity to pollution: soils with a moderately high potential to transmit contaminants to other receptors or over a significant distance (e.g. mixed cohesive and granular deposits of alluvium). H2 /H3 soils as defined by the Environment Agency groundwater vulnerability classification system; and • Agricultural land use / soil quality of ALC Grade 3b (moderate).
Medium	Attribute has a medium quality and / or rarity on local scale.	• Groundwater that is unlikely to be suitable for providing abstractions (e.g. Unproductive Aquifers); • Soils with an intermediate potential to transmit contaminants (e.g. Glacial clays with occasional sand bands). Soils of intermediate (I1 or I2) leaching potential as defined by the Environment Agency groundwater vulnerability classification system; and • Agricultural land use / soil quality of ALC Grade 4 (poor).
Low	Attribute has a low quality and/or rarity on local scale.	• Non sensitive water resources (non-classified, static groundwater); • Soils with a low potential to transmit contaminants (e.g. clay). Soils of low (L) leaching potential as defined by the Environment Agency groundwater vulnerability classification system; and • Agricultural land use/soil quality of ALC Grade 5 (very poor) or less.

Effect Magnitude

13.2.13 The magnitude of potential effects during both construction and operation of the Proposed Development has been assessed using the criteria presented in Table 13.2. The magnitude (scale of change) is determined by considering the degree of deviation from the baseline conditions and whether this is likely to result in any exceedances of statutory objectives or changes in suitable uses of the receptor.

13.2.14 In determining the scale of effects, some consideration has to be made regarding the likelihood of effect occurring. When assessing effects relating to contamination and soil or groundwater quality it is possible

to envisage a sliding scale of effects. For instance, it is possible that minor fuel leaks during construction work may result in a localised area of soil contamination; however, it is also possible, though significantly less likely, that a major fuel leak could occur during construction and this could affect a much larger area of soil. In assessing the magnitude of effects we have assumed a plausible and conservative scenario. It is not considered suitable to undertake the assessment using the worst possible scenario for all effects as these are unlikely to occur in normal circumstances.

13.2.15 For the purpose of this assessment magnitude is determined as very high, high, medium, low and negligible as detailed in Table 13.2, below.

Table 13.2 - Methodology for Assessing Magnitude of Impacts

Impact Magnitude	Definition
Substantial	• Change in soil quality or ground gas regime for a large area (>20ha) of land, sufficient to alter land use (e.g. remediation of 20ha of industrial land sufficient to enable mixed residential / commercial use). • Permanent loss of any area of agricultural land (ALC Grades 1, 2 and 3a). • Change in groundwater conditions sufficient to change aquifer use (e.g. contamination that prevents abstraction for potable supplies, or remediation of impacted aquifer sufficient to enable potable abstractions). • Generation of large volumes of non-inert waste materials for disposal off-site to landfill.
Moderate	• Change in soil quality or ground gas regime for a moderate area of land (<20ha) to a degree sufficient to alter land use in localised portions of the site or to a degree requiring a change in management / mitigation measures for site use. • Change in groundwater conditions that may be sufficient to change local groundwater regime and potential aquifer uses (e.g. localised contaminant impact, localised change in groundwater levels).
Slight	• Measurable but relatively small scale change in an area of contaminated land or ground gas regime, but insufficient to alter end land use. • Change in groundwater conditions that are insufficient to change status or potential use of the water body. • Permanent loss of any area of agricultural land (ALC Grades 3b, 4 or 5).
Negligible	• No measurable contamination mobilised. • No measurable change in area of agricultural land. • No discernible change to groundwater regime.

NOTES:

(1) An impact magnitude can be either positive or negative, except for negligible.

(2) If the assessor is certain that a receptor or attribute of a feature will suffer no impact whatsoever then the term 'No Effect' can be used in the place of 'Negligible Effect'. However, it is not usually possible to determine 'No Effect' in many cases with 100% certainty so the term 'Negligible' should be used in these cases.

