

TC/FRA&DS/P9298/23/04

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

AT

**Land South of A5
Watling Street
Hinckley
Leicestershire
LE10 3ED**

FOR

CNG Fuels



FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED

REPORT VERIFICATION

Site Address	Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED
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1 INTRODUCTION

1.1 Project Scope / Client Brief

Thomas Consulting has been commissioned by CNG Fuels to carry out a site-specific flood risk assessment and drainage strategy report in accordance with the National Planning Policy Framework (NPPF) to support a planning application that fulfils the requirements of the statutory local authorities.

1.2 Site Location & Topography

The site is located Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED and the report is to support the development of a Bio-CNG vehicle fuelling station. A copy of the development proposals can be found in Appendix A of this report. The approximate Ordnance Survey (OS) grid reference for the site is 440742 292568 and the location of the fuelling station is shown on Figure 1.



Figure 1: CNG Station location plan (Source: OS Maps, 2023: License No. 100020411)

The proposed site is approximately 0.92 ha and the plot of land comprises entirely of undeveloped greenfield grass land. The plot of land is situated west of the current BP petrol station and sits south of the A5 where an additional adopted slip-road has also been proposed for site access extending the current highway. Opposite the A5 sits an existing traveller site consisting of temporary homes. A topographical survey to ordnance datum has been made available by CNG Fuels and shows the levels of the site averaging between 89.2mAOD and 88.5mAOD. A full copy of the survey can be found in Appendix B.

1.3 National Planning Policy Framework and Planning Practice Guidelines

The NPPF and its Planning Practice Guidance (PPG) states any development other than the following outlined below is classed as a major development.

- Minor non-residential extensions: industrial/commercial/leisure etc extensions with a footprint less than 250 square meters.

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- Alterations: development that does not increase the size of buildings e.g. alterations to external appearance.
- Householder development: For example, sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling e.g. subdivision of houses into flats.

The guidance also states that a site-specific flood risk assessment is required for the following site proposals.

- A site proposed in Flood Zone 2 or 3 including minor development and change of use in development type to a more vulnerable class.
- More than 1 hectare (ha) in Flood Zone 1
- Less than 1 ha in Flood Zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs)
- In an area within Flood Zone 1 which has critical drainage problems as notified by the Environment Agency

1.4 Environment Agency Flood Map for Planning

National Planning Policy Framework (NPPF) Flood Zones comprise Flood Zone 1, Flood Zone 2, and Flood Zone 3. The Environment Agency's Indicative Flood Map for Planning (Figure 2) shows that most the site is located within the NPPF defined Flood zone 1 however the south east of the site intrudes Flood zone 2.

Flood Zones are based on an areas Annual Exceedance Probability (AEP) of River or Sea Flooding. For example, Flood Zone 1 has a 'Low Probability' of flooding as it has an AEP of <0.1% (Less than 1 in 1000 year) of occurring in any one year. Flood Zone 2 has a 'Medium Probability' having an AEP of 0.1-1.0% (1 in 1000 – 1 in 100 year) chance of river flooding, or 0.1-0.5% (1 in 1000 – 1 in 200 year) chance of tidal/sea flooding.

Flood Zones 3 is split between 'a' and 'b' classifications. Flood Zone 3a has a 'High Probability' of flooding as it has an AEP of >1.0% (More than 1 in 100 year) chance of river flooding, or >0.5% (More than 1 in 200 year) chance of sea/tidal flooding. Flood Zone 3b (The Functional Floodplain) comprises land where water has to flow or be stored in times of flooding. Local planning authorities should identify in the Strategic Flood Risk Assessments areas of a functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map for Planning).

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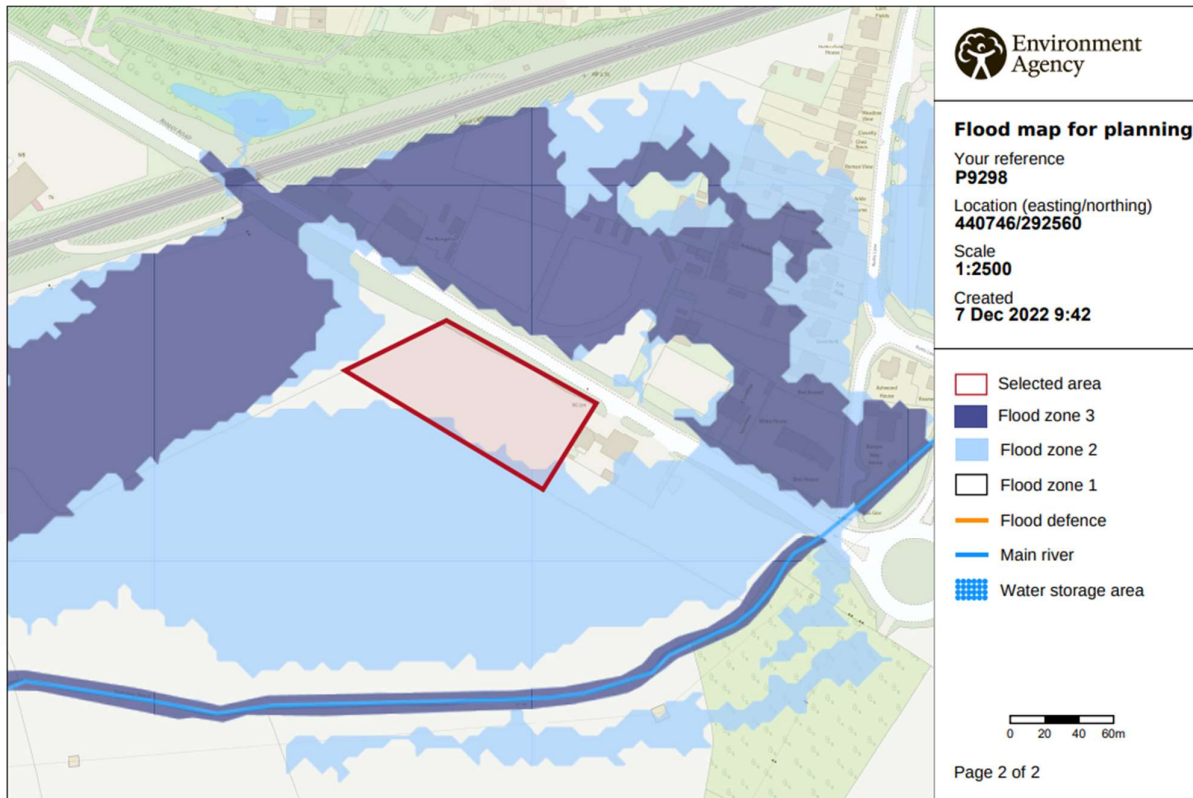


