Keuper Gas Storage Project

Preliminary Environmental Information Report – Geology and Ground Conditions

PREPARED FOR
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ACRONYMS AND ABBREVIATIONS

Acronym	Description
ALC	Agricultural Land Classification
BMV	Best Most Versatile
CEMP	Construction Environmental Management Plan
CSM	Conceptual Site Model
CWAC	Cheshire West & Cheshire Council
DEFRA	Department for Environment Food and Rural Affairs
DCO	Development Consent Order
EA	Environment Agency
EIA	Environmental Impact Assessment
EPA	The Environmental Protection Act 1990
ERM	Environmental Resources Management
ES	Environmental Statement
ESA	Environmental Site Assessment
GPP	Gas Processing Plant

Acronym	Description
IEMA	Institute of Environmental Management and Assessment
KGSL	Keuper Gas Storage Limited
KGSP	Keuper Gas Storage Project
LCRM	Land Contamination Risk Management
MC	Material Change
MSA	Mineral Safeguarding Area
NPPF	National Planning Policy Framework
NPS	National Policy Statement
PEIR	Preliminary Environmental Information Report
RIGGS	Regionally Important Geological and Geomorphological Sites
SPR	Source – Pathway – Receptor
SPZ	Source Protection Zone
SSSI	Sites of Special Scientific Interest
UKSO	UK Soil Observatory
WFD	Water Framework Directive

6. GEOLOGY AND GROUND CONDITIONS

6.1 INTRODUCTION

6.1.1.1 This chapter details the baseline conditions, potential effects, mitigation and impact assessment with respect to geology and ground conditions, including hydrogeology, soil resources and contamination, relevant to the Proposed Development. The potential effects of the Proposed Development have been identified through a technical review of the current design, construction, operational and decommissioning principles of the following topics:

- Soil, including agricultural soil resources;
- Geological features, including geological Sites of Special Scientific Interest (SSSI) and Regionally Important Geological and Geomorphological Sites (RIGGS);
- Mineral resources;
- Human Health receptors (e.g., exposure to contamination) and
- Groundwater, including abstractions.

6.1.1.2 This chapter is supported by the following technical documents:

6.1.1.3 **Volume 3, Appendix 6A**: Phase 1 Environmental Site Assessment (ESA), including a Landmark Envirocheck® Report (ref. 381333716_1_1, dated 15th July 2025[1])This chapter should be read in consideration of other chapters with interdependent effects, most notably:

- **Chapter 7, Hydrology and Flood Risk;**
- **Chapter 10, Ecology and Nature Conservation**; and
- **Chapter 16, Waste Management**.

6.2 LEGISLATION, POLICY AND GUIDANCE

6.2.1.1 Key items of legislation, policy and guidance specifically relevant to geology and ground conditions in the context of the Proposed Development are as follows:

- The Environmental Protection Act 1990[2];
- Groundwater (England and Wales) Regulations 2009[3];
- Water Resources Act 1991 [4];

[1] Landmark Information Group, *Envirocheck® Report 3281333716_1_1*, dated 15th July 2025. Copy provided as Annex A of the Phase 1 ESA (Volume 3, Appendix 6A)
[2] Environmental Protection Act 1990. Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents.
[3] Groundwater (England and Wales) Regulations, 2009. Available at: https://www.legislation.gov.uk/ukdsi/2009/9780111480816
[4] Water Resources Act 1991. Available at: https://www.legislation.gov.uk/ukpga/1991/57/contents.

- National Planning Policy Framework[5];
- National Policy Statements (including NPS for Overarching Energy (EN-1)[6] and NPS for Oil and Gas Supply and Storage (EN-4)[7];
- Cheshire West and Chester Council (CWAC) Local Plan[8];
- Cheshire Replacement Minerals Local Plan[9];
- Land Contamination Risk Management (LCRM) 2020[10];
- The Environment Agency's Approach to Groundwater Protection[11]; and
- New Perspective on Land and Soil in Environmental Impact Assessment, 2022[12].

6.2.2 LEGISLATION

The Environmental Protection Act 1990 (EPA)

6.2.2.2 The current legislation relating to contaminated land in the UK is primally provided for under Part IIA of the Environmental Protection Act (EPA). This includes the Contaminated Land (England) (Amendment) Regulations (2012)[13].

6.2.2.3 Part IIA of the EPA provides the means of identifying and remediating contaminated land that presents an unacceptable risk to receptors. EPA Part IIA defines 'contaminated land' as:

- "*Any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of the substances in, on, or under the land, that:*
- *Significant harm is being caused or there is a significant possibility of such harm being caused: or*

[5] Ministry of Housing, Communities & Local Government, *National Planning Policy Framework (NPPF)*, 2012 (revised 2023). Available at: https://assets.publishing.service.gov.uk/media/65a11af7e8f5ec000f1f8c46/NPPF_December_2023.pdf
[6] Overarching National Policy Statement for Energy (EN-1), January 2024. Available at: https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1
[7] National Policy Statement for Electricity Networks Infrastructure (EN-5), January 2024. Available at: https://www.gov.uk/government/publications/national-policy-statement-for-natural-gas-supply-infrastructure-and-gas-and-oil-pipelines-en-4
[8] Cheshire West and Chester Local Plan Part 1 (adopted 2015) and Part 2 (adopted 2019). Available at: https://consult.cheshirewestandchester.gov.uk/kse/folder/59487
[9] Cheshire Replacement Minerals Local Plan, 1999. Available at: https://www.cheshireeast.gov.uk/pdf/planning/spatial-planning/strategic-planning/en-ldf-crepmlp-99.pdf
[10] Environment Agency / Department for Environment, Food and Rural Affairs, *Land Contamination Risk Management (LCRM)*, October 2020 (last revised July 2023). Available at: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm
[11] Environment Agency, The Environment Agency's Approach to Groundwater Protection, 2018. Available at: https://assets.publishing.service.gov.uk/media/5ab38864e5274a3dc898e29b/Envirnment-Agency-approach-to-groundwater-protection.pdf
[12] Institute of Environmental Management & Assessment, *A New Perspective on Land and Soil in Environmental Impact Assessment*, 2022. Available at: https://www.iema.net/resources/blog/2022/02/17/launch-of-new-eia-guidance-on-land-and-soils
[13] *The Contaminated Land (England) (Amendment) Regulations*, 2012. Available at: https://www.legislation.gov.uk/uksi/2012/263/made

- *Significant pollution of controlled waters is being or there is a significant possibility of such pollution being caused."*

6.2.2.4 To be deemed 'contaminated land' it must be determined that substances are continuing to cause harm to land and / or enter Controlled Waters and / or are likely to cause harm to land and / or enter Controlled Waters.

6.2.2.5 Controlled Waters are defined in section 104 of the Water Resources Act (1991) as territorial waters which extend seawards for three miles, coastal waters, inland freshwaters and groundwater (excluding the unsaturated zone). The assessment of risk arising from contamination should be undertaken on both current and proposed land use.

6.2.2.6 Part IIA of the EPA provides that a site could be determined as 'contaminated land' if it was causing or could cause significant pollution of Controlled Waters.

Groundwater (England and Wales) Regulations 2009

6.2.2.7 The Groundwater (England and Wales) Regulations 2009 SI 2902 implement Article 6 of European Directive 2006/118/EC with the intention of preventing the entry of 'hazardous substances' into groundwater and the pollution of groundwater by 'non-hazardous' pollutants. Under the regulations, it is an offence to cause or knowingly permit the discharge of a 'hazardous substance' or 'non-hazardous pollutant' into groundwater unless authorised to do so via an Environmental Permit issued by the appropriate regulator.

6.2.2.8 The Water Resources Act 1991 provides statutory protection for Controlled Waters and makes it an offence to discharge to Controlled Waters without the permission or consent of the regulators of the area. The broad aims of the act are to ensure sustainable use of water resources, strengthening the voice of consumers, increasing competition and promoting water conservation.

6.2.3 NATIONAL POLICY

National Planning Policy Framework (NPPF)

6.2.3.2 The National Planning Policy Framework (NPPF), last updated in December 2024, sets out the Government's planning policies for England, and how they are expected to be applied. It has an overall aim of making effective use of land, including Chapter 15 (Conserving and enhancing the natural environment) and Chapter 17 (Facilitating the sustainable use of minerals) which include aspects around geology, minerals and land contamination.

6.2.3.3 Government planning policy on land contamination aims to prevent new contaminated land from being created and promotes a risk-based approach to addressing historical contamination. With regards

to historical contamination, regulatory intervention is held in reserve for land that meets the legal definition of 'contaminated land' and poses an unacceptable risk that cannot be dealt with through any other means, including through planning.

6.2.3.4 The sections of the NPPF considered relevant to geology, hydrogeology and ground conditions assessment are:

- *"187. Planning policies and decisions should contribute to and enhance the natural and local environment by:*
- *protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan); […]*

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; and

- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*
- *189. 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);

- *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*
- *adequate site investigation information, prepared by a competent person, is available to inform these assessments.*
- *190. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner".*

National Policy Statements 2024

6.2.3.5 The EN-1 – EN-6 are serval energy National Policy Statement (NPS) which outline the government's policy for delivering major energy infrastructure. The NPS that are of relevance to the Proposed Development are:

- The Overarching NPS for Energy (EN-1) (last updated in January 2024); and
- The NPS for Natural Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (last updated in January 2024).

6.2.3.6 NPS EN-1 includes controls on developments resulting in potential discharges affecting water or land quality and resulting effects to the environment or human health. The policy also details the importance of geological conservation, as well as potential effects on groundwater quality and resource value during construction or operation of developments.