13.2.16 It is recognised that environmental impacts can operate over a range of geographical areas and therefore a range of geographical scales will be taken into account in the magnitude of the impact.

13.2.17 The EIA Regulations require a description of the likely effects of the development and whether they are significant or not. Therefore, environmental effects are described as:

- Adverse or beneficial;
- Direct or indirect;
- Temporary or permanent;
- Short, medium or long term;
- Reversible or irreversible; and
- Cumulative.

13.2.18 A distinction is made between an 'impact' and an 'effect' and to help the reader understand the matrix approach different terminology is used. Impact magnitudes are termed 'substantial', 'moderate', 'minor' and 'negligible' or 'no impact', whereas effects are termed 'major', 'intermediate', 'slight' and 'neutral'. Furthermore, distinction is made with valency terminology whereby impact magnitude is either 'negative' or 'positive', and significance of effect is 'adverse' or 'beneficial'.

13.2.19 The EIA Regulations require consideration of a variety of types of effect, namely direct/ indirect, secondary, cumulative, positive/ negative, short-/ medium-/ long-term, and permanent/ temporary. In this ES, effects are considered in terms of how they arise, their valency (i.e. whether they are positive or negative) and duration. Each will have a source originating from the development, a pathway and a receptor.

13.2.20 Most predicted effects will be adverse/ negative or beneficial/ positive, direct, indirect, secondary or cumulative, temporary or permanent, short, medium or long term. Table 9.3, below, provides definitions of typical terminologies used in describing the nature of effects. In some cases, it is appropriate to identify that the interpretation of a change is a matter of professional opinion, and such effects will be described as 'subjective'.

13.2.21 The temporal scope of environmental effects is stated where known. Effects are typically described as:

- Temporary – these are likely to be related to a particular activity and cease when the activity finishes. The terms 'short-term' and 'long-term' may also be used to provide a further indication of how long the effect will be experienced; and
- Permanent – this typically means an unrecoverable change.

Table 13.3 - Terminology Definitions for Typical Effects

Nature of Effect	Description
Direct	Effects that occur through direct interaction of an activity with the ground.
Indirect	Effects that occur not as a direct result of the project.
Temporary	Effects which cause a change to the baseline for a limited period of time.
Permanent	Effects causing an irreversible change to the baseline.
Short term	Construction activities – assumed to be less than a year
Medium term	Construction activates – extending between 1 and 10 years
Long term	Completed development – extending over 10 years

13.2.22 Table 13.4, below, shows how the interaction of magnitude and sensitivity results in the significance of an environmental effect. If the impact is negative (i.e. undesirable) then the resulting effect is adverse. If the impact is positive (i.e. desirable) then the resulting effect is beneficial.

Table 13.4 - Methodology for Assessing the Significance of Impacts

		Magnitude of Impact			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
Sensitivity of Receptor	Very High	Major	Major	Intermediate	Minor
	High	Major	Intermediate	Minor	Minor
	Medium	Major	Intermediate	Minor	Neutral
	Low	Intermediate	Minor	Neutral	Neutral

13.2.23 The residual risk after consideration of the mitigation or remediation associated with identified significant effects will be reassessed using the same methodology as given in the assessment tables above.

13.2.24 Any impacts of minor significance or lower are not considered to be significant and as such it will not be necessary to always propose mitigation methods. Impacts of intermediate or higher significance will be deemed to be potentially significant and will require, where possible, mitigation methods to be adopted.

13.2.25 The methodology for the assessment of the level of confidence will be attributed as high or low in accordance with standard assessment criteria.

Limitations of the Assessment

13.2.26 All proposed assessment works relating to the Phase 1: Preliminary Geotechnical and Contamination Assessment were able to be carried out as intended.

13.2.27 The main point of note is that further intrusive investigation regarding slightly elevated levels of contamination, recorded within one location in the east of the site, was recommended within previous intrusive investigation works (Ruddlesden geotechnical ltd's Geotechnical Investigation and Contamination Assessment Report, ref: TB/JF/SR/14114/GICAR, dated: August 2014). At the time of our assessment, this further work had not been carried out and therefore it is considered that the recommendations in this area of the site may change based on the results, or lack, of further work.