Figure 2: Environment Agency Flood Zone Map (Source: Environment Agency, 2022, GOV.UK)

1.5 Development Classification

The PPG separates each development into a vulnerability class. These classifications can be found in Figure 3, whilst in Figure 4 permissible development in relation to its classification is shown.

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Vulnerability Classification	Development
Essential Infrastructure	- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk - Essential utility infrastructure, which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood - Wind turbines
Highly Vulnerable	- Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operation during flooding. - Emergency dispersal points - Basement dwellings - Caravans, mobile homes and park homes intended for permanent residential use - Installations requiring hazardous substances consent
More Vulnerable	- Hospitals - Residential institutions such as residential care homes, children's homes, prisons and hostels. - Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. - Non-residential uses for health services, nurseries and education establishments. - Landfill and sites used for waste management facilities for hazardous waste. - Sites used for holiday or short let caravans and camping, subject to a specific warning and evacuation plan
Less Vulnerable	- Police, ambulance and fire stations which are NOT required to be operational during flooding. - Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distributions; non-residential institutions not included in the 'more vulnerable' class; and assemble and leisure. - Land and buildings used for agriculture and forestry - Waste treatment (except landfill & hazardous waste facilities) - Minerals working & processing (except for sand & gravel working) - Water treatment works which do not need to remain operational during times of flood - Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water-Compatible Development	- Flood control infrastructure - Water transmission infrastructure & pumping stations - Sewage transmission infrastructure & pumping stations - Sand & gravel working - Docks, marinas and wharves - Navigation facilities - Ministry of Defence installations - Ship building, repairing & dismantling, dockside fish processing & refrigeration & compatible activities requiring a waterside location - Water based recreation (excluding sleeping accommodation) - Lifeguard and coastguard stations - Amenity open space, nature conservation & biodiversity, outdoor sports and recreation and essential facilities such as changing rooms - Essential ancillary sleeping or residential accommodation for staff required by uses in this category subject to a specific warning & evacuation plan.

Figure 3: NPPF Flood Risk Vulnerability Classification (Source: National Planning Practice Guidance, 2014)

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Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Figure 4: NPPF Flood Risk Vulnerability Classification (Source: National Planning Practice Guidance, 2014)

1.6 The Proposed Development in Relation to Planning Requirement

As the proposed development footprint is approximately 0.92 Hectares and is partially situated in Flood Zone 2, a flood risk assessment and strategic drainage strategy is required. The site is classed as a major development and according to the PPG would fall under the “Less Vulnerable” class. “Less Vulnerable” developments are acceptable in Flood Zone 2 as shown in Figure 4.

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2 SITE CHARACTERISTICS

2.1 Geological Assessment

A desk-based study has been carried out to analyse the basic site geology. British Geological Survey (BGS) and Land Information Systems (LandIS) provide mapping which indicates the characteristics of the soil, superficial and bedrock layers across the site Table 1.

Principal Aquifers - These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Secondary A Aquifers - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

Secondary B Aquifers - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons, and weathering. These are generally the water-bearing parts of the former non-aquifers.

Secondary (Undifferentiated) Aquifers - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

Geological Assessment			
Geological Layer	Classification	Description	Aquifer Class
Soil	Soilscape 18	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	N/A
Superficial (Drift)	Alluvium	Clay, silt, sand and gravel	Secondary A
Bedrock (Solid)	Mercia Mudstone	Mudstone	Secondary B

Table 1: Geological Assessment

Magic maps which are available online provide data on vulnerability zones such as source protection zones and/or groundwater vulnerability zones. The maps indicate that the site is a medium risk to groundwater vulnerability and the site is not in a source protection zone.

2.2 Existing Surrounding Natural or Manmade Drainage Features

According to the EA Main River Maps the closest known watercourse is approximately 150m south east from the site. This watercourse is called Sketchley Brook and flows west before connecting to the River Anker.