6.2.3.7 NPS EN-4 sets out requirements relating to storage and use of hazardous substances (including gas), borehole operations, consideration of geological and soil conditions during site selection, potential effects on water resources and / or quality and pollution control.

6.2.4 LOCAL PLANNING POLICY

Cheshire West and Chester Council (CWAC) Local Plan (Part 1, 2015; Part 2 2019)

6.2.4.1 Policies ENV4 (Biodiversity and Geodiversity) and ENV9 (Minerals Supply and Safeguarding) of Part One of the CWAC Local Plan outline the mechanisms for safeguarding of geological assets by:

- Safeguarding and enhancing [biodiversity and] geodiversity through the identification and protection of sites and/or features of international national and local importance (ENV4); and
- Making provisions for the adequate, steady and sustainable supply of sand, gravel, salt and brine […] whilst ensuring the prudent use of important natural finite resources (ENV9).

6.2.4.2 As stated in the plan, this specifically includes safeguarding of identified mineral resources and geologically-sensitive sites in the CWAC district through identification of geological SSSIs, RIGGS and Mineral Safeguarding Areas (MSA) which must be considered in planning applications. Part Two of the Local Plan provides specific policies and criteria by which this shall be implemented (policies DM44 and M1 – M9). Policy M2 of the Local Plan, states that non-mineral developments within MSAs will only be supported if it can be demonstrated that:

- *"Mineral sterilisation will not occur;*
- *[…] the mineral is no longer of any existing or potential value;*
- *The mineral can be extracted satisfactorily prior to the incompatible development taking place;*
- *The incompatible development is of a temporary nature […] and the site can be restored to a condition that does not inhibit extraction […];*
- *There is an overriding need for the incompatible development […]; or*
- *The development comprises one of the exempt types of development […]."*

6.2.4.3 A guidance note[14] is also available to support planning applications in relation to minerals safeguarding which states that the basis of assessment of compliance with Policy M2 is Compass Minerals and / or Inovyn (i.e. the operators of the only large salt extraction operations in the area) confirming that they foresee no sterilisation issues.

6.2.4.4 It is noted that the Local Plan is currently being updated and is intended to be adopted in summer / autumn 2027. Many of the current policies have been caried across to the current draft update and no significant changes in policy in relation to geology and ground conditions are anticipated. However, the updated Local Plan will continue to be reviewed in this MC progresses.

6.2.5 GUIDANCE

Land Contamination Risk Management, Environment Agency (2020)

6.2.5.2 The purpose of UK Government guidance 'Land Contamination Risk Management' (LCRM) 2020 is to provide a framework for dealing with land contamination in a proportionate way that is consistent with relevant legislation. It provides guidance on the approach to the assessment and remediation of land contaminated by means of risk assessment, options appraisal, remediation and verification.

6.2.5.3 The process is split into three stages: 1. Risk Assessment; 2. Options Appraisal; and 3. Remediation and Verification and guidance is provided on the required approach for each stage.

6.2.5.4 The Phase 1 ESA (**Volume 3, Appendix 6A**) is consistent with 'Stage 1 Tier 1' of the LCRM approach (Preliminary Risk Assessment).

The Environment Agency's Approach to Groundwater Protection (2018)

6.2.5.5 This document is an update to the previous '*Groundwater Protection: Principles and Practice (GP3)*' which provides guidance and position statements on the EA's approach to managing and protecting groundwater.

6.2.5.6 In the context of the Proposed Development, relevant guidance is provided regarding necessary assessments to be undertaken in relation to protection of water intended for consumption, infrastructure, pollutant storage, effluent discharges, land contamination and groundwater resources.

[14] Cheshire West and Cheshire Council, *Minerals Safeguarding Guidance Note*. Undated. Available at: https://cheshirewestandchester.objective.co.uk/portal/dm/guidance_forms/min_safe_gn

A New Perspective on Land and Soil in Environmental Impact Assessment, IEMA, (2022)

6.2.5.7 A New Perspective on Land and Soil in Environmental Impact Assessment (IEMA, 2022) sets out the approach to the assessment of effects on land and soil, considering soil functions, soil biodiversity, soil health, ecosystem services and natural capital and promotes the consideration of natural, undisturbed soils.

6.2.5.8 Where a potentially significant impact on soils is anticipated, the approach should include an Agricultural Land Classification (ALC) survey to appropriately identify the agricultural land quality based on soil, site and climatic conditions. An ALC survey will be produced for the Proposed Development as part of the ES and the results of these surveys will be presented as a separate appendix for the ES.

6.3 CONSULTATION

6.3.1.1 This section provides a summary of the consultation undertaken to date regarding geology and ground conditions associated with the Proposed Development.

6.3.1.2 A Scoping Opinion was sought from the Planning Inspectorate to determine the content of the assessment, as well as the approach and methods to be used. A Scoping Opinion was received from the Planning Inspectorate on 5 June 2025. This forms **Appendix 1B** as part of this PEIR.

6.3.1.3 **Table 6.1** summarises how this chapter of the PEIR addresses key points from the EIA Scoping Opinion related to geology and ground conditions.

TABLE 6.1 – SCOPING OPINION COMMENTS IN RELATION TO GEOLOGY AND GROUND CONDITIONS

Consultee	Topic	Summary of Comment	How this is Addressed in the PEIR
The Planning Inspectorate	Scoping Opinion ID 3.1.1: Temporary changes to soil function (e.g., by compaction, infiltration) (construction phase)	The Inspectorate is of the view that although the methodologies and procedures may not have changed, there would be an increase in the likely extent / area of soil potentially affected during	Scoped back in. **Section 6.8.2** includes an assessment of temporary changes to soil function for areas of the Site which were not proposed to be subject to ground disturbance in the

Consultee	Topic	Summary of Comment	How this is Addressed in the PEIR
		construction. The ES should include an assessment of temporary changes to soil function during the construction phase, where likely significant effects could occur.	Consented Development.
The Planning Inspectorate	Scoping Opinion ID 3.1.2: Damage to geological SSSIs or RIGGS (construction phase)	The Inspectorate agrees, on the basis that there are no geological SSSIs or RIGGS within the Zone of Influence of the Proposed Development, that an assessment of likely significant effects on such sites can be scoped out.	N/A – topic scoped out
The Planning Inspectorate	Scoping Opinion ID 3.1.3: Physical intrusion into groundwater (construction phase)	The Inspectorate agrees on the basis that there would be no change to the methodologies and control procedures, new or additional likely significant effects are unlikely, and this matter can be scoped out of further assessment.	N/A – topic scoped out

Consultee	Topic	Summary of Comment	How this is Addressed in the PEIR
The Planning Inspectorate	Scoping Opinion ID 3.1.4: Encountering contamination during ground disturbance works (construction phase and occasional operational phase maintenance activities)	The Inspectorate agrees on the basis that there would be no change to the methodologies and control procedures, new or additional likely significant effects are unlikely, and this matter can be scoped out of further assessment.	N/A – topic scoped out
The Planning Inspectorate	Scoping Opinion ID 3.1.5: Exposure of workforce to health impacts from (unexpected) contamination (construction phase and occasional operational phase maintenance activities)	The Inspectorate agrees on the basis that there would be no change to the methodologies and control procedures, new or additional likely significant effects are unlikely, and this matter can be scoped out of further assessment.	N/A – topic scoped out
The Planning Inspectorate	Scoping Opinion ID 3.1.6: Accidental spills / leaks (e.g., of fuels, lubricants, brine) (construction phase and operational phase)	The Inspectorate is content to scope these matters out of further assessment on the basis that such matters are capable of mitigation by standard measures, and	N/A – topic scoped out

Consultee	Topic	Summary of Comment	How this is Addressed in the PEIR
		new or additional likely significant effects are unlikely.	
The Planning Inspectorate	Scoping Opinion ID 3.1.7: Agricultural land – Best Most Versatile (BMV)	The ES should contain a clear tabulation of the areas of land in each BMV classification to be temporarily or permanently lost as a result of the Proposed Development, with reference to accompanying map(s) depicting the grades. Specific justification for the use of the land by grade should be provided.	**Section 6.6.3** presents baseline conditions for agricultural soils at the Site based on available (desk-based) data. Further intrusive surveys are planned for late 2025, the results of which will be presented in the ES (including tabulated areas).
The Planning Inspectorate	Scoping Opinion ID 3.1.8: WFD waterbodies	The ES should include an assessment of effects on WFD waterbodies, where likely significant effects could occur. The ES should include reference to any WFD assessment undertaken for the Proposed Development.	A Water Framework Directive (WFD) Assessment, considering both groundwater and surface water aspects, will be undertaken as part of the ES, led by the Hydrology team (see **Chapter 7, Hydrology and Flood Risk**). Groundwater aspects will include

Consultee	Topic	Summary of Comment	How this is Addressed in the PEIR
			Public and Private Water Supplies, Groundwater-Dependent Terrestrial Ecosystems and WFD groundwater bodies.
Environment Agency	Scoping Opinion Appendix 1: Reference to relevant EA guidance	The applicant should reference the Environment Agency's *Approach to Groundwater Protection* guidance document and consider whether aspects of the Proposed Development are aligned with the guidance.	The *Approach to Groundwater Protection* guidance document is referenced in **Section 6.2.5**, including a description of aspects of the document relevant to the Proposed Development. Mitigation measures which will be implemented to ensure compliance with legislation and guidance, including this document, are described in **Section 0**.
Environment Agency	Scoping Opinion Appendix 1: Inconsistent use of language in Scoping Report regarding development activities and potential for	In the impact assessment table, some entries relate to impacts whereas others describe activities related to the Proposed Development.	The language used in **Section 6.8** and specifically **Table 6.8** distinguishes between activities associated with the Proposed Development and

