Document E Renewable Energy Assessment

Huntingdonshire District Council

Final Report

Prepared by LUC

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Glossary

1.1 Please refer to the glossary in Document A for the complete list of terms and their definitions used within the Climate Change Study. The table below defines terms specific to this document.

Table 1.1: Glossary

Term	Definition
Deployable potential	The 'deployable potential' is the amount of renewable energy that could be realistically delivered within the Council taking into account factors such as planning, economic viability and grid connection.
Carbon Dioxide (CO_2)	A colourless, odourless, non-poisonous gas that is a normal part of Earth's atmosphere. Carbon dioxide is a product of fossil-fuel combustion as well as other processes. It is considered a greenhouse gas as it traps heat (infrared energy) radiated by the Earth into the atmosphere and thereby contributes to the potential for global warming.
Gigawatt hour (GWh)	The gigawatt hour is a unit for measuring energy. It is used to express the quantity of energy produced or consumed by a piece of equipment with power of one gigawatt for one hour. Gigawatt hour equates to one billion watthours.
$kgCO_2e$	A unit of measurement for the amount of carbon dioxide equivalent in kilograms.
$kgCO_2e$/kWh	a metric that measures the amount of carbon dioxide (CO2) emitted per kilowatt-hour (kWh) of electricity generated
Kilowatt (kW)	Kilowatt is a unit of power. It means one thousand watts of electricity.
Megawatt (MW)	Megawatt is a unit of power. It means one million watts of electricity.
National Grid	The system that manages the distribution of electricity and gas in Great Britain, including England, Scotland and Wales.

Glossary

Term	Definition
Net Zero	Net Zero refers to the point at which the amount of greenhouse gases being put into the atmosphere by human activity equals the amount of greenhouse gases being taken out of the atmosphere.
Technical Potential	The 'technical potential' is the total amount of renewable energy that could be delivered in Huntingdonshire based on a number of assumptions regarding the amount of resource and space.
tCO2	This term means one tonne of carbon dioxide.

Executive Summary

1. Huntingdonshire District Council commissioned LUC in 2024 to conduct a Renewable and Low Carbon Energy Study to inform the preparation of their Local Plan Update. This study identifies the different types of renewable and low carbon energy technologies that may be potentially suitable within the District. Its aim is to guide the development of planning policies that not only support the generation and storage of renewable and low carbon energy but also promote low carbon development, while ensuring the protection of Huntingdonshire's valued environment. The key objectives of the study were to:

- Review the 'technical' and 'deployable' potential for renewable and low carbon energy technologies of all scales within the District;
- Provide recommendations or appropriate policy options to include in the Local Plan regarding renewable and low carbon energy; and
- Advise on the potential to set targets for renewable energy or carbon savings over the life of the Local Plan Update.

2. Chapter 4 sets out the assessment of technical potential which identifies the total resource potential within Huntingdonshire. The 'technical potential' is the total amount of renewable energy that could be delivered in an area based on a number of assumptions regarding the amount of resource and space. The assumptions used to calculate 'technical potential' for each renewable technology are provided within Appendix A. The assessment of technical potential has been applied at a strategic scale across Huntingdonshire and more detailed site assessments (i.e. as required for a planning application) would be required to determine if specific sites are suitable in planning terms. The assessment of technical potential was then used to frame the debate on how much of the resource could actually be deployed when considering additional constraints relating to issues around planning, economic viability, supply chains, cumulative impacts and infrastructure (energy storage and transmission). Two deployment scenarios for Huntingdonshire were considered including:

- Business as usual (BAU) – the anticipated deployment of renewable and low carbon technologies under the business as usual scenario reflects the recent and existing deployment of these technologies within Huntingdonshire and the wider UK.
- Ambitious – This assumes the rate of renewable energy development that will be required for Huntingdonshire to meet its share of renewable energy generation in line with the Climate Change Committee's (CCC) 6th Carbon Budget. This assumes that 80% of Huntingdonshire's energy demand will be met by renewable energy by 2050.

3. For both the 'BAU' and 'Ambitious' scenarios, potential renewable energy generation targets are given for 2046 and 2050. The figures provided in Chapter 6 are the total levels of generation that are expected to be operational within 2046 and 2050 (i.e. this includes existing generation that is still operational or is repowered to the same capacity at that time).

4. Full details of the scenarios considered for each technology are outlined in Chapter 5 and further details setting out the technical assumptions are provided in Appendix A.

5. The findings of this study show that there is significant technical potential for additional renewable and low carbon energy development within the District, as shown in Table 4.11 in Chapter 4. If all this electricity and heat generation potential could be realised, it would have a total illustrative capacity of 43,379MW, outputting 45,756,392MWh of energy per year, equating to powering approximately 15.6 million homes with electricity and 304,000 homes with heat a year. This would save 6,169,064tCO_2 emissions annually, equating to planting approximately 238 million trees a year. It is however recognised that realising all the technical potential is not a realistic scenario.

6. Overall, at present an estimated 41% of electricity demand within Huntingdonshire is met by renewable/low carbon generation, solar photovoltaics and onshore wind are the main sources of renewable energy generation. For the business as usual scenario, this is estimated to increase to only 43% by 2050 (a 2% increase). In comparison, the ambitious scenario estimates that renewable/low carbon generation could provide 80% of Huntingdonshire's electricity demand by 2050, as required in the 6th Carbon Budget Balanced Net Zero Pathway scenario. This would require 4.3% of the identified land as having technical potential for wind and 1.2% and of the identified land as having technical potential for ground mounted solar to be developed. A summary of the total projected electricity that could be generated from renewable energy resources currently and in 2046 and 2050 under each scenario is provided in Table 5.32, Table 5.33 and Table 5.34 and Figure 5.1 and Figure 5.2. This is also compared with existing and projected energy demand.

7. To support the deployment of renewable energy in the District, it is recommended that stronger polices should be put in place supporting:

- Onsite renewable and low carbon energy generation via supportive and positively worded criteria based policies;
- Stand-alone renewable and low carbon energy schemes, including specific policies on solar PV and wind energy identifying areas of suitability for these technologies and recognising that some landscape change will be required; and
- Community-led renewable and low carbon energy schemes.

8. The delivery of renewable and low carbon projects will also require changes not just to planning policy but also to the implementation of policy. It will be imperative that due weight and consideration is given to the importance of addressing climate change in development management decisions. This should include providing appropriate training and checklists for development management officers and planning committees to ensure that the policies are implemented as intended and that due weight is given to Climate Change issues in all planning decisions.

Chapter 1

Introduction

1.1 LUC was commissioned by Huntingdonshire District Council in 2024 to prepare a renewable and low carbon study to assist with the preparation of the Local Plan Update. This study identifies the different types of renewable and low carbon energy technologies that may be potentially suitable within the District.

1.2 This report provides a robust evidence base to underpin planning policies that both support renewable and low carbon energy generation and storage and low carbon development but also protect the valued environment of Huntingdonshire. It identifies the potential for different renewable and low carbon energy technologies at all scales within the District.

Renewable energy refers to sources of energy that are not depleted when used, for example, wind and solar.

Low-carbon energy sources are technologies that produce power with substantially lower amounts of carbon dioxide emissions than are emitted from conventional fossil fuel power generation. An example of this is a heat pump. Whilst the heat from the ground is free and renewable, it still requires an electric pump to operate the system.

Decentralised energy generally refers to energy that is generated closer to where it will be used, rather than the more conventional very large scale ‘centralised’ energy plant that typically serve much wider areas.

1.3 The evidence base and the recommended policies meet the requirements of the existing National Planning Policy Framework (NPPF) and Planning Policy

Guidance (PPG) and take into account the guidance and considerations set out in relevant national policy statements. It is acknowledged that the Government are currently consulting on proposed changes to the NPPF which will have a material impact (if implemented) on the policy framework for renewable energy projects.

1.4 The evidence base and recommended policies will also help contribute towards achieving the net zero carbon vision and targets set out in the Council's Climate Change Strategy.

1.5 In summary, the key objectives of the study were to:

- Review the ‘technical’ and ‘deployable’ potential for renewable and low carbon energy technologies of all scales within the District and the factors that may affect the extent to which the technologies can be deployed – i.e. grid connection, planning, finance etc;
- Provide recommendations or appropriate policy options to include in the Local Plan regarding renewable and low carbon energy; and
- Advise on the potential to set targets for renewable energy or carbon savings over the life of the Local Plan Update.

Report Structure

1.6 The remainder of this report is structured as follows:

- Chapter 2 provides a review of the policy context in relation to renewable and low carbon energy.
- Chapter 3 outlines the existing renewable and low carbon energy generation in Huntingdonshire.
- Chapter 4 summarises the findings of the assessment of 'technical' potential for renewable and low carbon energy.
- Chapter 5 summarises the findings of the assessment of 'deployable' potential for renewable and low carbon energy.

- Chapter 6 outlines the potential planning policy options for the Local Plan Update.
- Chapter 7 summarises the study conclusions.

Chapter 2

Renewable and Low Carbon Policy Context

2.1 The following chapter provides a summary of the national and local legislative and policy context for the development of renewables and low carbon energy within Huntingdonshire. Please refer to Document A for more general national climate policy.

National Climate Change and Renewable Energy Legislation and Policy

2.2 The current profile of climate change on the world's stage has never been higher. The risks of failing to limit a global average temperature increase to 1.5°C are clearly set out in the IPCC Special Report 'Global Warming of 1.5°C' **[See reference 1]** and have recently been reiterated in COP26. In response to this and the 2016 Paris Agreement, the UK's Committee on Climate Change (CCC) in its Sixth Carbon Budget recommended in December 2020 a new emissions target for the UK: reduction by 78% by 2035 relative to 1990 and net zero greenhouse gases by 2050 **[See reference 2]**. It also advised that current carbon reduction targets submitted under the Paris Agreement are predicted to lead to global average temperatures rising around 3 degrees Celsius by 2100 compared to pre-industrial levels.

Climate Change Act 2008

2.3 The UK's legally binding emission reduction targets were first set by the Climate Change Act 2008 and included a reduction of at least 80% by 2050 against the 1990 baseline **[See reference 3]**. However, on 1st May 2019, Parliament declared a formal climate and environment emergency, and on 12th June 2019 the Government amended the Climate Change Act to target full net carbon neutrality (a 100% reduction of greenhouse gas emissions) in the UK by 2050 **[See reference 4]**.

2.4 In response to its obligations to prepare policies to meet climate targets, the UK Government has also produced various sector-specific policies and strategies. These include Powering Up Britain (2023), British Energy Security Strategy (2022), Net Zero Strategy (2021), Ten Point Plan for a Green Industrial Revolution (2020), UK National Energy & Climate Plan (2019), the Clean Growth Strategy (2017) and the Industrial Strategy White Paper (2017) (further details below). In addition, in December 2020, the former Department for Business Energy and Industrial Strategy (BEIS) published the Energy White Paper which sets out how the UK will clean up its energy system and reach net zero emissions by 2050. BEIS was subsequently split into three departments, with the Department for Energy Security and Net Zero (DESNZ) now responsible for energy and climate change.

UK Energy Act 2023

2.5 Energy policy in the UK is underpinned by the 2023 Energy Act and aligns with the Climate Change Act 2008. It is a legislative framework for providing secure, affordable, and low carbon energy. The Act will deliver a more efficient energy system in the long-term, helping to keep energy costs low. It will do this by increasing competition in Great Britain's onshore electricity networks, through a new tender process – reducing costs for network operation and development. This new model is expected to save consumers up to £1 billion off their energy bills by 2050. It is set to accelerate development of offshore wind and help deliver the UK's net zero commitments.

2.6 The National Energy System Operator (NESO) has been established through powers under the Energy Act 2023. This sets out the responsibilities of the new public body to maintain the UK's energy supplies, protect energy consumers and plan for an efficient clean energy system that is fit for the future. NESO will help connect new generation projects with the electricity grid, working alongside Great British Energy to deploy renewable energy **[See reference 5]**.

Powering Up Britain

2.7 This policy paper **[See reference 6]** sets out how the government will enhance the UK's energy security, seize the economic opportunities of the transition, and deliver on the net zero commitments. One of the main aims is to accelerate the deployment of renewables with the goal of developing up to 50GW of offshore wind by 2030 and to quintuple solar power by 2035.

British Energy Security Strategy

2.8 In response to the rising costs of oil and gas on the global energy market, the UK government has set out its plan to reduce the UK's dependence on imported oil and gas. A key part of this strategy (2022) is accelerating the UK's transition towards renewable sources. In regard to renewables, the strategy proposes to:

- Aim to cut the process time of development and deployment of offshore wind projects by half through a streamlined planning process, including reducing consent time from up to four years down to one year and establishing a fast track consenting route for priority cases where quality standards are met;
- Consult on developing local partnerships for communities who wish to host new onshore wind infrastructure; and

- Consult on amending planning rules to favour development of solar projects on non-protected land and support projects that are co-located with other functions.

Net Zero Strategy

2.9 The Net Zero Strategy (Oct 2021) sets out the UK's policies and proposals to meet its allocated carbon budgets and Nationally Determined Contributions (NDC's) alongside the long term vision of decarbonising the economy by 2050. The strategy sets out a delivery pathway showing indicative emissions reductions across sectors to meet the UK's targets up to the sixth carbon budget (2033-2037). This builds on the proposals set out in the Ten Point Plan for a Green Industrial Revolution. Key policies in the strategy include:

- By 2035 the UK will be powered entirely by clean electricity, subject to security of supply; and
- 40GW of offshore wind by 2030 and further development of onshore wind and solar projects. Ensuring that new renewable projects incorporate generation and demand in the most efficient way – taking into account the needs of local communities.

2.10 The strategy also outlines key commitments in Local Climate Action, including:

- Setting clearer expectations on how central and local government interact in the delivery of net zero;
- Establishing a Local Net Zero Forum, chaired by BEIS now DESNZ, to bring together national and local government officials to discuss policy and delivery on net zero; and
- Continuing the Local Net Zero Programme to support local areas with their capability and capacity to meet net zero.

Energy White Paper – Powering Our Net Zero Future

2.11 This white paper (2020) is based on the Ten Point Plan and sets out the specific energy-related measures that will be implemented in line with the UK's 2050 net zero target. The paper emphasises the UK government's commitment to ensuring that the cost of the transition is fair and affordable for consumers. Key commitments in the paper include:

- Targeting 40GW of offshore wind generation by 2030, including 1GW of floating wind generation. This is alongside the expansion of other renewable technologies;
- Supporting the development of carbon capture, usage and storage (CCUS) in four industrial clusters;
- Consulting on whether to stop gas grid connections to new homes being built from 2025;
- Increasing the installation of electric heat pumps from 30,000 per year to 600,000 per year by 2028; and
- Aim to develop 5GW of low-carbon hydrogen production capacity by 2030.

The Ten Point Plan for a Green Industrial Revolution

2.12 This plan (published in 2020) puts forward the ten main areas where the UK wishes to scale up decarbonisation, mobilising £12 billion of government investment. The outlined areas in the plan will be continually built upon by further legislation and policy, such as the Net Zero Strategy (2021) and Energy White Paper (2020).

UK Integrated National Energy and Climate Plan

2.13 The UK National Energy and Climate Plan (2020) sets out the UK's approach to meeting the five objectives of the EU's Energy Union **[See reference 7]**: energy security; energy efficiency; decarbonisation; the internal energy market; and research, innovation and competitiveness.

2.14 The Plan describes the current state of the energy sector in the UK, outlining the government's current approach to climate change mitigation through policy, and how this is expected to affect the five objectives of the Energy Union in future. This is supported by a summary table containing all the relevant UK policies that contribute to achieving the UK's climate goals, taken from the UK's National Communication with the United Nations Framework Convention on Climate Change (UNFCCC).

2.15 The report also includes scenario testing on the UK's projected emissions to 2035, with business as usual, all current measures and all current and planned measure scenarios. It demonstrates that the government's current measures have the potential to reduce baseline emissions by approximately 20% over the current baseline, with a further 10% reduction through implementation of planned measures.

Clean Growth Strategy

2.16 In the context of the UK's legal requirements under the Climate Change Act, the UK's approach to reducing emissions, as set out in the Clean Growth Strategy (2017), has two guiding objectives:

1. To meet domestic commitments at the lowest possible net cost to UK taxpayers, consumers and businesses; and

2. To maximise the social and economic benefits for the UK from this transition.

2.17 The Clean Growth Strategy sets out three possible pathways to decarbonise the UK's economy by 2050:

1. Electric: Including full deployment of electric vehicles (EVs), electric space heating, and industry moves to 'clean fuels'.

2. Hydrogen: Including heating homes and buildings, fuelling many vehicles and the power industry.

3. Emissions removal: Including construction of sustainable biomass power stations with carbon capture and storage technology.

2.18 The Strategy also encourages local authorities to actively pursue a low carbon economy:

> "Local areas are best placed to drive emission reductions through their unique position of managing policy on land, buildings, water, waste and transport. They can embed low carbon measures in strategic plans across areas such as health and social care, transport, and housing." [p118]

2.19 The strategy also announced up to £557 million in further 'Pot 2' (less established renewables) funding for Contracts for Difference (CfD) – a 15-year contract that offers low-carbon electricity generators payments for the electricity they produce. This opened in May 2019. The most recent allocation round (sixth) opened in 2024.

Green Finance Taskforce and the Green Finance Strategy

2.20 One of the key proposals within the Clean Growth Strategy is to develop world leading Green Finance capabilities by setting up a Green Finance Taskforce, the aim of which is to "provide recommendations for delivery of the public and private investment we need to meet our carbon budgets and maximise the UK's share of the global green finance market".

2.21 Building on the important work of the Green Finance Taskforce, the first Green Finance Strategy was produced in July 2019 and recently updated in 2023. This seeks to reinforce and expand the UK's position as a world leader on green finance and investment, delivering five key objectives:

- UK financial services growth and competitiveness;
- Investment in the green economy;
- Financial stability;
- Incorporation of nature and adaptation; and
- Alignment of global financial flows with climate and nature objectives.

2.22 The Strategy notes the importance of local key players in directing potential investors towards opportunities that meet local priorities and so are more likely to secure local community support.

Industrial Strategy White Paper

2.23 Achieving 'Clean Growth' is one of the future challenges the Government outlines as part of its Industrial Strategy. In order to maximise the advantages of the global shift to clean growth for the UK, the strategy proposes to:

- Develop smart systems for cheap and clean energy across power, heating and transport;

- Transform construction techniques to dramatically improve efficiency;
- Make our energy intensive industries competitive in the clean economy;
- Put the UK at the forefront of the global move to high efficiency agriculture;
- Make the UK the global standard setter for finance that supports clean growth; and
- Support key areas of innovation, investing £725m over 4 years.

UK Ban of New Petrol and Diesel Cars by 2030

2.24 Step 1 sees the phase-out date for the sale of new petrol and diesel cars set at 2030. Step 2 will see all new cars and vans be fully zero emission at the tailpipe from 2035. The zero emission vehicle (ZEV) mandate sets out the percentage of new zero emission cars and vans manufacturers that will be required to produce each year up to 2030. 80% of new cars and 70% of new vans sold in Great Britain must be zero emission by 2030, increasing to 100% by 2035 (prior to 2024, the target was 100% by 2030). This means that the uptake of Battery Electric vehicles (BEV) will likely significantly increase in Huntingdonshire and will increase the demand for electricity in the area. If Huntingdonshire is to meet its targets set in the Local Plan, this increase in electricity demand will need to be met by renewable resources **[See reference** 8**]**.

UK Heating System Target

2.25 The UK has a target for all new heating systems installed in UK homes from 2035 to be using low-carbon technologies, such as electric heat pumps. This will also increase the electricity demand in Huntingdonshire, increasing the need for renewable electricity generation **[See reference** 9**]**.

UK Power System Decarbonisation

2.26 The UK has committed to decarbonise the electricity system by 2035. This brings forward the 2050 commitment set out in the Energy White Paper by 15 years. This will be achieved by focusing on offshore wind, onshore wind, solar, nuclear and hydrogen **[See reference** 10**]**.

Great British Energy

2.27 The new Labour Government is setting up Great British Energy, a publicly-owned company headquartered in Scotland to invest in clean, home-grown energy and has introduced the Great British Energy Bill to Parliament. Great British Energy's mission will be to drive clean energy deployment to create jobs, boost energy independence, and ensure UK taxpayers, billpayers and communities reap the benefits of clean, secure, home-grown energy. This mission will be delivered through the following 5 functions:

- Project investment and ownership;
- Project development;
- Local Power Plan;
- Supply chain; and
- Great British Nuclear **[See reference** 11**]**.

Onshore Wind Energy Task Force

2.28 The Government is diligently examining how to achieve its ambition of securing an additional 600 MW – 1 GW of onshore wind capacity in England over the next nine years. As such, the Onshore Wind Energy Task Force was established in July 2024 to accelerate the development of onshore wind in England. The taskforce is chaired by Ed Miliband, the UK Secretary of State for Energy Security and Net Zero and Matthieu Hue, the CEO of EDF Renewables

UK. The taskforce includes industry experts, regulatory bodies and RenewableUK, the UK's renewable energy trade association. The taskforce will meet regularly throughout 2024 and issue a policy statement at the end of the year. The statement will outline a roadmap to 2030 and beyond, including the challenges and opportunities of increasing onshore wind capacity in England and the actions needed to achieve this. The taskforce will then become an overarching body to monitor the progress of the agreed actions.

National Planning Legislation

Planning Act and National Policy Statements

2.29 The Planning Act (2008) introduced a new planning regime for nationally significant infrastructure projects (NSIPs), including energy generation plants of capacity greater than 50 megawatts (50MW). In 2011, six National Policy Statements (NPSs) for Energy were published and subsequently updated in 2024. The energy NPSs are designed to ensure that major energy planning decisions are transparent and are considered against a clear policy framework. They set out national policy against which proposals for major energy projects will be determined by the National Infrastructure Directorate (NID) (formerly the Infrastructure Planning Commission or IPC).

2.30 The Overarching National Policy Statement for Energy (EN-1) sets out national policy for energy infrastructure and describes the need for new nationally significant energy infrastructure projects. EN-3 (NPS for Renewable Energy Infrastructure) provides the primary basis for decisions by the NID on applications it receives for nationally significant renewable energy infrastructure. It provides guidance on various technologies and their potential for significant effects. In 2016, onshore wind installations above 50MW were removed from the NSIP regime; as such, these applications are now dealt with by local planning authorities, based on the NPPF. The NPSs were consulted on in 2021 and officially updated in January 2024 to:

- Reflect the current regulatory framework and contain new transitional provisions applicable during and following a review;
- Update the Government's greenhouse gas emission reductions target from "at least 80%" by 2050 to net zero by 2050, and 78% by 2035 compared to 1990 levels;
- Add flexibility for the applicability of the NPS to new and developing types of energy infrastructure, such as carbon capture and storage and hydrogen infrastructure;
- Confirm future energy generation would come from a range of sources including renewables, nuclear, low carbon hydrogen, with "residual use of unabated natural gas and crude oil fuels" for heat, electricity, transport, and industrial applications; and
- Remove reference to the need for new coal and large-scale oil-fired electricity generation and update references to the need for other infrastructure.

2.31 Furthermore, renewable energy infrastructure is now classified as a Critical National Priority.

2.32 Since the 2021 update, the British Energy Security Strategy (2022) was published and as such sets out some commitments relating to planning reform. Therefore, various changes were made to the draft energy NPS and were consulted on until the end of May 2023. The amended NPSs are likely to strengthen the process for delivering major new energy infrastructure in England and Wales, reinforcing the country's national priority of delivering on net zero. The updates are also expected to speed up the planning process so that low-carbon generation can be developed at the right time and place whilst protecting and enhancing the national and historic environments and landscape.

Planning and Energy Act

2.33 The Planning and Energy Act (2008) enables local planning authorities to set requirements for energy use and energy efficiency in local plans, including a proportion of energy used in development to be generated from renewable and low carbon sources in the locality of the development. Such requirements can relate to specific types and scales of development but also broad areas within a local planning authority's area of influence, such as areas with optimal conditions for decentralised heat networks.

2.34 The Act also enables local authorities to require standards for energy efficiency in new buildings beyond those in the Building Regulations. In 2015 the energy efficiency requirements were proposed to be repealed, to effectively make the Building Regulations the sole authority regarding energy efficiency standards for residential development and removing the ability for local planning authorities to set their own energy efficiency standards. However, while the power was removed in principle and consultation on new Building Regulation has been undertaken, the Government has not yet produced a commencement date for repealing these powers, which therefore remain in place. More details on Part L of the Building Regulations are set out below.

National Planning Policy

National Planning Policy Framework (NPPF)

2.35 The Government published an updated and revised NPPF in July 2021 and again in December 2023, which sets out the environmental, social and economic planning policies for England. Central to the NPPF policies is a presumption in favour of sustainable development, that development should be planned for positively and individual proposals should be approved wherever possible. One of the overarching objectives that underpins the NPPF is set out in Paragraph 8: "an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including …mitigating and adapting to climate change, including moving to a low carbon economy."

2.36 The revised NPPF supports the contents of the Neighbourhood Planning Act (2017) by making explicit reference to the need for local planning authorities to work with duty to cooperate partners on strategic priorities (paragraph 24) and defined strategic policies that make sufficient provision for climate change mitigation and adaptation (paragraph 20). These amendments provide a clear policy framework for local planning authorities to work collaboratively with partners and neighbours to tackle climate change mitigation and adaptation at a strategic scale and over the longer term.

2.37 Paragraph 158 of the NPPF states:

> "Plans should take a proactive approach to mitigating and adapting to climate change taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures".

2.38 Paragraph 160 states that:

> "To help increase the use and supply of renewable and low carbon energy and heat, plans should:
>
> a. provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

b. consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c. identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers."

2.39 Paragraph 161 states that:

"Local planning authorities should "support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning."

2.40 The NPPF goes on to state at paragraph 163 that:

"When determining planning applications for renewable and low carbon development, local planning authorities should:

a. not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

b. approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to

> demonstrate that the proposed location meets the criteria used in identifying suitable areas" and
>
> c. in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site, and approve the proposal if its impacts are or can be made acceptable.

2.41 The December 2023 version of the NPPF contained the following footnotes to paragraph 163:

> Footnote 57: "Wind energy development involving one or more turbines can also be permitted through Local Development Orders, Neighbourhood Development Orders and Community Right to Build Orders. In the case of Local Development Orders, it should be demonstrated that the planning impacts identified by the affected local community have been appropriately addressed and the proposal has community support."
>
> Footnote 58: "Except for applications for the repowering and life-extension of existing wind turbines, a planning application for wind energy development involving one or more turbines should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan or a supplementary planning document; and, following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been appropriately addressed and the proposal has community support."

2.42 These footnotes have been characterised (and earlier, similar versions) as creating a de-facto ban on the development of onshore wind. As such, very few wind energy applications have been submitted for planning approval in England since the policy regime was originally introduced in 2015.

2.43 However, a Written Ministerial policy statement from the new Labour Government on onshore wind was published on 8 July 2024, which states that those two tests set out in Footnotes 57 and 58 no longer apply. As such, this means that onshore wind applications will be treated in the same way as other energy development proposals. These changes are reflected in the proposed reforms to the NPPF that the Government is consulting on from 30th July 2024 to 24th September 2024 **[See reference** 12**]**. These proposed reforms to the NPPF also include wider changes to support locally consented renewable energy development, including:

- Amendments to existing paragraph 163 to direct decision makers to give significant weight to the benefits associated with renewable and low carbon energy generation, and proposals' contribution to meeting a net zero future.
- Further amendments to paragraph 160 to set a stronger expectation that authorities proactively identify sites for renewable and low carbon development when producing plans, where it is likely that in allocating a site, it would help secure development.
- Development of renewables may be proposed in sensitive areas which may include valuable habitats.

2.44 The consultation also proposes bringing large onshore wind proposals back into the Nationally Significant Infrastructure Project regime, to support quick determination, followed by a revised National Policy Statement.

2.45 The Government has also signalled an intention to empower local communities to participate in decisions on local infrastructure and to benefit from hosting local renewable energy infrastructure and will shortly publish an update to the Community Benefits Protocol for Onshore Wind in England **[See reference** 13**]**.

2.46 A Written Ministerial Statement was published in May 2024 on solar energy, food security and BMV land **[See reference** 14**]**. The statement notes that the revised National Policy Statement states that ""applicants should, where possible, utilise suitable previously developed land, brownfield land, contaminated land and industrial land. Where the proposed use of any agricultural land has been shown to be necessary, poorer quality land should be preferred to higher quality land avoiding the use of "Best and Most Versatile" agricultural land where possible. The Government in Powering Up Britain: Energy Security Plan clarified that while "solar and farming can be complementary" developers must also have "consideration for ongoing food production."

National Planning Practice Guidance (PPG)

2.47 The online National Planning Practice Guidance (PPG) resource, published by the Department for Levelling Up, Housing and Communities (DLUHC) and Ministry of Housing, Communities and Local Government (MHCLG) provides further interpretation of national planning policy for the benefit of local planning authorities and planning practitioners. Although the section on climate change has not been updated following the changes to the Climate Change Act and the UK Climate Emergency Declaration, it strongly asserts the importance of climate change within the planning system and the need for adequate policies if Local Plans are to be found sound **[See reference** 15**]**:

> "Addressing climate change is one of the core land use planning principles which the National Planning Policy Framework expects to underpin both plan-making and decision-taking. To be found sound, local plans will need to reflect this principle and enable the delivery of sustainable development in accordance with the policies in the National Planning Policy Framework. These include the requirements for local authorities to adopt proactive strategies to mitigate and adapt to climate change in line with the provisions and objectives of the Climate Change Act 2008, and co-operate to deliver

strategic priorities which include climate change." [Paragraph 001, Reference ID: 6-001-20140306, Revision date: 06 03 2014].

2.48 In respect of the approach to identifying climate mitigation measures for new development, the PPG also states:

"Every area will have different challenges and opportunities for reducing carbon emissions from new development such as homes, businesses, energy, transport and agricultural related development. Robust evaluation of future emissions will require consideration of different emission sources, likely trends taking into account requirements set in national legislation, and a range of development scenarios." [Paragraph: 007, Reference ID: 6-007-20140306, Revision date: 06 03 2014].

2.49 The PPG also makes it clear with regards to renewable energy that **[See reference** 16**]**:

"When drawing up a Local Plan local planning authorities should first consider what the local potential is for renewable and low carbon energy generation. In considering that potential, the matters local planning authorities should think about include:

- The range of technologies that could be accommodated and the policies needed to encourage their development in the right places;
- The costs of many renewable energy technologies are falling, potentially increasing their attractiveness and the number of proposals; and
- Different technologies have different impacts and the impacts can vary by place.
- The UK has legal commitments to cut greenhouse gases and meet increased energy demand from renewable sources. Whilst local authorities should design their policies to maximise renewable and low

> carbon energy development, there is no quota which the Local Plan has to deliver." [Paragraph: 003, Reference ID: 5-003-20140306, Revision date: 06 03 2014].

2.50 The role community-led renewable energy initiatives have is outlined and states that they:

> "are likely to play an increasingly important role and should be encouraged as a way of providing positive local benefit from renewable energy development…Local planning authorities may wish to establish policies which give positive weight to renewable and low carbon energy initiatives which have clear evidence of local community involvement and leadership." [Paragraph: 004, Reference ID: 5-004-20140306, Revision date: 06 03 2014].

2.51 In terms of identifying suitable locations for renewable energy development, such as wind power, the PPG section on 'Renewable and Low Carbon Energy' states:

> "There are no hard and fast rules about how suitable areas for renewable energy should be identified, but in considering locations, local planning authorities will need to ensure they take into account the requirements of the technology and, critically, the potential impacts on the local environment, including from cumulative impacts. The views of local communities likely to be affected should be listened to.
>
> When identifying suitable areas it is also important to set out the factors that will be taken into account when considering individual proposals in these areas. These factors may be dependent on the investigatory work underpinning the identified area.

> There is a methodology available from the Department for Energy and Net Zero's website on assessing the capacity for renewable energy development which can be used and there may be existing local assessments. However, the impact of some types of technologies may have changed since assessments were drawn up (e.g. the size of wind turbines has been increasing). In considering impacts, assessments can use tools to identify where impacts are likely to be acceptable. For example, landscape character areas could form the basis for considering which technologies at which scale may be appropriate in different types of location." [Paragraph: 005, Reference ID: 5-005-20150618, Revision date: 18 06 2015].

2.52 It also goes on to state that:

> "Local planning authorities should not rule out otherwise acceptable renewable energy developments through inflexible rules on buffer zones or separation distances. Other than when dealing with setback distances for safety, distance of itself does not necessarily determine whether the impact of a proposal is unacceptable." [Paragraph: 008, Reference ID: 5-008-20140306, Revision date: 06 03 2014].

Neighbourhood Development Plans

2.53 Neighbourhood planning offers local communities an opportunity to produce positive and ambitious sustainable energy plans for their local area. The PPG on Renewable and Low Carbon Energy states that:

"Local and neighbourhood plans are the key to delivering development that has the backing of local communities." [Paragraph: 003 Reference ID: 5-003-20140306 Revision date: 06 03 2014]

2.54 Across the country, the large majority of the numerous plans adopted so far, show little evidence of having considered the issue of climate change and energy to the level that is required to have meaningful impact **[See reference 17]**.

2.55 However, given the right support, Neighbourhood Development Plan (NDP) groups can serve to convene and inform local communities and stimulate bottom-up renewable energy policies and development.

Building Regulations – Part L

2.56 National standards for energy use and emissions within new developments are set by Part L1A and Part L2A of the Building Regulations, which concern the conservation of fuel and power in new dwellings and new buildings other than dwellings respectively. The current regulations came into operation in 2010 but were re-issued in 2013 and amended in 2016. The regulations apply a cap to a building's emissions through the use of a nominal Target Emissions Rate (TER) measured in kgCO2/m2/year, which for dwellings must not be exceeded by the Dwelling Emissions Rate (DER) as calculated according to the Standard Assessment Procedure (SAP) methodology.

2.57 In October 2019 the Government launched a consultation on the next revision of the Building Regulations and proposed a new 'Future Homes Standard' with the message that "We must ensure that new homes are future-proofed to facilitate the installation of low-carbon heat, avoiding the need to be retrofitted later, and that home builders and supply chains are in a position to build to the Future Homes Standard by 2025".

2.58 The consultation considered two levels of emission reductions for new dwellings from 2020: either 20% or 31% over current 2013 Part L standards, and for the 2025 Future Homes Standard a 75-80% reduction together with low carbon heating systems. These standards aim to reduce or remove the dependency on fossil fuels and encourage the use of heat pumps, heat networks or in some circumstances direct electric heating in the context of a rapidly decarbonising UK electricity supply. The 2020 31% target (‘Fabric plus technology’) is stated as being the Government’s preferred option and would most likely comprise energy efficiency measures with onsite low carbon generation, whereas the 20% option (‘Future Homes Fabric’) would require higher levels of fabric energy efficiency.

2.59 The consultation also proposed that from 2020 the energy efficiency of new dwellings should be assessed in terms of ‘primary energy’ as the basis for the Part L performance target (alongside emission targets), and that from 2020, homes should be future-proofed for low carbon heating. This is likely to mean that, if not already fitted, homes should have a low temperature heat distribution system so that they will be compatible with heat pumps. Additionally, in order to counteract existing variations in local authority-set performance standards, the consultation also proposed to remove the powers from local authorities to set their own standards above Part L (as granted under the Planning and Energy Act).

2.60 In January 2021 the Government launched a consultation on the second stage of the 2-part consultation on proposed changes to Part L (Conservation of fuel and power) and Part F (ventilation) of Building Regulations. It confirmed that the Planning and Energy Act 2008 will not be amended, which means that local authorities will retain powers to set local energy efficiency standards for new homes. It also built on the Future Homes Standard consultation by setting out energy and ventilation standards for non-domestic buildings, existing homes and included proposals to mitigate against overheating in residential buildings.

2.61 This consultation considered two ambitious options to uplift energy efficiency and ventilation standards for new non-domestic buildings including: introduction of overheating standards for new residential buildings in 2021 and a 2021 uplift of energy and ventilation standards (Part L and Part F) for homes.

The Government responded in December 2021 to the consultation **[See reference 18]**, the responses are summarised below:

- Starting from 2025, the Future Building Standard will produce highly efficient new non-domestic buildings;
- A new full technical consultation on the Future Buildings Standard will commence in 2023;
- Employment of the performance metrics set out in the consultation will be undertaken: a new primary energy target, a CO2 emissions target and minimum standards for fabric and fixed building services; and
- The interim uplift will also make sure that construction professionals and supply chains are working to higher specifications in readiness for the introduction of the Future Buildings Standard from 2025.

2.62 Alongside, the publication of the Government's response, the 2021 uplift has been implemented, therefore as of 15th June 2022, all new build homes and commercial buildings must reduce their carbon emissions by 31% and 27% respectively, according to the updated Building Regulations. A further, more detailed, consultation began in December 2023 and went until March 2024. The Heat and Buildings Strategy outlines the need to eliminate virtually all emissions arising from heating, cooling and energy use in our buildings. As such, the 2025 Future Homes and Buildings Standards aim to build on the 2021 Part L uplift and set more ambitious requirements for energy efficiency and heating for new homes and non-domestic buildings. These standards are set to be in line with meeting the 2050 net zero target. The main proposals being consulted on include: performance requirements for new building, retaining existing metrics, improvements to standards for fixed building services and on-site electricity generation, improved standards for dwellings created through material change of use, expanding cleaner heat networks, changes to the regulations permitting local authorities to relax or dispense the energy efficiency requirements, gathering evidence on two proposed measures to improve building performance in new homes against expected energy use and reviewing approach to setting standards and transitional arrangements.

Local Policy and Guidance

Huntingdonshire Local Plan to 2036

2.63 Huntingdonshire's Local Plan to 2036 was adopted in May 2019. One of the plan's objectives is 'to promote high quality, well designed, locally distinctive, sustainable development that is adaptable to climate change and resilient to extreme weather'. Policy LP 35 Renewable and Low Carbon Energy states that 'a proposal for a renewable or low carbon energy generating scheme, other than wind energy, will be supported where it is demonstrated that all potential adverse impacts including cumulative impacts are or can be made acceptable'. Additionally, the policy states that wind every development will be supported where it lies within the area identified as suitable for wind energy development, being the whole of the District with the exception of the Great Fen and its Landscape and Visual Setting, or within an area defined in an adopted neighbourhood plan and following consultation the Council is satisfied that any potential adverse planning impacts have been fully addressed.

Huntingdonshire Futures Place Strategy (2023)

2.64 Huntingdonshire Futures is a collaborative strategy which sets out a shared vision for the future of Huntingdonshire in 2050 and a clear way forward to achieve it. The Place Strategy aims to set out plans for places, people, economy and the environment to improve the lives of residents, communities and businesses within Huntingdonshire.

2.65 The strategy sets out five journeys which are areas of focus that describe what the council aim for Huntingdonshire to be like as a place and the common outcomes that they will work towards. These journeys are:

- Journey 1 Pride in place: focusing on pride over Huntingdonshire as a place to live and work.

- Journey 2 Inclusive economy: focused on upskilling and providing job opportunities for residents
- Journey 3 Health embedded: focusing on a Huntingdonshire will value happiness and health above all else.
- Journey 4 Environmental innovation: sets out that the District will be net zero by 2040.
- Journey 5 Travel transformed: the District will transition away from the car, focusing on sustainable transport modes.