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Severn Trent are the water authority for this region. Their detailed sewer records show that there is a 'Pressure Combined' sewer running parallel to the A5 on the proposed development side of the A5 crossing the proposed site entrance and a '4" URPVC Water Main' running under the path on the opposite side of the A5. There are no gravity fed public sewers on their records which are included in Appendix C.

2.3 Geotechnical Assessment

A Preliminary Risk Assessment (PRA – Formally known as a Phase 1) was published on 21/12/22 by Thomas Consulting ref: TC/PRA/P9299/22/01 and suggests based on the superficial strata and bedrock, permeability is likely to be very low on the site.

On 16/01/23, BEK published a Site Investigation & Ground Assessment ref: BEK-23005-1. This report presented results from 7 window sample borehole logs on site. The borehole results were consistent throughout the site and concluded approximately, the top 0.4m-0.5m consisted of grass and top soils, followed by firm brown sandy gravely clay for the next 0.8m-2m and then stiff brown and gold clay until reaching to termination depths of between 4.45m-5.45m. The results also show that 5 of the 7 boreholes found didn't encounter any water however one borehole located furthest south east encountered a slight water strike at 2m (next to trees) and furthest north west was wet at ground level (next to trees). Furthermore, soakaway testing to BRE 365 was carried out at 2 locations and found that the percolation rate of the shallow strata does not support the use of soakaways on this site.

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3 ASSESSMENT OF FLOOD RISK

3.1 Explanation of Flood Risk

Flood events are often referred to as their probability of occurrence. This occurrence is usually related to how often a storm may return in any single year. Table 2 shows the storm return periods and how they are expressed as a fraction and percentage in common terminology.

Storm Return Period (Years)	Annual Exceedance Probability (AEP)	
	Fraction	Percentage
2	0.5	50%
10	0.1	10%
25	0.04	4%
50	0.02	2%
100	0.01	1%
200	0.005	0.5%
500	0.002	0.2%
1000	0.001	0.1%

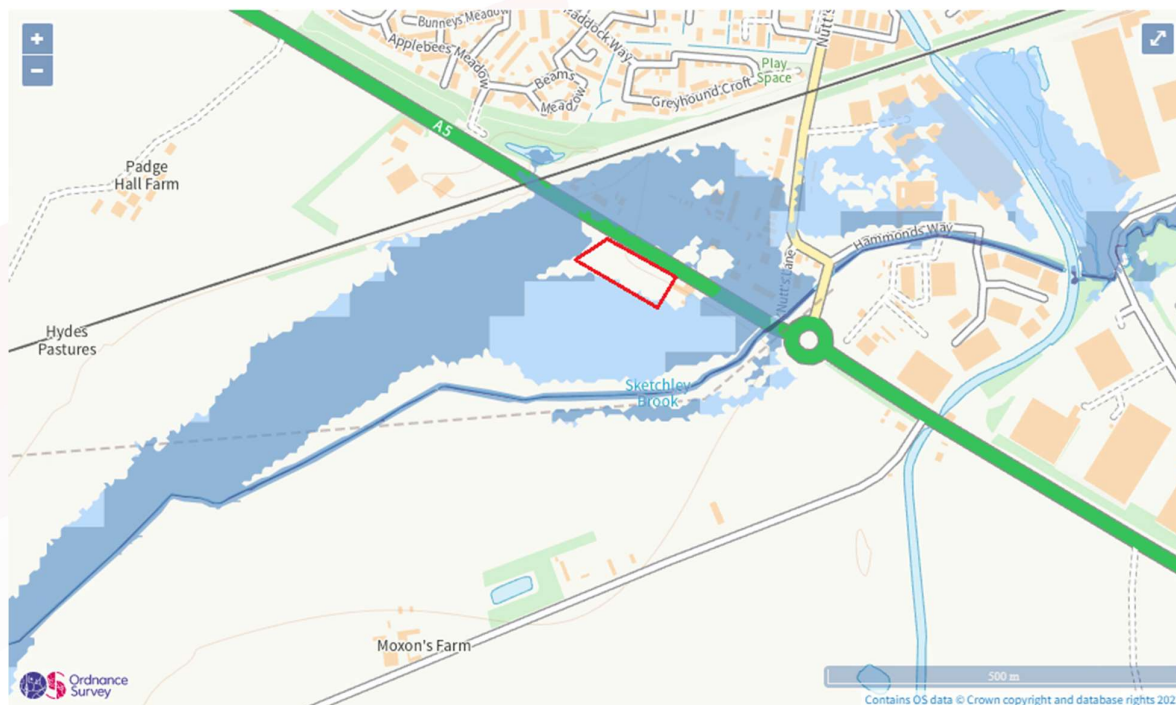
Table 2: Storm Return Period Probabilities

3.2 Flooding Resulting from the Rivers and/or Sea

Figure 5 shows the EA fluvial flood map derived from the DEFRA online portal. This map indicates areas which may be at risk of flooding from rivers and the sea. High risk is classed as a >3.3% Annual Exceedance Probability (AEP) event and is shown in dark blue. Medium risk is an AEP event of between 3.3-1% and is shown in blue. Low risk is an AEP event of between 1-0.1% and is shown in light blue. Very Low risk is an AEP event of <0.1% and is shown in white.

As can be seen the site is shown to be at low to medium risk of fluvial flooding. The maps show the latest information provided by the EA and considers the protections provided by current flood defences. However climate change is not assessed as part of the map's information.