Consultee	Topic	Summary of Comment	How this is Addressed in the PEIR
	impacts to receptors to be missed	Impact receptors for each activity associated with the Proposed Development (e.g. soil chemical quality, groundwater quality, groundwater quantity) should be clearly identified in the impact assessment.	impacts caused by those activities.
Environment Agency	Scoping Opinion Appendix 1: Scoping out potential groundwater impacts from physical intrusion into groundwater and encountering contamination	The Applicant should scope in impacts from physical intrusion into groundwater and encountering contamination during ground disturbance for further assessment on the basis that they were scoped in for the Consented Development. Unidentified or new sources of contamination may be present which have not been accounted for.	These aspects have been scoped out on the basis that there is no significant change in the activity from the Consented Development. Furthermore, an updated Phase 1 ESA has been undertaken which has not identified any new potential sources of contamination different from those identified in the Consented Development ES. Therefore, these aspects are not proposed to be scoped back in. This will be discussed with the EA during further

Consultee	Topic	Summary of Comment	How this is Addressed in the PEIR
			consultation prior to submission of the ES.
Environment Agency	Scoping Opinion Appendix 1: Surface water crossings	The applicant should provide details of proposed crossings of surface water bodies and proposed mitigation, supported by a hydrogeological risk assessment.	Impacts to surface waters are considered in **Chapter 7, Hydrology and Flood Risk**. However, no material changes are proposed in the nature, locations or construction techniques associated with the proposed crossings from the Consented Development.

6.3.1.4 No other consultation has been undertaken outside of the EIA Scoping Opinion in relation to geology and ground conditions.

6.4 BASIS OF THE ASSESSMENT

6.4.1.1 **Chapter 2, Proposed Development** presents a summary of the Proposed Development, which has been used to inform the basis of this assessment.

6.4.1.2 In the context of geology and ground conditions, the following aspects of the Proposed Development that may give rise to impacts that will be materially different from the Consented Development are considered:

- Construction activities associated with the change in configuration / location of the surface layout and design, including the Gas Processing Plant (GPP), Utility Compound, Maintenance Stores building and internal site roads;
- Construction activity associated with the underground elements of the Proposed Development, including the digging of trenches associated with changes to the configuration of the pipelines; and

- Addition of a construction laydown area located to the west of the GPP.

6.4.1.3 Where aspects of geology and ground conditions have not been previously assessed through the Consented Development (e.g. due to changes in policy and guidance) these are also considered in this PEIR, e.g. mineral safeguarding, dewatering of excavations, loss of BMV agricultural land.

6.4.1.4 The available design parameters for these aspects are presented in **Table 6.2**, below. At this stage in the design process, some specific design information is yet to be defined or cannot yet be fixed.

6.4.1.5 Where this is the case, the Rochdale Envelope approach has been utilised (as outlined in **Chapter 4, EIA Methodology and Consultation**), and a reasonable worst-case scenario has been assessed, using known maximum and minimum design parameters where appropriate. Where information gaps and uncertainties remain, they are presented in **Section 6.5.5**.

6.4.1.6 No elements of the operational or decommissioning phases are materially different from the Consented Development.

TABLE 6.2 – SUMMARY OF RELEVANT DESIGN PARAMETERS

Activity (Construction Phase)	Relevant Design Parameters	Assumptions
Construction		
Permanent ground (surface) disturbance	Total area: approximately 17.5 ha. Comprising: GPP: ~7.7 ha (compared to Consented Development of ~3.8 ha). Utility Compound: ~0.75 ha (compared to Consented Development of 0 ha). Maintenance Store: ~0.075 ha (compared to Consented Development of 0 ha). Site roads: ~9 ha (compared to Consented Development of 8.5 ha).	Topsoil stripped during construction will be re-used elsewhere on site (e.g. landscaping, ecological enhancement opportunities).

Activity (Construction Phase)	Relevant Design Parameters	Assumptions
Temporary ground (surface) disturbance	Only additional area from Consented Development is the additional construction laydown area to the west of the GPP (~ 1.2 ha). Temporary ground disturbance for utilities will occur in slightly different locations from the Consented Development, though overall affected area will not be materially different.	Stripped topsoil will be stored in line with best practice and replaced following completion of construction.
Foundations / excavations	No change in general design approach from the Consented Development, although number and location of foundations / excavations may change. Estimated maximum depth of foundations: 2.5 m (slab / strip footings), 15 m (piles).	Dewatering required where excavations extend below water table. Piled foundations are anticipated to intercept the bedrock aquifer.

6.5 ASSESSMENT METHODOLOGY

6.5.1.1 This section sets out the scope and methodology for the assessment of the impacts of the Proposed Development on geology and ground conditions, where these are materially different from the Consented Development.

6.5.2 SCOPE OF THE ASSESSMENT

6.5.2.1 The aspects of the construction phase of the Proposed Development which are anticipated to have materially different potential effects on geology and ground conditions from those previously assessed through the Consented Development are as follows:

- Early works, construction laydown and site preparation and access (soil stripping, site levelling etc.) in areas not assessed through the Consented Development (i.e. the extension to the GPP, Utility Compound, Maintenance Store);
- Excavations for foundations and utilities to the extent that they are materially different to those assessed through the Consented Development; and

- Dewatering of excavations.

6.5.2.2 Therefore, potential effects considered in this chapter include:

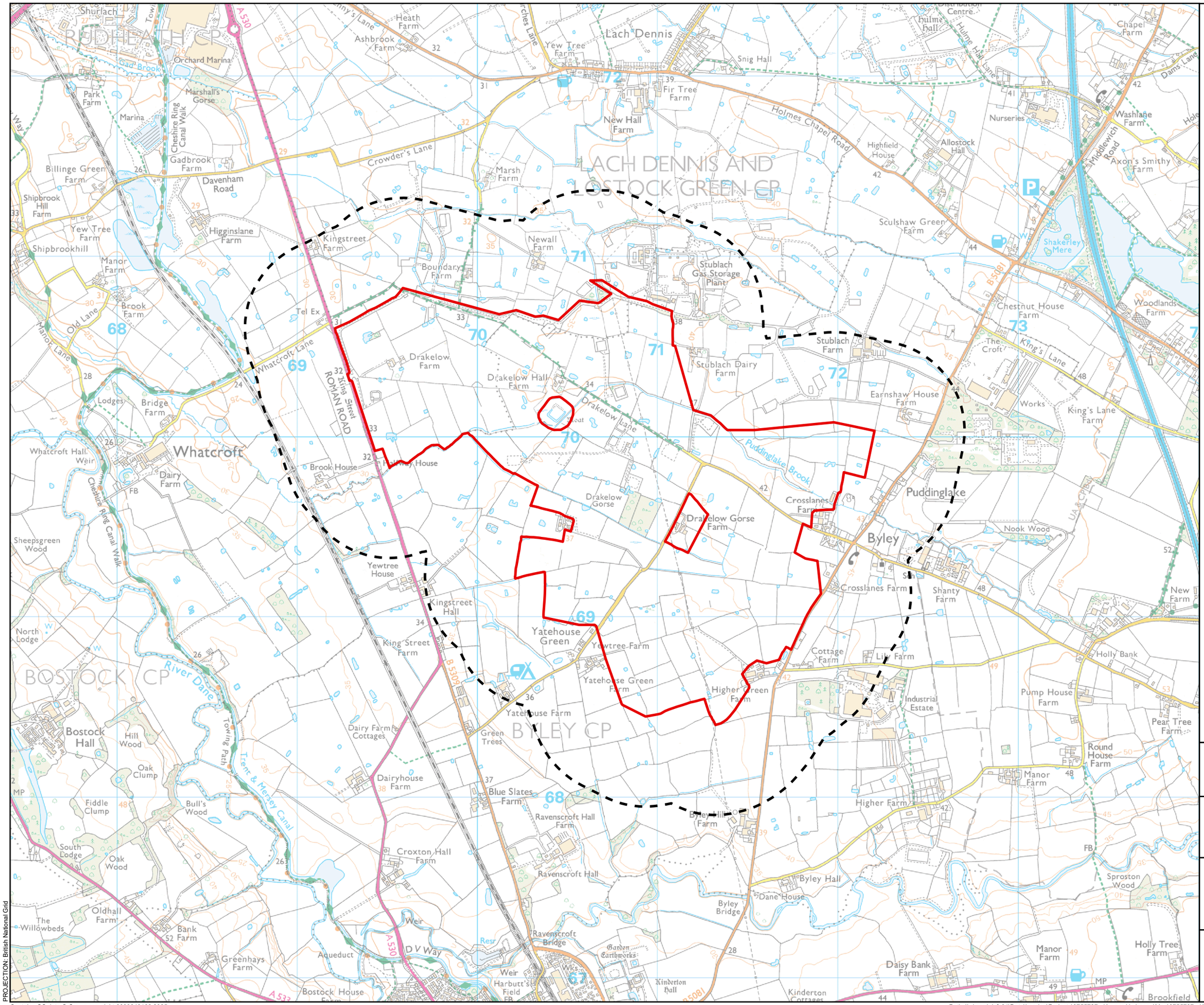
- Loss of BMV agricultural soils (in areas not assessed through the Consented Development);
- Loss of soil function, soil compaction and changes to drainage (in areas not assessed through the Consented Development);
- Sterilisation of mineral resources; and
- Impact on groundwater quality and / or changes to flow regimes as a result of dewatering of excavations.

