

Steeping River

Environmental and agricultural baseline

2025



Contents

1.	Introduction	5
1.1	Aim and purpose of this document	5
1.2	Usage statement	5
1.3	Catchment context	5
2.	Overview of legislation and policy context	9
2.1	Environment Act (2021)	9
2.2	Agriculture Act (2020)	9
2.3	Flood and Water Management Act (2010)	10
2.4	National Planning Policy Framework (NPPF)	10
2.5	Environmental Improvement Plan (EIP) (2023)	11
2.6	Summary of key legislation, policy and guidance	11
2.7	Local plans	14
3.	Methodology	16
3.1	Catchment study area	16
3.2	Limitations and Assumptions	17
4.	Catchment-scale baselines	19
4.1	Landscape	19
4.2	Agriculture	23
4.3	Ground conditions	30
4.4	Water environment	42
4.5	Biodiversity	52
4.6	Cultural heritage	67
4.7	Population and health	75
4.8	Air quality	87

Tables

Table 1: Summary of key environmental legislation and policy	11
Table 2: Glossary of landscape and land use terminology	19
Table 3: Glossary of agriculture terminology	23
Table 4: Overview of ALC classification within the catchment	24
Table 5: Estimated land use, crop areas and livestock populations on commercial agricultural holdings, 2021 data. Data provided by Collinson & Associates (Rounded to nearest decimal place)	27
Table 6: Glossary of ground conditions terminology	30
Table 7: Source Protection Zone definitions as per Groundwater source protection zones (SPZs) - GOV.UK [56]	31
Table 8: Summary of Bedrock Geology within the catchment	35
Table 9: Summary of the identified roddon hierarchy	38
Table 10: Summary of encountered Superficial Deposit aquifer designations within the catchment	38

Table 11: Summary of encountered Bedrock Geology aquifer designations within the catchment	39
Table 12: Glossary of water environment terminology	42
Table 13: Summary of WER/WFD surface water bodies within the study area and their latest Cycle 3 (2022) status classifications	47
Table 14: Summary of RNAG for waterbodies within the catchment	48
Table 15: WER/WFD Protected Areas present within the catchment	50
Table 16: WER/WFD groundwater body within the catchment and their latest Cycle 3 (2019) status classifications	51
Table 17: Glossary of biodiversity terminology	52
Table 18: Designated Sites within the catchment	54
Table 19: Habitat types identified within the catchment	58
Table 20: Key species within the catchment	64
Table 21: Overview of IUCN Global Red List species identified within the catchment	66
Table 22: Glossary of cultural heritage terminology	67
Table 23: Glossary of population and health terminology	75
Table 24: LSOAs and MSOAs which intersect with the catchment boundary	78
Table 25: Population Density by LSOA Area (2021)	79
Table 26: Age Structure by MSOA area	80
Table 27: Glossary of air quality terminology	87

1. Introduction

1.1 Aim and purpose of this document

This document presents a catchment-scale environmental and agricultural baseline for the Steeping River catchment. It is intended to support future choices, investments and actions for the Fens2100+ programme (hereafter referred to as the “Fens 2100+”). The environmental and agricultural baseline covers the following disciplines:

- Landscape
- Agriculture
- Ground conditions (soils and resources)
- Water Environment
- Biodiversity
- Cultural Heritage
- Population and Health
- Air Quality

1.2 Usage statement

This document should be read alongside the Steeping River baseline evidence report and is intended to provide a strategic environmental and agricultural baseline which will inform the development of a future Sustainability Appraisal for the Fens 2100+. This document provides a proportionate level of detail required for a strategic catchment-scale baseline and excludes a detailed baseline analysis that may be required at project level to align with the Environment Agency’s Minimum Technical Requirements or Environmental Impact Assessment. An assessment of potential effects or impact(s) and their significance has not been provided.

1.3 Catchment context

The Steeping River catchment (hereafter referred to as “the catchment”¹) covers 63km² (6,300ha) of east Lincolnshire, located at the far north-east of the Fens 2100+ study area. It spans from the base of the chalk hills of the Lincolnshire Wolds, to the Lincolnshire Marshes, where it outfalls at Burgh Sluice into The Wash near Gibraltar Point.

The Environment Agency have permissive powers to carry out flood and coastal risk management activities on Main Rivers as well as certain non-Main Rivers known as critical ordinary watercourses. In addition, the Environment Agency are responsible for producing a national strategy for Flood and Coastal Erosion Risk Management (FCERM). The latest strategy published in 2020 contains ‘Measure 1.5.4’. This

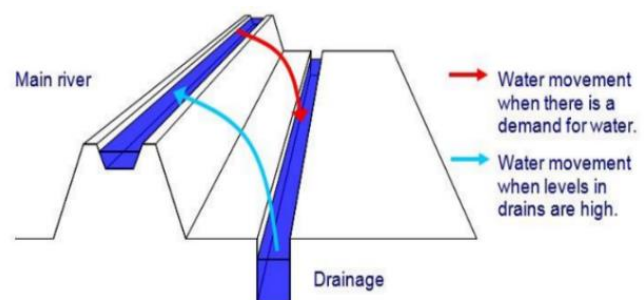


Figure 1: Schematic of a water-level dependent environment such as the lower River Steeping. Image taken from the Environment Agency Steeping, Great Eau & Long Eau Abstraction Licensing Strategy [53].

¹ The Steeping River catchment is not strictly a hydrological catchment as there are movements of water both into and out of the area defined, that are not being considered in this report. However, the term ‘catchment’ has been used throughout the dialogue with the Environment Agency during establishment of the study areas and these areas are being defined for water management purposes. Therefore, the term catchment is used to describe the study area.

requires development of a long-term plan for managing future flood risk in the Fens. Ordinary watercourses are regulated by Internal Drainage Boards (IDBs) and the Lead Local Flood Authority (LLFA), which is Lincolnshire County Council for the catchment.

Lindsey Marsh Drainage Board play a vital role in managing water levels and drainage across the catchment for agricultural and environmental purposes. They seek to maintain and, if possible, enhance biodiversity through implementation of their Biodiversity Action Plan (2010). They are responsible for managing the complex network of drains that feed into Main Rivers by pumps, as shown in Figure 1. They also regulate water levels on non-Main Rivers (ordinary watercourses).

Lindsey Marsh Drainage Board own and are responsible for managing water levels within the network of subsidiary drains that discharge into the Steeping River by pumps. Both organisations have a complicated task of managing flood risk whilst balancing agricultural water demands e.g. for irrigation and maintaining water supply rights to nature reserves.

The catchment lies only slightly above sea level (approximately 3m above ordnance datum (AOD)) with a wide coastal plain partially consisting of drained salt marsh and priority habitats including coastal and floodplain grazing marsh and coastal saltmarsh. It is a highly productive agricultural area with approximately one-third of the land classified as Grade 1 agricultural land.

The land-use within the catchment is primarily agricultural with areas to the north of the catchment utilised for grazing and keeping of livestock. Field patterns decrease in size in the north of the catchment, where more intact hedgerows and blocks of woodlands are present. The southern catchment surrounding The Wash, the largest estuarine system in the UK, is predominately under arable agriculture. Presence of irrigation reservoirs (over 1ha) in this area supports higher value cropping. Between The Wash and Skegness lies Lincolnshire Wildlife Trust Gibraltar Point National Nature Reserve (NNR). This site is recognised nationally and internationally for its species and habitats. Other key land uses are summarised below.

1.3.1 Settlements

Key settlements include the historic port market town of Wainfleet All Saints, located near the western catchment boundary, and directly south of Wainfleet All Saints, separated by the Steeping River is the village Wainfleet St Mary (shown in Figure 2). There are several other linear settlements spread along minor roads and lanes across the catchment.



Figure 2: Aerial image of Wainfleet St Mary © Chris and licensed for reuse under Creative Commons Licence.

1.3.2 Access and connectivity

The main arterial roads include the A52, which runs south-west to north-east through the catchment and provides access to the region's major road network, and the A158 which runs parallel to the east of the catchment connecting to Lincoln. Figure 4 illustrates the spatial distribution of transport and access routes in the catchment.

- There are railway links with stations at Thorpe Culvert and Wainfleet. The East Midlands rail line runs south along the western boundary of the catchment.



Figure 3: Railway crossing and sluice of the Wainfleet Relief Channel © Sam Hazell

- There are no National Cycle routes or National Trails in the catchment.
- The King Charles III England Coast Path National Trail starts in Skegness, located 2km from the eastern boundary of the catchment and is currently under construction south of Gibraltar Point.

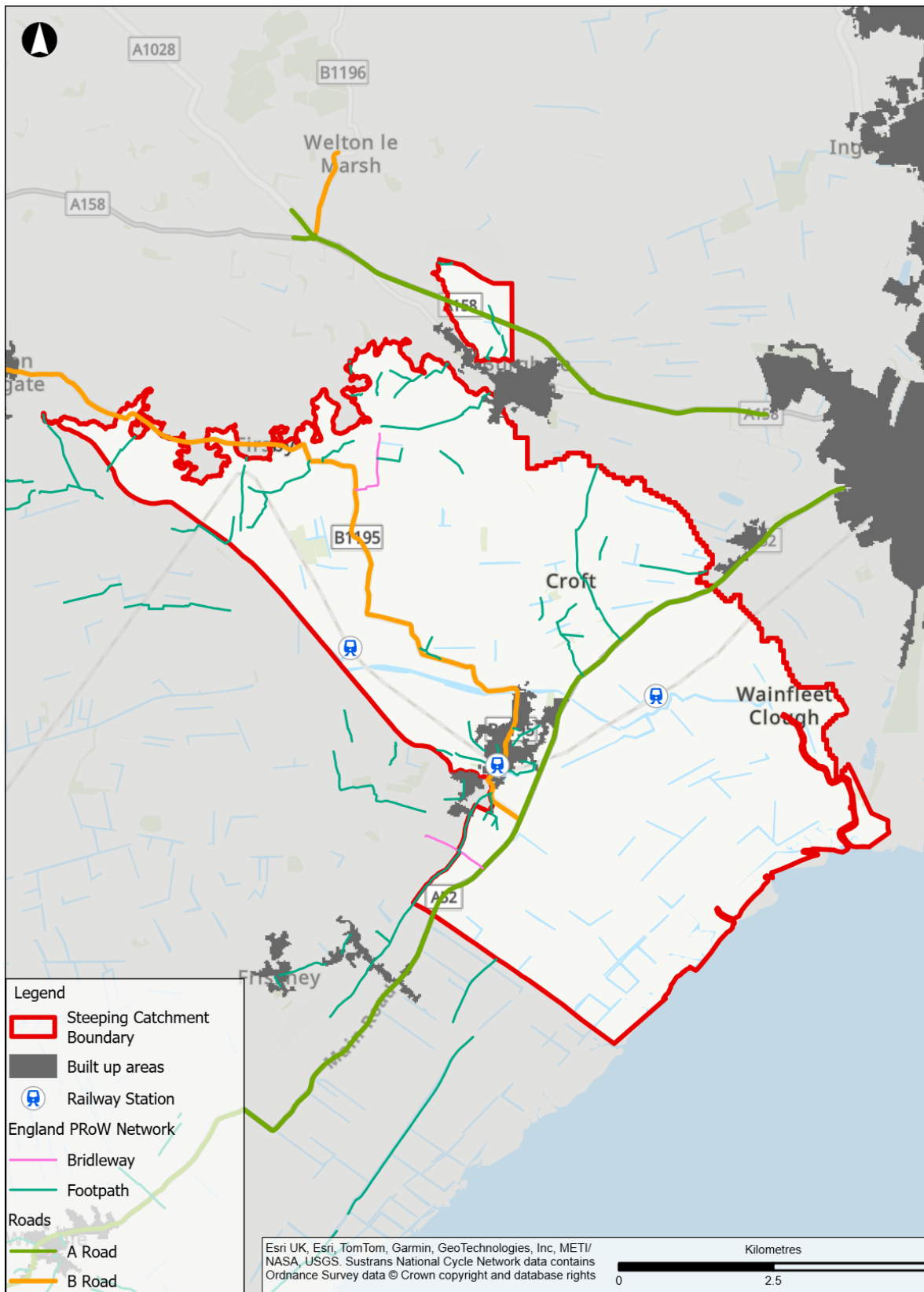


Figure 4: Local transport and access routes

1.3.3 Renewable energy infrastructure

In common with other areas across the Cambridgeshire and Lincolnshire Fens, landowners across catchment have diversified to invest in renewable energy projects. Around 1km² (100ha) of the catchment is also used for or has planning permission for renewable energy production. Notable projects include:

- The Hollies Solar Park (8.6 MW) - a farm diversification project with solar PV and two wind turbines;
- Lincoln Farm Solar Park (11.4 MW);
- Manor Farm Solar Park (in construction – expected capacity of 22 MW); and
- White House Farm anaerobic digestion (AD) plant.

1.3.4 Tourism

A number of holiday parks comprising a mix of caravan and camping sites, some of which also host fishing ponds/lakes are located across the north and north-east of the catchment towards Skegness. These include farm diversification projects, such as at The Hollies Windfarm Park, and purpose-built holiday parks, such as Rivulet Leisure Park.

Gibraltar Point, a 4.4km² (440ha) Natural Nature Reserve (NNR), managed by the Lincolnshire Wildlife Trust, is located in the south-eastern corner of the catchment (Figure 5). One of the earliest of Britain's official Bird Observatories, the reserve includes a visitor centre, café and bird hides, with walkways and cycle tracks throughout.



Figure 5: Gibraltar Point © Rob Farrow and licensed for reuse under Creative Commons Licence.

2. Overview of legislation and policy context

This section presents an overview of the legislative and planning policy that may be applicable to any future Flood and Coastal Erosion Risk Management (FCERM) intervention or project within the catchment. This includes national, regional and local policy which has been considered across the disciplines included within this document. A detailed baseline analysis that may be required at project level to align with the Environment Agency's Minimum Technical Requirements or Environmental Impact Assessment.

2.1 Environment Act (2021)

The Environment Bill became an Act [1] (law) in November 2021, amending the Environment Act 1995 [2]. The Act provides targets and policy for improving the natural environment in relation to air quality, restoring natural habitats, increasing biodiversity, reducing waste and making better use of resources. Key aspects of the Environment Act 2021 which are relevant to the Fens 2100+ include but are not limited to:

- Provisions that require that at least a 10% net gain for biodiversity be demonstrated through a Biodiversity Net Gain assessment (using Defra's Statutory Biodiversity Metric);
- A new mandatory system of spatial strategies for nature through Local Nature Recovery Strategies (LNRS); designed as tools to encourage more coordinated practical and focused action and investment in nature;
- Measures to support new and existing internal drainage boards (amending the Land Drainage Act 1991);
- Effective collaboration between water companies through statutory water management plans; and
- Requirement for local authorities to report to Defra on local air quality and local air quality management within their local authority area. This also requires an assessment of compliance against the relevant air quality standards.

2.2 Agriculture Act (2020)

The Agriculture Act for England [3], represents a significant shift in agricultural policy post-Brexit. This legislation aims to reward farmers and land managers for delivering "public goods" such as improved air and water quality, thriving wildlife, and measures to tackle climate change. The Bill includes measures to phase out the Basic Payment Scheme (BPS) by 2028, which is proceeding as planned.

Key features of the bill include:

- Environmental Land Management Scheme: Farmers will be incentivised to provide environmental goods and services alongside food production. The proposed schemes are:
 - the Sustainable Farming Incentive (SFI) will pay farmers to adopt and maintain sustainable farming practices that can protect and enhance the natural environment alongside food production, and also support farm productivity;
 - Countryside Stewardship (CS) will pay for more targeted actions relating to specific locations, features and habitats. There will be an extra incentive through CS Plus for land managers to join up across local areas to deliver bigger and better results; and

- Landscape Recovery will pay for bespoke, longer-term, larger scale projects to enhance the natural environment.
- Transition Period: A seven-year transition period to move away from the EU's Basic Payment Scheme (BPS), which primarily rewarded the amount of land farmed, towards a system that rewards environmental benefits. This includes the phase out of the BPS by 2028, which is proceeding as planned. In 2024, the payments are for the first time delinked from land, meaning that farmers who were farming before 2024 will continue to receive the remainder of BPS through to 2027, even if they stop farming or dispose of land. These changes mean there will be a push towards farming being profitable at global market prices by 2028; and
- Support for Innovation: Investments in new technology and research to boost productivity and sustainability in farming.

2.3 Flood and Water Management Act (2010)

The Flood and Water Management Act 2010 [4] is a significant piece of legislation in the UK aimed at improving the management of flood risk and water resources. Key aspects of this legislation include:

- Risk Management Authorities: The Act designates various authorities, including the Environment Agency, Lead Local Flood Authorities (LLFAs), and Internal Drainage Boards (IDBs), with specific responsibilities for managing flood risks;
- Partnership and Cooperation: It emphasises the need for these authorities to work in partnership and share information to effectively manage flood risks;
- Sustainable Drainage Systems (SuDS): The Act promotes the use of sustainable drainage systems to manage surface water and reduce flood risk;
- Flood Risk Management Strategies: Authorities are required to develop and implement strategies for managing flood risks, including mapping and assessing flood risks;
- Reservoir Safety: The Act includes provisions to improve the safety of reservoirs, ensuring they are regularly inspected and maintained; and
- Powers and Duties: It grants new powers to authorities to carry out works to manage flood risks and imposes duties on them to maintain a register of structures or features that affect flood risk.

2.4 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) [5] sets out the Government's planning policies for England and how these should be applied. It was last updated in December 2024. It aims to achieve sustainable development through a balanced approach that considers economic, social, and environmental objectives. Key aspects of Sustainable Development in the NPPF include:

- Growth and Innovation: Ensuring sufficient land is available to support economic growth, innovation, and productivity;
- Infrastructure: Coordinating the provision of infrastructure to support development;
- Housing: Providing a sufficient number and range of homes to meet the needs of present and future generations;

- Community Well-being: Fostering well-designed, safe, and accessible places that support health, social, and cultural well-being;
- Natural and Built Environment: Protecting and enhancing natural, built, and historic environments;
- Resource Efficiency: Using natural resources prudently, minimising waste and pollution, and mitigating climate change impacts; and
- Meeting the challenge of climate change, flooding and coastal change: Supporting measures that ensure the future health and resilience of communities and infrastructure to climate change impacts, including flooding.

2.5 Environmental Improvement Plan (EIP) (2023)

The Environmental Improvement Plan for England (EIP) [6] details how the Government will work with communities and businesses to improve the environment compared to its current state. It is the first revision of the 25 Year Environment Plan (25YEP), providing interim targets to measure progress for improving the environment. Key aspects of the plan which are relevant to the Fens 2100+ include but are not limited to:

- Supporting the management of 70% of the countryside to adopt nature friendly land management practices by incentivising farmers;
- Updating a Green Finance Strategy setting out steps to leverage private finance to deliver the goals of the 25YEP;
- Deliver investment plan to improve coastal and flood defences, including £100 million on the most frequently flooded areas; and
- Reward farmers for actions to reduce risks and impacts from floods, droughts, and wildfires through our new future farming schemes.

2.6 Summary of key legislation, policy and guidance

A wide range of legislation is relevant to the different aspects of the environment and agriculture for Fens 2100+. Table 1 presents a summary of the relevant key legislation, policy and guidance. This summary is not intended to be exhaustive and should be reviewed as part of any future interventions or projects.

Table 1: Summary of key environmental legislation and policy

Topic	Relevant Legislation, Policy and Guidance	Summary
Landscape	Guidelines for Landscape and Visual Impact Assessment [7]	Protection of landscape character and quality and the creation of Green Infrastructure.
	The European Landscape Convention (2006) [8]	
Agriculture	Autumn Budget 2024 [9]	The changes to Agricultural Property Relief (APR) and Business Property Relief (BPR) were announced in the Autumn Budget 2024. APR will be extended to include land managed under environmental agreements with the UK government, devolved governments, public bodies, local authorities, or

		approved responsible bodies. The 100% relief rate for APR and BPR will apply only up to a combined allowance of £1 million. These changes will be legislated in the Finance Bill 2024-25.
Ground Conditions	Safeguarding our Soils - A strategy for England (2009) [10]	Protect best quality soils and agricultural land as well as the protection and restoration of peatland habitat.
	England Peat Action Plan [11]	
	Greater Lincolnshire Nature Partnership – Geodiversity Strategy (GLNP) [12]	
Water Environment	The Environment (Amendment etc.) (EU Exit) Regulations 2020 [13]	The key objectives of these acts/policies are to reduce and manage flood risk, improve water quality (so all water bodies achieve ‘Good status’ as set out in the Water Environment Regulations), prevent or limit groundwater pollution and promote the efficient use of water.
	Environmental Protection Act 1990 [14]	
	Water Resources Act 1991 [15]	
	The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WFD) [16]	
	Land Drainage Act 1991 [17]	
	Water Act 2014 [18]	
	Water Resources (Abstraction and Impounding) Regulations 2006 [19]	
	Flood Risk Regulations 2009 [20]	
	Nitrate Pollution Prevention Regulations 2015 (as amended) [21]	
Biodiversity	The Conservation of Species and Habitat Regulations 2017 [22]	These pieces of legislation state the offences relating to protected species and the requirements for licenses to allow any damaging works to proceed. Specific actions which are prohibited by legislation can be made lawful on the approval and granting of a derogation license from Natural England (NE) and, or assent can be applied for when works are proposed within Special Site of Scientific Interest (SSSI) that could damage the interest features, or specific conditions are stated. In addition, the Habitats Regulations set out the requirement for the consideration of the potential effects of a plan or project upon European Sites
	Wildlife and Countryside Act 1981 (as amended) (WCA) [23]	
	Natural Environment and Rural Communities (NERC) Act 2006 [24]	
	The Countryside and Rights of Way Act 2000 [25]	
	The Hedgerows Regulations 1997 [26]	
	Protection of Badgers Act 1992 [27]	

	The Salmon and Freshwater Fisheries Act 1975 [28]	through the Habitats Regulations Assessment (HRA) process.
	The Eels (England and Wales) Regulations 2009 [29]	
	The Invasive Alien Species (Enforcement and Permitting) Order 2019 [30]	
Cultural Heritage	Ancient Monuments and Archaeological Areas Act (1979) [31]	Protect nationally important archaeological remains, historic buildings, historic landscape features and remains of military aircraft and vessels that have crashed, sunk or been stranded and of associated human remains
	Planning (Listed Buildings and Conservation Areas) Act (1990) [32]	
	Protection of Military Remains Act (1986) [33]	
	Hedgerows Regulations (1997) [34]	
	Treasure Act (1996) [35]	
Population and Health	Countryside and Rights of Way Act (2000) [25]	Promote sustainable and healthy communities and social inclusion and community participation. The policies and guidance encourage a 'whole system' approach to engaging planning and environmental agencies in support of health, well-being and social care provision.
	Health and Social Care Act (2012) [36]	
	Lincolnshire Joint Strategic Needs Assessment [37]	
	Lincolnshire Joint Health and Wellbeing Strategy [38]	
Air Quality	Air Quality Standards Regulations 2010 (amended in 2016) [39]	Defines the policy framework for twelve air pollutants known to have harmful effects on human health or the natural environment. The Secretary of State for the Environment has the duty of ensuring compliance with the air quality limit values. The regulation sets out the national air quality standards for NO ₂ , PM ₁₀ and PM _{2.5} . It also provides guidance on how air quality should be considered to comply with the NPPF.
	Planning Practice Guidance (PPG) 2014 [40]	
	Defra Clean Air Strategy 2019 [41]	

2.7 Local plans

2.7.1 East Lindsey Local Plan

The East Lindsey District Council Local Plan (Core Strategy) (adopted 2018) covers the entirety of the catchment (Figure 6). The Local Plan sets out the vision and strategic priorities for the District.

Chapters 9 and 10 of the local plan relates to inland flood risk and coastal East Lindsey respectively and are considered key aspects of the local plan for the Fens 2100+ project. Similarly, chapter 12 'Protecting and enhancing our natural environment' is a key consideration for the environment and agriculture in the Steeping.

The Local Plan identifies 29 Strategic Policies to support implementation. The following policies are considered key to the environment and agriculture in the Steeping:

- Strategic Policy 16 - Inland Flood Risk: outlines support for development that demonstrates an integrated approach to sustainable drainage and developments that seek to improve existing, or create new, flood defences;
- Strategic Policy 23 – Landscape: outlines the requirement to protect, enhance and manage an attractive and healthy working and living environment and also recognises the importance of access to the countryside and protection of distinctive character;
- Strategic Policy 24 - Biodiversity and Geodiversity: outlines the requirement for development to protect and enhance the biodiversity and geodiversity value of land and to minimise fragmentation. The policy also recognises the importance of linking up newly created habitats; and the value of ancient woodland and aged or veteran trees; and
- Strategic Policy 25 – Green Infrastructure: outlines the requirement to safeguard and deliver a network of accessible green infrastructure and recognises the importance of identifying new accessible green spaces and connecting into existing green infrastructure.

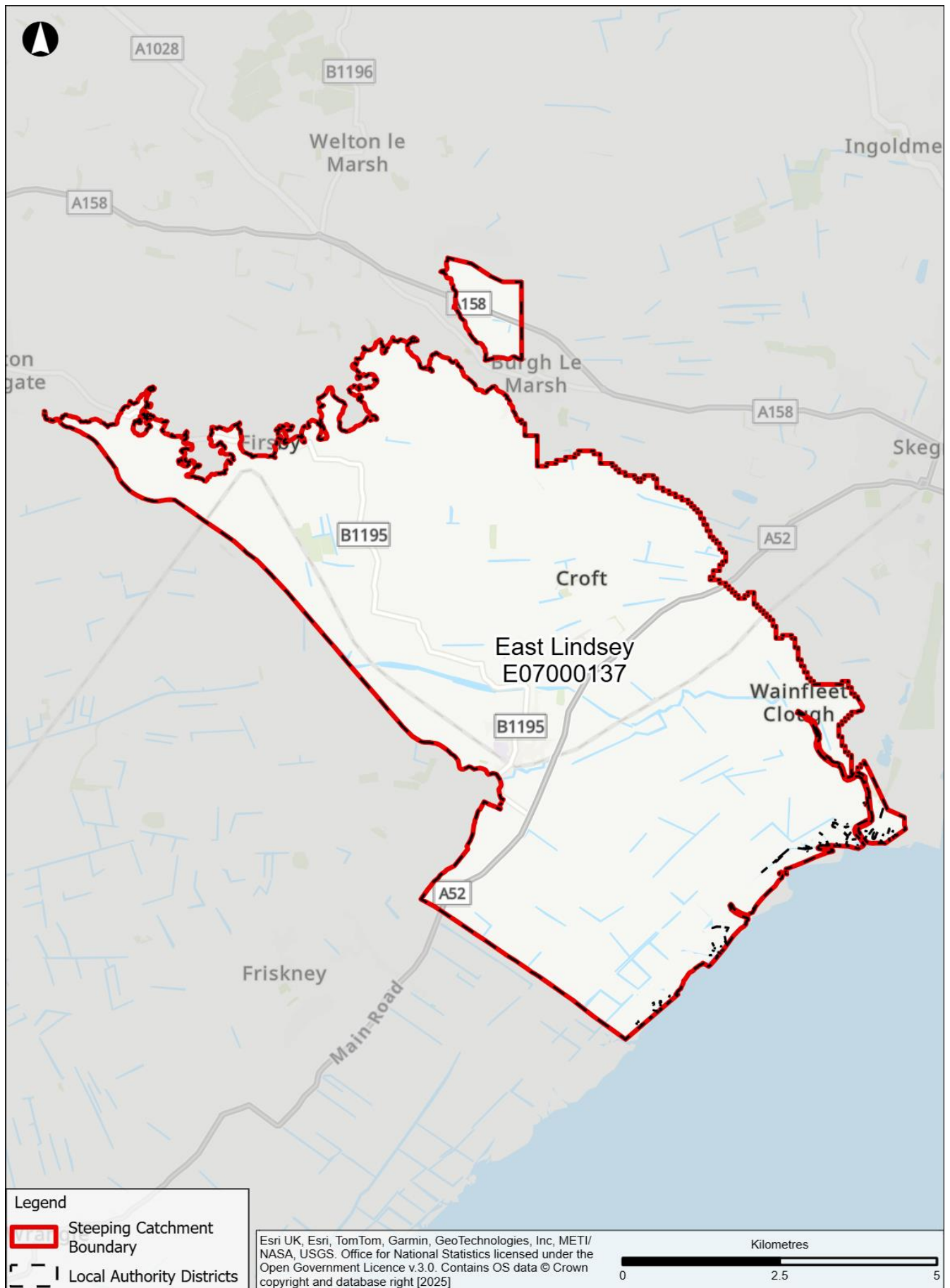


Figure 6: Local Authority boundaries within the catchment

3. Methodology

This section presents an overview of the methodology used to develop the catchment-scale environmental and agricultural baseline. It has been produced using a desk-based review of publicly available information from a variety of sources.

3.1 Catchment study area

Figure 7 presents an overview of the study area used for the Steeping River catchment environmental and agricultural baseline. The red line boundary of the study area includes a land parcel to the northeast where it is understood that water is transferred from this land parcel into the main catchment and then flows to the Steeping River.

