

Scotland England Green Link 2 - English Onshore Scheme

Environmental Statement:
Volume 3 - Appendices

Appendix 10C - Preliminary Hydrogeology
Risk Assessment



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Project Name:
Scotland England Green Link 2 – England
Onshore Scheme

Date:
3rd May 2022

Preliminary Hydrogeological Risk Assessment (SEGL2)

1. Introduction

The baseline assessment undertaken as part of the Environmental Statement (ES) for the English Onshore Scheme (EOS) of the proposed Scotland England Green Link 2 (SEGL2) identified that the planning application boundary passes through a Source Protection Zone (SPZ) 2 (Outer) and 3 (Total Catchment) between Hutton Cranswick and Bainton over a distance of approximately 4.7 km (see Figure 10-C-1, below).

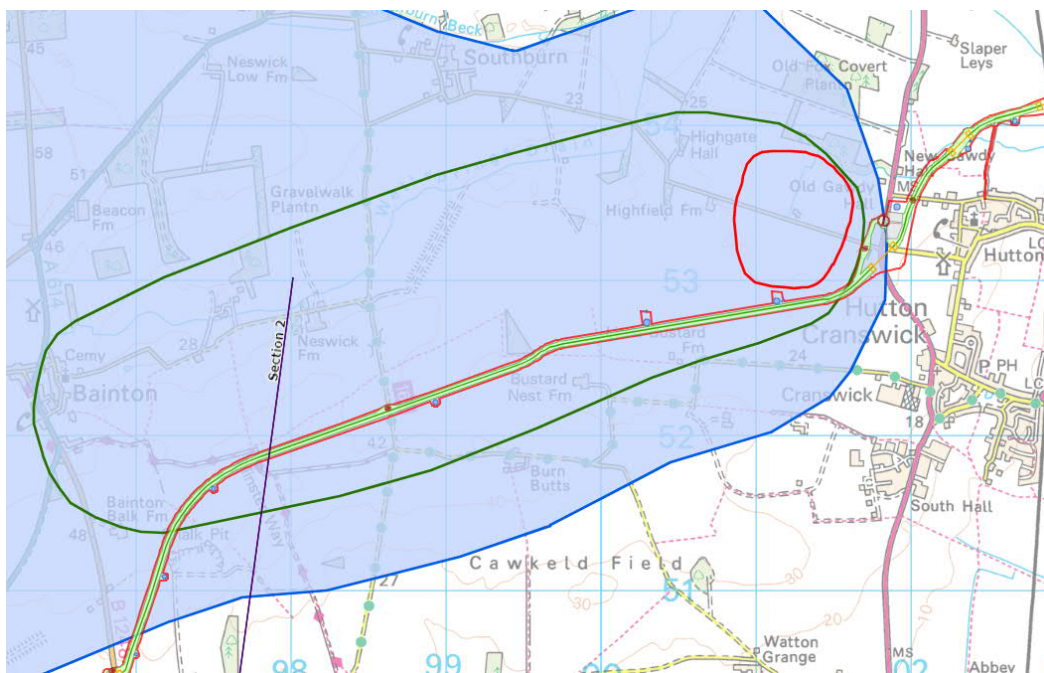


Figure 10-C-1: Map showing the locations of the SPZ1 (red outline), SPZ2 (green outline) and SPZ3 (blue outline) transected by the planning application boundary (light green shading with red outline) between Hutton Cranswick and Bainton.