6.5.2.3 In the case of sterilisation of mineral resources and impact on groundwater quality and / or changes to flow regimes as a result of dewatering, there are no proposed changes from the Consented Development that have the potential to result in materially different effects. However, these aspects were not previously assessed through the Consented Development so are considered in the current assessment.

6.5.2.4 No aspects of the operational or decommissioning phases are anticipated to be materially different to those already assessed through the Consented Development in the context of geology and ground conditions.

6.5.3 STUDY AREA

6.5.3.1 For the purpose of this assessment, the Study Area comprises the Site, plus a 500 m buffer, as shown on **Figure 6.1**.



Path: \\uksprdgisfs01\Data\London\Projects\0755727 - Keuper Hydrogen\Map\0755727 - Keuper Hydrogen - PEIR.aprx\0755727 - PEIR - C6 - Geology and Soils Study Area - A01

6.5.4 BASELINE SURVEY METHODOLOGY

6.5.4.1 The process of identifying baseline conditions at the Site in relation to geology and ground conditions has been undertaken in line with LCRM guidance. A 'Phase 1' desk-based Environmental Site Assessment (ESA), consistent with a 'Stage 1 Tier 1' assessment under LCRM guidance, has been completed, which:

- Collates and reviews site-specific data including a general search of the area using an environmental database (Landmark Envirocheck® Report) which includes up-to-date datasets (on site and within 500 m of the Proposed Development) on the following key areas:
  - Historic land use (historical mapping and aerial imagery);
  - Industrial land use and permits for industrial processes;
  - Sensitive land use and designated sites (ecology, hydrology, hydrogeology etc.);
  - Recorded pollution incidents; and
  - Licensed landfill and waste management facilities.
- Reviews available previous ground investigation reports for the Site to obtain site-specific data on the anticipated ground conditions;
- Uses the data obtained to identify potential contaminative sources, the presence and nature of potential pathways and receptors (including human receptors, ecological receptors and natural resources, such as groundwater, surface watercourses and designated sites) to develop a Conceptual Site Model (CSM); and
- Evaluates the risk to identified receptors using the 'source-pathway-receptor' methodology. Land contamination may be a hazard, but it does not constitute a risk unless all three elements, and therefore a 'pollutant linkage', are present. In assessing the potential for contamination to cause a significant effect, the extent and nature of the potential source or sources of contamination must be assessed, any pathways present must be identified, and sensitive receptors or resources identified and appraised. This approach takes into account the sensitivity and vulnerability of the receptor, the likelihood of occurrence and the magnitude of the potential impact when evaluating potential risk.

6.5.4.2 The risk evaluation uses professional judgement and takes into consideration the application of statutory standards and guidance, such as:

- LCRM, Environment Agency, 2020[15];

[15] Environment Agency, *Land Contamination Risk Management*, October 2020 (revised July 2023).

- CLR11 - Model Procedures for the Management of Land Contamination, Environment Agency 2004 (withdrawn)[16];
- GPLC2 – FAQs, technical information, detailed advice and references, Environment Agency 2010[17];
- Contaminated Land Assessment Exposure tool guidance, Environment Agency, 2014[18];
- Human Health Toxicological Assessment of Contaminants in Soil, Environment Agency, January 2009[19];
- Using Soil Guideline Values, Environment Agency, March 2009[20]; and
- Groundwater Pollution Prevention Principles (GP3), Environment Agency, March 2017 (withdrawn)[21].

6.5.4.3 A copy of the Phase 1 ESA report is provided in **Appendix 6A**.

6.5.4.4 In addition, a targeted ground investigation was undertaken for design purposes in the location of the proposed GPP by Byrne Looby in 2022 as part of the Consented Development[22]. The findings of this investigation are incorporated into the baseline description.

6.5.4.5 For the ES, the baseline survey will also incorporate the findings of an ALC survey, planned for late 2025.

6.5.5 METHODOLOGY FOR THE ASSESSMENT OF EFFECTS

6.5.5.1 The assessment methodology specific to the geology and ground conditions assessment is outlined in the following sections and incorporates relevant Environment Agency and IEMA guidance (see **Section 6.2.5**).

6.5.5.2 The potential impacts for this topic are characterised on the basis of the potential harm to a receptor within a given source-pathway-receptor combination, or a pollutant linkage and graded with a level of magnitude.

6.5.5.3 In order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences a source-pathway-receptor methodology is adopted, with the underlying principle that the identification of pollutant linkages consists of the following three elements:

[16] Environment Agency, [Withdrawn] *Model Procedures for the Management of Land Contamination (CLR11)*, September 2004.
[17] Environment Agency, *Guiding Principles for Land Contamination (GPLC)*, June 2016.
[18] Environment Agency, *Contaminated Land Exposure Assessment (CLEA) Tool*, 2014 (revised 2015).
[19] Environment Agency, *Human Health Toxicological Assessment of Contaminants in Soil*, Science Report SC050021/SR2, January 2009.
[20] Environment Agency, *Using Soil Guideline Values*, Science Report SC050021/SGV, March 2009.
[21] Environment Agency, [Withdrawn] *Groundwater Protection: Principles and Practice (GP3)*, August 2013.
[22] Byrne Looby, *Ground Investigation Report, Keuper Gas Storage Project*. Byrne Looby ref. K0044-BLP-GEO-R-000, dated 21st December 2021 and Byrne Looby, *Geotechnical Design Report, Keuper Gas Storage Project*. Byrne Looby ref. K0044-GEO-R002-02, dated 5th April 2022

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

Sensitivity of Receptors

6.5.5.4 The sensitivity (value) of potential receptors can be described qualitatively according to the categories presented in **Table 6.3**.

TABLE 6.3 – RECEPTOR SENSITIVITY

Sensitivity	Receptor
High	• Human health: onsite residential developments, onsite construction workers • Controlled waters (groundwater): Source Protection Zone or highly productive aquifer • Soil resource: Presence of best and most versatile (BMV) land (Grades 1, 2 or 3a), surface mineral reserves, soils supporting nationally important environmental designated sites, high carbon sequestration soils (e.g. peat), or soils acting as important catchment pathways for water flow and/ or flood management.
Medium	• Human health: onsite commercial developments, off-site residential developments • Controlled waters (groundwater): Moderately productive aquifer • Soil resource: Presence of land of moderate quality (Grade 3b), sites supporting locally important environmental designated sites, moderate carbon sequestration soils (e.g. mineral soils), or soils acting as minor catchment pathways for water flow and/ or flood management.
Low	• Human health: transient or limited access, off-site commercial development • Controlled waters (groundwater): Low productivity aquifer or rocks essentially with no groundwater • Soil resource: Presence of land of poor quality (Grade 4) or urban soils.

Magnitude of Impacts

6.5.5.5 The magnitude of impacts is determined by considering the intensity (or scale), spatial coverage and longevity of an impact. The magnitude of impact on the receptors is presented in **Table 6.4**.

TABLE 6.4 – MAGNITUDE OF IMPACT

Magnitude	Description	Example
Large	• Results in loss of attribute and / or likely to cause exceedance of statutory objectives and / or breach of legislation. • High degree of disruption to cultivation patterns and with high risk of change in land use.	• Contamination of a highly productive aquifer. • Loss or isolation of a strategic mineral resource. • Permanent or irreversible loss of soil functions over an area of >20 ha, or loss or isolation of strategic mineral resource. • Impact of the health of a large number of human receptors, including off-site.
Medium	• Results in impact on integrity of attribute / or loss of part of attribute, and / or possibly cause exceedance of statutory objectives and/or breach of legislation. • Moderate degree of disruption to cultivation patterns with moderate risk of change in land use.	• Loss or isolation of a regional / local mineral resource. • Contamination of a moderately productive aquifer. • Reduction in the value of a feature, permanent or irreversible loss of soil functions over an area of 5 – 20 ha, or loss or isolation of regional / local mineral resource. • Impact on the health of on-site human receptors (i.e. the workforce).
Small	• Results in minor impacts on receptor. • Minimal degree of disruption to cultivation patterns and low risk of change in land use.	• Measurable change in receptor, but of limited size / proportion. • Contamination of a minor aquifer. • Reduction in the value of a feature, permanent or irreversible loss of soil functions over an area of <5 ha, or a temporary, reversible loss.
Negligible	• No loss or alteration of characteristics, features or	• No significant loss in quality of receptor.

Magnitude	Description	Example
	elements, no observable impact in either direction. • Minimal or no disruption to cultivation patterns and very low risk of change in land use.	

Significance of Effects

6.5.5.6 The significance of effect is determined by assessing the potential magnitude of impact on the receptors against the sensitivity of the receptor. **Table 6.5** presents the matrix for evaluation of the significance of effects. Moderate or major effects are considered significant in EIA terms.

TABLE 6.5 – SIGNIFICANCE OF EFFECT

	Magnitude of Impact			
Sensitivity	**Negligible**	**Small**	**Medium**	**Large**
High	Not Significant	Moderate Adverse – Significant	Moderate Adverse – Significant	Major Adverse – Significant
Medium	Not Significant	Minor Adverse – Not Significant	Moderate Adverse – Significant	Moderate Adverse – Significant
Low	Not Significant	Not Significant	Minor Adverse – Not Significant	Minor Adverse – Not Significant

Likelihood of Occurrence

6.5.5.7 The significance of effects is determined as if the impact has actually happened. However, in the context of geology and ground conditions it is also important to consider the likelihood of the impact occurring when assessing the overall significance of effects. The likelihood of occurrence is defined as follows:

- High: Occurrence of an impact is very likely in the short-term and is almost certain to occur in the long term, or a complete pathway is known to already exist.
- Medium: An impact may occur, either due to an unplanned event or the presence of a complete pathway, and it is probable that it will do so over the long term.
- Low: An impact may occur, either due to an unplanned event or the presence of a complete pathway, and it is possible that it will do so over the long term but there is no certainty that it will do so.
- Unlikely: The potential for an impact to occur may be present, but the circumstances under which an adverse effect would materialise, even in the long-term, are improbable.