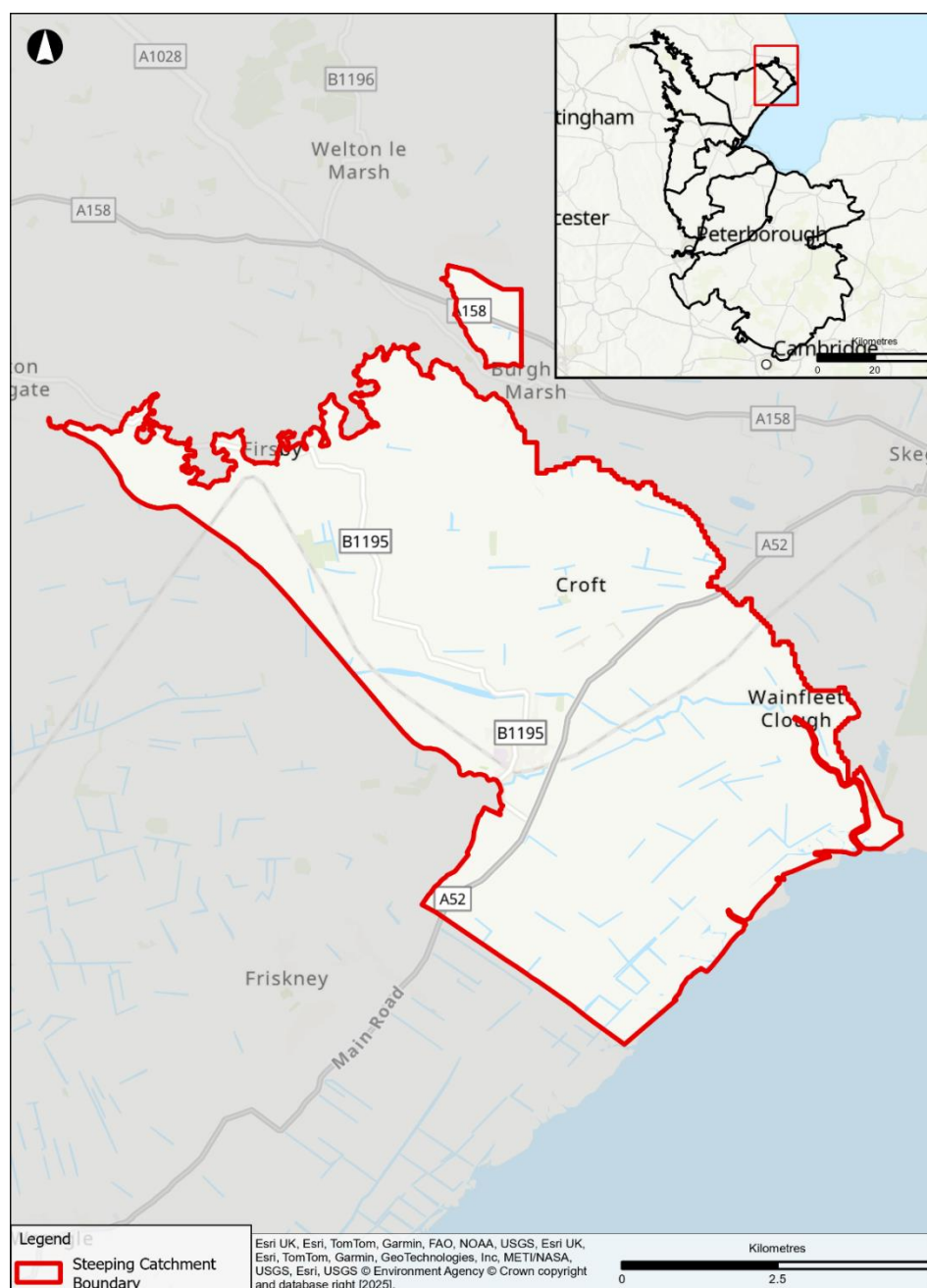


Figure 7: Steeping River catchment study area

3.2 Limitations and Assumptions

The following limitations and assumptions have been made in the production of this catchment-scale baseline report:

- The baseline collated comprises a proportionate level of detail from publicly available data sources and it is reported at the geographical basis relevant to the data availability. Therefore, this report reviews and provides commentary of existing reports written by others. Arup accept no responsibility for any error or omission in this report which is due to an error or omission in the original documentation we refer to. Arup have not independently verified the information and have assumed it to be accurate, complete, reliable, and current as of the date of such information;
- This baseline assessment has not been informed or verified by any field surveys or site visits conducted by Arup;
- Due to the strategic nature of this baseline report, engagement and consultation with external stakeholders or statutory consultees has not been undertaken to inform this report;
- This baseline assessment is currently limited to the catchment boundary that has been defined for the Fens 2100+ project by the Environment Agency. It should be noted that the zone of influence for any future interventions or projects as part of Fens 2100+ may extend beyond the study area identified in Figure 7; and
- Arup has used publicly available data to undertake a review of baseline conditions throughout the study area.

The following limitations and assumptions apply to the individual environmental and agricultural baseline chapters presented in this document:

- Landscape:
 - The landscape baseline excludes discussion on the significance of landscape and visual considerations.
- Agriculture
 - The agricultural baseline is based on the official data available which is produced at district level. There is no official data boundary that matches the catchment study area. Data reported within this baseline has been sense-checked against other sources such as published satellite data and been informed by local sector knowledge, to ensure that the estimates are as robust as possible.
 - As publicly available satellite derived data on land cover (and crops) improves over the next 5 years, the ability to analyse agricultural data at small spatial levels will improve. However, agricultural cropping is also subject to larger year to year variations, often due to extreme weather events, or longer-term changes in the market. Therefore, even if detailed data was available, e.g. for the 2023-2024 crop year, this would need to be treated with caution and averaged with other years.
 - The greenhouse and controlled environment agriculture data resolution is poor at national as well as regional levels, as Defra withdrew from collecting this data in the early 2010s. This baseline therefore uses the limited Defra data to sense-check local knowledge of the larger greenhouse units. The output per hectare in this sector is also extremely variable from crop to crop and farm to farm. The approach taken was to use conservative averages derived from Defra national data and to check this against feedback from individual growers undertaken by Collison and Associates.
 - The main additional assumption is that farms in the catchments do not, on average,

deviate much from regional and national averages of output for the enterprises they run. This is the only practicable way to produce the data, as individual farm level data is not available or published by any source. Our working assumption is that, given the higher productivity in general of the Fens that this produces a conservative estimate of the true value of farm output in the Fens.

- Ground conditions:
 - This baseline does not provide a review of available ground investigation data (borehole data etc.) beyond those specifically outlined or comprise the development of a catchment level ground model. Further, this baseline excludes discussion on the significance of mineral safeguarding designations, their specific extents or resource volume capability.
- Water Environment:
 - The water environment baseline excludes in-depth discussion on Water Framework Directive / Water Environment Regulations. Reporting of all Water Environment Regulations baseline data or delivery of any preliminary compliance assessments has been excluded.
- Biodiversity:
 - The biodiversity baseline excludes discussion on non-statutory designated sites (e.g. Local Wildlife Sites and Roadside Nature Reserves). Records of protected and notable species from Local Environmental Records Centres or flora or fauna records have not been obtained at this stage.
- Cultural heritage:
 - The cultural heritage baseline excludes discussion on the significance of heritage assets, the assessment of impact(s), and a detailed baseline analysis which would identify non-designated heritage assets and specific areas of archaeological potential.
- Population and health:
 - The population and health baseline is based on the official data available which is published at different spatial boundaries. There is no official data boundary that matches the catchment study area. The baseline collated comprises a proportionate level of detail from publicly available data sources and it is reported at the geographical basis relevant to the data availability. Different classes of administrative unit each have their own datasets in terms of the geographical scale at which they operate and these have been used to inform the baseline:
 - Lower Layer Super Output Area (LSOAs)
 - Middle Layer Super Output Areas (MSOAs)
 - Lower Tier Local Authority areas
 - Upper Tier Local Authority Areas
- Air Quality:
 - The air quality baseline will exclude discussion on consideration of pollutants other than NO₂, NO_X, PM₁₀ and PM_{2.5}. No dispersion modelling has been carried out at this time.

4. Catchment-scale baselines

The following sections provide an overview of the environmental and agricultural baseline.

4.1 Landscape

This section outlines the baseline landscape characteristics for the catchment. Table 2 outlines the key terminology used in this section.

Table 2: Glossary of landscape and land use terminology

Terminology	Summary Definition
National Character Area	A National Character Area (NCA) is a natural subdivision of England based on landscape, biodiversity, geodiversity, and economic activity. Their boundaries follow natural lines in the landscape, not county or district boundaries. This makes them a good framework for decision-making and planning for future change [42].
Landscape Character Assessment	The process of identifying and describing the unique variations in the character of the landscape. It aims to explain the distinct combination of elements and features that make one landscape different from another [43].
Green and Blue Infrastructure	Refers to a strategic network of natural and semi-natural areas designed to deliver a wide range of environmental, social, and economic benefits.

4.1.1 Landscape character

National Character Area

Figure 8 provides an overview of the National Character Areas that intersect the catchment boundary.

The northern two-thirds of the catchment are located within National Character Area (NCA) 42 Lincolnshire Coast and Marshes [44]. The Lincolnshire Coast and Marshes is a low-lying, broad plain bounded largely by the North Sea to the east, the Lincolnshire Wolds to the west, the Humber Estuary to the north and the entrance to The Wash to the south. Marine processes strongly influence the physical and biological character of the NCA through sediment transfer.

There are long, wide coastal views across this NCA, and also out to adjoining areas such as the North Norfolk coast which can be seen from the south of the NCA.

Most settlement is concentrated on the coast, around Grimsby and the resorts of Skegness, Mablethorpe and Cleethorpes. The extensive caravan parks, particularly around Skegness, are very distinct from the rest of the area. Much of the remaining coast is undeveloped and is managed as nature reserves and is under agri-environment schemes – including Tetney Marshes, Donna Nook, Anderby Marsh and Gibraltar Point.

A complex series of rivers flow slowly east across the plain to the sea, some natural, some manmade, such as the many drains and ditches which combine to form important networks linking with other semi-natural habitats. Several rivers, such as the Great Eau, terminate as raised embanked water carriers. The rising sea levels, when combined with river flooding, can potentially cause major flood events in the low-lying areas and there is a need for combined action in coastal areas to address flood risk. Major flooding has occurred in the area and fluvial flooding is managed by a network of over 30 pumping stations across the NCA.

Statements of Environmental Opportunity (SEO) for the NCA have been identified by Natural

England² based on the unique characteristics and properties of the Lincolnshire Coast and Marshes. These priorities comprise the following:

- Safeguard, manage and enhance the dynamic coastal landscape of internationally and nationally important habitats including sand dunes, salt marsh, mudflats, etc. for the wildlife they support, to increase ecological resilience and the landscape's ability to mitigate flood risk and climate change;
- Conserve and enhance the historic features and settlement character of the dispersed rural villages and market towns. Encourage a strategic approach to land use planning to conserve and enhance the historic landscape and heritage features, encouraging initiatives which enhance green infrastructure links and manage the pressures of flood risk and climate change and do not contribute negatively to the character of the area;
- Ensure sustainable food production while enhancing and strengthening the network of farmland features; manage, expand, create and link habitats to benefit biodiversity, soil and water quality. Manage the rivers, water levels and the provision and quality of water in the whole catchment for human and ecological benefit; and
- Conserve and enhance the character of the traditional seaside resorts and the long sandy beaches which help to make the area an important tourist destination; improve opportunities to enhance people's enjoyment of the undeveloped areas along the wild coast, while protecting high levels of tranquillity and the extensive, open views.

The southern third of the catchment is located within NCA 46 The Fens [45]. The Fens is a distinctive, historic and human influenced wetland landscape lying to the west of The Wash estuary. The NCA is notable for its large-scale, flat, open topography with extensive vistas to level horizons. The level, open topography shapes the impression of huge skies which convey a strong sense of place, tranquillity and inspiration.

Vegetation cover largely comprises meadows, coastal and flood plain grazing marsh, purple moor-grass and rush pastures and sparse woodland. Given the flat and open landscape, new planting can introduce inappropriate and visually intrusive elements.

The NCA has a distinctive hierarchy of rivers, drains and ditches which strongly influences the dominant rectilinear/geometric landscape pattern which is a consistent feature of the area. The drainage infrastructure (including the network of drainage ditches, embankments and pumping stations) provides an evident reminder of the area's reclaimed past.

² Statements of Environmental Opportunity are developed by Natural England and reflect their opinion on how best to secure environmental gains within each NCA.

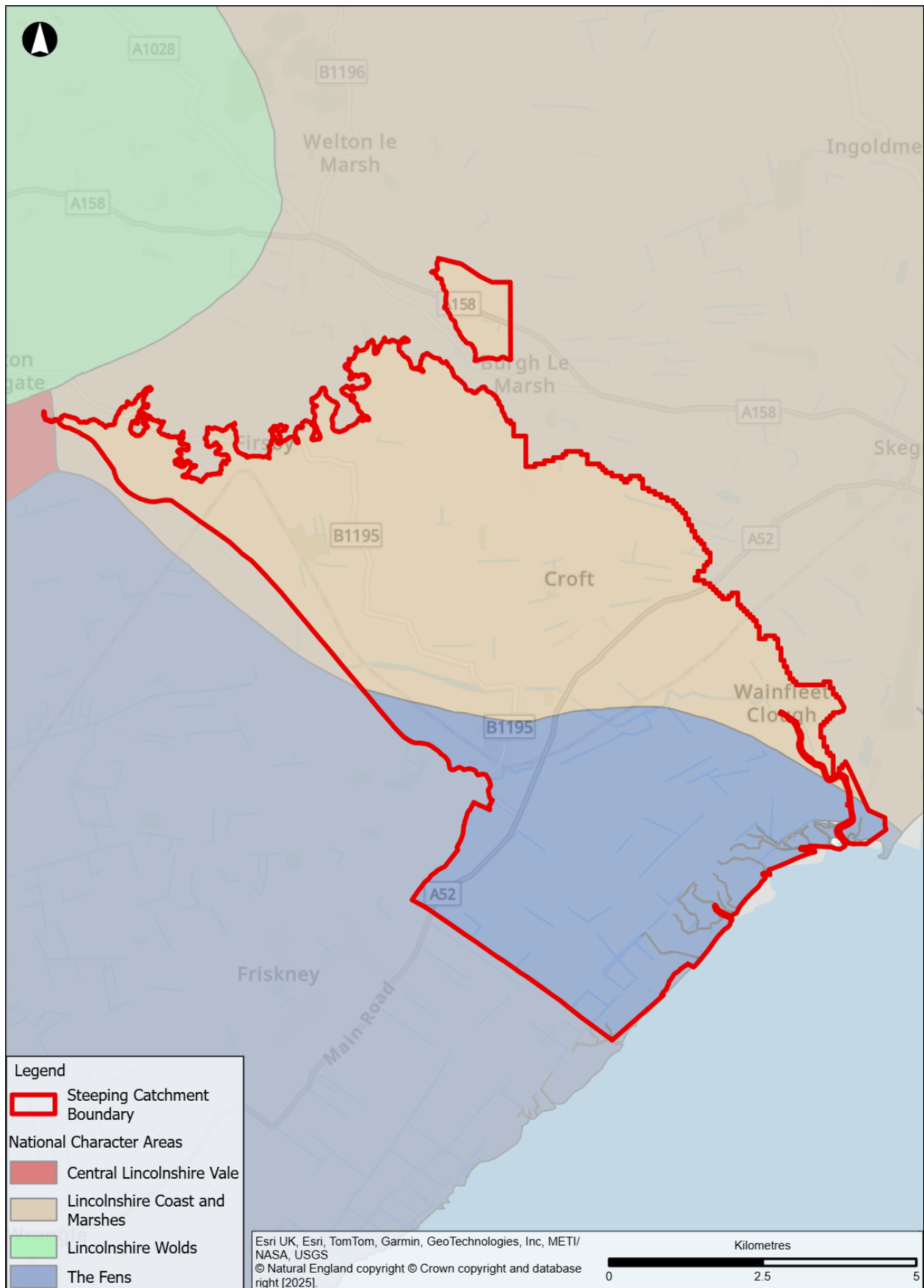


Figure 8: Overview of National Character Areas within the catchment

Landscape Character Assessment

East Lindsey District Council produced the East Lindsey Landscape Character Assessment in November 2011 [46] as part of the evidence informing the Local Development Framework (LDF) and is used as a material consideration when determining planning applications.

The catchment is spread across four-character zones defined by the study, but the majority of the area is located within Wainfleet Reclaimed Saltmarsh to the south and Tetney Lock to Skegness Coastal Outmarsh to the north and east.

Wainfleet Reclaimed Saltmarsh is an intensively farmed landscape on flat drained reclaimed saltmarsh, with limited hedgerow or woodland planting. It is sparsely populated with occasional farmsteads. Views are open with large skies and flat farmland. Tetney Lock to Skegness Coastal Outmarsh is a low lying, drained coastal plain contained to the east by sea embankments and sand dunes. Mixed use agricultural landscape with extensive network of drains and dykes.

4.1.2 Statutory designated landscapes

There are no statutory landscape designations (i.e. National Parks or National Landscapes³) within the catchment. The Lincolnshire Wolds National Landscape is located around 2km from the northern boundary of the catchment. There are no local landscape designations within the catchment.

Natural heritage and nature conservation designations can contribute to landscape character and landscape value outside of statutory and locally designated landscapes. Please see Section 4.5 Biodiversity and Section 4.6 Heritage for further information.

4.1.3 Green and blue infrastructure

Much of the catchment is covered by The Wash and Fens Green Infrastructure Plan [47] identifying plans to enhance access to green infrastructure, promote biodiversity and proposals for the creation of new habitat networks. The Plan includes habitat network maps that identify potential opportunities to create and enhance habitat networks across the catchment and wider Fens landscape.

Green Infrastructure mapping undertaken by Natural England [48] indicates that the catchment comprises sparse tree cover, however there are areas of accessible woodlands within the catchment, such as 0.55ha located in Thorpe Saint Peter.

The catchment falls within the boundary of the Greater Lincolnshire Local Nature Recovery Strategy [49] (LNRS) which is currently being developed to identify priorities and opportunities for nature recovery. This strategy will help map areas of existing high-quality habitats or areas of biodiversity, outline opportunities to recover or enhance biodiversity and identify local priorities to provide broader environmental benefits. The Greater Lincolnshire LNRS is part of Round 1 of the national rollout.

³ Following the government's Landscapes review of 2019, Areas of Outstanding Natural Beauty (AONB) became National Landscapes as of November 2023. A number of documents including legislation still refer to these as AONB. The statutory status of National Landscapes remains.

4.2 Agriculture

This section outlines the baseline agricultural land uses and productivity of the catchment. Table 3 outlines the key terminology used in this section.

Table 3: Glossary of agriculture terminology

Terminology	Summary Definition
Agricultural Land Classification	A system used in England and Wales to assess and compare the quality of agricultural land. It categorises land into five grades based on its versatility and suitability for growing crops.
Countryside Stewardship (CS)	Countryside Stewardship is part of ELMS and recently has undergone changes in what in funds. It provides financial incentives to farmers, foresters, and land managers to improve and protect the environment. CS Higher Tier will open in summer 2025.
Entry Level Stewardship (ELS)	An agri-environment scheme in England under the previous Common Agricultural Policy (CAP) that provided funding to farmers and land managers for delivering environmental management on their land this is now closed to new agreements.
Environmental Land Management Scheme (ELMS)	ELMS are part of the broader agricultural policy reforms in England, transitioning from the EU's Common Agricultural Policy (CAP). It provides financial incentives and support to landowners for making changes to their land that produce environmental benefits. These schemes aim to promote sustainable farming practices, enhance biodiversity, improve water and air quality, and contribute to climate change mitigation. There are currently three ELMS Schemes.
Gross Value Added	An economic productivity metric that measures the contribution of a corporate subsidiary, company, or municipality to an economy, producer, sector, or region.
Soilscape	A soilscape is a classification used to describe the broad regional differences in soil types and their distribution across a landscape. Soilscapes are helpful for understanding the general characteristics of soils in a region, including their carbon stock, which can inform land management, agricultural practices, and environmental conservation efforts.

4.2.1 Overview of soilscape within the catchment

Throughout the majority of the catchment, the land is soilscape 21 [50], *'Loamy⁴ and clayey soils of coastal flats with naturally high groundwater'*, a soil with *'Lime-rich to moderate'* status. This soilscape, can support different cropping, *'Lighter soils support a wide range of crops and are highly productive as they contain much available water and are stoneless and flat. Heavier soils are less easily worked and favour grass'*.

There are also smaller areas of soilscape 1 *'Saltmarsh soils'* suitable for *'Extensive grazing only'* covering the whole of the catchment's component of The Wash SSSI, and a small part of the Gibraltar Point NNR, with Gibraltar point also having a small area (less than 1km²) of soilscape 4, *'Sand dune soils'* which are *'Not normally cropped'*.

In the north of the catchment around Firsby and Irby in the Marsh, the soil changes from soilscape 21, to soilscape 18 *'Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils'*. These soils are classified as *'Mostly suited to grass production for dairying or beef; some cereal production often for feed. Timeliness of stocking and fieldwork is important, and wet ground conditions should be avoided at the beginning and end of the growing season to avoid damage to*

⁴ Loamy soils are composed of a balanced mixture of sand, silt and clay, offering excellent nutrient retention and water-holding capacity. Its structure and fertility make it highly suitable for most plant species and agricultural applications.

soil structure. Land is tile drained and periodic moling or subsoiling will assist drainage'. This soil is less productive and more suited to grass due to its '*Impeded drainage*'.

To the south of Great Steeping village, there is a small area of soilscape 23 'Loamy and sandy soils with naturally high groundwater and a peaty surface' which surrounds the Steeping River for approximately 3km of its length. Natural England's 2008 peaty soils locations layer [51], identifies 0.62km² within this area as peat. Natural England and DEFRA released an updated England Peat Map in 2025 which provides a national dataset of peat and peaty soils. The dataset was produced using remote sensing techniques and may contain local inaccuracies in data.

Drainage of the lowland peat for agriculture has resulted in peat 'wastage' across the Fens. It is estimated that land levels have lowered by up to 5m over the last two centuries due to peat degradation and in some areas of the Fens, such as Holme Fen in the Great Ouse catchment, shrinkage rates have been recorded at c.18cm annually [52]. As such, most of this area in the Steeping catchment can be assumed to have degraded to wasted peat soils, or to peat remnant mineral soils. The estimated carbon stock of peatland within the catchment is discussed further in the Natural Capital Technical Appendix.

4.2.2 Overview of Agricultural Land Classification within the catchment

Across the catchment, around 33.5km² (56%) of land is classified as ALC Grade 1 and 2 land, with the majority of the Grade 1 land located within the area south of Wainfleet All Saints shown in Figure 9. Table 4 presents an overview of ALC classification.

Table 4: Overview of ALC classification within the catchment

	Grade 1	Grade 2	Grade 3	Grade 4	Non-agricultural
Area (km ²)	22.49	11.09	24.71	1.46	0.18
Percentage of catchment (%)	37.5%	18.5%	41.2%	2.4%	0.3%

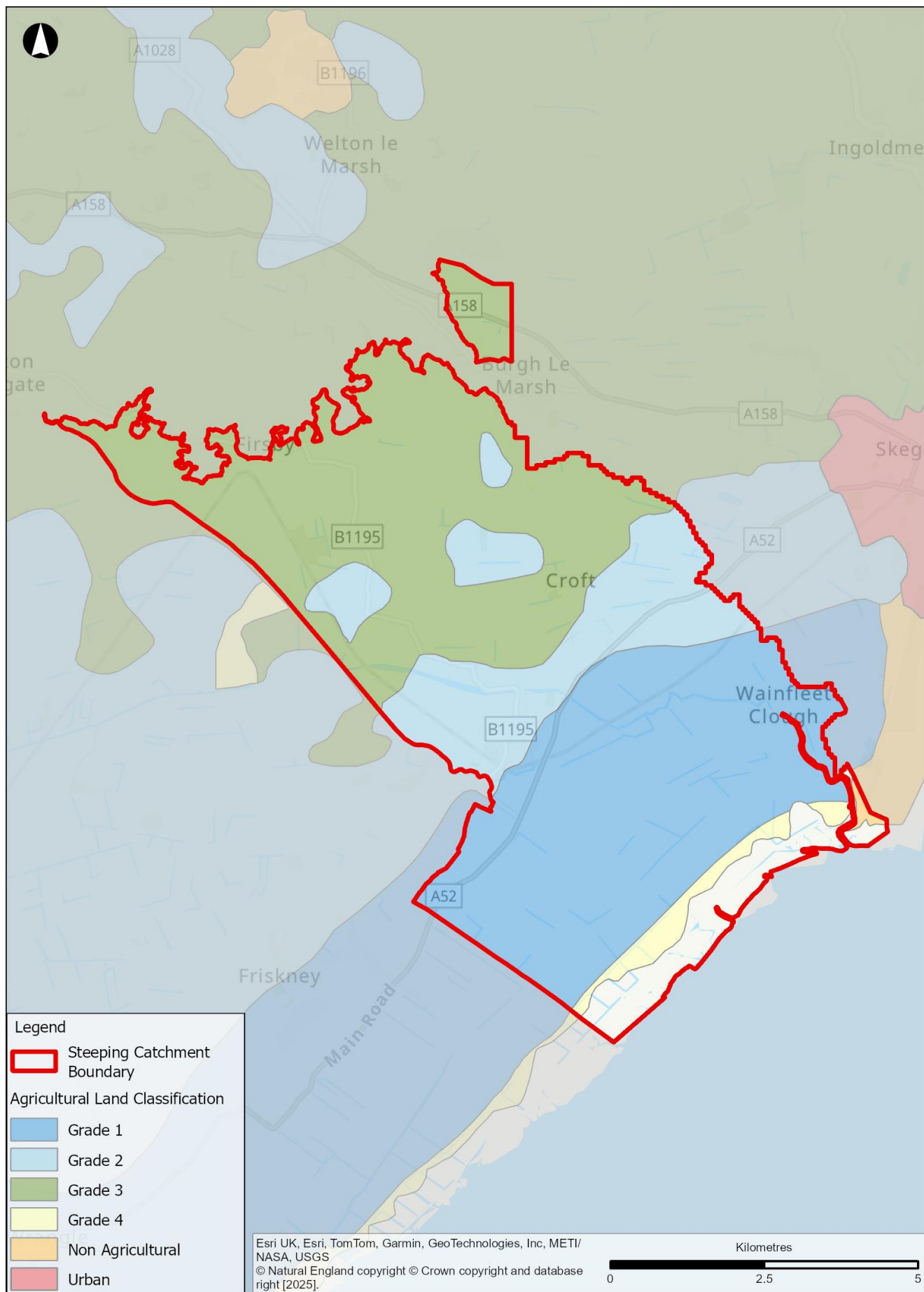


Figure 9: Overview of Agricultural Land Classification within the catchment

4.2.3 Agriculture and water management

The Steeping, Great Eau & Long Eau Abstraction Licensing Strategy [53] covers waterbodies within the catchment. This shows that the whole catchment area at Q30 flows has available water⁵. At Q50 flows, the catchment has primarily restricted available water, with only the catchment area between Croft and Skegness having water available at this flow level.

Water is only available for abstraction from the Lower River Steeping on 138 days of the year. Notably, the total water available for abstraction per day across the entire catchment is just 12,300 cubic metres, sufficient to provide irrigation of c.25mm across c.0.5km² of land. Consequently, irrigated crops can only be produced in this catchment reliably using water from the on-farm reservoirs which are in the area towards The Wash.

The catchment has a long history of flooding which impacts both properties and farming. Recent events include:

- On 12th June 2019 significant rainfall led to overtopping of embankments on the Wainfleet Relief Channel, and a series of breaches resulted in extensive flooding in the catchment. 85 houses were internally flooded, nearly 600 homes evaluated and 5.5km² of farmland flooded (circa 10% of the farmland in the catchment).
- Winter 2023/24 was at the centre of the wettest 18 months on record for Lincolnshire. On 23rd October 2023 Storm Babet caused widespread flooding in Lincolnshire with over topping in Wainfleet.

Flooding has major impacts on crops and to a lesser extent areas of land utilised for livestock grazing. Flood events can restrict the ability to establish new crops, reduce crop yields and quality, or can destroy crops once ready for harvest leading to direct agricultural damages and wider economic consequences for landowners.

4.2.4 Value of agriculture in the catchment

The Fens is an area of national agricultural importance due to its rich peaty soils. Farms across the catchment are mainly focused on the production of arable and grassland crops. Alongside arable agriculture, a proportion of the agricultural land is also used for the keeping of livestock, with a number of farms producing beef cattle and/or sheep, in the central and northern parts of the catchment where land quality is lower due to poor drainage. Smaller areas of more water-intensive, and higher value crops, such as potatoes and sugar beet are present, particularly in the south of the catchment fed by irrigation reservoirs.

The majority of these grazing areas are managed under stewardship agreements, through either the recently introduced Countryside Stewardship (CS) scheme, or the historic Entry Level Stewardship (ELS) scheme.

Approximately 49km² (78%) of land across the catchment is currently farmed. Land use is not published at catchment level, so the proxy of the East Lindsey district has been used, and checked using satellite imagery of crop cover, to estimate the land use allocation as set out in Table 5: Estimated land use, crop areas and livestock populations on commercial agricultural holdings, 2021 data. Data provided by Collinson & Associates.

⁵ The Environment Agency's Water Resources Geographical Information System provides a snapshot in time on water availability at four flow snapshots. From high to low, these are: Q30 (i.e.. the flow of a river which is exceeded on average for 30% of the time, therefore you would expect the river flow to be lower than Q30 on 256 days in an average year, i.e. a higher flow), Q50, Q70 and Q95. These are calculated for each integrated Water Framework Directive waterbody and looks at the balance between the flow in the river, the quantity needed to support the ecology and the water that can be licensed for abstraction.

Table 5: Estimated land use, crop areas and livestock populations on commercial agricultural holdings, 2021 data. Data provided by Collinson & Associates (Rounded to nearest decimal place)

	Estimated total farmed area	Cereals	Arable crops excl. cereals	Grassland	Fruit and vegetables
East Lindsey (km ²)	1,372.7	710	297.0	215.0	41.8
Steeping catchment (km ²)	49	25.5	10.75	7.75	1.5
Percentage of farmed land in the catchment (%)	n/a	52%	22%	16%	3%

Crops produce direct economic output, whereas grassland does not directly create economic value but instead supports the grazing of sheep and cattle, or the production of livestock feed or (AD) energy inputs. It is estimated that the agricultural value of across crop areas (based on 2021 data)⁶ for key agricultural outputs are:

- Cereal production – c. £3.69 million
- Other arable – c.£2.49 million
- Fruit and vegetables – c.£2.87 million

Grassland does not directly create economic value but instead supports the grazing of sheep and cattle, or the production of livestock feed. The estimated overall economic output of crop and livestock is in the region of £10 million, highlighting the importance of the agricultural sector.

There are also a number of camping, caravan and holiday let sites operated by farming businesses in the catchment area, due to the close proximity of the catchment to the Skegness holiday location. Consequently, the level of income from farm diversification is believed to be above the 5.4% national average.

Within the catchment, there are a range of renewable energy enterprises in operation however, without the availability of accurate data on the revenues from the farm diversification enterprises in the catchment, the national average has been used to provide a conservative output figure. The gross annual agricultural output (including farm related diversification) in the Steeping is therefore believed to be c.£11,153,000 (in 2023 values).

4.2.5 Agriculture and the food chain

Farming is critical to the local economy within the catchment. The whole agri-food chain employs people at different stages of food production, from agriculture to food processing and packing and retail. In East Lindsey District a total of 3,500 people were directly employed in crop and animal production, hunting and related service activities sector in 2022. The catchment covers 3.6% of the total agricultural area within the district therefore based on the output in Table 5, it is estimated that agriculture supported around 126 jobs across the catchment.

⁶ Data provided by Collinson & Associates. Based on 2021 land and livestock data available from Defra.

These jobs have an estimated Gross Value Added (GVA) of £34,831 per job, whereas across the 2023 the agricultural GVA was around £29,613 per job (15% lower than in the Steeping) [54]. Employment from direct agriculture also supports wider jobs across in the agri-food supply chain.