13.3 Baseline Environment

Existing Baseline

13.3.1 The following report was produced by Ruddlesden geotechnical to inform the preparation of this Chapter and is included within the ES Volume 3 – Technical Appendices:

- Phase 1: Preliminary Geotechnical and Contamination Assessment Report.

  This Phase 1 report referred to two previous intrusive (Phase 2) reports, which included the formation of 82 (eighty-two) trial pits and laboratory testing:

- Geotechnical Investigation and Contamination Assessment Report (ref: SR/SB/DT/09157/GICAR; dated: March 2010); and
- Geotechnical Investigation and Contamination Assessment Report (ref: TB/JF/SR/14114/GICAR; dated: August 2014).

Topsoil

13.3.2 Topsoil, comprising silty gravelly clay, was typically encountered to depths of between 0.20m and 0.60m.

Made Ground

13.3.3 Made ground was encountered in four locations across the site at depths of up to 1.20m.

Superficial Geology

13.3.4 Head deposits/ Alluvium, comprising firm to stiff orange/ yellow brown slightly gravelly silty clay, was encountered in fifty-one (51) locations to depths of between 0.30m and 3.40m, typically increasing in thickness to the south. The Head deposits/ Alluvium were similar in strength and composition to the underlying bedrock deposits, but have been distinguished by their gravel content, which typically comprised flint and other mixed lithologies.

Solid Geology

13.3.5 Kimmeridge Clay, comprising firm to stiff bluish grey silty clay with mudstone lithorelics and shell fragments, was encountered beneath the Topsoil/ Superficial Geology across the whole site.

Groundwater

13.3.6 Groundwater has previously been encountered at depths of between 2.00m and 2.70m. These groundwater seepages typically coincide with partings of sand and gravel of relatively greater permeability than the surrounding clay soils. Based on the results of the previous investigations, and nearby surface water features, groundwater is anticipated to be within 5m of existing ground levels.

Groundwater Vulnerability

13.3.7 The superficial geology (Head and Alluvium deposits) are both classified as Secondary A Aquifers. These are 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. These are generally aquifers formerly classified as Minor Aquifers.

13.3.8 The underlying bedrock deposits (Kimmeridge Clay Formation) are described as Unproductive. These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Contamination Assessment

13.3.9 Based on results of testing undertaken during previous intrusive investigations, the levels of contamination recorded across the majority of the site are not potentially harmful to human health given the proposed end use or to the water environment.

13.3.10 However, elevated levels of contamination, which are considered to potentially be harmful to human health given the proposed end use, were locally recorded within made ground in the far east of the site.

13.3.11 Further work is recommended to confirm whether or not the elevated levels of contamination recorded in the made ground in the east of the site are potentially harmful to human health and whether remedial measures, which will likely comprise localised contaminated soil removal and/ or capping of gardens, are required.

Agricultural Land Classification

13.3.12 A site-specific Agricultural Land Classification and Soil Resources report produced by Reading Agricultural Consultants Ltd has classified the vast majority of the site as lower quality agricultural land in Subgrade 3b and Grade 4 (97%); only 3% is classified as best and most versatile in Subgrade 3a.

Mineral Safeguarding

13.3.13 The site is not identified as falling within a Mineral Safeguarding Area.

13.4 Mitigation within the Submitted Design

Design

13.4.1 A Construction Drainage Design Plan will be prepared by the contractor and the construction drainage and surface water protection strategies will be implemented to primarily prevent water quality being significantly impacted.

13.4.2 Prior to the commencement of construction an adequately developed Construction Environmental Management Plan (CEMP) and a Construction Phase CDM Health and Safety Plan will be prepared/ revised as necessary.

13.4.3 The surface water strategy is to be based on providing a SUDS design as per the guidance as set out within The SUDS Manual (CIRIA 697) (CIRIA, 2007).

Construction

13.4.4 In order to minimise the potential effects of construction activities to ground conditions, it is understood that the following standard construction best practice procedures will be implemented during the construction phase.