6.5.6 ADDRESSING UNCERTAINTY

6.5.6.1 At this stage, limited project-specific ground investigation data are available for the Site. Site-specific ground investigation surveys (including a groundwater monitoring regime) for geological / geotechnical assessment will be undertaken by the applicant or their appointed designers during the detailed design stage of the Proposed Development. Any pertinent soil, geological, hydrogeological and ground contamination information collected during further ground investigation will be used to update the baseline.

6.6 BASELINE

6.6.1 INTRODUCTION

6.6.1.1 The following sections provide a description of the existing baseline environment in relation to geology and ground conditions, including hydrogeology, soil resources and contamination.

6.6.1.2 The baseline Site conditions have been determined by collating data from a range of topographical, historical and geological maps, publicly available online resources, and from a Landmark Envirocheck® Report (ref. 381333716_1_1, dated 15th July 2025[1], copy provided as Annex A of the Phase 1 ESA report in **Appendix 6A**).

6.6.1.3 A more detailed description of the baseline environment is provided in the Phase 1 ESA report '*Phase 1 Environmental Site Assessment – Keuper Gas Storage Project*' (provided in **Appendix 6A**).

6.6.2 OVERVIEW OF THE SITE AND STUDY AREA

The Site

6.6.2.1 The Site covers a total area of approximately 358 ha, located to the south of the existing Stublach Gas Storage facility and to the west of the village of Byley in Cheshire. The Site is bound to the west by the A530 road (King Street Roman Road) and to the east by the B5081

(Byley Road) and properties in Byley village. Site location is shown in **Figure 6.2**.

6.6.2.2 The Site is generally low-lying with relatively flat topography. Elevation varies between approximately 25 m and 30 m above ordnance datum ('aOD').

6.6.2.3 The Site is mainly occupied by agricultural land, predominantly used for grazing. A number of farms (including residential dwellings) are present within the Site boundary. Numerous compounds, as well as a small electrical distribution station and gas distribution station, associated with the nearby gas storage facilities (Stublach and Holford) are present within the Site boundary.

6.6.2.4 Puddinglake Brook flows in generally westerly direction through the centre of the Site. Numerous small ponds are present.

6.6.2.5

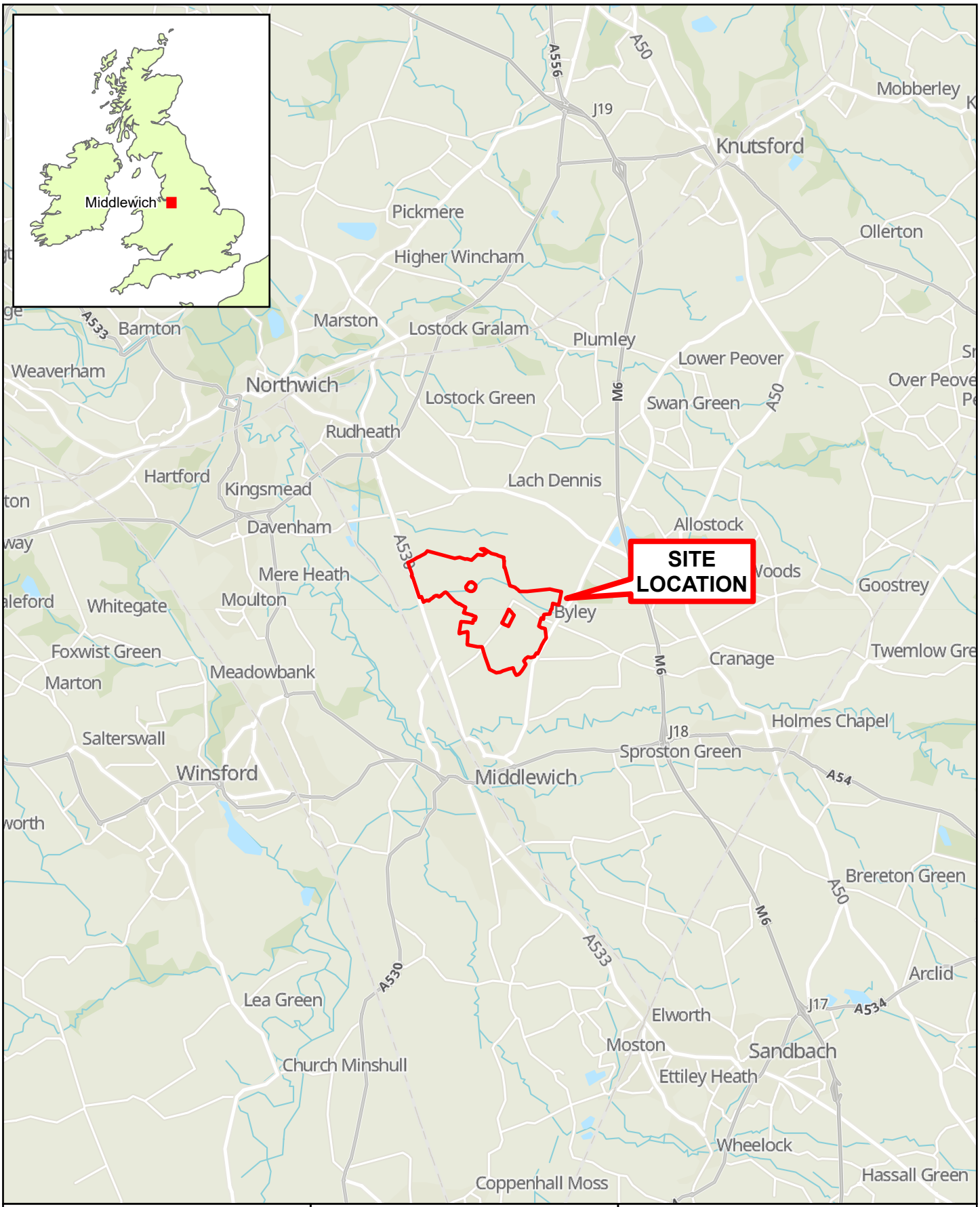
Surrounding Land Use within the Study Area

6.6.2.6 The Study Area also comprises predominantly agricultural land, with some settlements and isolated commercial / industrial properties.

6.6.2.7 Properties within the Study Area include:

- North: Agricultural land with occasional farm buildings. Buildings and infrastructure at Stublach Gas Storage facilities are located immediately to the north of the Site;
- East: Agricultural land with farm buildings and residential properties in the settlement of Byley. A small industrial estate (known as Firmin Coates or Middlewich Road Industrial Estate) is present beyond Byley Road, including haulage/distribution facilities, vehicle sales/repairs, warehousing and an electrical substation;
- South: Agricultural land with farm buildings and dwellings in the settlement of Yatehouse Green; and
- West: Agricultural land with occasional farm buildings. The A530 road (King Street Roman Road) and Middlewich Branch Line (railway) run generally north-south within the Study Area to the west of the Site.

6.6.2.8 Surrounding land uses are shown in **Figure 6.2**.



Site Boundary

0 20 40 60 80 100
Metres

N

Figure 6.2
Site Location

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: MC
PROJECT: 0755727	CHECKED: BH
DATE: 14/08/2025	APPROVED:

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PROJECTION: British National Grid

Path: \\uksprdgisfs01\Data\London\Projects\0755727 - Keuper Hydrogen\Map\0755727 - Keuper Hydrogen - PEIR.aprx\0755727 - PEIR - C6 - Site Location - A01

Historical Land Use

6.6.2.9 The majority of the Site has been undeveloped, agricultural land since the first available historical OS mapping (included within the Envirocheck® report – see **Annex A** of **Appendix 6A**), dated 1876.

6.6.2.10 Pertinent historical features on Site and within the Study Area identified in the Phase 1 ESA (**Appendix 6A**) include:

On Site

- Numerous ponds and small areas of marshland within the Site and Study Area, some of which have been infilled throughout the time period covered by the available mapping;
- A network of field drains, shown on mapping since the 1960s; and
- A potential livestock burial pit used during the 1967 foot and mouth outbreak, located in the north of the Site (exact location unknown).

Off-site

- Construction of a large 'camp' approximately 300 m east of the Site, associated with the former RAF Cranage airfield during and post World War II (1940s- 1960s) and reportedly used for aircraft storage, maintenance and pilot training. The location of the camp was subsequently identified as a Local Authority recorded landfill (Kings Lane / Rudheath Wood; no details available on type of waste), housed a 'depot' from the 1980s and in the 2010s was redeveloped as a large gas distribution station;
- A sewage works, located approximately 20 m east of the Site in the 1950s – 1970s; and
- Development of Firmin Coates / Middlewich Road Industrial Estate, approximately 300 m southeast of the site, from the 1950s onwards.

6.6.2.11 Online unexploded ordnance (UXO) mapping by Zetica[23] indicates that the Site is in an area classified as having a 'low' risk of UXO. However, the former RAF Cranage airfield was identified as a potential target during World War II.

Potential Sources of Contamination

6.6.2.12 Based on the limited previous development of the Site the potential for widespread, gross contamination to be present is considered to be very low.