In 2023, farmers purchased £21.086 billion of intermediate consumption (e.g. seeds); and invested £5.140 billion in fixed capital across the UK. Input and capital spending therefore was equivalent to £26.226 billion to generate £34.767 billion of gross output, or 75.4% of gross output. Spending in the UK by farmers in the Steeping on inputs and capital can therefore be estimated as being £8.41 million (2023). Given that approximately £300,000 of input spending is believed to support one FTE job in the agricultural input supply chain, this spending is equivalent to a further 28 jobs supported by catchment farms.

Employment is also supported by the further processing, storage and distribution of food produced by agriculture. In 2022, employment [55] in Great Britain within agriculture (and fishing) was 469,000; whereas food and drink manufacturing was 445,000; and food and drink and agricultural raw materials wholesaling was 250,000. The freight logistics sector also employed 703,300 staff (road, rail and water freight), of which c.30% can be attributed to the food and drink supply chain. As such 210,990 jobs were associated with logistics in the end-to-end food chain, of which 40% is believed to be focused on the manufacturing and farm to factory gate end of the food chain or c.84,400. It can be estimated that 75% of the food chain employment depends on domestic production. As such, every job on farm, can be estimated to support a further 1.25 additional jobs in the agri-food supply chain, with higher value crops such as fruit and vegetables, and potatoes providing a high multiplier.

This national figure however ignores differences between food types, with vegetables and fruit supporting higher supply chain multiples. Similarly, some 'other arable crops' such as potatoes or sugar beet, also disproportionately support more supply chain jobs.

Therefore, in the catchment, given the over-representation of fruit and vegetable production, and that of higher value crops such as sugar beet or potatoes, this supply chain job multiplier is believed to be higher, at two jobs per job supported on farm. When added to direct employment on farms, the agriculture and food production supply chain is thus estimated to support 406 jobs in the catchment (126 on farms, 28 in input supplies to farms and 252 in the wider supply chain).

The reliance on local employment in food processing, and related industries is demonstrated across the catchment with a number of small and medium food supply chain businesses present. A number of larger food chain businesses located in neighbouring areas also actively trade, source supplies from or add value to food produced in the catchment. Agriculture and the environment

4.2.6 Agriculture and the environment

Within the catchment, there are ten farming businesses with active mid-tier Countryside Stewardship agreements, ranging in size from 0.047km² to 2.14 km². Four farms, and the Gibraltar point National Nature Reserve have higher tier Countryside Stewardship agreements ranging in size from 4.62 km² to 0.07 km². Figure 10 provides an overview of the current environmental stewardship agreements in place across the catchment.

The majority of grazed areas are managed under stewardship agreements, through either the recently introduced Countryside Stewardship (CS) scheme, or the historic Entry Level Stewardship (ELS) scheme. It is believed many farms will replace these historic schemes with new ELMS agreements in the future.

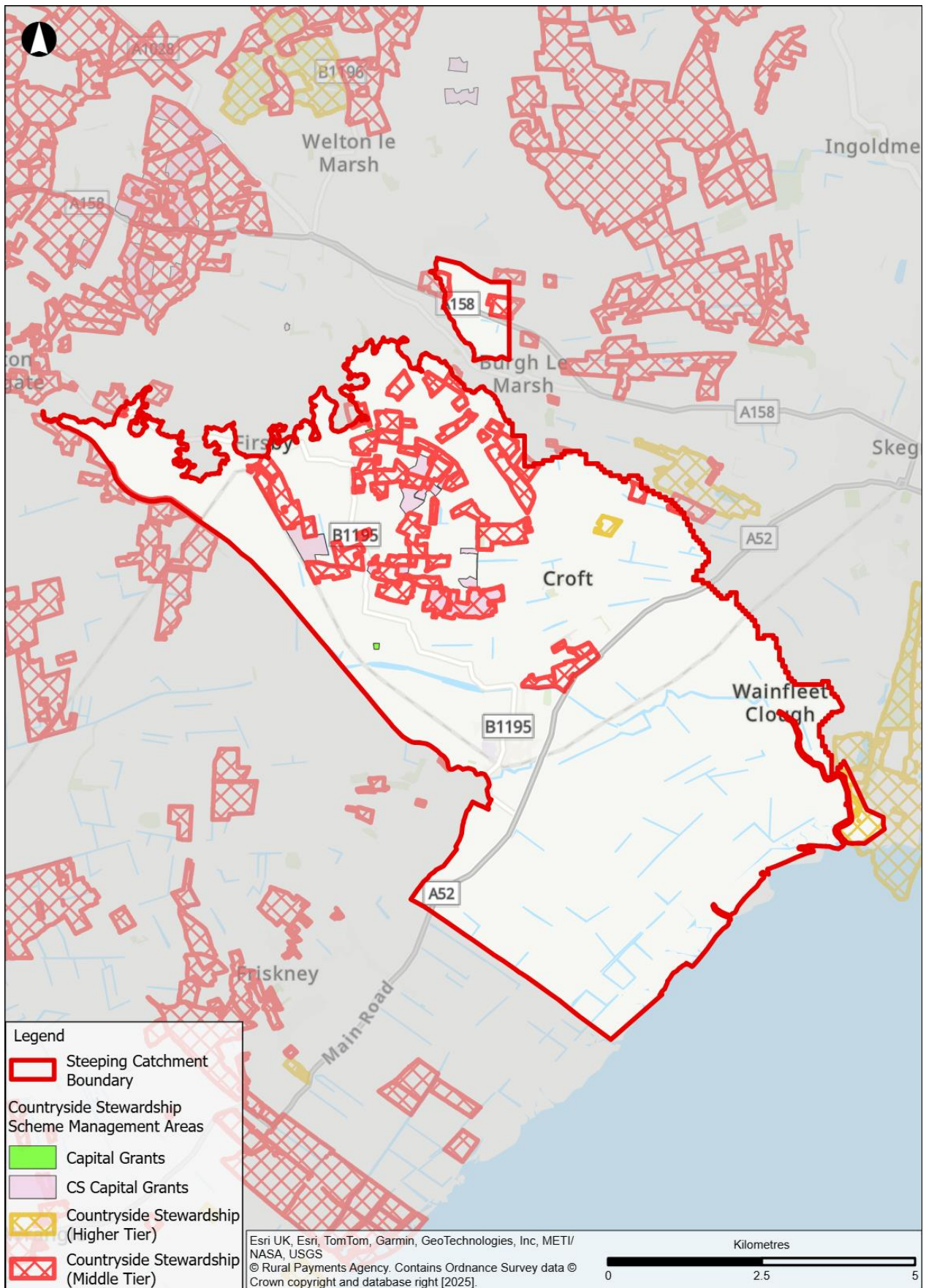


Figure 10: Overview of current environmental stewardship agreements within the catchment

4.3 Ground conditions

This section outlines the baseline ground conditions in the catchment. Table 6 outlines the key terminology used in this section. It should be noted that superficial deposits of a coastal or marine origin can be highly variable and complex in their composition, deposition and extent. Those presented here are intended to provide an insight into a variety of deposits that may be encountered within the catchment and may not represent the full variety and complexity of such deposits.

Table 6: Glossary of ground conditions terminology

Terminology	Summary Definition
Source Protection Zones (SPZs)	SPZs are defined areas around large and public potable groundwater abstraction sites to protect and safeguard drinking water quality. They constrain the proximity of any activities that may impact upon drinking water abstraction. [56]
Nitrate Vulnerable Zone (NVZs)	NVZs are areas designated as being at risk from agricultural nitrate pollution and include just over half of all land in England [57]. Nitrate pollution poses a risk to water quality through eutrophication which is harmful to aquatic life, disrupts biodiversity and damages sensitive habitats and has the potential to affect drinking water.
Engineered materials	Earthworks where the ground has been artificially realigned or adapted. These materials can be poorly sorted, containing an undefined mix of silts, sands, gravels and peats and other organic materials.
Palaeochannels / Roddons	A remnant reach of river bed representing areas of incised channel and tidal creek systems, cut contemporaneously into the underlying clay deposits and filled with “fossilised” silt and sand.
Buried valleys	An ancient, abandoned river or drainage network which has become partially or completely buried by more recent sediment.
Faulting	The process of rock masses breaking and moving along fractures in the Earth’s crust causing displacement.

4.3.1 Catchment-scale designations

Source Protection Zones

Large areas of the catchment have Source Protection Zone (SPZ) designation of Zone III – Total Catchment and with localised areas of Zone I (Inner Protection and Subsurface Activity) to Zone II (Outer Protection and Subsurface Activity). The remainder of the catchment does not have a designation. The definition of the zones is provided in Table 7.

Table 7: Source Protection Zone definitions as per Groundwater source protection zones (SPZs) - GOV.UK [56]

Designation	Definition
Inner Zone – SPZ1	A groundwater SPZ1 is the area immediately around an abstraction point for domestic supply or for food production purposes. Groundwater in a SPZ1 is most vulnerable to pollution given the close proximity of the abstraction point and the water's intended use for human consumption. It is defined within the Environmental Permitting (England and Wales) Regulations 2016 as one of the following. 1. The area within 50 metres of a point where the groundwater is abstracted for domestic supply or food production purposes. 2. The area where it takes groundwater that is intended to be used to supply water for domestic or food production purposes up to 50 days to travel to the groundwater abstraction point. For any given abstraction point, whichever area is largest applies.
Outer Zone – SPZ2	A groundwater SPZ2 is the area around an abstraction point for domestic supply or for food production purposes that meets one of the following definitions. • The area within 250 metres of the abstraction point if the maximum allowable annual volume, divided by 365, is less than 2,000 cubic metres per day. This is when this is authorised by either an abstraction licence under section 24 of the Water Resources Act 1991 or the right to abstract small quantities under section 27 of the Water Resources Act 1991 • The area within 500 metres of the abstraction point if the maximum allowable annual volume, divided by 365, is equal to or greater than 2,000 cubic metres per day. This is when this is authorised by an abstraction licence under section 24 of the Water Resources Act 1991 • The area where it takes groundwater that is used to supply water for domestic or food production purposes up to 400 days to travel to the groundwater abstraction point. For any given abstraction point, whichever area is largest applies.
Total catchment – SPZ3	This is the area around a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken. This could extend some distance from the source point.

Nitrate Vulnerable Zone

The entire catchment is designated as a Nitrate Vulnerable Zone (NVZ).

Radon

The risk from radon is significantly influenced by the underlying bedrock geology. Areas within the catchment have a radon potential of 10-30% [58]. The areas with a radon potential of 10-30% are typically located along the crop or subcrop of the Tealby Formation, Claxby Formation and Spilsby Formation. Other areas of the catchment exhibit a range from <1% to 5%.

4.3.2 Geology

The geology of the catchment is presented on the 1:50,000 Geological Mapping (Skegness Sheet 116 Solid and Drift Geology [59]). The strata identified within the catchment including those designated as engineered materials, superficial deposits and bedrock geology are described below:

Engineered materials

The catchment is predominately an artificially drained and heavily engineered landscape. Much the catchment has been altered by artificial realignment or adaption of pre-existing watercourses or the formation of new cuts and drains and this has resulted in the creation of many associated earthwork flood embankments but also areas of cuts and adaptations to local infrastructure.

It is commonly observed that many raised flood embankments originate from the 1800s, if not earlier, and are dredging bunds. Some embankments now support roads and access tracks but have not necessarily been strengthened to accommodate for modern traffic loads.

Similarly, the composition of these earthworks is often of poor quality and have been identified as comprising of locally sourced materials, frequently including material from channel “digout” where new cuttings are being formed or from deepening and widening existing cuttings. Material from subsequent dredging activities is also locally incorporated to raise the embankments. These materials can be poorly sorted, containing an undefined mix of silts, sands, gravels and peats and other organic materials. These materials also present several engineering risks including settlement and shrinkage, susceptibility to scour and can be susceptible to seepage, all of which can contribute to failures.

Wainfleet Relief Channel

The scale of engineered watercourses is best demonstrated by Wainfleet Relief Channel, constructed c.1973 and adapted from the Weir Dike (shown on the earliest available OS mapping of 1888). The relief channel transports water north of Wainfleet and flows north-west to southeast between its intersection with the Steeping River at Thorpe Culvert and Havenhouse. Throughout this length, it contains a number of sluices, overbridges and facilitates crossings of the Boston to Skegness railway line, which is seemingly at grade with the relief channel as shown in Figure 11.



Figure 11: Photograph 1: Railway crossing and sluice of the Wainfleet Relief Channel © Hazell, N.D

The Wainfleet Relief Channel has also been subject to breaches. In June 2019, a period of extreme heavy rainfall led to an increase of the water levels within the Steeping River and the Wainfleet Relief Channel, resulting in a c.30m breach of the section of the southern embankment of the Wainfleet Relief Channel between the Boston to Skegness railway crossing and Spilsby Road (B1195). This caused significant flooding of the surrounding area and the evacuation of approximately 600 homes.

Superficial deposits

The catchment exhibits a broad range of superficial deposits and includes a mix of those associated coastal deposition and reworking, fluvial processes and those of a glacial origin. It should be noted that superficial deposits of a coastal or marine origin can be highly variable and complex in their composition, deposition and extent and may represent frequent episodes of reworking and deposition.

An overview of the superficial materials that may be encountered within the catchment is presented in Figure 12.

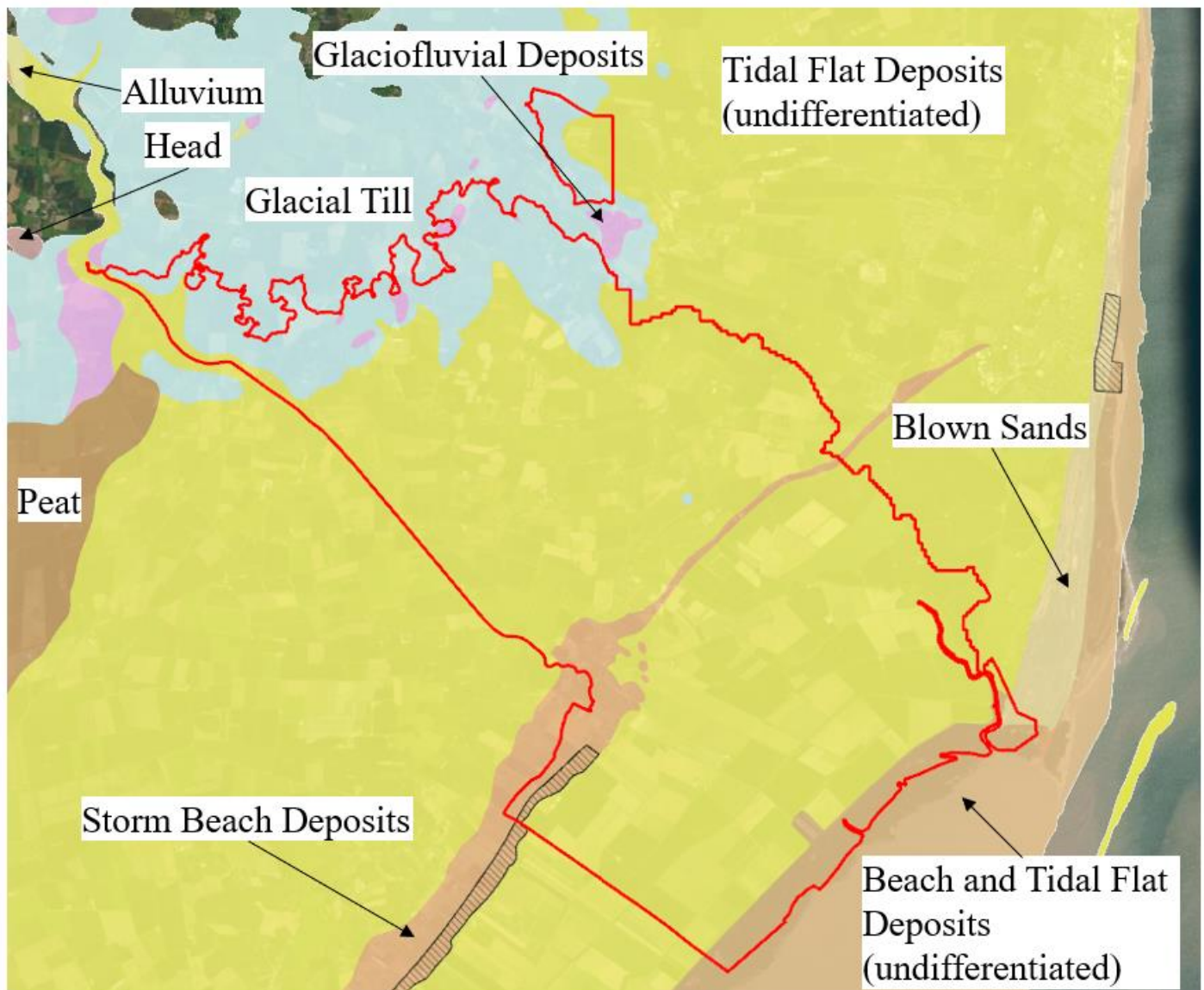


Figure 12: Simplified overview of superficial deposits in the catchment from British Geological Survey 1:50K Geological Mapping ©

Alluvium

Alluvium or Alluvial materials, derived from fluvial sources are commonplace across the catchment and will be subject to frequent periods of deposition and reworking. Alluvium is often grey or brown in colour but can be locally variable and is predominantly composed of cohesive materials including significant proportions of clay and silt. Alluvium may also locally contain sands and gravels and varying quantities of organic materials and shell fragments. All materials may be laterally restricted and may only be present as isolated lenses and horizons. The depth and thickness of Alluvium is also likely to be highly variable. Boreholes in the region such as TF36NE1 and TF63NE19 [60] describe Alluvium to an approximate thickness of 2m, describing as a black and grey silts and as soft to firm mottled orangish brown sandy and silty clays respectively.

Head Deposits

Head Deposits are not displayed within the catchment but are identified near Halton Hologate and in the wider region. They can also be locally thin, discontinuous and sporadic and may not always be mapped. Head Deposits are typically composed of cohesive materials, usually predominantly

clay but is commonly poorly sorted and may contain a mix of reworked materials such as sands and gravels and fragments of any underlying strata as localised lenses. It is generally regarded as a function or product of topography and the resulting “hillwash” is then deposited by solifluction and gelifluction. Since Head Deposits are typically a function of topography, they are generally located on the face or at the base of slopes.

Blown Sands

Blown Sands are present along the coast and will comprise of dunes and interdunes. These deposits are noted to extend from the southern extent of Skegness and present along the coast down to Gibraltar Point. These sands may exhibit well-sorted (single size particle) properties and will consist of wind-borne particles [61].

Storm Beach Deposits

Storm Beach Deposits represent high-energy or powerful storm events and are currently mapped on the British Geological Survey (BGS) GeoIndex as a linear extent, orientated southwest to northeast and located approximately 7km inland of the existing coastline. The associated storm waves deposit a traceable landscape by linear ridge of high ground low rounded ridges, typically consisting of coarse materials such as gravels, cobbles and boulders. These deposits represent events where tidal levels have exceeded the levels reached by normal spring tides. Within the catchment this deposit has been utilised to support the A52 which connects Boston with Skegness.

Tidal Flat Deposits

- **Terrington Beds**

The Terrington Beds cover a broad extent of land along the coastal edge of The Wash and are noted to extend in land as far as Little Steeping and Burgh le Marsh. They typically comprise of pale brown silts, fine grained sands and interlaminated reddish-brown clays. They are often extensive, near to horizontal and can facilitate the creation of marshy land and areas of unconsolidated sediment, mainly of mud and/or sand. In borehole TF45NE20 they are described as firm to stiff brown, occasionally grey, sandy clays and describe the presence of fibrous and amorphous peat.

- **Peat**

Peat is not mapped as underlying the catchment according to the available 1:50,000 mapping or on the GeoIndex [60] but given the regional setting, it could be encountered. It is evidenced in borehole records [such as TF46SE31] from the Wainfleet All Saints Relief Channel where is described as a black, clayey amorphous peat.

- **Barroway Drove Beds**

The Barroway Drove Beds may underlie the Tidal Flat Deposits (Terrington Beds) in the catchment and are often identified across the region. They frequently comprise primarily of clay and silt but can locally contain sands and gravels. The Barroway Drove Beds may also include Peat but can also be underlain by repeating smaller layers or lenses of Peat [62].

Glacial Till (Diamicton)

Glacial Till, Mid-Pleistocene in age, are noted to crop towards the north of the catchment but may be concealed by younger superficial deposits such as those associated with the Tidal Flat Deposits. It would likely predominantly comprise of firm to stiff clays but also be poorly sorted, containing a mix of granular materials such as sands and gravels and may also contain localised “soft” spots. The gravels within the Glacial Till are likely to comprise of chalk fragments and

occasionally flint fragments.

Glaciofluvial Deposits

Glaciofluvial Deposits are present locally within the catchment and may have a relation to the location of historical watercourses and terrains influenced by fluvial processes. In terms of composition, they are typically composed of sands and gravels but can contain cohesive materials and localised organic materials.

4.3.3 Bedrock Geology

Beneath the superficial soils, the catchment is underlain by a variety of differing bedrock geologies, that typically range from Upper Jurassic clays and mudstone in the extreme southwest of the catchment, through Lower Cretaceous sandstones, limestones and ironstones and with Upper Cretaceous chalks present to the north-east. The bedrock geology of the region typically becomes younger from the southwest towards the north-east, progressing towards the Lincolnshire Wolds.

The anticipated bedrock geology of the catchment is presented in Figure 13 and Table 8. The distribution of these geological units is best observed with the available 1:50,000 Geological Mapping (Skegness Sheet 116 Solid and Drift Geology [59]). Figure 13 presents a simplified map of the solid geology underlying the catchment.

Table 8: Summary of Bedrock Geology within the catchment

Formation	Members (if applicable)	Description [60]
Carstone Formation		Greenish-brown, rusty coloured when weathered sandstone or conglomerate, with quartz, quartzite, pyritised sandstone, ironstone and
Sutterby 'Marl' Formation		Thin, limited extent, grey calcareous, fossiliferous mudstone. Potential for pyrite
Skegness 'Clay' Formation		Dark grey and grey fossiliferous mudstone, potential for pyrite and phosphatic materials
Roach Formation		Interbedded mudstones and limestones, locally inter-burrowed and interbedded clay, "chamosite" ⁷ mud, quartz sand and fine gravels of quartz and ironstone
Tealby Formation	Upper Tealby Clay Member	Grey, locally silty and glauconitic clays and occasional ooidal horizons
	Tealby Limestone Member	Sandy limestone and occasional oolitic clays
	Lower Tealby Clay Member	Bluish grey, locally glauconite-rich, silty ooidal clay
Claxby Ironstone Formation		Pale grey to dark brown, ferruginous oolitic ironstone, locally silty clay and calcareous, particularly at the top of the formation. Phosphatic nodules and fossiliferous, potential for pyrite bearing strata

⁷ Chamosite is the Fe²⁺ end member of the chlorite group. A hydrous aluminium silicate of iron

Formation	Members (if applicable)	Description [60]
	Hundleby Clay Member	Pale, purple to grey, mottled brown silty clay
Spilsby Sandstone Formation	Upper Spilsby Sandstone Member	Grey or brown sandstone with iron oolites and underlain by yellow and white calcareous sands and green glauconitic sands and phosphatic nodules.
	Lower Spilsby Sandstone Member	Glauconitic and calcareous sands and sandstone and phosphatic nodules.
Kimmeridge Clay Formation		Mudstone, siltstone and cementstones, may be calcareous or kerogen-rich and locally fossiliferous. [63]

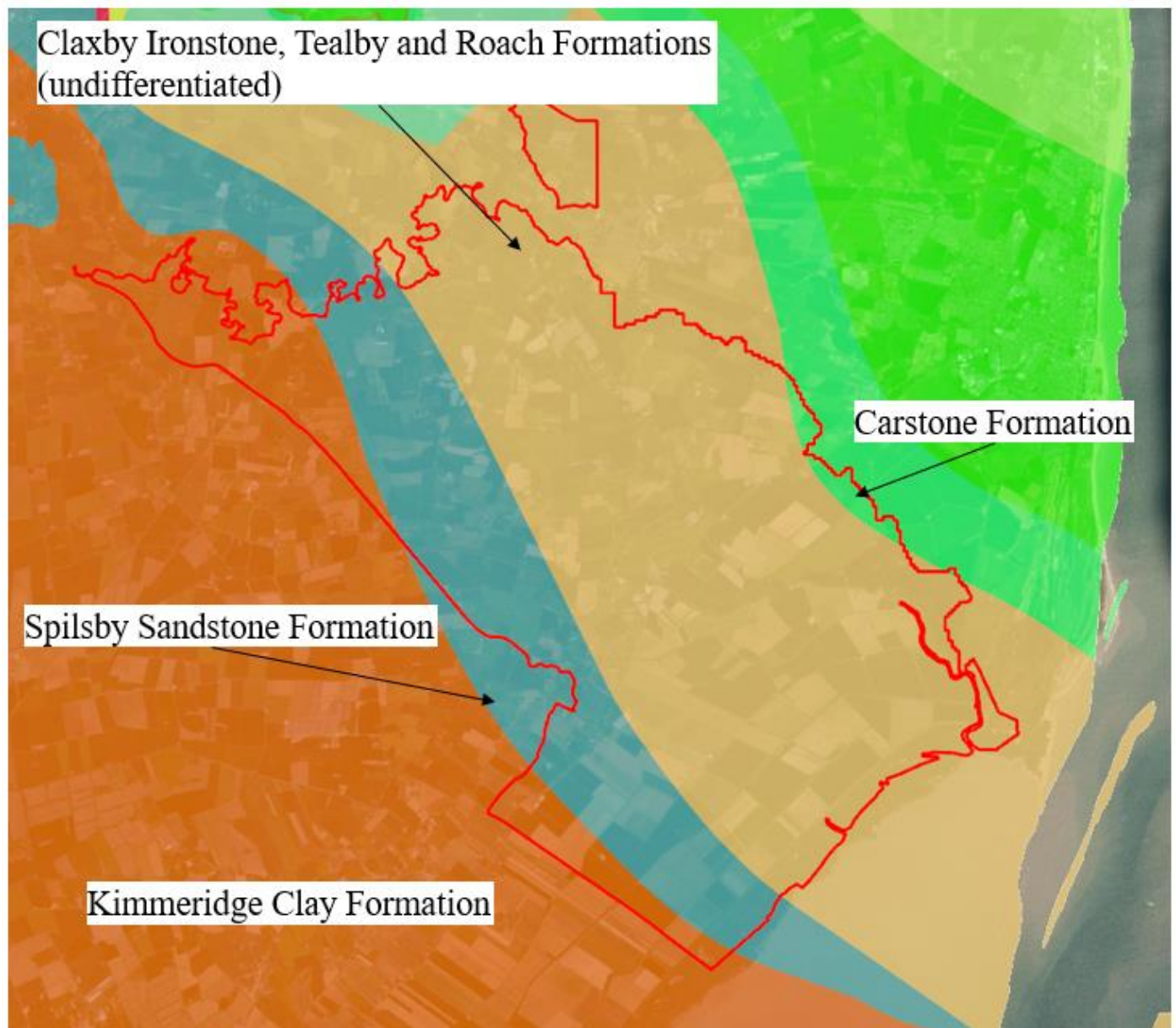


Figure 13: Simplified overview of the Solid Geology underlying the catchment from British Geological Survey 1:50K Geological Mapping©

4.3.4 Regional structure

Palaeochannels / “Roddons”

An influential feature of significance in the Fens, is the presence of palaeochannels which are locally referred to as “roddons”. The influence of anthropogenic changes and involvement such as agriculture and engineered drainage, has caused these former channels to become positive topographical features. As the land surrounding, which is notably cohesive and susceptible to shrink, the more granular material infilling the former channel remains proud. These features, whilst subtle, can form ridges up to 1m high.

It is also noted that the roddons would not be able to facilitate or be re-used as channels in the event of future marine transgression events, and due to compaction, settlement and peat wastage that has occurred between them, they may be capable of funnelling or concentrating water flow between them [64]. A summary of the encountered roddon structures scale across the Fens is provided in Table 9.

Table 9: Summary of the identified roddon hierarchy

Roddon Hierarchy	Dimensions	Description
Major “Trunk” Roddon	2m to >1km	Predominantly fine sand, consistent of grain size from mouth to upper extents, likely representative of being deposited under uniform depositional conditions
Tributaries	1m to >10m	Predominantly silt
Minor Tributaries		Predominantly clay

Buried Valleys

There is a potential for buried valleys to present in the region, including one identified in close proximity to Wainfleet All Saints [65]. The buried valley here is suggested as being preglacial and would likely be infilled with a mix of materials potentially including a mix of sands and gravels and Glacial Till. Buried valleys present the risk of encountering much deeper than anticipated superficial materials which in themselves, may be influential on settlement or act as preferential pathways for groundwater migration. A borehole [60] undertaken near Burgh-le-Marsh [Borehole ID TF46SE18], likely situated on the centreline of the proposed buried valley indicates superficial materials, a mix of sands and gravels and Glacial Till, down to a depth of 25metres below ground level.

Faulting

A series of small faults are identified on the available 1:50,000 geological mapping across the region but none are presented within the catchment. The presence of faulting is likely to be subtle across the region and with a relatively subdued and flat topography, the identification of faulting at the surface is low. Faulting could also be present at depth [59].

4.3.5 Hydrogeology

A summary of aquifer designations for geologies at outcrop and underlying the site have been summarised using information from the GeoIndex [60], Magic Maps [66] and hydrogeological Mapping [67].

Superficial Geology Aquifers

A summary of the superficial aquifers is presented in Table 10.

Table 10: Summary of encountered Superficial Deposit aquifer designations within the catchment

Formation	Superficial Aquifer Designation
Blown Sand	Secondary A. Very small yields and often poor water quality
Glaciofluvial Deposits	
Alluvium	
River Terrace Deposits	
Glacial Till	Secondary (Undifferentiated) Very small yields and often poor water quality
Head	
Beach and Tidal Flats including Bank Deposits	
Peat	Unproductive. Low permeability that can however confine underlying aquifers

Bedrock Geology Aquifers

A summary of the bedrock aquifers is presented in Table 11.

Table 11: Summary of encountered Bedrock Geology aquifer designations within the catchment

Formation	Bedrock Aquifer Designation
Carstone Formation	Principal. Highly productive aquifers, capable of producing larger yields.
Sutterby 'Marl' Formation Skegness 'Clay' Formation	Secondary B. Very small yields and often poor water quality
Roach Formation	Secondary A. Very small yields and often poor water quality
Tealby Formation (including Upper Tealby Clay Member, Tealby Limestone Member and Lower Tealby Clay Member)	Secondary B. Very small yields and often poor water quality
Claxby Ironstone Formation	
Spilsby Sandstone Formation (including Upper and Lower Spilsby Sandstone Members)	Principal. Moderately productive aquifer Spring lines and perched aquifers common
Kimmeridge Clay Formation	Unproductive. Low permeability that can however confine underlying aquifers

4.3.6 Geotechnical Appraisal – engineered structures

Earthworks

Earthworks constructed within the catchment to facilitate the transportation and containment of surface waters may be locally subject to failures and degradation. Many earthworks are not built to modern engineering standards, commonly composed of dredgings and localised digout and in many cases they perform as required despite this. The composition and distribution of the materials can be highly variable and as a result can present the risk of localised failures. These failures can be divided into five main risks. These include:

- Slope failure under extreme groundwater conditions where slopes are formed out of low shear strength materials are steep gradients on poor foundations;
- Settlement due to consolidation of the foundation soil and internal deformation due to self-weight consolidation and external loading;
- Overtopping;
- Excessive seepage; and
- Animal activity.