13.4.5 All construction staff will be required to provide access to appropriate welfare facilities and Personal Protective Equipment (PPE).

13.4.6 The applicant and principal contractor will ensure that all consents and licences are in place before works commence.

13.4.7 Particular attention will be given to the storage and use of fuels for the plant on site. All storage and use of fuels and oils will be in accordance with best practice guidelines (as may be updated) Environment Agency Pollution Prevention Guidelines (PPG 2 Above ground oil storage tanks, and PPG 8 Safe Storage and Disposal of used Oils). All fuels and oils will be secured within a bunded area. The secondary containment system must provide storage of at least 110% of the tank's maximum capacity. If more than one container is stored, the system must be capable of storing 110% of the biggest container's capacity or 25% of the total tank capacity within the bund, whichever is the greater. All ancillary equipment, such as hoses, must also be contained within the bunded areas which should be located at least 10m away from watercourses. Drainage within the temporary site compound where construction vehicles will park and where any diesel fuel will be stored, will be directed to an oil interceptor to prevent pollution if any spillage occurs. Where oil storage containers (in excess of 200 litres in capacity) are brought onto site during the construction phase, the containers and their location will comply with the Control of Pollution (Oil Storage) Regulations (2001). Reference should be made to Environment Agency Pollution Prevention Guidelines (PPG 2 Above ground oil storage tanks) for suitable guidance regarding compliance with the Oil Storage Regulations).

13.4.8 Where other containers are brought onto site, including the storage and handling of drums and Intermediate Bulk Containers (IBCs), these will be required to comply with the Environmental Protection Act (1990) and the Environment Act (1995). Reference should be made to Environment Agency Pollution Prevention Guidance (PPG 26 Drums and intermediate bulk containers) for suitable guidance.

13.4.9 Any storage and handling of flammable liquids (defined as any liquid with a flash point of 55°C and below) will be required to conform to the Chemicals (Hazardous Information and Packaging for Supply)

Regulations and HSG51 (HSE, 1998). Reference should be made to Environment Agency PPG 26 and HSG140 for suitable guidance, including:

- PPG1 General Guide to the Prevention of Water Pollution;
- PPG 2 Above Ground Oil Storage Tanks;
- PPG 3 Use and Design of Oil Separators in Surface Water Drainage Systems;
- PPG 4 Disposal of Sewage Where No Mains Drainage is Available;
- PPG5 Works and Maintenance in or near Water;
- PPG6 Working at Construction and Demolition Sites;
- PPG 8 Safe Storage and Disposal of Used Oils;
- PPG18 Managing Fire Water and Major Spillages;
- PPG 21 Incident Response Planning;
- PPG 22 Dealing with Spills;
- PPG 26 Drums and Intermediate Bulk Containers; and
- EA Regulatory Position Statement (June 2011): Managing Concrete Wash Waters on Construction Sites: Good Practice and Temporary Discharges to Ground or to Surface Waters.

13.5 Likely Significant Environmental Effects of the Scheme

Construction Phase Effects

13.5.1 Based upon the Proposed Development and the known ground conditions at the site, the following potential effects on receptors are considered to be applicable to the site assuming the mitigation measures detailed above are implemented during the construction phase.

Construction Workers (Contamination)

13.5.2 Based on the findings of the Phase 1: Preliminary Geotechnical and Contamination Assessment Report (ES Volume 3, Technical Appendix 13.1), it is considered that there is a low likelihood risk of construction workers being exposed to ground contamination. Nevertheless, the sensitivity of the receptor is considered to be **very high**. Based on the levels of contamination recorded, the potential magnitude of the impact is considered to be **slight**. This would result in a **direct**, **short term** and **temporary intermediate adverse** effect which is considered to be significant.