6.6.2.13 However, the Phase 1 ESA (see **Appendix 6A**) identified the following potential sources of contamination at the Site and within the Study Area:

[23] Zetica, UXO Risk Maps (online mapping) https://zeticauxo.com/guidance/risk-maps/

On Site

- Farmland, including storage and use of pesticides, oils etc.;
- Small electrical and gas distribution stations;
- Made Ground in locations of previous development (e.g. well head compounds, electrical/gas distribution stations, roads) and used to infill ponds/marshes;
- Yatehouse Green Farm Landfill, straddling the south-eastern Site boundary; and
- Potential burial ground associated with 1960s foot and mouth outbreak.

Off-site

- Farmland, including storage and use of pesticides, oils etc. within the Study Area;
- Stublach and Holford Gas Storage Facilities;
- Former sewage works (1950s – 1970s);
- Historical landfills recorded at Yatehouse Farm, Kings Lane (Rudheath Wood) Landfill;
- RAF Cranage (World War II camp and airfield);
- Activities at Firmin Coates / Middlewich Road Industrial Estate;
- Gas distribution station; and
- Railway line.

6.6.2.14 The locations of potential sources of contamination are shown on **Figure 6.3**.

Site Boundary
Site Boundary 500m Buffer
Source Point
Residential Receptor
Identified Surface Water Receptor

Stublach Gas Storage Facility
Potential Location of 1960s Foot and Mouth Burial Site
Potential Location of 1960s Foot and Mouth Burial Site
Gas Distribution Station
Electrical Distribution Station
Historical Sewage Works (1950s-1970s)
Concrete Products Manufacturing Facility
Historical Camp (1940s-1960s)
Gas Distribution Station
RAF Cranage Airfiled (1940s-1960s)
Byley Warehousing (Ind. Estate)
Yatehouse Farm Historical Landfill
Yatehouse Green Farm LA Recorded Landfill
Firmin Coates / Middlewich Rd. Ind. Estate

0 100 200 300 400 500
Metres

N

SCALE: See Scale Bar	VERSION: A01
SIZE: A3	DRAWN: WB
PROJECT: 0755727	CHECKED: KT
DATE: 14/08/2025	APPROVED:

Figure 6.3
Potential Sources of Contamination and Identified Receptors

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PROJECTION: British National Grid

Path: \\uksprdgisfs01\Data\London\Projects\0755727 - Keuper Hydrogen\Map\0755727 - Keuper Hydrogen - PEIR.aprx\0755727 - PEIR - C6 - Site Layout Plan Showing Potential Sources of Contamination and Receptors - A01

6.6.3 SOILS AND GEOLOGY

Soil Classification

6.6.3.2 According to UK Soil Observatory (UKSO) 'Soilscapes' data[24], the soils underlying the Site are described as '*slowly permeable, seasonally wet, slightly acid but base-rich, loamy and clayey soils*' (Soilscape 18).

6.6.3.3 Natural England's ALC map for the North West Region[25] indicates that the soils underlying the Site are classified as Grade 3 'Good to Moderate'. This map does not further divide Grade 3 land into Subgrades 3a (considered Best and Most Versatile (BMV) land) and Subgrade 3b (non-BMV land).

Site-specific ALC surveys are planned for late 2025, the findings of which will be incorporated into the baseline at ES stage. **Geology**

6.6.3.4 The 1:50,000 scale map from the British Geological Survey (BGS) (extract included in the Envirocheck report in **Annex A**) shows that the Site is underlain by:

- Superficial deposits, comprising Glacial Till; and
- Bedrock, comprising Sidmouth Mudstone Formation.

6.6.3.5 Available-to-view BGS records for five boreholes drilled in the west of the Site in 1991 (SJ67SE180, SJ67SE187, SJ67SE188, SJ67SE189 and SJ67SE190)[26] indicate that the geological sequence underlying this part of the Site comprises:

- Approximately 0.3 m of topsoil, locally with up to 0.7 m of Made Ground; and
- Red-brown sandy Clay with occasional sand and sandstone boulders to a depth of up to 8 m below ground level (bgl).

6.6.3.6 A targeted ground investigation undertaken in the proposed location of the GPP in 2022[22] recorded the following geological sequence:

- Topsoil (firm, brown, sandy Clay), between 0.2m and 0.6m in thickness;
- Glacial Till (firm to stiff, brown, slightly sandy, slightly gravelly Clay), up to 8.4 m in thickness (where proven);
- Sidmouth Mudstone bedrock (weak, reddish-brown Mudstone), encountered at 7.4 m – 8.7 m bgl.

6.6.3.7 No Made Ground was encountered.

[24] Cranfield University, *LandIS Soils Guide / UK Soil Observatory online mapping*. Available at: https://mapapps2.bgs.ac.uk/ukso/home.html (accessed July 2025).
[25] Natural England, *1:250,000 Series Agricultural Land Classification – North West Region* (ALC002). Available at: https://publications.naturalengland.org.uk/publication/144015 (accessed July 2025).
[26] British Geological Survey, *GeoIndex online mapping*. Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html (accessed July 2025).

6.6.3.8 There are no RIGGS[27] or geological SSSIs[28] in the Study Area.

6.6.3.9 The entire Site is located in a MSA with respect to salt, designated under Policies ENV9 / M2 of the Local Plan[8], although is approximately 3 km from the nearest safeguarded salt and brine operation (Holford Brinefields). A MSA with respect to Sand and Gravel, which aligns with the Secondary A Aquifer is present approximately 150 m east of the Site at its closest point.

6.6.3.10 The Mining Remediation Authority's (formerly the Coal Authority) online mapping[29] indicates that the Site is not within a Coal Mining Reporting Area.

6.6.3.11 According to UK Radon mapping[30], the Site falls within an area of low radon potential where less than 1 % of homes may be at or above the radon action level.

6.6.3.12 The ES for the Consented Development provided a detailed baseline description of the deep geology underlying the Site. No elements of the MC will impact upon deep geology. Therefore, no detailed baseline description of deep geology is provided in this chapter.

Receptors – Soils

As detailed above, the majority of soils at the Site are classified as ALC Grade 3. In the absence of Site-specific data until ES stage, it is currently conservatively assumed that all Grade 3 soils at the Site are Subgrade 3a (i.e. BMV land) **Receptors - Geology**

6.6.3.13 Although not strictly soils and geology receptors, human health and property as potential receptors of ground contamination are considered in this section.

6.6.3.14 The Phase 1 ESA (**Appendix 6A**) details the identified potential contaminative sources, the presence and nature of potential pathways and identified receptors to develop a CSM for the Site, then evaluated potential risk using the 'source-pathway-receptor' methodology. Sensitivity, vulnerability and potential risk classifications shown in Table 6.6 were assigned based on the available data. Justification for the classifications is provided in the Phase 1 ESA in **Appendix 6A**.

6.6.3.15 In the context of the source-pathway-receptor risk evaluation, sensitivity is defined as the potential significance of impacts (should any exist) and vulnerability is defined as the likelihood for impacts (should any exist) to reach a sensitive receptor.

[27] Cheshire West and Chester Council, *Local Plan online mapping*. Available at: https://maps.cheshirewestandchester.gov.uk/cwac/localplan (accessed July 2025).
[28] Department for the Environment, Food and Rural Affairs (DEFRA), *MAGiC online mapping*. Available at: https://magic.defra.gov.uk/MagicMap.html (accessed July 2025).
[29] Mining Remediation Authority, *Online Map Viewer*. Available at: https://datamine-cauk.hub.arcgis.com/ (accessed July 2025).
[30] UK Health Security Agency and British Geological Survey, Indicative Atlas of Radon in the United Kingdom (online mapping). Available at: https://www.ukradon.org/radonmaps/ (accessed July 2025).

TABLE 6.6 – SUMMARY OF POTENTIAL RISK BASED ON SOURCE-PATHWAY-RECEPTOR RISK EVALUATION (HUMAN HEALTH AND PROPERTY RECEPTORS)

Receptor	Sensitivity	Vulnerability	Potential Risk
Human Health – Site Users (Commercial)	High	Low	Low
Human Health – Site Users (Residential)	High	Moderate	Low
Human Health – Users of Neighbouring Sites within the Study Area	High	Low/Moderate	Low
Property	Low	Very Low	Very Low

6.6.4 GROUNDWATER RESOURCES

Hydrogeology

6.6.4.2 The EA classifies the aquifers underlying the Site as follows:

- Superficial Aquifer – Glacial Till: Secondary Undifferentiated Aquifer, defined as '*aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value.*'; and
- Bedrock Aquifer – Sidmouth Mudstone: Secondary B Aquifer, defined as '*mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers.*'

6.6.4.3 Within the Study Area, the following aquifer are also identified:

- Superficial Aquifer – Glaciofluvial Sands and Gravels (located approximately 150 m east of the Site at its closest point): Secondary A Aquifer, defined as 'permeable layers that can support local water supplies, and may form an important source of base flow to rivers'.

6.6.4.4 Extracts of EA aquifer maps are included in the Envirocheck® report as **Annex A** of the Phase 1 ESA in**, Appendix 6A**.

6.6.4.5 Based on available-to-view BGS borehole records (see above), depth to groundwater is anticipated to be approximately 2.5 m – 3.5 m bgl. A targeted ground investigation in 2021 recorded variable

groundwater levels in five monitoring wells in the location of the proposed GPP between ground level and 12.7 m bgl.

6.6.4.6 No active, licensed groundwater abstractions were identified within the Study Araea, although, one was identified approximately 620 m south of the Site at Byley Hill Farm (abstraction licence ref. 2568002010, issued in April 1993 for 'General agriculture' at a maximum rate of 3 m^3 per day.