Earthwork slope instability

Slope instability of the embankments side slopes could take the form of shallow surface slips where the embankment is not particularly high and the slopes are steep, or deeper, rotational failures where the embankments are taller with slopes that are less steep and poor foundation soils (i.e. peat). The cause of slope instability is due to high groundwater conditions within the embankment and the foundation soil during flood conditions coupled with the embankments being built out of low strength soils with overly steep side slope angles over poor foundation soils also with low strength.

Poor vegetation cover can also present a risk to shallow slope instability. If vegetation is well-maintained, it can help to stabilise the shallow soils through root cohesion and control of moisture content. However, sward length and species composition can both affect the efficacy of bank stabilisation by vegetation cover. For example, a ranker sward comprising of shallow or predominantly tap-rooted vegetation offers poor resistance compared to a species-rich sward.

Slope instability is often a very localised feature and where it does occur it might only impact of a few metres to a few tens of metres of linear embankment. It can result in potential loss of containment by increasing the risk of seepage due to the reduced seepage pathways through the embankment. Additionally, further scouring or erosion of the embankment may occur where bare soil is exposed on either the riverward or landward face in the event of overtopping.

Settlement and deformation

Settlement can occur from a range of causes. The embankment can settle due to consolidation of the foundation soil due to ongoing drainage activities and long-term creep settlement of organic rich soils. Settlement can over time lower the crest and where the foundation soil comprises contrasting soils which consolidate by different amounts, differential settlement can occur across the embankment.

Settlement may occur due to internal consolidation of the embankment where this was inadequately compacted. At a shallow depth with embankments where clay soils are present, these can be susceptible to changes in moisture and can readily change in volume leading to shrinkage and swelling. Overtime this can lead to differential settlement at the surface and becomes particularly obvious where embankments support roads in the form of cracking and undulation of the pavement.

Seepage

Seepage can occur in earthworks or structures that are composed of granular or have more permeable layers such as sands and gravels. It can also occur where there are palaeo-channels beneath the embankment or where there are burrowing animals. The composition of earthworks in the region can be variable, so the risk of seepage can be highly variable.

Seepage essentially undermines the effectiveness of any structure designed to retain water and can result in the removal of material, particularly fines and ultimately leading to reduction in mass soil strength with the potential to induce slope failure or ultimately, breaching.

Overtopping

Overtopping of embankments is identified as a risk, particularly if low spots are present due to settlement. Where embankments are poorly vegetated (either due to a lack of soil binding vegetation or surface cover), there is additional risk from scour during an overtopping event which could lead to a breach and effective loss of containment.

Animal Activity

Animal activity presents several risks to earthworks including the establishment of burrows through and within earthworks but also from the frequent trafficking and trampling of surface soils and vegetation. Burrowing can encourage instability and promote seepage whilst animal movement on the surface, can lead to the removal of protective vegetation.

Aggressive groundwater conditions

Acid groundwaters could be encountered in areas that are rich in pyritic minerals such as the

fossiliferous strata encountered in the region. Those that promote mobility of groundwaters or where groundwater levels can fluctuate as to promote oxidation, would be anticipated to have a greater potential to create aggressive (acidic) groundwater conditions and would potentially have a detrimental impact on concrete foundations and sub-structures.

Backfilled and abandoned channels

Backfilled channels and abandoned channels may present soft spot areas or could facilitate seepage. Portions of the Steeping River have been previously straightened and realigned in some locations such as that adjacent to Wheelbridge. These realignment processes can be seen clearly in available LiDAR imaging (Figure 14) and some more prominent features in available aerial imaging, with the former meandering course of the Steeping River identifiable in this location, also suggesting there may be a topographical variation between the former course and the surrounding land. Similarly, former tributaries can be viewed across much of the catchment from LiDAR data.



Figure 14: LiDAR image of the Steeping River near Wheelbridge showing outline of historic watercourse. Outline of historic watercourse indicated by lighter meanders underneath current watercourses and field boundaries.

4.4 Water environment

This section outlines the baseline water environment in the catchment, focusing primarily on surface water bodies considered within the Water Environment Regulations / Water Framework Directive. Analysis of the groundwater bodies present within the catchment has focused on their overarching statuses at this stage. Further information regarding the hydrogeology baseline condition of the catchment, including details of the various aquifers and source protection zones and drinking water safeguard zones present, is provided in the Ground Conditions (soils and resources) baseline. An overview of flood risk and key flood risk management infrastructure within the catchment is provided in the Steeping River catchment baseline report and the flood risk technical appendix. Table 12 outlines the key terminology used in this section.

Table 12: Glossary of water environment terminology

Terminology	Summary Definition
Main River	Designated 'Main Rivers' are usually larger rivers and streams with the highest flood risk. The Environment Agency, using its permissive powers, can carry out maintenance, improvement, or construction work on Main Rivers to manage flood risk and protect the environment. As these powers are permissive only, the Environment Agency is not obliged to carry out either maintenance or new works on Main Rivers.
Flood Zone	Areas classified by the probability of river or sea flooding, excluding the presence of flood defences.
AIMS	Asset Information and Maintenance programme dataset detailing flood risk management assets. The dataset is owned by the Environment Agency but includes assets also owned or operated by third parties.
River Basin District	The area of land (and sea) comprising one or more neighbouring river basins together with their associated groundwaters and coastal waters. There are 10 river basin districts in England.
Management Catchment	A sub-category of a river basin district, a management catchment comprises a number of water body catchments in one management unit at which actions are applied.
Operational Catchment	A sub-category of a management catchment, an operational catchment groups water body catchments together for economic appraisal.
Water Framework Directive (WFD) or Water Environment Regulations (WER)	Legislation designed to halt the deterioration in status of water bodies in Europe (WFD) and England (WER) and achieve good status for rivers, lakes and groundwaters.
River Basin Management Plan (RBMP)	RBMPs are produced for each river basin district and set the legally binding, locally specific environmental objectives for water regulation and planning activities.

4.4.1 Catchment overview

The Main Rivers within the catchment comprise the Steeping River, Lady Wath's Beck, Wainfleet Relief Channel, Cowcroft Drain and The River Lymn (see Figure 15).

The Steeping River has its source in the Lincolnshire Wolds and has a total catchment area of

almost 200km², of which the scheme only covers 63km². In the upstream reaches, the river is known as the River Lymn and becomes the Steeping River downstream of the village of Great Steeping where it is joined by Lady Wath's Beck (located in the northern extent of the catchment). The Steeping River flows in a straightened, north-west to south-easterly direction through the catchment and outfalls to The Wash at Wainfleet Clough and Burgh Sluice.

The Wainfleet Relief Channel was constructed in the 1970s to take high-flows around Wainfleet All Saints. The channel bifurcates from the Steeping River at Thorpe Culvert and flows in a fairly linear south-easterly direction to the north of Wainfleet All Saints before rejoining the Steeping River at Havenhouse. The old course of the Lymn leaves the Steeping River main channel at Cloughs Bridge and is understood to be maintained as a drainage ditch by the Internal Drainage Board (IDB). The Lymn joins Cowcroft Drain at Lymn Bank. Cowcroft Drain flows in a general southerly direction through the centre of the catchment and discharges as The Lymn into the relief channel via Croft Lane pumping station.

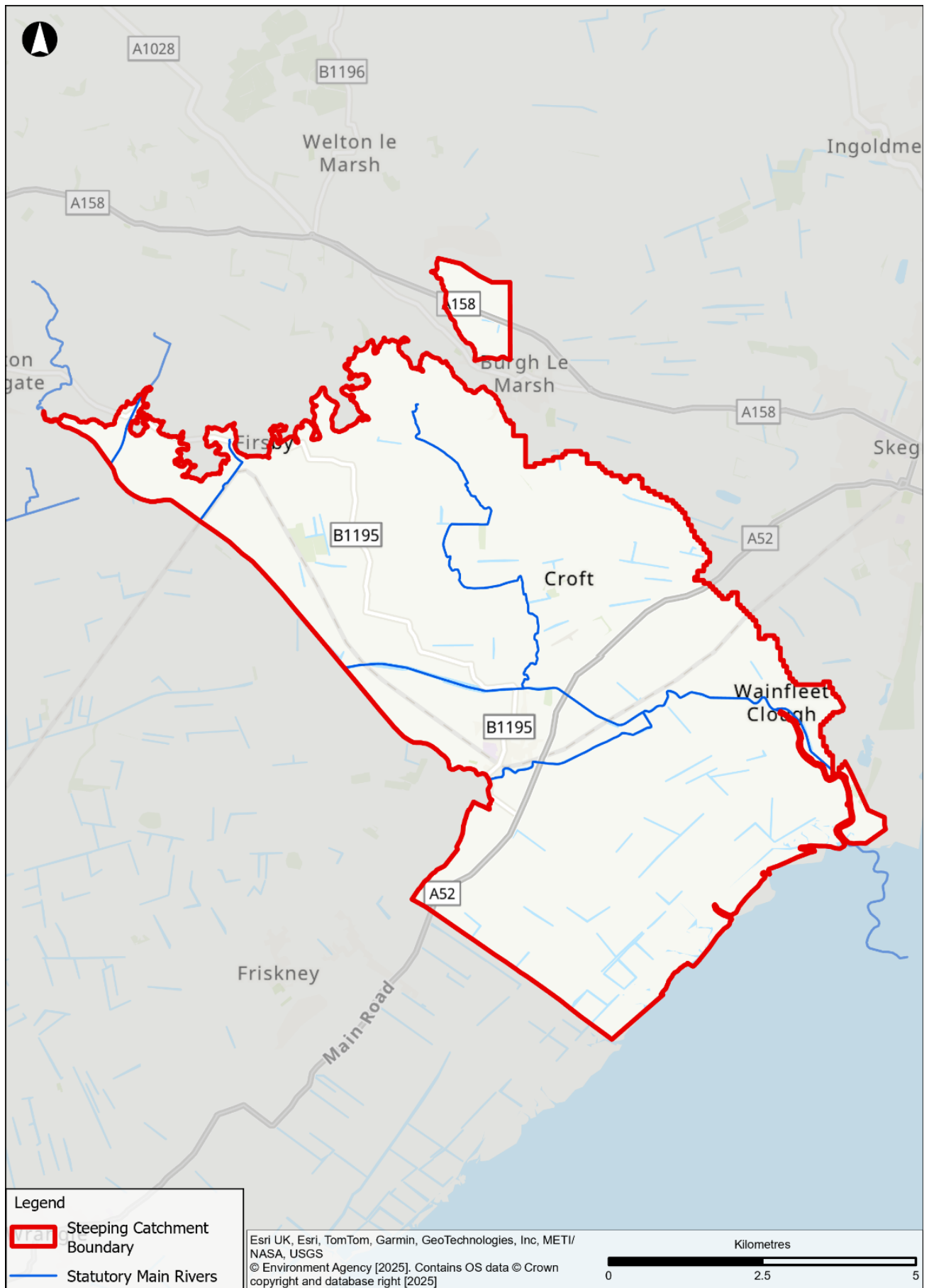


Figure 15 Main Rivers in the catchment

4.4.2 Water Environment Regulations (WER) / Water Framework Directive (WFD)

Surface water bodies

The catchment is located within the Anglian River Basin District (RBD), which extends from Lincolnshire in the north to Essex in the south, and Northamptonshire in the west to the East Anglian coast. The district is predominantly rural, with agricultural land uses dominating over half the area. The RBD is subdivided into 14 management catchments.

The majority of the catchment falls within the lower reaches of the 'Lymn / Steeping' river water body catchment. located within the Steeping and Eaus operational catchment, which in turn forms part of the Environment Agency's Witham management catchment. Some areas along the eastern extent of the catchment fall into the western edge of the neighbouring 'Cow Bank Drain' river water body catchment area, which is located within the same operational catchment.

A portion of the far south-eastern extent of the catchment comprise areas that are not defined as WER/WFD surface water bodies. These are coastal areas which drain into saltmarsh and mudflat habitats that form the margins of the 'Wash Outer' coastal water body extent, which is located within The Wash Transitional and Coastal (TraC) operational catchment, as part of the wider Anglian TRaC management catchment area. The location and extent of these surface water body catchments is shown in Figure 16. An overview of surface water bodies and their current statuses is provided in Table 13.

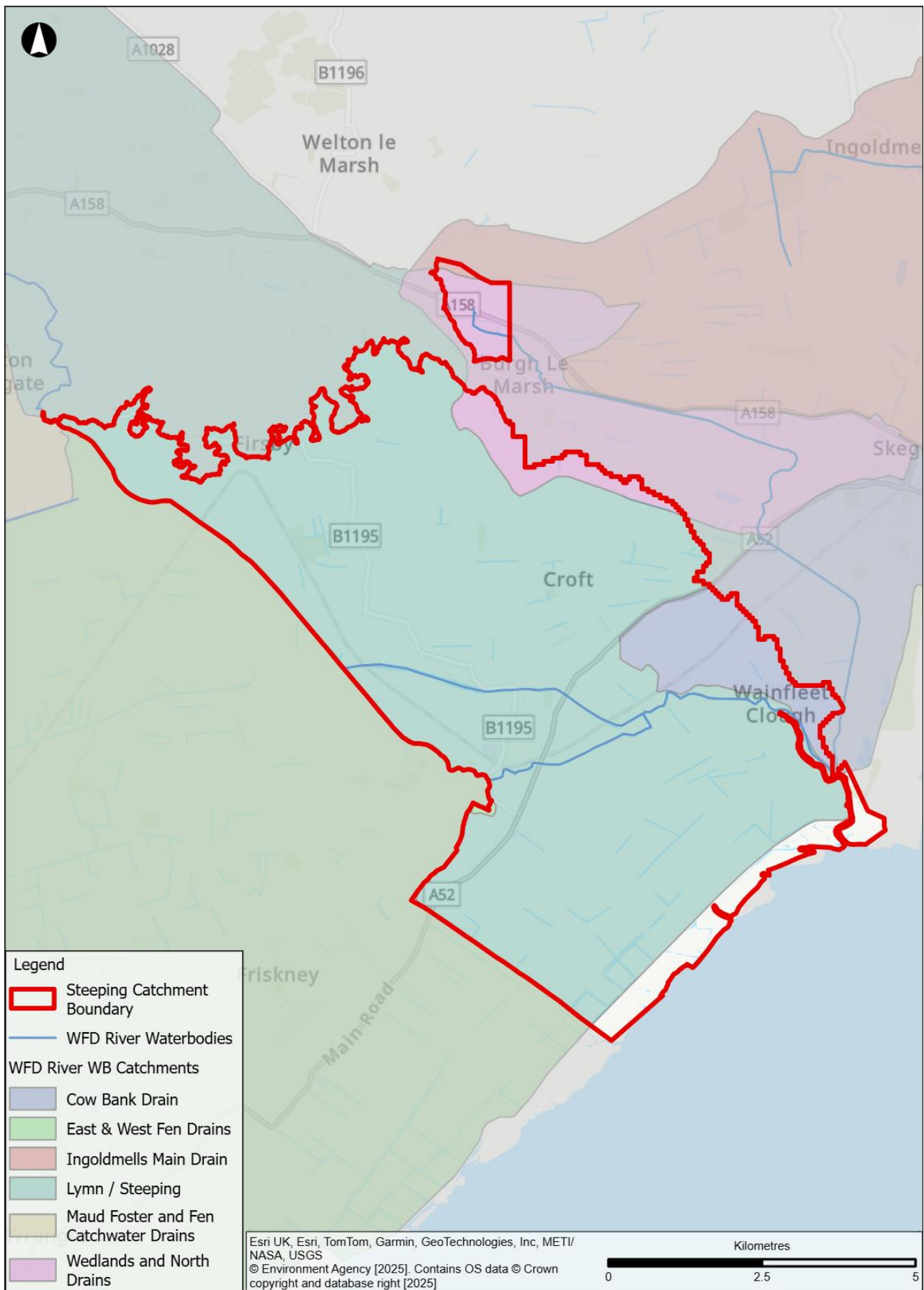


Figure 16: WER/WFD surface water bodies in the catchment

Table 13: Summary of WER/WFD surface water bodies within the study area and their latest Cycle 3 (2022) status classifications

Waterbody Name	Waterbody ID	Waterbody Type	Hydromorphological Designation	Catchment area (km ²)	Overall Status	Ecological Status	Biological quality elements	Physico-chemical quality elements	Hydromorphological Supporting Elements	Supporting Elements	Specific Pollutants	Chemical Status
Lymn / Steeping	GB105030062430	River	Heavily modified	170.3	Moderate	Moderate	Moderate	Good	Supports Good	Moderate	High	Fail*
Cow bank drain	GB105030056440	River	Heavily Modified	13.8	Moderate	Moderate	Moderate	Moderate	Supports Good	Good	-	Fail*

** Note: Chemical Status is assessed once per RBMP Cycle (every 6 years) and so was last assessed in 2019 (and is recorded as 'does not require assessment' within the latest interim Cycle 3 2022 status classifications)*

Existing pressures on status

The Environment Agency's 'Reasons for Not Achieving Good' (RNAG) dataset identifies the key pressures and activities that are currently considered to be limiting the status of each of the different status elements that are not currently achieving their 'Good' status objective. Each RNAG is linked to a 'Surface Water Management Issue' (SWMI), which have been identified via the catchment management planning process. These comprise the main issues that are deemed to limit the uses and potential benefits of managing the water environment in the river basin district in a sustainable way.

The latest RNAG identified for the water bodies present within the catchment are summarised in Table 14. The current RNAGs identified for the water bodies in the study are primarily related to diffuse pollution from agricultural and rural land management and physical modifications associated with flood defence structures, land drainage operations, and agricultural land use.

Table 14: Summary of RNAG for waterbodies within the catchment

	Number of RNAGs per Surface Water Management Issue (SWMI)						
Water body	Physical modifications	Pollution from wastewater	Pollution from towns, cities and transport	Changes to the natural flow and level of water	Invasive non-native species	Pollution from rural areas	Pollution from abandoned mine
Lym / Steeping	3	0	0	0	2	3	0
Cow Bank Drain	0	0	0	0	0	0	0
TOTAL	3	0	0	0	2	3	0

Mitigation Measures

The heavily modified water body Mitigation Measures assessments for the surface water bodies within the Steeping catchment identified various measures derived to mitigate the impacts of flood protection and land drainage 'uses'. These measures are required to be in place for the water bodies to achieve their Good Ecological Potential objectives under the WER/WFD. A variety of measures are already in place or not applicable to both water bodies, but the Lymn Steeping water body has measures which are not in place. These measures comprise:

- Removal or re-location of set-back embankments;
- Restoration of lateral connectivity with the water bodies surrounding floodplain e.g. flood plain spillways;
- Removal/softening of hard engineering structures that modify natural bank profile;

- Preserve and/or restore existing in stream and riparian/shoreline habitats;
- Restore or increase in-channel morphological diversity e.g. riffle and pool creation and bar creation etc.;
- Installation of structures designed to facilitate and improve the passage of migratory (e.g. salmon and sea trout) and non-migratory fish where structures cannot be removed;
- Modification of structure to prevent/reduce fish entrainment e.g. screens;
- Retro-fitting existing structures to accommodate niche habitats, as opposed to more substantial structural modifications that would be likely to deliver greater hydromorphological change but may not be possible given the use;
- Leaving habitat or parts of natural habitat while undertaking operations or maintenance in a water body;
- Ensure best practice is applied when undertaking maintenance works e.g. coffer dam placement, working during appropriate flow conditions;
- Removal or re-location of set-back embankments;
- Restoration of lateral connectivity with the water bodies surrounding floodplain e.g. flood plain spillways;
- Removal/softening of hard engineering structures that modify natural bank profile;
- Preserve and/or restore existing in stream and riparian/shoreline habitats;
- Restore or increase in-channel morphological diversity e.g. riffle and pool creation and bar creation etc.;
- Installation of structures designed to facilitate and improve the passage of migratory (e.g. salmon and sea trout) and non-migratory fish where structures cannot be removed;
- Modification of structure to prevent/reduce fish entrainment e.g. screens;
- Retro-fitting existing structures to accommodate niche habitats, as opposed to more substantial structural modifications that would be likely to deliver greater hydromorphological change but may not be possible given the use;
- Leaving habitat or parts of natural habitat while undertaking operations or maintenance in a water body; and
- Ensure best practice is applied when undertaking maintenance works e.g. coffer dam placement, working during appropriate flow conditions.

WER/WFD Protected Areas

Under the WER/WFD, 'Protected Areas' were defined as areas requiring additional protection because of their sensitivity to pollution or due to their particular economic, social or environmental importance. These include designated water bodies (or parts of water bodies) or catchment areas that are abstracted from for human consumption, support economically significant aquatic species, are recreational waters, are sensitive to nutrient enrichment or support habitats or species of international conservation importance.

The specific environmental designations, measures and actions for these Protected Areas have

been established under previous European Directives and their associated domestic legislation/regulations, which set out the requirements to ensure the protection of the area's water environment or protection of wildlife that is directly dependent on that water environment. Where a WER/WFD water body falls within or forms all or part of one of these designated Protected Areas, the water body is subject to additional environmental objectives (and associated monitoring regimes, risk assessments, and regulations) in accordance with the relevant legislation.

The WER/WFD Protected Areas present within the catchment are summarised in Table 15.

Table 15: WER/WFD Protected Areas present within the catchment

Protected Area Type	Protected Area Name (code)	Relevant waterbody
Nitrates Directive	Lincolnshire Chalk (G80)	Lymn / Steeping
	Lymn / Steeping NVZ (S376)	Lymn / Steeping
	Witham Drains NVZ (S716)	Lymn / Steeping
Shellfish Water Directive	West Wash (UKSW4)	Lymn / Steeping
Special Area of Conservation	The Wash & North Norfolk Coast (UK0017075)	Lymn / Steeping
	Saltfleetby – Theddlethorpe Dunes & Gibraltar Point (UK0030270)	Cow Bank Drain
Special Protection Area	The Wash (UK9008021)	Lymn / Steeping
	Gibraltar Point (UK9008022)	Cow Bank Drain
Ramsar Site	The Wash (UK11072)	Lymn / Steeping
	Gibraltar Point (UK11027)	Cow Bank Drain

Groundwater bodies

Groundwater bodies are the principal units of groundwater as defined in the WER/WFD, and are considered to be hydraulically connected, distinct entities of groundwater. In total, the catchment extent either wholly or partially encompasses two groundwater bodies:

- Steeping Great Eau Long Eau and Witham Spilsby Sandstone Unit Operational Catchment: Spilsby Sandstone Unit; and
- Steeping Long Eau Little Eau Chalk Unit Operational Catchment: South Lincolnshire Chalk Unit.

The status of the groundwater bodies is summarised in Table 16.

Table 16: WER/WFD groundwater body within the catchment and their latest Cycle 3 (2019) status classifications

Waterbody Name	Waterbody ID	Surface Area (km2)	Overall Status	Quantitative Status	Chemical (GW) Status
Spilsby Sandstone	GB40501G401700	8,882.4	Poor	Poor	Good
South Lincolnshire Chalk	GB40501G401600	661.3	Poor	Good	Poor

4.5 Biodiversity

This section outlines the baseline biodiversity in the catchment. Table 17 outlines the key terminology used in this section.

Table 17: Glossary of biodiversity terminology

Terminology	Summary Definition
Priority Habitat and Species	Priority habitats and species are those identified as being of principal importance for the conservation of biodiversity. These habitats and species are listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006.
Critically Endangered	Critically Endangered species are defined by the IUCN as species that face an extremely high risk of extinction in wild habitats.
Endangered	Endangered species are species which have been defined by IUCN as very likely to become extinct in their known native ranges in the near future.
Biodiversity Net Gain (BNG)	Biodiversity Net Gain (BNG) is a world-leading government strategy to create and improve natural habitats by making sure development has a measurably positive impact.
International Union for Conservation of Nature (IUCN)	International Union for Conservation of Nature is a membership union comprised of government and civil society organisations and is regarded as the global authority on the status of the natural world and the measures needed to safeguard it.
Local Nature Reserves (LNR)	Local Nature Reserve are statutory designated areas under Section 21 of the National Parks and Access to the Countryside act 1949.
National Nature Reserves (NNR)	National Nature Reserves are areas of land declared under the National Parks and Access to the Countryside Act 1949 or Wildlife and Countryside Act (1981).
Special Areas of Conservation (SAC)	Special Areas of Conservation are protected areas in the UK designated under the Conservation of Habitats and Species Regulations 2017 (as amended) in England and Wales (including the adjacent territorial sea).
Special Protection Areas (SPAs)	Special Protection Areas are protected areas for birds in the UK classified under the Conservation of Habitats and Species Regulations 2017 (as amended) in England and Wales (including the adjacent territorial sea).
Sites of Special Scientific Interest (SSSI)	Sites of Special Scientific Interest are protected areas within England. They are designated (legally protected) to maintain and protect a specific aspect of biological or earth heritage interest.

4.5.1 Designated nature conservation sites

There are eleven statutory internationally / nationally designated nature conservation sites within or partially within the catchment, some of which overlap in entirety or partially with other designations. These comprise:

- Gibraltar Point –SPA, Ramsar site, NNR and SSSI;
- The Wash – SPA, Ramsar site and SSSI;
- Saltfleet by Theddlethorpe Dune & Gibraltar Point –SAC, NNR and SSSI; and
- Bratoft Meadows – SSSI.

The location of each designated site is shown in Figure 17, and a summary provided in Table 18.

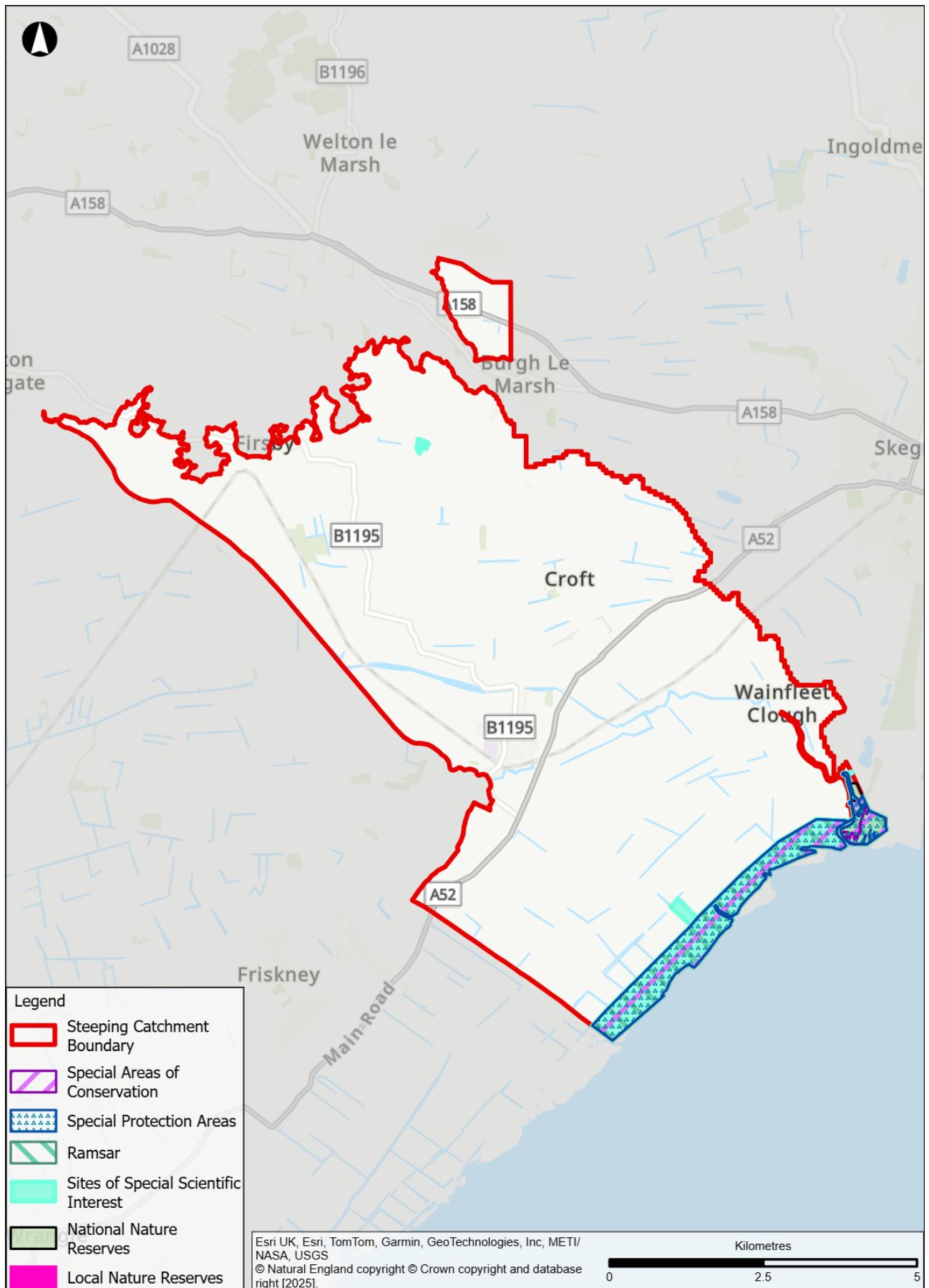


Figure 17: Overview of Designated sites for nature conservation within the catchment