2.66 As set out, journey four considers how the District is home to beautiful landscapes and sets out that in 2040 Huntingdonshire will be net zero. This journey states that a culture of experimentation is needed as well as investing in net zero projects. This could be achieved by improving energy efficiency for homeowners and businesses, delivering re wilding projects and supporting developments to function like the circular economy. This journey also sets out how natural assets could inspire new infrastructure, but repair and retrofitting are needed to support nature based solutions in the public realm and private buildings.

2.67 The strategy also sets out the possibility for all energy to be produced within the District by fast tracking community energy, embedding renewable energy generation through new developments and the promotion of a multi-functional agricultural landscape where renewable energy could be delivered in tandem with agricultural practices. The strategy also promotes accelerating climate action and sets out the possibility of establishing a youth climate council, providing business support and training to delivery sustainable improvements and development advice, training and awareness programmes on sustainability.

2.68 The strategy sets out a clear vision for the future of the District by 2050 and establishes that achieving net zero is integral to this. The document sets out that each pathway will have delivery requirements and associated action plans which are under development.

Huntingdonshire Climate Strategy

2.69 In February 2023 Huntingdonshire District Council adopted in full their Climate Strategy, which outlines the Council's vision for addressing the climate emergency with an Action Plan designed to achieve a net zero carbon council by 2040 and to influence district-wide action on emissions and biodiversity. The strategy sets out six key climate actions, one of which is to define a pathway for the council to move to 100% renewable energy usage.

Huntingdonshire Climate Action Plan 2023

2.70 Alongside Huntingdonshire's Climate Strategy lies the Climate Action Plan which sets out various actions based on the themes within the Strategy. These actions relate to energy and renewables such as develop an energy strategy and develop a plan for the Council to use 100% renewable energy. Each action also has a priority level and target completion date.

Wind Energy Development in Huntingdonshire SPD (2014)

2.71 This Supplementary Planning Document (SPD) aims to assist the interpretation and application of policies within the Local Plan concerned with landscape character, visual impacts and the location of wind turbine developments. The SPD is composed of two parts: landscape sensitivity to wind turbine development and cumulative landscape visual impacts of wind turbine development. Both parts of the SPD aim to provide guidance on all scales of proposed wind turbine development in Huntingdonshire and set out a positive approach to guide development rather than completely restrict it.

Chapter 3

Existing renewable and low carbon energy generation

Introduction

3.1 This chapter sets out information on existing renewable and low carbon energy generation within Huntingdonshire.

3.2 It is not possible to identify an exact figure for the amount of existing renewable energy generation across the District, however estimates for installed electricity generation capacity and output are set out in Table 3.1. This draws on:

- Sub-regional data from the Government's Feed-in Tariff (FiT) scheme **[See reference** 19**]**; and
- Department for Energy Security & Net Zero's (DESNZ) Renewable Energy Planning Database (REPD) **[See reference** 20**]** data which lists all renewable electricity projects over 150kW.

3.3 As outlined in Table 3.1, there is currently 255MW of operational renewable electricity generation capacity across Huntingdonshire, providing annual emission savings of 43,197tCO2. As such, an estimated 41% of electricity demand within Huntingdonshire is met by renewable/low carbon generation.

3.4 Table 3.1 shows that solar photovoltaics (PV) and onshore wind are the main sources of renewable energy generation in Huntingdonshire.

Table 3.1: Existing and consented renewable and low carbon energy installations in Huntingdonshire

Technology	Estimated Total Capacity (MW)	Electricity Output (MWh/year)	Potential CO2 Savings (tonnes/yr)
Anaerobic Digestion	7.1	40,514	5,388
Biomass (dedicated)	1.5	7,450	991
Hydropower	0.04	141	19
Landfill Gas	5.0	N/A	N/A
Micro CHP	0.01	7	1
Solar PV	143.4	126,866	16,873
Solar PV – Roof	25.4	22,445	2,985
Onshore Wind	72.6	127,371	16,940
Total	**255**	**324,794**	**43,197**

3.5 Figures 3.1 to 3.3 only include projects that were registered as operational and consented at the time of preparing this report.

Figure 3.1: Existing operation and consented renewable energy generation: capacity

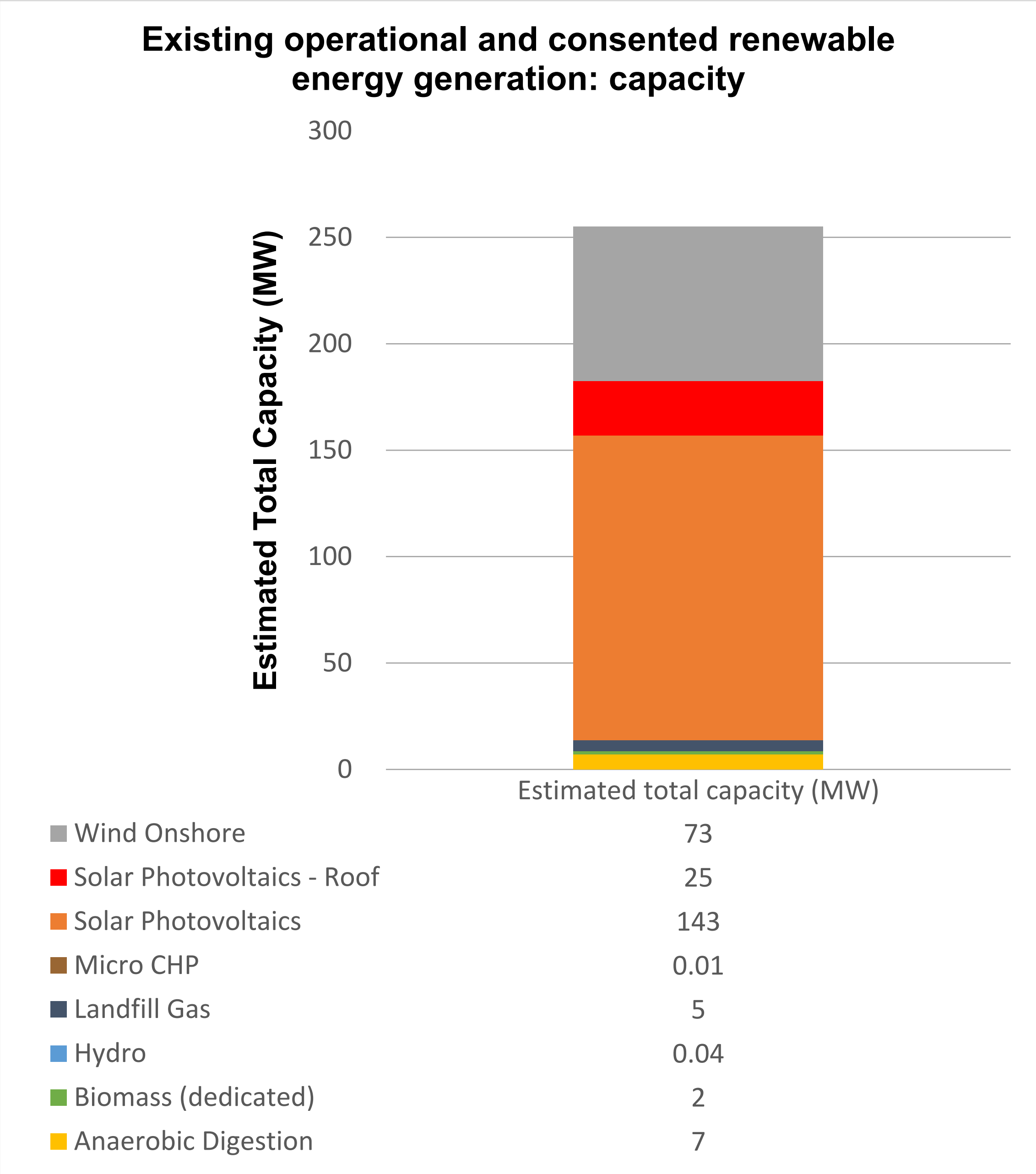


Figure 3.2: Existing operational and consented renewable energy generation: electricity output

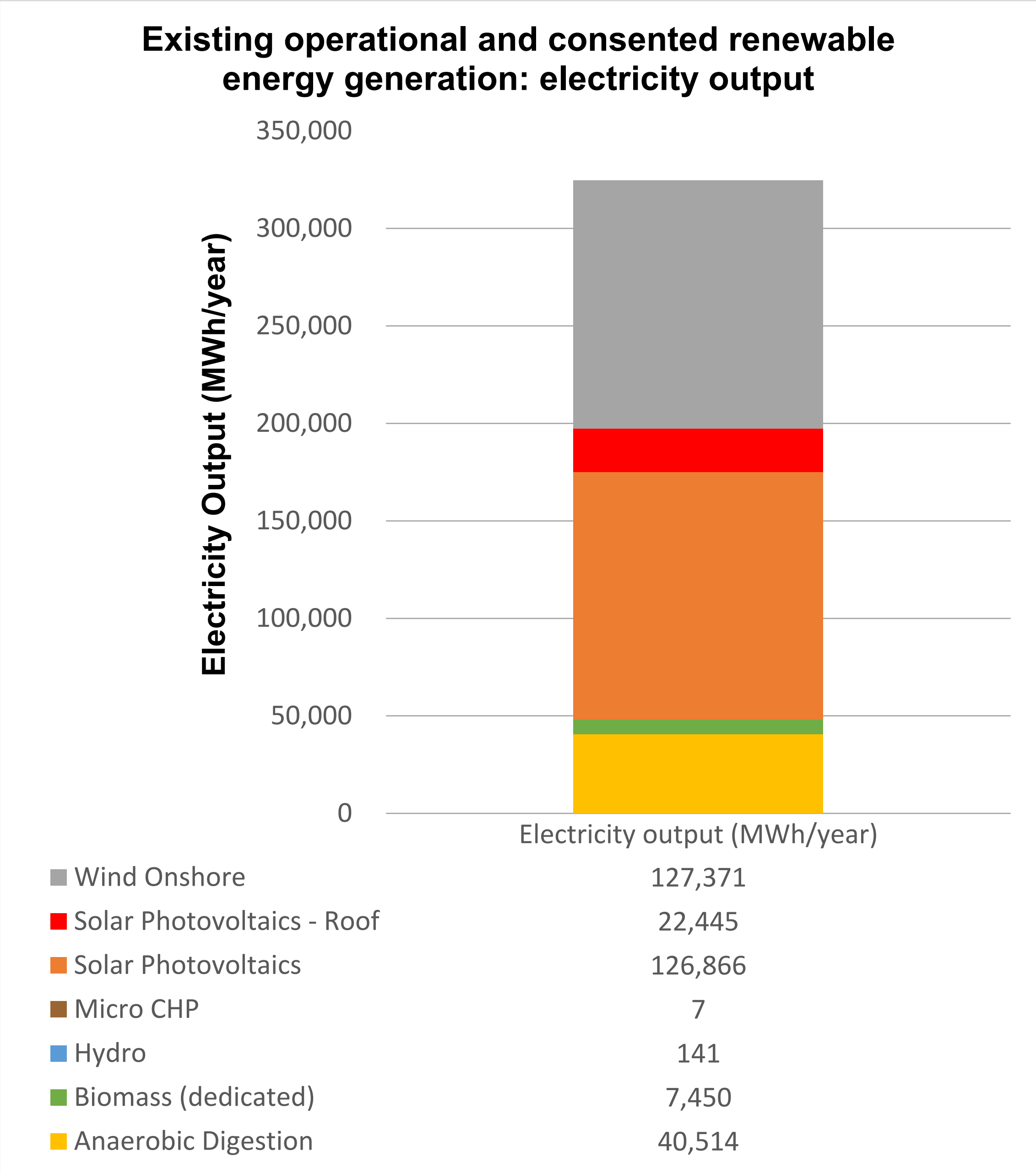
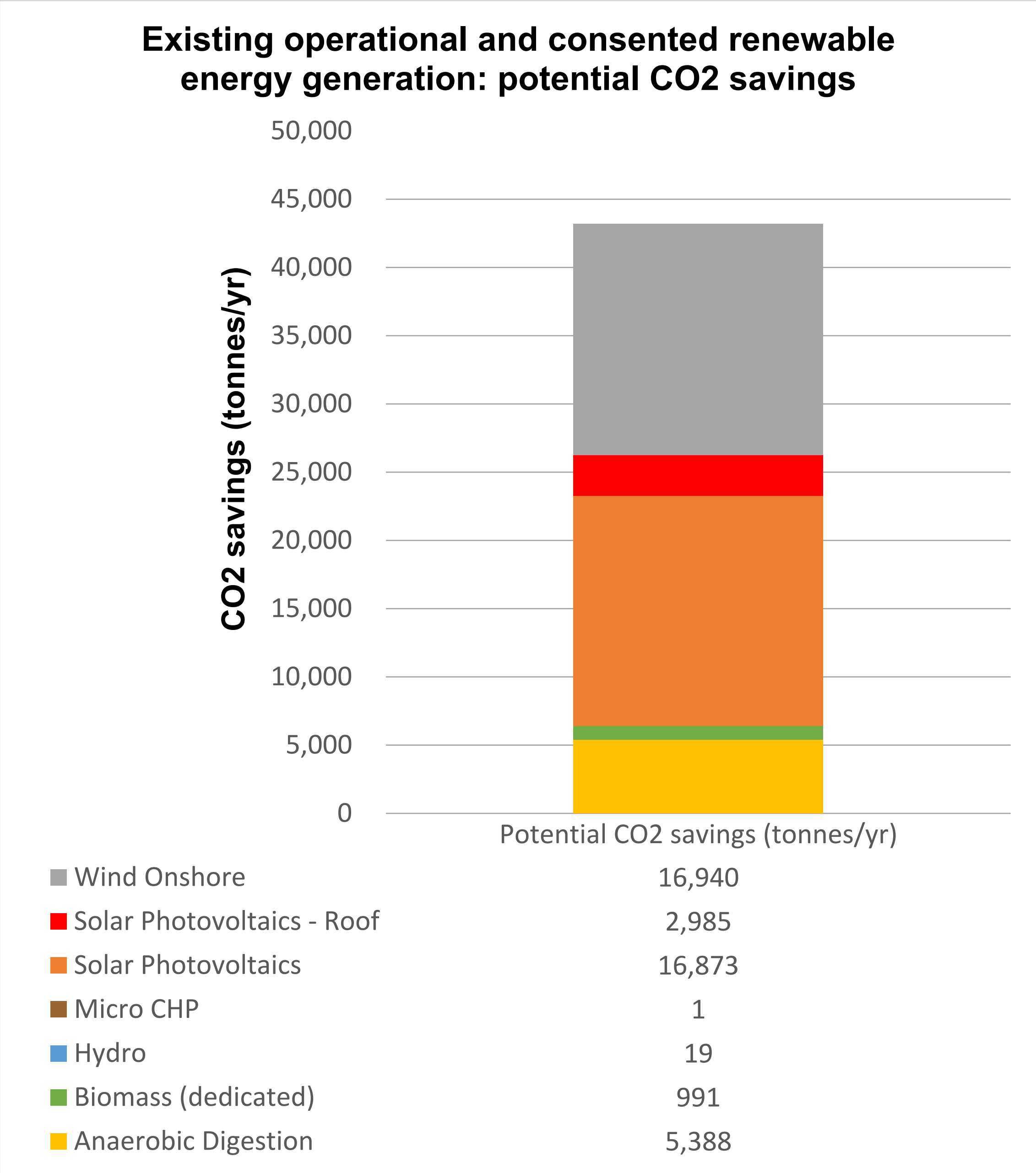


Figure 3.3: Existing operational and consented renewable energy generation: potential CO2 savings



3.6 The locations for existing and consented installations across Huntingdonshire, as currently listed in the Renewable Energy Planning Database are shown in Figure 3.4 below.

3.7 Figure 3.4 shows that the renewable energy installations are widely distributed across Huntingdonshire, with the exception of the north-west of the District. Most of these are ground mounted solar photovoltaics and onshore wind.

Renewable Heat

3.8 The amount of existing renewable heat generation in Huntingdonshire from biomass, solar water heating and heat pumps has been estimated using sub-national data within the Renewable Heat Incentive (RHI) statistics **[See reference** 21**]**. These statistics indicate that there are 98 (approx. 1.1MW) domestic accredited full applications for the Renewable Heat Incentive within Huntingdonshire. Technology breakdowns for domestic installations are given in Table 3.2. In addition, Table 3.1 indicates there is 5MW of operational landfill gas development.

Table 3.2: Existing domestic renewable heat installations

Technology	Number of Accredited Full Domestic Applications	Average System Capacity (kW)	Approx. Installed Capacity (MW)	Approx. Delivered Heat (MWh/year)	Approx. CO2 Savings (tonnes/yr)
Air Source Heat Pumps	53	10.2	0.5	871	151
Ground Source Heat Pumps	22	15.0	0.3	526	93
Biomass systems – assuming heat only	12	26.5	0.3	1,216	256

Technology	Number of Accredited Full Domestic Applications	Average System Capacity (kW)	Approx. Installed Capacity (MW)	Approx. Delivered Heat (MWh/year)	Approx. CO2 Savings (tonnes/yr)
Solar water heating	11	2.8	0.03	12	3

Renewable Energy Assessment
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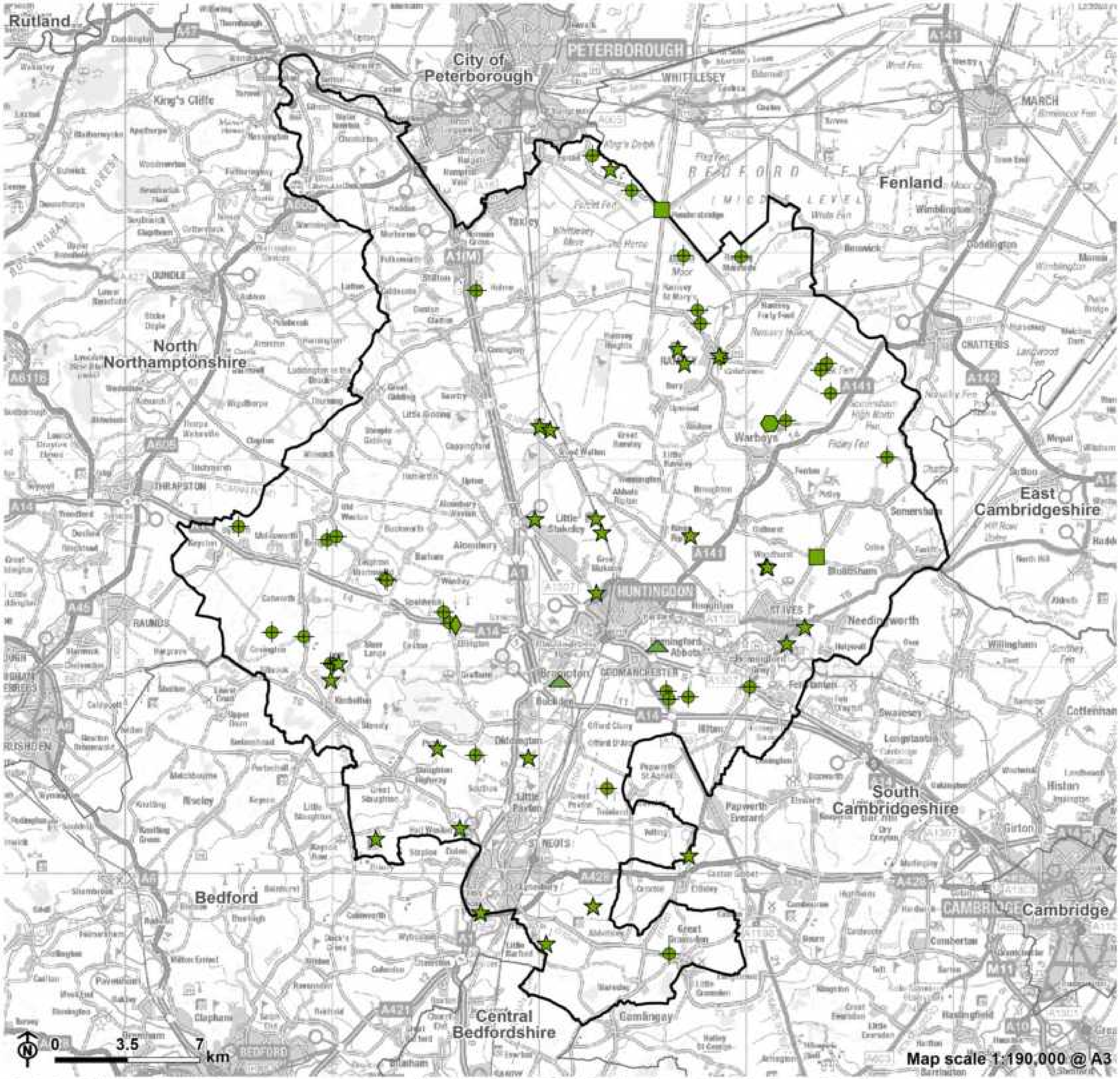
Figure 3.4: Existing and consented renewable energy installations within Huntingdonshire



Huntingdonshire District

Neighbouring Local Authority

Technology

- Advanced Conversion Technologies
- Anaerobic Digestion
- Biomass (dedicated)
- Landfill Gas
- Solar Photovoltaics
- Wind Onshore

Chapter 4

Renewable and Low Carbon Energy Opportunities

4.1 This chapter provides the results of the assessment of the 'technical' potential for renewables within Huntingdonshire. The 'technical potential' is the total amount of renewable energy that could be delivered in the area based on a number of assumptions regarding the amount of resource and space.

4.2 The assumptions used to calculate 'technical potential' for each renewable technology are provided within Appendix A. The assessment of technical potential has been applied at a strategic scale across Huntingdonshire and more detailed site assessments (i.e. as required for a planning application) would be required to determine if specific sites are suitable in planning terms.

4.3 The assessment of technical potential identifies the total resource potential within Huntingdonshire. Issues that affect what level of renewable and low carbon development could realistically be delivered within Huntingdonshire – i.e. the 'deployable potential' are set out in Chapter 5. This considers factors such as planning, economic viability and grid connection.

Assessment of Technical Potential for Renewables

4.4 The following section summarises the assessment of technical potential for each form of renewable and low carbon technology. For each resource, where relevant, it includes:

- Description of the technology;
- Summary of existing deployment within Huntingdonshire;

- Assumptions used to calculate technical potential;
- Results of assessment of technical potential; and
- Summary of issues affecting deployment.

4.5 The assessment approach is based on the former Department of Energy and Climate Change (DECC) Renewable and Low-Carbon Energy Capacity Methodology: Methodology for the English Regions (2010) **[See reference 22]** but this has been updated and refined to take account of local circumstances within Huntingdonshire where appropriate.

4.6 In addition, the potential carbon savings as a result of generation via the identified potential from each renewable technology was calculated by considering the “emissions factor” of energy sources. An emissions factor provides the annual average carbon intensity of energy used and is used to calculate the potential carbon savings of replacing national grid-sourced electricity, mains gas and heating oil, with that from renewables, which have negligible carbon emissions.

4.7 The emissions factors for mains gas and heating oil used in this assessment were 0.210 kgCO2e/kWh and 0.298 kgCO2e/kWh respectively, and were sourced from SAP10.2 **[See reference 23]**. These sources of energy remain consistent and as such their emissions factor does not change over time **[See reference 24]**.

4.8 However, the sources of electricity feeding the national grid can change and its carbon intensity is decreasing over time as more of the UK’s grid electricity is sourced from renewables. As such, the carbon savings from deploying renewables is also decreasing over time. The national grid electricity emission factor used within this assessment was 0.133 kgCO2e/kWh. This is sourced from the National Grid (2024) Future Energy Scenarios: FES 2024 Data workbook **[See reference 25]** and provides the annual average carbon intensity of electricity based on a five-year forecast from 2023. This was used as this is the most up to date forecast available, and so the most accurate value to use to calculate the potential carbon savings of using renewable energy in the future.

Wind

Description of Technology

4.9 Onshore wind power is an established and proven technology with thousands of installations currently deployed across many countries throughout the world. The UK has the largest wind energy resource in Europe.

4.10 Turbine scales do not fall intrinsically into clear and unchanging size categories. At the largest scale, turbine dimensions and capacities are evolving quite rapidly with the largest turbines in Scotland now reaching 250m to blade tip. The deployment of turbines at particular 'typical' scales in the past has also been influenced by changing factors which include the availability of various subsidies. As defined scales need to be applied for the purpose of the resource assessment, the assessment used five size categories based on consideration of current and historically 'typical' turbine models:

- Very large (150-220m tip height);
- Large (100-150 tip height);
- Medium (60-100 tip height);
- Small (25-60 tip height); and
- Very small (<25m tip height).

4.11 An assessment of technical potential for very small wind (<25m height) was not undertaken as it is not possible to define areas of suitability for these using the same assessment criteria. Notional turbine sizes falling within the middle of each class size are used for the technical resource assessment as set out in Table 4.1.

Table 4.1: Notional turbines used for the resource assessment

Scale	Typical Turbine Installed Capacity	Typical Turbine Height (maximum to blade tip)
Very large	4MW	185m
Large	2.5MW	125m
Medium	0.5MW	80m
Small	0.05MW	45m

4.12 Most turbines above the smallest scales have a direct connection into the electricity network. Smaller turbines may provide electricity for a single premises via a 'private wire' (e.g. a farm or occasionally a large energy use such as a factory), or be connected to the grid directly for export. Typically, turbines will be developed in larger groups (wind farms) only at the larger scales. The amount of energy that turbines generate will depend primarily on wind speed but will be limited by the maximum output of the individual turbine (expressed as 'installed capacity' in Table 4.1).

4.13 A review of wind turbine applications across the UK found that tip heights range from less than 20m up to around 250m, with larger turbine models particularly in demand from commercial developers following the reduction in financial support from Government and driven by the manufacturers and trends from other European markets where turbines of this scale have been developed for some time. The majority of operational and planned turbines range between 80m and 250m, with the majority of new applications in Scotland and Wales currently being at the larger end of the scale.

4.14 For January to March 2024, the UK had 15,460 MW of installed onshore wind capacity, providing 11,040 GWh electricity during that time **[See reference 26]**. Since the removal of financial support and restrictive policy requirements in the 2015 Written Ministerial Statement and subsequently incorporated in the NPPF, onshore wind development activity moved overwhelmingly away from England towards Scotland and Wales, where it is focusing particularly on sites with high wind speeds and the ability to accommodate large numbers of tall turbines. Very few onshore wind energy projects have been approved and built within England since 2015. However, this is likely to change since the removal of Footnotes 57 and 58 by the new Labour Government.

Existing Development within Huntingdonshire

4.15 According to the most recent DESNZ Renewable Energy Data base **[See reference 27]** there are six operational wind developments within Huntingdonshire currently. However, each of these wind developments are small scale, ranging from 1.8MW to 3MW.

Assumptions used to Identify Land with Technical Potential

4.16 The assessment of technical potential for very large, large, medium and small turbines was undertaken using GIS (Geographical information Systems) involving spatial mapping of key constraints and opportunities. The assessment identified areas with suitable wind speeds (applying a reasonable but relatively generous assumption in this respect, bearing in mind that only the highest wind speeds are potentially viable at the present time) and the number of turbines that could theoretically be deployed within these areas. A series of constraints relating to physical features, such as environmental/heritage protection were then removed. The remaining areas have ‘technical potential’ for wind energy development.

4.17 The key constraints considered are set out in detail in Appendix A.

4.18 Unconstrained areas of land were excluded if they were below a minimum developable size of 40m width and an area that varied per turbine size:

- Very large: 0.8ha

- Large: 0.6ha
- Medium: 0.4ha
- Small: 0.2ha

Results

Technical Potential

4.19 Figure 4.1 and Table 4.2 below provides a summary estimate of the technical potential for wind energy within Huntingdonshire. The analysis examined the potential for very large, large, medium and small turbines. Where potential exists for more than one size of turbine, it was assumed that the larger turbines would take precedence as, to ensure viability, developers usually seek to install the largest capacity turbines possible.

4.20 The calculation of potential wind capacity involved applying an assumption concerning development density. In practice, turbines are spaced within developments based on varying multiples of the rotor diameter length. Although turbine separation distances vary, a 5 x 3 rotor diameter oval spacing **[See reference 28]**, with the major axis of the oval oriented towards the prevailing wind direction, taken to be south-west as the ‘default’ assumption in the UK, was considered a reasonable general assumption to use at the present time in this respect. In practice, site-specific factors such as prevailing wind direction and turbulence are taken into account by developers, in discussion with turbine manufacturers. Bearing in mind the strategic nature of the present study, the density calculation did not take into account the site shape, and a standardised density was used instead as set out below:

- Very large: 4 turbines per km^2
- Large: 8 turbines per km^2
- Medium: 22 turbines per km^2
- Small: 167 turbines per km^2

4.21 The calculation of potential energy yield requires the application of a 'capacity factor' i.e. the average proportion of maximum turbine capacity that would be achieved in practice over a given period. Capacity factors vary in practice in accordance with wind speed, terrain and turbine scale. It was not possible to find suitable local historic data on capacity factors, taking into account these kinds of variations in Huntingdonshire for the present study, and so a single capacity factor of 20.0% was used for all turbine scales, based on regional data **[See reference 29]**.

4.22 In addition, the potential carbon savings as a result of generation via the identified wind potential was calculated. This assumed that the electricity generated from the identified wind potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.133kgCO2e/kWh **[See reference 30]**.

4.23 The assessment results indicate that there is a technical potential to deliver up to around 4,941MW of wind energy capacity in Huntingdonshire, equating to powering approximately 3.2 million homes a year **[See reference 31]**. The associated potential annual CO_2 savings of 1.2 million tonnes are equivalent to planting approximately 44.4 million trees a year **[See reference 32]**. The greatest potential for very large turbines (see Figure 4.1 and Table 4.2).

Figure 4.1: Onshore wind potential capacity and carbon savings within Huntingdonshire

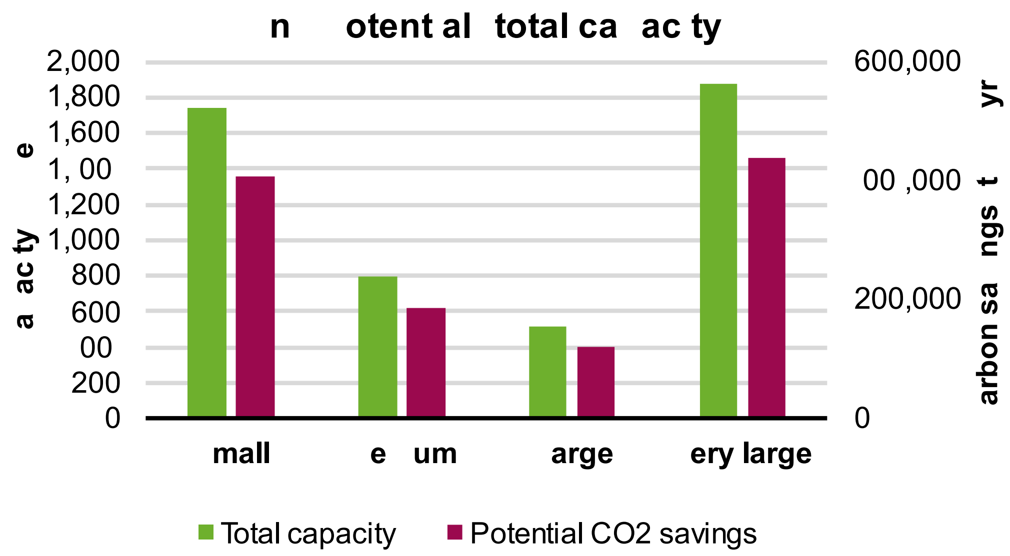


Table 4.2: Potential wind capacity and output

Development Scale	Estimated Total Capacity (MW)	Electricity Output (MWh/year)	Potential CO2 Savings (tonnes/year)
Small	1,742	3,058,848	406,827
Medium	801	1,406,850	187,111
Large	518	908,622	120,847
Very large	1,880	3,300,013	438,902
Total	**4,941**	**8,674,334**	**1,153,686**

4.24 The maps included in Appendix B show the areas which have been identified via the GIS analysis to have technical potential for wind development at each considered turbine scale. These figures indicate that the largest areas of potential for wind generation, particularly large scale generation, are spread across the southern, eastern and western sections of Huntingdonshire. There is limited potential in the northern and central sections of the District.

4.25 In order to illustrate the GIS tool parameters, a series of opportunity and constraints maps were produced. Figure B.1 in Appendix B shows the wind speed within Huntingdonshire at 50m above ground level (agl). This shows that the highest wind speeds are located in a small pocket in the southwest of Huntingdonshire. Other mapped constraints that have influenced the assessment outcomes are included in Appendix B. It is noted that maps depicting the physical constraints are only included for small and very large turbines for illustrative purposes, showing the minimum and maximum buffer distances applied to physical features depending on turbine size.

4.26 An assessment of this nature will necessarily have certain limitations, including:

- Wind data – It is important to note that the macro-scale wind data which was used for this assessment can be inaccurate at the site-specific level and therefore can only be used to give a high level indication of potential capacity and output within Huntingdonshire. Developers will normally require wind speeds to be accurately monitored using anemometers for an extended period (typically at least one to two years) for commercial scale developments.
- Cumulative effects – Multiple wind turbine developments can have a variety of cumulative effects. Cumulative landscape and visual effects, in particular, would clearly occur if all the identified areas of wind development potential were to be realised. Cumulative effects, however, cannot be taken into account in a high-level assessment of this nature and must be considered on a site-by-site basis.
- Site-specific features and characteristics – In practice, developments outside protected areas may potentially an impact on amenity and sensitive ‘receptors’ such as protected species. These impacts can only be assessed via site-specific surveys.
- Aviation – Although operational airports and airfields, as well as MOD land in active use were considered to be constraints to wind development,

airport safeguarding zones were only mapped for information. Aviation interests were not used to restrict potentially suitable areas as these impacts require site by site consideration and mitigation may be available to address any issues.

Issues affecting deployment

4.27 The technical wind development potential within Huntingdonshire, as estimated through application of reasonable constraints within a GIS tool, is not the same as the development capacity that may be expected to be deployed in practice.

4.28 Certain limitations of the resource assessment with respect to deployable wind potential have already been noted in the previous section. For example, cumulative impacts can only be considered fully when developments come forward in practice but would generally be expected to reduce the overall deployable capacity. However, there are four key factors that affect the deployable wind potential that merit individual consideration: landscape sensitivity, grid connection, development income and planning issues. These are discussed in turn below.

Landscape Sensitivity

4.29 Landscape and Visual Impact (LVI) has historically often been a defining consenting consideration within the context of planning applications for wind developments, and has therefore been a particularly important influence on the choice of turbine scales and locations by developers.

4.30 As the degree of acceptable landscape and visual impact is generally a matter that needs to be considered within the context of an overall planning balance, no land was excluded from the GIS technical constraints assessment on landscape or visual grounds. Instead, a separate landscape sensitivity assessment (LSA) should be undertaken to consider all Landscape Character

Areas defined within the Huntingdonshire Landscape Character Assessment with technical potential for development. The LSA could be used alongside the output of this assessment of technical potential to help the Council identify which areas may be more or less suitable for onshore wind energy development within Huntingdonshire. It should be noted that site specific assessments (including landscape and visual impact and residential amenity assessments) would also be needed to verify the suitability of specific wind energy development proposals in landscape terms.

Grid Connection

4.31 Historically, it has been possible to connect a variety of wind energy development scales into the distribution network at a wide range of distances from the nearest connection point. This situation has changed dramatically over recent years due to two factors in combination:

- The distribution network, and even the transmission network **[See reference** 33**]**, have become increasingly congested, to the point at which connections in many cases cannot take place without expensive network reinforcement costs (which fall to the developer) being incurred, or generation being curtailed, or both.
- The Government's cancelling of subsidies for onshore wind in 2016 has reduced wind development incomes to the point at which previously affordable reinforcement works would now render many developments unviable, particularly those of smaller scale.

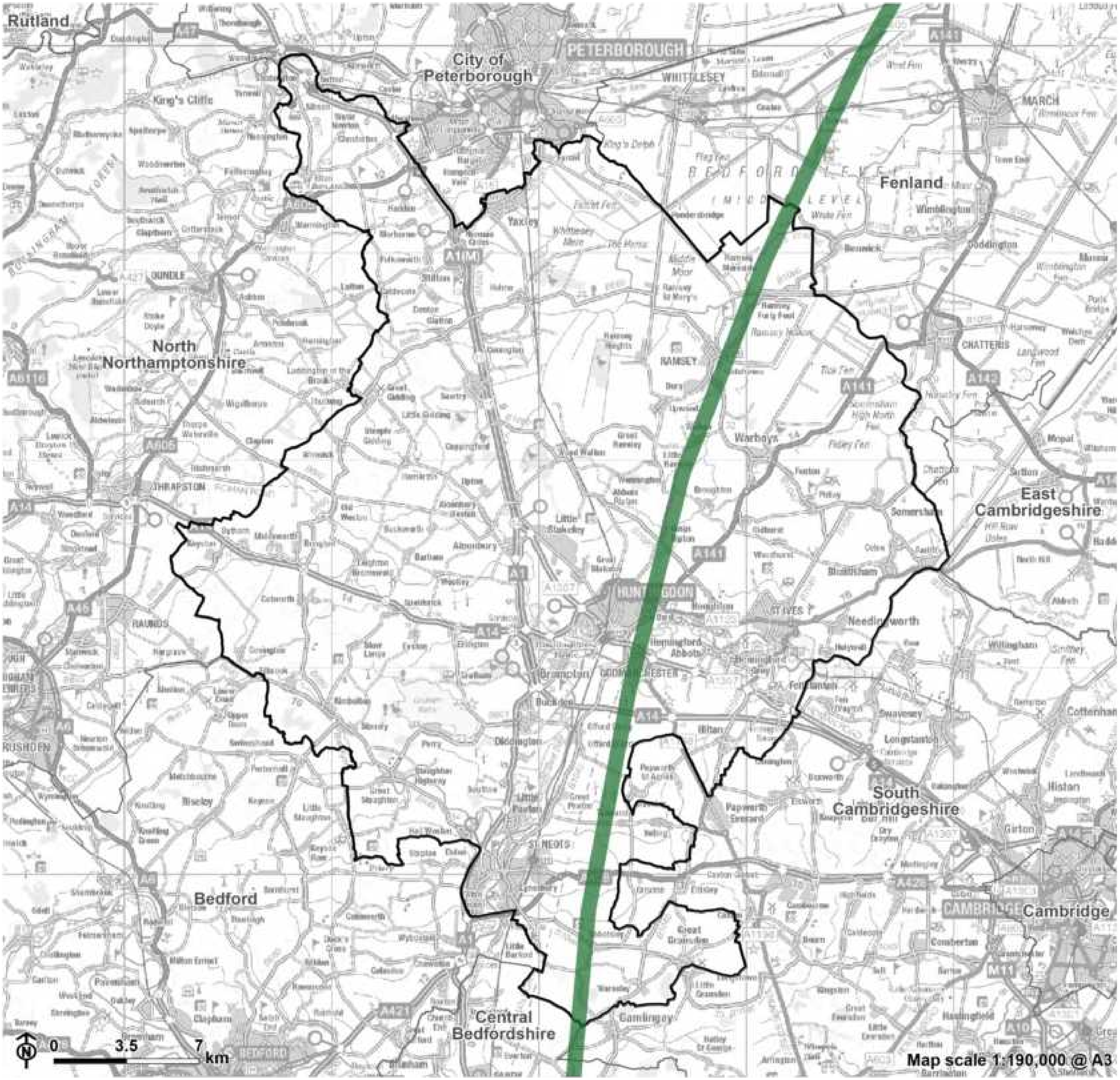
4.32 Within Huntingdonshire, UK Power Networks (UKPN) is the distribution network operator. UKPN's RIIO-ED2 Business Plan proposes investment across the network from 1 April 2023 to 31 March 2028 **[See reference** 34**]**. One of the plan's main aims is to release network capacity and invest strategically where they are certain that long-term capacity is required. Additionally, UKPN has proposed investments that will facilitate 1.2GW of rapid connection of distributed generation and storage to their networks.