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Extent of flooding from rivers or the sea
 High Medium Low Very low

Figure 5: Environment Agency Fluvial Flood Map (Source: Environment Agency, 2023, GOV.UK)

3.3 Flooding Resulting from Surface Water

Also available on the DEFRA online portal are maps provided by the EA showing areas known to be affected by surface water flooding. These maps are based on historic flooding information received from statutory authorities and a generalised model based on digital terrain modelling.

The maps work in the same colour coding as described above for the fluvial maps where High risk AEP events are displayed in Dark Blue, Medium Risk in Blue, Low Risk in Light Blue and Very Low Risk in White. Figure 6 shows the site is predominantly not at risk of surface water flooding however it borders around areas with low and medium extent of flooding.

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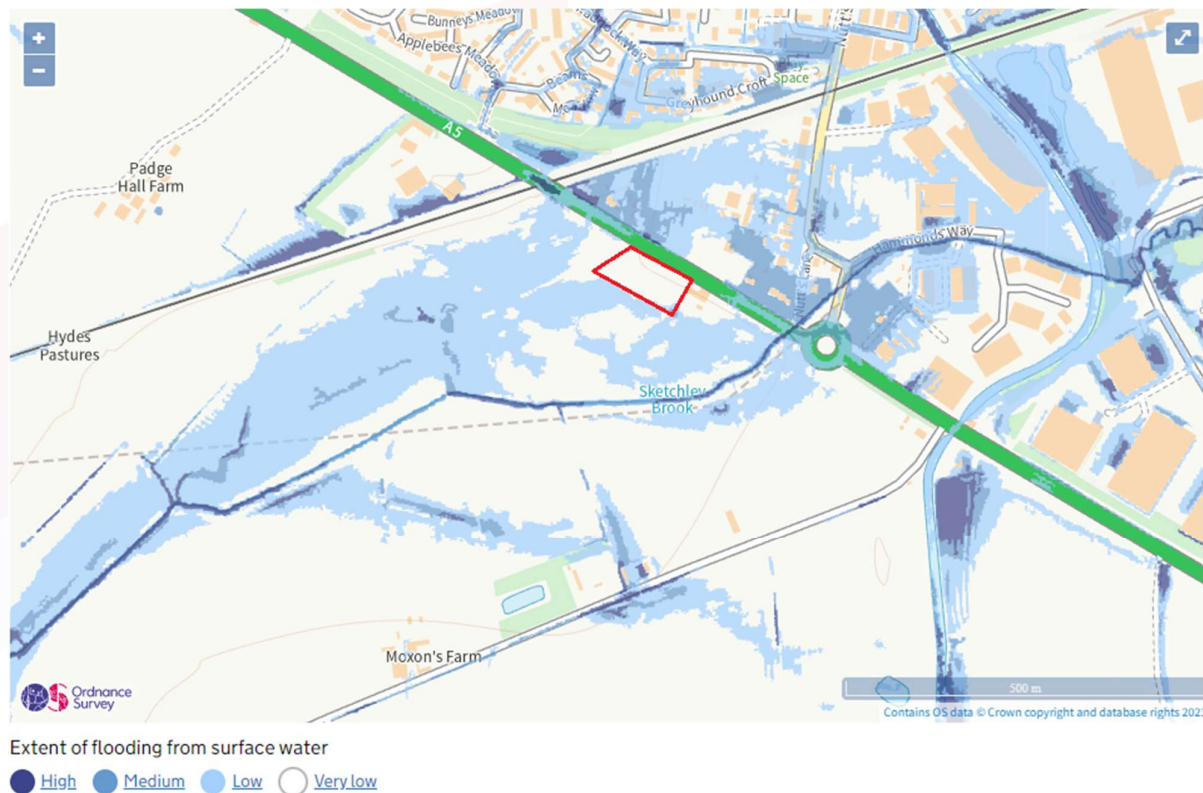


Figure 6: Environment Agency Surface Water Flood Map (Source: Environment Agency, 2023, GOV.UK)

3.4 Flooding Resulting from Other Sources

Hinckley & Bosworth Borough Council provide reference to Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA) completed by JBA Consulting in 2019 and 2020 respectively.

The Level 1 SFRA explains that Sketchley Brook poses a fluvial flood risk to Hinckley and that the region/borough is within the <25% susceptible ground flooding classification. Section 5.7 of their report (Page 54) explains that Borehole records hold valuable information on groundwater flooding. As previously mentioned in section 2.3, window borehole samples concluded that within the site 1 of 7 borehole samples encountered a slight water strike at a depth of 2m whilst 1 other encountered water at ground level.

The DEFRA portal also provides Reservoir Flood Maps produced by the EA, in which a copy for the area can be seen in Figure 7. This map indicates the maximum extent of flooding from reservoirs highlighted in light blue. As can be seen the site is not at risk of flooding from reservoirs and has no other canals or artificial sources nearby that pose any risk of flooding.