In addition, a very small section (approximately 150 m) of the planning application boundary, comprising a haul road only, passes through an SPZ2 to the south of Kiplingcotes Farm (see Figure 10-C-2, below):

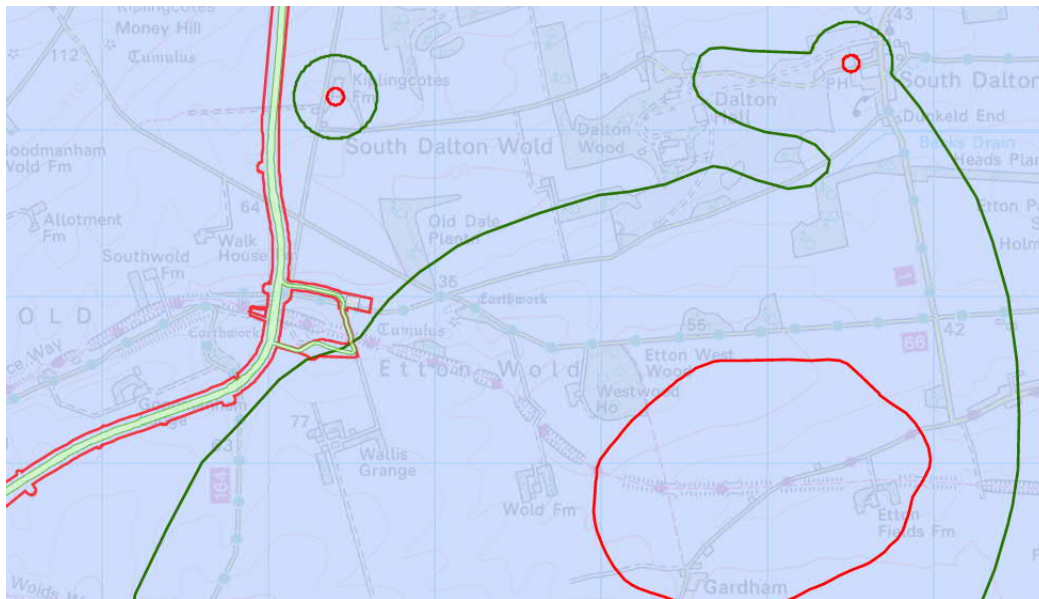


Figure 10-C-2: Map showing the locations of the SPZ1 (red outline), SPZ2 (green outline) and SPZ3 (blue outline) transected by the planning application boundary (light green shading with red outline) to the south of Kiplingcotes Farm

2. Hydrogeological Risk Assessment

In line with Environment Agency guidance¹, a Hydrogeological Risk Assessment (HyRA) has been carried out for the section of the proposed development which passes through the SPZ2 south of Dalton and between Hutton Cranswick and Bainton to demonstrate that the risks are acceptable and can be mitigated. Position statement N7 (Hydrogeological Risk Assessment) states that:

Developers proposing schemes that present a hazard to groundwater resources, quality or abstractions must provide an acceptable hydrogeological risk assessment (HRA) to the Environment Agency and the planning authority. Any activities that can adversely affect groundwater must be considered, including physical disturbance of the aquifer. If the HRA identifies unacceptable risks then the developer must provide appropriate mitigation. If this is not done or is not possible the Environment Agency will recommend that the planning permission is conditioned, or it will object to the proposal.

Furthermore, the areas designated as SPZs are also classified as Drinking Water (Groundwater) Safeguard Areas (shown by areas of blue shading on Figures 10-C-1 and 10-C-2, above). The Water Framework Directive (WFD) requires that drinking water protected areas are identified (WFD Article 7.1) and given the necessary protection (WFD Article 7.3), with the aim of avoiding deterioration in their quality in order to reduce the level of purification treatment required in the production of drinking water².

In the absence of site-specific ground investigation data at this stage of the development, the HyRA is considered to be 'preliminary' and will be reviewed and updated based on the findings of any future ground investigation. The following sections summarise the preliminary HyRA undertaken.

2.1 Proposed Development within SPZ2 to the South of Kiplingcotes Farm

2.1.1 Proposed Development

The proposed development within the SPZ2 to the south of Kiplingcotes Farm comprises the following elements:

- Shallow topsoil strip; and
- Placement of geo textile and stone surface for construction of a temporary haul road.