4.33 The National Grid Electricity System Operator (ESO) has recently announced a significant restructuring, and the government has decided to acquire ESO, transitioning it into public ownership. National Energy System Operator (NESO) has assumed the role of overall electricity system operator for the UK, under the Energy Act 2023. A set of offshore and onshore network recommendations have been made within the Beyond 2030 plan **[See reference** 35**]**. For Cambridgeshire, it includes a mixture of new infrastructure, alongside updates to the existing network. For example, NESO has proposed new transmission capacity between the South Lincolnshire, Cambridgeshire and North West Norfolk boundary to Hertfordshire to be provided, seen in Figure 4.2. This upgrade is needed to enable the development of reliable and robust offshore network connection.

4.34 Although investment is being proposed it is likely that grid capacity will remain constrained for the immediate future. Grid could therefore be a significant constraint in the short-medium term in relation to the deployment of wind and all large-scale grid connected renewable energy developments. As the local plan period extends past 2030, policy will have to be flexible to allow for future scenarios, changes in national policy and the grid being upgraded, or better balanced.

LUC

Figure 4.2: ESO infrastructure upgrades in the East of England region



Huntingdonshire District

Neighbouring Local Authority

New onshore network infrastructure (low maturity option)

Notes:

Source: Beyond 2030. © National Grid Electricity System Operator Ltd 2024, all rights reserved. Accessed from: https://www.nationalgrideso.com/

This map is illustrative. Based on Figure 20, page 99, from Beyond 2030 - National Grid.

12713_Additional_Figures 08/08/2024 EB:spears_d

Development Income

4.35 Financial support mechanisms in the form of Government subsidies such as the Renewables Obligation (RO) and Feed In Tariff (FiT) previously allowed onshore wind to be developed at a variety of scales and at a variety of wind speeds. The RO closed to all new generating capacity on 31 March 2017 and the Feed In Tariff (FiT) closed to new applicants from 1 April 2019.

4.36 The Contracts for Difference (CfD) scheme is now the Government's main mechanism for supporting low-carbon electricity generation **[See reference** 36**]**. The first auction included 'Pot 1' technologies; 'established' technologies, including onshore wind. The successful applicants of Round 1 auctions, as announced in February 2015, included onshore wind developments. Since then, Round 2 and Round 3 of the auctions in September 2017 and September 2019 excluded Pot 1 technologies, including onshore wind developments. As a result of the general decline in financial support for onshore wind, developers are predominantly interested in developing wind turbines in locations with high wind speeds, such as Scotland, Wales and northern England, to enable schemes to be financially viable.

4.37 Round 4 of CfD auctions opened in December 2021, Round 5 opened in March 2023, and Round 6 opened in March 2024, all of which now include Pot 1 technologies, such as onshore wind **[See reference** 37**]**. Following the budget uplift announced by the new Labour government in July 2024 **[See reference** 38**]**, Round 6 includes a budget increase compared to previous Rounds, although the majority of the budget is allocated to offshore wind. It remains unclear whether this will make schemes more financially viable for developers in England as much of the country has relatively low wind speeds, and any potentially financially viable developments require a number of very large turbines to maximise the power output and make the scheme economic.

4.38 Various initiatives can in theory improve wind development viability beyond the provision of subsidy. These could include, for example, establishment of local supply companies that can 'capture' the uplift from wholesale to retail energy prices. The signing of Power Purchase Agreements (PPA), such as between a developer and the Council, agreeing that the developer will sell the electricity generated to the Council, could make individual turbines viable, for example on an industrial estate.

4.39 Between 2010 and 2022, solar and wind power experienced a large cost deflation. For onshore wind projects specifically, the global weighted-average cost of electricity fell by 69% **[See reference** 39**]**. Over the last decade, turbine prices have fallen globally despite the increase in rotor diameters, hub-heights and nameplate capacities.

4.40 In addition, the Smart Export Guarantee has been introduced since January 2020 **[See reference** 40**]**. This is an obligation set by the Government for licensed electricity suppliers to offer a tariff and make payment to small-scale, low-carbon generators for electricity exported to ESO (formerly National Grid), providing certain criteria are met **[See reference** 41**]**. Wind developments of up to 5 MW capacity could benefit from this obligation. However, as mentioned above, the obligation does not provide equal financial benefits to the previous Feed In Tariff (FiT) scheme (which provided funding for smaller scale renewable energy developments), as it only provides payments for electricity export, not generation, and it does not provide a guaranteed price for exported electricity.

4.41 Overall, viability challenges, based on reduced income relative to capital costs, are a systemic challenge for wind development at all scales within southern England at the present time – to the extent that, if this challenge is not addressed by Government, the deployable wind potential within Huntingdonshire is likely to remain low.

Planning Issues

4.42 In addition to the lack of financial support mechanisms, until July 2024, the NPPF stated that wind energy development may only be permitted within areas identified suitable for wind energy developments within the development plan or supplementary planning document and where the development has the support of the local community (Footnote 58 in the NPPF). As such, the uptake of wind energy in England was very minimal as it discouraged developers. However, with the removal of the footnote by the new Labour Government, there may be an increase in onshore wind in England in the coming years. The Government's Onshore Wind Task Force is currently looking at how it going to achieve its ambition of securing 600MW-1GW of additional onshore wind in England over the next 9 years and the policy interventions that are needed to achieve this.

4.43 Securing consent for onshore wind turbines, particularly very large scale wind turbines which are the most economically viable, is likely to remain a challenge although setting out positive planning policies within the Local Plan can help with this.

Health and Safety

4.44 Onshore wind farms could potentially impact on the health and safety of the surrounding communities. There is potential for an increase in noise levels at nearby sensitive receptors during construction and decommissioning (e.g. from construction/decommissioning activity – construction of access tracks, piling etc.) and from construction traffic on the roads. In addition, shadow flicker at houses within close proximity to wind turbines could occur, but this is unlikely.

Onshore wind has the second largest technical potential energy output in Huntingdonshire of all the renewable and low carbon energy technologies considered in this study, after ground-mounted solar PV. It is estimated to have the potential to contribute 19% of Huntingdonshire's total technical potential energy output (based on the illustrative total technical potential **[See reference** 42**]**). In light of the recent proposed changes to the NPPF and the Government's ambition to deliver onshore wind, there is renewed optimism within the onshore wind energy industry. The economic viability of onshore wind in England does, however, remain a challenge to deployment; despite a more favourable national planning policy. Commercial renewable energy developers may prioritise schemes in the

North of England, where wind speeds are higher. Grid capacity could also be a significant constraint in the short-medium term.

Solar PV (ground-mounted)

4.45 In addition to PV modules integrated on built development, there are a large number of ground-mounted solar PV arrays or solar farms within the UK. These consist of groups of panels (generally arranged in linear rows) mounted on a frame. Due to ground clearance and spacing between rows (and between rows and field boundary features) solar arrays do not cover a whole field and allow vegetation to continue to grow between and even underneath the panels.

4.46 Ground-mounted solar project sizes vary greatly across the UK although developers in a post-subsidy environment are increasingly focusing on large-scale development, with the largest currently consented scheme in England (Longfield Solar Farm in Essex) being up to 500MW **[See reference 43]**. There is no one established standard for land take per MW of installed capacity, although land requirements for solar are comparatively high compared with wind. For the present assessment, an approximate land requirement of 1.2 hectares per MW has been applied based on past and recent development experience.

4.47 From January to March 2024, the UK had 16,695 MW of installed solar PV capacity, with this providing 1,914 GWh of electricity during the year **[See reference 44]**. These figures include all forms of solar PV – although according to the most recent available data, ground-mounted schemes account for 48.6% of overall solar capacity **[See reference 45]**. Falling capital costs mean solar PV is increasingly viable in a post-subsidy context, although as outlined above, at present developers are generally focusing on large developments in order to achieve economies of scale. Grid connection costs can also critically affect viability.

Existing Development within Huntingdonshire

4.48 The data available from DESNZ **[See reference 46]** identifies there is 143.4 MW of ground-mounted solar PV currently consented, installed or under construction in Huntingdonshire.

Assumptions used to Identify Land with Technical Potential

4.49 A GIS assessment of technically suitable land for solar development was undertaken using a similar approach to that undertaken for wind development. The assessment identified areas with financially viable solar irradiance levels (amount of sunlight) for PV. A series of primary constraints relating to physical features and environmental/heritage protection were then removed. The remaining areas have 'technical potential' for ground-mounted solar energy development.

4.50 Solar development is more 'modular' than wind (development size is dictated by the number of panels, which themselves do not differ greatly in size) and constraints are not affected by project scale in the way that they are for wind. Therefore, the identification of available land for ground-mounted solar has not been broken down into discrete project sizes but rather any land technically suitable for development has been identified.

4.51 To note, the use of agricultural land for solar development is an issue for the District, given that the majority of the District is classified as grades 1, 2 or 3 land. Agricultural land of grades 1, 2 and 3a land is classed as "the best and more versatile (BMV)" land, having higher value for food production. The NPPF requires planning policies and decisions to contribute to and enhance the natural and local environment by recognising the economic and other benefits of BMV; however, there is no requirement to use it solely for food production. The key constraints considered in the assessment of technical potential are set out in Appendix A and agricultural land grade 1 was treated as a constraint and excluded from the areas identified as having technical potential for ground-mounted solar PV development. However, it should be noted that the construction and operation of a solar farm will not lead to the long-term degradation or loss of soils. The solar farm could give intensively farmed land the opportunity to recover.

4.52 Typically, solar farms are subject to a Landscape and Environmental Management Plan (LEMP) which requires the ground beneath and around the panels to be seeded and managed to promote biodiversity through mowing or grazing, as well as typically avoiding the use of pesticides, herbicides, and fertilizers whilst the solar farm is operational. Grazing by small livestock is often used to keep the grass low and continue an agricultural use during the project lifetime. Solar farms also provide diversification for landowners, by adding a consistent income stream to their business that is not dependent on agriculture. This provides longer-term security against volatility in wholesale food commodity markets and yields, offering support to their wider farming business / operations. The UK Government Food Security Report (December 2021) implies that while there will be the loss of arable production on some higher quality land due to solar farms, this will not impact on the UK's food security. **[See reference** 47**]**

Results

Technical Potential

4.53 Figure 4.3, Figure 4.4 and Table 4.3 below provide a summary estimate of the technical potential for ground-mounted solar PV within Huntingdonshire. As the full technical potential is very large, utilisation of 1%, 3% and 5% of the resource is also quantified. Adopting the 3% development scale would result in a total potential technical capacity from ground-mounted solar PV across Huntingdonshire of 1,087MW – this approximately equates to an area of 13km^2, equating to powering approximately 356,000 homes a year **[See reference** 48**]**, with potential CO_2 savings equating to planting approximately 4.9 million trees a year **[See reference** 49**]**.

4.54 The calculation of potential energy yield requires the application of a ‘capacity factor’ i.e. the average proportion of maximum PV capacity that would be achieved in practice over a given period. Capacity factors vary in practice in accordance with solar irradiation, which in turn is affected by location, slope and aspect. It was not possible to find suitable historic data on capacity factors taking into account these kinds of factors within Huntingdonshire for the present study, and so a single capacity factor of 10.1% was used, based on regional data for the East of England **[See reference** 50**]**.

4.55 The potential carbon savings as a result of generation via the identified ground-mounted solar potential was also calculated. This assumes that the electricity generated from the identified ground-mounted solar potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.133kgCO2e/kWh **[See reference 51]**.

Figure 4.3: Ground-mounted solar PV potential

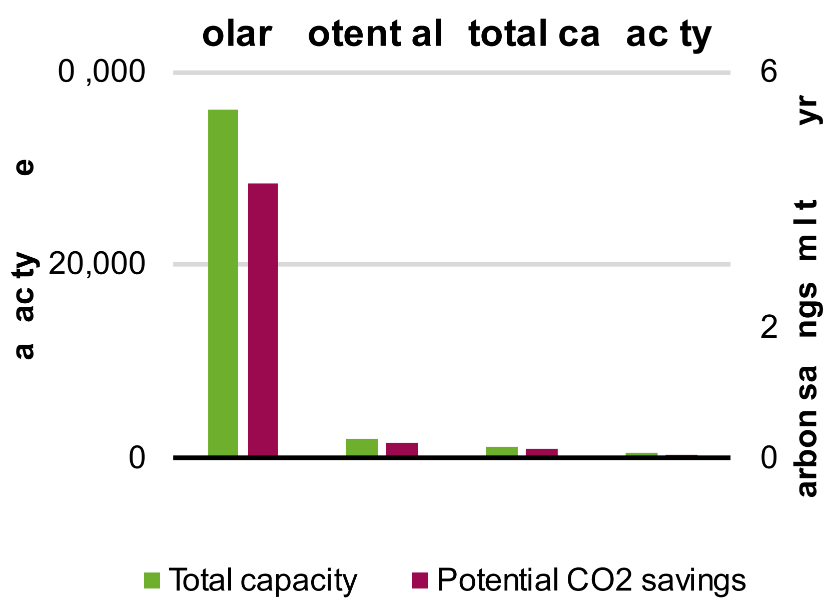


Figure 4.4: Ground-mounted solar PV potential: 1%, 3% and 5% only

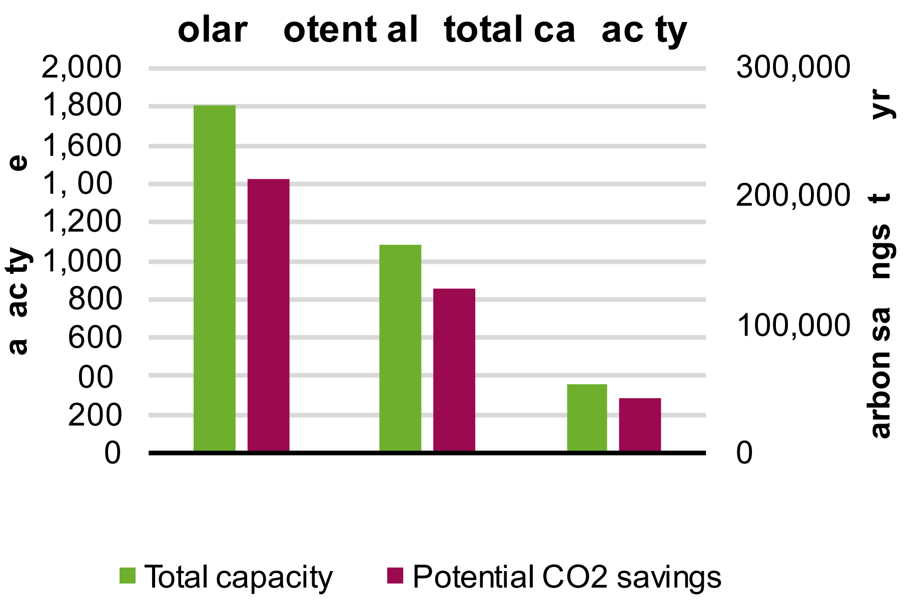


Table 4.3: Potential solar capacity and output

Development Scale	Potential Installed Capacity (MW)	Electricity Output (MWh/year)	Potential CO_2 Savings (tonnes/yr)
100% of tech. resource	36,241	32,064,908	4,264,633
5% of tech. resource	1,812	1,603,245	213,232
3% of tech resource	1,087	961,947	127,939
1% of tech resource	362	320,649	42,646

4.56 The key constraints and resulting potentially suitable land for solar development are presented in maps in Appendix C.

4.57 As with the wind resource assessment, the solar assessment has some key limitations. In particular, cumulative impacts are again a key consideration that the tool cannot take into account but which would affect the suitability of planning applications in practice. Due to the less constrained nature of solar, relative to wind, in terms of the factors that can reasonably be considered within a high-level resource assessment, a large area of land has been identified as technically suitable for ground mounted solar; but in practice development of all or even the majority of this land would clearly not be appropriate.

Issues Affecting Deployment

4.58 Considerations, other than cumulative impact, that would reduce the deployable potential of ground-mounted solar PV in practice include landscape sensitivity, grid connection and development income. These are discussed in turn below.

Landscape Sensitivity

4.59 Although the landscape and visual impacts of solar PV tends not to be as contentious as wind development, it is still often a key consenting issue, particularly for larger development scales. As the degree of acceptable landscape and visual impact is generally a matter that needs to be considered within the context of an overall planning balance, no land was excluded from the GIS technical constraints assessment on landscape or visual grounds. Instead, similar to wind, a separate landscape sensitivity assessment (LSA) should be undertaken to consider all Landscape Character Areas defined within the Huntingdonshire Landscape Character Assessment with technical potential for development. The LSA could be used alongside the output of this assessment of technical potential to help the Council identify which areas may be more or less suitable to different scales of ground mounted solar development within Huntingdonshire.

Grid Connection

4.60 As with wind, a key consideration in relation to solar PV development viability is the interaction between development income and grid connection costs. As noted above, at the present time viable solar developments are generally larger scale. It is understood, however, that even larger scale solar developments will only generally be viable at present where a grid connection is available in relatively close proximity to the development site, and does not involve significant network reinforcement costs. Although connections can in principle be made either into existing substations or into power lines (a 'tee in' connection), proximity requirements alone would limit the deployable solar PV potential in much of Huntingdonshire at the present time.

Development Income

4.61 Until recently, the lack of financial support for solar PV has limited the deployable potential, particularly for smaller schemes and schemes at greater distances from potential grid connection points. The present assessment cannot, however, rule out the potential for such schemes, bearing in mind that the financial context for solar is changing – for example solar has been included in the latest round of the Contracts for Difference (CfD) auctions. Renewable generators located in the UK that meet the eligibility requirements can apply for a CfD by submitting what is a form of 'sealed bid'. Round 6 of auctions opened in March 2024, with an increased budget compared to previous rounds, and includes Pot 1 technologies, such as solar PV >5MW and onshore wind >5MW **[See reference 52]**.

4.62 Over recent years solar panel costs also have decreased significantly, and as such subsidy-free solar energy schemes in the right locations are financially viable at larger scales. Solar PV module prices have dropped in price by 89% since 2010. A Government report confirmed that solar farms offer the most cost-effective power generation method, with levelized costs projected to decrease significantly by 2040 **[See reference 53]**. It is noted however that at present, commercial ground mounted solar PV schemes are predominantly pursued at large scales to ensure viability via economies of scale.

4.63 With regards to smaller scale solar developments, the Smart Export Guarantee has been introduced since January 2020 **[See reference** 54**]**. This is an obligation set by the Government for licensed electricity suppliers to offer a tariff and make payment to small-scale low-carbon generators for electricity exported to the National Grid, providing certain criteria are met. This could help to increase the financial viability of solar energy developments of up to 5 MW capacity. However, the obligation does not provide financial benefits equal to the previous Feed in Tariff (FiT) scheme, as it only provides payments for electricity export, not generation, and it does not provide a guaranteed price for exported electricity. In its first year of operation, several new tariffs were launched, up to a peak of 11p/kWh, and the scheme is running smoothly, and enables customers to shop around for the best tariff, incentivising suppliers to increase their prices to compete **[See reference** 55**]**. However, in April 2021 the Environmental Audit Committee wrote a letter to the Business Secretary raising concern about the lack of clarity from the Government on the role of community energy in decarbonising the energy sector and called for the introduction of a floor price above zero for the Smart Export Guarantee to help support such community energy **[See reference** 56**]**. It may therefore be that future changes to the Smart Export Guarantee or introduction of additional schemes may increase the potential developer income on future solar PV developments.

Health and Safety

4.64 There are potential health and safety issues around glint and glare for any light-sensitive receptors i.e. aviation, roads, rail infrastructure and residential properties. However, this is unlikely as solar panels are designed to absorb light. Modern solar PV panels have high-tech anti-reflective coatings and ultra-transparent glass to improve panel efficiency **[See reference** 57**]**.

Ground-mounted solar PV has the largest technical potential energy output in Huntingdonshire of all the renewable and low carbon energy technologies considered in this study. It was estimated to have the potential to contribute 70% of Huntingdonshire's total technical potential energy output (based on the illustrative total technical potential **[See reference 58]**). The economic viability of ground mounted solar PV in England is good as the costs have decreased significantly in recent years. Although Huntingdonshire has a good amount of technical potential for ground mounted solar, there is uncertainty surrounding the capacity of the grid and the costs of connecting to it.

Solar – Rooftop

Description of Technology

4.65 Both solar PV and solar water heating are well-established technologies in the UK, with uptake having been significantly boosted through the Feed-in Tariff (FiT) and the Renewable Heat Incentive (RHI) schemes. Installations are largely confined to southwest to southeast facing roofs, pitched between 20-60º, and which have minimal shading. These may be installed upon existing roofs or can be roof-integrated. Roof-integrated systems, such as PV tiles, shingles and semi-transparent PV panels, form part of the roof itself and can offset some of the cost of conventional roofing materials.

4.66 On flat roofs, commonly found on flats and on-domestic properties, the orientation of the roof is less critical to the viability of solar technologies. However, on these roofs, the panels will instead need to be pitched on tilted frames and spaced appropriately to limit self-shading.

4.67 On pitched roofs, approximately 7.5m^2 of roof space per kW of high efficiency (e.g. monocrystalline silicon) solar PV panel is required. These PV systems can also be connected to export power to the grid at times when there is insufficient energy use or storage capabilities within the property. In comparison, the rooftop size requirements for the installation of solar water heating systems is limited to the usage of hot water within the property itself. On residential properties, solar water heating systems therefore typically occupy 1.5m2 of flat panel per resident, and properties require sufficient space to accommodate a hot water storage tank.

4.68 Standard installations of solar panels are considered to be ‘permitted development’ **[See reference** 59**]** and therefore do not normally require planning consent. However, installations on listed buildings, or on buildings in designated areas (e.g. on the site of a scheduled monument or in a conservation area) are restricted in certain situations and may require planning consent.

Other emerging Solar PV technologies Considered but not Assessed

4.69 The breadth of uses for solar PV technology is vast and spans many diverse applications such as solar phone chargers, roof or ground-mounted power stations and solar streetlamps. There is also a new design for a solar PV integrated motorway noise barrier that is being considered for use by Highways England, and a trial of track-side solar panels being used to power trains by Imperial College. Solar car park canopies also offer potential, as demonstrated by the 2.7MW system installed by FlexiSolar at a large manufacturing site in England **[See reference** 60**]**.

4.70 Emerging solar PV technologies include ‘floatovoltaics’, whereby PV systems float on waterbodies such as reservoirs and lakes, often floating on rafts and anchored to the side of the water body. For example, a 6.3 MW 23,046 panel scheme has been developed on Queen Elizabeth II Reservoir, near Heathrow airport **[See reference** 61**]**, and a 3 MW 12,000 panel scheme has been installed on Godley Reservoir near Manchester **[See reference** 62**]**. These schemes generally occupy only a small area of the water bodies and are beneficial in reducing evaporation over the summer. As such, there may be potential to utilise the various lakes within Huntingdonshire for 'floatovoltaics'.

4.71 However, if such ‘floatavoltaic’ systems were installed on more natural water bodies as opposed to reservoirs, their installation could risk impacting the ecosystems of water bodies by creating too much shading beneath the panels. This would require more investigation if proposals for such ‘floatavoltaic’ systems are proposed on sensitive or protected water bodies.

Existing Development within Huntingdonshire

4.72 Huntingdonshire saw 25,368 kW of solar PV capacity installed between April 2010 (launch of the Feed in Tariff (FiT)) and March 2019 (when it closed), with 3,282 installations deployed on domestic properties **[See reference** 63**].** The data from DESNZ **[See reference** 64**]** identifies there is 25.37 MW of roof-mounted solar PV currently operational in Huntingdonshire.

4.73 There were 11 accredited domestic installations of solar water heating systems under the Renewable Heat Incentive (RHI) scheme within Huntingdonshire in March 2024 **[See reference** 65**]**.

Assumptions Used to Calculate Technical Potential

4.74 The total potential capacity of roof mounted solar was estimated based on typical system sizes and the estimated percentage of suitable roofs within the study area. A high-level assessment was undertaken, considering the number of buildings and types of building within Huntingdonshire. Assumptions on the suitability of the roofs of these buildings were applied – see Appendix A.

4.75 Roofs that have potential to deliver solar PV also have the potential to deliver solar water heating generation. However, this was treated as being mutually exclusive with solar PV potential, i.e. the same roof space can only be utilised for one of the technologies.

4.76 The total potential capacity of solar PV and solar water heating was calculated along with the generation potential. The calculation of potential energy yield requires the application of a 'capacity factor' i.e. the average proportion of maximum PV capacity or solar water heating that would be achieved in practice over a given period. A capacity factor of 10.1% was used for Solar PV, based on regional data for the East of England **[See reference 66]**, and a capacity factor of 4.5% was used for solar water heating, based on national scale DESNZ data **[See reference 67]**.

4.77 The potential carbon savings as a result of generation via the identified roof-mounted solar potential was also calculated. This assumed that the electricity generated from the identified solar PV potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.133kgCO2e/kWh **[See reference 68]**. Similarly, this assumed that the heat generated from the identified solar water heating potential would result in negligible carbon emissions and would replace that currently provided by the mains gas (emission factor of 0.210kgCO2e/kWh **[See reference 69]**), or either heating oil (emission factor of 0.298kgCO2e/kWh **[See reference 70]**) or national grid electricity (emission factor of 0.133kgCO2e/kWh **[See reference 71]**) for properties located 'off-gas' – see Appendix A.

Results

Technical Potential

4.78 Figure 4.5 and Table 4.3 below provide a summary estimate of the technical potential for roof-mounted solar PV and Figure 4.6 and Table 4.4 below provide a summary estimate of the technical potential for roof-mounted solar water heating within Huntingdonshire.

Figure 4.5: Total capacity of rooftop solar PV potential and carbon savings

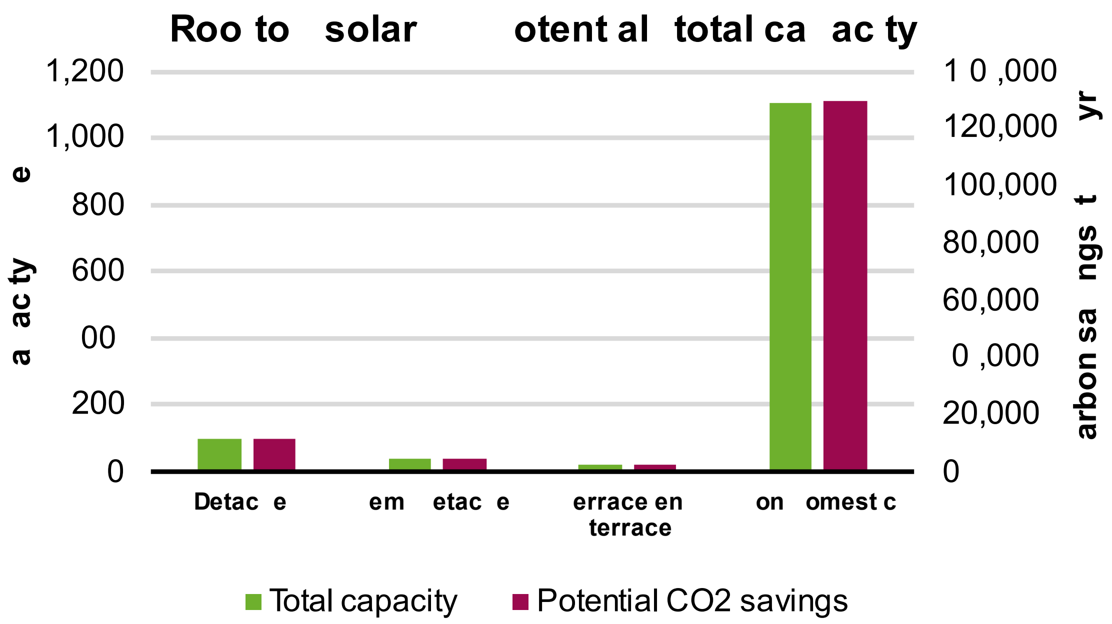


Table 4.3: Assessment of rooftop solar PV

Building Category	Estimated capacity (MW)	Electricity output (MWh/year)	Potential CO2 savings (tonnes/year)
Detached	95	84,185	11,197
Semi-detached	36	31,425	4,180
Terrace/end terrace	17	15,019	1,998
Non-domestic	1,103	976,074	129,818
Total	**1,156**	**1,106,703**	**147,191**

Figure 4.6: Rooftop solar water heating potential capacity and savings

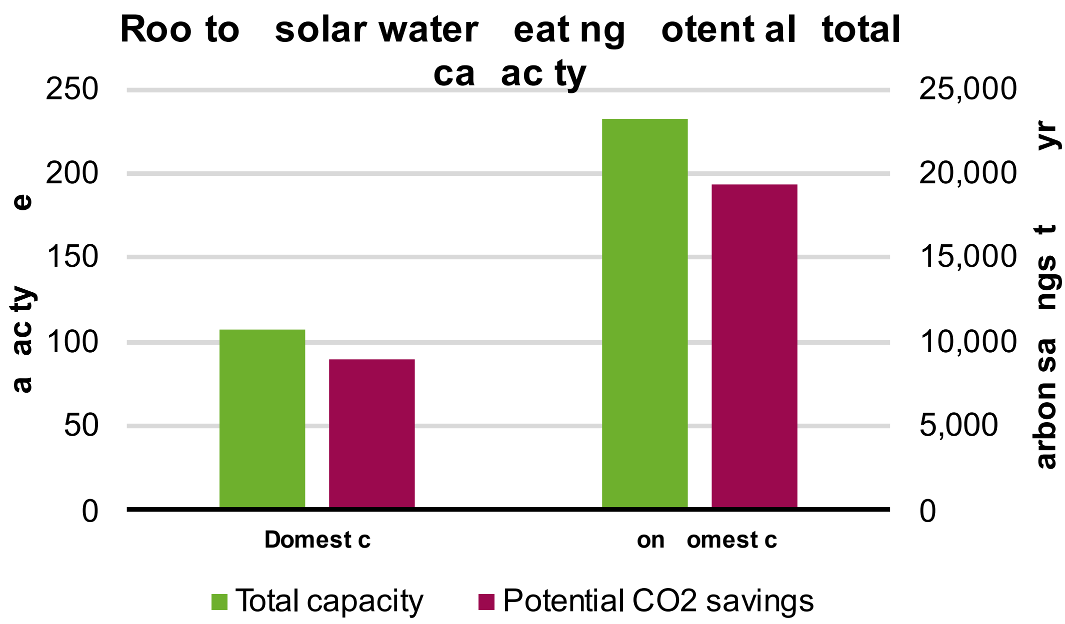


Table 4.4: Assessment of rooftop solar water heating

Building category	Estimated Capacity (MW)	Delivered Heat (MWh/yr)	Potential CO2 Savings (tonnes/yr)
Domestic	108	42,419	8,934
Non-domestic	233	91,678	19,309
Total	**341**	**134,097**	**28,244**

Issues Affecting Deployment

Grid Decarbonisation

4.79 Rooftop solar PV is proving to be attractive to developers as an easily deployed renewable energy generation technology that offsets high-carbon mains electricity usage, thereby helping to meet tightening buildings emission standards. However, the ‘value’ of this offsetting will continue to drop as the mains grid electricity gradually decarbonises.

4.80 Nonetheless, for those already receiving a proportion of free electricity from onsite solar PV, the financial benefits of reduced bills from mains electricity usage will continue. Over the past decade, the cost of solar PV has reduced significantly, and this fall in cost is likely to continue in conjunction with UK grid parity (generation of power at or below the cost of mains power) expected in 1-3 years, without the need of subsidies.

4.81 In addition, recent advances in smart power management controls and energy storage systems have benefited solar PV. The dual deployment of these technologies with rooftop solar PV, for example through time-of-use electricity tariffs, could automate and optimise the generation and storage of power, determining whether power is used directly on site, stored for later use, or exported immediately directly to the grid. Furthermore, the integration of solar PV into ‘whole house’ systems, which could also incorporate electric vehicle charging, could further incentivise uptake of rooftop solar PV technologies.

Lack of Financial Incentives

4.82 The Feed in Tariff (FiT) scheme, which enabled properties to gain payments for energy generation and export from small-scale renewable installations, closed to new applicants in March 2019. Following this, the Government introduced the Smart Export Guarantee scheme in January 2020.

This scheme requires that licenced electricity suppliers offer a tariff to pay small-scale (>5MW) low carbon electricity generators to export electricity to the grid. However, this scheme is generally less beneficial than the FiT as the payments are only related to the exported electricity, rather than the total amount of electricity generated. However, as part of the Spring Statement 2022, the Chancellor made the announcement that from 1 April 2022 until 31 March 2027 VAT on installing energy-saving materials (ESMs), which includes solar thermal and PV systems, in residential properties will be 0% in Great Britain. The measure is intended to incentivise the take-up of ESMs in line with the government's net zero objectives and making schemes potentially more financially viable for most users **[See reference** 72**]**.

4.83 Compared to solar PV, solar water heating installations are less common, as preference was previously given to PV installations during the more profitable FiT period. This is with the exception of solar water heating installations on properties that are located off the gas grid. For off-gas properties, the installation of roof-mounted solar water heating panels are often more financially beneficial, due to the higher cost of heating fuels like electricity and oil in comparison to mains gas.

4.84 With regards to non-domestic properties, the installation of roof-mounted solar water heating technologies is more limited than on domestic properties, as the viability of these installations is dependent on hot water demand, as well as competition with point-of-use hot water heating. This technology is less likely to play a significant role in the decarbonisation of heat in comparison to heat pumps, particularly if grid electricity continues to decarbonise as predicted.

4.85 It is noted that in certain circumstances, rooftop solar PV and solar water heating installations can be considered to be permitted development **[See reference** 73**]** and therefore may not need planning permission, potentially encouraging uptake.

Roof-mounted solar PV has the third most potential energy output in Huntingdonshire (2%) of all the renewable and low carbon energy technologies in this study (based on the illustrative total technical potential **[See reference** 74**]**). Rooftop solar PV is currently attractive to developers as the cost of solar PV has reduced significantly in the last decade and depending on the size and location of the installation it could be considered through permitted development. It is an easily deployed renewable energy generation technology that offsets high-carbon mains electricity usage.

Hydropower

Description of Technology

4.86 The generation of energy via hydropower involves using water flowing from a higher to a lower level to power a turbine that is connected to an electrical generator. The resultant energy generation is therefore directly proportional to the height difference (the head) of the water flowing and the volume of water flowing.

4.87 Hydropower is a proven well-established technology. There are few technological constraints to its use, with the exception of ensuring:

- The water course has sufficient flow rates and heads (height difference) throughout the year;
- The electricity generates can be transmitted to the end user; and
- The site is accessible and can accommodate the required equipment.

4.88 Based on these few constraints, the energy yields of potential installations can be accurately estimated and the economic viability of installations determined relatively easily.

4.89 However, due to the environmental constraints on large-scale multi-MW installations, the most potential for hydropower exists mainly from small or micro-scale schemes. In the UK, micro scale (typically under 100 kW) hydropower installations can include schemes that provide power to individual homes, whilst small-scale schemes can reach up to a few hundred kW in size and export electricity directly to the grid. These small schemes commonly incorporate dams, weirs, leats (artificial watercourses dug into the ground), turbine houses and power lines, which have the potential to visually impact the landscape. However, suitable siting and design of these installations can commonly mitigate these impacts. For 'low head run of river' developments, typically for schemes located in lowland areas, these can often be located on the site of old mills and utilise existing channel systems and weirs or dams. In comparison, in 'high head run of river' schemes, that are typically found in upland steeper areas, the water flow is often diverted via enclosed penstocks (pipelines) to the turbines.

4.90 In addition to potential landscape and visual impacts, impacts on hydrology and river ecology require consideration in determining the suitability of sites for hydropower developments. For example, aquatic plants may impact the performance of a hydropower scheme by impacting the water flows and waterfalls. Moreover, river fish populations may be sensitive to changes in water flows, as well as risk physical harm from the hydropower equipment installed. However, mitigation measures including the incorporation of 'fish passes' are often included within schemes to limit such impacts.

4.91 Potential impacts of hydropower developments upon the status indicators of a water body, as set out in the Water Framework Directive, may require abstraction licences, discharge permits and flood defence consent from the Environment Agency. As well as the assessment of potential impacts from individual hydropower installations upon waterways, the cumulative impacts of hydropower and any other water abstraction activities along a waterway on the protected rights of other river users will require assessment. Moreover, as permissions on use of waterways for hydropower are commonly issued with a time limit on the permitted abstraction period, this must also be considered. Unless such time periods are sufficiently long, the long-term viability of hydropower developments may be at risk if these permissions are not renewed in the future.

Existing Development within Huntingdonshire

4.92 Feed in Tariff (FiT) **[See reference 75]** data indicates that there are currently 2 known hydropower installations located within Huntingdonshire with a total capacity of 42 kW.

Results

Technical Potential

4.93 It has not been possible within the scope of this study to undertake a new assessment of the potential hydropower resource within Huntingdonshire. However, in 2010 the Environment Agency published the findings of a study identifying hydropower opportunities within England and Wales **[See reference 76]**. This study has not been updated since, but it was produced to provide an overview at national and regional scales of the potential hydropower opportunities available, as well as the relative environmental sensitivity of identified potential sites to development. It is noted that this data is indicative and that further site-specific study would be required in order to determine the technical potential and suitability of sites for hydropower developments.

4.94 The study included identifying 'heavily modified water bodies' that are identified as being at significant risk of failing to achieve good ecological status because of modifications to their hydromorphological characteristics resulting from past engineering works, including impounding works. Due to these characteristics, such waterbodies were identified as having the potential to create hydropower barriers that would also be beneficial to the passage of fish upstream. These were overlayed with identified locations where suitable yearly flow characteristics are present and could feasibly support hydropower sites. The resultant identified sites were classified as 'win-win' opportunities where hydropower developments could potentially be installed whilst also improving the ecological status of waterways.

4.95 Figure 4.7 shows the win-win locations that were identified within Huntingdonshire. The 2010 data shows that three sites were identified within Huntingdonshire, which have the potential to support a total of 472 kW of hydropower installations. Using the capacity factor of 38.2% for the UK **[See reference 77]**, it is calculated that this could provide 1,579 MWh of electricity per year and provide carbon savings of 210 tonnes of CO2 per year. Further site-specific study would, however, be required to determine more accurately the suitability and technical potential of each site.

It was not possible within the scope of this study to undertake an assessment of the technical potential for hydropower within Huntingdonshire. However, the lack of existing hydropower installations together with the failure of a historic, national study to identify any such potential suggest that hydropower is unlikely to represent a meaningful renewable and low carbon energy resource for Huntingdonshire.