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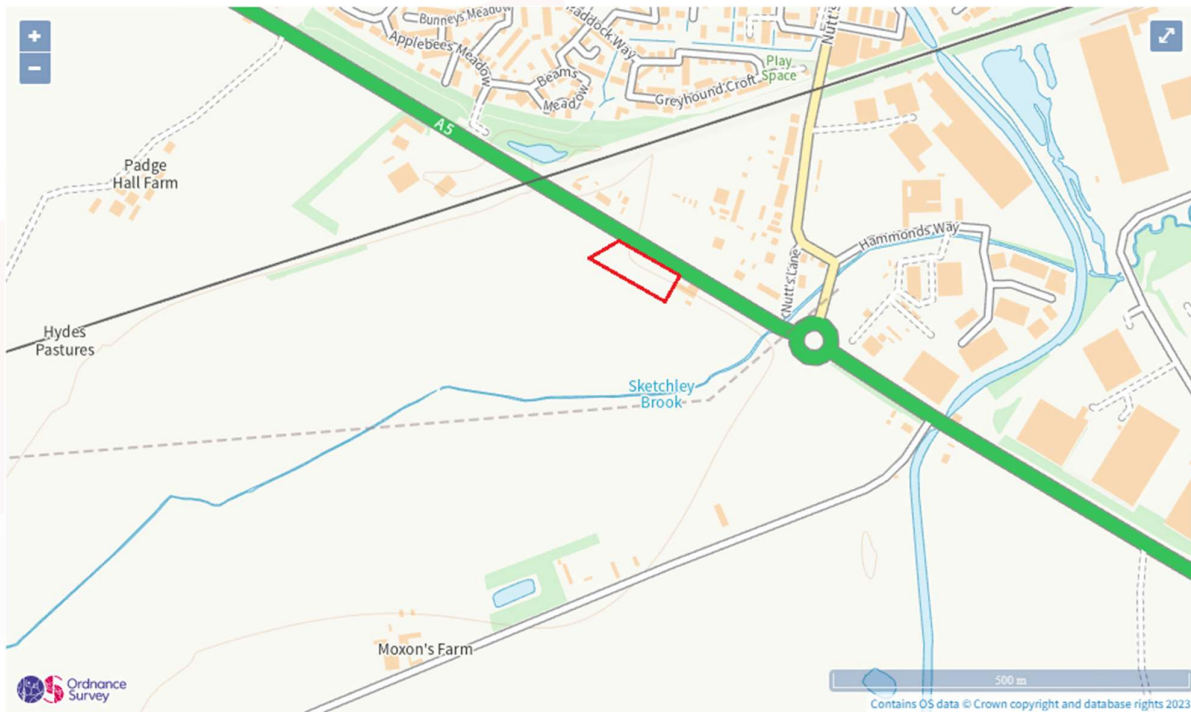


Figure 7: Environment Agency Reservoir Flood Map (Source: Environment Agency, 2023, GOV.UK)

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4 FLOOD MITIGATION

4.1 Flood Defence

Although the site is partially situated in Flood Zone 2, Product 4 data was readily available from a previous CNG site and has been taken into consideration for a more accurate analysis as the information provided is still relevant. The Product 4 data was requested by TC to the Environment Agency (EA) on 23/02/2022 and was received on 15/03/2022. A reference plan and Product 4 document referenced 253382 was provided showing modelled water levels of Sketchley Brook. Reference to the plan can be made in Figure 8 below showing the node point locations analysed within the document. A full copy of the Product 4 data received from the EA can be found in Appendix D of this report.

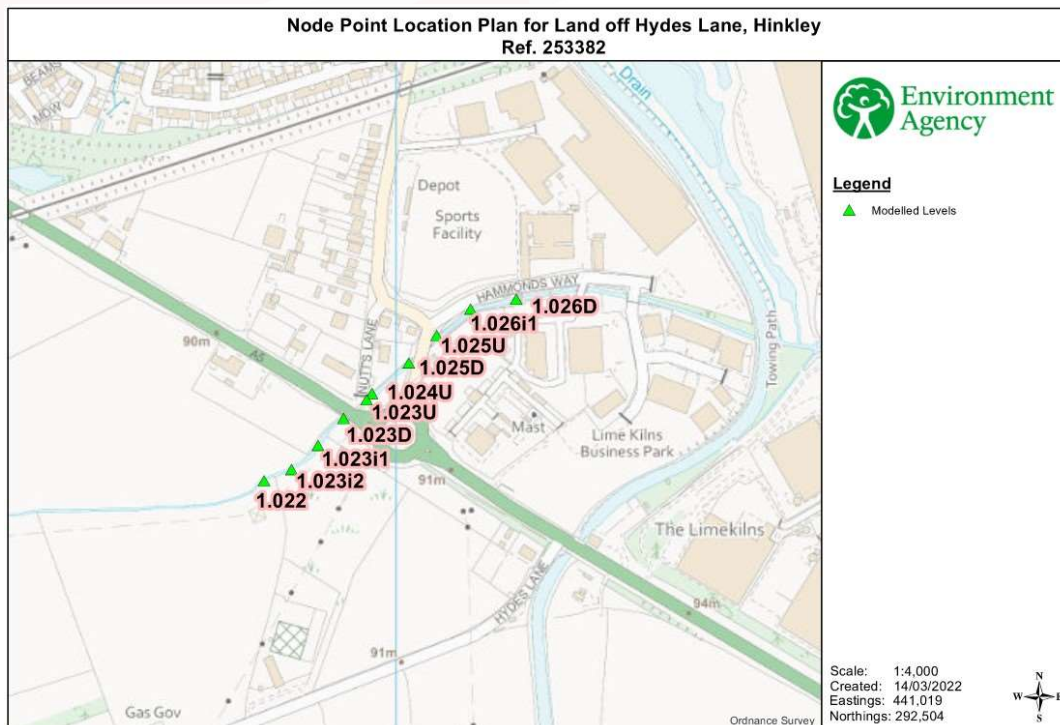


Figure 8: Environment Agency Node Location Plan (Source: Environment Agency, 2022)