¹ *The Environment Agency's Approach to Groundwater Protection*. Version 1.2, dated February 2018 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692989/Environment-Agency-approach-to-groundwater-protection.pdf)

² <https://data.gov.uk/dataset/7fe90245-d6e8-4d7c-a13a-65a87455f429/drinking-water-safeguard-zones-groundwater>

2.1.2 Potential Contamination Sources

Identified Historical Sources of Contamination

As part of the baseline assessment in the ES, AECOM has reviewed historical mapping dating from 1851 to 2020. This review identified no potential historical sources within both the planning boundary and SPZ2.

Potential Sources of Contamination During Construction Phase

The following potential sources of contamination have been identified associated with the proposed works within the SPZ2 south of Kiplingcotes Farm:

- Imported materials (e.g. temporary haul road construction); and
- Vehicles/plant using the haul road (e.g. fuel spillage).

No storage of fuels or materials is proposed within the SPZ2.

Potential Sources of Contamination During Operational Phase

Once construction is completed, the haul road will be removed and the land reinstated to its current condition. No potential sources of contamination will remain during the operational phase.

2.1.3 Mitigation Measures

All works will be undertaken in accordance with the project Construction Environmental Management Plan (CEMP) to mitigate the risk to groundwater, including:

- Chemical testing of all imported materials;
- Plant inspections and maintenance; and
- Spill kits available and staff trained in their use.

2.1.4 Dewatering

Any dewatering activities on the site will be on a small scale, abstracting low volumes of water over a limited period of time, as such it is unlikely, any groundwater abstraction will have a significant long term impact on the groundwater levels locally in the aquifer or at the public supply well. Should any dewatering activities require to abstract significant volumes of water an abstraction licence will be obtained, and a more detailed assessment will be undertaken.

2.1.5 Summary

Due to the absence of identified historical sources of contamination, the low-risk activity proposed in this location (i.e. construction of a temporary haul road) and the mitigation measures in place, it is considered that the potential to impact groundwater is very low.

Therefore, this area is not considered further in this preliminary HyRA.

2.2 Proposed Development within SPZ2 at Hutton Cranswick-Bainton

2.2.1 Proposed Development

The proposed development within the SPZ2 between Hutton Cranswick and Bainton comprises the following elements:

- Stripping of topsoil and stockpiling in a suitable location;
- Hydraulic excavation (open cut) of a single trench, typically between 1.0 m and 1.5 m deep and a maximum of 1.5 m wide and stockpiling of subsoil (separate to topsoil);
- Placement of a base layer Cement Bound Sand (CBS) or other similar material, followed by two underground HVDC cables, each approximately 15cm diameter, (and potentially a fibre optic cable for performance monitoring) within the trench. Cables will not be oil (or other fluid) filled;
- Bedding of the cables within CBS (or other similar material);
- Backfilling of the trench with a protective tile, warning tape, subsoil and topsoil (from stockpiled excavated material);
- Provision for temporary soil storage, laydown areas and temporary haul roads within the planning application boundary to facilitate the trench construction, comprising topsoil stripping/stockpiling and placement of a geotextile membrane (if required) and stone; and

- 4 temporary drainage features (attenuation ponds).

No construction compounds or refuelling bays are proposed within the SPZ2.

2.2.2 Potential Contamination Sources

Identified Historical Sources of Contamination

As part of the Environmental Statement AECOM have reviewed historical mapping dating from 1851 to 2020. This review identified the following potential historical sources within both the planning boundary and SPZ2:

- Former Market Weighton and Driffeld railway line (shown on 1890 – 1977 mapping), located partially within the planning application boundary and SPZ2 between Burnbutts Lane and Bainton; and
- Historical chalk pit (shown on 1851 – 1950 mapping), located immediately south of the planning application boundary and within the SPZ2 between Burnbutts Lane and Bainton.

These historical sources are planned to be investigated as part of future ground investigation and assessed in line with the project Construction Environmental Management Plan (CEMP), including risk assessment and remediation (if required).