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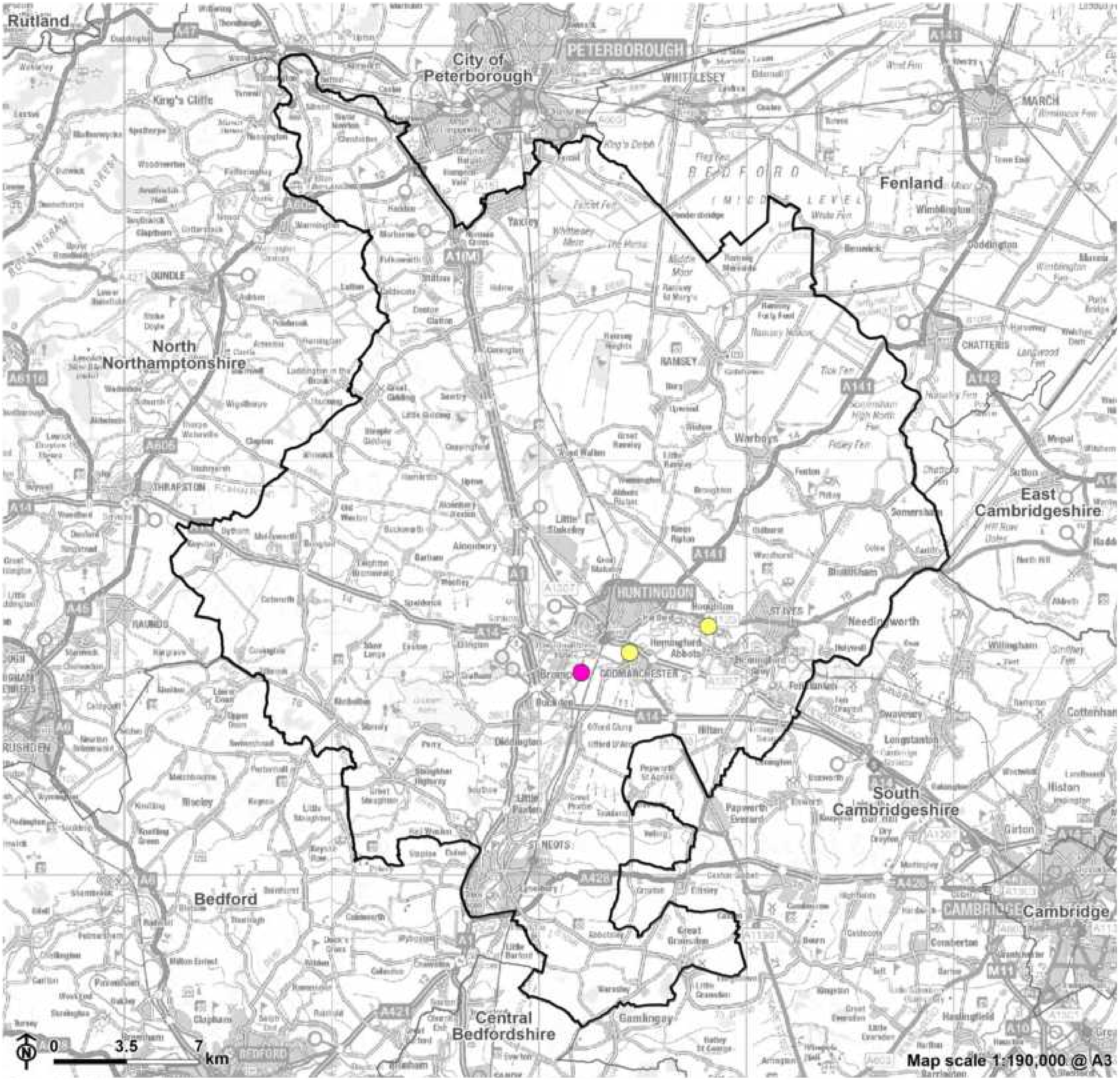
Figure 4.7: win-win hydropower sites identified in Huntingdonshire



Huntingdonshire District
Neighbouring Local Authority

Power category

20 - 50 kW
100 - 500 kW

Notes:

Source: Environment Agency Hydropower Opportunities Mapping Project 2010.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12713_Additional_Figures 08/08/2024 EB:spears_d

Heat Pumps

Description of Technology

Air Source Heat Pumps

4.96 Almost any building theoretically has the potential for an air source heat pump to be installed. Therefore, the assessment considered the potential for air source heat pumps to be delivered in all buildings. In October 2023, the Government's Boiler Upgrade Scheme **[See reference** 78**]** increased grants for the installation of air source and ground source heat pumps to £7,500. The scheme also offers £5,000 off the cost of a biomass boiler. Up to the end of January, the scheme has now received 33,424 applications in total which is up 39% since January 2023.

4.97 Data to be used for assessment of air source heat pump potential:

- System Size:
  - Average size of systems, derived from Renewable Heat Incentive (RHI) deployment data (domestic and non-domestic) published by DESNZ.
  - Capacity factor derived from national DESNZ data.
- Heating fuel assumed to be offset:
  - Seasonal Performance Factor (heat pump efficiency) derived from BEIS (now DESNZ) RHI data.
  - The actual proportions of electricity and oil usage by off-gas properties is unknown. As such, an illustrative 50% or these properties are estimated to be fuelled by electricity and 50% by oil for the purposes of this study.

Figure 4.8: Air source heat pump potential capacity and savings for domestic and non-domestic

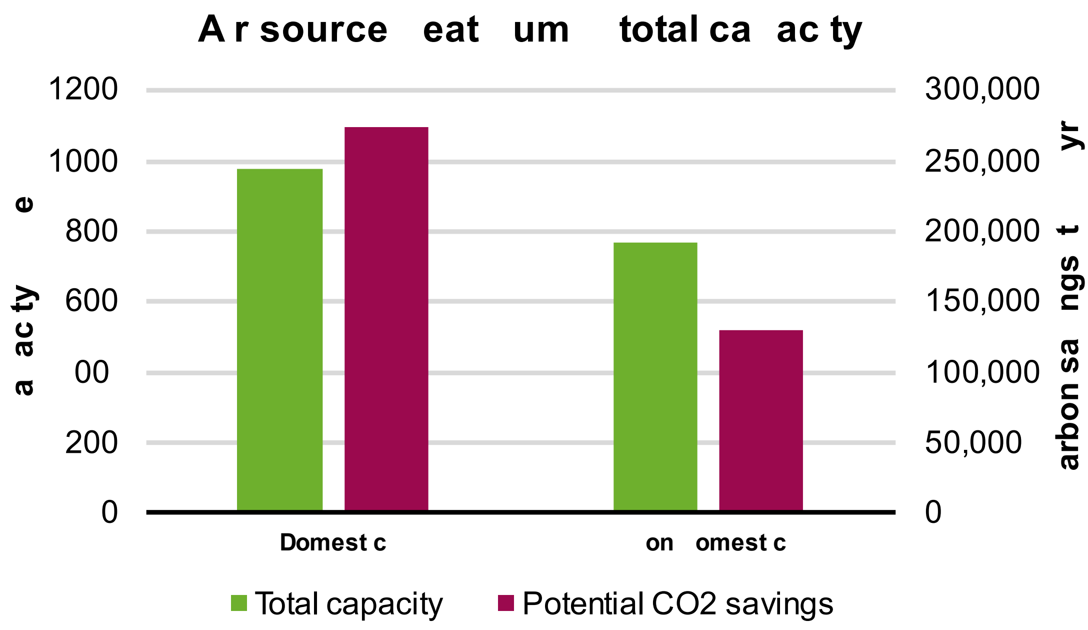


Table 4.5: Assessment of air source heat pumps

Building category	Estimated capacity (MW)	Delivered Heat (MWh/yr)	Potential CO2 Savings (tonnes/yr) (including SPF [See reference 79])
Domestic	980	1,579,613	274,345
Non-domestic	766	1,234,779	130,335
Total	**1,746**	**2,814,392**	**404,680**

Ground Source Heat Pumps

4.98 Ground source heat pumps require more space than air source, requiring pipes to be buried vertically in a deeper system or horizontally in a shallow wider system. Due to these significant space constraints, this study did not estimate the potential capacity of ground source heat pumps across the study area, as it was not possible to estimate how many properties have access to the required space.

4.99 Average system sizes of domestic pumps were derived however from DESNZ data.

Open Loop Ground Source Heat Pumps

4.100 The British Geological Survey has produced a map identifying the potential viability of open-loop ground source heat pumps across England and Wales, considering hydrogeological and economic factors **[See reference** 80**]**. This indicates that land within Huntingdonshire is favourable for open-loop ground source heat pumps.

4.101 However, the British Geological Survey states that this is an initial screening assessment only and that identified areas favourable for open-loop systems are not automatically suitable for this technology to be installed. Instead, detailed environmental assessments of proposed sites would be required, considering local variations in environmental conditions and factors such as the availability of water (i.e. the amount of water that is available for licensing by the Environment Agency) and discharge of water from a scheme **[See reference** 81**]**. With the limited data available, it is therefore not possible to determine the potential annual energy generation and carbon savings that could be produced by open loop ground source heat pumps within Huntingdonshire.

Water Source Heat Pump

4.102 The DECC 2014 water source heat map identified, at a high level, opportunities for water source heat pump technologies **[See reference** 82**]**. Less is known about the potential for water source heat pumps. In the right locations, they have been shown to have the potential to provide efficient low carbon heating or cooling at scale as long as the buildings to be served are in close vicinity, as demonstrated by the Kingston Heights installation by the River Thames **[See reference** 83**]**. This incorporates a 2.3MW water source heat pump for space and water heating of a mixed development. In addition, the Grade I listed house Kelmarsh Hall installed a water source heat pump to obtain heat from the estate's lake and reduce the site's carbon footprint by 50% **[See reference** 84**]**.

4.103 Although it has not been possible within the scope of this study to assess the potential for water source heat pumps, the sensitivity analysis included in the 2014 DECC water source heat map **[See reference** 85**]** identified the River Ouse as having a heat capacity of 21 MW. Viability would largely depend on having a sufficiently high heat demand local to the potential heat pump location.

Overall, it was not possible within the scope of this study to undertake an assessment of the technical potential for ground source or water source heat pumps within Huntingdonshire. Air source heat pumps have a relatively small technical potential energy output (approximately 6%) of all the renewable and low carbon energy technologies considered in this study (based on the illustrative total technical potential **[See reference** 86**]**). They do, however, benefit from the fact that almost any building theoretically has the potential for an air source heat pump to be installed

Biomass and Waste

Description of Resource

4.104 Biomass is defined generally as material of recent biological origin that is derived from plant or animal matter. 'Dry' biomass is commonly combusted to produce electricity or generate heat. 'Wet' biomass is commonly used to produce biogas via anaerobic digestion. This can be used as 'green' gas on the grid or used to produce 'biofuel' for transport.

4.105 In many countries, dry biomass materials such as wood are commonly used as a fuel for modern heating systems. These modern technologies can be used to heat a variety of building sizes and can be utilised within individual boilers or district heating systems.

4.106 In addition, organic wastes can be considered a source of low-carbon energy production if their use in generation prevents them from otherwise decomposing and potentially releasing methane, contributing to greenhouse gas levels in the atmosphere.

4.107 Biomass can also be used to generate electricity, fuelling electricity plants or combined heat and power (CHP) plants. This is becoming increasingly common due to the low carbon emissions of its use. However, to ensure the technology is low-carbon, consideration must be given to ensuring the biomass feedstocks are sustainably sourced with minimal carbon emissions associated with any required processing and transportation. Except for landfill gas, energy supply from most bioenergy sources has grown since 2010 with the largest upturn from plant biomass (imported and domestic).

4.108 The most common types of biomass feedstocks for energy production include:

- Virgin woodfuel: Including forestry and woodland residues, and energy crops.
- Waste residues: Including municipal and commercial solid waste, recycled wood waste, agricultural residues and sewage.

Virgin Woodfuel

Description of Technology

4.109 The virgin woodfuel considered within this study includes:

- Untreated wood residues (from forestry, woodlands, arboriculture, tree surgery, etc); and
- The energy crops Miscanthus and Short Rotation Coppice (SRC).

4.110 It is noted that there is some overlap in which virgin wood enters certain waste streams, however this is difficult to extract from contaminated non-virgin wood. As such, virgin woodfuel within waste streams is not considered within this part of the assessment.

4.111 It is necessary to separately consider virgin and non-virgin woodfuel resources as different legislation will apply to its usage for energy generation regarding emission permits. Virgin woodfuel is considered to be clean and safer than non-virgin woodfuel, which may be contaminated for example by paint or preservatives. As such the use of non-virgin woodfuel for energy generation would fall under stricter emission and pollution controls.

4.112 Provided that virgin woodfuel is sustainably sourced, such as via sustainable woodland management through re-growth and low emissions from processing and transportation, it can be considered a sustainable fuel. The carbon emissions released from the combustion of the wood are theoretically balanced by the regrowth of replacement woodland and energy crops, provided the carbon emissions released in growing and transporting the woodfuel are mitigated. For example, logs and woodchip are considered to be less sustainable due to their 'bulky' nature, and as such should be sourced locally to limit greater transport emissions.

4.113 Woodfuel biomass is commonly produced as logs, woodchips, pellets and briquettes, and there are several processes that are required to prepare the woodfuel to reach these usable states. Processing influences the moisture content, size and form of the biomass fuels and the quality control of these factors is necessary to ensure the biomass is usable within specific boilers and thermal conversion processes.

4.114 Virgin woodfuel biomass can be utilised for both heat-only generation as well as CHP, and a variety of energy conversion technologies can be used, such as direct combustion, gasification and pyrolysis.

Existing Development within Huntingdonshire

4.115 The data available from DESNZ **[See reference** 87**]** identifies there is one anaerobic digestion facility awaiting construction in Huntingdonshire. Once installed it will provide 6.8MW of energy. In addition, Renewable Heat Incentive (RHI) scheme data **[See reference** 88**]** indicates that 12 domestic properties (0.01% of the dwelling stock) have small-scale biomass within Huntingdonshire.

4.116 No further data was identified on use of woodfuel within the area, although there will be significant amounts used domestically in open fires, stoves and wood burners. There are several firewood suppliers within Huntingdonshire, for example Cambridge Firewood Company and All Seasons Logs.

Results

Technical Potential of Forestry and Woodland Resource

4.117 To determine the potential for biomass generation from forestry and woodland, it was assumed that all woodland within the study area has a sustainable yield of two odt/ha/yr (oven-dried tonnes/ha/year) **[See reference** 89**]** and the assumptions within Appendix A were applied. Both the potential for heating and for combined heat and power were calculated.

4.118 To identify existing suitable woodland within the study area, the Forestry Commission's National Forest Inventory (NFI) was used. Only woodland categories that were considered to be mature **[See reference** 90**]** and able to provide a sustainable yield of woodfuel, and that were not protected ancient woodland or a biodiversity site, were considered (see Appendix A). It should be noted that while important local woodland sites were included within this assessment, they are essential to the character of Huntingdonshire and are protected locally.

4.119 Figures 4.9 to 4.12 show the existing woodland opportunities and constraints to woodland exploitation for biomass considered within this assessment.

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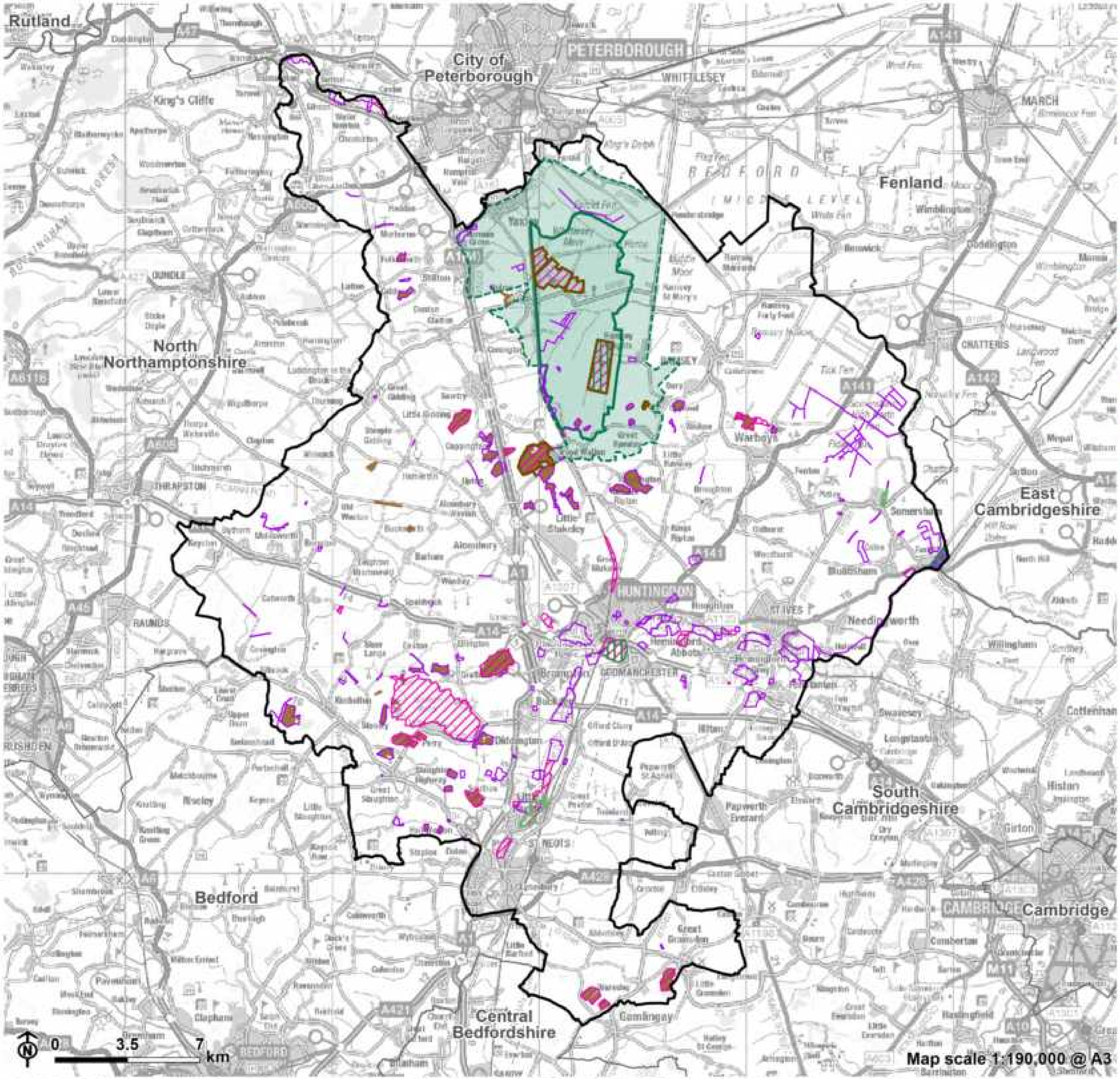
Figure 4.9: Natural Heritage Constraints: Biomass - Virgin woodfuel - Forestry and woodland



- Huntingdonshire District
- Neighbouring Local Authority
- Ramsar site
- Special Protection Area
- Special Area of Conservation
- Site of Special Scientific Interest
- National Nature Reserve
- Local Nature Reserve
- Ancient woodland
- County Wildlife Site
- The Great Fen
- The Great Fen - Landscape and Visual setting

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12713_Additional_Figures 09/10/2024 EB:spears_d

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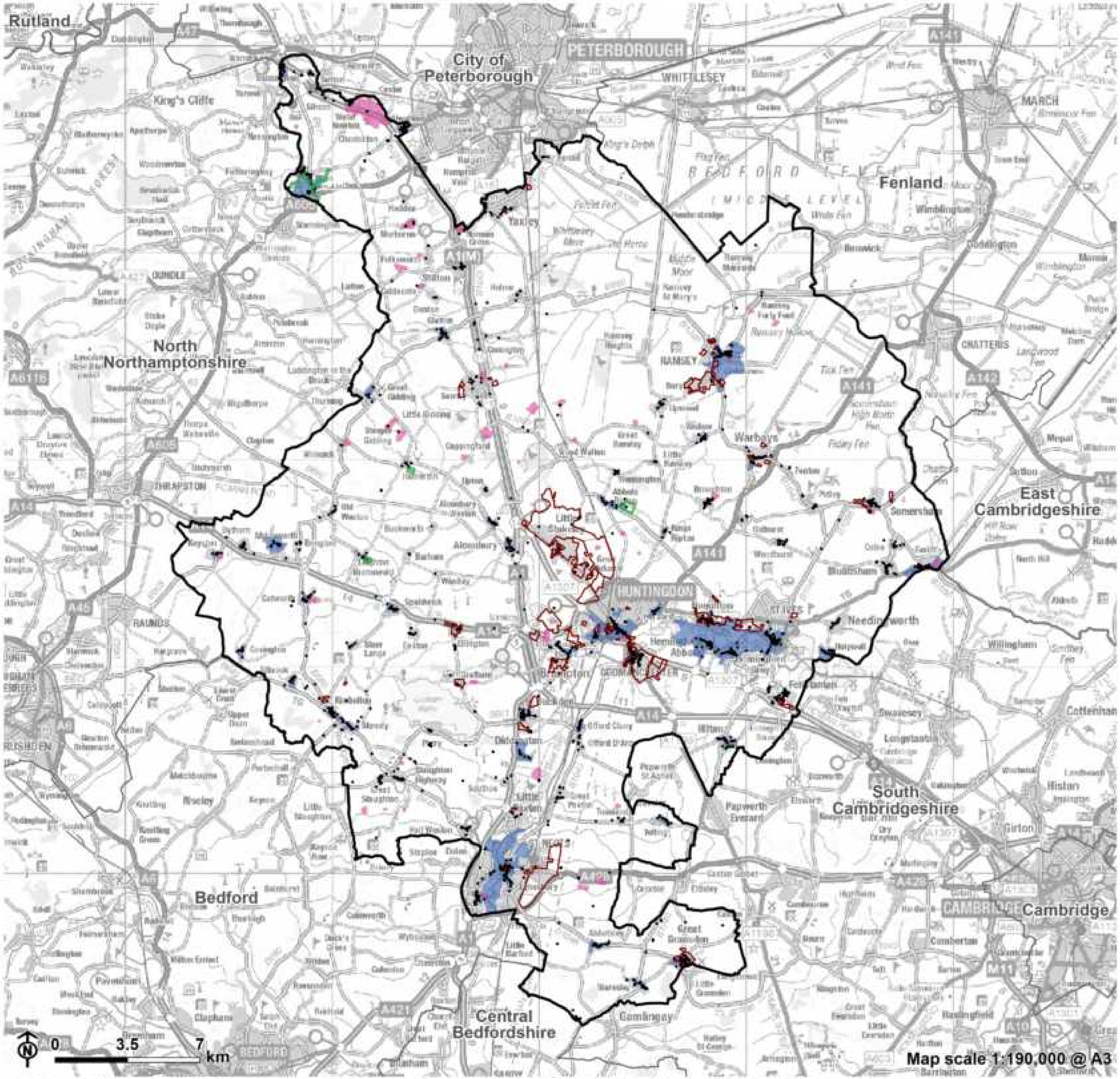
Figure 4.10: Cultural Heritage and planning Constraints: Biomass - Virgin woodfuel - Forestry and woodland



- Huntingdonshire District
- Neighbouring Local Authority
- Registered Parks and Gardens
- Listed building
- Conservation area
- Scheduled monument
- Future developments, safeguarded land and employment sites

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

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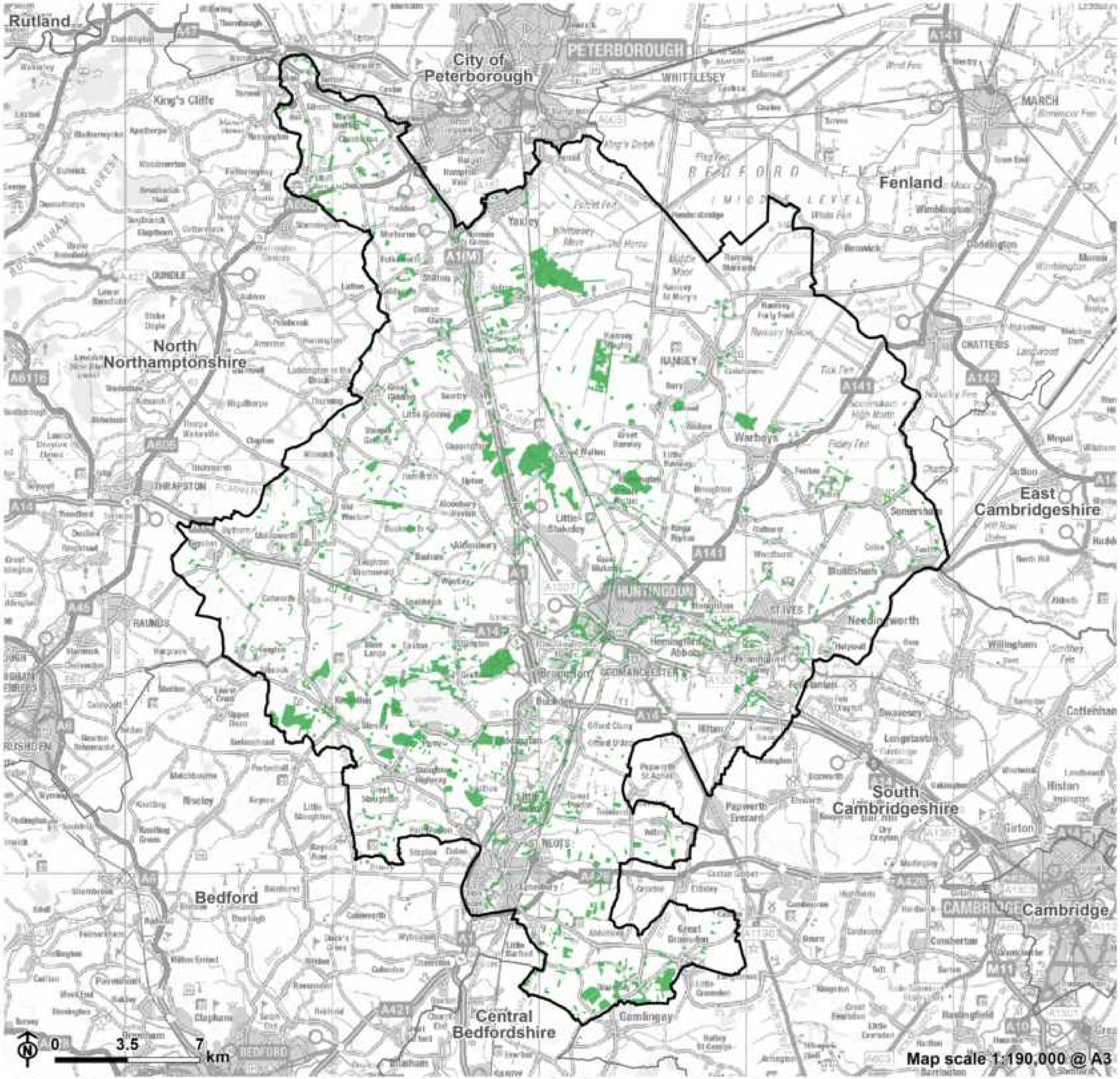
Huntingdonshire District Council

Figure 4.11: Opportunities: Biomass - Virgin woodfuel - Forestry and woodland



- Huntingdonshire District
- Neighbouring Local Authority
- Woodland

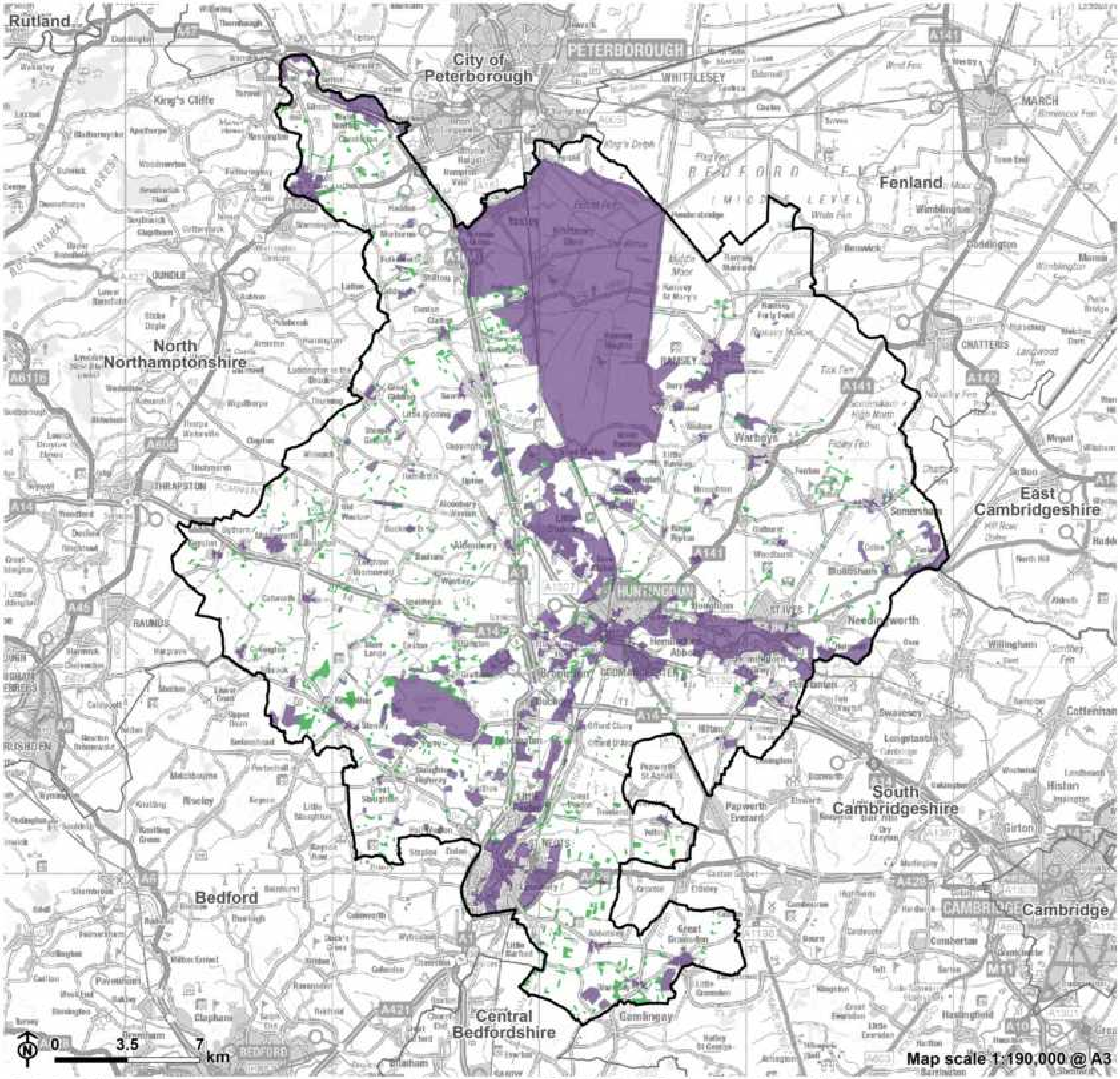
Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12713_Additional_Figures 09/10/2024 EB:spears_d

Renewable Energy Assessment
Huntingdonshire District Council

Figure 4.12: Opportunities and constraints: Biomass - Virgin woodfuel - Forestry and woodland



- Huntingdonshire District
- Neighbouring Local Authority
- Woodland
- All constraints

Notes:

MOD land is not shown in the figure but was included as a constraint in the assessment.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

The calculated woodland and forestry biomass resource was calculated in line with the assumptions outlined in Appendix A. The technical potential findings are presented in Table 4.6, considering the biomass resource is used for heating only, and in Table 4.7 considering the biomass resource is used for heat and electricity generation via CHP. This only assumes the use of woodfuel from woodland within Huntingdonshire District.

Table 4.6: Woodfuel: Assessment of forestry and woodland resource - use for heating only

Woodland Type	Estimated Capacity (MW)	Delivered Heat (MWh/year)	Potential CO2 Savings (tonnes/year)
Assumed woodland	0.3	1,263	266
Broadleaved	2.3	8,905	1,876
Conifer	0.2	824	174
Coppice	0.0	0.0	0.0
Mixed mainly broadleaved	0.01	55	12
Mixed mainly conifer	0.04	162	34
Total	**2.9**	**11,209**	**2,361**

Table 4.7: Woodfuel: Assessment of forestry and woodland resource - use for CHP

Woodland Type	Estimated Capacity (MW)	Delivered Electricity (MWh/year)	Delivered Heat (MWh/year)	Potential CO2 Savings (tonnes/year)
Assumed woodland	0.3	492	820	238
Broadleaved	2.3	3,469	5,782	1,679
Conifer	0.2	321	535	155
Coppice	0.0	0.0	0.0	0.0
Mixed mainly broadleaved	0.01	21	36	10
Mixed mainly conifer	0.04	63	105	30
Total	**2.9**	**4,367**	**7,279**	**2,114**

4.120 In addition to the calculated potential woodland and forestry biomass resource within Huntingdonshire, surplus woodfuel could potentially also be sourced from neighbouring authorities, provided the cost and transportation sustainability were viable. Furthermore, the cutting of hedgerows could additionally provide a source of woodfuel, however due to the lack of data regarding hedgerow yields, it has not been possible to factor this into the assessment. Woodfuel could be used from neighbouring areas but as stated above, this assessment only focuses the technical potential for wood fuel grown within the District.

Technical potential of energy crops

4.121 Miscanthus and Short Rotation Coppice (SRC) are the two main virgin woodfuel energy crops used within biomass and considered within this study. Such crops are commonly planted specifically to be used in the production of heat and electricity, whilst other 'biofuel' crops, including sugar cane, maize and oilseed rape, are more commonly planted to be used as transport fuels.

4.122 The benefits of Miscanthus cultivation relative to SRC are:

- It utilises existing machinery (SRC requires specialist equipment to be cultivated);
- It is higher yielding;
- It is annually harvested (SRC is harvested only once every three years); and
- It is a relatively dry fuel product when cut (SRC requires drying once cut, prior to use).

4.123 The benefits of SRC cultivation relative to Miscanthus are:

- It is easier and cheaper to establish;
- It is better for biodiversity; and
- It is suitable for a wider range of boilers.

4.124 Although both crops have similar lead-in times of approximately four years until they are able to produce commercial harvests, Miscanthus will reach its peak yield in the fifth year and SRC in the seventh year, after its second rotation.

4.125 In order to protect the best and most versatile agricultural land for food crops, it was assumed that neither energy crop should be planted on Grade 1 or 2 agricultural land within Huntingdonshire. It was assumed that both crops have the ability to successfully grow on Grade 3 and 4 agricultural land. It was also assumed the SRC has the potential to grow on Grade 5 agricultural land. However, there is no Grade 5 agricultural land in Huntingdonshire. Cultural heritage, natural heritage and physical constraints were also considered to prevent the growing of the crops. The constraints to energy crop planting are presented in Figure 4.13 to Figure 4.16 and the full assumptions considered within the assessment are outlined in Appendix A.