The most applicable node references to this assessment are as follows;

- 1.022, 1.023D, 1.023i1, 1.023i2

The modelled data is from analysis undertaken in 2013. Maximum water levels have been provided against the corresponding nodes in the un-defended scenario and have been highlighted in Figure 9 below;

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Annual Exceedance Probability - Maximum Water Levels (mAOD) UN-DEFENDED				
Node Label	EASTING	NORTHING	1% (1 in 100)	0.1% (1 in 1000)
1.025U	441042	292566	90.22	90.48
1.024U	440975	292506	90.22	90.35
1.023U	440969	292499	90.21	90.34
1.022	440863	292416	88.54	88.72
1.023D	440946	292480	88.92	88.99
1.025D	441013	292538	90.22	90.34
1.026D	441124	292604	90.34	90.55
1.026i1	441077	292594	90.23	90.48
1.023i1	440919	292453	88.70	88.83
1.023i2	440892	292428	88.59	88.76

Figure 9: Environment Agency Max Water Level (Source: Environment Agency, 2022)

The maximum water levels associated with a number of annual exceedance probabilities has also been provided for the defended scenario which have been highlighted in Figure 10 below;

Annual Exceedance Probability - Maximum Water Levels (mAOD) DEFENDED											
Node Label	EASTING	NORTHING	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (Climate Change)*	0.5% (1 in 200)	0.1% (1 in 1000)
1.025U	441042	292566	89.594	89.6	89.965	90.17	90.195	90.223	90.29	90.296	90.476
1.024U	440975	292506	89.59	89.59	89.96	90.17	90.19	90.22	90.29	90.30	90.35
1.023U	440969	292499	89.58	89.58	89.95	90.15	90.18	90.21	90.28	90.28	90.34
1.022	440863	292416	88.16	88.18	88.37	88.50	88.52	88.54	88.61	88.61	88.72
1.023D	440946	292480	88.74	88.74	88.83	88.90	88.91	88.92	88.95	88.95	88.99
1.025D	441013	292538	89.59	89.60	89.96	90.17	90.19	90.22	90.29	90.29	90.34
1.026D	441124	292604	90.01	90.01	90.14	90.29	90.31	90.34	90.42	90.43	90.55
1.026i1	441077	292594	89.65	89.65	89.97	90.17	90.20	90.23	90.29	90.30	90.48
1.023i1	440919	292453	88.40	88.41	88.56	88.66	88.68	88.70	88.75	88.75	88.83
1.023i2	440892	292428	88.21	88.23	88.43	88.55	88.57	88.59	88.65	88.65	88.76

Figure 10: Environment Agency Max Water Level for AEP's (Source: Environment Agency, 2022)

The EA explain within their document that they hold no record of historic flooding in the area and that there are no formal defences owned or operated by the EA protecting the proposed development site. As this is the case the un-defended 1% AEP maximum recorded water level (mAOD) will be analysed for the site.

4.2 Flood Defence/Mitigation Recommendations

As can be seen the 1% AEP / 1 in 100-year return period + climate change shown in Figure 10 will be analysed with a maximum water level recorded at **88.95mAOD**. The proposed finished forecourt level shows elevations ranging between **88.59-89.95mAOD** and are also protected by a minimum kerb height of 88.94m AOD surrounding the forecourt. A levels plan and catchment plan has been made available in Appendix E. Furthermore, the site is at a minimum distance of approximately 150m away from the closest relevant node shown within the product 4 data and therefore any overland flooding is assumed to dissipate over the adjacent land before reaching the site. As discussed in section 1.2, the site is to be used as bio-fuelling station which is not deemed to be harmful to the environment compared to a tradition petroleum fuelling station. Biomethane when it escapes is light enough to be carried through air molecules and therefore, would likely escape into the atmosphere rather than transported through water.

CNG Fuelling stations are also not personnel manned sites. Therefore, they technically can be allowed to flood during extreme rainfall events. As the proposed development is situated over 150m from the brook, our precautionary recommendations are as follows;

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- All plant and apparatus on site should be either bunded and/or adequately sealed if located below ground (i.e. storage tanks, sampling chambers, ducting). Anything located above ground such as pumps etc should be raised above the flood level, if required and/or possible, on plinths etc.
- Non-return valves and anti-flood mechanisms should be installed on devices such as oil interceptors, treatment devices, flow controls and headwalls. This prevents the potential for pollutant displacement during flood events.
- The site should be designed as to not displace flood water off the site and should be designed as to hold the water until the storm event and flooding subsides.
- The site should be designed so that safe access and egress is still available for emergency vehicles etc. This will need to be analysed following the provision of a topographical survey to ensure safe flood levels are maintained on site for emergency crews to access the site.

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5 SURFACE WATER DRAINAGE STRATEGY

5.1 Catchment Assessment

A catchment assessment has been completed in AutoCAD to determine the different types of proposed land cover with the results demonstrated in Table 3. The total site area is 0.92ha, however the new proposed slip road for site access hasn't been included in the catchment assessment as it is intended to drain into the existing highway drains. A full catchment plan along with a levels plan of the site has been made available in Appendix E as previously mentioned.