Table 18: Designated Sites within the catchment

Site Name	Designation	Citation / Overview and key features
Gibraltar Point	SPA Ramsar site NNR SSSI	SPA – An actively accreting dune system with extensive sand dunes and salt marshes. Qualifying features include a nationally important breeding colony of little tern (<i>Sterna albifrons</i>) and nationally important wintering populations of bar-tailed godwit (<i>Limosa lapponica</i>), sanderling (<i>Calidris alba</i>) and grey plover (<i>Puvialis squatarola</i>). Ramsar site – Habitats include dunes, salt marsh, freshwater pools, freshwater marshland and areas of grassland. The site regularly supports over 20,000 waterfowl (including internationally and nationally important populations of grey plover, sanderling, bar-tailed godwit, dark-bellied brent goose (<i>Branta bernicla</i>), red knot (<i>Calidris canutus</i>), little tern, oystercatcher (<i>Haematopus ostralegus</i>), dunlin (<i>Calidris alpina</i>), red-throated diver (<i>Gavia stellata</i>) and also has an appreciable assemblage and number of rare wetland invertebrate species including red data book species including endangered saltmarsh knot-horn (<i>Gymnacyla canella</i>) and a fungus gnat species (<i>Rhymosia connexa</i>), and eight species listed as rare including marsh moth (<i>Athetis pallustris</i>) and scarce pug (<i>Eupithecia extensaria</i>). The site also supports noteworthy flora (higher plants) and nationally important amphibian species natterjack road (<i>Bufo calamita</i>). NNR - Site which forms a small part of Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC and SSSI. Habitats include sand dunes, saltmarsh, marshes, and meadows. SSSI - The SSSI is managed by the Lincolnshire and South Humberside Trust for Nature Conservation. Designated for its sand dunes, saltmarsh, freshwater marsh, and associated fauna. Invertebrates include butterflies/moths (<i>Lepidoptera</i>), true flies (<i>Diptera</i>) and beetles (<i>Coleoptera</i>), including 12 species which are nationally rare. Breeding birds include interest feature little tern in addition to mallard (<i>Anas platyrhynchos</i>), shelduck (<i>Tadorna tadorna</i>), ringed plover (<i>Charadrius hiaticula</i>), oystercatcher, and redshank (<i>Tringa totanus</i>). Passage and wintering birds include interest features oystercatcher, grey plover, knot, bar-tailed godwit, brent goose, dunlin, and wigeon (<i>Mareca penelope</i>) in addition to sanderling, and the area is of national importance for its numbers of little ringed plover (<i>Charadrius dubius</i>).
The Wash	SPA Ramsar site SSSI	SPA – The Wash Special Protection Area (SPA) covers 622km² and forms part of the larger Wash and North Norfolk Coast Special Area of Conservation which encompasses the largest embayment in the UK, as well as extensive intertidal sand and mudflats, subtidal sandbanks, biogenic and geogenic reef, saltmarsh and a barrier beach system unique in the UK. The Wash SPA supports non-breeding including a large number of species such as: bar-tailed godwit; bewick's swan (<i>Cygnus columbianus bewickii</i>) and black-tailed godwit (<i>Limosa limosa islandica</i>). Ramsar site – The Wash is Britain's largest estuarine system, fed by four rivers. It has extensive saltmarshes, intertidal banks, and deep channels. It is crucial for migrant wildfowl and wading birds, supports a shellfish fishery, and hosts large populations of common and grey seals. The sublittoral area includes diverse marine communities. SSSI - Covers the same area as the SPA and Ramsar, and is of international biological interest. The intertidal mudflats and saltmarshes are crucial winter-feeding areas for waders and wildfowl, supporting large numbers of migrant birds. The saltmarsh and

		shingle communities are botanically significant, and the mature saltmarsh is a valuable bird breeding zone. The Wash is also an important breeding ground for common seals (<i>Phoca vitulina</i>).
Saltfleet by Theddlethorpe Dune & Gibraltar Point	SAC SSSI NNR	SAC - This site comprises two dune systems within the Lincolnshire Coast & Marshes National Character Area, with a total area of 967.6ha. It includes a range of dune systems including shifting dunes and fixed dune features. It is designated for its: Shifting dunes along the shoreline with white dunes (<i>Ammophila arenaria</i>); Fixed coastal dunes with herbaceous vegetation (grey dunes) - Annex 1 priority habitat; Dunes with sea buckthorn (<i>Hippopha rhamnoides</i>); Humid dune slacks and Embryonic shifting dunes. Saltfleetby-Theddlethorpe Dunes also supports natterjack toad with active management to support breeding. SSSI - This nationally important site includes flats, dunes, and salt and freshwater marshes, supporting a rich variety of flora and fauna. It is the most north-easterly breeding site in Britain for the natterjack toad and is crucial for research into coastal development. The intertidal sands and muds provide feeding and roosting grounds for breeding and wintering wildfowl and waders, while the saltmarsh communities host species like glasswort (<i>Salicornia</i>) and sea lavender (<i>Limonium</i>). The freshwater marsh and dune slacks are home to rare plants and breeding grounds for the natterjack toad and other amphibians. The mature dunes support diverse flora, including orchids, and are frequented by migrant birds and notable invertebrates.
Bratoft Meadows	SSSI	SSSI - The ancient Bratoft Meadow, designated in 1984, is one of the best examples of species-rich neutral grassland in Lincolnshire. It includes two parts divided by a narrow strip of improved grassland and is managed by annual hay making in July and aftermath cattle grazing. The meadow is dominated by sweet vernal grass (<i>Anthoxanthum odoratum</i>), red fescue (<i>Festuca rubra</i>), meadow fescue (<i>Festuca pratensis</i>), and creeping bent (<i>Agrostis stolonifera</i>), with a rich sward featuring betony (<i>Betonica officinalis</i>), dyer's greenweed (<i>Genista tinctoria</i>), cowslip (<i>Primula veris</i>), adder's tongue fern (<i>Ophioglossum vulgatum</i>), and saw-wort (<i>Serratula tinctoria</i>). Wetter areas have cuckooflower (<i>Cardamine pratensis</i>) and ragged robin (<i>Lychnis flos-cuculi</i>), and the southern field has abundant green-winged orchid (<i>Anacamptis morio</i>). A third field, separated by a narrow strip of improved pasture, includes yellow rattle (<i>Rhinanthus minor</i>), great burnet (<i>Sanguisorba officinalis</i>), and devil's-bit scabious (<i>Succisa pratensis</i>), and is also cut for hay. The site attracts large numbers of butterflies and has 18 recorded species of terrestrial mollusc.

4.5.2 Priority habitats and other habitats

A habitat map for the catchment was created using Arup's suite of earth observation tools. Initially, habitats within the catchment that are listed on the Priority Habitat Inventory (PHI) were mapped. The PHI describes the spatial extent of 25 priority habitats in England. They were extracted from the existing Steeping map tiles to highlight areas specifically designated by Natural England.

In cases, where a single area has multiple priority habitat designations (indicative of coexisting habitats in the PHI) both habitats were kept as a separate category. For example, "Coastal floodplain and grazing marsh" and "Coastal floodplain and grazing marsh; Coastal saltmarsh" were kept as two discrete classes in accordance with the PHI.

Following mapping of the PHI areas, OS open map data was used to identify features such as roads, buildings, trees and intertidal zones. Remaining habitats were then identified using a combination of earth observation imagery and publicly available datasets. The imagery was segmented into polygons and each polygon was assigned to a habitat type based on classification rules using Living England, Corine Land Cover, European Space Agency (ESA) World Cover datasets.

The habitats (including priority habitats) that have been identified within the boundary of the catchment are shown in Figure 18 and presented in Table 19.

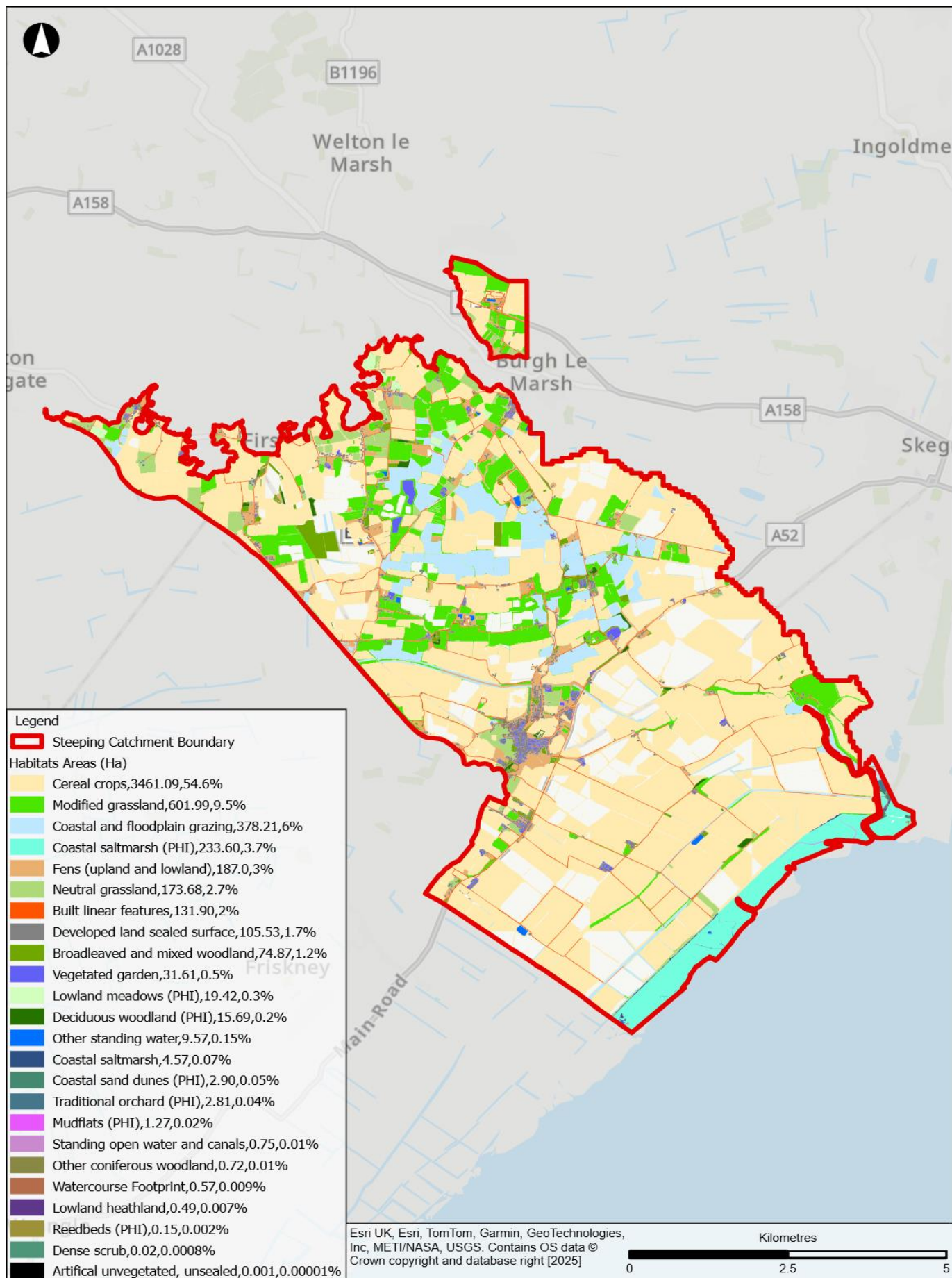


Figure 18: Habitat map for the catchment developed using earth observation

Table 19: Habitat types identified within the catchment

	Habitat Type	Area within the Steeping catchment (km ²)	Habitat Description [68]	Context within the catchment
Coastal	Coastal Saltmarsh (PHI)	2.34	Coastal saltmarshes in the UK, are the vegetated upper portions of intertidal mudflats. They lie between mean high water neap tides and mean high water spring tides, with the lower limit defined by pioneer saltmarsh vegetation and the upper limit one metre above the highest astronomical tides. Saltmarshes are found in sheltered locations such as estuaries, saline lagoons, behind barrier islands, at sea loch heads, and on beach plains. Their vegetation consists of halophytic species adapted to regular tidal immersion, showing clear zonation based on inundation frequency. Pioneer species like glassworts can withstand up to 600 tides per year, while upper marsh species endure occasional inundation.	This habitat is limited to the eastern boundary and is adjacent to a much larger extent of habitat immediately outside of the catchment. Coastal saltmarsh habitats are key parts of the designated sites that overlap with the catchment.
	Coastal saltmarsh	0.05	This is an area of coastal saltmarsh identified from publicly available sources but not identified on the PHI.	This habitat is limited to the southern coastal region of the catchment between the Coastal Saltmarsh (PHI) and the cereal crops.
	Coastal sand dunes (PHI)	0.03	Coastal sand dunes form where there is an adequate supply of sand and prevalent onshore winds. The sand is blown landwards and trapped by dune-building grasses. Dunes develop in various locations, including bays, spits, and hinterlands, with the largest systems in the UK being hindshore dunes. Less common types include ness dunes, climbing dunes, and tombolos. Dune vegetation varies by stability and hydrological conditions, supporting diverse plant species and rich invertebrate life. These ecosystems are particularly rich in butterflies, moths, and burrowing bees and wasps.	This habitat is limited to the eastern boundary and is adjacent to a much larger extent of habitat immediately outside of the study area. Coastal sand dune habitats are key parts of the designated sites that overlap with the catchment.

	Mudflats (PHI)	0.01	Mudflats are intertidal habitats formed by sediment deposition in low-energy coastal environments like estuaries. Their sediment is mainly silts and clays with high organic content, and sand content increases near estuary mouths. Mudflats are linked to other coastal habitats such as soft cliffs and saltmarshes, often appearing between subtidal channels and vegetated saltmarshes. They can be several kilometres wide in large estuaries but have been reduced by land reclamation. Mudflats dissipate wave energy, reducing erosion and flooding risks, and play a crucial role in nutrient chemistry and contaminant sequestration. They are highly productive but have low species diversity.	This habitat is extremely sparse and is limited to isolated patches within the coastal saltmarsh. Mudflats are found within The Wash SPA.
	Coastal and floodplain grazing marsh - Coastal saltmarsh (PHI)	0.0013	This habitat is a combination of coastal and floodplain grazing marsh and coastal saltmarsh (descriptions of these habitats is described in detail in the habitat descriptions for the individual habitats.	This habitat is extremely sparse and is limited to isolated patches within the eastern coastal saltmarsh.
<i>Aquatic / semi-aquatic</i>	Coastal and Floodplain Grazing Marsh (PHI)	3.76	Grazing marsh is defined as periodically inundated pasture, or meadow with ditches which maintain the water levels, containing standing brackish or fresh water. The ditches are especially rich in plants and invertebrates. Almost all areas are grazed, and some are cut for hay or silage. Sites may contain seasonal water-filled hollows and permanent ponds with emergent swamp communities, but not extensive areas of tall fen species like reeds; although they may abut with fen and reed swamp communities. Grazing marshes are particularly important for the number of breeding waders such as snipe <i>Gallinago gallinago</i> , lapwing <i>Vanellus vanellus</i> and curlew <i>Numenius arquata</i> they support. Internationally important populations of wintering wildfowl also occur including Bewick swans <i>Cygnus bewickii</i> and whooper swans <i>Cygnus cygnus</i> .	This habitat is found within the central area and is associated with agricultural areas adjacent to watercourses. Small patches of marsh are located near to the coastal habitats. Coastal and floodplain grazing marsh is associated with many of the designated nature conservation sites. The habitat is important for birds within the catchment providing areas for foraging and roosting.
	Fens (upland and lowland)	1.89	This is an area of lowland fens habitat identified from publicly available sources.	This habitat is sporadically across the central and northern area of the catchment.

	Other standing water	10.0	This is an area of other standing water identified from publicly available sources.	This habitat is very sparse and is limited to isolated patches across the catchment.
	Coastal and floodplain grazing marsh - Lowland meadows (PHI)	0.02	Lowland meadows are unimproved neutral grasslands found in lowland areas, including various types such as crested dog's-tail (<i>Cynosurus cristatus</i>) and common knapweed (<i>Centaurea nigra</i>) grassland. These habitats, which support rare plants like snake's head fritillary (<i>Fritillaria meleagris</i>) and green-winged orchid (<i>Orchis morio</i>), have significantly declined due to agricultural changes, with less than 15,000 hectares remaining in the UK. They are important for farmland birds like skylark (<i>Alauda arvensis</i>) and corncrake (<i>Crex crex</i>) and are found in agricultural areas, recreational sites, and roadside verges. Seasonally flooded grasslands are included but less widespread, requiring integrated conservation efforts.	This habitat is extremely sparse and is limited to isolated patches. This habitat is not a key part of the designated sites that overlap with the catchment.
	Standing open water and canals	0.008	This is an area of standing open water and canals identified from publicly available sources.	This habitat is extremely sparse and is located adjacent to the coastal and floodplain grazing marsh as well as the coastal saltmarsh on the south and south-eastern boundary of the catchment.
	Watercourse	0.006	This is an area of watercourse identified from publicly available sources.	This habitat is extremely sparse and is located adjacent to mouth of the Steeping River.

	Reedbeds (PHI)	0.002	Reedbeds are wetlands dominated by common reed (<i>Phragmites australis</i>), with water levels at or above ground most of the year. They often include open water, ditches, wet grassland, and carr woodland. Reedbeds are crucial bird habitats, supporting six nationally rare species and providing roosting and feeding sites for migratory birds and wintering raptors. They also host five GB Red Data Book invertebrates, including the red leopard moth and a rove beetle.	This habitat is extremely sparse and is limited to isolated patches. This habitat is not a key part of the designated sites that overlap with the catchment.
Grassland	Modified grassland	6.62	This is an area of modified grassland identified from publicly available sources.	This habitat is scattered throughout the entire catchment, with the highest concentration located in the central northern area.
	Neutral grassland	1.74	This is an area of neutral grassland identified from publicly available sources.	This habitat is found primary on the border of the catchment and is generally located adjacent to cereal crops.
	Lowland Meadows (PHI)	0.19	Lowland grasslands, treated as lowland meadows, includes most forms of unimproved neutral grassland in the UK. It covers various plant communities and considers both hay-cut and livestock-grazed pastures. These grasslands, though less common in non-agricultural settings, can be found in recreational sites, churchyards, and roadside verges. Excluded are maritime grasslands, upland hay meadows, and Molinia-Juncus pastures. Unimproved neutral grassland has declined significantly due to changing agricultural practices, with a 97% reduction in lowland England and Wales by 1984. Losses continued in the 1980s and 1990s, at rates of 2-10% per annum in some areas.	This habitat is extremely sparse and is limited to isolated patches in the arable landscape generally to the north of the catchment.
Shrub and Heathland	Lowland heathland	0.005	This is an area of lowland heathland identified from publicly available sources.	This habitat is extremely sparse and is limited to isolated patches.
	Dense scrub	0.0005	This is an area of dense scrub identified from publicly available sources.	This habitat is extremely sparse and is limited to isolated patches.

Woodland	Broadleaved and mixed woodland	0.75	This is an area of broadleaved and mixed woodland identified from publicly available sources.	This habitat is scattered throughout the entire catchment, with the highest concentration located in the northern area of the catchment.
	Deciduous woodland (PHI)	0.16	Lowland mixed deciduous woodland grows on a range of soil conditions, from very acidic to base-rich, and includes most semi-natural woodland in southern and eastern England, and parts of lowland Wales and Scotland. These woodlands, often ancient and small (less than 20ha), complement upland oak and ash types. They show great variety in canopy and ground flora species, with <i>Quercus robur</i> being the common oak. The National Vegetation Classification places most of this type in W8 and W10, with lesser amounts in W16. Locally, they may form mosaics with other types, including beech woodland and wet areas. Canopy variations include field maple, lime, elm, hornbeam, wych elm, ash, and oak, with occasional birch and alder stands.	This habitat is extremely sparse and is limited to isolated patches in the arable landscape. This habitat is not a key part of the designated sites that overlap with the catchment.
	Other coniferous woodland	0.007	This is an area of other coniferous woodland identified from publicly available sources.	This habitat is extremely sparse and is limited to isolated patches in the northern area of the catchment surrounded by fens.
Agricultural	Cereal Crops/ Arable	42.9	This is an area of arable land / cereal crops identified from publicly available sources. Further analysis of agricultural land use is available in the Catchment Agricultural Baseline. It is noted that there are likely to be some variation between landcover datasets used. The agricultural baseline has identified that the agricultural land use in the catchment is dominated by arable crops.	This habitat is widely dispersed across the entirety of the catchment.
	Vegetated Garden	0.32	This is an area of vegetated garden identified from publicly available sources.	This habitat is scattered throughout the entire catchment. Generally, the areas are adjacent to residential areas.

	Traditional Orchard (PHI)	0.03	Habitat structure, rather than vegetation type, topography, or soils, defines traditional orchards. These orchards are similar to wood-pasture and parkland but differ in tree species (mainly Rosaceae), denser tree arrangement, smaller habitat patches, and wider dispersion. They include nut plantings like hazel and walnuts. Management focuses on fruit and nut production through grafting and pruning, unlike wood-pastures where timber is the main product. Grazing or cutting herbaceous vegetation is integral, and scrub, often in hedgerows, plays a similar ecological role. Ponds and wetlands are common for livestock watering.	This habitat is extremely sparse and is limited to isolated patches. This habitat is not a key part of the designated sites that overlap with the catchment.
Developed Land	Built linear features	1.34	This is an area of built linear features identified from publicly available sources.	This habitat is located across the catchment and is associated with agricultural areas adjacent to watercourses.
	Developed land sealed surface	1.06	This is an area of developed land sealed surface identified from publicly available sources.	This habitat is located across the catchment and is associated residential communities such as Wainfleet All Saints.

4.5.3 Key species

The key species identified as qualifying species for the protected areas and designated sites within the catchment are presented in Table 20. Only species that are relevant to protected areas are included in the following table (i.e. Gibraltar point SPA and Ramsar site supports nationally important breeding population of little tern). Therefore, this table is intended to highlight some of the key species and not as an exhaustive list.

Table 20: Key species within the catchment

Species Common Name	Scientific Name	Relevant Protected Area or Key Habitats
Little Tern	<i>Sterna albifrons</i>	Gibraltar Point SPA, SSSI, NNR; Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC, SSSI
Bar-tailed Godwit	<i>Limosa lapponica</i>	Gibraltar Point SPA, SSSI; The Wash SPA, Ramsar
Sanderling	<i>Calidris alba</i>	Gibraltar Point SPA, SSSI
Grey Plover	<i>Pluvialis squatarola</i>	Gibraltar Point SPA, SSSI
Bewick's Swan	<i>Cygnus columbianus bewickii</i>	The Wash SPA, Ramsar; Coastal and Floodplain Grazing Marsh
Black-tailed Godwit	<i>Limosa limosa islandica</i>	The Wash SPA, Ramsar
Common Seal	<i>Phoca vitulina</i>	The Wash Ramsar, SSSI
Natterjack Toad	<i>Bufo calamita</i>	Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC, SSSI
Brent Goose	<i>Branta bernicla</i>	Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SAC, SSSI
Curlew	<i>Numenius arquata</i>	Coastal and Floodplain Grazing Marsh
Glassworts	<i>Salicornia spp.</i>	Coastal Saltmarsh; Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SSSI

4.5.4 Critical habitat screening

A critical habitat screening exercise has been conducted based on the criteria outlined in International Finance Corporation Performance Standard 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012) [69].

Critical habitats are defined as areas with high biodiversity value based on criterion 1 to 5 as outlined in the IFC guidance note. This screening has specifically focused only on Criterion 1 in Performance Standard 6 as defined below. The results of the critical habitat screening are presented in Table 21.

International Finance Corporation Performance Standard 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources.

Criterion 1: Critically Endangered and Endangered Species.

Species threatened with global extinction and listed as CR and EN on the IUCN Red List of Threatened Species shall be considered as part of Criterion 1. Critically Endangered species face an extremely high risk of extinction in the wild. Endangered species face a very high risk of extinction in the wild.

As described in footnote 11 of Performance Standard 6, the inclusion in Criterion 1 of species that are listed nationally/regionally as CR or EN in countries that adhere to IUCN guidance shall be determined on a project-by-project basis in consultation with competent professionals.

Thresholds for Criterion 1 are the following:

- a) Areas that support globally important concentrations of an IUCN Red-listed EN or CR species ($\geq 0.5\%$ of the global population AND ≥ 5 reproductive units GN16 of a CR or EN species).
- b) Areas that support globally important concentrations of an IUCN Red-listed Vulnerable (VU) species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in GN72(a).
- c) As appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species.

Figure 19 Critical habitat Criterion 1

Table 21: Overview of IUCN Global Red List species identified within the catchment

Common Name and Status (IUCN Global Red List)	Scientific Name	Habitat and ecology	Population Trend	Relevance to the catchment
European Eel (Critically Endangered)	<i>Anguilla anguilla</i>	Wetlands (inland), Marine Neritic, Marine Oceanic, Marine Intertidal, Artificial/Aquatic & Marine	Decreasing	This species is considered to be present in a number of watercourses across the catchment including in River Lymn and Burgh Sluice Relief Channel drain system (<i>Sustainable Eel Group, and Steeping River Community Update, 2021</i>). 20,000 young eels were released across four sites along the River Lymn (<i>BBC, 2013</i>). Following a nationwide search, scientists from The Rivers Trust identified four sites along the River Lymn as a location to release 20,000 young eels due to their unique and significant scientific features, stemming from the river's origin in the Lincolnshire Wold chalk and its journey through lowland fenland to the sea (<i>BBC, 2013</i> & <i>Sustainable Eel Group</i>).
White-clawed Crayfish (Endangered)	<i>Austropotamobius pallipes</i>	Wetlands (inland), Artificial/Aquatic & Marine	Decreasing	Chalk streams have been identified as highly suitable habitats for white-clawed crayfish due to the high calcium levels (Lincolnshire Wolds, 2018). Native white-clawed crayfish have been in decline since the introduction of the non-native American signal crayfish (Lincolnshire Wolds, 2018).
Freshwater Pearl Mussel (Endangered)	<i>Margaritifera margaritifera</i>	Wetlands (inland)	Decreasing	It is possible that some scattered individuals are present within the catchment however the only viable populations are in Scotland.
Glistening waxcap (Endangered)	<i>Gloioxanthomyces vitellinus</i>	Grassland	Decreasing	The IUCN red list distribution indicates that this species range falls within the catchment however the presence of this species is unconfirmed at present.

4.6 Cultural heritage

This section outlines the cultural heritage baseline in the catchment. Table 22 outlines the key terminology used in this section.

Table 22: Glossary of cultural heritage terminology

Terminology	Summary Definition
Designated heritage asset	A World Heritage Site, Scheduled Monument, Listed Building, Protected Wreck Site, Registered Park and Garden, Registered Battlefield or Conservation Area designated under the relevant legislation.
Non-designated heritage asset	A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest. It includes designated heritage assets and assets identified by the local planning authority (including local listing).
Historic environment	All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora.
Historic Landscape Character	The Historic Landscape Character of Lincolnshire is interpreted on two scales: Character Area and Character Zone. There are 10 Character Area's across the county. Character Areas are large, regional parts of the county's landscape and are known as, for example, 'The Fens', 'The Wash', and 'The Southern Cliff'. Each Character Area comprises between two and five Character Zones, for example, 'The East Fen' and 'The West Fen' are the two Character Zones of 'The Fens' Character Area. Character Zones can still cover large parts of the landscape and are assessed in greater detail than Character Areas which communicate the broad trends of the component Character Zones. The major urban centres of exclude the major urban centres of Lincoln, Scunthorpe, and Grimsby are excluded and have their own urban assessments.
Saltern	Salterns are associated with salt making. The process of extracting salt from seawater (or other naturally occurring brine) in the fens and marshlands of Britain during the Iron Age and Roman, Early Medieval, and Medieval periods was principally through evaporation. The excavation of pools in which to hold water for evaporation resulted in the production of large amounts of waste material (e.g. clay or sand) which was deposited in large mounds near the pools. These mounds are the 'salterns'. In Lincolnshire salterns are known to have been sufficiently large and numerous to create areas of elevated and dry ground, effectively pushing the coastline away from nearby settlements. Some surviving salterns (and their associated settlements) are designated scheduled monuments, although most are not. They are, however, an important archaeological and heritage resource. Lincolnshire's salterns contribute to Historic England's Farmstead and Landscape Statement for the Lincolnshire Coast and Marshes (National Character Area 42).
Setting of a heritage asset	The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral.
Significance (for heritage policy)	The value of a heritage asset to this and future generations because of its heritage interest. The interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting. For World Heritage Sites, the cultural value described within each site's Statement of Outstanding Universal Value forms part of its significance.

4.6.1 Archaeological and historical background

The catchment historic environment is best understood through the evidence of the long interaction of people, the land and the sea which can be read in the settlements, fields, place names and the layers of soil in this area.

From the end of the last Ice Age to the time of the Roman Conquest, the low-lying landscape to the east of the Wolds experienced multiple periods of marine inundation, which is reflected in successive deposits of peat, which formed when the sea levels were lower, and silts and clays deposited by higher sea levels [70]. The remainder of the catchment area would have been an expanse of shifting marshes and tidal creeks which would have been an excellent resource for prehistoric people for fishing, fowling, foraging and collecting materials such as rushes and clay.

The Romans established a port, *Vainona*, at Wainfleet, which was connected to the fort and settlement *Banovallum* (Horncastle) and a station at Burgh by roads [71]. The Romans may also have established some of the efforts to embank and drain the land, and the 'Roman bank' sea bank has been attributed to them, although there is limited direct evidence [72]. Archaeological investigations undertaken as part of a solar farm development near Croft found evidence of an Iron Age or Romano-British settlement and Roman remains have been found in the Wainfleet area.

With the exception of Wainfleet, which is thought to have been established in the 12th century, the majority of settlements in the catchment area were established in the early medieval period, with their names recorded in the Norman Domesday Survey of 1086 [73]. These names are some of the clearest evidence of early medieval settlement, with the villages retaining traces of their former inhabitants in their Old Norse or Old English names, including 'Frisian farmstead' (Firsby), Thorpe, which means 'settlement', and 'marsh and tidal creek' (Wainfleet).

Possibly starting in the Roman period, one of the activities which has most shaped the historic environment is salt working, which was firmly established by the early medieval period. The process created enormous quantities of waste silt which formed mounds, called 'salterns'. A wide band of salterns called the 'tofts' which runs south-west along former coastline from Wainfleet is estimated to consist of approximately 96 million cubic metres of waste silt, making it one of the single largest human-made medieval features in Britain [73]. The tofts are clearly shown on Grundy's 1774 map of the area (Figure 20). The settlement of Wainfleet was actually built onto this mound of waste silt, which acted to create an area of higher ground.

Through the medieval period, the coastal marshes provided rich summer grazing for sheep and cows overwintered in the Wolds. There was also an important port at Wainfleet, with a sheltered harbour formed behind Gibraltar Point, although it has shifted in form over time, possibly partially responsible for the decline of Wainfleet's port, although the silting of the river may also have been a factor.

In the post-medieval period, the defining process which has reshaped the catchment area is the large-scale reclamation of coastal saltmarsh from the sea and the drainage of the fenland to allow the rich soil to be used for intensive agriculture. Grundy's map of the area from 1774 shows it in the process of this land reclamation, with numerous dikes and banks, including one marked as the 'new proposed drain'.

The network of embankments and drains are some of the most visible aspects of this historic landscape, but there are also geomorphological features which have resulted from the drainage, particularly the sinking of the drained land as the underlying peat has desiccated and contracted. One distinctive aspect of this is that the former creeks, long silted up, are visible using lidar and aerial imagery as they are now raised above the surrounding land and are known as 'roddons' [73]. One final aspect of the catchment area's historic environment of particular note is a group of structures installed during the Second World War to defend from coastal invasion. These are

focused on Gibraltar Point and remains are visible within the dune system.