Surrounding Site Users

13.5.3 There is a possibility that surrounding site users/ residents may be exposed to increased levels of potentially contaminated dust due to ground disturbance, though based on the recorded levels, it is considered that there is a low likelihood risk of surrounding site users/ residents being exposed to potentially contaminated dust. Nevertheless, the sensitivity of the receptor is considered to be **very high**. Based on the levels of contamination recorded, the potential magnitude of the impact is considered to be **slight**. This would result in a **direct**, **short term** and **temporary, intermediate adverse** effect which is considered to be significant.

Controlled Waters (Contamination)

13.5.4 There is a potential that earthworks and construction could increase the potential for contaminant migration to the underlying groundwater due to accidental spills and leakages from construction activities and storage of materials (including soil stockpiles, chemicals and fuels). The sensitivity of the underlying groundwater is considered to be **high** due to its classification as a Secondary Aquifer. Given mitigation measures detailed within this Chapter, the potential magnitude of the impact is considered to be **slight**. This would result in a **direct**, **short term** and **temporary, intermediate adverse** effect which is considered to be significant.

Vegetation and Wildlife (Contamination)

13.5.5 The Proposed Development may result in exposure of land contamination that is normally covered by vegetation. Wildlife may then be exposed to these contaminants either by direct contact, ingestion or inhalation of dust particles whereby previously they would have been exposed by plant uptake, ingestion of plants with soils, or burrowing through soils. Due to the short-term nature of the works and the amount of disturbance likely during the works, the potential exposure of wildlife during construction is therefore limited. The sensitivity of this receptor is considered to be **medium** and due to the nature of the works, the potential magnitude of the impact is considered to be **slight**. This would result in a **direct**, **short term** and **temporary, minor adverse** effect which is not considered significant.

Agricultural Soils

13.5.6 The majority of the site has been identified as being in Agricultural Land Classification Grade 3b or 4 and as such is considered to be of **medium to high** sensitivity. The potential magnitude of the impact of its loss as part of the Proposed Development is considered to be **moderate**. The impact would be **direct**, **long term** and **permanent, intermediate adverse** which is considered to be significant.

Mineral Resources

13.5.7 The site is not identified as being in a Mineral Safeguarding and as such is considered to be of **low** sensitivity. The potential magnitude of the impact of its loss as part of the Proposed Development is considered to be **negligible** and therefore not significant.

Operational Phase Effects

13.5.8 The following impacts and effects are considered to be likely as a result of operational phase activities. It should be noted that these impacts assume that the surface water strategy is based on providing a SUDS design as per the guidance as set out within The SUDS Manual (CIRIA 697) (CIRIA, 2007). It is also assumed that oil/ silt interceptors will be provided in accordance with the Environment Agency Pollution Prevention Guidelines (PPG 3 Use and Design of Oil Separators in Surface Water Drainage Systems).

Future Site Users (Contamination)

13.5.9 Given that the majority of the recorded levels of contamination are deemed appropriate for the proposed end use, the possibility that future site users would be exposed to increased levels of potentially contaminated soils during operational use is considered to be unlikely, particularly given the requirement

for further ground investigation, which will identify whether remedial measures (e.g. localised contaminated soil removal and/ or capping of garden areas) are required to protect end users. Nevertheless, the sensitivity of the receptor is considered to be **very high**. Based on the levels of contamination recorded and the recommended further work/ remedial work, the potential magnitude of the impact is considered to be **negligible**. This would result in a **direct**, **long term** and **permanent, minor adverse** effect, which is not considered to be significant.

Controlled Waters (Contamination and Recharge)

13.5.10 It is considered unlikely that the operational phase of the Proposed Development will result in any new, discernible impacts to controlled waters in the Secondary Aquifer. The presence of drainage systems, foundations and hardstanding surface cover could change the shallow hydrogeological (groundwater) regime beneath the site. Therefore, it is considered that there would be a **negligible** impact to groundwater flow that has **high** sensitivity. The significance of this effect is considered to be **direct**, **long term** and **permanent** and **minor adverse,** which is not considered to be significant.