6.6.4.7 The Site is not located within a groundwater Source Protection Zone (SPZ) nor a Drinking Water Safeguard Zone with respect to groundwater, and none are identified within 1 km of the Site. The combined groundwater vulnerability at the Site is classified as 'low', with a small area classified as 'medium' at the far east of the Site, corresponding with the possible location of the glaciofluvial Sands and Gravels.

6.6.4.8 The regional Water Framework Directive (WFD) groundwater unit beneath the Site (Weaver and Dane Quaternary Sand and Gravel Aquifers) is classified as 'Poor' chemical status, 'Good' quantitative status and 'Poor' overall status (2019 data)[31]. No groundwater chemical quality data is available.

6.6.4.9 Groundwater conditions in the context of groundwater-fed surface water courses are discussed in **Chapter 7, Hydrology and Flood Risk**.

Receptors – Groundwater

6.6.4.10 The following potential groundwater receptors in the context of the Proposed Development, and including groundwater contamination, have been identified:

- Glacial Till: Superficial Secondary (Undifferentiated) Aquifer – underlying the Site;
- Glaciofluvial Sands and Gravels: Superficial Secondary A Aquifer – within the Study Area (150 m east of the Site at the closest point); and
- Sidmouth Mudstone bedrock: Secondary B Aquifer – underlying the Site.

6.6.4.11 The licensed abstraction outside of the Study Area is not considered as a potential receptor due to the very small size of the abstraction (maximum 3 m^3 per day). Additional consultation will be undertaken with the Environmental Agency and Local Planning Authority as part of the ES to identify (unlicensed) Private Water Supplies in the Study Area, if any.

6.6.4.12 Using the same methodology as described above, sensitivity, vulnerability and potential risk classifications for groundwater

[31] Environment Agency, *Catchment Data Explorer online mapping*. Available at: https://environment.data.gov.uk/catchment-planning (accessed July 2025).

receptors were assigned based on the available data, as shown in **Table 6.6**. Justification for the classifications is provided in the Phase 1 ESA in **Appendix 6A**.

6.6.4.13 In the context of the source-pathway-receptor risk evaluation, sensitivity is defined as the potential significance of impacts (should any exist) and vulnerability is defined as the likelihood for impacts (should any exist) to reach a sensitive receptor.

TABLE 6.7 – SUMMARY OF POTENTIAL RISK BASED ON SOURCE-PATHWAY-RECEPTOR RISK EVALUATION (GROUNDWATER RECEPTORS)

Receptor	Sensitivity	Vulnerability	Potential Risk
Groundwater (superficial) – Secondary A / Secondary Undifferentiated Aquifers	Moderate	High	Low
Groundwater (bedrock) – Secondary B Aquifer	Moderate	Low/Moderate	Very Low

6.7 MITIGATION

6.7.1.1 The Applicant is committed to the implementation of measures to mitigate impacts that could lead to significant effects in relation to geology and ground conditions.

6.7.1.2 The proposed mitigations are essentially unchanged from that secured through the Consented Development. This includes mitigations that are integral to the design of the Proposed Development, including for legislative compliance, as well as good practice mitigation measures that the Proposed Development is committed to adopting during construction, operation and maintenance, and decommissioning. Further context is provided in **Chapter 19, Securing Mitigation.**

6.7.1.3 The following subsections briefly outline the proposed measures relevant to each phase of the Proposed Development and the mechanisms for securing these measures.

6.7.1.4 The significance of the effects reported in **Section** Error! Reference source not found. takes into account adoption of these measures in full.

6.7.2 CONSTRUCTION

6.7.2.1 Mitigation during construction will be aligned with that described in paragraphs 7.5.1 – 7.5.7 of the Consented Development ES,

primarily being secured through implementation of a Construction Environmental Management Plan (CEMP).

6.7.2.2 The CEMP is supported by supplementary plans, including but not limited to:

- Soil Management Plan;
- Dust Management Plan;
- Sediment Control Plan; and
- Waste Management Plan.

6.7.2.3 The Updated Outline CEMP prepared for the Consented Development will be updated to reflect the MC and will be submitted alongside the ES.

6.7.2.4 In addition to the CEMP, other mitigations in relation to geology and ground conditions during the construction phase will include:

- Re-use of soils on Site wherever possible to avoid permanent loss of soil function and align with the principles of the Waste Hierarchy (see **Chapter 16, Waste Management**);
- Further data review and assessment, including ground investigation, to evaluate the potential presence and extent of contamination and assess potential risk to receptors and inform groundwater management during dewatering of excavation, if required; and
- Groundwater investigations and a hydrogeological risk assessment to better understand the hydrogeological regime at the Site and inform drainage design and dewatering strategy.

6.7.3 OPERATION AND MAINTENANCE

6.7.3.1 In the context of geology and ground conditions, no aspects of operation and maintenance of the Proposed Development are anticipated to be materially different to the Consented Development. Mitigation during operation will be aligned with that described in paragraph 7.5.8 of the Consented Development ES and is not discussed further in this chapter.

6.7.4 DECOMMISSIONING

6.7.4.1 In the context of geology and ground conditions, no aspects of decommissioning of the Proposed Development are anticipated to be materially different to the Consented Development. Mitigation during decommissioning will be aligned with that described in paragraphs 7.5.9 and 7.5.10 of the Consented Development ES and is not discussed further in this chapter.

6.8 ASSESSMENT OF EFFECTS

6.8.1.1 The assessment of effects of the MC in relation to geology and ground conditions, including hydrogeology, soil resources and contamination,

below has been informed by the available baseline data for the Site presented in **Section** Error! Reference source not found. and taking into account implementation of the embedded mitigation measures described in **Section 0**. The assessment methodology follows that outlined in **Section 0** and draws on the CSM developed as part of the Phase 1 ESA (see **Appendix 6A**) in relation to receptor sensitivity and vulnerability and the potential for complete Source – Pathway – Receptor (SPR) linkages to be present.

6.8.1.2 As described previously, assessment has been made only where potentially effects are anticipated to be materially different to the Consented Development.

6.8.2 CONSTRUCTION

6.8.2.1 As described in Section 6.5.2, the only aspects of the construction phase of the Proposed Development which are anticipated to have materially different potential effects on geology and ground conditions from those previously assessed through the Consented Development are as follows:

- Early works, construction laydown and site preparation and access in areas not assessed through the Consented Development;
- Excavations for foundations and utilities; and
- Dewatering of excavations.

6.8.2.2 The potential effects on geology and ground conditions outlined in Section 6.5.2 are considered below.

6.8.2.3 The magnitude of impact of each of the effects above is shown in **Table 6.8**, below, and described in the following sections.

Loss of BMV Agricultural Soils (Permanent and Temporary)

6.8.2.4 Compared to the Consented Development, the MC will result in an additional permanent loss of 5.7 ha of potentially BMV agricultural soil resulting from the construction of the GPP, Utilities Compounds, Maintenance Stores and Site roads. Stripped soils from permanent development areas will be re-used elsewhere on the Site, e.g. for landscaping.

6.8.2.5 Soil handling will be undertaken during drier periods and will be compliant with relevant legislation, guidance and good practice techniques. Both the additional area of potentially BMV soils subject to permanent development compared to the Consented Development (approximately 5.7 ha) and the total area including the Consented Development area (approximately 17.5 ha are considered a 'medium' magnitude of impact in line with IEMA guidance, based on the conservative assumption that all Grade 3 soils at the Site are Subgrade 3a. Based on this, combined with the 'high' sensitivity classification (again, on the conservative assumption that all Grade 3 soils at the Site are Subgrade 3a), the potential effects of permanent

loss of BMV soils as a result of the Proposed Development are assessed as **Moderate (Significant)**.

6.8.2.6 However, should some or all of the soils in areas subject to permanent ground disturbance be classified as Subgrade 3b (non-BMV), the potential effects may be Not Significant. This will be confirmed in the ES once Site-specific ALC survey data is available.

6.8.2.7 In areas of temporary loss (e.g. laydown areas, construction compounds), topsoil and subsoil will be stripped, stored separately in line with DEFRA guidance**Error! Bookmark not defined.** and re-instated on completion of construction, as far as reasonably practicable, resulting in no permanent loss of BMV soils.

6.8.2.8 As above, soil handling will be undertaken during drier periods and will be compliant with relevant legislation, guidance and good practice techniques. Temporary, reversible losses are categorised as 'small' magnitude of impact in line with IEMA guidance. Based on this, combined with the 'high' sensitivity classification (conservatively assuming that all Grade 3 soils at the Site are Subgrade 3a), the potential effects of temporary loss of BMV soils as a result of the Proposed Development are assessed as **Moderate (Significant)**. However, as above, should some or all of the soils subject to temporary disturbance be classified as Subgrade 3b (non-BMV), the potential effects may be Not Significant. This will be confirmed in the ES once Site-specific ALC survey data is available.

6.8.2.9 It is also noted that the land will be returned to agricultural use, as far as reasonably practicable, during the decommissioning stage, ultimately reducing the impact to **Negligible**.

Loss of Soil Function, Compaction and Changes to Drainage (Temporary and Permanent)

6.8.2.10 In areas subject to vehicle and heavy plant movement (i.e. access roads and laydown areas), there is the potential for compaction of soil to occur (without mitigation), which may alter rainfall infiltration rates (and subsequently effects on groundwater recharge) and drainage (and subsequent effects on surface water flows – see **Chapter 7, Hydrology and Flood Risk**).