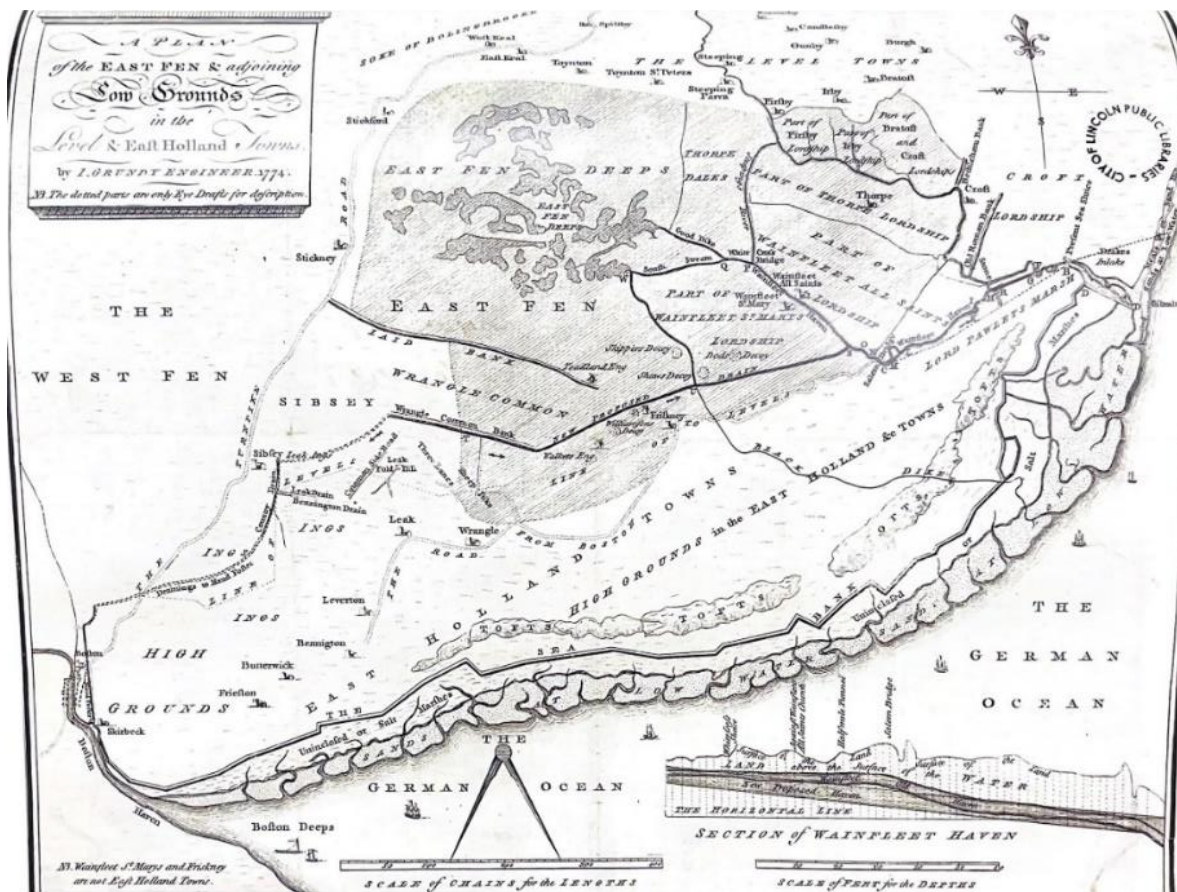


Figure 20: Grundy, 1774. 'A Plan of the East Fen & adjoining low grounds in the Level and East Holland Towns'. Environment Agency ©.

Map originally sourced from R.C. Wheeler (ed.), Maps of the Witham Fens from the Thirteenth to the Nineteenth Century, Lincoln Record Society, volume 96. Lincoln, 2008.

Note: This map provides an overview of land that falls within the Steeping catchment (top) and the East and West Fens catchment.

4.6.2 Historic Landscape Character

As discussed in the Landscape baseline, the catchment spans the boundary between NCA 42 and NCA 46, reflecting its transitional qualities as a landscape between the land and the sea. The Lincolnshire Historic Landscape Character (HLC) area divides the catchment into areas that form part of the Wolds, the Grazing Marshes and The Wash. Figure 21 shows the HLC areas within the catchment.

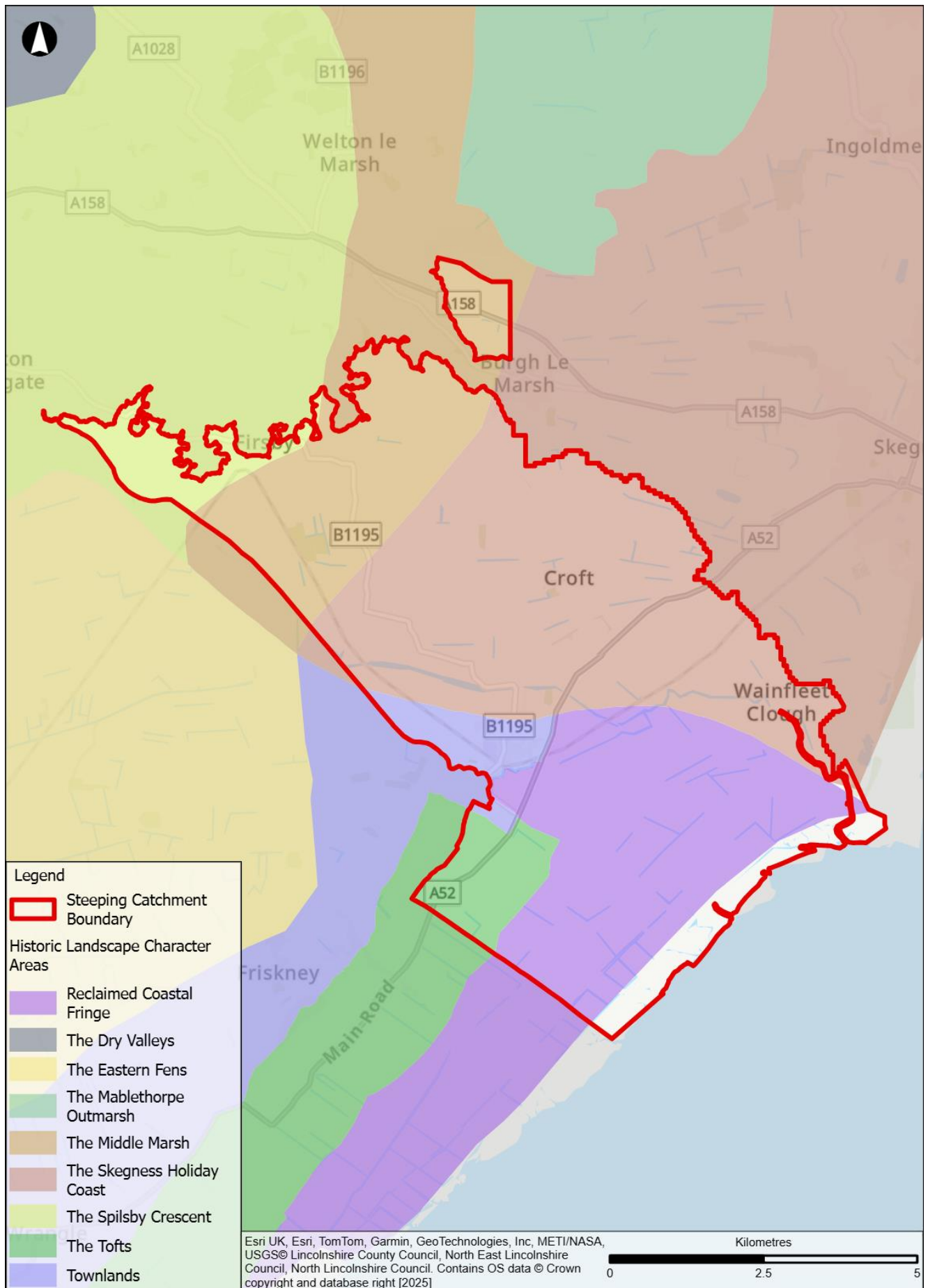


Figure 21: Historic Landscape Character areas within the catchment

Only a very small part of the catchment area is located in the Wolds, specifically the Spilsby Crescent which forms the edge of the area of higher chalklands which bound the catchment area to the north and west and from where the Steeping flows. Great and Little Steeping are located in this HLC. The northern part of the catchment area, where the settlements of Irby in the Marsh, Firsby and Bratoft are located and the whole of the area north and east of Wainfleet is a landscape of regular arable fields which formerly were part of an expanse of commonly grazed summer pasture on the marshes that extend along much of the Lincolnshire Coast. To the south of Wainfleet, in parallel bands moving back from The Wash, are the intensively farmed fields of the reclaimed coastal fringe, the tofts, the band of higher ground formed through centuries of salt manufacture and, most inland, the townlands where historic settlements had formed on islands of drier ground.

4.6.3 Designated heritage assets

The following designated heritage assets are located within the catchment.

There are four scheduled monuments, including medieval salt workings (NHLE: 1004930), the Magdalen College School (NHLE: 1004931, also designated as a Grade I listed building), a market cross (NHLE: 1013530, which is also listed Grade II*) and a churchyard cross (NHLE: 1013532).

There are fifty listed buildings, including three listed Grade I (the Church of All Saints in Croft, NHLE: 1223215), the Church of St Peter in Thorpe St Peter, NHLE: 1223796 and the Magdalen College School in Wainfleet All Saints, NHLE: 1224243), and three listed Grade II* (Cross, Wainfleet All Saints Market Square, NHLE: 1223766, the Church of All Saints, Irby on the Marsh, NHLE: 1223593 and Old Church of All Saints, Great Steeping, NHLE: 1267241). The 44 Grade II listed buildings include farmhouses, residential buildings, public houses, agricultural buildings, windmills, war memorials, churches and bridges.

There is one conservation area covering Wainfleet

There are no registered battlefields, protected wrecks, registered parks and gardens or World Heritage Sites within the catchment. Figure **22** sets out the designated heritage assets within the catchment.

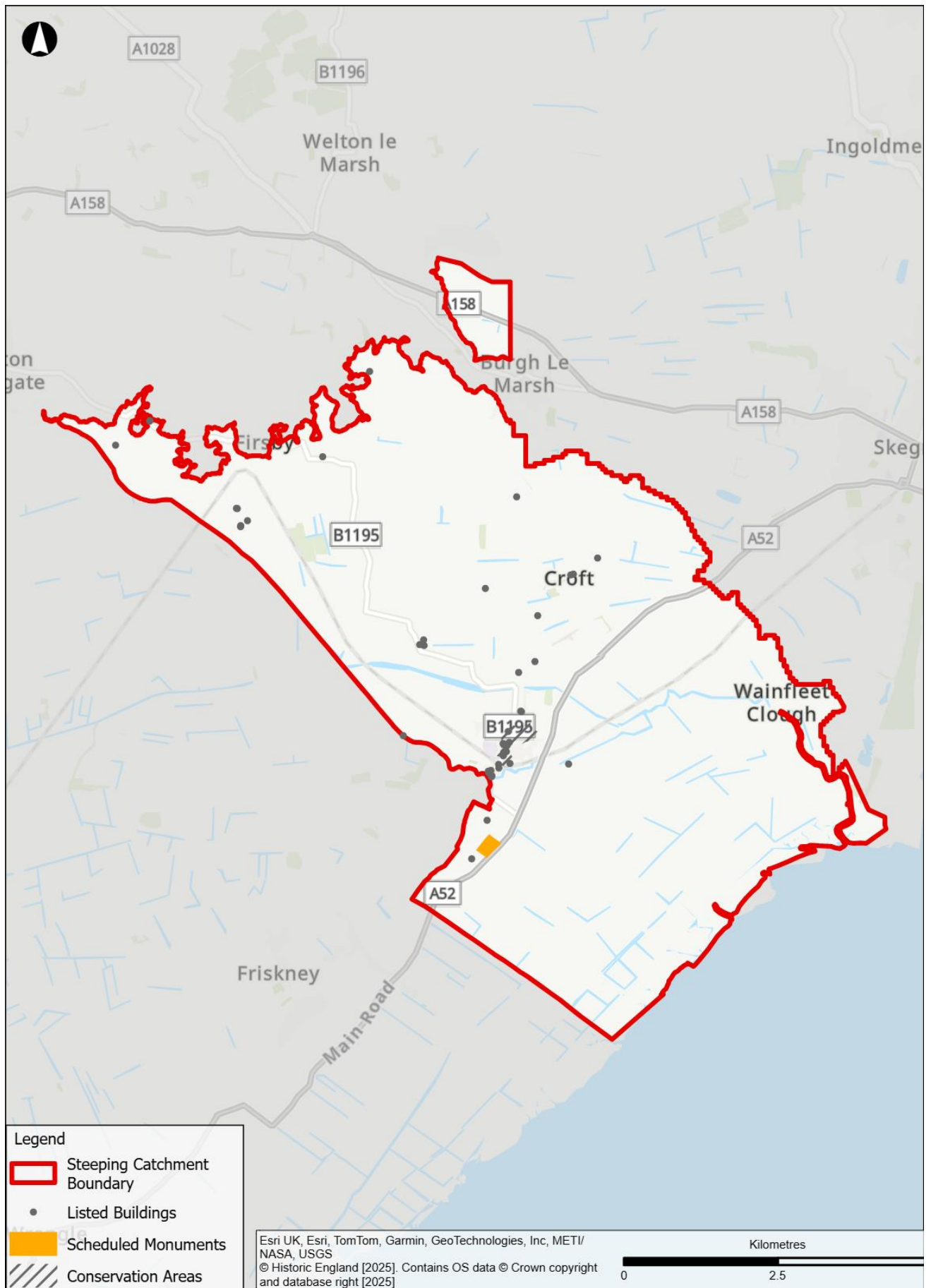


Figure 22: Designated sites for heritage within the catchment

4.6.4 Non-designated heritage assets

While specific non-designated heritage assets have not been identified as part of this study, the following are known or likely to be present:

- As yet undiscovered archaeological remains are likely to be present across the catchment area, ranging from prehistoric and Roman remains buried deeply beneath the silts and potentially including rare organic remains within, between or beneath peat deposits to later traces of settlement, agriculture, industry and drainage.
- All the major villages within the catchment area have early origins and there are earthwork traces around them indicating the likely survival of remains of settlement and agriculture, although this is likely to be limited to higher ground. Several deserted or shrunken medieval villages are recorded, which could be of schedulable quality.
- The tofts, although a landscape-scale feature, is a non-designated heritage asset in its own right, having been created through generations of salt workings and likely containing archaeological remains associated with this industry.
- The earthwork sea banks and the later drainage dykes and associated infrastructure such as windmills and pumping stations are an important part of how the history of this area can be understood.
- Boats, jetties and other structures of all periods could be buried within silted up channels.
- Second World War defences at Gibraltar Point.

Prehistoric remains are likely to date from the Mesolithic period onward. These are likely to comprise scatters of stone tools or the detritus from tool manufacture and are most commonly recovered from higher drier parts of the landscape, beyond the fen-edge. Overall, Mesolithic remains are rare across the county and there is little known evidence of seasonal occupation sites; although these would have existed.

It is possible that the known Neolithic settlement sites of the county have Mesolithic origin or connections. Remains likely to be encountered from the Neolithic period include examples of tools (including weapons), and pottery - although fewer examples of this have been recovered north of the River Welland. Burial monuments for inhumed remains are also built during this period. Often, evidence for the Bronze Age transition is found near these monuments and at the same settlement sites.

The Bronze Age is notable not only the wider adoption of metal (resulting in the presence of metalworking sites and metal artefacts), but also changes in burial practice with community burial monuments falling out of use in favour of individual burial mounds. There are also observable changes in pottery typologies. These trends continue into and throughout the Iron Age, although burial in monuments disappears from practice.

The Iron Age also brings with it evidence for possible landscape division through the marking of territorial boundaries and salt production. Important archaeological remains, such as trackways or walkways, boats, and metal and wooden objects such as swords and shields and jewellery, survive well in waterlogged environments and, when founds, are often of national importance.

Roman influence in rural Lincolnshire is most observable through the presence of large-scale engineering works such as Carr Dyke, and other navigable canals and waterways, and the roads network. There are shifts in religious and burial practice during the Roman period with inhumation and cremation cemeteries replacing the Iron Age preference for excarnation. It is likely that the

'Romanisation' of the Iron Age settlements occurred steadily during the period with existing settlements and societal structures being absorbed into the more structured rural Roman economy and practices of land and people management. Industry expands during this period with remains of metal working sites, evidence of large-scale quarrying, and the production of pottery and presence of kilns becoming common. Salt production also continues.

4.7 Population and health

This section outlines the population and health baseline for the catchment. Table 23 outlines the key terminology used in this section.

Table 23: Glossary of population and health terminology

Terminology	Summary Definition
Indices of Multiple Deprivation (IMD) [74]	These datasets are small area measures of relative deprivation across each of the constituent nations of the United Kingdom and is part of a suite of outputs that form the Indices of Deprivation (IoD). The IoD2019 is based on 39 separate indicators, organised across seven distinct domains of deprivation which are combined and weighted to calculate the Index of Multiple Deprivation 2019. Areas are ranked from the most deprived area (rank 1) to the least deprived area. Some of these separate indicators include Employment Deprivation, Income Deprivation, Health Deprivation and Disability, Education Skills and Training Deprivation, Crime, Living Environment Deprivation and Barriers to Housing and Services.
Lower Layer Super Output Area (LSOAs) [75]	These are defined geographical areas which comprise between 400 and 1,200 households and have a usually resident population of between 1,000 and 3,000 persons. These LSOAs are a neat aggregation or split of wards, or may be exactly the same as wards in some areas. Unlike wards whose population sizes vary widely, the LSOAs provide a consistently sized statistical unit. There are 32,844 LSOAs in England.
Middle Layer Super Output Areas (MSOAs)	Middle layer Super Output Areas (MSOAs) are made up of groups of LSOAs, usually four or five. They comprise between 2,000 and 6,000 households and have a usually resident population between 5,000 and 15,000 persons. MSOAs fit within local authorities. There are 6,856 MSOAs in England.

Different classes of administrative unit each have their own datasets and are ordered from smallest to largest in terms of the geographical scale at which they operate. Data for the population and health baseline is collected at the level of Lower Layer Super Output Areas (LSOAs), and Middle Layer Super Output Areas (MSOAs). All of these administrative areas which intersect with the catchment have been included in the analysis, although emphasis has been placed more heavily on those areas which intersect with a larger proportion of the catchment, given its smaller size. For example, although three MSOAs intersect with the catchment - the East Lindsey 008 MSOA covers less than 1% of the catchment. Accordingly, discussion of any data collected at MSOA level, is largely restricted to East Lindsey 013 and 017 MSOAs.

In most of England, including the Fens, there is a two-tier system of local government sitting at larger scales than the MSOAs: county and district. In two-tier areas, each county council area is subdivided into districts, for which there is an independent district council. Lincolnshire (governed by the Lincolnshire County Council) is subdivided into several district areas, one of which is the East Lindsey District Council area, which covers the Steeping catchment in its entirety.

4.7.1 Overview

The catchment is located in the county of Lincolnshire. Figure 23 and Figure 24 show a map of the MSOA and LSOA areas within the catchment.

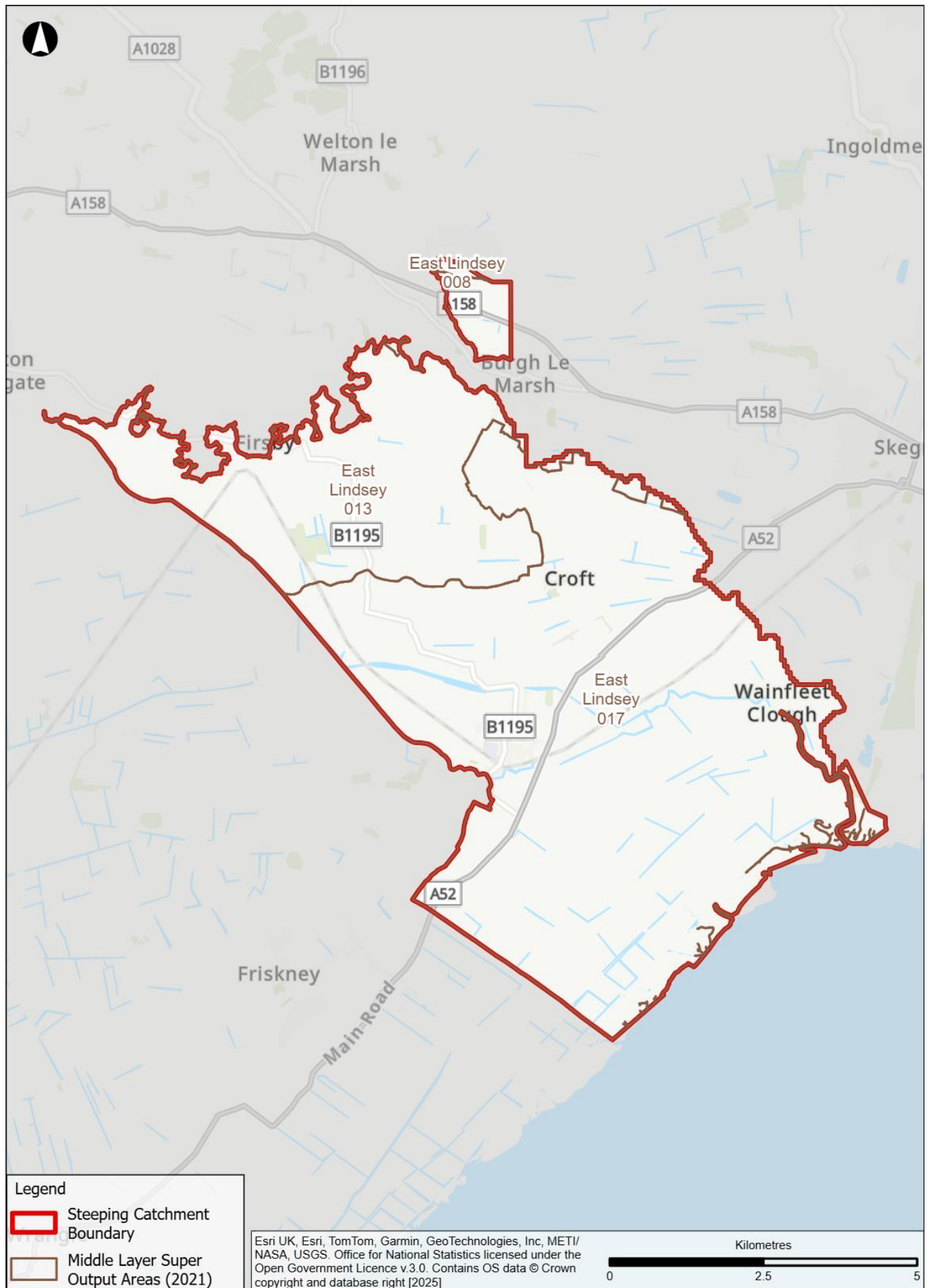


Figure 23: MSOAs which intersect with the catchment boundary

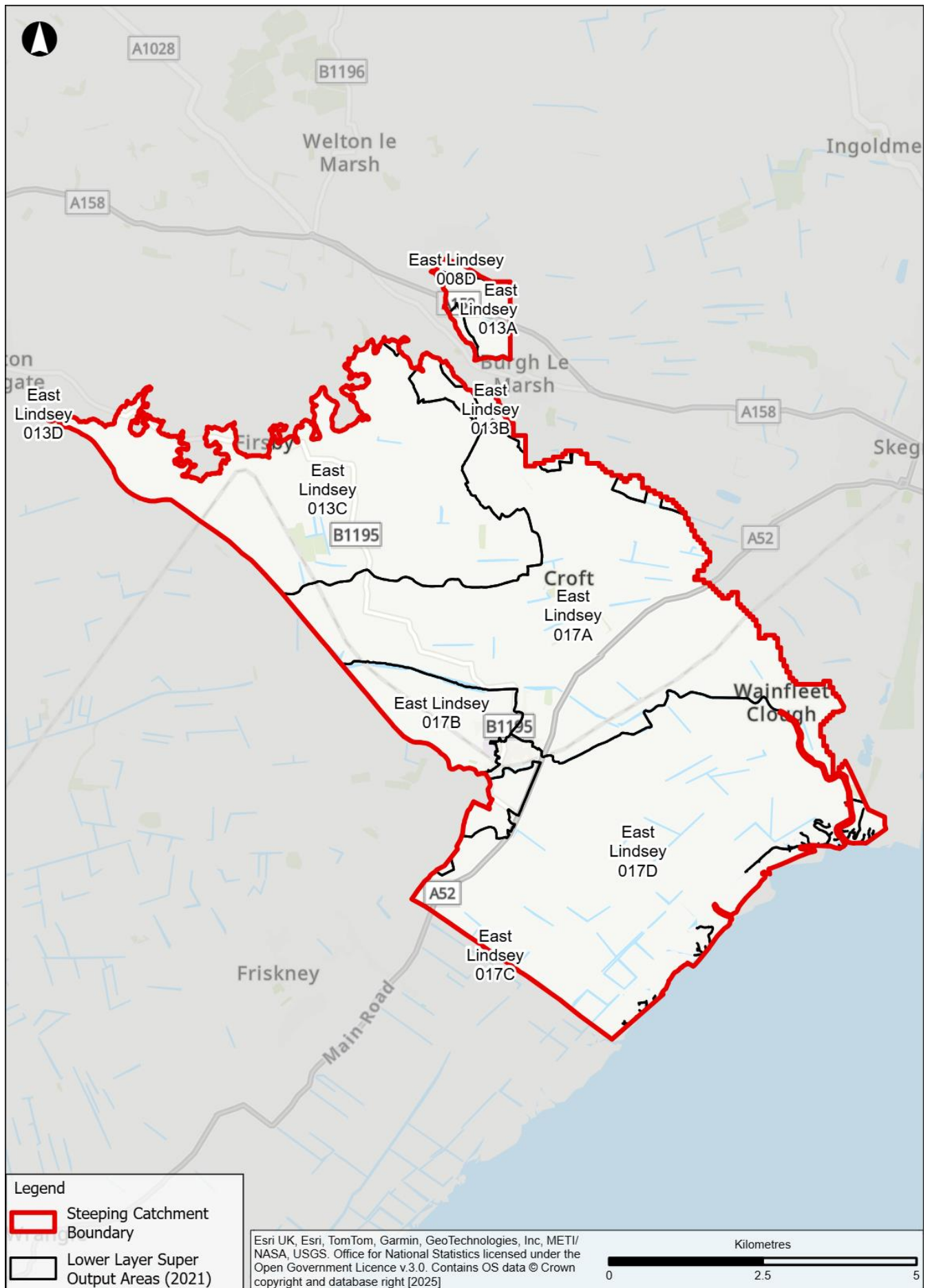


Figure 24: LSOAs which intersect the catchment boundary

Table 24 shows the overlap between the MSOA and LSOA areas that intersect the catchment, and have been used to report and analyse the demographic and health profile. Where summary values were not available for the catchment, data for East Lindsey District Council area has also been provided.

Table 24: LSOAs and MSOAs which intersect with the catchment boundary

LSOAs	MSOAs
East Lindsey 008D (E01026113)	East Lindsey 017 (E02005440)
East Lindsey 013A (E01026046)	East Lindsey 013 (E02005436)
East Lindsey 013B (E01026047)	East Lindsey 008 (E02005431)
East Lindsey 013C (E01026055)	
East Lindsey 013D (E01026059)	
East Lindsey 017A (E01026056)	
East Lindsey 017B (E01026110)	
East Lindsey 017C (E01026111)	
East Lindsey 017D (E01026112)	

4.7.2 Demographic Profile

Population

In 2022, the total population across the LSOAs that intersect the catchment was 3,289⁸ compared to the population of Lincolnshire which totals 766,333 [76].

In the East Lindsey District as a whole (which extends far beyond the boundary of the Steeping catchment), the population size increased by 4.3% in the decade between 2011 and 2021, from around 136,400 to around 142,300. When considering only the three MSOAs within East Lindsey which intersect with the Steeping catchment, the increase in population was slightly higher, at 5.5% on average. This was lower than the overall increase for England (6.6%) in the same period [77].

Future population growth is only projected for local authority areas or larger national units. Based on 2018 population projections, the population of East Lindsey will increase by 8% from 148,571 to 160,525 between 2025 and 2041 [78]. In comparison, England as a whole will see less growth, at 6%. Section 4.7.6 outlines the provisions that have been made in the relevant Local Plans for the additional housing which will accommodate this future population growth in settlements across the catchment.

Population density

The population density within LSOAs intersecting with the catchment are displayed in Table 25. The highest density area is the East Lindsey 013B LSOA, which encompasses much of the village of Burgh le Marsh and sits mostly outside of the catchment. All other LSOAs intersecting with the catchment have a population density which is considerably lower than the national average of 434

⁸ *This population figure has been calculated using the total population of every LSOA that fully or partially overlaps with the Steeping catchment area. It considers the proportion of the LSOA which intersects with the study area, such that the same percentage of the population of an LSOA will be counted as the percentage area which overlaps with the catchment study area. It is assumed that the population density across each LSOA is uniform.

people per square kilometre [79].

Table 25: Population Density by LSOA Area (2021)

LSOA	Area (km ²)	Mid-2022 population	Population Density (residents per km ²)
E01026113: East Lindsey 008D	69.86	1,996	29
E01026046: East Lindsey 013A	15.73	1,480	94
E01026047: East Lindsey 013B	2.07	1,263	610
E01026055 : East Lindsey 013C	26.45	1,147	43
E01026059 : East Lindsey 013D	20.65	1,212	59
E01026056 : East Lindsey 017A	37.35	1,309	35
E01026110 : East Lindsey 017B	17.57	1,498	85
E01026111 : East Lindsey 017C	36.94	1,571	43
E01026112 : East Lindsey 017D	24.57	1,245	51

Age distribution

The catchment has a distinctively elderly population relative to Lincolnshire as a whole, which itself has 5.3% more residents aged 65 or older than the rest of England.

In the two MSOAs which cover the vast majority (over 99%) of the catchment (East Lindsey 013 and 017), the latest Census data shows that 30.8% and 29.5% are aged 65 or over, respectively. The East Lindsey 013 MSOA which covers the rural northern portion of the catchment, from Croft to Burgh le Marsh and Great Steeping, has the highest proportion of elderly residents of any other part of the wider Fens study area, at 30.8%. The pressure of an ageing population is significant across the catchment, especially compared to England as a whole, where 18.5% of the population is aged 65 or above.

Although currently high, the proportion of elderly residents in the catchment is set to increase further in the future. In East Lindsey as a whole, the percentage of the population aged 65 or over was 29.8% in 2018 and this is projected to increase to 37.8% in 2043 [78].