Vegetation and Wildlife (Contamination)

13.5.11 The operation of the development will not result in the generation of dust/ spoil/ contamination associated with underlying soils. Therefore, the potential exposure of wildlife during operation is unlikely. The sensitivity of this receptor is considered to be **medium** and the magnitude to be **negligible**. The significance of this effect is deemed to be **direct**, **long term** and **permanent**, **neutral,** and therefore not significant.

13.6 Additional Mitigation, Compensation and Enhancement Measures

Construction Phase

13.6.1 Further investigation is required to determine whether remediation measures (e.g. localised contaminated soil removal or capping of gardens) are required to protect human health. This will be required to satisfy planning and warranty provider conditions.

Operational Phase

13.6.2 Other than the above described measures, no additional mitigation is required.

13.7 Assessment Summary and Likely Significant Residual Environmental Effects

13.7.1 Residual effects are summarised within Table 13.5, below.

Construction Phase

13.7.2 There are no significant residual effects as standard construction procedure will appropriately mitigate against potential identified effects.

Operational Phase

13.7.3 There will be no significant residual effects as standard design requirements will appropriately mitigate potential identified effects.

13.8 Cumulative Impacts

13.8.1 The potential effects associated with ground conditions and contamination are considered to be local and as such will not result in a cumulative increase in the magnitude of impact upon identified receptors.

Table 13.5 Assessment Summary and Residual Environmental Effects (Ground Conditions)

	Sensitivity of Receptor	Impact Magnitude	Nature of Effect	Significance of Effect	Additional Mitigation	Residual Impact Magnitude	Residual Significance and Nature of Effect
Construction Phase							
Construction Workers	Very high	Slight	Direct, temporary, short term	Intermediate	Standard construction best practice procedures	Negligible	Neutral
Surrounding Users	Very high	Slight	Direct, temporary, short term	Intermediate	Standard construction best practice procedures	Negligible	Neutral
Controlled Waters	High	Slight	Direct, temporary, short term	Intermediate	Standard construction best practice procedures	Negligible	Neutral
Vegetation and Wildlife	Medium	Slight	Direct, temporary, short term	Minor	Standard construction best practice procedures	Negligible	Neutral
Agricultural Soils	Medium to High	Moderate	Direct, permanent, long term	Intermediate	Standard construction best practice procedures	Negligible	Neutral
Mineral Resources	Low	Negligible	Direct, permanent, long term	Neutral	None required	Negligible	Neutral
Operational Phase							
Future Site Users	Very high	Negligible	Direct, permanent, long term	Minor	Further ground investigation work, possibly followed by localised contaminated soil removal and/ or capping of gardens.	Negligible	Neutral
Controlled Waters	High	Negligible	Direct, permanent, long term	Minor	None required	Negligible	Neutral
Vegetation and Wildlife	Medium	Negligible	Direct, permanent, long term	Neutral	None required	Negligible	Neutral

	Sensitivity of Receptor	Impact Magnitude	Nature of Effect	Significance of Effect	Additional Mitigation	Residual Impact Magnitude	Residual Significance and Nature of Effect
Agricultural Soils	Medium to High	Negligible	Direct, permanent, long term	Neutral/ Minor	None required	Negligible	Neutral
Mineral Resources	Low	Negligible	Direct, permanent, long term	Neutral	None required	Negligible	Neutral

13.9 References

- Defra & Environment Agency (2004): CLR 11: Model Procedures for the Management of Land Contamination.
- Department for Communities and Local Government (2012): National Planning Policy Framework.
- Environmental Protection Act (1990): Part 2A.
- European Commission (2000): Water Framework Directive.
- HMSO (2009): Groundwater (England & Wales) Regulations.
- Ruddlesden Geotechnical (2010): Geotechnical Investigation and Contamination Assessment Report; ref: SR/SB/DT/09157/GICAR.
- Ruddlesden Geotechnical (2014): Geotechnical Investigation and Contamination Assessment Report; ref: TB/JF/SR/14114/GICAR.
- Ruddlesden Geotechnical (2017): Phase 1: Preliminary Geotechnical and Contamination Assessment; ref: TB/SR/14114/PGCAR.