Renewable Energy Assessment
Huntingdonshire District Council

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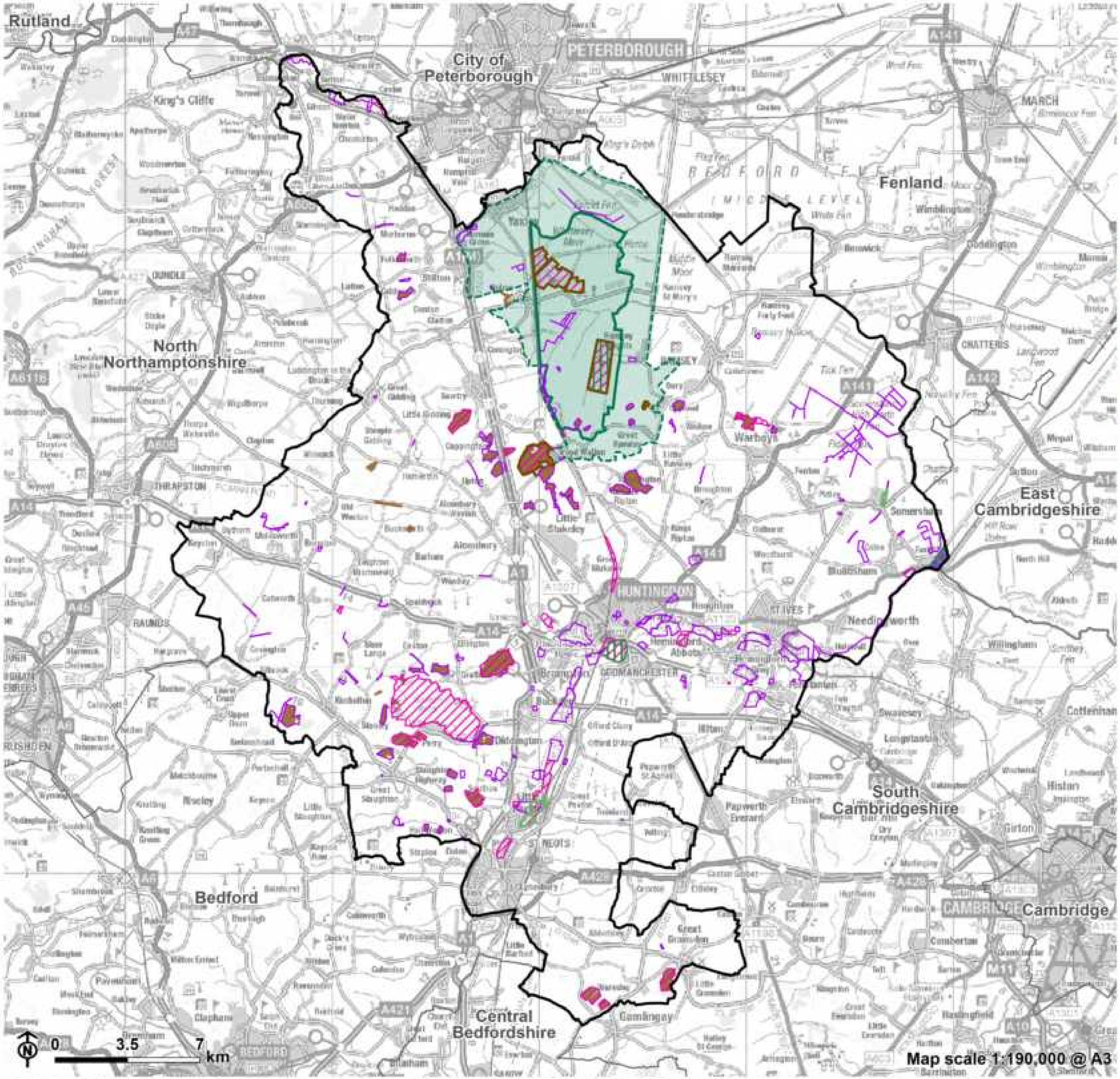
Figure 4.13: Constraints: Biomass – Virgin woodfuel – Energy crops – Natural heritage



- Huntingdonshire District
- Neighbouring Local Authority
- Ramsar site
- Special Protection Area
- Special Area of Conservation
- Site of Special Scientific Interest
- National Nature Reserve
- Local Nature Reserve
- Ancient woodland
- County Wildlife Site
- The Great Fen
- The Great Fen - Landscape and Visual setting

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

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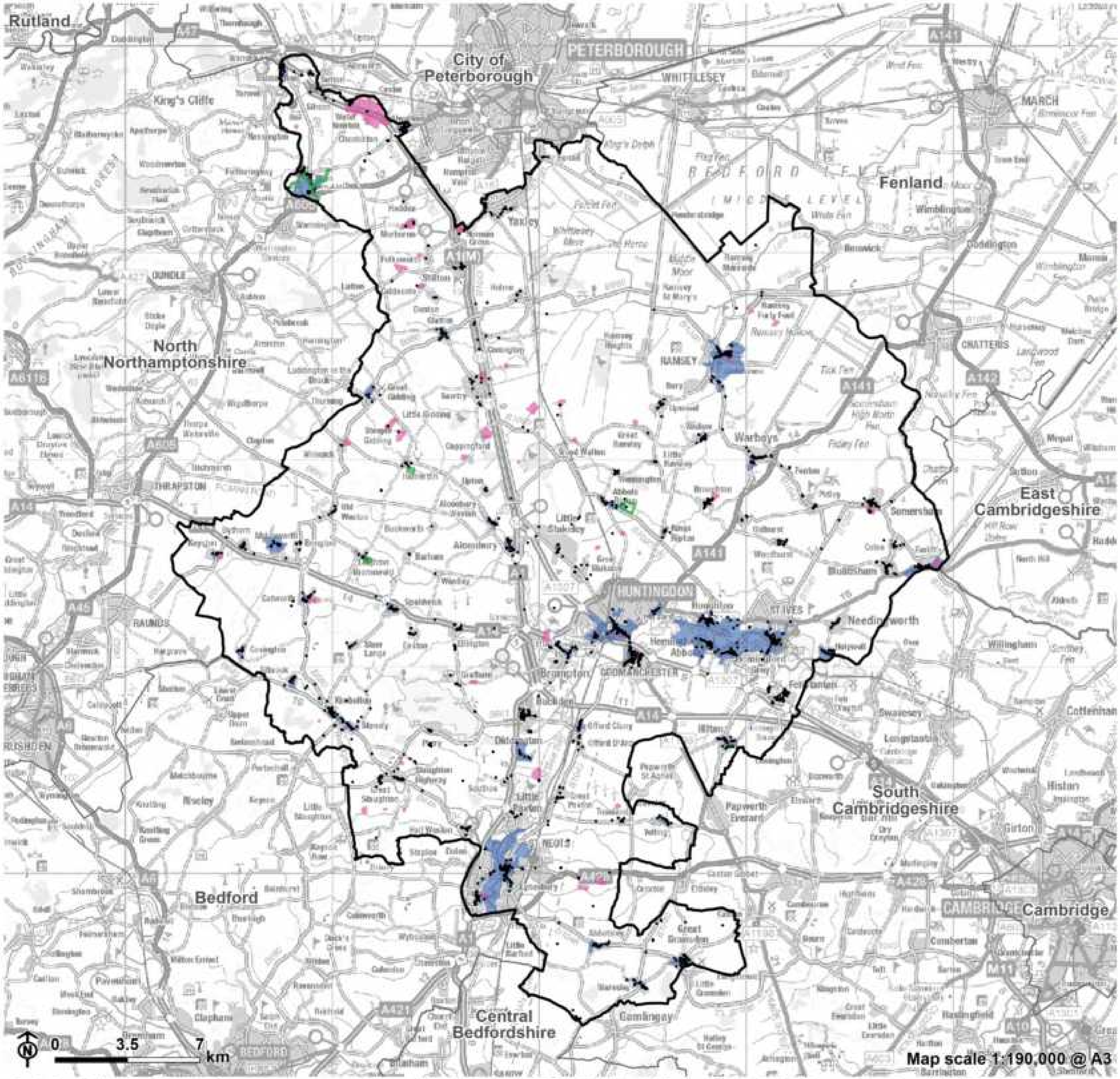
Huntingdonshire District Council

LUC

Figure 4.14: Constraints: Biomass – Virgin woodfuel – Energy crops – Cultural heritage

- Huntingdonshire District
- Neighbouring Local Authority
- Registered Parks and Gardens
- Listed building
- Conservation area
- Scheduled monument



Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Renewable Energy Assessment
Huntingdonshire District Council

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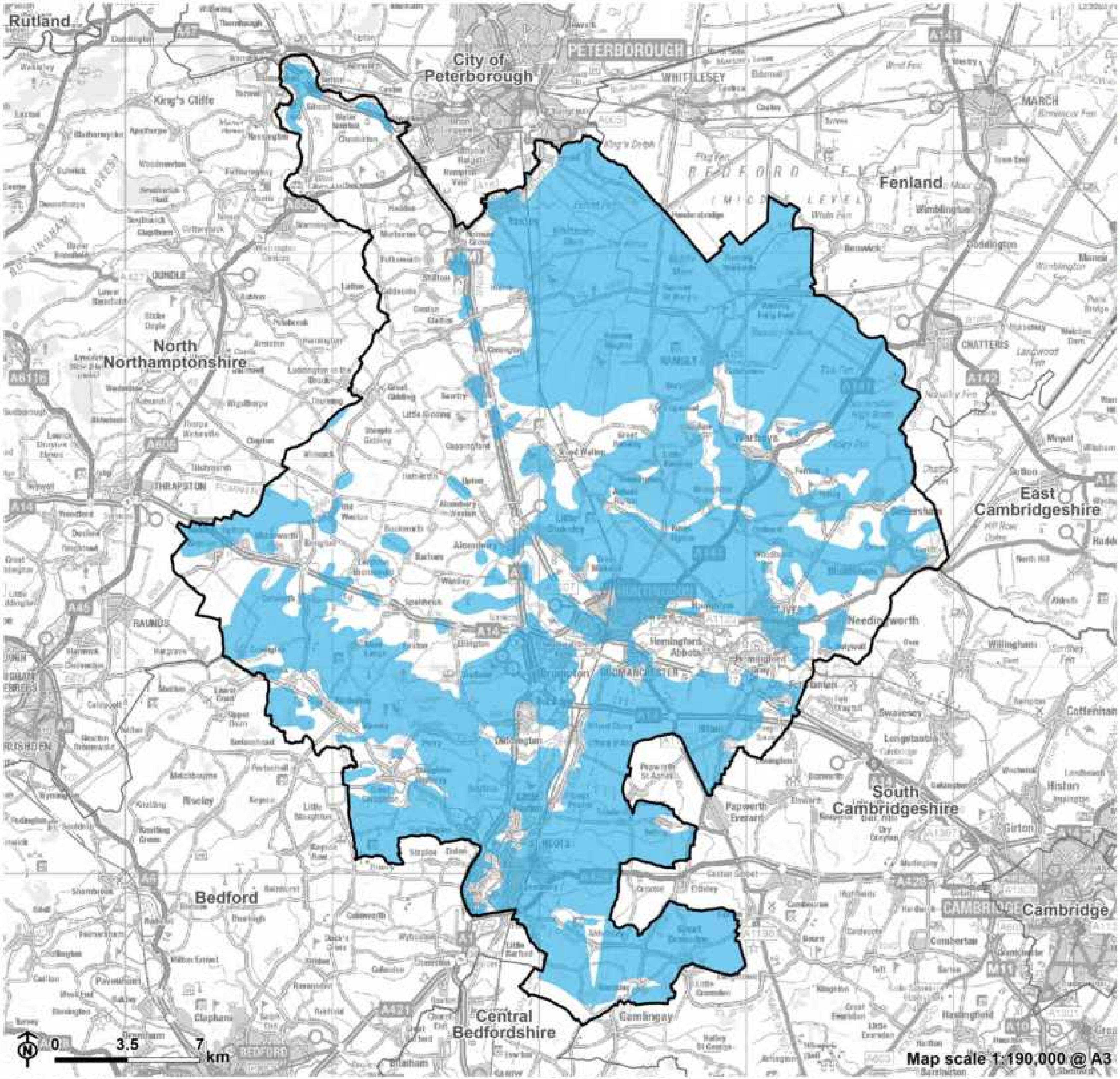
Figure 4.15: Constraints: Biomass – Virgin woodfuel – Energy crops – Agricultural



- Huntingdonshire District
- Neighbouring Local Authority
- Grade 1 & 2 agricultural land, and non-agricultural land

Notes:

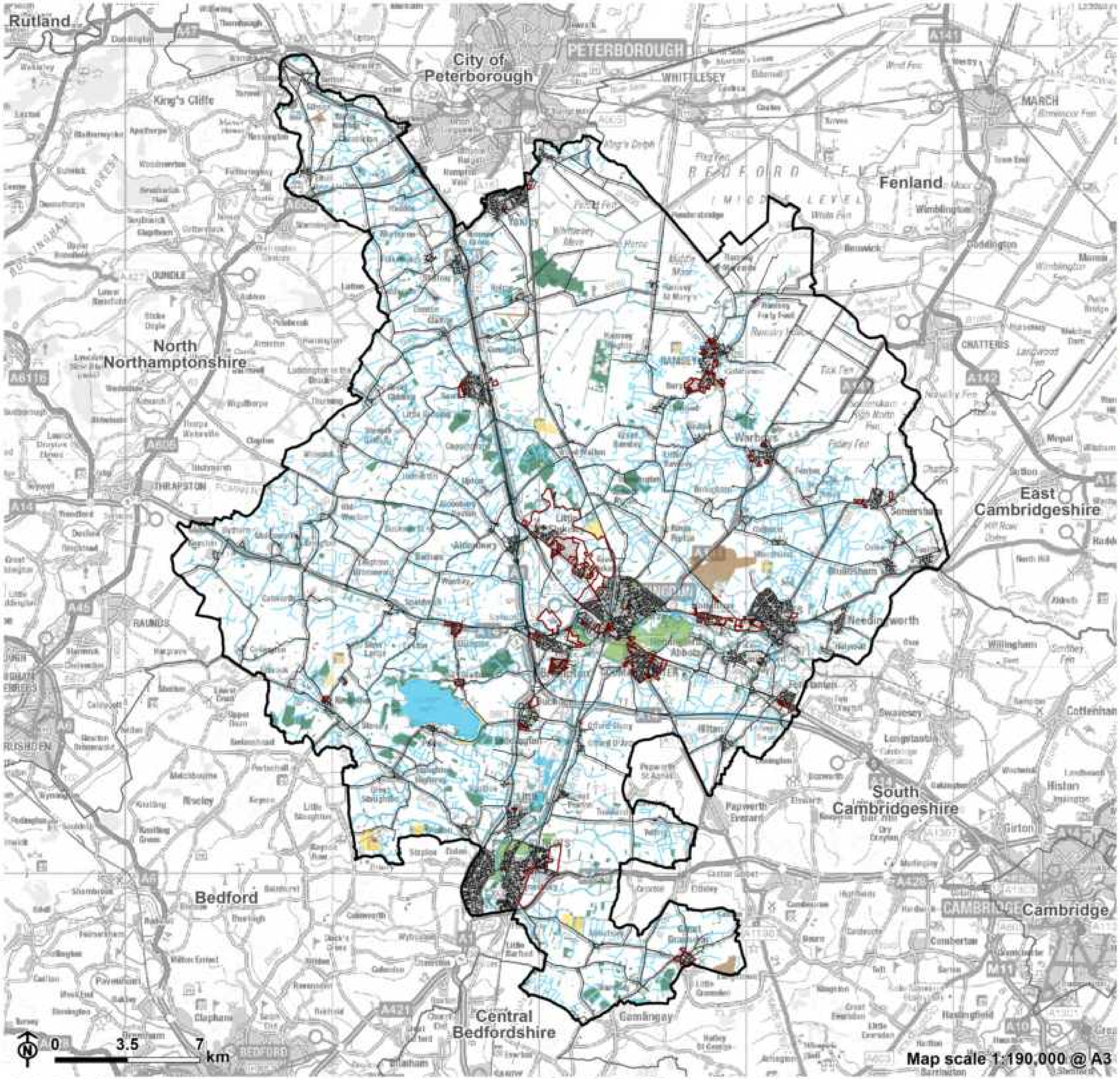
No land was classified as Grade 5.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Renewable Energy Assessment
Huntingdonshire District Council

LUC

Figure 4.16: Constraints: Biomass – Virgin woodfuel – Energy crops – Physical



- Huntingdonshire District
- Neighbouring Local Authority
- Roads and railways
- Building
- Airports and airfields
- Watercourses and water bodies
- Existing solar development
- Designated open space
- Woodland
- Future developments, safeguarded land and employment sites

Notes:

MOD land is not shown in the figure but was included as a constraint in the assessment.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12713_Additional_Figures 09/10/2024 EB:spears_d

4.126 Table 4.8 presents the findings of the technical assessment, assuming that the energy crops would be used for heating only, and Table 4.9 presents the findings assuming that the energy crops were used to produce electricity and heat via CHP. A total area of 22,228 hectares was identified to have technical potential for energy crop growth.

Table 4.8: Woodfuel: Assessment of energy crops - use for heating only

Energy Crop Type	Estimated Capacity (MW)	Delivered Heat (MWh/year)	Potential CO2 Savings (tonnes/year)
Miscanthus	226	862,628	181,690
SRC	41	157,464	33,166
Total	**267**	**1,020,092**	**214,855**

Table 4.9: Woodfuel: Assessment of energy crops - use for CHP

Energy crop type	Estimated Capacity (MW)	Delivered Electricity (MWh/year)	Delivered Heat (MWh/year)	Potential CO2 Savings (tonnes/year)
Miscanthus	226	336,089	560,148	162,680
SRC	41	61,350	102,249	29,696
Total	**267**	**397,439**	**662,398**	**192,376**

Issues affecting deployment

4.127 The quantity of production of virgin woodfuel for biomass from forestry and woodland will depend on the quantity of woodland that can be actively managed and the incentives available for landowners to extract and process the woodfuel. At present, the demand for domestic log-burners dominates the virgin woodfuel market. The demand for woodchip stoves and pellet boilers is less than that for log-burners, however the economic viability of these installations is greater for off-gas properties, due to the higher costs of heating fuels such as oil and electricity, and due to the benefits offered by the Renewable Heat Incentive scheme. However, heat pump deployment is anticipated to significantly increase in the UK as the electricity grid decarbonises and the electrification of heat increases. The viability of biomass installations will need to compete with the costs of heat pumps, as well as additional constraints such as space for fuel storage, solid fuel flue regulations and maintenance requirements.

4.128 The deployment of energy crops, and to a lesser degree the management of woodland for woodfuel, will be influenced by:

- Economic viability;
- End-use/market;
- Land ownership;
- Existing farming activities;
- Potential biodiversity impacts;
- Protected landscapes; and
- The presence of water-stressed areas.

4.129 Notably, the conflict between land use for food production or for energy crops will require consideration with regards to the potential scale of energy crop potential within Huntingdonshire.

4.130 The availability of incentives for landowners and farmers to grow and harvest crops will impact energy crop production. Often, longer-term supply contracts with end users will need to be arranged in advance. In addition, the establishment of supply-chains and logistics of fuel processing may initially limit the widespread uptake of energy crop resource. Other issues that may limit the exploitation of Huntingdonshire’s energy crop resource include the requirement for an Environmental Impact Assessment (EIA) of energy crop projects, the planning and permitting of energy generating plants and the question of alternative markets for Miscanthus and SRC other than energy use.

4.131 There is ambition at national level for biomass to play an important role in decarbonising the UK's energy generation. The Government's Clean Growth Strategy (2017) and the Committee on Climate Change's 'Net Zero – the UK's contribution to stopping global warming' report (2019) both acknowledge the significant opportunities offered by biomass, notably if it is used in conjunction with carbon capture and storage technology to both sequester carbon from the atmosphere via plant growth and capture that subsequently released in bioenergy conversion processes. The Committee on Climate Change has also reviewed the carbon and wider sustainability impacts of biomass production and use and concluded that sustainable, low-carbon bioenergy is possible but only if:

- Rules governing the supply of sustainable sources of biomass for energy are improved; and
- The use of harvested biomass is carefully managed to maximise and minimise the release of carbon into the atmosphere **[See reference** 91**]**.

4.132 Since the 1960s, agricultural subsidies under the EU's Common Agricultural Policy (CAP) have significantly shaped farming practices in the UK, including the extent to which bioenergy initiatives have been deployed. The UK's 25-year Environment Plan and phased exit from CAP-based subsidies now provide a new context for policies and strategies to scale up biomass production, not least by the Government's new Environmental Land Management (ELM) scheme, which will pay farmers to deliver beneficial outcomes.

Energy from Waste

Description of Technology

4.133 Generally referred to as 'Energy from Waste', this technology involves extracting energy using a process undertaken on the non-recyclable residual elements of waste stream. Solid dry materials can be processed into Refuse-Derived Fuel (RDF) and are usually incinerated to produce heat and/or electricity. A proportion of this fuel (usually up to 50% of the residual waste prior to being processed) could be considered as 'renewable' depending on its organic, non-fossil fuel content, for example as set out by Ofgem for the purposes of the Renewables Obligation **[See reference** 92**]**. However, the RDF itself remains a significant source of carbon emissions, particularly from the plastic content of the waste stream, so there is some debate whether it should be classed as a renewable or even a partially renewable fuel. Residual waste arisings should therefore be minimised at source as far as possible in order to reduce their impact on emissions.

4.134 Another form of energy from waste technology uses anaerobic digestion to process food waste. One of the by-products of the process is biogas which is then either combusted to generate electricity or processed into biomethane and injected directly into the gas grid.

Existing Development within Huntingdonshire

4.135 Waste disposal is dealt with at County level and there is only one energy recovery treatment plant, Peterborough ERF, which is located outside of the District, in Peterborough.

Results

Technical Potential

4.136 Huntingdonshire's technical resource for municipal and commercial waste, as a sustainable energy generating technology, is directly related to the amount of residual waste that is generated and collected within the District, and whether all this can be treated using energy recovery processes. This is complicated by the fact that waste disposal is dealt with at County level and, as stated above, there is only one energy recovery treatment plant, Peterborough ERF which is located outside of the District, in Peterborough.

4.137 Cambridgeshire County Council is the mineral and waste planning authority and is responsible for the preparation of a minerals and waste local plan. The Cambridgeshire and Peterborough Minerals and Waste Local Plan was adopted by Cambridgeshire County Council and Peterborough City Council on 28 July 2021. The Local Plan sets the framework for all waste developments until 2036. It sets out policies to guide mineral and waste management development and will enables new modern waste management facilities to manage waste in a much better way than landfill.

4.138 Locally, municipal waste has shown a decrease in total arisings from 2016; however, in recent years there has been a slight increase year-on-year. The recycling rate has mostly remained stable with some minor fluctuations year-on-year. In 2018 management rates were: recycling 56%, otherwise recovered 14%, and disposal to landfill 30%. Waste treatment (recovery) has increased with a corresponding decrease in waste sent to landfill for disposal.

4.139 The Department for Environment, Food and Rural Affairs figures show 65,262 tonnes of waste were collected and disposed by Huntingdonshire District Council in the year to March 2023. Of this, 34,817 tonnes were sent for reuse, recycling or composting – meaning the district had a recycling rate of 53.3% **[See reference** 93**]**.

Issues Affecting Deployment

4.140 As discussed above, 'deployment' of this technology is related to levels of residual waste arisings within the District and County. These levels are likely to decrease in the future as waste minimisation and recycling initiatives increase to comply with tightening regulations. Additionally, biomaterials (e.g., wood products, pulp, paper, fibre, etc) are a key input to several sectors of the economy – and are likely to increase in importance. Given that competition for renewable materials is likely to increase in the coming decades, it will become increasingly essential to prioritise the recycling and reuse of biomaterials – and not for energy recovery.

Waste residues – agricultural residues

Description of technology

4.141 Agricultural waste also represents a potential renewable energy resource, particularly from using livestock slurry as a feedstock for the anaerobic digestion (AD) process. This describes the process by which organic matter is broken down by microbes in the absence of oxygen to produce methane-based biogas for heat and/or power generation, and a liquid or solid digestate residue, which can often safely be used as a fertiliser. This potential resource is considered below.

4.142 Biogas generation from the anaerobic digestion of sewage is also classed as a renewable form of energy, with most large plant generating heat and/or electricity for the site's own needs and exporting excess power to the local grid. Biogas can also be upgraded to biomethane and injected directly into the gas grid. Heat recovery systems can also be used with sewage or wastewater infrastructure to provide heat to local users, although this application is not yet widespread. Consideration of this resource was outside the scope of this study.

Existing development within Huntingdonshire

4.143 Agricultural waste is mostly animal matter and plant waste which is dealt with on site. The data available from DESNZ **[See reference 94]** notes that an application for an anaerobic digestion plant at The Drove, Pondersbridge was approved and is currently awaiting construction.

Results

Technical Potential

4.144 As Huntingdonshire is predominantly rural, agricultural waste is a potential renewable energy resource, particularly from using livestock slurry as a feedstock for the anaerobic digestion process. Using estimates from Defra statistics on animal numbers for 2024 **[See reference 95]** and resulting slurry and biogas yields, an estimate has been made of the potential emissions savings.

4.145 The biogas from agricultural residues was calculated in line with the assumptions outlined in Appendix A. The technical potential findings are presented in Table 4.10, assuming the biomass resource is used for electricity, and in Table 4.11, assuming the biomass resource is used for heat.

Table 4.10: Biomass: Assessment of slurry - use for CHP

Livestock	Estimated Capacity (MW)	Delivered electricity (MWh/year)	Delivered Heat (MWh/year)	Potential CO2 Savings (tonnes/year)
Cattle	3	4,418	7,363	2,138
Pigs	0.07	123	206	60

Livestock	Estimated Capacity (MW)	Delivered electricity (MWh/year)	Delivered Heat (MWh/year)	Potential CO2 Savings (tonnes/year)
Poultry	2	4,082	6,803	1,976
Total	**5**	**8,623**	**14,371**	**4,174**

Issues affecting deployment

4.146 Larger AD (or biomass) plants can cause landscape impacts, with the presence of features such as storage tanks, lighting and ground disturbances having the potential to impact the landscape of the site itself and the landscape character of the surrounding area. The presence of the storage tanks and industrial buildings within AD plants could also impact views from key viewpoints and settlements, and multiple AD plants could have cumulative impacts on landscape character. AD plants can also cause local nuisance issues due to release of bioaerosols and odour.

This section of the study estimated the technical potential in Huntingdonshire for energy from virgin woodfuel (untreated wood residues from forestry/ woodland and from energy crops) and from agricultural slurry. It was not possible within the scope of the study to estimate potential from other waste residues such as food waste or sewage waste. While much smaller than the technical potential from ground-mounted solar PV or from onshore wind, the combined technical potential (for electricity and heating) of virgin woodfuel and agricultural slurry is nevertheless potentially significant in Huntingdonshire, representing approximately 2.4% of the total technical potential energy output of all the renewable and low carbon energy technologies considered in this study (based on the illustrative total technical potential **[See reference** 96**]**). Deployment of virgin woodfuel as an energy source will be influenced by a wide variety of factors affecting the quantity of land that is managed as woodland or for energy crops, incentives available for landowners to extract and process the woodfuel, as well as economic viability.

Summary

4.147 The findings of this study show that there is significant technical potential for additional renewable and low carbon energy development within the District, as shown in Table 4.11 below. If all this electricity and heat generation potential could be realised, it would have a total illustrative capacity of 43,379MW, outputting 45,756,392MWh of energy per year, equating to powering approximately 15.6 million homes with electricity and 304,000 homes with heat a year. This would save 6,169,064tCO_2 emissions annually, equating to planting approximately 238 million trees a year. It is recognised however that the development of all the technical potential is not a realistic scenario. An assessment of the 'deployable' potential is included in Chapter 5.

Table 4.11: Summary of illustrative technical potential by renewable energy technology

Technology	Estimated Total capacity (MW)	Energy output – electricity (MWh/yr)	Energy output – heat (MWh/yr)	Energy output – total (MWh/yr)	Potential CO_2 savings (tonnes/yr)
Wind	4,941	8,674,334	-	8,674,334	1,153,686
Ground-mounted solar (100%)	36,241	32,064,908	-	32,064,908	4,264,633
Rooftop solar PV	1,156	1,106,703	-	1,106,703	147,191
Hydro	0.5	1,579	-	1,579	210
ASHP	1,746	-	2,814,392	2,814,392	404,680

Technology	Estimated Total capacity (MW)	Energy output – electricity (MWh/yr)	Energy output – heat (MWh/yr)	Energy output – total (MWh/yr)	Potential CO_2 savings (tonnes/yr)
Biomass – livestock slurry (CHP)	5	8,623	14,371	22,994	4,174
Biomass – woodfuel (CHP)	3	4,367	7,279	11,646	2,114
Biomass – energy crops – miscanthus only (CHP)	226	336,089	560,148	896,237	162,680
Biomass – energy crops – SRC only (CHP)	41	61,350	102,249	163,599	29,696
Total illustrative technical potential	**43,379**	**42,257,952**	**3,498,439**	**45,756,392**	**6,169,064**

Chapter 5

Potential Deployable Scenarios

5.1 The resource assessment outlined above was undertaken to quantify the renewable and low carbon energy resources across Huntingdonshire, by examining the opportunities and constraints for each energy source or technology. This approach calculated the theoretical potential resource from each technology, considering technical constraints to development. The assessment of technical potential has been used to frame the debate on how much of the resource could actually be deployed when considering additional constraints relating to issues around planning, economic viability, supply chains, cumulative impacts and infrastructure (energy storage and transmission).

It is important to note however that it is not possible to be prescriptive about technology-specific targets as there are numerous scenarios and variables to consider regarding the technology mix that could be deployed. The deployability of wind turbines and ground-mounted solar PV in particular is often subject to complex site-specific constraints that need to be considered on a site-by-site basis. The influence of Government policy is also a key factor that can significantly affect the viability of different forms of renewable energy technology.

Scenarios Considered

5.2 Two deployment scenarios for Huntingdonshire were considered including:

- Business as usual (BAU) – the anticipated deployment of renewable and low carbon technologies under the business as usual scenario reflects the recent and existing deployment of these technologies within Huntingdonshire and the wider UK.

- Ambitious – This assumes the rate of renewable energy development that will be required for Huntingdonshire to meet its share of renewable energy generation in line with the Climate Change Committee's (CCC) 6th Carbon Budget. This assumes that 80% of Huntingdonshire's energy demand will be met by renewable energy by 2050.

5.3 For both the 'BAU' and 'Ambitious' scenarios, potential renewable energy generation targets are given for 2046 and 2050. The figures provided are the total levels of generation that are expected to be operational within 2046 and 2050 (i.e. this includes existing generation that is still operational or is repowered to the same capacity at that time).

5.4 Full details of the scenarios considered for each technology are outlined below and further details setting out the technical assumptions are provided in Appendix A.

Results

Electricity Demand

5.5 A summary of the existing and predicted energy demand for Huntingdonshire for 2021 **[See reference 97]**, 2046 and 2050 is set out in Table 5.1. The existing energy demand has been obtained from figures published by DESNZ. Projected demand has been calculated in relation to the UK CCC 6th Carbon Budget Balanced Net Zero Pathway for Electricity Generation Scenario. (see Appendix A).

5.6 The UK's electricity system will clearly need to undergo significant transformation on the path to net-zero due to the requirements to decentralise supplies using renewable energy, decarbonise heat supplies through electrification (e.g. heat pumps) and develop electric vehicles. This will lead to a significant increase in electricity demand across all sectors in Huntingdonshire by 2050.

Table 5.1: Total energy demand (GWh/year)

Demand	2021	year	2050
GWh/year	795.03	1,548.89	1,591.86
Equivalent number of homes powered with electricity (homes/yr) **[See reference** 98**]**	294,455	573,662	589,579

Renewable Energy Technology Deployment

5.7 Table 5.2 to Table 5.24 set out the potential deployment rates for each form of renewable energy technology under the BAU and ambitious deployment scenarios. Information is also provided on the existing levels of deployment for each technology. For each technology projections are provided setting out:

- How much electricity would be generated in GWh;
- The total installed capacity in MW;
- The equivalent number or scale of technology required – how many wind turbines, area of solar panels etc **[See reference** 99**]**; and
- Potential carbon savings in tonnes per year. The estimation of potential carbon savings is purely indicative as it will depend on the rate that the UK electricity grid is decarbonised as a whole and how long it takes to implement each scenario.

5.8 The broad assumptions used to frame the scenarios are also provided with more detail set out in Appendix A.

Wind Energy

5.9 The deployment scenarios for wind are based on the following assumptions:

- Business as usual:
  - An average of 2.4MW of wind development has become operational per year in the past 10 years within Huntingdonshire. It should be noted that these developments were granted prior to the restrictive planning policy introduced in the 2015 National Planning Policy Framework **[See reference** 100**]**. Since the recent change in government and removal of these restrictions in the National Planning Policy Framework **[See reference** 101**]**, as mentioned above, it is therefore assumed that this deployment pattern could potentially be achievable.
  - Necessary upgrades to the grid are undertaken.

  NB: Percentage of identified technical potential delivered by 2050: 2.9%.
- Ambitious:
  - The CCC 6th Carbon Budget requires renewables to deliver 80% of electricity demand. It was assumed that wind and ground mounted solar will be deployed to fulfil the deficit in meeting this demand via the deployment of only the other assessed renewable technologies. It was assumed that an additional 217 GWh/year capacity (2.5% of the total identified technical potential) of wind development and 216 GWh/year (0.67% of the total identified technical potential) of ground mounted solar development would be delivered in order to deliver the 47% of the total electricity demand in 2050 required.
  - Necessary upgrades to the grid are undertaken.

  NB: Percentage of identified technical potential delivered by 2050: 4.3%.

5.10 Table 5.2 sets out the generation capacity of wind at present and under the BAU and Ambitious scenarios in 2046 and 2050.

Table 5.2: Wind Capacity: Electricity generation per year (GWh)

Electricity Generation per Year (GWh)	Existing	2046	2050
Business as usual	127	234	251
Ambitious	127	363	376

Table 5.3: Wind Capacity: Installed Capacity (MW)

Capacity (MW)	Existing	2046	2050
Business as usual	73	133	143
Ambitious	73	207	214

Table 5.4: Wind Capacity: Equivalent scale of technology

Equivalent Scale of Technology	Existing	2046	2050
Business as usual	29 x 2.5 MW turbines (approx. 363 ha)	53 x 2.5 MW turbines (approx. 655 ha)	57 x 2.5 MW turbines (approx. 714 ha)
Ambitious	29 x 2.5 MW turbines (approx. 363 ha)	83 x 2.5 MW turbines (approx. 1,034 ha)	86 x 2.5 MW turbines (approx. 1,072 ha)

Table 5.5: Wind Capacity: Equivalent homes powered (homes/yr) [See reference 102]

Equivalent homes powered (homes/yr)	Existing	2046	2050
Business as usual	47,174	86,514	92,808
Ambitious	47,174	134,461	139,436

Table 5.6: Wind Capacity: Potential CO2 Savings (tonnes/yr)

Potential CO2 Savings (tonnes/yr)	Existing	2046	2050
Business as usual	16,940	31,067	33,327
Ambitious	16,940	48,285	50,072

Table 5.7: Wind Capacity: Equivalent trees planted (trees/yr) [See reference 103]

Equivalent trees planted (trees/yr)	Existing	2046	2050
Business as usual	652,201	1,196,085	1,283,106
Ambitious	652,201	1,858,964	1,927,756

Ground Mounted Solar

5.11 The deployment scenarios for ground mounted solar are based on the following assumptions:

- Business as usual
  - Continued average of 6.6MW of solar development coming forward every year, as based on REPD (2024) data trends for the past 10 years within Huntingdonshire.
  - Necessary upgrades to the grid are undertaken.

  NB: Percentage of identified technical potential delivered by 2050: 0.9%.
- Ambitious
  - The CCC 6th Carbon Budget requires renewables to deliver 80% of electricity demand. It was assumed that wind and ground mounted solar will be deployed to fulfil the deficit in meeting this demand via the deployment of only the other assessed renewable technologies. It was assumed that an additional 217 GWh/year capacity (2.5% of the total identified technical potential) of wind development and 216 GWh/year (0.67% of the total identified technical potential) of ground mounted solar development would be delivered in order to deliver the 47% of the total electricity demand in 2050 required.
  - Necessary upgrades to the grid are undertaken.
  - Solar energy storage becomes more viable.

  NB: Percentage of identified technical potential delivered by 2050: 1.2%

5.12 Table 5.8 sets out the generation capacity of ground mounted solar at present and under the BAU and Ambitious scenarios in 2046 and 2050.

Table 5.8: Ground Mounted Solar Capacity: Electricity generation per year (GWh)

Electricity generation per year (GWh)	Existing	2046	2050
Business as usual	127	273	296
Ambitious	127	362	375

Table 5.9: Ground Mounted Solar Capacity: Installed capacity (MW)

Capacity (MW)	Existing	2046	2050
Business as usual	143	308	335
Ambitious	143	409	424

Table 5.10: Ground Mounted Solar Capacity: Equivalent scale of technology

Equivalent Scale of Technology	Existing	2046	2050
Business as usual	14 x 10MW solar farms (approx. 172 ha)	31 x 10 MW solar farms (approx. 370 ha)	33 x 10 MW solar farms (approx. 401 ha)
Ambitious	14 x 10 MW solar farms (approx. 172 ha)	41 x 10 MW solar farms (approx. 490 ha)	42 x 10 MW solar farms (approx. 509 ha)

Table 5.11: Ground Mounted Solar Capacity: Equivalent homes powered (homes/yr) [See reference 104]

Equivalent homes powered (homes/yr)	Existing	2046	2050
Business as usual	46,987	100,974	109,612
Ambitious	46,987	133,928	138,884

Table 5.12: Ground Mounted Solar Capacity: Potential CO2 savings (tonnes/yr)

Potential CO2 Savings (tonnes/yr)	Existing	2046	2050
Business as usual	16,873	36,260	39,362
Ambitious	16,873	48,093	49,873

Table 5.13: Ground Mounted Solar Capacity: Equivalent trees planted (trees/yr) [See reference 105]

Equivalent trees planted (trees/yr)	Existing	2046	2050
Business as usual	649,616	1,396,002	1,515,423
Ambitious	649,616	1,851,595	1,920,114

Roof Mounted Solar

5.13 The deployment scenarios for roof mounted solar are based on the following assumptions:

- Business as usual:
  - The most recent Feed in Tariff (FiT) statistics (2019), in combination with the data on domestic and non-domestic properties within Huntingdonshire (see Appendix A), indicates that: 4.34% of domestic properties have solar PV; and 141 non-domestic properties have solar PV. It was assumed therefore that, due to some form of subsidy similar to FiT continuing: An additional 4.34% of dwellings will install the average domestic system size of solar PV every 10 years, as based on household projections (see Appendix A); and another 141 non-domestic properties will install the average non-domestic system size of solar PV every 10 years.

  NB: Percentage of identified technical potential delivered by 2050: 8.5%.
- Ambitious
  - It was assumed that subsidies return to an extent and/or government policy, such as via the Future Homes Standard, that by 2050 75% of the total housing stock, which includes new builds as well as retrofit, will have solar PV and that 15% of existing non-domestic buildings will have solar PV (the projected number of non-domestic buildings in 2050 is not known).
- It is noted that rooftop solar water heating is significantly less popular than Solar PV. The most recent Renewable Heat Incentive (RHI) data (2024), in combination with the data on domestic and non-domestic properties within Huntingdonshire (see Appendix A), indicates that 0.01% of domestic properties have rooftop solar water heating and estimated 1 non-domestic property has rooftop solar water heating **[See reference 106]**. It is therefore assumed that the majority of domestic rooftop solar PV installations will take priority over solar water heating, and as such solar water heating is not considered within the deployment scenarios.

NB: Percentage of identified technical potential delivered by 2050: 38.1%.

5.14 Table 5.14 sets out the generation capacity of rooftop solar at present and under the BAU and Ambitious scenarios in 2046 and 2050.

Table 5.14: Rooftop Solar Capacity: Electricity generation per year (GWh)

Electricity Generation per Year (GWh)	Existing	2046	2050
Business as usual	22	84	94
Ambitious	22	401	422

Table 5.15: Rooftop Solar Capacity: Capacity (MW)

Capacity (MW)	Existing	2046	2050
Business as usual	25	95	106
Ambitious	25	453	477

Table 5.16: Rooftop Solar Capacity: Equivalent scale of technology

Equivalent Scale of Technology	Existing	2046	2050
Business as usual	4,879 x detached dwelling solar installations	18,223 x detached	20,334 x detached

Equivalent Scale of Technology	Existing	2046	2050
		dwelling solar installations	dwelling solar installations
Ambitious	4,879 x detached dwelling solar installations	87,057 x detached dwelling solar installations	91,742 x detached dwelling solar installations

Table 5.17: Rooftop Solar Capacity: Equivalent homes powered (homes/yr) [See reference 107]

Equivalent homes powered (homes/yr)	Existing	2046	2050
Business as usual	8,313	31,052	34,649
Ambitious	8,313	148,344	156,326

Table 5.18: Rooftop Solar Capacity: Potential CO2 Savings (tonnes/yr)

Potential CO2 Savings (tonnes/yr)	Existing	2046	2050
Business as usual	2,985	11,151	12,442
Ambitious	2,985	53,270	56,137

Table 5.19: Rooftop Solar Capacity: Equivalent trees planted (trees/yr) [See reference 108]

Equivalent trees planted (trees/yr)	Existing	2046	2050
Business as usual	114,929	429,303	479,031
Ambitious	114,929	2,050,903	2,161,264

Hydropower

5.15 The deployment scenarios for hydropower are based on the following assumptions:

- Business as usual
  - The most recent Feed in Tariff (FiT) statistics (2019), indicates that there is 0.04MW of hydropower installations currently present within Huntingdonshire. It was assumed that no additional installations will take place going forwards.

  NB: Percentage of identified technical potential delivered by 2050: 8.9%.
- Ambitious:
  - 100% of the identified technical potential for hydropower is delivered at any time up to 2050.

  NB: Percentage of identified technical potential delivered by 2050: 100%.

5.16 Table 5.20 sets out the generation capacity of hydropower at present and under the BAU and Ambitious scenarios in 2046 and in 2050.

Table 5.20: Hydropower Capacity: Electricity generation per year (GWh)

Electricity Generation per Year (GWh)	Existing	2046	2050
Business as usual	0.1	0.1	0.1
Ambitious	0.1	0.8	1.6

Table 5.21: Hydropower Capacity: Capacity (MW)

Capacity (MW)	Existing	2046	2050
Business as usual	0.04	0.04	0.04
Ambitious	0.04	0.2	0.5

Table 5.22: Hydropower Capacity: Equivalent scale of technology

Equivalent scale of technology	Existing	2046	2050
Business as usual	1 x 50kW installations	1 x 50kW installations	1 x 50kW installations
Ambitious	1 x 50kW installations	5 x 50kW installations	9 x 50kW installations

Table 5.23: Hydropower Capacity: Equivalent homes powered (homes/yr) [See reference 109]

Equivalent homes powered (homes/yr)	Existing	2046	2050
Business as usual	52	52	52
Ambitious	52	292	585

Table 5.24: Hydropower Capacity: Potential CO2 savings (tonnes/yr)

Potential CO2 savings (tonnes/yr)	Existing	2046	2050
Business as usual	19	19	19
Ambitious	19	105	210

Table 5.25: Hydropower Capacity: Equivalent trees planted (trees/yr) [See reference 110]

Equivalent trees planted (trees/yr)	Existing	2046	2050
Business as usual	720	720	720
Ambitious	720	4,042	8,084

Biomass

5.17 The deployment scenarios for biomass (including anaerobic digestion) are based on the following assumptions:

- Business as usual
  - Continued average of 0.3MW of large scale biomass installed every 10 years, as based on existing deployment trends (see Appendix A).