6.8.2.11 The additional area which may be subject to loss of soil function in the MC is approximately 1.2 ha greater than was previously assessed through the Consented Development. In the areas of the MC which may be subject to compaction and changes to drainage ALC Grade 3 natural soils are present (conservatively assumed to all be Subgrade 3a, i.e. BMV). These soils are already subject to heavy machinery movements related to the current agricultural use.

6.8.2.12 Topsoil and subsoil will be stripped and stored in separate stockpiles within the temporary working areas on Site in line with DEFRA guidance**Error! Bookmark not defined.**. Soil handling will be undertaken

during drier periods and will be compliant with relevant legislation, guidance and good practice techniques. Post-construction, the temporary working areas will be reinstated to pre-existing condition, as far as reasonably practicable.

6.8.2.13 With this mitigation in place, combined with the fact that the site includes areas currently subject to agricultural activity, the likely effects on soil function from the Proposed Development are assessed as **Not Significant**.

Sterilisation of Mineral Resources

6.8.2.14 The glacio-fluvial Sands and Gravels located approximately 150 m to the east of the Site at their closest point are a designated MSA. Although they lie within the Study Area, the MSA with respect to Sand and Gravel will not be subject to any temporary or permanent disturbance and no effects are anticipated on the MSA arising from the Proposed Development.

6.8.2.15 The entire Site, and indeed the entire eastern part of the CWAC district, is located in a MSA with respect to salt. Inovyn (who are the operators of the only large salt extraction operations in the area) have confirmed that they foresee no sterilisation issues for the Proposed Development.

6.8.2.16 Since the Proposed Development is not anticipated to result in any adverse effects on the commercial extraction of salt and Inovyn (as a key consultee) fully supports the Proposed Development, the Proposed Development is considered compatible with the CWAC Local Plan Policy M2 in regard to MSAs.

6.8.2.17 The likely effects of the Proposed Development on sterilisation of mineral resources are assessed as **Negligible (Not Significant)**.

Impact on Groundwater Quality and/or Flow Regimes

6.8.2.18 During construction, dewatering of foundations / piles / excavations may be required which, without mitigation, could result in impacts to groundwater flow and/or quality, as well as indirect effects on abstractions and surface watercourses, including ecological receptors dependent on those watercourses. Potential impacts on surface watercourses and ecology are assessed in **Chapter 7, Hydrology and Flood Risk** and **Chapter 10, Ecology and Nature Conservation**, respectively.

6.8.2.19 Additional ground investigation, including identification of potential sources of contamination, groundwater monitoring and hydrogeological assessment will be undertaken prior to construction to better understand the hydrogeological regime at the Site and inform the design of the dewatering system. Prior to the ES, additional consultation will be undertaken to identify Private Water

Supplies within the Study Area, if any. At present, no licensed abstractions have been identified in the Study Area.

6.8.2.20 The proposed methodology for treatment of groundwater removed from excavations / foundations, alongside surface water runoff from construction areas, will be presented in the Updated Outline CEMP to demonstrate how sediment load and contamination, if present, will be reduced prior to discharge via an appropriate, approved route.

6.8.2.21 Taking into account the proposed mitigation, the likely effects of dewatering of excavations/foundations during construction of the Proposed Development are assessed as **Negligible (Not Significant)**.

TABLE 6.8 – ASSESSMENT OF POTENTIAL EFFECTS – CONSTRUCTION PHASE

Impact	Impacted Receptor / Potential Effect	Receptor Sensitivity (Value)	Exposure Pathway	Key Mitigation(s)	Magnitude of Impact (Post-Mitigation)	Significance of Residual Effect	Likelihood of Occurrence
Loss of BMV Agricultural Soil	Soils – permanent loss of area of BMV soil resource	High (on the conservative assumption that all Grade 3 soils are Subgrade 3a)	Permanent development (GPP, Utility Compound, Maintenance Store, Site roads) on BMV soils (area 17.5 ha)	Design of MC to reduce loss of BMV soils as far as reasonably practicable. Stripped soils from permanent development areas will be re-used elsewhere on the Site; from temporary areas will be re-instated on completion of construction. Soil handling and storage in line with relevant legislation, guidance and good practice techniques, including DEFRA guidance**Error! Bookmark not defined.**.	Moderate	Moderate (Significant)	High
	Soils – temporary loss of area of BMV soil resource	High (on the conservative assumption that all Grade 3 soils are Subgrade 3a)	Temporary development (e.g. laydown areas, construction compounds) on BMV soils		Small	Moderate (Significant)	High
Loss of Soil Function	Soils – e.g. compaction, effects on drainage	High (on the conservative assumption that all Grade 3 soils are Subgrade 3a)	Compaction of BMV soils by heavy machinery (e.g. in temporary construction laydown areas)	Soil Management Plan to be developed and implemented. Soil handling and storage in line with relevant legislation, guidance and good practice techniques, including DEFRA guidance**Error! Bookmark not defined.**. Reinstatement of stripped soils on completion of construction works.	Negligible	Negligible (Not Significant)	Low
	Groundwater (Superficial Aquifer) – effects on recharge rates	Medium	Reduction in recharge to superficial aquifer as a result of compaction		Negligible	Negligible (Not Significant)	Low
Sterilisation of Mineral Resources	Designated MSA – Loss of mineral resource (salt)	Medium	Loss of mineral resource due to construction of the Proposed Development, i.e. salt dissolution to create caverns	Consultation with Inovyn (salt extraction operator).	Negligible	Negligible (Not Significant)	High
Impact on Groundwater Quality	Groundwater (Superficial Aquifer) – effects on	Medium	Sediment load / potential leaching of contaminants from soil		Negligible	Negligible	Low

Impact	Impacted Receptor / Potential Effect	Receptor Sensitivity (Value)	Exposure Pathway	Key Mitigation(s)	Magnitude of Impact (Post-Mitigation)	Significance of Residual Effect	Likelihood of Occurrence
and/or Flow (as a result of dewatering)	groundwater quality and/or flow		into shallow groundwater Reduction in flow to abstractions	Groundwater assessment to evaluate the hydrogeological regime and inform dewatering strategy design. Identification (via ground investigation) and appropriate procedures to address the risk from contamination during construction. Control measures to be implemented during construction via the CEMP, such as appropriate site drainage, wastewater management and water quality monitoring. Handling and storage of excavated soils, including potentially contaminated (hazardous) soils, to be undertaken in accordance with Technical Guidance and best working practices. Foundation Risk Assessment to be undertaken in advance of construction, including in relation to piling within the bedrock aquifer.			
	Groundwater (Bedrock Aquifer) – effects on groundwater quality and/or flow	Medium			Negligible	Negligible	Low

6.8.3 OPERATION AND MAINTENANCE

6.8.3.1 In the context of geology and ground conditions, no aspects of operation and maintenance of the Proposed Development are anticipated to be materially different to those previously assessed through the Consented Development. Therefore, no additional assessment of effects has been undertaken in relation to this phase of the Proposed Development.

6.8.4 DECOMMISSIONING

6.8.4.1 In the context of geology and ground conditions, no aspects of decommissioning of the Proposed Development are anticipated to be materially different to those previously assessed through the Consented Development. Therefore, no additional assessment of effects has been undertaken in relation to this phase of the Proposed Development.

6.9 SUMMARY OF INDIRECT EFFECTS

6.9.1.1 For the purposes of this EIA, 'indirect effects' are defined as the consequences of other development that are relied on by the Proposed Development, but not part of the Proposed Development (and therefore the Application).

6.9.1.2 No indirect effects are currently anticipated in relation to geology and ground conditions. This will be reviewed in the ES and assessed if required.

6.10 SUMMARY OF CUMULATIVE EFFECTS

6.10.1.1 The cumulative effects of impacts from the Proposed Development together with impacts from other planned projects or developments on the same resources and/or receptors are assessed in **Chapter 18, Cumulative Effects Assessment**.

6.10.1.2 The ES will summarise the conclusions of the Cumulative Effects Assessment (CEA) that are relevant to geology and ground conditions.

6.11 SUMMARY AND CONCLUSIONS

6.11.1.1 This chapter has assessed the potential effects of the Proposed Development on geology and ground conditions, including hydrogeology, soil resource and contamination. Only those effects which are anticipated to be materially different to the Consented Development, or were not assessed through the Consented Development (e.g. due to changes in policy), have been considered. No material changes are anticipated in relation to the operation and decommissioning phases of the Proposed Development in relation to geology and ground conditions.

6.11.1.2 Key receptors which have the potential to be directly impacted by the Proposed Development were identified as agricultural soil (in areas not assessed through of the Consented Development), safeguarded mineral resources and groundwater. In the context of SPR contaminant linkages, potential effects on human health receptors, groundwater resources and property arising from ground contamination were also considered.

6.11.1.3 Further assessment will be made in relation to the groundwater regime prior to construction to allow the design to be refined as required. In addition, further assessment will be made in relation to potential ground contamination in the form of intrusive ground investigation and/or additional data review prior to construction to enable risks to be adequately assessed and design to be refined, where practicable. Mitigation measures will be implemented to reduce the potential magnitude and/or likelihood of potential impacts, as set out in the CEMP during construction of the Proposed Development.

6.11.1.4 Considering the implementation of the proposed mitigation measures, the significance of residual effects with respect to the majority of aspects of geology and ground conditions have been assessed as **Not Significant**. In the case of potential effects to agricultural soils, potential effects from loss of BMV soils and loss of soil function have been conservatively assessed as **Moderate (Significant)** at this stage, on the basis that all Grade 3 soils at the Site are Subgrade 3a (i.e. BMV). In reality, this is unlikely to be the case. The assessment will be revisited at ES stage once Site-specific ALC survey data is available.

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