Catchment Assessment	
Type of Land	Associate Area m ² (Ha)
Paved Impermeable Area	5308.6 (0.53)
Garden & landscaped area	1171.1 (0.12)
Highway Junction and Site Access	2748.2 (0.27)

Table 3: Catchment Assessment on Proposed Development

5.2 Urban Creep

Urban Creep is not a statutory requirement, however, to account for future increases in impermeable area through the development of extensions and/or alterations to habitable dwellings an increase of 10% is usually applied to associated roof areas. However, as this development is for the construction of a bio-methane fuelling station, no expansion is proposed or expected, nor is there any space in the land ownership to extend the site further. Therefore, urban creep isn't to be applied.

5.3 Climate Change

Climate Change projections indicate that worsening rainfall events are to occur over the next few decades. These effects are becoming more prominent and speeding up in development. To account for the effects of climate change in accordance with guidance outlined by the Environment Agency an uplift allowance of 40% has been added to the 100-year return period to increase the worst-case scenario for the design of the drainage network.

5.4 Proposed Runoff Rates

Runoff calculations have been provided in Appendix F and have been completed using the IH124 method via the UK SuDS HR Wallingford online portal. The proposed greenfield runoff rates have been calculated from 0.74 Ha as this is the area within the redline boundary that is currently not being captured by highway gullies into their separate system. Below in Table 4 is a summary of the results.

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Peak Rate of Runoff (l/s) Assessment		
Return Period	Greenfield	Proposed Rate
Q1	2.69	3.24
QBAR	3.24	3.24
Q30	6.48	3.24
Q100	8.33	3.24

Table 4: Surface Water Rate of Runoff Results – Entire Development

As can be seen in Table 4, the proposed rate has been restricted to the Greenfield QBAR runoff rate, with proposed runoff rates being less than greenfield runoff rates for any return period greater than QBAR.

5.5 SuDS Hierarchy

All surface water drainage designs are to follow the SuDS Hierarchy outlined within the SuDS Manual. This hierarchy requires the designer to attempt infiltration methods, prior to proposing disposal to a watercourse. If the above two are not possible then consideration can be made to the disposal of surface water to the public sewer network. However, a connection to a dedicated sewer (i.e. surface water or foul) should always be sought in preference to the connection of a combined sewer.

As previously mentioned in section 2.3, soakaways have been found unviable on this site and therefore, following the SuDS hierarchy, a connection to Sketchley Brook previously mentioned in section 2.2 has been sought.

5.6 Design Parameters

The following design parameters have been utilised within the drainage model;

- Simulations have been set to analyse in 1 in 5 year return period, 1 in 30 and 1 in 100 + 40% climate change.
- Storm durations have been capped at 1440 minutes as the worst case storm scenario was 480 minutes.
- CV values are set at industry standard 0.75 for summer and 0.84 for winter.
- The calculations use the most recent FEH-13 rainfall data for the analysis.
- The restricted discharge rate for the site has been set at QBAR (3.2l/s)

5.7 Surface Water Drainage Proposals

Based on the above assessment the following SuDS techniques are proposed:

- Geocellular Storage Tanks & Restricted Run-Off Discharge (Flow Control Chamber)
- Full Retention Oil Separator

The SuDS have been sized to contain a future 1% AEP event of critical duration with future climate change (40%) accounted for. Although much of the areas housing the plant don't need to be positively drained as the granular finish will act similar to that pre-development, it has still been included in the drainage catchment areas for conservative design. The hydraulic calculations and proposed drainage layout are included in Appendix G & H respectively.

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It is proposed that the entirety of the sites paved impermeable area runoff is to be drained via rainwater gullies and channel drainage which is then passed through a Full Retention Separator prior to being stored within a geocellular attenuation tank under a parking bay south east of the fuelling stations forecourt. The geocellular attenuation tank is proposed to be a double stack of geocellular crates (800mm deep) with a total storage volume of 212m³. The water then flows into a flow control chamber housing a pumping water east to a manhole located adjacent to Sketchley Brook before discharging into the Brook.

As the site is currently a greenfield site proposed for development it is a statutory requirement that off-site runoff is restricted so that discharge rates do not exceed pre-development greenfield runoff rates for any storm duration. Due to this, the pump is set to a fixed rate of 3.2 l/s set by the Greenfield QBAR rate as previously mentioned in section 5.4.

5.8 Exceedance Routing

The drainage model has been designed as to store a 100-year return period, plus the effects of climate change utilising overland storage within the forecourt. In this case, SW10 will allow exceedance flows to exit via heavy duty grated gully lids as shown in Figure 11, where flood water will pond on the forecourt until the storm subsides. The forecourt can contain 155m³ of additional overland storage which has the capacity to contain the 1 in 100 year + 40% climate change event. An overland storage drawing which models this has been made available in Appendix I. In the rare case that a storm of greater severity occurs, water will breach the kerb south west of the site and disperse over the neighbouring fields.



DGHTOD6/4545/KU

Unite D400 3 flange gully grate 450mm x 450mm clear opening with 150mm frame depth



Figure 11: Proposed Gully lid

The Gully lid specified in Figure 11 fully complies with BS EN 124:2015, has up to a 1,440cm² waterway area and can be used in a group class 3 D400 carriageway environment.