  NB: Percentage of identified technical potential delivered by 2050: 4.4%.
- Ambitious:
  - It was assumed that Huntingdonshire takes on its share of the projected UK electricity generation from biomass, based on the National Grid Future Emissions Scenarios **[See reference** 111**]** Holistic Transition Pathway (see Appendix A).
- It is noted that there are different sources of biomass that have different technical potentials within Huntingdonshire. The calculations presented in these scenarios assume an even mixture of the assessed biomass sources being delivered (wood fuel, energy crops and livestock slurry) via CHP. See Appendix A for further details.

  NB: Percentage of identified technical potential delivered by 2050: 9.0%.

5.18 Table 5.26 sets out the generation capacity of biomass at present and under the BAU and Ambitious scenarios in 2046 and in 2050.

Table 5.26: Biomass: Electricity generation per year (GWh)

Electricity Generation per Year (GWh)	Existing	2046	2050
Business as usual	46	48	49

Electricity Generation per Year (GWh)	Existing	2046	2050
Ambitious	46	95	98

Table 5.27: Biomass: Capacity (MW)

Capacity (MW)	Existing	2046	2050
Business as usual	30	31	31
Ambitious	30	61	63

Table 5.28: Biomass: Equivalent scale of technology

Equivalent Scale of Technology	Existing	2046	2050
Business as usual	30 x 1 MW installations	31 x 1 MW installations	31 x 1 MW installations
Ambitious	30 x 1 MW installations	61 x 1 MW installations	63 x 1 MW installations

Table 5.29: Biomass Capacity: Equivalent homes powered (homes/yr) [See reference 112]

Equivalent homes powered (homes/yr)	Existing	2046	2050
Business as usual	17,070	17,865	17,992
Ambitious	17,070	35,339	36,380

Table 5.30: Biomass: Potential CO2 savings (tonnes/yr)

Potential CO2 Savings (tonnes/yr)	Existing	2046	2050
Business as usual	6,130	6,415	6,461
Ambitious	6,130	12,690	13,064

Table 5.31: Biomass Capacity: Equivalent trees planted (trees/yr) [See reference 113]

Equivalent trees planted (trees/yr)	Existing	2046	2050
Business as usual	235,998	246,993	248,752
Ambitious	235,998	488,570	502,968

Summary

5.19 At present an estimated 41% of electricity demand within Huntingdonshire is met by renewable/low carbon generation, solar photovoltaics and onshore wind are the main sources of renewable energy generation. For the business as usual scenario, this is estimated to increase to only 43% by 2050. In comparison, the ambitious scenario estimates that renewable/low carbon generation could provide 80% of Huntingdonshire's electricity demand by 2050, as required in the 6th Carbon Budget Balanced Net Zero Pathway scenario. This would require 4.3% of the identified land as having technical potential for wind and 1.2% and of the identified land as having technical potential for ground mounted solar to be developed. A summary of the total projected electricity that could be generated from renewable energy resources currently and in 2046 and

2050 under each scenario is provided in Table 5.32, Table 5.33 and Table 5.34 and Figure 5.1 and Figure 5.2. This is also compared with existing and projected energy demand.

Table 5.32: Total electricity demand (GWh)

Existing	2046	2050
795	1,549	1,592

Table 5.33: Total electricity deployable if business as usual

Business as Usual	Existing	2046	2050
Deployable electricity generation (GWh)	323	638	689
Deployable capacity (MW)	271	567	614
Equivalent homes powered (homes/yr) [See reference 114]	119,597	236,457	255,113
Equivalent trees planted (trees/yr) [See reference 115]	1,653,464	3,269,102	3,527,031
Deployable generation percentage of demand	41%	41%	43%

Table 5.34: Total electricity deployable if ambitious

Ambitious	Existing	2046	2050
Deployable electricity generation (GWh)	323	1,221	1,273
Deployable capacity (MW)	271	1,130	1,179
Equivalent homes powered (homes/yr) **[See reference** 116**]**	119,597	452,363	471,611
Equivalent trees planted (trees/yr) **[See reference** 117**]**	1,653,464	6,254,074	6,520,186
Deployable percentage of demand	41%	79%	80%

Figure 5.1: Business as Usual Scenario - Electricity

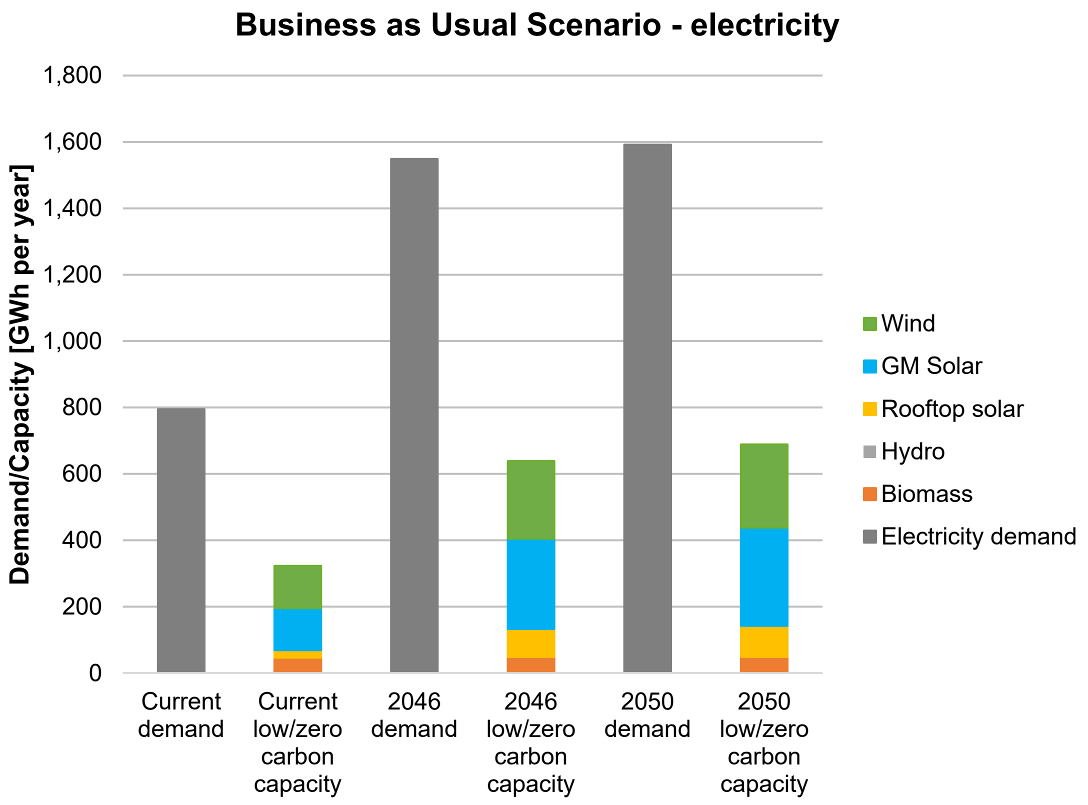
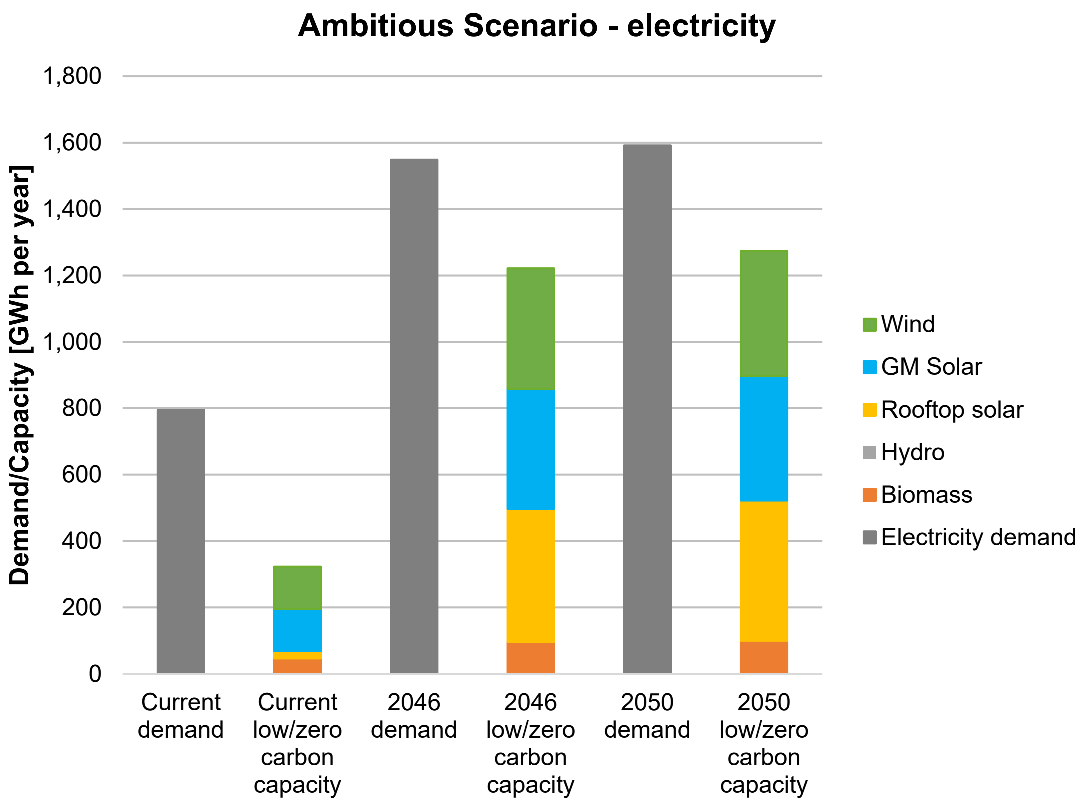


Figure 5.2: Ambitious Scenario - Electricity



Heat Demand

5.20 Tables 5.25 to 5.28 present the potential renewable and low carbon heat scenarios for heat pumps.

5.21 It was assumed that the projected electricity demand, as derived from the UK demand outlined in the Climate Change Committee 6th Carbon Budget (see Appendix A), encompasses the electricity required to generate heat.

5.22 Instead, the below scenarios are illustrative of the potential increases in renewable and low carbon heating likely to be required within Huntingdonshire, as based on previous deployment trends and government policy.

5.23 The following two assumptions have also been made:

- Biomass is anticipated to play an increased role in future small scale heating, particularly with the phase out of new gas boilers. However, there is little information available currently regarding the amount of future biomass installations. Moreover, Government Boiler Upgrade Scheme statistics indicate that from May 2022 to December 2023, only 10 applications were received within the East of England region to upgrade boilers to biomass **[See reference 118]**. As such, small scale biomass heating is not considered within the deployment scenarios.
- Rooftop solar water hating is significantly less popular than solar PV. As such, it was assumed therefore that the majority of domestic rooftop solar PV installations will take priority over solar water heating, and as such solar water heating is not considered within the deployment scenarios.

Air Source Heat Pumps

5.24 The deployment scenarios for air source heat pumps are based on the following assumptions:

- Business as usual:
  - An additional 0.07% of dwellings will install the UK average domestic system size of air source heat pumps every 10 years, as based on household projections (see Appendix A).
  - Another 2 non-domestic properties will install the UK average non-domestic system size of air source heat pumps every 13 years (as projections of the growth of non-domestic properties are not available to calculate any increase in this deployment over time).

- It was assumed that from 2025 all new homes will install the UK average domestic system size of air source heat pumps, as part of the phase out of new gas boilers.
- It was assumed that Huntingdonshire takes on their share (0.30% based on the Huntingdonshire proportion of UK electricity demand) of the previously capped 90,000 heat pumps to receive grants from the government over the next 3 years. It was assumed these grants may continue for the rest of the 2020s, so an overall 300,000 additional domestic pumps across the UK will be deployed via these grants, with Huntingdonshire delivering their share (see Appendix A).

NB: Percentage of identified technical potential delivered by 2050: 14.2%.

- Ambitious:
  - Huntingdonshire takes on its share of the 600,000 annual heat pump installations up to 2030, and then it's share of the 1.7 million heat pump installations per year following this, as outlined in the Government's Heat and Building Strategy, until all homes (existing and new) within Huntingdonshire have installed a heat pump by 2050 (see Appendix A).

NB: Percentage of identified technical potential delivered by 2050: 60.9%.

Table 5.35: Air Source Heat Pumps: Heat generation per year (GWh)

Heat Generation per Year (GWh)	Existing	2046	2050
Business as usual	1	185	398
Ambitious	1	1,641	1,713

Table 5.36: Air Source Heat Pumps: Capacity (MW)

Capacity (MW)	Existing	2046	2050
Business as usual	1	115	247
Ambitious	1	1,018	1,063

Table 5.37: Air Source Heat Pumps: Equivalent scale of technology

Equivalent Scale of Technology	Existing	2046	2050
Business as usual	61 x domestic air source heat pump installations	11,242 x domestic air source heat pump installations	24,230 x domestic air source heat pump installations
Ambitious	61 x domestic air source heat pump installations	99,828 x domestic air source heat pump installations	104,201 x domestic air source heat pump installations

Table 5.38: Air Source Heat Pumps: Equivalent homes powered (homes/yr) [See reference 119]

Equivalent homes powered (homes/yr)	Existing	2046	2050
Business as usual	87	16,071	34,640
Ambitious	87	142,718	148,968

Table 5.39: Air Source Heat Pumps: Potential CO2 savings (tonnes/yr)

Potential CO2 Savings (tonnes/yr)	Existing	2046	2050
Business as usual	174	32,099	69,188
Ambitious	174	285,051	297,536

Table 5.40: Air Source Heat Pumps: Equivalent trees planted (trees/yr) [See reference 120]

Equivalent trees planted (trees/yr)	Existing	2046	2050
Business as usual	6,681	1,235,829	2,663,725
Ambitious	6,681	10,974,460	11,455,118

5.25 A summary of the total projected heat that could be generated from renewable energy resources currently and in 2046 and 2050 under each scenario is provided in Tables 5.41 and 5.42.

Table 5.41: Total demand and deployable potential: Deployable heat generation (GWh)

Deployable Heat Generation (GWh)	Existing	2046	2050
Business as usual	1	185	398

Deployable Heat Generation (GWh)	Existing	2046	2050
Ambitious	1	1,641	1,713
Equivalent homes powered (homes/yr) [See reference 121]	87	16,071	34,640
Equivalent trees planted (trees/yr) [See reference 122]	6,681	1,235,829	2,663,725

Table 5.42: Total demand and deployable potential: Deployable capacity (MW)

Deployable Capacity (MW)	Existing	2046	2050
Business as usual	1	115	247
Ambitious	1	1,018	1,063
Equivalent homes powered (homes/yr) [See reference 123]	87	142,718	148,968
Equivalent trees planted (trees/yr) [See reference 124]	6,681	10,974,460	11,455,118

Conclusions

5.26 The above tables and figures illustrate that Huntingdonshire has the potential to deliver 80% of the District's electricity demand from renewables by

2050, as required by the 6th Carbon Budget Balanced Net Zero Pathway scenario **[See reference** 125**]** subject to various existing deployment constraints being overcome.

5.27 In order to deliver 80% of electricity from renewables by 2050, the ambitious scenario indicates the following total renewable and low carbon energy generation capacity would need to be deployed:

- Wind: 86 x 2.5 MW turbines (approx. 1,072 ha).
- Ground mounted solar: 42 x 10 MW solar farms (approx. 509 ha).
- Roof-mounted solar: Equivalent to 91,742 detached dwelling solar installations.
- Hydropower: 9 x 50kW installations.
- Biomass: 63 x 1MW installations.

5.28 In addition, the ambitious scenario also illustrates the potential levels of renewable and low-carbon heat developments by 2050:

- Air source heat pumps: The equivalent of 104,201 domestic installations.

5.29 This could provide large carbon savings by replacing the existing carbon emissions from mains electricity and gas, oil or electrical heating fuels. However, the carbon emissions from mains electricity reflects the existing UK electricity generation mix. This is anticipated to decarbonise, as the contribution of renewable and low-carbon technologies to national electricity generation increases. Therefore, the calculated carbon emissions savings from the deployment of renewable technologies within Huntingdonshire in comparison to grid electricity will decrease over time.

5.30 This will not however be the case where renewable and low-carbon electricity is used to replace gas and oil fuelled heating, for example as gas boilers are phased out and replaced with heat pumps. In such scenarios, the emissions from converting to renewable and low carbon heat generation will continue to decrease over time. However, issues around the sustainability of biomass and potential impacts on air quality may need to be addressed when considering the use of this low-carbon technology.

5.31 There is also potential to provide more solar energy as the assessments undertaken only account for 1.2% of land. If further land was considered, Huntingdonshire could reach its net-zero carbon target as well as become a renewable energy exporter and export electricity directly to the grid.

5.32 These scenarios are purely illustrative and heavily dependent on policy and technology costs. Site-specific appraisal work would be required to estimate the deployability of technologies in particular locations more accurately. In addition, the potential for Huntingdonshire to achieve net-zero carbon emissions and supply 80% of electricity demand from renewables will be dependent on both energy demand reductions, as well as the decarbonisation of the transport sector.

Chapter 6

Policy Options

6.1 In order to have a realistic chance of meeting net zero targets, local planning authorities need to adopt a presumption in favour of renewable energy projects, provided they are not subject to technical, environmental or safety concerns. Increasing the amount of energy produced from renewable and low carbon technologies will help to make sure the UK has a secure energy supply, reduce greenhouse gas emissions to slow down climate change and stimulate investment in new jobs and businesses. Planning has an important role in the delivery of new renewable and low carbon energy infrastructure in locations where the local environmental impact is acceptable **[See reference** 126**]**.

6.2 An effective local development plan is key to the delivery of appropriate renewable energy development within Huntingdonshire. This section provides an overview of some of the key policy issues the Council may wish to consider as part of the preparation of the Local Plan update and other local planning guidance or documents. The strengths and weaknesses of each policy approach is provided below each option.

6.3 The main policy options proposed for consideration at this stage include:

- Criteria based policies in relation to renewable and low carbon energy projects that ensure that the adverse impact of renewable and low carbon energy development are addressed satisfactorily, including cumulative impacts;
- Development of ‘energy opportunity maps’ to identify suitable areas for renewable and low carbon energy sources, and supporting infrastructure;
- Allocation of sites for standalone renewable and low carbon energy developments;
- Encouraging community renewables by supporting community-led initiatives for renewable and low carbon energy, including developments being taken forward through neighbourhood planning; and

- Decommissioning.

6.4 A review has been undertaken of the existing local plan policies, Policies LP 12 and LP 35 within the Local Plan (2019). This provides a useful starting point for the analysis of options to strengthen future policies. A summary of the existing relevant policy and the strengths and weaknesses for both are set out below:

- Policy LP 12 sets out the Council's approach to achieving standards of design. It states that proposals should make efficient use of energy and other resources and non-residential uses should meet BREEAM standards 'Good' as a minimum.
- Policy LP 35 supports proposals for renewable or low carbon energy where it is demonstrated that all potential adverse impacts including cumulative impacts are or can be made acceptable. It also sets out that a proposal for wind energy development will only be supported where it lies within the area identified as suitable for wind energy development, being the whole of the district except for the Great Fen and its Landscape and Visual Setting, or within an area defined in an adopted neighbourhood plan and following consultation. Additionally, when identifying and considering landscape and visual impacts regard should be had to the Wind Energy in Development in Huntingdonshire SPD (2014).

Strengths:

- Further guidance is provided within the Wind Turbine Development guidance note and Wind Energy in Development in Huntingdonshire SPD (2014).
- Policy LP 35 identifies areas of potential suitability for wind energy which was previously necessary to comply with the NPPF.
- BREEAM is a useful tool/standard for driving energy performance.

Weaknesses:

- Could consider the use of net zero targets and further detail to give developers a better steer.

- No mention of how unregulated emissions or embodied carbon should be addressed.
- There is no mention of community-led projects or shared benefits, potentially limiting the growth of community energy initiatives or any other form of renewable energy development unless it is linked with a property.

Criteria Based Policies

6.5 The NPPF states that local authorities should design their policies to maximise renewable and low carbon energy development while ensuring that adverse impacts are addressed satisfactorily. The PPG provides helpful guidance for local authorities on how to develop robust criteria based policies in relation to renewable and low carbon energy projects. Key points include:

- The criteria should be expressed positively (i.e. that proposals will be accepted where the impact is or can be made acceptable);
- Should consider the criteria in the National Policy Statements as these set out the impacts particular technologies can give rise to and how these should be addressed;
- Cumulative impacts require particular attention, especially the increasing impact that wind turbines and large-scale solar farms can have on landscape and local amenity as the number of turbines and solar arrays in an area increases;
- Local topography is an important factor in assessing whether wind turbines and large-scale solar farms could have a damaging effect on landscape. Recognise that the impact can be as great in predominantly flat landscapes as in hilly areas;
- Care should be taken to ensure heritage assets are conserved in a manner appropriate to their significance, including the impact of proposals on views important to their setting; and

- Protecting local and residential amenity is an important consideration which should be given proper weight in planning decisions.

6.6 Drawing on the guidance outlined in the PPG, after expressing positive support in principle for renewable and low carbon energy development, Local Plans should list the criteria that will be taken into account in considering specific applications. This should not be a long negative list of constraints, but it should set out the range of safeguards that seek to protect the environment – including landscape and townscape. Other key considerations may include residential amenity, aviation, heritage, tranquillity, etc **[See reference** 127**]**. For example, the Lancaster Regulation 19 Partial Review Local Plan Part 2 **[See reference** 128**]** Policy DM53: Renewable and Low Carbon Energy Generation is a criteria-based policy that goes further than most policies as it sets out criteria for onshore wind, hydro, solar, other renewable and low carbon technologies, heating and cooling networks and energy storage. Cornwall Climate Emergency DPD Policy RE1: Renewable and Low Carbon Energy builds on this by including criteria for various renewable energy types and states that significant weight will be given to community led energy schemes. This policy option could also support renewable, smart decentralised energy grids and battery storage. Cornwall Climate Emergency DPD Policy RE1: Renewable and Low Carbon Energy builds on this by including criteria for various renewable energy types and states that significant weight will be given to community led energy schemes. The Council should also include text within the policy regarding wider opportunities, such as “The Council will seek to try to maximise wider benefits of the renewable energy development e.g. for biodiversity on solar sites”.

6.7 It is important that policy does not preclude the development of specific technologies other than in the most exceptional circumstances and does not merely repeat national policy but is relevant to the process of decision-making at the local level, focusing on locally distinctive criteria related to local assets, characteristics, and sensitivities.

6.8 We recommend that any criteria-based policy designed to manage the development of renewable and low carbon technologies should be supported by guidance on the most suitable locations (see appropriate sections relating to energy opportunity mapping and allocations below), either within the Local Plan or an accompanying Supplementary Planning Document (SPD) **[See reference 129]** on renewables. Guidance could also take the form of the findings of a renewable energy study. For example, Stroud Local Plan Review Pre-Submission Draft Plan (May 2021) Delivery Policy ES2 Renewable or low carbon energy generation is a criteria-based policy that states that ground mounted solar and wind energy developments are more likely to be supported in areas identified as suitable in principle as indicated on the Policies Map. The Policies Map utilises technical potential maps that LUC and CSE produced as part of the Renewable Energy Resources Assessment (2019) to identify areas of suitability for wind and solar energy. Huntingdonshire District Council could take a similar approach.

6.9 The strengths and weaknesses of adopting criteria-based policies are summarised below:

Strengths:

- Creates greater policy certainty for developers.
- Allows the Council to clearly set out the circumstances in which renewable energy proposals will and will not be permitted.

Weaknesses:

- May be perceived to be overly restrictive by certain stakeholders.

De el o ment o ‘Energy ortun t es a s’

6.10 The NPPF and PPG encourage local planning authorities to “consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure”. It is welcomed that the Council has identified suitable areas for onshore wind in Policy LP 35, but the Council can go further and identify suitable areas for all types of renewable and low carbon energy sources that can be spatially defined, where this would help secure the development of such sources. The consultation version of the NPPF removes the word ‘consider’ and instructs local authorities to identity suitable areas.

6.11 Clearly identifying and mapping an area’s renewable and low carbon sources of energy represents a positive and proactive way to spatially plan for renewable and low carbon energy generation. With a spatial map illustrating energy opportunities it is easier for local authorities to work with local communities and developers to identify the areas that would be most appropriate for development in strategic terms, accelerating the planning and development processes and avoiding conflict.

6.12 Energy opportunities maps can provide a spatial summary of the key opportunity areas (in terms of their technical potential) for various forms of renewable energy. These can be used to inform development decisions and discussions and guide development towards the most suitable areas.

6.13 At the scale of neighbourhood planning, energy opportunities maps can provide a useful tool for communities and other stakeholders to identify the key opportunities for renewables within their area. It is important to note, however, that it is not possible to identify locations for all types of renewable energy, as many technologies such as building integrated solar, heat pumps, farm-scale anaerobic digestion, and small-scale biomass can be located in nearly all areas.

6.14 The strengths and weaknesses of adopting ‘Energy Opportunities Maps’ are summarised below:

Strengths:

- Enables planners to have informed discussions with developers and communities about potential opportunities for renewable and low carbon energy technologies – i.e. proactive rather than reactive planning.

- Meets NPPF, PPG requirements that LPAs should identify suitable areas for renewable and low carbon energy sources and supporting infrastructure.
- Can act as a useful tool for neighbourhood planning.

Weaknesses:

- Not possible to identify locations for all types of renewable energy technologies.
- It does not provide a definitive statement on the suitability of a certain location for a particular development – each application must be assessed on its own merits. It is not a replacement for detailed site studies.
- May identify potential areas for renewable energy development that are unpopular.

Allocating Sites for Standalone Renewable and Low Carbon Energy Schemes

6.15 The Local Plan could encourage the uptake of large- and small-scale renewable energy projects through specifically allocating sites for standalone renewable developments. This could provide more strategic direction to the siting of renewables for developers, investors, the local authority, statutory stakeholders and communities. It may be possible to allocate sites which have the greatest potential for sustainable energy and carbon reduction or sites that could potentially be developed for other purposes (e.g. resulting in the sterilisation of potential sites).

6.16 If sites exist that have potential for standalone renewable or low carbon energy use but are constrained in a way that would make them less attractive to commercial developers, then allocating the site is a way of promoting that site for renewable/low carbon development to a wider audience such as landowners or co-operatives. It is noted that the Council has undertaken a 'call for sites' exercise for renewable and low carbon development and a few sites have been identified. The Council will now need to consider the merits of promoted sites in isolation or in combination with other planned types of development.

6.17 Again, it would be important that site allocations only highlight appropriate schemes/areas; site developers and communities would still be required to undertake detailed site-based assessment work to support individual development planning applications and if required Environmental Impact Assessments. Furthermore, site allocations should be framed such that they do not preclude projects in other locations. Building on the criteria-based policy option above, this policy could also provide criteria specific to the site.

6.18 The strengths and weaknesses of allocating sites for standalone renewable and low carbon energy schemes are summarised below:

Strengths:

- Provide strategic direction to the siting of renewables.
- Ensure sites with the greatest potential are identified – albeit there may be other sites beyond the call for sites which are also suitable for development.
- May promote sites to a wider audience such as co-operatives.
- Can set specific criteria to enhance the quality of development and address, mitigate, and overcome constraints impacting a site.

Weaknesses:

- Resource intensive to gather necessary evidence to justify allocation and arguable not the best use of Council resources.
- Would be desirable to secure agreement of landowner which may be resource intensive (if not submitted as part of the call for sites).

- May identify potential sites for renewable energy development that are unpopular.

Encouraging Community Renewables

6.19 There is no definition of community energy within planning law, and planning authorities are unable to assess renewable energy proposals from community energy groups any differently to commercial projects, nor give weight to the substantial co-benefits delivered by these projects **[See reference** 130**]**. However, the NPPF states that local authorities should support community-led initiatives for renewable and low carbon energy, including developments being taken forward through neighbourhood planning. Community-led renewable energy projects are increasingly being seen as an attractive option for local communities wishing to contribute to local/national climate change targets and as a way to generate local revenue to directly benefit the community. For example, the Westmill Wind Farm Co-operative **[See reference** 131**]** in Swindon was the first 100% community owned wind farm to be built in the south of England.

6.20 Community groups can face considerable challenges in the pre-planning stage and there are a number of opportunities for local authorities to provide advice and guidance throughout this stage, including the provision of early advice on planning requirements and lending support to consultation activities within the community. Engaging communities in the earliest stages of plan-making and providing clear information on local issues and the decision-making process can aid the development of community renewable energy projects.

6.21 Examples of plans that include policies to support community renewable energy schemes include the adopted Bath and North East Somerset Local Plan **[See reference** 132**]** and the adopted Cornwall Climate Emergency Development Plan Document **[See reference** 133**]**.

6.22 The Council's emerging Local Plan could introduce its support for community renewable schemes by stating that the Council would actively support community renewable energy schemes which are led by or meet the needs of local communities. Such developments would normally be conceived by and/or promoted within the community within which the renewable development will be undertaken, delivering economic, social and/or environmental benefits to the community. Neighbourhood plans provide a particular opportunity to define detailed local site allocation policies for renewable and low carbon technologies. To aid neighbourhood planning committees, the Council could develop an interactive map to support the development of renewable and community energy schemes through neighbourhood plan policies (for example using outputs from this study).

6.23 Currently, there is no policy within the Local Plan that relates to community energy schemes. As such, a policy should be incorporated within the Local Plan update specifically relating to community-led renewable schemes. It should explicitly state that the Council would actively support community energy schemes which are led by or meet the needs of local communities.

6.24 Specific wording proposed:

Support will be given to renewable and low carbon energy generation developments that are led by, or meet the needs of local communities.

The positive benefits of community energy schemes will be a material consideration in assessing renewable energy development proposals. The preference is for schemes that are led by and directly meet the needs of local communities, in line with the hierarchy and project attributes below:

Community Led Energy:

- Project part or fully owned by a local community group or social enterprise;

- Local community members have a governance stake in the project or organisation e.g. with voting rights.

Justification

6.25 As stated above, community groups can face considerable challenges in the pre-planning stage and there are a number of opportunities for local authorities to provide advice and guidance at this stage. The policy wording above is based on Policy SCR4 which was successfully adopted in the Bath and North Somerset Local Plan.

6.26 The strengths and weaknesses of encouraging community renewable schemes are summarised below:

Strengths:

- Provides support to local communities to develop renewables and low carbon energy.
- Generates local revenue to directly benefit the local community.
- Can secure a broad base of local support for renewable energy schemes.

Weaknesses:

- Care may need to be taken not to prescribe the process of community ownership (i.e. shared ownership etc.) as it is not the role of the planning system to do this.

Decommissioning

6.27 Due to the temporary nature of renewable energy infrastructure, such as solar panels and wind turbines which typically have a lifespan in the range of 20 to 30 years, there is a need for renewable energy project stakeholders to plan for project end-of-life obligations.

6.28 Decommissioning ensures that infrastructure is removed responsibly, minimising its environmental impact whilst allowing for the repurposing of land for other uses, particularly due to the often-significant land space that renewable energy infrastructure occupies. Repurposing may also include updating more viable and feasible renewable energy technologies for further renewable energy projects. This is often more economically viable than maintaining outdated infrastructure that may no longer be cost-effective. The recycling and / or repurposing of materials may also establish economic opportunities whilst promoting sustainable outcomes.

6.29 Examples of plans that include policies to support the decommissioning of renewable energy infrastructure include the adopted Cheshire East Local Plan **[See reference** 134**]**, Salford Local Plan **[See reference** 135**]**, and the Central Lincolnshire Local Plan **[See reference** 136**]**. Requirements for the decommissioning of renewable energy infrastructure are typically captured within the wider scope of a broader renewable and low carbon energy policy rather than an independent policy specifically for decommissioning.

6.30 However, a policy could be included in the Local Plan update to provide guidance for the decommissioning of renewable energy installations to ensure the safe, efficient, and environmentally responsible decommissioning of infrastructure. Like the policy examples provided, this policy could sit within the wider remit of an all-encompassing renewable energy policy.

6.31 The policy could also state that decommissioning activities must minimise adverse environmental impacts, including habitat disruption, pollution, and landscape degradation, must prioritise public safety and mitigate any potential hazards associated with the removal of renewable energy infrastructure, maximise the reuse, recycling, and repurposing of materials to minimise waste generation, consider stakeholder consultation and community engagement and consider opportunities for job creation and sustainable redevelopment of decommissioned sites.

6.32 The Council could also consider utilising the function of planning conditions to ensure that redundant renewable infrastructure is removed when no longer in use and land is restored to an appropriate use.

6.33 The strengths and weaknesses of decommissioning are summarised below:

Strengths

- Provides clarity for renewable energy developers surrounding the expectations and requirements for infrastructure at the end of its operational life.
- Safeguards the environment and biodiversity by incorporating measures to ensure proper restoration of sites post-decommissioning.
- Front-loaded decommissioning policy can help ensure that developers provide financial guarantees to cover decommissioning costs at an early stage.

Weaknesses

- Difficult to set out detailed decommissioning plans considering the projects may be in place for 30+ years.
- Decommissioning requirements may deter developers from investing, particularly if they perceive the associated costs and obligations as prohibitive.
- Advancements in renewable energy technology may outpace provisions outlined in decommissioning policy, rendering it obsolete.

Monitoring

6.34 Careful monitoring of the success of the policies should also be established to measure the District's progress towards its ultimate goal of becoming net zero by 2040. The following monitoring indicators could be incorporated within the Local Plan update:

- Number of renewable energy applications that have come forward and whether they have been granted planning permission.
- Capacity of renewable energy schemes, how much has been generated from renewables and furthermore how much that contributes to the net zero target.
- If suitable areas for wind and ground mounted solar are identified within the Local Plan update, the number of developments that come forward in these areas could be monitored.
- Identifying the key issues arising in determination of applications for different forms of renewables and if there are any significant blockages.
- Number of community led renewable schemes that come forward.

Additional policy options for on-site renewable energy

6.35 Although the policy options set out above focus more on large-scale renewable energy generation, the Council could also provide policy support for the generation of on-site renewable energy, which contribute to the same goals of reducing emissions and demand on the local grid whilst also supporting residents and businesses to reduce their energy bills. Below sets out some additional policy options for on-site renewable energy the Council may wish to consider in its Local Plan update as well as through wider policymaking and Council-led initiatives.

- Loosen or remove planning restrictions to make it easier to install building-mounted renewables. Learning from the London Borough of Camden's guidance on retrofitting within Conservation Areas **[See reference** 137**]**, the Council could set out clear guidance on retrofitting existing buildings especially regarding solar PV and how it will be applied within Conservation Areas and Listed Buildings. This could include specific guidance for each Conservation Area, either by updating Conservation Area Management Plans to specifically include the District's approach to solar PV or through the creation of overarching guidance based on area types throughout the District. As for new development, Document C, in its exploration of sustainable building design options, recommends that HDC require all new commercial and residential development to achieve high sustainability standards via accreditation schemes. This will need to be achieved through a significant take-up of on-site renewables in new development (along with high energy efficiency standards). Obstacles for new development to propose building-mounted renewables should therefore be removed to facilitate this.
- Local Development Orders (LDOs) have come to be used for a range of uses, including most recently the provision of low carbon solutions. For example, Swindon Borough Council has prepared low carbon-related LDOs covering non-domestic air source heat pumps and district heating installations, hydrogen and electric car fuelling installations and pre-identified sites for solar arrays and solar farms **[See reference** 138**]**. Huntingdonshire could employ a similar approach.

6.36 Although not covered in this report, policy options for retrofitting are explored in Document C.

Policy Examples

6.37 In addition to some of the specific examples referred to above, Section 3 of the TCPA/RTPI Climate Change Planning Guidance (2023) **[See reference** 139**]** provides various model approaches for renewable energy and low carbon policy options that can be referred to as examples for local authority plan making.

Chapter 7

Summary and Conclusions

Summary

7.1 This study has sought to provide Huntingdonshire Council with clear evidence of the potential for renewable and low carbon development within Huntingdonshire and the policy options the Council could consider for inclusion within their Local Plan update.

7.2 At present an estimated 41% of electricity demand within Huntingdonshire is met by renewable/low carbon generation. The findings show that there is significant technical potential for renewable and low carbon energy and that Huntingdonshire could deliver 80% of its electricity demand from renewable energy sources by 2050 if they follow an ambitious deployment scenario. In contrast continuing with the current rate of deployment would only deliver 43% of 2050's predicted energy demand. The greatest potential lies in the opportunity to use the power of the sun, wind and plants in the form of ground mounted solar PV, rooftop solar PV, onshore wind and biomass.

7.3 Delivery of the 'ambitious' scenario set out in this study will require a step change in the approach to renewable energy development within Huntingdonshire. Due to the recent change to the NPPF there is new potential for onshore wind to be consented in England and as such it may be a good future option in Huntingdonshire. The economic viability of onshore wind in England does, however, remain a challenge to deployment. Decarbonising heat supplies is also likely to pose a significant challenge in moving towards the scale of change required, i.e. deployment issues associated with rolling out the installation of heat pumps retrospectively.

7.4 One of the difficulties for local authorities in setting District-wide carbon targets is the co-dependency on national policy measures, such as those which will contribute to decarbonising both the electricity grid and heat supplies. Such measures are likely to be achieved through a mix of technologies, including some which most local authorities have little or no influence over such as offshore wind power and the development of hydrogen infrastructure. The rate at which grid decarbonisation occurs will be dependent on national policies and local authorities will in turn be largely dependent on a decarbonised grid to fulfil their own policy commitments.

7.5 New developments do, however, have the potential to make a significant contribution towards low and zero carbon energy generation capacity within the area, particularly if a rapid trajectory towards operational net zero carbon is adopted for new buildings – aided by the Future Homes Standard when this is implemented. It is difficult to quantify their impact as the mix of technologies used will depend on costs, onsite emission targets and applied emission factors, but it is likely that developers will focus on heat technologies such as heat pumps and rooftop solar. However, the additional capacity will not decrease overall emissions; it will instead limit the additional emissions resulting from the new development itself.

Conclusions

7.6 Achieving net zero is hugely challenging considering the radical changes that are needed to enact the necessary innovative transformative action across all sectors. However, in their 'Net Zero' report, the Committee on Climate Change view the UK-wide target as being "achievable with known technologies, alongside improvements in people's lives… However, this is only possible if clear, stable and well-designed policies to reduce emissions further are introduced across the economy without delay" **[See reference 140]**.

7.7 As such, this study focusses primarily on the potential interventions through local planning for net zero carbon development, sustainable building design and renewable energy. With Huntingdonshire District Council in the process of preparing its Local Plan update, there is a clear window of opportunity to ensure that the Local Plan update sets out a step change in the support given to the development of renewable and local carbon energy projects.

7.8 To support the deployment of renewable energy in the District, it is recommended that stronger polices should be put in place supporting:

- Onsite renewable and low carbon energy generation via supportive and positively worded criteria based policies;
- Stand-alone renewable and low carbon energy schemes, including specific policies on solar PV and wind energy identifying areas of suitability for these technologies and recognising that some landscape change will be required; and
- Community-led renewable and low carbon energy schemes.

7.9 Careful monitoring of the success of the policies should also be established to measure the District's progress towards its ultimate goal of becoming net zero by 2040. Additionally, monitoring can also help address unintended consequences on future occupants such as badly installed heat pumps or higher costs to run the technology.