Table 26: Age Structure by MSOA area

Age Band	East Lindsey 013	East Lindsey 017	East Lindsey 008	Lincolnshire	England
0-15	17.0%	16.0%	14.7%	17.2%	19.2%
16-64	52.2%	54.5%	53.1%	59.0%	62.3%
65+	30.8%	29.5%	32.2%	23.8%	18.5%

Ethnicity

The catchment has a higher proportion of ethnically white residents than England. Across the nine LSOA areas which wholly or partially overlap with the catchment, an average of 96% of the 12,721 residents are white, compared to a national average of approximately 82% [80].

4.7.3 Employment Status

Employment

An average of 47.2% of the adults in the two MSOA areas East Lindsey 013 and 017 are economically active (above 16 years old and not in full time education). This is lower than the figure for England of 58.6% but is largely accounted for by the high proportion of retirees in these MSOA areas [81].

As a predominantly rural catchment, it is unsurprising that a high proportion of the population is employed in the agricultural sector. In the East Lindsey 017 MSOA, 9.2% of economically active residents work in the agricultural, forestry and fishing sector [81]. In the East Lindsey 013 LSOA this figure is 4.6%, which is still significantly higher than the figure for England at 0.8%. The largest employment sector in both areas is wholesale and retail trade, which constitutes 16.5% and 20.4% in East Lindsey 013 and 017 MSOAs respectively.

Travel to work

Across the catchment, there is a high reliance on private vehicles for getting to and from places of work. The most common commute mode is driving a car or van, with an average of approximately 65.5% travelling to work in this way across the two MSOAs. This is higher than the East Lindsey local authority figure of 59.5%, and significantly higher than the England figure of 44.5%. Only 5.4% of those employed in East Lindsey 017 MSOA travel to work on foot, whereas in the East Lindsey 013 MSOA, the figure is 2% higher than the England average, at 9.6%.

The average unemployment status of Lincolnshire is lower than the average for England. Within the catchment there is significant variation in employment levels. In the East Lindsey 017 MSOA, 6.3% of residents are unemployed, as measured by the percentage of the working age population claiming out of work benefits, and 2.3% of people are long term unemployed. These levels are lower in the East Lindsey 013 MSOA, at 4.8% and 1.7% respectively [82].

4.7.4 Health profiles

Life expectancy

Average life expectancy at birth for both males and females within Lincolnshire is slightly below

the England average. For females, life expectancy is close to the Lincolnshire average in East Lindsey 017 MSOA (82.7 years) and in East Lindsey 013 MSOA (82.4 years) [83]. For males, the life expectancy is 78.3 years and 78.0 years respectively for these MSOA areas.

Mortality and cause of death

Health indicators relating to mortality are assessed using the Standardised Mortality Ratio (SMR) which is calculated by dividing the number of observed deaths by the number of expected deaths. This ratio illustrates whether a study population is more or less likely to die than a reference population (in this case the reference population is England, which has a SMR of 100). Wherever the SMR is greater than 100, there are a higher number of deaths than expected. Deaths from coronary heart disease are particularly pronounced in the Wainfleet All Saints area (East Lindsey 017 MSOA).

Long-term illness or disability

In the wider East Lindsey District, 8.2% of the population are classed as being in either bad or very bad health [84]. Of the residents in the same district, 24.9% are qualified as disabled under the Equality Act. In the East Lindsey 013 MSOA the proportion of those residents who reported having a limiting long-term illness or disability is even higher at 26.8% [85].

In the health deprivation and disability domain of the Index of Multiple Deprivation, which measures the prevalence of premature death and reduction in quality of life due to poor physical and mental health, it is notable that all areas within the catchment are within the top 30% most health deprived in the country. A significant portion of the southern coastal area in the catchment (the East Lindsey 017D LSOA) is within the 10% most deprived.

Obesity

East Lindsey 017 MSOA has the second highest prevalence of obesity (including severe obesity) amongst reception age children of all MSOA areas in Lincolnshire [86]. 17.4% of reception age children in this area are obese, placing the MSOA in the top 5% across England for this indicator. In East Lindsey 013 MSOA, this figure is lower at 11.1%, but this is still within the top 20% of areas in England. By year 6, prevalence of obesity (including severe obesity) is 27.6% and 23.1% in MSOA areas East Lindsey 017 and 013 respectively.

Mental wellbeing

The estimated prevalence of common mental disorders (aged 16 and over) is 15.8% for Lincolnshire, which is marginally lower than the prevalence of 16.9% reported for England [87].

Self-reported wellbeing

Self-reported wellbeing status of people within the UK is now measured by the Office for National Statistics. This data was not available at ward level, and as such Lincolnshire has been used as a comparator to England. Reports for Lincolnshire reflected fewer people with a low satisfaction score than the England average, at 4.5% compared to 6.1%. Comparatively, the percentage of people with a low happiness score was significantly lower in Lincolnshire than the England average. The percentage of people with a high anxiety score was only marginally higher than the England average of 24.2%, with the Lincolnshire score being 25.5% [88].

4.7.5 Deprivation

Overall deprivation

Over half of the catchment towards Skegness and the Coast is within the top 20% of deprived neighbourhoods, based on the most recent 2019 data (Figure 25) [74]. East Lindsey 017D which covers the coastal portion of the catchment including Wainfleet All Saints and Friskney is the most deprived part of the catchment, categorised as being in the top 10% most deprived neighbourhoods nationally across all measures.

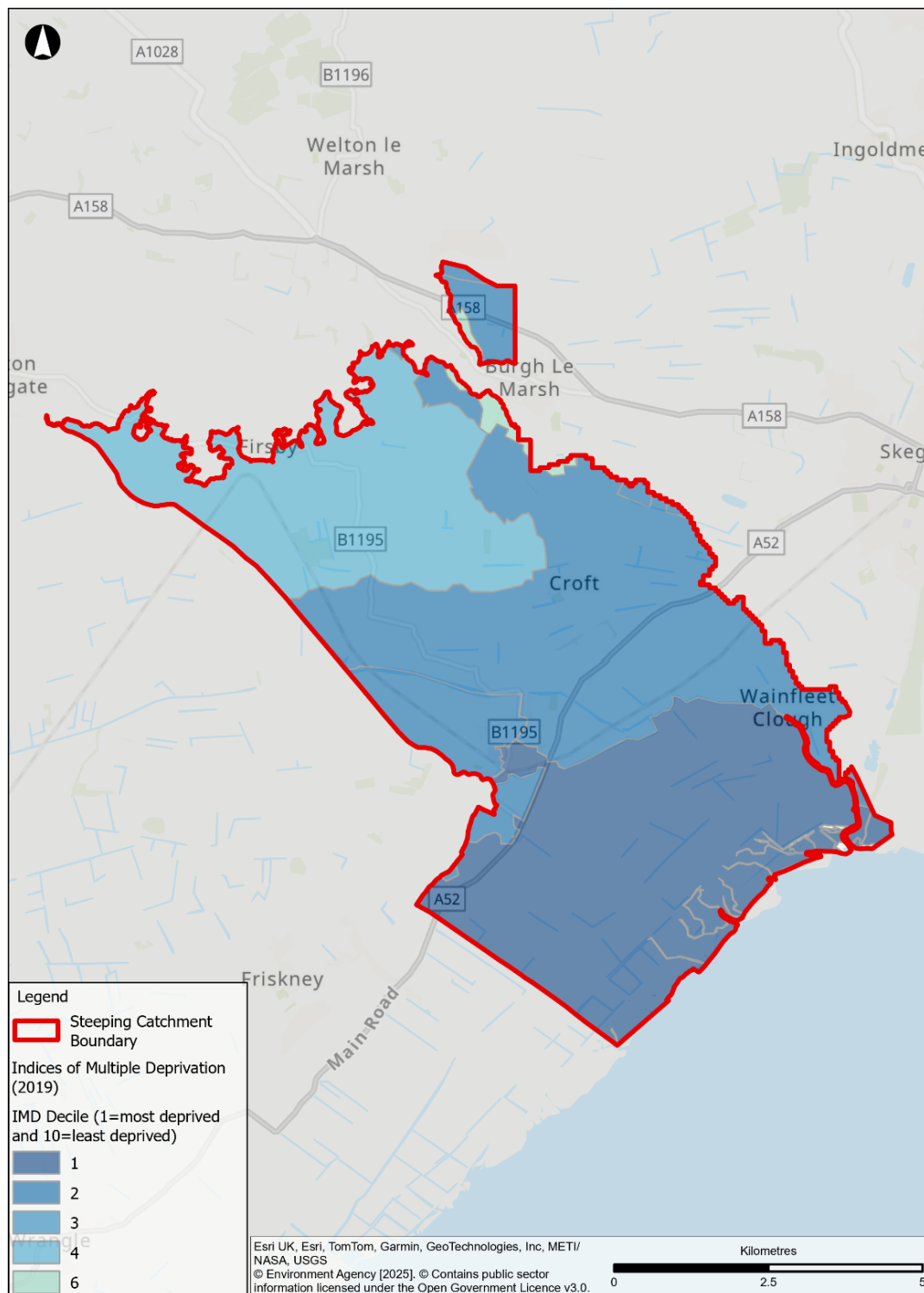


Figure 25: Map of deprivation across the catchment

Education, skills and training deprivation

In terms of education, skills and training, the majority of the catchment is within the top 30% most deprived, with only the northern portion of the catchment occupying the average 50% decile in the country. Across East Lindsey, the proportion of the catchment in the most deprived decile of the education, skills and training domain increased from 14% to 22% between 2015 and 2019. 25.2% of adults in the wider East Lindsey local authority have no qualifications.

Income deprivation

The IMD 2019 identified that all of the catchment is within the 40% most deprived areas in England and Wales with regards to the proportion of the working age population who are experiencing deprivation relating to low income, including those people who are out of work and those in work but with low earnings [74]. Again it is the East Lindsey 017D LSOA area which is the most deprived of any in the catchment, ranked 220 out of 32,844 LSOAs in England; where 1 is the most deprived LSOA.

4.7.6 Housing and private property

In determining the number of properties within the catchment now and in the future, household projections are utilised as a key dataset, as well as considering existing housing and land allocated for housing. The 2018-based household projections to 2043 [89] for the East Lindsey local authority area state that in 2018, there were 64,159 households, predicted to increase by 22.8% to 78,769 by 2043. The District is one of the most sparsely populated parts of the country. Only 5% of the area, the towns, is identified as “urban” and there is no single, dominating urban centre [90]. Based on population projections and the failure to meet housebuilding targets in the past, the Local Plan has identified that East Lindsey has a total housing requirement of 7,819 for the period 2017 to 2031.

It is important to note that these figures cover the whole District Borough and not only the figures within the catchment. Housing allocations for settlements within, or partially located within the catchment are outlined in the East Lindsey Local Plan as follows:

- Burgh le Marsh has a housing allocation of 148; and
- Wainfleet has a housing allocation of 96

Chapter three of the East Lindsey Local Plan states that no contributions for affordable homes will be sought in the low value areas which are the coastal flood hazard areas. Given this, affordable housing will still be supported as set out in Strategic Policy 18 (SP18) Coastal East Lindsey if it comes forward on sites in this zone and developers believe that they can deliver a viable proposal. Under the plan, any new affordable housing will be energy efficient and of a high-quality design.

4.7.7 Social infrastructure

There are limited community resources located within the catchment. This includes just three schools, including the Shining Stars Nursery and the Wainfleet Magdalen Church of England/Methodist School in Wainfleet All Saints, as well as the Great Steeping Primary School. There is one further primary school and a nursery school in Burgh le Marsh just outside catchment to the north.

- There are no secondary schools within the catchment. The nearest secondary schools serving the area are Giles Academy in Old Leake; Woodlands Academy and King Edward VI Academy in Spilsby; Skegness Grammar School; and Skegness Academy.
- The Magdalen Library in Wainfleet is the only public library in the catchment.

- There are no hospitals located within the catchment. The nearest hospitals are the Skegness and District General Hospital, less than three miles east of the catchment, and the Boston West Hospital and Pilgrim Hospital are located at the southern extent of the catchment in Boston, around 15 miles away. Wainfleet Surgery is the only GP practice in the catchment, although Burgh Surgery lies just outside the catchment to the north. The nearest dentist practices are located in Spilsby, Skegness and Boston. There is one care home in Wainfleet.
- There are no supermarkets within the catchment area, the nearest being in Burgh le Marsh and Spilsby.

Within the catchment, the playground in the village of Croft represents the only site designated for sports, play and active recreation (see Figure 26) [91]. Outside of the catchment boundary there are three playing fields and one bowling green in Burgh le Marsh. Just outside the catchment in Wainfleet St Mary there is one further play space which serves the residents of Wainfleet All Saints. In Skegness, outside and to the east of the catchment there are three golf courses, four playing fields, three sports facilities, three bowling greens and ten play spaces. The key challenge identified in the local plan which have prevented better provision of leisure facilities are the ageing population, low population density and small settlement sizes, heavy reliance on private transport, and significant levels of deprivation and poor health.

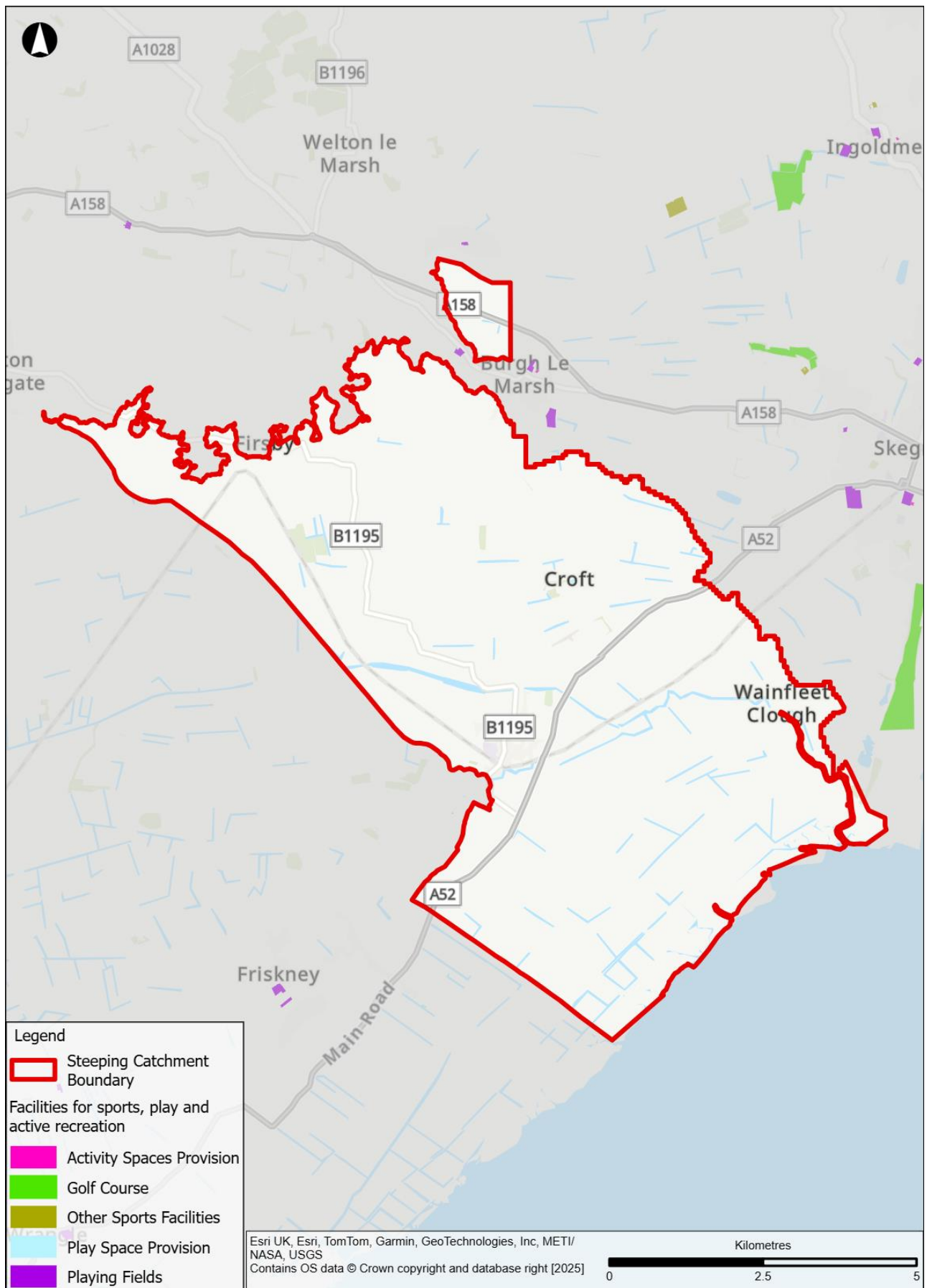


Figure 26: Facilities for sports, play and active recreation within the catchment

4.7.8 Transport Infrastructure

The catchment is poorly served for active travel routes, compared to much of England. There are no public national cycle network routes or Bridleways, as shown in Figure 4. The King Charles III England Coast Path National Trail starts in Skegness, located 2km from the eastern boundary of the catchment, and extends northwards, but does not yet cross the Steeping catchment. There are 24.8km of public footpaths and 1.7km of byways, mostly restricted to the northern portion of the catchment away from the coastal marshes.

4.8 Air quality

This section outlines the air quality baseline in the catchment. Table 27 outlines the key terminology used in this section.

Table 27: Glossary of air quality terminology

Terminology	Summary Definition
Air quality management area (AQMA)	A geographically defined area designated by a local authority where national air quality objectives are not likely to be met. This may cover an area from one street or much larger where the Local Authority is required to develop an Air Quality Action Plan to improve air quality in the area.
Air Quality Action Plan	The action plan developed by a local authority setting out measures to address achieving air quality objectives in a designated AQMA.
Background concentrations	The levels of air pollutants for a reference year including nitrogen, nitrogen dioxide and particulate matter, published by Defra for support the review and assessment of local air quality under the Environment Act (2021) [92]
Sensitive receptors	A receptor that is potentially sensitive to changes in air quality such as residential property, schools, hospitals, and statutory designated ecological sites.
NO _x , NO ₂	Nitrogen oxides (NO _x) refers to nitric oxide (NO) and nitrogen dioxide (NO ₂), both of which are mainly formed during the combustion of fossil fuels.
PM ₁₀ and PM _{2.5}	Particulate matter (PM) is everything in the air that is not a gas. It consists of a huge variety of chemical compounds and materials, some of which can be toxic. Particulates are classified according to size. The UK is currently focused on measuring the fractions of PM where particles are less than 10 micrometres in diameter (PM ₁₀) and less than 2.5 micrometres in diameter (PM _{2.5}).
Units - µg/m ³	The units are in microgrammes of pollutant per cubic metre of air.

4.8.1 AQMAs

There are no AQMAs within the catchment or within the East Lindsey District Council local authority area.

4.8.2 Air quality monitoring

According to the East Lindsey District Council Air Quality Status Report (2024), the local authority did not undertake any automatic (continuous) monitoring between 2016-2023. The local authority conducts passive diffusion tube monitoring, however there are no monitoring sites within the catchment.

The nearest diffusion tube monitoring sites are located within Skegness at roadside locations on Roman Bank (A52) approximately 3.3km east of the catchment. Other non-automatic monitoring stations are present in Louth and Horncastle. These sites recorded NO₂ only (no PM₁₀ or PM_{2.5}). It should be noted that these sites are urban in nature, whereas the catchment is largely rural. Given the distance of these sites from the catchment and the nature of their locations, it is not considered that they would be representative of the catchment.

Monitoring data is reviewed here however to give an indication of likely ambient air quality conditions in the local authority area. During 2023, all diffusion tubes from East Lindsey District Council recorded NO₂ annual mean concentrations below the annual air quality objective of 40µg/m³.

4.8.3 Background concentrations

Background concentrations refer to the existing levels of pollution in the atmosphere, produced by a variety of stationary and non-stationary sources, such as roads and industrial processes. Defra publishes background pollutant for every 1km x 1km OS grid square across the UK for NO_x, NO₂ and PM₁₀ and PM_{2.5}, as well as national air quality objectives for each pollutant.

- The average Defra background concentrations of NO₂ are found to be well below the national annual air quality objective (a mean of 4.4µg/m³) in the vicinity of the catchment, well below the limit value of 40µg/m³.
- The average Defra background concentrations of NO_x (relevant to ecological receptors) are also found to be well below the national annual air quality objective of 30µg/m³ (a mean of 5.5µg/m³) in the vicinity of the catchment.
- The average Defra background concentrations of PM₁₀ are also well below the national annual air quality objective of 40µg/m³. The average annual mean in the vicinity of the catchment was 13.3µg/m³ in 2023.
- The average Defra background concentrations of PM_{2.5} are also below the national annual air quality objective of 20.0µg/m³, with a mean of 6.5µg/m³ in 2023 in the vicinity of the catchment. This is also below the Environmental Improvement Plan target (12µg/m³) and the Environmental Target (10µg/m³) for PM_{2.5}.

4.8.4 Sources of Air Pollution

Industrial air pollution sources are regulated through a system of operating permits or authorisations, requiring stringent emission limits to be met, and ensuring that any releases to the environment are minimised or rendered harmless. Regulated (or prescribed) industrial processes are classified as Part A(1), A(2), Part B of Medium Combustion Plant processes and are regulated through the Pollution Prevention and Control (PPC) system [93] [94]. The larger more polluting processes are regulated by the Environment Agency and the smaller, less polluting ones by the local authorities. Local authorities focus on regulation for emissions to air, whereas the Environment Agency regulates emissions to air, water, and land.

There are no regulated industrial installations listed on the Environment Agency website [95] within the catchment, but there are two within 1km of the catchment. These installations relate to Middlemarsh waste landfill site to the east of the catchment near Burgh le Marsh and an intensive poultry farm in Monksthorpe to the north of the catchment. Neither of these installations have emissions to air, so are not assessed further. It is assumed that any industrial installations further from the catchment would be captured within the Defra background concentrations.

Traffic is also a significant contributor to local air pollution, particularly in urban areas. Pollution from traffic includes vehicle exhaust emissions, secondary pollutants formed in the atmosphere, evaporative emissions from vehicles and non-combustion emissions such as tyre wear and road dust.

4.8.5 Sensitive Receptors

Sensitive human receptors include residential receptors, schools and hospitals. This may include medical institutions, hospices, residential care homes or sheltered accommodation and schools, nurseries, and other places of education where children or young people are present.

Below is a list with sensitive receptors within the Catchment, although this is not an exhaustive list:

- Individual properties and residential areas within the catchment e.g. Wainfleet All Saints and Wainfleet St Mary;
- Designated conservation sites e.g. NNR, SSSI, SPA, SACs;
- The Magdalen Church of England / Methodist School (Wainfleet All Saints);

- Shining Stars Nursery;
- Wainfleet Surgery; and
- Wainfleet Care Home.

There are also a number of sensitive nationally and internationally designated ecological receptors within the catchment, such as The Wash SPA, Ramsar and SSSI. Please see Section 4.5 for further information.

Bibliography

- [1 HM Government, “Environment Act,” 2021. [Online]. Available: Available at:
] <https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted..>
- [2 H. Government, “Environment Act 1995”.
]
- [3 UK Parliament, “Agriculture Act 2020,” 2020. [Online]. Available:
] <https://www.legislation.gov.uk/ukpga/2020/21/contents/enacted>. [Accessed 22 November 2024].
- [4 HM Government, “Flood and Water Management Act 2010 c. 29.,” 2010. [Online].
] Available: <https://www.legislation.gov.uk/ukpga/2010/29>. [Accessed October 2024].
- [5 Ministry of Housing, Communities and Local Government (MHCLG), “National
] Planning Policy Framework (NPPF).,” 2021. [Online]. Available:
<https://www.gov.uk/government/publications/national-planning-policy-framework--2> .
[Accessed 18 August 2024].
- [6 Department of Environment, Food and Rural Affairs (DEFRA, 2013)., “ Environmental
] Improvement Plan (EIP),” [Online]. Available: Environmental Improvement Plan 2023 -
GOV.UK (www.gov.uk). [Accessed 14 August 2024].
- [7 Landscape Institute and Institute of Environmental Management & Assessment ,
] “Guidelines for Landscape and Visual Impact Assessment. Third Edition.,” Routledge,
London, 2013.
- [8 Council of Europe, “Landscape Convention (2006) (ETS No. 176),” [Online]. Available:
] <https://www.coe.int/en/web/conventions/full-list?module=treaty-detail&treatynum=176>.
[Accessed 05 December 2024].
- [9 UK Government, “Autumn Budget 2024,” 12 November 2024. [Online]. Available:
] <https://www.gov.uk/government/publications/autumn-budget-2024>. [Accessed 30 October 2024].
- [1 Department for Environment, Food and Rural Affairs (DEFRA 2009), “Safeguarding
0] our Soils – A strategy for England.,” [Online]. Available:
[https://assets.publishing.service.gov.uk/media/5a795b71ed915d0422067beb/pb13297](https://assets.publishing.service.gov.uk/media/5a795b71ed915d0422067beb/pb13297-soil-strategy-090910.pdf)
-soil-strategy-090910.pdf . [Accessed 06 December 2024].
- [1 Department for Environment, Food and Rural Affairs (DEFRA, 2021), “England Peat
1] Action Plan,” [Online]. Available: England Peat Action Plan (publishing.service.gov.uk).
[Accessed 14 August 2024].
- [1 Greater Lincolnshire Nature Partnership (2022), “Geodiversity Strategy,” [Online].
2] Available: <https://glnp.org.uk/our-services/geodiversity-strategy>. [Accessed 06 December 2024].
- [1 HM Government, “The Environment (Amendment etc.) (EU Exit) (Amendment)
3] (England and Wales) Regulations 2020,” 2020. [Online]. Available:

<https://www.legislation.gov.uk/ukxi/2020/603/introduction/made>. [Accessed 08 July 2024].

[1 HM Government, "Environmental Protection Act 1990 [Online].," [Online]. Available:
4] <https://www.legislation.gov.uk/ukpga/1990/43/contents> . [Accessed 10 July 2024].

[1 HM Government, "Water Resources Act 1991," [Online]. Available:
5] <https://www.legislation.gov.uk/ukpga/1991/57/contents>. [Accessed 08 July 2024].

[1 HM Government, "The Water Environment (Water Framework Directive) (England and
6] Wales) Regulations 2017 (WFD) [Online].," [Online]. Available:
<https://www.legislation.gov.uk/ukxi/2017/407/contents/made> . [Accessed 10 July 2024].

[1 HM Government, "Land Drainage Act 1991 [Online].," [Online]. Available:
7] <https://www.legislation.gov.uk/ukpga/1991/59/contents> . [Accessed 10 July 2024].

[1 HM Governemnt, "Water Act 2014 [Online].," [Online]. Available:
8] <https://www.legislation.gov.uk/ukpga/2014/21/contents/enacted>. [Accessed 10 July 2024].

[1 HM Government, "Water Resources (Abstraction and Impounding) Regulations 2006
9] [Online].," [Online]. Available:
<https://www.legislation.gov.uk/ukxi/2006/641/contents/made> .

[2 HM Government, "Flood Risk Regulations 2009 [Online].," [Online]. Available:
0] <https://www.legislation.gov.uk/ukxi/2009/3042/contents/made> . [Accessed 10 July 2024].

[2 HM Government, "Nitrate Pollution Prevention Regulations 2015 [Online].," [Online].
1] Available: <https://www.legislation.gov.uk/ukxi/2015/668/contents> . [Accessed 10 July 2024].

[2 HM Government, "The Conservation of Habitats and Species Regulations 2017,"
2] [Online]. Available: <https://www.legislation.gov.uk/ukxi/2017/1012/contents/made>.
[Accessed 12 August 2024].

[2 HM Government, "Wildlife and Countryside Act 1981 (as amended)," [Online].
3] Available: <https://www.legislation.gov.uk/ukpga/1981/69> . [Accessed 12 August 2024].

[2 HM Government, "Natural Environment and Rural Communities Act 2006 Chapter 16.,"
4] [Online]. Available:
https://www.legislation.gov.uk/ukpga/2006/16/pdfs/ukpga_20060016_en.pdf.
[Accessed 12 August 2024].

[2 H. Government, "Countryside and Rights of Way Act 2000.," [Online]. Available:
5] <https://www.legislation.gov.uk/ukpga/2000/37/contents..> [Accessed 12 August 2024].

[2 H. Government, "The Hedgerow Regulations 1997.," [Online]. Available:
6] <https://www.legislation.gov.uk/ukxi/1997/1160/contents/made..> [Accessed 12 August 2024].

[2 HM Government, "Protection of Badgers Act 1992.," [Online]. Available:
7] <https://www.legislation.gov.uk/ukpga/1992/51/contents>. [Accessed 12 August 2024].

- [2 HM Government, "Salmon and Freshwater Fisheries Act 1975.," [Online]. Available:
8] <https://www.legislation.gov.uk/ukpga/1975/51>. [Accessed 12 August 2024].
- [2 HM Government, "The Eels (England and Wales) Regulations 2009.," [Online].
9] Available: <https://www.legislation.gov.uk/uksi/2009/3344/contents/made..> [Accessed 12 August 2024].
- [3 HM Government, " The Invasive Alien Species (Enforcement and Permitting) Order
0] 2019.," [Online]. Available:
<https://www.legislation.gov.uk/uksi/2019/527/contents/made.> . [Accessed 12 August 2024].
- [3 HM Government, "Ancient Monuments and Archaeological Areas Act 1979.," [Online].
1] Available: <https://www.legislation.gov.uk/ukpga/1979/46..> [Accessed 12 August 2024].
- [3 HM Government, " Planning (Listed Buildings and Conservation Areas) Act 1990.,"
2] [Online]. Available: <https://www.legislation.gov.uk/ukpga/1990/9/contents.> . [Accessed 12 August 2024].
- [3 HM Government, "Protection of Military Remains Act 1986.," [Online]. Available:
3] <https://www.legislation.gov.uk/ukpga/1986/35/contents..> [Accessed 12 August 2024].
- [3 HM Government, "The Hedgerows Regulations 1997.," [Online]. Available:
4] <https://www.legislation.gov.uk/uksi/1997/1160/contents/made.> . [Accessed 12 August 2024].
- [3 HM Government, "Treasure Act 1996.," [Online]. Available:
5] <https://www.legislation.gov.uk/ukpga/1996/24/contents.> [Accessed 12 August 2024].
- [3 Department of Health and Social Care, "Health and Social Care Act.," 2012. [Online].
6] Available: <https://www.legislation.gov.uk/ukpga/2012/7/contents.> [Accessed 18 August 2024].
- [3 Lincolnshire Health Intelligence Hub, "Joint Strategic Needs Assessment," 2023.
7] [Online]. Available: <https://lhih.org.uk/joint-health-and-wellbeing-strategy/>. [Accessed 18 August 2024].
- [3 Lincolnshire Health Intelligence Hub, "Joint Health and Wellbeing Strategy," 2024.
8] [Online]. Available: <https://lhih.org.uk/joint-health-and-wellbeing-strategy/>. [Accessed 04 September 2024].
- [3 HM Government, "The Air Quality Standards (Amendment) Regulations 2016, SI
9] 2016/1184," [Online]. Available:
<https://www.legislation.gov.uk/uksi/2016/1184/contents/made.> [Accessed 16 November 2024].
- [4 Department for Communities and Local Government, "Planning Practice Guidance: Air
0] Quality," 2014. [Online]. Available: <https://www.gov.uk/guidance/air-quality--3.>
[Accessed 14 November 2024].
- [4 Department for Environment, Food and Rural Affairs (DEFRA), "Clean Air Strategy
1] 2019," [Online]. Available: <https://www.gov.uk/government/publications/clean-air-strategy-2019.> [Accessed 14 November 2024].