Potential Sources of Contamination During Construction Phase

The following potential sources of contamination have been identified associated with the proposed works within the SPZ between Hutton Cranswick and Bainton:

- Imported materials (e.g. for temporary haul road construction (stone) and backfilling of the cable trench (CBS, or similar));
- Plant used for excavation of the trench (e.g. fuel/oil spillage);
- Temporary storage of excavated soil; and
- Temporary attenuation ponds / drainage discharge.

No construction compounds or storage of fuels is proposed within the SPZ2.

Potential Sources of Contamination During Operational Phase

Once construction is completed, the trench will be backfilled and all surface areas reinstated to their current condition. No potential sources of contamination will remain during the operational phase.

2.2.3 Environmental Setting

As described in the baseline assessment (Chapter 10.5 of the ES), the following are anticipated to be present within the Hutton Cranswick – Bainton section of the EOS:

Geology

- Superficial deposits comprising Glacial Till; and
- Bedrock comprising Flamborough Chalk Formation.

Information obtained from nearby, publicly available British Geological Survey (BGS) borehole records are summarised in Table 10-C-1, below:

Table 10-C- 1: Summary of BGS Borehole Records

BGS Borehole Ref.	TA05SW34	TA05SW4A / TA05SW15 / TA05SW17
Location	Manor Farm, Burnbutts Road	Southburn Road Pumping Station (i.e. the location of the current Hutton Cranswick Pumping Station)
Distance	230 m south of the planning application boundary, on the southern boundary of the SPZ2.	480 m north of the planning application boundary, in the centre of the SPZ in question.
Superficial Deposits	Clay (inferred to be Glacial Till), encountered to 6.7 m below ground level (bgl).	Clay (inferred to be Glacial Till), encountered to 7.9 m bgl.
Bedrock	Chalk, encountered from 6.7 m bgl to base of well (30.5 m bgl).	Chalk/marl rubble, encountered at 7.9 m bgl, becoming (unweathered) chalk from approximately 21 m bgl.
Groundwater Levels	Water strikes recorded at 14.0 m, 17.0 m and 30.5 m bgl in 2012.	Resting water level recorded at 2.7 m bgl in 1937. Pump reportedly sited at 91 m bgl in 1950.

Hydrogeology

- Secondary Undifferentiated Aquifer (superficial aquifer) and Principal Aquifer (bedrock aquifer);
- Anticipated groundwater flow direction is towards the east-northeast, based on the relative location of surface water features (River Hull) and the profile of the defined SPZ;
- Groundwater vulnerability is classified as 'medium'; and
- Based on BGS records (above), the bedrock (chalk) aquifer is inferred to be confined by the overlying clay (Glacial Till) with recorded water strikes (>14 m) being significantly deeper than resting water levels (<3 m).

2.2.4 Identified Hydrogeological Receptors

A groundwater abstraction at Hutton Cranswick Pumping Station, located on Southburn Road, approximately 480 m north of the planning application boundary (and approximately 500m from the proposed cable trench excavation), is operated by Yorkshire Water for potable public supply.

2.2.5 Mitigating Factors and Mitigation Measures

The following mitigating factors/measures are considered to reduce risk to groundwater:

- Excavations will be no more than 1.5m in depth and are therefore anticipated to be entirely within the topsoil, subsoil and superficial deposits (Glacial Till). Based on available BGS data, chalk bedrock is anticipated to be present at a depth of between 6.7 m and 9.4 m bgl, and will therefore be afforded protection by at least 5 m of low permeability Glacial Till beneath the base of the proposed excavations;
- Groundwater is considered unlikely to be encountered within the excavations, with the potential exception of perched (i.e. not laterally continuous) groundwater within more permeable lenses within the Glacial Till. If groundwater is encountered, a dewatering plan will be in place to manage the water appropriately;
- All works will be undertaken in accordance with the England Onshore Scheme CEMP, detailing the following:
 - No storage of fuel, or refuelling of plant and equipment, within the SPZ2. Refuelling will be restricted to designated areas within construction compounds, of which none are to be located within the SPZ2;
 - Inspection and maintenance of plant and equipment, and the provision of spill kits on site in order to mitigate the potential risk of spills or losses (e.g. of fuel, hydraulic oil) to identified receptors;
 - Measures for appropriate temporary storage of soil. In addition, future ground investigation will include chemical testing and risk assessment to identify potential risks to groundwater from mobilisation of contaminants, if present, present within soil in the SPZ2;
 - Chemical testing of materials imported to site will be tested to mitigate the risk to groundwater;
 - Unless where essential (e.g. for safety at road crossings), vehicle washing will not take place within the SPZ2. Where vehicle washing does take place, this will be undertaken in designated areas in which the arising effluent can be captured and managed appropriately; and
 - Surface Water Management Plan (SWMP) will be in place to mitigate potential impacts to identified receptors by ensuring surface water runoff quality and quantity is managed effectively. This includes intercepting surface run-off from the works areas by filters and 'header' drains running along the edge of the temporary haul roads, which will lead to attenuation ponds prior to being discharged to appropriate surface watercourses (subject to agreement from the relevant IDB).

2.2.5 Potential Pollutant Linkages and HyRA

Potential Source – Pathway - Receptor (SPR) linkages with respect to hydrogeology are summarised as follows:

Sources

- Contaminants associated with the construction of the proposed cable route through the Hutton Cranswick – Bainton SPZ2, including:
- Fuel from plant / equipment; and
- Materials stored/used on site (e.g. CBS).

Pathways

- Migration of contaminants into shallow groundwater within the superficial deposits (if present), followed by vertical migration to the underlying bedrock aquifer; and
- Lateral migration within the bedrock aquifer towards the public supply borehole as a result of pumping.

Receptors

- Principal Bedrock Aquifer (specifically the Hutton Cranswick Pumping Station potable supply)

The preliminary HRA in Table 10-C-2, has been a produce taking into consideration the hydrogeological setting and mitigation measures described above:

Table 10-C-2: Preliminary Hydrogeological Risk Assessment

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk ³	Justification
Contaminants associated with the construction of the proposed cable route	Migration of contaminants into shallow groundwater within the superficial deposits (if present), followed by vertical migration to the underlying bedrock aquifer	Principal Bedrock Aquifer (specifically the Hutton Cranswick Pumping Station potable supply)	Medium	Unlikely	Low	<p>Although a sensitive receptor has been identified, the potential risk is considered to be low for the following reasons:</p> <ul style="list-style-type: none"> - The relatively significant distance from the proposed development to the abstraction point (c.500m) and the location across inferred hydraulic gradient (south); - The anticipated presence of at least 5 m of low permeability Glacial Till between the base of the excavation and the underlying aquifer unit; - The relatively significant depth to groundwater in the chalk (c. 14.0 m bgl). If groundwater is present in the Glacial Till it is considered likely to be 'perched' in nature (i.e. laterally and vertically discontinuous); - All works will be undertaken in accordance with the CEMP, and mitigation measures described therein.
	Lateral migration within the bedrock aquifer towards the public supply borehole					

2.2.8 Dewatering

Any dewatering activities on the site will be on a small scale, abstracting low volumes of water over a limited period in the perched water above the Principal Bedrock Aquifer utilised for the public water supply borehole. As such it is dewatering is unlikely to have a significant impact on the groundwater in aquifer locally or at the public supply borehole. Should any dewatering activities require to abstract significant volumes of water an abstraction licence will be obtained.

2.2.9 Summary

Given the proposed construction methodology, cable design, the anticipated geological conditions and the mitigation measures which will be in place, the potential risk to the chalk aquifer and potable supply at Hutton Cranswick is considered to be low.

This preliminary HyRA will be reviewed and updated in light of any changes in methodology, cable design and/or site-specific ground investigation data that becomes available.

³ Potential severity, likelihood of occurrence and potential risk ratings have been assigned based on criteria presented in the National House Building Council/Environment Agency/Chartered Institute of Environmental Health publication R&D 66 (NHBC/EA/CIEH, 2008).