7.10 The delivery of renewable and low carbon projects will also require changes not just to planning policy but also to the implementation of policy. It will be imperative that due weight and consideration is given to the importance of addressing climate change in development management decisions. This should include providing appropriate training and checklists for development management officers and planning committees to ensure that the policies are implemented as intended and that due weight is given to Climate Change issues in all planning decisions.

Appendix A

Key Assumptions to be Applied in the Assessment of Renewable and Low Carbon Energy Resource

Appendix A

Key Assumptions to be Applied in the Assessment of Renewable and Low Carbon Energy Resource

Introduction

A.1 This note sets out the key assumptions that were used within the assessments of technical potential for the different types of renewable energy technology including:

- Wind;
- Ground-mounted solar;
- Rooftop solar;
- Hydropower;
- Heat pumps; and
- Biomass (including forestry and woodland residues, energy crops, recycled wood waste, agricultural residues [including anaerobic digestion] and sewage)

A.2 Please note, the assumptions outlined below are written in the past tense and will subsequently be updated and incorporated into an appendix within the main report.

Existing Property Statistics for Huntingdonshire

A.3 The existing stock of domestic dwellings and non-domestic properties within Huntingdonshire was derived from LLPG Address data.

A.4 The overall proportion of 'off-gas' properties (those not connected to the gas network) was derived from the 2024 - Department for Energy Security & Net Zero (DESNZ) LSOA estimates[1].

[1] DESNZ (2024) LSOA estimates of properties not connected to the gas network 2015 to 2022. Available at: https://www.gov.uk/government/statistics/lsoa-estimates-of-households-not-connected-to-the-gas-network

Table A - 1: Properties in Huntingdonshire

Property type	Number of properties within Huntingdonshire
Detached dwelling	45,745
Semi-detached dwelling	25,370
Terraced dwelling	24,964
Flat[2]	15,401
Other dwelling[3]	1,235
Total dwellings considered in the rooftop solar and air source heat pump assessments	**112,715**
Properties other than dwellings[4]	16,467
Total properties considered in the rooftop solar and air source heat pump assessments	**129,182**

Source: Huntingdonshire OS Address data

Emission Factors

A.5 To determine the potential CO_2 savings from the identified potential renewable resources, the identified potential electricity/heating output was multiplied by the emissions factors at present of the fuels the renewable energy generation would replace:

- Grid electricity: 0.133 $kgCO_2e/kWh$[5]
- Mains gas: 0.210 $kgCO_2e/kWh$[6]
- Heating oil: 0.298 $kgCO_2e/kWh$[7]
- Woodfuel: 0.011 $kgCO_2e/kWh$[8]

A.6 The actual proportions of electricity and oil usage by off-gas properties for heating is unknown. As such, an illustrative 50% of these properties are estimated to be fuelled by electricity and 50% by oil for the purposes of this study.

UK Capacity Factors

A.7 Regional capacity factors, where available, were used when calculating technical potential and deployment scenarios within Huntingdonshire. Where unavailable, national DESNZ and RHI data on annual load factors were used when calculating technical potential and deployment scenarios.

[2] Flats could not be considered in in the rooftop solar and air source heat pump assessments as data was not available to determine if all flats were suitable.

[3] Excluding ancillary buildings, car parking, garages, house boats, caravans and chalets. Other dwellings could not be considered in in the rooftop solar and air source heat pump assessments as data was not available to determine if all properties were suitable.

[4] Commercial properties excluding land, ancillary buildings, military buildings, objects of interest, parent shells, waste sites, minerals sites, ancillary buildings, parking, and other inappropriate locations including fisheries, telephone boxes, lighthouses, beach huts, ATMs, cemeteries, and utilities.

[5] National Grid (2024) Future Energy Scenarios: FES 2024 Data workbook – Key Stats: Annual average carbon intensity of electricity (five year forecast from 2023). Available at: https://www.nationalgrideso.com/future-energy/future-energy-scenarios-fes

[6] BRE (2024) Standard Assessment Procedure: RdSAP10 Specification. Available at: https://bregroup.com/sap/sap10

[7] BRE (2024) Standard Assessment Procedure: RdSAP10 Specification. Available at: https://bregroup.com/sap/sap10

[8] BEIS and DESNZ (2022) Greenhouse gas reporting: conversion factors 2022. Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022: Wood logs/chips/pellets.

Table A - 2: UK renewable capacity factors

Technology	UK-level Capacity Factor
Anaerobic Digestion[9]	64.9%
Hydro[10]	38.2%
Micro CHP[11]	12.6%
Solar PV[12]	9.6%
Wind[13]	24.5%
Solar Water Heating[14]	4.5%
Air Source Heat Pumps[15]	18.4%
Ground Source Heat Pumps[16]	18.2%
Biomass (plant-based)[17]	56.7%
Sewage Sludge Digestion[18]	43.8%

Wind Resource Assessment Parameters

A.8 The potential wind development resource within Huntingdonshire was assessed using a Geographical Information Systems (GIS) approach. This involved mapping a variety of technical and environmental parameters to identify parts of the district which are constrained with respect to wind development at various scales. The remaining land was then identified as having 'technical potential' (subject to further site-specific assessment at application stage)[19]. The parameters of the GIS tool are set out in **Table A - 3**.

A.9 The maximum theoretical wind generation capacity of the areas of technical potential was estimated using:

[9] BEIS and DESNZ (2023) Quarterly and annual load factors. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors. The average of all the available load factors was used.
[10] BEIS and DESNZ (2023) Quarterly and annual load factors. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors. The average of all the available load factors was used.
[11] BEIS and DESNZ (2023) Quarterly and annual load factors. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors. The average of all the available load factors was used.
[12] BEIS and DESNZ (2023) Quarterly and annual load factors. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors. The average of all the available load factors was used. The average of all the available load factors for the East of England was used for the technical potential assessment for wind – see footnote 19.
[13] BEIS and DESNZ (2023) Quarterly and annual load factors. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors. The average of all the available load factors was used. The average of all the available load factors for the East of England was used for the technical potential assessment for wind – see footnote 27.
[14] BEIS and DESNZ (2023) Non-domestic RHI mechanism for budget management: estimated commitments – RHI budget caps. Available at: https://www.gov.uk/government/publications/rhi-mechanism-for-budget-management-estimated-commitments
[15] BEIS and DESNZ (2023) Non-domestic RHI mechanism for budget management: estimated commitments – RHI budget caps. Available at: https://www.gov.uk/government/publications/rhi-mechanism-for-budget-management-estimated-commitments
[16] BEIS and DESNZ (2023) Non-domestic RHI mechanism for budget management: estimated commitments – RHI budget caps. Available at: https://www.gov.uk/government/publications/rhi-mechanism-for-budget-management-estimated-commitments
[17] DESNZ (2023) Load factors for renewable electricity generation (DUKES 6.3). Available at: https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes
[18] Statista (2023) Load factor of electricity from sewage sludge digestion in the United Kingdom (UK) from 2010 to 2022. Available at: https://www.statista.com/statistics/555718/sewage-sludge-digestion-electricity-load-factor-uk/
[19] The area of unconstrained land is treated as a single block of land which may not be the case in reality. This singular block is created from merging many polygons, which are not simple shapes of equal width. This means some slivers, or areas smaller than the required width, may be present in the results adjoining to suitably sized areas of land.

- Standardised turbine densities and assumed turbine maximum generation capacities (the latter expressed in Megawatts (MW));
- One or more assumed capacity factors based on historic data broken down at least to regional level (using data from the Department for Business, Energy and Industrial Strategy (BEIS, now DESNZ) relating to Feed in Tariff (FiT) installations)[20]; and
- The assumption that, where land has technical potential for multiple turbine scales, the largest scale will be developed in preference to smaller scales.

Table A - 3: Proposed assumptions to be used for assessment of technical potential for onshore wind – Constraints

Parameter	Assumption	Data Source	Justification and Notes
Wind Turbine Size	Five turbine sizes were considered: ▪ Very large (150-220m tip height) ▪ Large (100-150m tip height) ▪ Medium (60-100m tip height) ▪ Small (25-60m tip height) ▪ Very small (<25m tip height) Assessment was based on notional turbine sizes, approximately intermediate within each class size i.e.: ▪ Very large: 185m tip height, 4MW capacity ▪ Large: 125m tip height, 2.5MW capacity ▪ Medium: 80m tip height, 0.5MW capacity ▪ Small: 45m tip height, 0.05MW capacity	▪ LUC ▪ Research into turbine manufacturers ▪ BEIS (now DESNZ) renewable energy planning database and other databases containing information on wind turbine applications.	There are no standard categories for wind turbine sizes. The categories chosen are based on consideration of currently and historically 'typical' turbine models at various different scales. The approach is intended to be flexible in the light of uncertainty regarding future financial support for renewable energy. A review of wind turbine applications across the UK showed tip heights ranging from less than 25m up to around 220m, with larger turbine models in demand from developers following the reduction in financial support from Government and driven by the manufacturers and trends from other European markets where turbines of this scale have been developed for some time[21]. Due to the structure of the financial support system in the past, smaller turbines (those in the medium to small categories) have tended to be deployed as 1-2 turbine developments. As this is a strategic scale study, notional turbine sizes, approximately intermediate within each class size, were used to represent each scale of turbine within this assessment. No mapped-based assessment of 'very small' turbines was undertaken. The type of buffers applied to constraints for the assessment of other turbine size categories in many cases do not reasonably apply to very small turbines. Equally, mapping a strategic district-wide 'resource' for very small turbines (which are generally developed individually in association with particular farm or other buildings) is not particularly meaningful. Instead, it is recommended that policy references the entire

[20] An energy generator's 'capacity factor' can be defined as the actual energy yield produced over a period of time expressed as a proportion of the energy yield that would have been produced if the generator had operated at its full generation capacity continuously over the same period. This was averaged at 20.6% for the East of England over the past 12 years. BEIS and DESNZ (2023) Quarterly and annual load factors. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors

[21] LUC review in February 2024

Parameter	Assumption	Data Source	Justification and Notes
			plan area as suitable for very small wind in principle (subject to site-specific assessment).
Wind Speed	Exclude: ▪ All areas with mean annual average wind speed <5m/s at 50m above ground level (agl).	▪ Global Wind Atlas/Vortex ▪ Industry practice	Wind speed requirements change with turbine scale and model. Some turbine manufacturers produce models which may operate at lower wind speeds and the configuration of certain turbine models can be altered to improve yield in lower wind speed environments. Future changes in government policy and turbine technology could allow developments to be deliverable at lower wind speeds than are currently viable. A 5m/s threshold was applied to take account of such changes.
Roads	Exclude: ▪ Roads (excl. restricted access tracks) with a buffer of the height of the turbine (to blade tip height) +10%.	▪ Ordnance Survey OpenRoads	These buffers were applied as a safety consideration. The proposed buffer distance is based on standard safety distances used by wind turbine developers and the DECC Renewable and Low-carbon Energy Capacity Methodology[22]. Restricted access tracks were excluded from consideration as these predominantly comprise of forestry and other tracks which could be more easily diverted than standards roads.
Railways	Exclude: ▪ Railways with a buffer of the height of the turbine (to blade tip height) +10%.	▪ Ordnance Survey VectorMap District	This buffer was applied as a safety consideration, based on the same principles as used for roads.
Electricity Lines	Exclude: ▪ Major transmission lines (132kV minimum) with a buffer of the height of the turbine (to blade tip height) +10%.	▪ Ordnance Survey OpenMap ▪ National Grid ▪ UK Power Networks	This buffer was applied as a safety consideration. It is derived from guidance by the Energy Networks Association (Engineering Recommendation L44) and National Grid (Technical Advice Note 287). It is noted that this guidance also states that a buffer of 3x the rotor diameter should be applied to account for turbine wake downwind of a turbine impacting the weathering of electricity lines. However, this also states that this impact is variable depending on factors including turbine positioning. This would require site-level study and consultation with the relevant DNO. As such, this buffer distance was not applied as a constraint.

[22] DECC (2010) Renewable and Low-carbon Energy Capacity Methodology. Available at: https://www.gov.uk/government/news/decc-publishes-methodology-for-renewable-and-low-carbon-capacity-assessment

Parameter	Assumption	Data Source	Justification and Notes
Gas pipelines	Exclude: ■ Gas pipelines with a 1.5x hub height buffer.	■ National Grid	This buffer was applied as a safety consideration. It is derived from guidance by the United Kingdom Onshore Pipeline Operators' Association (UKOPA/GP/013 Edition 1). It is noted that only National Grid open data was available for use within this study. Further site-specific study would be required to consider any other buried pipelines not contained within this dataset.
Airports and Airfields	Exclude: ■ Operational airports and airfields.	■ Ordnance Survey OpenMap Local Functional Site layer with the theme 'Air Transport'	OS OpenMap Local Functional Site data with the theme Air Transport was used in the assessment. It is noted that land within consultation zones surrounding airports and airfields may also be unsuitable for wind turbine development, and further consultation between potential developers and airport and airfields is required to determine if there is any impact from a proposed development.
MOD Land	Exclude: ■ MOD land.	■ OpenStreetMap	MOD land was considered unsuitable for wind turbine development, as this land is already in use for MOD activities. Further consultation with the MOD would be required to determine if there is any potential for wind turbine development to be delivered on this land. Due to the sensitive nature of this data, these sites were included as constraints to development within the assessment, but were not individually mapped.
Noise	Exclude: ■ Sensitive[23] and non-sensitive receptor[24] buffer zones based on turbine size: – Very large scale: 500m for residential/other sensitive receptors, 250m for non-residential.	■ OS Addressbase ■ OS OpenMap	Wind turbines generate sound during their operation, and their noise impacts upon nearby properties must be limited to appropriate levels, defined in particular by the 'ETSU' Guidance – The Assessment and Rating of Noise from Wind Farms (1995) (as supplemented by the Institute of Acoustics). The relationship between turbine size and the separation distance from properties at which acceptable noise levels will be achieved is in practice quite complex and variable. However, the present assessment has applied specialist acoustic advice to define minimum distances.

[23] Sensitive receptors include residential properties, schools, hospitals and care homes. These were identified via the LLPG data.
[24] Non-relevant addresses that have no applicable noise receptors were excluded, identified via the LLPG data, including: ancillary buildings, car parking, garages, non-buildings.

Parameter	Assumption	Data Source	Justification and Notes
	– Large scale: 480m for residential/other sensitive receptors, 230m for non-residential. – Medium scale: 400m for residential/other sensitive receptors, 180m for non-residential. – Small scale: 180m for residential/other sensitive receptors, 80m for non-residential. For properties outside (but close to) the authority boundary, indicative buffers were applied to the available property/buildings data from OS OpenMap. As this data does not distinguish commercial and residential properties, and it was not possible to verify uses by other means, non-residential buffers were used throughout.		below which it is generally unlikely that the required noise levels under ETSU-R-97 will be achievable. The buffer for a noise level of 35dB LA90 for small-medium turbines and 38dB LA90 for large-very large turbines was used as the minimum limit applied to sensitive receptors in a typical rural location. The approach taken necessarily involves applying various assumptions, including: ■ An assumed single turbine development in all cases (rather than multiple turbines); and ■ The assumption that no properties will be 'financially involved' in the wind development or are located in an existing nosier area (financial involvement and existing elevated baseline noise levels may allow higher noise levels to be accepted in individual cases). The limitations associated with such assumptions are considered preferable to avoiding the use of noise-related separation distances for the assessment, bearing in mind that noise is a key factor that influences the acceptable siting of turbines in practice. The assessment defines the minimum distances below which adherence to the Industry standard (ETSU-R-97) noise guidance would not be possible and it should not be inferred that the proposed distances represent acceptance of any given proposal within the areas of identified suitable potential as site based noise monitoring and assessments would still be required. Note: Within the Authority, where address points did not overlay OS OpenMap buildings data, points were buffered 5m to estimate building footprint. Where OS OpenMap buildings did not overlay address point data, these buildings were assumed to be of non-sensitive use[25]. Moreover, due to lack of sufficient data, buildings outside of the Authority were assumed to be of non-sensitive use. This was to ensure that land was not unnecessarily ruled as being constrained to wind development, as a result of non-sensitive buildings being mistakenly assessed as being sensitive. It is noted further site specific study would be required to determine the necessary buffer distance between specific buildings and proposed turbines.

[25] Where OS buildings overlayed non-relevant addresses (see footnote 24) these were excluded from consideration.

Parameter	Assumption	Data Source	Justification and Notes
Buildings	Exclude: ▪ Buildings with a buffer of the height of the turbine (to blade tip height) +10%.	▪ OS OpenMap	National Planning Practice Guidance notes that the topple distance + 10% is a safe separation distance between turbines and buildings.
Future Developments, Safeguarded Land and Employment Sites	Exclude: ▪ Site allocations from Huntingdonshire's Plan: – Mixed use sites; – Housing sites; – Employment sites; – Recreation sites; – Site allocations; – Local Employment Areas; and – Established Employment Areas.	▪ Huntingdonshire District Council	Generally unsuitable for wind turbine development, unless allocations contain relatively large undeveloped portions. Identification of suitable land for wind within specific allocation boundaries would require a separate site-specific study. In addition, it is assumed that opportunities for renewables within such sites will already be considered as part of their design.
Existing Renewable Energy Developments	Exclude: ▪ Land boundaries of consented and operational renewable energy installations.	▪ Huntingdonshire District Council ▪ BEIS (now DESNZ) ▪ Aerial imagery ▪ LUC windfarm database	The quarterly BEIS (DESNZ) Renewable Energy Planning Database, Huntingdonshire Council data and the LUC internal windfarm database was used to determine the locations of operational and consented renewable energy installations. To approximate the site boundary, land was excluded based on Huntingdonshire Council boundary data in combination with assessment of surrounding recent aerial imagery. For existing wind developments, it was assumed these were of notional medium scale tip height and occupied a 5 x 3 rotor diameter oval spacing[25], with the major axis of the oval oriented towards the prevailing wind direction, taken to be south-west (see turbine spacing below). Existing roof-mounded solar PV developments are building-integrated and therefore were excluded via the consideration of existing built development as a constraint.

[25] To mitigate impacts on the productivity of wind turbines located close to one another caused by wind turbulence, it is standard practice for developers to maintain an oval of separation between turbines that is equal to 5 times the turbine rotor diameter (the cross sectional dimension of the circle swept by the rotating blades) on the long axis, and 3 times the rotor diameter on the short axis.

Parameter	Assumption	Data Source	Justification and Notes
			Additionally, existing landfill gas developments were not considered a constraint to solar developments, as there is potential that solar developments. Existing battery developments were not included as, due to their small scale, their exact location within a site was difficult to identify. Moreover, there is potential for battery and turbine developments to also be co-located.
Terrain	Exclude: ▪ Slopes greater than 15%.	▪ EA Lidar DTMs	This is a development/operational constraint. Developers have indicated that this is the maximum slope they would generally consider feasible for development. Although it is theoretically possible to develop on areas exceeding 15% slopes, turbine manufacturers are considered unlikely to allow turbine component delivery to sites where this is exceeded.
Water Environment	Exclude: ▪ Watercourses and waterbodies with a 50m buffer.	▪ Ordnance Survey OpenMap Local ▪ Ordnance Survey OpenRivers	A 50m buffer was applied around all rivers and waterbodies to take account of good practice such as that relating to pollution control during construction. OS Survey OpenMap Local surface water area data was intersected with OS OpenRivers data, so only the larger surface waterways/waterbodies within this dataset were treated as constraints. This was to exclude smaller field drains from consideration, which are particularly densely situated in the northeast of the authority. It would be unduly conservative to place a 50m buffer constraint along all these minor drains that are included within this data. It is noted that therefore not all smaller waterways/waterbodies are included as a constraint, and developers will need to consider potential impacts on all waterways/waterbodies as part of any further detailed site analysis, including land drains. This would be necessary to minimise any potential effects associated with pollution and sedimentation during construction, as well as the use of these linear features for bat foraging corridors. In addition, OpenMap Local surface water line data is line data, and so a 1m buffer was applied to approximate a footprint of smaller waterways contained within this dataset.
Woodland	Exclude: ▪ Ancient Woodland Inventory with a 50m buffer, and	▪ Forestry Commission ▪ Natural England	All areas of woodland were excluded with a +50m buffer to reduce risk of impact on bats. A 50m clearance distance of turbine blades from tree canopies and other habitat features is standard practice and endorsed by Natural England guidance set out in 'TIN051'. A 50m horizontal buffer from turbine masts is a reasonable proxy clearance for the purposes of a strategic study bearing in mind unknowns

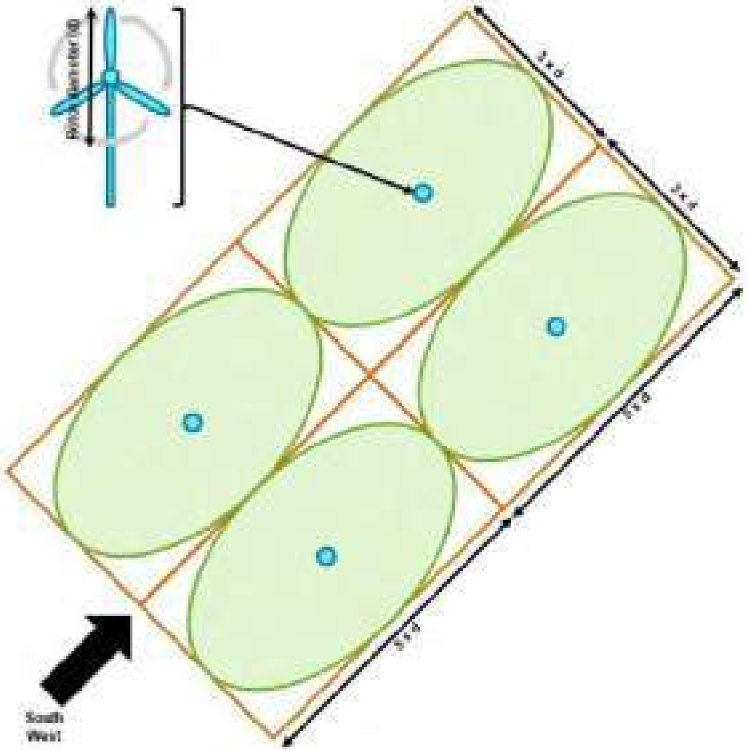
Parameter	Assumption	Data Source	Justification and Notes
	■ Woodland as shown on the National Forest Inventory with a 50m buffer including: – Assumed woodland; – Broadleaved; – Conifer; – Coppice; – Coppice with standards; – Low density; – Mixed mainly broadleaved; – Mixed mainly conifer; and – Young trees.		concerning tree height and turbine dimensions. In addition, a 50m buffer cannot be applied to all linear habitat features and individual trees due to a lack of data for a study of this scale. Further site specific study would therefore be required to accurately define buffer distances between turbines and adjacent woodland. The following National Forestry Inventory categories of woodland were considered non-permanent or non-woodland and therefore not excluded as wind turbine development may be suitable in these locations: ■ Cloud/shadow; ■ Failed; ■ Felled; ■ Group prep; ■ Shrub; ■ Uncertain; and ■ Windblown.
Biodiversity (International Designations)	Exclude international designations: ■ Special Protection Areas (SPA); ■ Special Areas of Conservation (SAC); ■ Ramsar sites.	■ Natural England	As protected by: ■ Conservation of Habitats and Species Regulations 2017 (as amended) The following designations would also be considered constraints however none are present within the study area: ■ Potential SAC ■ Potential SPA ■ Proposed Ramsar sites
Biodiversity (National Designations)	Exclude national designations: ■ Sites of Special Scientific Interest (SSSI); and ■ National Nature Reserves.	■ Natural England	As protected by: ■ Wildlife and Countryside Act 1981 ■ Conservation of Habitats and Species Regulations 2017 (as amended)

Parameter	Assumption	Data Source	Justification and Notes
Biodiversity (Regional and Local Designations)	Exclude other designations: ▪ The Great Fen; ▪ The Great Fen Landscape and Visual setting. ▪ Local Nature Reserves; and ▪ County Wildlife Sites (CWS).	▪ Natural England ▪ Huntingdonshire District Council	Generally, would not be suitable for renewables development based on law/policy/guidance including: ▪ NPPF ▪ Natural Environment and Rural Communities Act 2006 ▪ Huntingdonshire's Local Plan to 2036 (Adopted May 2019) It is noted that further site-specific study would be required to consider non-designated features. Note: The linear County Wildlife Sites (CWSs) data contains only line data. This contains rivers, that all intersect the OS surface water data. Therefore, the available OS surface water datasets (see above) were used to represent the linear CWSs in this assessment.
Cultural Heritage	Exclude: ▪ Registered Parks and Gardens; ▪ Scheduled Monuments; ▪ Listed Buildings; ▪ Conservation Areas.	▪ Historic England ▪ Huntingdonshire District Council	As protected by: ▪ NPPF ▪ National Heritage Act 1983 ▪ Ancient Monuments and Archaeological Areas Act of 1979 ▪ Planning (Listed Buildings and Conservation Areas) Act 1990 ▪ Huntingdonshire's Local Plan to 2036 (Adopted May 2019) Registered Battlefields and World Heritage Sites (core sites) would also be considered constrains to wind development, however there are none located within the authority. It is noted that further site specific study would be required to determine if any unexpected archaeological remains or undesignated but nationally significant features are present that would require consideration, as well as the setting of historic features. Note: Listed building point data was buffered 5m to estimate building footprints.
Minimum Development Size	Unconstrained areas of land were excluded if they were below a minimum developable	▪ N/A	The minimum development size was based on developer knowledge of recent wind turbine developments, and accounts for the estimated land take requirements for a

Parameter	Assumption	Data Source	Justification and Notes
	size of 40m width and an area that varied per turbine size: ▪ Very large: 0.8ha ▪ Large: 0.6ha ▪ Medium: 0.4ha ▪ Small: 0.2ha		single turbine base, the adjacent laydown area and other immediate infrastructure requirements adjacent to the turbine itself. However, further site specific study would be required in order to determine the land take requirements of individual turbines depending on factors such as their model and location.
Turbine Spacing	The following standardised turbine densities were considered when determining the overall potential for turbine development across Huntingdonshire: ▪ Very large: 4 per km^2 (assuming a rotor diameter of 130m) ▪ Large: 8 per km^2 (assuming a rotor diameter of 90m) ▪ Medium: 22 per km^2 (assuming a rotor diameter of 55m) ▪ Small: 167 per km^2 (assuming a rotor diameter of 20m)	▪ N/A	The calculation of potential wind capacity involved applying an assumption concerning development density. In practice, turbines are spaced within developments based on varying multiples of the rotor diameter length. Although turbine separation distances vary, a 5 x 3 rotor diameter oval spacing[27], with the major axis of the oval oriented towards the prevailing wind direction, taken to be south-west as the 'default' assumption in the UK, was considered a reasonable general assumption at the present time in this respect. This is based on industry knowledge of recent developer applications. In practice, site-specific factors such as prevailing wind direction, turbine model and varying rotor diameters, and turbulence are taken into account by developers, in discussion with turbine manufacturers. Bearing in mind the strategic nature of the present study, the density calculation did not take into account the site shape, and a standardised rectangular grid density based on a 5 x 3 rotor diameter was used instead (see image below).

[27] To mitigate impacts on the productivity of wind turbines located close to one another caused by wind turbulence, it is standard practice for developers to maintain an oval of separation between turbines that is equal to 5 times the turbine rotor diameter (the cross sectional dimension of the circle swept by the rotating blades) on the long axis, and 3 times the rotor diameter on the short axis.

Figure A - 1: Wind turbine spacing



A.10 The parameters below have not been used to exclude land for the purposes of this study. This does not mean that these constraints are not present or do not require consideration on a specific site.

Table A - 4: Proposed assumptions to be used for assessment of technical potential for onshore wind – Constraints considered but not used

Parameter	Assumption	Data Source	Justification and Notes
Wildlife Trust Sites	▪ No land excluded on this basis.	▪ Wildlife Trust	Wildlife Trust reserve data was not available to use for this project. Further site specific study would be required to consider these sites.
Electricity Grid	No land excluded on this basis.	▪ UK Power Networks	General commentary was provided on the current state of grid capacity within Huntingdonshire to inform the assessment of deployment potential. However, as grid capacity is so variable with little certainty in advance of where there could be capacity for additional electricity generation to be connected, no land was excluded on this basis for the technical assessment. Further consultation would be required with UKPN to determine the feasibility to connect specific sites to the electricity grid. Moreover, for larger wind turbine schemes, developers commonly deliver substations and additional grid infrastructure as required to support the additional generation capacity requirements of the development, limiting concerns regarding connecting to constrained parts of the existing grid.
NATS Safeguarding Areas	Guidance includes reference to the following safeguarding areas: ▪ 30km for aerodromes with a surveillance radar facility; ▪ 17km for non-radar equipped aerodromes with a runway of 1,100m or more, or 5km for those with a shorter runway; ▪ 4km for non-radar equipped unlicensed aerodrome with a runway of more than 800m or 3km with a shorter runway; ▪ 10km for the air-ground-air communication stations and navigation aids; and	▪ NATS	Further consultation between potential developers and NATS is required to determine if there is any impact from a proposed development. NATS safeguarding areas were therefore not excluded.

Parameter	Assumption	Data Source	Justification and Notes
	■ 15 nautical miles (nm) for secondary surveillance radar. These are indicative of potential constraints to wind development but cannot be used to definitely exclude land as unsuitable. They are generally presented as separate figures alongside the main assessment of technical potential.		
Shadow Flicker	No land excluded on this basis.	■ N/A	Wind turbines may in some circumstances cause 'shadow flicker' within nearby properties. However, shadow flicker effects can be readily mitigated and so shadow flicker was not considered as a constraint for the purposes of this study.
Residential Amenity	No land excluded on this basis.	■ N/A	It is noted that it may be inappropriate to develop wind turbines in proximity to residential properties, due to impacts upon residential amenity. However, due to the potential for micro siting, property aspect and potential for mitigation, it would require further site specific study to determine whether wind turbines would be suitable in proximity to residential properties. Therefore, this factor would require consideration within a site specific residential and visual amenity assessment.
Public Rights of Way and Cycle Paths	No land excluded on this basis.	■ Huntingdonshire District Council ■ SusTrans	Public Rights of Way and cycle paths can diverted if necessary to ensure they are safely distanced from wind turbines. Public Rights of Way and cycle paths were therefore not excluded.
Green infrastructure	No land excluded on this basis.	■ N/A	It is noted that it may be inappropriate to develop wind turbines in some areas of designated green infrastructure, however it is not wholly prohibited by policy and therefore wind could be developed in these locations. Further site specific study would be required to consider these areas.
Geological designations	No land excluded on this basis.	■ N/A	As protected by: ■ Town and Country Planning Act 1990 ■ Huntingdonshire's Local Plan to 2036 (Adopted May 2019)

Parameter	Assumption	Data Source	Justification and Notes
			However, no GIS data was available for these sites. Further site specific study would be required to consider these designations.
Blade oversail of biodiversity and cultural heritage designations	No land excluded on this basis.	■ N/A	Depending on individual designated site characteristics, it may not be suitable for the blades of adjacent wind turbines to oversail the site. However, this is site dependent and would require further studies. As such, a blade oversail buffer was not excluded.

Ground-Mounted Solar Resource Assessment Parameters

A.11 Huntingdonshire's technical potential for ground mounted solar PV development was assessed in a similar way to the potential for wind. The key GIS tool parameters are set out in **Table A - 5** below.

A.12 The maximum solar PV capacity of the area of technical potential was estimated using an assumed development density expressed as Megawatts (MW) per hectare; and regional capacity factor[25] (again, derived from historic data broken down to at least regional level).

A.13 As solar PV is essentially modular, the land with technical potential was not differentiated by project scale.

Table A - 5: Proposed assumptions to be used for assessment of technical potential for commercial/large scale ground-mounted solar – Constraints

Parameter	Assumption	Data Source	Justification and Notes
Development Size Categories	None.	▪ N/A	Solar development is more 'modular' than wind (development size is dictated by the number of panels, which themselves do not differ greatly in size) and constraints are not affected by project scale in the way that they are for wind. Therefore, the identification of available land for ground-mounted solar has not been broken down into discrete project sizes but rather any land technically suitable for development has been identified.
Roads	Exclude: ▪ Roads.	▪ Ordnance Survey OpenRoads	Physical features preventing the development of ground-mounted solar PV were excluded. There is no requirement for safety buffers in relation to these with respect to ground-mounted solar PV. Restricted access tracks were excluded from consideration as these predominantly comprise of forestry and other tracks which could be more easily diverted than standards roads. Note: Only line data for roads was available and in order to create a footprint from the road centre, it was assumed that single carriageways are 10m in width, dual carriageways 20m and motorways 30m.
Railways	Exclude: ▪ Railways.	▪ Ordnance Survey VectorMap District	Physical features preventing the development of ground-mounted solar PV were excluded. There is no requirement for safety buffers in relation to these with respect to ground-mounted solar PV.

[25] An energy generator's 'capacity factor' can be defined as the actual energy yield produced over a period of time expressed as a proportion of the energy yield that would have been produced if the generator had operated at its full generation capacity continuously over the same period. This was averaged at 10.1% for the East of England over the past 12 years. BEIS and DESNZ (2023) Quarterly and annual load factors. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors

Parameter	Assumption	Data Source	Justification and Notes
			Note: In order to create a footprint from the railway centrelines data, it was assumed that railways were 15m in width.
Planning/Land Use Other	Exclude: ■ Registered Common Land; ■ Open Access Land; ■ Country Parks; and ■ Locally designated open space.	■ Natural England ■ Huntingdonshire District Council	Due to land take requirements, these land uses/types were considered generally to constrain ground-mounted solar development, particularly at larger scales, although in some circumstances they may offer opportunities for smaller scale development collocated with their other facilities. They were excluded from the resource assessment but may be subject to bespoke policies with the Local Plan allowing development to take place in principle subject to defined criteria being satisfied.
MOD Land	Exclude: ■ MOD land.	■ OpenStreetMap	MOD land was considered unsuitable for solar development, as this land is already in use for MOD activities. Further consultation with the MOD would be required to determine if there is any potential for solar development to be delivered on this land. Due to the sensitive nature of this data, these sites were included as constraints to development within the assessment, but were not individually mapped.
Buildings	Exclude: ■ All buildings with a 10m buffer.	■ OS OpenMap Local data	Buildings were buffered by 10m to account for shading and impacts on solar output. It is noted that further site specific study considering building heights and orientation in relation to the site would be required to determine the exact buffers required to account for shading.
Future Developments, Safeguarded Land and Employment Sites	Exclude: ■ Site allocations from Huntingdonshire's Plan: – Mixed use sites; – Housing sites; – Employment sites; – Recreation sites; – Site allocations; – Local Employment Areas; and	■ Huntingdonshire District Council	Generally these will be unsuitable for ground-mounted solar, although there may be some potential for installations on undeveloped land/open space within these areas. Identification of this potential would require a separate, site-specific study. In addition, it is assumed that opportunities for renewables within such sites will already be in development as part of their allocation.

Parameter	Assumption	Data Source	Justification and Notes
	– Established Employment Areas.		
Existing Renewable Energy Developments	Exclude: ■ Land boundaries of consented and operational renewable energy installations.	■ Huntingdonshire District Council ■ BEIS (now DESNZ) ■ Aerial imagery ■ LUC windfarm database	The quarterly BEIS (DESNZ) Renewable Energy Planning Database, Huntingdonshire Council data and the LUC internal windfarm database was used to determine the locations of operational and consented renewable energy installations. To approximate the site boundary, land was excluded based on Huntingdonshire Council boundary data in combination with assessment of surrounding recent aerial imagery. For existing wind developments, it was assumed these were of notional medium scale tip height and occupied a 5 x 3 rotor diameter oval spacing[29], with the major axis of the oval oriented towards the prevailing wind direction, taken to be south-west (see turbine spacing below). Existing roof-mounded solar PV developments are building-integrated and therefore were excluded via the consideration of existing built development as a constraint. Additionally, existing landfill gas developments were not considered a constraint to solar developments, as there is potential that turbines could be incorporated onto such existing sites. Existing battery developments were not included as, due to their small scale, their exact location within a site was difficult to identify. Moreover, there is potential for battery and solar developments to also be co-located.
Minerals Sites with a 250m buffer	Exclude: ■ All operational minerals sites with a 250m buffer ■ Allocated minerals sites with a 250m buffer	■ Huntingdonshire District Council	The IAQM 2016 Guidance on the Assessment of Mineral Dust Impacts for Planning indicates that adverse dust impacts from sand and gravel sites are uncommon beyond 250m and beyond 400m from hard rock quarries measured from the nearest dust generating activities. The data provided by Huntingdonshire District Council was from July 2021. Developers would need to consider more recent applications as part of further site specific study.
All operational waste Sites	Exclude: ■ All operational waste sites	■ Huntingdonshire District Council	Waste sites will frequently be quite highly constrained with respect to ground-mounted solar development (e.g. areas of active landfill) but equally may present opportunities in some circumstances, particularly when they are to be

[29] To mitigate impacts on the productivity of wind turbines located close to one another caused by wind turbulence, it is standard practice for developers to maintain an oval of separation between turbines that is equal to 5 times the turbine rotor diameter (the cross sectional dimension of the circle swept by the rotating blades) on the long axis, and 3 times the rotor diameter on the short axis.

Parameter	Assumption	Data Source	Justification and Notes
	■ Allocated waste sites		decommissioned/restored during a plan period. Waste sites were therefore excluded from the identified ground-mounted solar resource but potentially subject to bespoke policy wording in the local plan. The data provided by Huntingdonshire District Council was from July 2021. Developers would need to consider more recent applications as part of further site specific study.
Terrain	Exclude: ■ Areas with north-east to north-west aspect and inclinations greater than 7 degrees; and ■ All areas with inclinations greater than 15 degrees.	■ EA Lidar DTM	Although it is possible to develop Ground-mounted solar PV installations on slopes facing north-east to north-west, it would generally not be economically viable to do so. However, slopes that are north-east to north-west facing and below 7° are considered potentially suitable[10], as generation output will not be significantly affected.
Agricultural Land Use	Exclude: ■ Agricultural land use classifications grades 1.	■ Natural England ■ Huntingdonshire District Council	Agricultural Land Use is a consideration, with grades 1, 2 and 3a land being classed as *"the best and more versatile (BMV)"* land and having higher value for food production. Further investigation would be required of grade 3 land to determine whether it is grade 3a or b, as available data does not distinguish these. Ground-mounted Solar PV projects, over 50kWp, should ideally utilise previously developed land, brownfield land, contaminated land, industrial land or agricultural land preferably of classification 3b, 4, and 5. However, solar developments can be built on BMV land, if they have been deemed to pass the sequential test, whereby sites on lower grade a non-agricultural land are prioritised over BNM land. Within Huntingdonshire, the majority of land is grades 1, 2 or 3 agricultural land, and there are existing solar farms present on some of this. As such, only grade 1 (excellent quality) agricultural land was treated as a constraint to solar development, and further site-specific study would be required to determine if sites on lower grade BMV would be suitable based on the sequential text.

[10] Based on current standard developer practice.