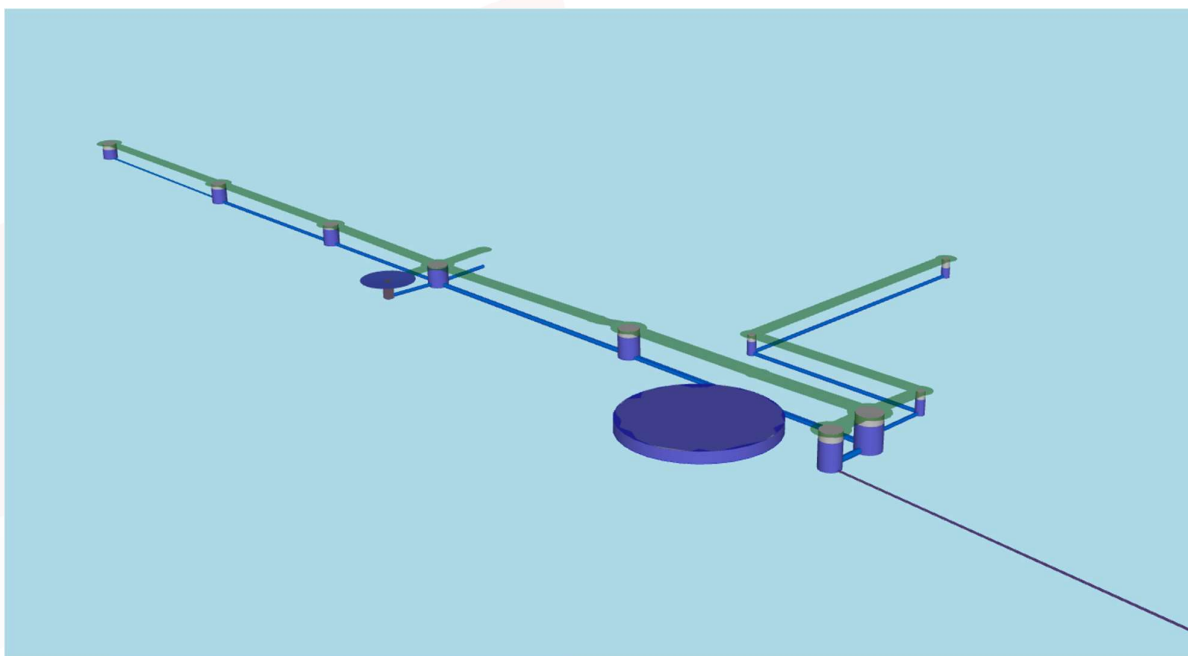


Figure 12: Extract of Causeway Flow Drainage Model

As can be seen from Figure 12, the flooding occurs at SW10 (the specified gully's) in which water will pond within the confines of the forecourt before the storm subsides.

5.9 Treatment Processes

Treatment of the surface water run-off from the development has been completed in accordance with the Simple Index method outlined within the SuDS Manual. As per Section 5.7, the proposed drainage methods have been shown below against the proposed development usage to indicate adequate treatment has been provided.

SuDS Simple Index Method			
Pollution Hazard	TSS	Metals	Hydro-Carbons
Medium	0.7	0.6	0.7
SuDS	TSS	Metals	Hydro-Carbons
SPEL ESR Puraceptor	0.8	0.6	0.99
Total	1.05	0.9	1.29

Table 5: SuDS Simple Index Method

A copy of our Simple Index Method calculations has been provided in Appendix J.

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6 CONCLUSIONS

- The site is approximately 0.92ha and is located south of the A5 in Hinckley. The site currently comprises of undeveloped greenfield grass land and is generally flat with average elevations of 89.2mAOD and 88.5mAOD.
- The proposed development is classed as a major development and according to the NPPF's PPG as a bio-fuelling station the site is classed as less vulnerable to flood risk. Less vulnerable developments are deemed acceptable in Flood Zone 2.
- The site is at a medium risk to groundwater vulnerability and the site is not in a source protection zone.
- The site is mainly located within Flood Zone 1 and is partially occupied by Flood Zone 2 towards the south east site boundary. It borders a low to medium risk of flooding from surface water and a medium risk from fluvial flooding.
- Severn Trent sewer records show that there is a combined sewer and water main running parallel to the A5 on the closest and opposing sides respectively.
- Site investigation testing to BRE365 has concluded that infiltration methods aren't viable on this site and therefore following the SuDS hierarchy, discharge to the closest watercourse has been initially sought.
- It is proposed that the entirety of the sites paved impermeable area runoff is to be drained via rainwater gullies and channel drainage which is then passed through a Full Retention Separator prior to being stored within a geocellular attenuation tank under a parking bay south east of the fuelling stations forecourt. The water then continues to a flow control chamber housing a pump before discharging into Sketchley Brook south west of the site.
- The pump is restricted to a fixed QBAR Greenfield run-off rate of 3.2 l/s that is discharged into the Sketchley Brook.
- The site has been designed to store surface water on site for storm intensities of 1 in 5 year return period, 1 in 30 and 1 in 100 + 40% climate change. If a storm of greater severity does occur, water will exceed the site via breaching the kerb south west of the site before dissipating into the neighbouring field.
- All surface water drained from the forecourt gets treated through a SPEL Puraceptor complying with the simple index method before entering Sketchley Brook further east of the site.

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7 REFERENCES

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