- [4] Natural England, "National Character Area Profiles," 2014. [Online]. Available:
2] <https://nationalcharacterareas.co.uk/>. [Accessed 14 December 2024].
- [4] L. Institute, "Landscape Character Assessment," 10 December 2024. [Online].
3] Available: https://www.landscapeinstitute.org/wp-content/uploads/2016/01/Landscape-Character-Assessment-TIN-08_15-20160216.pdf. [Accessed February 2016].
- [4] Natural England, "National Character Area 42: Lincolnshire Coast and Marshes.,"
4] 2024. [Online]. Available: <https://nationalcharacterareas.co.uk/Lincolnshire-Coast-and-Marshes/>. [Accessed 18 October 2024].
- [4] Natural England, "National Character Area 46: The Fens," 2024. [Online]. Available:
5] <https://nationalcharacterareas.co.uk/The-Fens/>. [Accessed 18 October 2024].
- [4] East Lindsey District Council, "Landscape Character Assessment," 2011. [Online].
6] Available: <https://www.e-lindsey.gov.uk/article/6163/Landscape-Character-Assessment..> [Accessed 17 October 2024].
- [4] The Wash Estuary Project, "The Wash and Fens Green Infrastructure Plan," 2011.
7] [Online]. Available: <https://safe.rbi-umbrella.com/doc/docview/viewer/docN6C474CC9F406949a074e68b7ce3e7d6a04d7568b7b5f335fb946b7ffaa27578795d6f60120ce>. [Accessed 15 October 2024].
- [4] Natural England, "Green Infrastructure," 2025. [Online]. Available:
8] <https://designatedsites.naturalengland.org.uk/GreenInfrastructure/Map.aspx>. [Accessed 21 January 2025].
- [4] Greater Lincolnshire Local Nature Recovery Strategy, "Greater Lincolnshire Local
9] Nature Recovery Strategy," 2025. [Online]. Available: <https://www.glincsnrs.org.uk>. [Accessed 22 January 2025].
- [5] Land Information Service, "Land Information Service, Soilscales, Cranfield
0] Environment Centre, Cranfield University. [online].," [Online]. Available: <https://www.landis.org.uk/soilscales/>. [Accessed 05 October 2024].
- [5] Natural England, "Peaty Soils Location (England), Authoritative, Natural England Open
1] Data Publication, Defra group ArcGIS Online organisation [online].," 2008. [Online]. Available: <https://naturalengland-defra.opendata.arcgis.com/datasets/Defra::peaty-soils-location-england/about>. [Accessed 15 November 2024].
- [5] I. a. K. C. Holman, "A revised estimate of peat reserves and loss in the East Anglian
2] Fens," *Cranfield University, Commissioned by the RSPB.*, 2011.
- [5] Environment Agency, "Steeping, Great Eau & Long Eau Abstraction Licensing
3] Strategy, A strategy to manage water resources sustainably," March 2020. [Online]. Available: <https://assets.publishing.service.gov.uk/media/5e74e07886650c296f6eda49/The-Steeping-Great-Eau-and-Long-Eau-abstraction-management-strategy.pdf>. [Accessed 05 October 2024].
- [5] DEFRA, "Accredited Official Statistics, Agriculture in the UK 2023, chapter 7: crops
4] [online].," 2024. [Online]. Available: <https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2023/chapter-7-crops>. [Accessed 05 October 2024].

- [5] Office for National Statistics, “Business Register and Employment Survey: open
5] access (2015 to 2022) [online],” 2024. [Online]. Available:
<https://www.nomisweb.co.uk/query/construct/summary.asp?mode=construct&version=0&dataset=189>. [Accessed 07 October 2024].
- [5] Environment Agency, “Groundwater source protection zones [online].,” 2019. [Online].
6] Available: <https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs>.
[Accessed 16 August 2024].
- [5] F. & R. A. a. E. A. Department for Environment, “Nitrate vulnerable zones,” HM
7] Government, 12 February 2025. [Online]. Available:
<https://www.gov.uk/government/collections/nitrate-vulnerable-zones>. [Accessed 28
August 2025].
- [5] UK Radon Map, “<https://www.ukradon.org/information/ukmaps>”.
8]
- [5] British Geological Society, Skegness, Sheet 116. Solid and Drift Geology. 1:50,000.
9] England and Wales, 1996.
- [6] British Geological Society, “GeoIndex Onshore,” 09 2024. [Online]. Available:
0] <https://mapapps2.bgs.ac.uk/geoindex/home.html>. [Accessed October 8 2024].
- [6] A. A. M. a. J. H. Powell, Classification of artificial (man-made) ground and natural
1] superficial deposits applications to geological maps and datasets in the UK., 1999.
- [6] D. e. a. Smith, Holocene drainage systems of the English Fenland: roddons and their
2] environmental significance., Proceedings of the Geologists' Association. Vol. 121,
Issue 3, Pg 256-269., 2010.
- [6] Kent. P., Eastern England from the Tees to The Wash. British Regional Geology.
3] Second Edition., Institute of Geological Sciences. Natural Environment Research
Council, 1980.
- [6] Smith., “Holocene drainage systems of the English Fenland: roddons and their
4] environmental,” 2010.
- [6] R. Gallois, Geology of the country around King's Lynn and The Wash : memoir for
5] 1:50000 geological sheet 145 and part of 129 (England & Wales)., 1994.
- [6] MAGIC, “<https://magic.defra.gov.uk/MagicMap.aspx>”.
6]
- [6] Hydrogeological Map of England, and Wales, 1:625,000 scale, Institute of Geological
7] Sciences, 1977.
- [6] J. N. C. Committee, “UK Terrestrial & Freshwater Habitat Descriptions,” JNCC
8] Resource Hub., 2015. [Online]. Available: <https://hub.jncc.gov.uk/assets/b0b5e833-7300-4234-8ae5-bdbf326e854c..> [Accessed 15 April 2025].
- [6] International Finance Corporation (IFC), “International Finance Corporation’s Guidance
9] Note 6: Biodiversity Conservation and Sustainable Management of Living Natural
Resources.,” 2019. [Online]. Available:

<https://www.ifc.org/content/dam/ifc/doc/2010/20190627-ifc-ps-guidance-note-6-en.pdf>. [Accessed 27 October 2024].

- [7 P. Migoń, “ ‘The Fens – An example of large-scale anthropic transformation of a
0] lowland landscape’,” in *in Goudie, A. and Mignoń, P (eds) Landscapes and Landforms of England and Wales, World Geomorphological Landscapes*,, Switzerland, Springer Nature, 2020.
- [7 W. H. Wheeler, *A History of the Fens of South Lincolnshire*, Facsim. of 2nd ed.,
1] London: Simpkin Marshall, 1896, 1990.
- [7 E. A. Labrum, *Civil Engineering Heritage, Eastern & Central England*, London: ICE,
2] 1994.
- [7 C. R. Green, *Land on the Edge: The landscape evolution of the Lincolnshire Coastline*,
3] Historic England project number: 8398, 2023.
- [7 Ministry of Housing, Communities, Local Government, “The English indices of
4] Deprivation (2019),” 2019. [Online]. Available:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/835115/loD2019_Statistical_Release.pdf. [Accessed 21 August 2024].
- [7 Office for National Statistics (ONS), “Census 2021 Geographies,” 2021. [Online].
5] Available:
<https://www.ons.gov.uk/methodology/geography/ukgeographies/censusgeographies/census2021geographies#lower-layer-super-output-areas-isoas->. [Accessed 08 September 2024].
- [7 Office for National Statistics (ONS), “Lower Layer Super Output Area Population
6] Estimates,” 2021. [Online]. Available:
<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/lowersuperoutputareamidyearpopulationestimatesnationalstatistics>. [Accessed 09 September 2024].
- [7 Office for National Statistics (ONS), “East Lindsey Population Change,” 2021. [Online].
7] Available: <https://www.ons.gov.uk/visualisations/censuspopulationchange/E07000137/>. [Accessed 09 September 2024].
- [7 Office for National Statistics (ONS), “Sub-National Population Projections for England:
8] 2018-based,” [Online]. Available:
<https://www.ons.gov.uk/releases/subnationalpopulationprojectionsforengland2018based#:~:text=Population%20figures%20over%20a%2025-year%20period,%20by%20five-year%20age%20groups>. [Accessed 09 September 2024].
- [7 Office for National Statistics (ONS), “Population density, people per square kilometre.,”
9] 2020. [Online]. Available: <https://fingertips.phe.org.uk/local-health#page/3/gid/1938133180/pat/30000/par/al-Sr1JPIAp8k/ati/8/are/E05010784/iid/93747/age/1/sex/4/cat/-1/ctp/-1/yr/1/cid/4/tbm/1>. [Accessed 14 September 2024].
- [8 Office for National Statistics (ONS), “Ethnic Group (Detailed),” 2022. [Online].
0] Available: <https://www.ons.gov.uk/datasets/TS021/editions/2021/versions/1/filter-outputs/2c157d27-8f89-4567-9598-fe558a180c57>. [Accessed 19 October 2024].

- [8 Office for National Statistics (ONS), "Census Profile for MSOA areas in England and
1] Wales.," 2021. [Online]. Available:
<https://www.nomisweb.co.uk/reports/localarea?compare=E02005436,E07000137,E92000001>. [Accessed 19 October 2024].
- [8 Office for Health Improvement and Disparities, "Unemployment, percentage of the
2] working age population claiming out of work benefit, 2021 to 2022 (%).," 2022.
[Online]. Available: https://fingertips.phe.org.uk/local-health#page/0/gid/1938133180/pat/30000/par/al-PFHqBc7RZ0/ati/3/iid/93747/age/1/sex/4/cat/-1/ctp/-1/yr/1/cid/4/tbm/1/page-options/car-ao-0_car-do-1. [Accessed 19 October 2024].
- [8 Office for Health Improvement and Disparities, "Life expectancy at birth," 2022.
3] [Online]. Available: <https://fingertips.phe.org.uk/local-health#page/3/gid/1938133185/pat/30000/par/al-Sr1JPIAp8k/ati/8/iid/93283/age/1/sex/2/cat/-1/ctp/-1/yr/5/cid/4/tbm/1/page-options/car-do-0>. [Accessed 19 October 2024].
- [8 Office for National Statistics (ONS), "2021 Census profile for for areas in England and
4] Wales," 2021. [Online]. Available:
https://www.nomisweb.co.uk/sources/census_2021/report?compare=E07000137#section_9. [Accessed 05 September 2024].
- [8 Office for Health Improvement and Disparities, "Percentage of people who reported
5] having a limiting long-term illness or disability," 2022. [Online]. Available:
https://fingertips.phe.org.uk/local-health#page/8/gid/1938133184/pat/402/par/E10000019/ati/3/are/E02005436/iid/93276/age/1/sex/4/cat/-1/ctp/-1/yr/1/cid/4/tbm/1/page-options/car-ao-0_car-do-0_map-ao-4.
- [8 Office for Health Improvement and Disparities, "Reception prevalence of obesity
6] (including severe obesity), 2021-2022 (%).," 2022. [Online]. Available:
https://fingertips.phe.org.uk/local-health#page/8/gid/1938133183/pat/402/par/E10000019/ati/3/are/E02005436/iid/93105/age/200/sex/4/cat/-1/ctp/-1/yr/3/cid/4/tbm/1/page-options/car-ao-0_car-do-0_map-ao-4. [Accessed 09 September 2024].
- [8 Adult Psychiatric Morbidity Survey, "Estimated prevalence of common mental
7] disorders: % of population aged 16 and over.," 2017. [Online]. Available:
<https://fingertips.phe.org.uk/common-mental-disorders#page/4/gid/8000026/pat/6/ati/202/are/E10000019/iid/93495/age/164/sex/4/cat/-1/ctp/-1/yr/1/cid/4/tbm/1>. [Accessed 08 September 2024].
- [8 Office for Health Improvements and Disparities, "Self-reported wellbeing indicators by
8] area.," 2021. [Online]. Available:
<https://fingertips.phe.org.uk/search/self%20reported#page/1/gid/1/pat/6/ati/402/are/E10000019/iid/22301/age/164/sex/4/cat/-1/ctp/-1/yr/1/cid/4/tbm/1>. [Accessed 08 September 2024].
- [8 Office for National Statistics (ONS), "Household Projections for England: 2018-
9] based.," 2022. [Online]. Available:
<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/householdprojectionsforengland/2018based>. [Accessed 17 September 2024].

- [9 East Lindsey (2018), “East Lindsey Local Plan Core Strategy Adopted July 2018
0 Supporting Economic Growth for the Future [online],” [Online]. Available:
https://www.e-lindsey.gov.uk/media/9791/Core-Strategy/pdf/Core_Strategy_adopted_version_for_web.pdf. [Accessed 05 October 2024].
- [9 Sports England, “Active Places Power.,” 2024. [Online]. Available:
1 <https://designatedsites.naturalengland.org.uk/GreenInfrastructure/Map.aspx>.
[Accessed 09 September 2024].
- [9 HM Government, “Environment Act,” 2021. [Online]. Available:
2 <https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted>. [Accessed 4
November 2024].
- [9 HM Government, “Directive 2010/75/EU of the European Parliament and of the
3 Council of 24 November 2010 on industrial emissions (integrated pollution prevention
and control),” [Online]. Available: <https://www.legislation.gov.uk/eudr/2010/75/contents>.
[Accessed 10 October 2024].
- [9 HM Government, “The Environmental Permitting (England and Wales) Regulations
4 2016, SI 2016/1154,” [Online]. Available:
<https://www.legislation.gov.uk/uksi/2016/1154/contents>. [Accessed 10 October 2024].
- [9 Department for Environment, Food and Rural Affairs (DEFRA), “Environmental
5 Permitting Regulations - Installations,” [Online]. Available:
<https://environment.data.gov.uk/public-register/view/search-industrial-installations>.
[Accessed 10 October 2024].
- [9 H. Government, “Environment Act 2021,” [Online]. Available:
6 <https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted>. [Accessed 10
December 2024].
- [9 HM Government, “Flood and Water Management Act 2010,” [Online]. Available:
7 <https://www.legislation.gov.uk/ukpga/2010/29/contents>. [Accessed 10 July 2024].
- [9 Chartered Institute for Archaeologists (CIfA), “Code of Conduct: professional ethics in
8 archaeology,” [Online]. Available:
<https://www.archaeologists.net/sites/default/files/Code%20of%20conduct%20revOct2022.pdf>. [Accessed 10 September 2024].
- [9 T. H. C. G. K. H. P. K. G. Nixon, “Archaeology and Construction: good practice
9 guidance.,” CIRIA C799, 2021.
- [1 The Department for Levelling Up, Housing and Communities (DLUHC), “Planning
0 Practice Guidance,” 2024. [Online]. Available:
0 <https://www.gov.uk/government/collections/planning-practice-guidance>. [Accessed 10
September 2024].
- [1 Chartered Institute for Archaeologists (CIfA), “Standard and guidance for historic
0 environment desk-based assessment.,” 2024. [Online]. Available:
1 https://www.archaeologists.net/sites/default/files/CIfAS%26GDBA_4.pdf. [Accessed 10
September 2024].

- [1 Historic England, "Managing Significance in Decision-Taking in the Historic Environment. Historic Environment Good Practice Advice in Planning: 2.," 2015.
0 [Online]. Available: <https://historicengland.org.uk/images-books/publications/gpa2-managing-significance-in-decision-taking/>. [Accessed 10 September 2024].
- [1 Historic England, "The Setting of Heritage Assets. Good Practice Advice in Planning
0 Note 3 (Second edition).," 2017. [Online]. Available:
3] <https://historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/> . [Accessed 10 September 2024].
- [1 Historic England, "Conservation Principles, Policies and Guidance for the Sustainable
0 Management of the Historic Environment.," 2008. [Online]. Available:
4] <https://historicengland.org.uk/images-books/publications/conservation-principles-sustainable-management-historic-environment/conservationprinciplespoliciesandguidanceapril08web/> . [Accessed 10 September 2024].
- [1 Environment Agency, "Minimum Technical Requirements – Environment and
0 Sustainability LIT 65150.," 2023. [Online]. Available:
5] <https://www.gov.uk/government/collections/technical-guidance-for-regulated-industry-sectors-environmental-permitting>. [Accessed 10 September 2024].
- [1 Lincolnshire Wildlife Trust, "Nature Reserves, Gibraltar Point National Nature Reserve,
0 Lincolnshire Wildlife Trust. [online].," 2024. [Online]. Available:
6] <https://www.lincstrust.org.uk/nature-reserves/gibraltar-point-national-nature-reserve>.
[Accessed 04 October 2024].
- [1 Department for Environment, Food and Rural Affairs (DEFRA), "Magic Map [online],"
0 2024. [Online]. Available: <https://magic.defra.gov.uk/MagicMap.aspx>. [Accessed 04
7] October 2024].
- [1 Natural England, "The Wash SSSI Designated Sites Viewer, Natural England [online],"
0 2024. [Online]. Available:
8] <https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1002591&SiteName=wash%20SSSI&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=> .
[Accessed 04 October 2024].
- [1 Farmers Weekly, "How solar panel diversification is working for a sheep enterprise
0 [online].," 2022. [Online]. Available: <https://www.fwi.co.uk/livestock/how-solar-panel-diversification-is-working-for-a-sheep-enterprise> . [Accessed 28 October 2024].
- [1 Skegness Gateway, "Gateway approved: 336-acre development to transform East
1 Lincolnshire, Skegness Gateway News. [online],," 2024. [Online]. Available:
0] <https://skegnessgateway.co.uk/news/gatewayapproved/?page=2> . [Accessed 04
October 2024].
- [1 Natural England, "Provisional Agricultural Land Classification (ALC) (England),
1 Authoritative, Natural England Open Data Publication, Defra group ArcGIS Online
1] organisation [online].," 2019. [Online]. Available: <https://naturalengland-defra.opendata.arcgis.com/datasets/Defra::provisional-agricultural-land-classification-alc-england/about>. [Accessed 28 October 2024].

- [1 UK Centre for Ecology and Hydrology, "Lowland peatlands [online]," (n.d.). [Online].
1 Available: <https://lowlandpeat.ceh.ac.uk/>. [Accessed 28 October 2024].
2]
- [1 Fens For the Future , "Cranfield University, A revised estimate of peat reserves and
1 loss in the East Anglian Fens, Commissioned by the RSPB, Holman, IP and
3] Kechavarzi, C, January 2011 [online].," 2011. [Online]. Available:
<https://www.fensforthefuture.org.uk/admin/resources/banners/cranfieldfenland-phase-2-peat-assessment-19-01-11-final.pdf>. [Accessed 16 November 2024].
- [1 Water Management Consortium, "Water Management Consortium, Boards, Lindsey
1 Marsh, LM Area Map. [online]," [Online]. Available:
4] https://static.wixstatic.com/media/ecef50_d338db0acf594697bdd35949ffe5ce18~mv2.png . [Accessed 04 October 2024].
- [1 Water Management Consortium, "Water Management Consortium, Lindsey Marsh
1 Drainage Board Minutes, January 2024 [online]," [Online]. Available: Water
5] Management Consortium, Lindsey Marsh Drainage Board Minutes, January 2024
[online] . [Accessed 04 October 2024].
- [1 Water Management Consortium, "Water Management Consortium, Lindsey Marsh
1 Drainage Board Minutes, January 2024 [online]," [Online]. Available: [https://www.wmc-
6\] idbs.org.uk/lm-board-minutes](https://www.wmc-idbs.org.uk/lm-board-minutes). [Accessed 04 October 2024].
- [1 Association of Drainage Authorities (ADA), "Wainfleet Flooding," 2019. [Online].
1 Available: <https://www.ada.org.uk/2019/06/wainfleet-flooding/>. [Accessed 07 October
7] 2024].
- [1 BBC , " Floods force thousands from homes [online]," 2007. [Online]. Available:
1 <http://news.bbc.co.uk/1/hi/uk/6239828.stm> . [Accessed 07 October 2024].
8]
- [1 Norfolk County Council on behalf of Lincolnshire County Council, "Investigation into
1 the flooding in Wainfleet in June 2019 [online]," 2020. [Online]. Available:
9] [https://lincolnshire.moderngov.co.uk/documents/s31670/Appendix%20A%20-%20Wain-
fleet%20Flood%20Investigation%20Report.pdf](https://lincolnshire.moderngov.co.uk/documents/s31670/Appendix%20A%20-%20Wainfleet%20Flood%20Investigation%20Report.pdf) . [Accessed 07 October 2024].
- [1 BBC, "Lincolnshire Flooding: Storm Babet affects more than 150 homes [online],"
2 2023. [Online]. Available: [https://www.bbc.co.uk/news/uk-england-lincolnshire-
0\] 67176154](https://www.bbc.co.uk/news/uk-england-lincolnshire-67176154). [Accessed 10 October 2024].
- [1 East Lindsey District Council , "Planning – Application Summary S/195/00730/12, East
2 Lindsey District Council [online].," [Online]. Available: [https://publicaccess.e-
1\] lindsey.gov.uk/online-
applications/applicationDetails.do?activeTab=summary&keyVal=_EASTL_DCAPR_11
0304](https://publicaccess.e-lindsey.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_EASTL_DCAPR_110304). [Accessed 05 October 2024].
- [1 Facebook, "Croftmarsh Limited, Facebook. [online]," 2024. [Online]. Available:
2 <https://www.facebook.com/p/Croftmarsh-limited-100057865320972/> . [Accessed 04
2] October 2024].
- [1 Companies House, "C W Parker (Wainfleet) Limited, Find and update company
2 information. [online]," 2024. [Online]. Available: [https://find-and-update.company-
3\] information.service.gov.uk/company/00493859](https://find-and-update.company-information.service.gov.uk/company/00493859). [Accessed 04 October 2024].

- [1 DEFRA (2024), “ Official Statistics, Crop areas in England sourced from Basic
2 Payment Scheme compared to areas from the Defra June Survey of Agriculture,
4] DEFRA [online].,” [Online]. Available: <https://www.gov.uk/government/statistics/crop-areas-in-england-sourced-from-basic-payment-scheme-compared-to-areas-from-the-defra-june-survey-of-agriculture>. [Accessed 05 October 2024].
- [1 DEFRA, “Value per hectare of other arable crops, including potatoes, sugar beet,
2 oilseed, field beans, etc. Accredited Official Statistics, Agriculture in the UK 2023,
5] chapter 7: crops [online].,” 2024. [Online]. Available:
<https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2023/chapter-7-crops>.
- [1 DEFRA, “Value per hectare of fresh vegetables grown in the open; and fresh fruit
2 grown in the open. Accredited Official Statistics, Agriculture in the UK 2023, chapter 7:
6] crops [online].,” 2024. [Online]. Available:
<https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2023/chapter-7-crops>. [Accessed 05 October 2024].
- [1 DEFRA , “Output per head of English Beef Herd 2023. Based on DEFRA (2024).
2 Accredited official statistics, Livestock populations in England [online].,” 2024. [Online].
7] Available: <https://www.gov.uk/government/statistics/livestock-populations-in-england>.
[Accessed 07 October 2024].
- [1 DEFRA, “Chapter 4: Accounts, Agriculture in the United Kingdom 2023 [online].,” 2024.
2 [Online]. Available: <https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2023/chapter-4-accounts>. [Accessed 05 October 2024].
- [1 Farmers Weekly, “ Alternative land uses: Leasing land for solar – key points. [online].,”
2 2024. [Online]. Available: <https://www.fwi.co.uk/business/alternative-land-uses-leasing-land-for-solar-key-points>. [Accessed 15 October 2024].
- [1 Nomis, “Nomis, official census and labour market statistics, Business Register and
3 Employment Survey [online].,” 2024. [Online]. Available:
0] <https://www.nomisweb.co.uk/query/construct/summary.asp?mode=construct&version=0&dataset=189>. [Accessed 07 October 2024].
- [1 DEFRA , “Research and analysis, UK Food Security Index 2024 [online].,” 2024.
3 [Online]. Available: <https://www.gov.uk/government/publications/uk-food-security-index-2024/uk-food-security-index-2024>. [Accessed 05 October 2024].
- [1 Companies House, “George Bateman & Son Limited, Find and update company
3 information. [online].,” 2024. [Online]. Available: <https://find-and-update.company-information.service.gov.uk/company/00232213>. [Accessed 04 October 2024].
- [1 Batemans Brewery, “ Batemans Brewery [online].,” [Online]. Available:
3 <https://www.batemansbrewery.co.uk/>. [Accessed 04 October 2024].
3]
- [1 Companies House , “The Chuckling Cheese Company Limited, Find and update
3 company information. [online].,” 2024. [Online]. Available: <https://find-and-update.company-information.service.gov.uk/company/09442023/filing-history>.
4] [Accessed 04 October 2024].

- [1 The Chuckling Cheese Company, "The Chuckling Cheese Company. [online].,"
3 [Online]. Available: <https://www.chucklingcheese.co.uk/>. [Accessed 04 October 2024].
5]
- [1 Lymn Bank Farm Cheese Co, "Lymn Bank Farm [online]," [Online]. Available:
3 <https://lymnbankfarm.com/>. [Accessed 04 October 2024].
6]
- [1 Companies House (2024) , "Lymn Bank Farm Limited, Find and update company
3 information. [online]," [Online]. Available: [https://find-and-update.company-](https://find-and-update.company-information.service.gov.uk/company/08433609/filing-history)
7] [information.service.gov.uk/company/08433609/filing-history](https://find-and-update.company-information.service.gov.uk/company/08433609/filing-history). [Accessed 04 October
2024].
- [1 Companies House (2024), "MGH Corporation Limited, Find and update company
3 information. [online]," [Online]. Available: [https://find-and-update.company-](https://find-and-update.company-information.service.gov.uk/company/13322603/filing-history)
8] [information.service.gov.uk/company/13322603/filing-history](https://find-and-update.company-information.service.gov.uk/company/13322603/filing-history). [Accessed 04 October
2024].
- [1 Fairburns Eggs, "Fairburns Eggs Business [online]," 2024. [Online]. Available:
3 <https://www.fairburnseggs.co.uk/about-us/the-business>. [Accessed 10 October 2024].
9]
- [1 East Lindsey District Council, "Planning-Application Summary S/039/01190/16," 2016.
4 [Online]. Available: [https://publicaccess.e-lindsey.gov.uk/online-](https://publicaccess.e-lindsey.gov.uk/online-applications/applicationDetails.do?keyVal=_EASTL_DCAPR_121118&activeTab=summary)
0] [applications/applicationDetails.do?keyVal=_EASTL_DCAPR_121118&activeTab=sum-](https://publicaccess.e-lindsey.gov.uk/online-applications/applicationDetails.do?keyVal=_EASTL_DCAPR_121118&activeTab=summary)
mary. [Accessed 04 October 2024].
- [1 Windfarm Park, "Windfarm Park About Us [online].," [Online]. Available:
4 <https://windfarmpark.co.uk/about.php>. [Accessed 04 October 2024].
1]
- [1 East Lindsey District Council , "Planning – Planning Application Documents
4 S/020/02242/13 | Planning Permission, East Lindsey District Council [online].," 2020.
2] [Online]. Available: [https://publicaccess.e-lindsey.gov.uk/online-](https://publicaccess.e-lindsey.gov.uk/online-applications/applicationDetails.do?activeTab=documents&keyVal=_EASTL_DCAPR_14218)
applications/applicationDetails.do?activeTab=documents&keyVal=_EASTL_DCAPR_1
14218. [Accessed 04 October 2024].
- [1 East Lindsey District Council, " Planning – Application Summary S/051/00114/24, East
4 Lindsey District Council [online].," 2024. [Online]. Available: [https://publicaccess.e-](https://publicaccess.e-lindsey.gov.uk/online-applications/applicationDetails.do?keyVal=_EASTL_DCAPR_140126&activeTab=summary)
3] [lindsey.gov.uk/online-](https://publicaccess.e-lindsey.gov.uk/online-applications/applicationDetails.do?keyVal=_EASTL_DCAPR_140126&activeTab=summary)
applications/applicationDetails.do?keyVal=_EASTL_DCAPR_140126&activeTab=sum
mary. [Accessed 04 October 2024].
- [1 East Lindsey District Council, "Planning – Application Summary S/184/01054/15, East
4 Lindsey District Council [online].," [Online]. Available: [https://publicaccess.e-](https://publicaccess.e-lindsey.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_EASTL_DCAPR_118322)
4] [lindsey.gov.uk/online-](https://publicaccess.e-lindsey.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_EASTL_DCAPR_118322)
applications/applicationDetails.do?activeTab=summary&keyVal=_EASTL_DCAPR_11
8322. [Accessed 04 October 2024].
- [1 GeoIndex Onshore, 2024. [Online]. Available:
4 <https://mapapps2.bgs.ac.uk/geoindex/home.html>.
5]

- [1 Environment Agency, "Flood risk information for planning.," 2024. [Online]. Available:
4 [https://www.gov.uk/government/publications/flood-risk-maps-for-surface-water-how-to-](https://www.gov.uk/government/publications/flood-risk-maps-for-surface-water-how-to-use-the-map)
6] [use-the-map](https://www.gov.uk/government/publications/flood-risk-maps-for-surface-water-how-to-use-the-map). [Accessed 10 November 2024].
- [1 K. N. R. S. P. R. J. P. J. P. R. H. Y. M. A. T. N. C. S. Jenkins, "The UK Fens Climate
4 Change Risk Assessment: Big challenges and strategic solutions.," Tyndall Centre for
7] Climate Change Research, University of East Anglia, Norwich., 2024. [Online].
Available: [https://awinnovationhub.co.uk/wp-content/uploads/2024/11/Fens-Climate-](https://awinnovationhub.co.uk/wp-content/uploads/2024/11/Fens-Climate-Change-Risk-Assessment-Final-4.pdf)
Change-Risk-Assessment-Final-4.pdf. [Accessed 02 December 2024].
- [1 Google, "Google Earth," Google, 2024. [Online]. [Accessed December 2024].
4
8]
- [1 Department of Environment, Food and Rural Affairs (DEFRA), "Structure June Local
4 Authority," 2022. [Online]. Available:
9] [https://assets.publishing.service.gov.uk/media/62c40b06e90e077485f509d5/structure-](https://assets.publishing.service.gov.uk/media/62c40b06e90e077485f509d5/structure-june-eng-localauthority-05jul22.ods)
june-eng-localauthority-05jul22.ods. [Accessed 05 October 2024].