Parameter	Assumption	Data Source	Justification and Notes
Water Environment	Exclude: ▪ Watercourses and waterbodies with a 50m buffer.	▪ Ordnance Survey OpenMap Local	A 50m buffer was applied around all rivers and waterbodies to take account of good practice such as that relating to pollution control during construction. OS Survey OpenMap Local surface water area data includes waterways of approximately a minimum of 2m width. OpenMap Local surface water line data is line data, and so a 1m buffer was applied to approximate a footprint of smaller waterways.
Woodland	Exclude: ▪ Ancient Woodland Inventory with a 20m buffer; and ▪ Woodland as shown on the National Forest Inventory with a 20m buffer including: – Assumed woodland; – Broadleaved; – Conifer; – Coppice; – Coppice with standards; – Failed; – Felled; – Group prep; – Low density; – Mixed mainly broadleaved; – Mixed mainly conifer; – Shrub; and – Young trees.	▪ Forestry Commission ▪ Natural England	Forested areas were buffered by 20m to account for shading and impacts on solar output. It is noted that further site specific study considering woodland heights and orientation in relation to the site would be required to determine the exact buffers required to account for shading. The following National Forestry Inventory categories of woodland were considered non-permanent or non-woodland and therefore not excluded as ground mounted solar development may be suitable in these locations: ▪ Cloud/shadow; ▪ Uncertain; and ▪ Windblown.
Biodiversity (International Designations)	Exclude international designations: ▪ Special Protection Areas (SPA);	▪ Natural England	As protected by: ▪ Conservation of Habitats and Species Regulations 2017 (as amended)

Parameter	Assumption	Data Source	Justification and Notes
	■ Special Areas of Conservation (SAC); ■ Ramsar sites.		The following designations would also be considered constraints however none are present within the study area: ■ Potential SAC ■ Potential SPA ■ Proposed Ramsar sites
Biodiversity (National Designations)	Exclude national designations: ■ Sites of Special Scientific Interest (SSSI); and ■ National Nature Reserves.	■ Natural England	As protected by: ■ Wildlife and Countryside Act 1981 ■ Conservation of Habitats and Species Regulations 2017 (as amended)
Biodiversity (Regional and Local Designations)	Exclude other designations: ■ The Great Fen; ■ The Great Fen Landscape and Visual setting; ■ Local Nature Reserves; and ■ County Wildlife Sites (CWS).	■ Natural England ■ Huntingdonshire District Council	Generally, would not be suitable for renewables development based on law/policy/guidance including: ■ NPPF ■ Natural Environment and Rural Communities Act 2006 ■ Huntingdonshire's Local Plan to 2036 (Adopted May 2019) It is noted that further site-specific study would be required to consider non-designated features. Note: The linear County Wildlife Sites (CWSs) data contains only line data. This contains rivers, that all intersect the OS surface water data. Therefore, the available OS surface water datasets (see above) were used to represent the linear CWSs in this assessment.
Cultural Heritage	Exclude: ■ Registered Parks and Gardens; ■ Scheduled Monuments; ■ Listed Buildings; ■ Conservation Areas.	■ Historic England ■ Huntingdonshire District Council	As protected by: ■ NPPF ■ National Heritage Act 1983 ■ Ancient Monuments and Archaeological Areas Act of 1979 ■ Planning (Listed Buildings and Conservation Areas) Act 1990 ■ Huntingdonshire's Local Plan to 2036 (Adopted May 2019)

Parameter	Assumption	Data Source	Justification and Notes
			Registered Battlefields and World Heritage Sites (core sites) would also be considered constrains to solar development, however there are none located within the authority. It is noted that further site specific study would be required to determine if any unexpected archaeological remains or undesignated but nationally significant features are present that would require consideration, as well as the setting of historic features. Note: Listed building point data was buffered 5m to estimate building footprints.
Minimum Development Size	Unconstrained areas of land were excluded if they were below a minimum developable size of 0.6ha.	▪ N/A	A minimum development size of 0.6ha (0.5MW) was set in agreement with Huntingdonshire District Council.
Development Density	1.2 hectares per MW.	▪ N/A	The Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) states that, along with associated infrastructure, generally a solar farm requires between 2 to 4 acres for each MW of output. This equates to 0.8-1.6ha per MW. For this study, the average of 1.2ha per MW was used. It its noted that on sites where solar farms are co-located with wind turbines, the value of MW per ha may increase as infrastructure may be able to be shared between the technologies.

A.14 The parameters below have not been used for the purposes of this study. This does not mean that these constraints are not present or do not require consideration on a specific site.

Table A - 6: Proposed assumptions to be used for assessment of technical potential for commercial/large scale ground-mounted solar – Constraints considered but not used

Parameter	Assumption	Data Source	Justification and Notes
Wildlife Trust Sites	▪ No land excluded on this basis.	▪ Wildlife Trust	Wildlife Trust reserve data was not available to use for this project. Further site specific study would be required to consider these sites.
Solar Irradiance	No land excluded on this basis.	▪ Global Solar Atlas	Using modern solar panel technology, the vast majority of land within England is deemed suitable for solar panel development in terms of solar irradiance. Any land unsuitable due to slope and aspect which limit the total hours of direct daily sunlight

Parameter	Assumption	Data Source	Justification and Notes
			within a location, were excluded from consideration as based on the above constraints table. Therefore, no land was excluded from this assessment based on this, and solar irradiance levels they were mapped for information only to indicate where the more productive sites may be located.
Electricity Grid	No land excluded on this basis.	▪ UK Power Networks	Grid connection is a key consideration for solar developments, as additional grid connections costs, such as long cable distances and additional substation requirements, can significantly hinder the economic viability of this technology. General commentary was provided on the current state of grid capacity within Huntingdonshire to inform the assessment of deployment potential. However, as grid capacity is so variable with little certainty in advance of where there could be capacity for additional electricity generation to be connected, no land was excluded on this basis for the technical assessment. Further consultation would be required with UKPN to determine the feasibility to connect specific sites to the electricity grid.
Gas pipelines	No land excluded on this basis.	▪ National Grid	Although the presence of buried pipelines could impact the suitability of overlaying above-ground solar panels, mitigation and panel layout design can be applied to limit impacts. Further site-specific study would be required to consider this parameter. As such, no land was excluded on this basis.
Electricity lines	No land excluded on this basis.	▪ Ordnance Survey OpenMap ▪ National Grid ▪ UK Power Networks	Although overhead lines have the potential to cause some limited shading of solar panels, and thereby impact on potential PV generation potential, panel layout design can limit impacts. Further site-specific study would be required to consider this parameter. As such, no land was excluded on this basis.
Residential Amenity	No land excluded on this basis.	▪ N/A	It is noted that it may be inappropriate to develop solar farms in proximity to residential properties, due to impacts upon residential amenity. However, due to the potential for micro siting, property aspect and potential for mitigation, it would require further site specific study to determine whether solar developments would be suitable in proximity to residential properties.

Parameter	Assumption	Data Source	Justification and Notes
			Therefore, this factor was considered within the landscape sensitivity assessment and no land was excluded on this basis from the technical assessment.
Public Rights of Way/Cycle Paths	No land excluded on this basis.	▪ Huntingdonshire District Council ▪ DEFRA ▪ SusTrans	Public Rights of Way and cycle paths can be diverted if necessary around or safely through ground mounted solar developments, and these impacts are considered as part of the assumed development density. Public Rights of Way and cycle paths were therefore not excluded.
Airports and Airfields	No land excluded on this basis.	▪ Ordnance Survey OpenMap Local Functional Site layer with the theme 'Air Transport' ▪ Aerial imagery	Glint and glare caused by solar panels is a consideration for aviation safety. However, this is site dependent and scheme design can enable solar developments to be situated within airports and airfields themselves. As such, only the airport and airfield buildings and hardstanding should treated as constraints to solar development. Although airport buildings were treated as constraints to solar development, considered under *"Buildings"*, no spatial data was available to map runways and in-use airport hardstanding. Therefore, further site-specific study would be required to consider these.
Green infrastructure	No land excluded on this basis.	▪ N/A	It is noted that it may be inappropriate to develop ground mounted solar in some areas of designated green infrastructure, however it is not wholly prohibited by policy and therefore solar could be developed in these locations. Further site specific study would be required to consider these areas.
Geological designations	No land excluded on this basis.	▪ N/A	As protected by: ▪ Town and Country Planning Act 1990 ▪ Huntingdonshire's Local Plan to 2036 (Adopted May 2019) However, not GIS data was available for these sites. Further site specific study would be required to consider these designations.

Rooftop Solar Resource Assessment

A.15 The total potential capacity of roof mounted solar was estimated based on typical system sizes and the estimated percentage of suitable roof space within the study area. Roofs that have potential to deliver solar PV also have the potential to deliver solar water heating generation. However, this was treated as being mutually exclusive with solar PV potential, i.e. the same roof space can only be utilised for one of the technologies. Generation potential was therefore calculated for each technology for separate comparison.

Table A - 7: Solar PV resource assessment assumptions

Parameter	Assumption	Data Source	Justification and Notes
System Size	Average size of system based on property type: ▪ Detached[31]: 5.2kW ▪ Semi-detached[31]: 3.5kW ▪ Terrace/end-terrace[31]: 1.7kW ▪ Non-domestic[32]: 90kW	▪ BEIS (now DESNZ)	Typical system sizes for dwellings were estimated based on Energy Saving Trust and Jinko Solar data[33]. Due to lack of appropriate data on typical system sizes and suitability of roofs, dwellings classed as 'flats', 'in part of a converted or shared house (including bedsits)' and those classed as 'other dwellings' were not included within the assessment. Average sized solar PV systems in Huntingdonshire for non-domestic installations recorded on the FiT Register up to March 2019 was 90kW.
Suitable Roofs	Proportion of properties with suitable roofs (estimate): ▪ 40% of dwellings[34]; and ▪ 75% of non-domestic properties[35].	▪ OS Addressbase ▪ OS OpenMap	Proportions estimated from prior research undertaken by CSE, which considered suitable type and orientation of roof, and space availability[36]. Conservation areas and listed buildings were not treated as constraints to rooftop solar generation. Permitted development rights in England allow solar to be installed within conservation areas provided this is not on walls fronting a highway. In addition, rooftops solar generation has the potential to be installed in this circumstance and on any listed buildings through the granting of planning permission.

[31] Energy Saving Trust (2024) Solar panel calculator. Available at: https://energysavingtrust.org.uk/tool/solar-energy-calculator/. Assumption of a sloping roof. The calculator advises on average you can have up to 12 panels on a detached house, 8 panels on a semi-detached house and 4 panels on a terraced house. Jinko Solar (2024) Tiger Neo. Available at: https://www.jinkosolar.com/en/site/tigerneo. Assumption of 430w solar panel modules being used.
[32] BEIS and DESNZ (2020) Sub-regional Feed-in Tariffs statistics: March 2019. Available at: https://www.gov.uk/government/statistical-data-sets/sub-regional-feed-in-tariffs-confirmed-on-the-cfr-statistics
[33] Energy Saving Trust (2024) Solar panel calculator. Available at: https://energysavingtrust.org.uk/tool/solar-energy-calculator/. Assumption of a sloping roof. The calculator advises on average you can have up to 12 panels on a detached house, 8 panels on a semi-detached house and 4 panels on a terraced house. Jinko Solar (2024) Tiger Neo. Available at: https://www.jinkosolar.com/en/site/tigerneo. Assumption of 430w solar panel modules being used.
[34] Detached, semi-detached and terrace/end terrace.
[35] Excluding land, car parking, utilities, marina and moorings, and objects of interest.
[36] LUC and CSE (2020) Test Valley Renewable and Low Carbon Energy Study. Available at: https://www.testvalley.gov.uk/planning-and-building/planningpolicy/evidence-base/evidence-base-environment

Parameter	Assumption	Data Source	Justification and Notes
			Properties were included in the assessment based on Huntingdonshire LLPG Address data (see **Table A - 1**). Note: Where OS OpenMap buildings did not overlay address points data, these buildings were assumed to be of commercial use, most often forming outbuildings to properties such as agricultural buildings.

Table A - 8: Solar water heating resource assessment assumptions

Parameter	Assumption	Data Source	Justification and Notes
System Size	Average size of system based on property type: ▪ Domestic: 4kW ▪ Non-domestic: 90kW	▪ BEIS (now DESNZ)	Average sizes for solar water heating systems obtained from RHI deployment data[37]. Due to lack of appropriate data on typical system sizes and suitability of roofs, dwellings classed as 'flats', 'in part of a converted or shared house (including bedsits)' and those classed as 'other dwellings' were not included within the assessment.
Suitable Roofs	See above – the same as for roof-mounted solar PV.	▪ See above – the same as for roof-mounted solar PV.	See above – the same as for roof-mounted solar PV.
Heating Fuel Offset	Heating fuel assumed to be offset: ▪ Electricity: 50% of off-gas properties ▪ Oil: 50% of off-gas properties ▪ Gas: All on-gas properties	▪ BEIS (now DESNZ)	The actual proportions of electricity and oil usage by off-gas properties is unknown. As such, an illustrative 50% or these properties are estimated to be fuelled by electricity and 50% by oil for the purposes of this study.

[37] DESNZ (2024) RHI monthly deployment data: March 2024 (Annual edition). Available at: https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-march-2024-annual-edition

Hydropower

A.16 It has not been possible within the scope of this study to undertake a new assessment of the potential hydropower resource within Huntingdonshire.

A.17 However, in 2010 the Environment Agency published the findings of a study identifying hydropower opportunities within England and Wales. This was produced to provide an overview at national and regional scales of the potential hydropower opportunities available, as well as the relative environmental sensitivity of identified potential sites to development. These findings were reviewed as part of this study. It is noted that this data is indicative and that further site specific study would be required in order to determine the technical potential and suitability of sites for hydropower developments.

A.18 The study included identifying 'heavily modified water bodies' that are identified as being at significant risk of failing to achieve good ecological status because of modifications to their hydromorphological characteristics resulting from past engineering works, including impounding works. Due to these characteristics, such waterbodies were identified as having the potential to create hydropower barriers that would also be beneficial to the passage of fish upstream. These were overlayed with identified locations where suitable yearly flow characteristics are present and could feasibly support hydropower sites. The resultant identified sites were classified as 'win-win' opportunities where hydropower developments could potentially be installed whilst also improving the ecological status of waterways.

Heat Pumps

Air Source Heat Pumps

A.19 Almost any building theoretically has the potential for an air source heat pump to be installed. Therefore, the assessment considered the potential for air source heat pumps to be delivered in all buildings.

Table A - 9: Air source heat pump resource assessment assumptions

Parameter	Assumption	Data Source	Justification and Notes
System Size	Average size of system based on property type: ■ Domestic: 4kW ■ Non-domestic: 90kW	■ BEIS (now DESNZ) ■ OS Addressbase ■ OS OpenMap	Average sizes for air source heat pump systems obtained from RHI deployment data[39]. Due to a lack of appropriate data on typical system sizes and suitability of individual properties, dwellings classed as 'flats' and those classed as 'other dwellings' were not included within the assessment.
Heating Fuel Offset	SPF: 3.6 (efficiency of 72%). Heating fuel assumed to be offset: ■ Electricity: 50% of off-gas properties ■ Oil: 50% of off-gas properties ■ Gas: All on-gas properties	■ BEIS (now DESNZ)	SPF derived from BEIS (now DESNZ) Renewable Heat Incentive data: 3.6[40]. For every 3.6kW of heat generated, offsetting CO_2 from the existing heating fuel (gas/oil/electricity), 1kW of energy is consumed, contributing to CO_2 generated by consuming electricity.

[39] DESNZ (2024) RHI monthly deployment data: March 2024 (Annual edition). Available at: https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-march-2024-annual-edition
[40] DESNZ (2024) RHI monthly deployment data: March 2024 (Annual edition). Available at: https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-march-2024-annual-edition

Parameter	Assumption	Data Source	Justification and Notes
			The actual proportions of electricity and oil usage by off-gas properties is unknown. As such, an illustrative 50% or these properties are estimated to be fuelled by electricity and 50% by oil for the purposes of this study.

Ground Source Heat Pumps

A.20 Ground source heat pumps require more space than air source, requiring pipes to be buried vertically in a deeper system or horizontally in a shallow wider system. Due to these significant space constraints, this study did not estimate the potential capacity of ground source heat pumps across the study area, as it was not possible to estimate how many properties have access to the required space.

A.21 It is noted however that the average system size of domestic pumps are 10.2kW[40].

Open Loop Ground Source Heat Pumps

A.22 The British Geological Survey has produced a map identifying the potential viability of open-loop ground source heat pumps across England and Wales, considering hydrogeological and economic factors[41]. This was reviewed as part of this study.

A.23 However, the British Geological Survey states that this is an initial screening assessment only and that identified areas favourable for open-loop systems are not automatically suitable for this technology to be installed. Instead, detailed environmental assessment of proposed sites would be required, considering local variations in environmental conditions and factors such as the availability of water (i.e. the amount of water that is available for licensing by the Environment Agency) and discharge of water from a scheme[42]. Therefore, with the data available, it is not possible to determine the potential annual energy generation and carbon savings that could be produced by open loop ground source heat pumps within Huntingdonshire.

Water-Source Heat Pump

A.24 The DECC 2014 water source heat map identified, at a high level, opportunities for water source heat pump technologies[43]. This was reviewed as part of this study.

Biomass Resource Assessment

Virgin Woodfuel Thermal Conversion: Forestry and Woodland

A.25 To determine the potential for biomass generation from forestry and woodland, it was assumed that all woodland within the study area has a sustainable yield of two odt/yr (oven-dried tonnes/ha/year)[44] and assumptions (see **Table A - 10**) were applied. Both the potential for heating and for combined heat and power were calculated.

A.26 To identify existing suitable woodland within the study area, the Forestry Commission's National Forest Inventory (NFI) was used. The NFI records the location and extent of all forests

[40] DESNZ (2024) RHI monthly deployment data: March 2024 (Annual edition). Available at: https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-march-2024-annual-edition
[41] British Geological Survey (2021) Open-loop ground source heat pump viability screening map. Available at: https://www.bgs.ac.uk/technologies/web-map-services-wms/open-loop-ground-source-heat-pump-viability-screening-map-wms/
[42] British Geological Survey (2012) Non-Technical Guide: A screening tool for open-loop ground source heat pump schemes (England and Wales). Available at: https://www.bgs.ac.uk/geology-projects/geothermal-energy/open-loop-gshp-screening-tool/
[43] DECC (2015) National Heat Map: Water source heat map layer. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/416660/water_source_heat_map.PDF
[44] Forestry Research (2024) Potential yields of biofuels per ha p.a. Available at: https://www.forestresearch.gov.uk/tools-and-resources/fthr/biomass-energy-resources/reference-biomass/facts-figures/potential-yields-of-biofuels-per-ha-pa/

and woodland above 0.5ha across the UK and it is noted that although a sample of forests and woodland are ground surveyed every 5 years, the inventory is updated annually using aerial photography, interpretation of satellite imagery and administrative records of newly planted areas covered by government grant schemes[45]. Therefore, there can be occasional errors due to misidentification of sites not ground-surveyed.

A.27 To calculate the total capacity of the resource in MW from the annual generation potential in MWh, a national capacity factor was applied, as based on national data for plant-sourced biomass[46].

Table A - 10: Proposed assumptions to be used for assessment of technical potential for virgin woodfuel thermal conversion: forestry and woodland

Parameter	Assumption	Data Source	Justification and Notes
Woodland Resource	The following National Forestry Inventory (NFI) woodland categories within the study area were included: ▪ Broadleaved; ▪ Conifer; ▪ Coppice; ▪ Coppice with standards; ▪ Assumed woodland; ▪ Mixed mainly conifer; and ▪ Mixed mainly broadleaved. Energy generation per hectare per year: 10.3 MWh/ha/year	▪ Forestry Commission	These woodland categories were included as they were assumed to be mature and able to provide a sustainable yield of woodfuel. The following woodland categories were not included as they were assumed to currently be unable to provide a sustainable yield of woodfuel: ▪ Cloud\shadow; ▪ Failed; ▪ Felled; ▪ Ground prep; ▪ Low density; ▪ Shrub; ▪ Uncertain; ▪ Windblow; and ▪ Young trees. The non-woodland categories within the NFI were also not assessed as they do not provide woodfuel.

[45] Forestry Commission (2019) About the NFI. Available at: https://www.forestresearch.gov.uk/tools-and-resources/national-forest-inventory/about-the-nfi/

[46] DESNZ (2023) Load factors for renewable electricity generation (DUKES 6.3). Available at: https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes

Parameter	Assumption	Data Source	Justification and Notes
			The assumed energy generation per hectare per year is derived from Forestry Commission data[47].
Constraints	The following constrained areas of woodland were excluded from the assessment: ▪ Ancient woodland; ▪ Special Protection Areas (SPA); ▪ Special Areas of Conservation (SAC); ▪ Ramsar sites; ▪ Sites of Special Scientific Interest; ▪ National Nature Reserves; ▪ Local Nature Reserves; ▪ County Wildlife Sites; ▪ The Great Fen; ▪ The Great Fen Landscape and Visual setting; ▪ Registered Parks and Gardens; ▪ Scheduled Monuments; ▪ Listed Buildings; ▪ Conservation Areas; ▪ Future developments, safeguarded land and employment sites; and ▪ MOD land.	▪ Natural England ▪ Huntingdonshire District Council	As protected by: ▪ Conservation of Habitats and Species Regulations 2017 (as amended) ▪ Wildlife and Countryside Act 1981 ▪ Conservation of Habitats and Species Regulations 2017 (as amended) ▪ NPPF ▪ Natural Environment and Rural Communities Act 2006 ▪ Huntingdonshire's Local Plan to 2036 (Adopted May 2019) The following designations would also be considered constraints however none are present within the study area: ▪ Potential SAC ▪ Potential SPA ▪ Proposed Ramsar sites ▪ Registered Battlefields ▪ World Heritage Sites (core sites) It is noted that further site-specific study would be required to consider non-designated biodiversity and cultural heritage features. Note: Listed building point data was buffered 5m to estimate building footprints. Note: The linear County Wildlife Sites (CWSs) data contains only line data. This contains rivers, that all intersect the OS surface water data. Therefore, the available OS surface water datasets (see above) were used to represent the linear CWSs in this assessment.

[47] Forestry Research (2024) Potential yields of biofuels per ha p.a. Available at: https://www.forestresearch.gov.uk/tools-and-resources/fthr/biomass-energy-resources/reference-biomass/facts-figures/potential-yields-of-biofuels-per-ha-pa/ Data for Wood (forestry residues, SRW, thinnings, etc.).

Parameter	Assumption	Data Source	Justification and Notes
Heating Fuel Offset: Heating Only	Boiler efficiency assumed to be 77%[48]. Heating fuel assumed to be offset: ■ Electricity: 50% of off-gas properties ■ Oil: 50% of off-gas properties ■ Gas: All on-gas properties	■ BEIS (now DESNZ)	Biomass boiler efficiency derived from research by BEIS (DESNZ)[49]. The actual proportions of electricity and oil usage by off-gas properties is unknown. As such, an illustrative 50% or these properties are estimated to be fuelled by electricity and 50% by oil for the purposes of this study.
Fuel Offset: Combined Heat and Power (CHP)	CHP efficiency: ■ Electricity: 30% ■ Heating: 50% Heating fuel assumed to be offset: ■ Electricity: 50% of off-gas properties ■ Oil: 50% of off-gas properties ■ Gas: All on-gas properties	■ CSE	Average CHP efficiencies estimated from prior research undertaken by CSE[50].

Virgin Woodfuel Thermal Conversion: Energy Crops

A.28 To determine the potential for biomass generation via thermal conversion (burning within a boiler) from the two main woodfuel energy crops Miscanthus and Short Rotation Coppice (SRC), the below assumptions (**Table A - 11**) were applied. Both the potential for heating and for combined heat and power were calculated.

[48] BEIS and DESNZ (2018) Measurement of the in-situ performance of solid biomass boilers. Available at: https://www.gov.uk/government/publications/biomass-boilers-measurement-of-in-situ-performance. As this study is calculating the potential energy generation from a known amount of fuel, as opposed to an infinite energy supply such as wind, only the boiler efficiency was considered to calculate the overall energy generation potential, not the load factor for biomass boilers, which considered the percentage of time a boiler is operating at peak output annually.
[49] BEIS and DESNZ (2018) Measurement of the in-situ performance of solid biomass boilers. Available at: https://www.gov.uk/government/publications/biomass-boilers-measurement-of-in-situ-performance. As this study is calculating the potential energy generation from a known amount of fuel, as opposed to an infinite energy supply such as wind, only the boiler efficiency was considered to calculate the overall energy generation potential, not the load factor for biomass boilers, which considered the percentage of time a boiler is operating at peak output annually.
[50] LUC and CSE (2020) Test Valley Renewable and Low Carbon Energy Study. Available at: https://www.testvalley.gov.uk/planning-and-building/planningpolicy/evidence-base/evidence-base-environment

A.29 To calculate the total capacity of the resource in MW from the annual generation potential in MWh, a national capacity factor was applied, as based on national data for plant-sourced biomass[51].

Table A - 11: Proposed assumptions to be used for assessment of technical potential for virgin woodfuel thermal conversion: energy crops

Parameter	Assumption	Data Source	Justification and Notes
Energy Crop Resource	Yields: ▪ Miscanthus: 13 odt/ha/year ▪ SRC: 9 odt/ha/year Ratio of crops per hectare: ▪ Miscanthus: 80% ▪ SRC: 20% Energy generation per hectare per year: ▪ Miscanthus: 63 MWh/ha/year ▪ SRC: 46 MWh/ha/year	▪ Forestry Commission	Miscanthus and SRC yields and assumed energy generation per hectare per year was derived from Forestry Commission data[52]. The average proportion of miscanthus and SRC grown in the UK was derived from Defra data[53]. The analysis assumed that of the land identified as suitable for energy crops, 4ha of Miscanthus would be delivered for every 1ha of SRC.
Constraints	Agricultural land constraints for miscanthus: ▪ Grade 1 ▪ Grade 2 ▪ Grade 5 ▪ Non-agricultural land Agricultural land constraints for SRC:	▪ Aerial imagery ▪ BEIS (now DESNZ) ▪ Forestry Commission ▪ Natural England ▪ Ordnance Survey OpenRivers	The NNFCC energy crops report produced for DECC indicates that miscanthus planting should be restricted to good and moderate quality (Grade 3) and poor quality (Grade 4) agricultural land and that SRC can grow on this land as well as very poor (Grade 5) land[54]. Excellent quality (Grade 1) and very good quality (Grade 2) agricultural land has the potential to deliver the highest crop yields and as such it was assumed that food crops would be prioritised above energy crops on this land.

[51] DESNZ (2023) Load factors for renewable electricity generation (DUKES 6.3). Available at: https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes

[52] Forestry Research (2024) Potential yields of biofuels per ha p.a. Available at: https://www.forestresearch.gov.uk/tools-and-resources/fthr/biomass-energy-resources/reference-biomass/facts-figures/potential-yields-of-biofuels-per-ha-pa/. Data for Wood (forestry residues, SRW thinnings, etc.)

[53] Defra (2021) Area of crops grown for bioenergy in England and the UK: 2008-2020: Section 2: Plant biomass: miscanthus, short rotation coppice and straw. Available at: https://www.gov.uk/government/statistics/area-of-crops-grown-for-bioenergy-in-england-and-the-uk-2008-2020/section-2-plant-biomass-miscanthus-short-rotation-coppice-and-straw

[54] NNFCC (2012) Domestic Energy Crops: Potential and Constraints Review. Available at: https://www.gov.uk/government/publications/domestic-energy-crops-potential-and-constraints-review

Parameter	Assumption	Data Source	Justification and Notes
	■ Grade 1 ■ Grade 2 ■ Non-agricultural land Physical constraints: ■ Roads ■ Railways ■ Common Land ■ Open space ■ Buildings ■ Airports and airfields ■ MOD land ■ Future developments, safeguarded land and employment sites ■ Existing solar farms ■ Watercourses and waterbodies ■ Woodland and ancient woodland Natural heritage constraints: ■ Special Protection Areas (SPA) ■ Special Areas of Conservation (SAC) ■ Ramsar sites ■ Sites of Special Scientific Interest ■ National Nature Reserves ■ Local Nature Reserves ■ County Wildlife Sites ■ The Great Fen;	■ Ordnance Survey OpenMap ■ Ordnance Survey OpenRoads ■ Huntingdonshire District Council	Physical features preventing the planting of energy crops were excluded. With regards to existing renewable energy developments, only existing ground-mounted solar farms were excluded as their land take prevents crop planting. Wind turbines have a far smaller land-take and crops could in theory be planted beneath and surrounding turbines within a wind farm. In addition, designated sites were also excluded, as protected by: ■ Conservation of Habitats and Species Regulations 2017 (as amended) ■ Wildlife and Countryside Act 1981 ■ Conservation of Habitats and Species Regulations 2017 (as amended) ■ NPPF ■ Natural Environment and Rural Communities Act 2006 ■ The Convention Concerning the Protection of the World Cultural and Natural Heritage ■ National Heritage Act 1983 ■ Ancient Monuments and Archaeological Areas Act of 1979 ■ Planning (Listed Buildings and Conservation Areas) Act 1990 ■ Huntingdonshire's Local Plan to 2036 (Adopted May 2019) It is noted that further site-specific study would be required to consider non-designated biodiversity and cultural heritage features. The following designations would also be considered constraints however none are present within the study area: ■ Potential SAC ■ Potential SPA ■ Proposed Ramsar sites ■ Registered Battlefields ■ World Heritage Sites (core sites) Note: Only line data for roads was available and in order to create a footprint from the road centre, it was assumed that single carriageways are 10m in width, dual

Parameter	Assumption	Data Source	Justification and Notes
	■ The Great Fen Landscape and Visual setting; Cultural heritage constraints: ■ Registered Parks and Gardens ■ Scheduled monuments ■ Listed Buildings ■ Conservation Areas		carriageways 20m and motorways 30m. In order to create a footprint from the railway centrelines data, it was assumed that railways were 15m in width. Listed building point data was buffered 5m to estimate building footprints. Note: The linear County Wildlife Sites (CWSs) data contains only line data. This contains rivers, that all intersect the OS surface water data. Therefore, the available OS surface water datasets (see above) were used to represent the linear CWSs in this assessment.
Heating Fuel Offset: Heating Only	Boiler efficiency assumed to be 77%[33]. Heating fuel assumed to be offset: ■ Electricity: 50% of off-gas properties ■ Oil: 50% of off-gas properties ■ Gas: All on-gas properties	■ BEIS (now DESNZ)	Biomass boiler efficiency derived from research by BEIS (DESNZ)[34]. The actual proportions of electricity and oil usage by off-gas properties is unknown. As such, an illustrative 50% or these properties are estimated to be fuelled by electricity and 50% by oil for the purposes of this study.

[33] BEIS and DESNZ (2018) Measurement of the in-situ performance of solid biomass boilers. Available at: https://www.gov.uk/government/publications/biomass-boilers-measurement-of-in-situ-performance. As this study is calculating the potential energy generation from a known amount of fuel, as opposed to an infinite energy supply such as wind, only the boiler efficiency was considered to calculate the overall energy generation potential, not the load factor for biomass boilers, which considered the percentage of time a boiler is operating at peak output annually.

[34] BEIS and DESNZ (2018) Measurement of the in-situ performance of solid biomass boilers. Available at: https://www.gov.uk/government/publications/biomass-boilers-measurement-of-in-situ-performance. As this study is calculating the potential energy generation from a known amount of fuel, as opposed to an infinite energy supply such as wind, only the boiler efficiency was considered to calculate the overall energy generation potential, not the load factor for biomass boilers, which considered the percentage of time a boiler is operating at peak output annually.

Parameter	Assumption	Data Source	Justification and Notes
Fuel Offset: Combined Heat and Power (CHP)	CHP efficiency: ▪ Electricity: 30% ▪ Heating: 50% Heating fuel assumed to be offset: ▪ Electricity: 50% of off-gas properties ▪ Oil: 50% of off-gas properties ▪ Gas: All on-gas properties	▪ CSE	Average CHP efficiencies estimated from prior research undertaken by CSE[57].

Biogas from Agricultural Residues

A.30 As Huntingdonshire is predominantly rural, agricultural waste is a potential renewable energy resource, particularly from using livestock slurry as a feedstock for the anaerobic digestion process. Using estimates from Defra statistics on animal numbers for 2024[58] and resulting slurry and biogas yields, an estimate has been made of the potential emissions savings.

A.31 To calculate the total capacity of the resource in MW from the annual generation potential in MWh, a capacity factor was applied, as based on national data for animal-sourced biomass[59].

Table A - 12: Slurry resource assessment assumptions

Parameter	Assumption	Data Source	Justification and Notes
Slurry Resource	Number of animals required to produce 1 tonne of slurry per day: ▪ Cattle: 30 ▪ Pigs: 275	▪ Shared Practice ▪ The Andersons Centre	The number of animals required to produce 1 tonne of slurry per day was derived from the average of the figure brackets provided in the Shared Practice Anaerobic Digestion Good Practice Guidelines[60]: ▪ Cattle: 20-40

[57] LUC and CSE (2020) Test Valley Renewable and Low Carbon Energy Study. Available at: https://www.testvalley.gov.uk/planning-and-building/planningpolicy/evidence-base/evidence-base-environment
[58] Defra (2022) Structure of the agricultural industry in England and the UK at June. Available at: https://www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june
[59] DESNZ (2023) Load factors for renewable electricity generation (DUKES 6.3). Available at: https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes
[60] Shared Practice (1997) Good Practice Guidelines: Anaerobic Digestion of farm and food processing residues. Available at: http://www.sharedpractice.org.uk/Library/library.html

Parameter	Assumption	Data Source	Justification and Notes
	▪ Poultry: 10,500 Biogas yield: ▪ Cattle: 20m3/tonne ▪ Pigs: 20m3/tonne ▪ Poultry: 65m3/tonne Energy content of biogas: ▪ 6.7kWh per m3		▪ Pigs: 250-300 ▪ Poultry: – Laying hen litter: 8,000-9,000 – Broiler manure: 10,000-15,000 Biogas yields derived from the average of the figure brackets provided in The Andersons Centre data[61]: ▪ Cattle: 15-25 m3/tonne ▪ Pigs: 15-25 m3/tonne ▪ Poultry: 30-100 m3/tonne Energy content of biogas also derived from The Andersons Centre data.
Heating and Electricity Fuel Offset	CHP plant efficiency[62]: ▪ Heat: 50% ▪ Electricity: 30% Heating fuel assumed to be offset: ▪ Electricity: 50% of off-gas properties ▪ Oil: 50% of off-gas properties ▪ Gas: All on-gas properties	▪ The Andersons Centre	CHP plant efficiency derived from The Andersons Centre data[63]. The actual proportions of electricity and oil usage by off-gas properties is unknown. As such, an illustrative 50% or these properties are estimated to be fuelled by electricity and 50% by oil for the purposes of this study.

[61] The Andersons Centre (2010) A Detailed Economic Assessment of Anaerobic Digestion Technology and its Suitability to UK Farming and Waste Systems. Available at: https://theandersonscentre.co.uk/service/economic-analysis/
[62] As this study is calculating the potential energy generation from a known amount of fuel, as opposed to an infinite energy supply such as wind, only the CHP efficiency was considered to calculate the overall energy generation potential, not the load factor for biogas CHP units, which considered the percentage of time a boiler is operating at peak output annually.
[63] The Andersons Centre (2010) A Detailed Economic Assessment of Anaerobic Digestion Technology and its Suitability to UK Farming and Waste Systems. Available at: https://theandersonscentre.co.uk/service/economic-analysis/

Energy from Waste

A.32 Any data the council holds on Huntingdonshire waste streams, such as municipal and commercial solid waste, recycled wood waste or food waste, was used to assess the technical potential of energy generation from waste.

Deployment Scenario Assumptions

A.33 Two scenarios were considered, business as usual and ambitious. Levels of potential renewable energy deployment under these scenarios were considered for two target dates - the end of the Huntingdonshire Local Plan period, 2046, and to 2050, which is when the UK aims to reach net zero[64].

Electricity Demand

Existing Demand

A.34 The electricity demand of Huntingdonshire was calculated using 2021 local authority-level data, and compared to 2021 UK-level data:

- 2021 Huntingdonshire electricity demand: 795.03 GWh[65]
- 2021 UK electricity demand: 268,401.82 GWh[66]
- Proportion of UK electricity demand from Huntingdonshire: 0.30%

A.35 The year 2021 was used as the baseline of existing energy demand at the request of the Council and is the most up-to-date data currently available on energy demand. The most recent data available on consented and operational renewable developments (Spring 2024 REPD[67], 2019 FIT[68] and 2021 RHI[69]) was used to assess the "existing" deployment of renewables.

Proportion of Demand

A.36 The above projections indicate that the 2021 electricity demand in Huntingdonshire represents 0.30% of the electricity demand of the UK. This figure was used to scale down UK-level renewable targets to be applicable to Huntingdonshire, i.e. it was assumed that development of renewables within Huntingdonshire would total 0.30% of the UK-level of renewable development (see deployment scenarios below).

Projected Demand

A.37 The projected electricity demand of Huntingdonshire was estimated by proportionally scaling up the 2021 demand based on the UK-level Sixth Carbon Budget[70] Balanced Net Zero Pathway for electricity generation scenario.

Table A - 13: Projected energy demand in Huntingdonshire

Projected Electricity Demand	2021	2046	2050
Estimated Huntingdonshire Annual Demand (GWh)	795.03	1,548.89	1,591.86

Housing Projections

A.38 To estimate the total number of homes and number of new homes within Huntingdonshire, the projected households up to 2043 from ONS data[71] were used. The projected growth of

[64] Climate Change Committee (2020) The charts and data behind the 6th Carbon Budget reports. Available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/
[65] DESNZ (2023) Total final energy consumption at regional and local authority level: 2005 to 2021. Available at: https://www.gov.uk/government/statistics/total-final-energy-consumption-at-regional-and-local-authority-level-2005-to-2021
[66] DESNZ (2023) Digest of UK Energy Statistics (DUKES): electricity. Electricity: commodity balances (DUKES 5.1) - Excel. Available at: https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes
[67] BEIS, now DESNZ (2024) Renewable Energy Planning Database: quarterly extract - January 2024. Available at: https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract
[68] BEIS and DESNZ (2020) Sub-regional Feed-in Tariffs statistics: March 2019. Available at: https://www.gov.uk/government/statistical-data-sets/sub-regional-feed-in-tariffs-confirmed-on-the-cfr-statistics. Final release.
[69] DESNZ (2024) RHI monthly deployment data: March 2024. Available at: https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-march-2024-annual-edition
[70] Climate Change Committee (2020) The charts and data behind the 6th Carbon Budget reports. Available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/
[71] ONS (2020) Household projections for England. 2018-based. Principal projection edition of this dataset. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/householdprojectionsforengland

households within Huntingdonshire between 2042 and 2043 (0.43%) was then projected forwards to estimate the number of households in 2050:

- 2021: 75,581 households
- 2025: 77,790 households[72]
- 2046: 86,334 households
- 2050: 87,845 households

A.39 It is noted that these household figures are lower than those derived from LLPG Address data (see **Table A-1**). This difference is likely because the household projections define a 'household' differently to how OS Address data records residential property addresses, including the greater detail that OS Address data provides regarding property type. Nonetheless, the below deployment scenarios are based on the number of additional households over time, rather than the total number of households. As such, the below scenarios are based on justified assumptions that estimate anticipated generation by renewable and low carbon technologies in proportion to anticipated housing growth.

Business as Usual Scenario

A.40 The anticipated deployment of renewable and low carbon technologies under the business as usual scenario reflects the recent and existing deployment of these technologies within Huntingdonshire and the wider UK.

Wind

A.41 The Renewable Energy Planning Database (REPD)[73] indicates that an average of 2.4MW of wind development has become operational per year in the past 10 years within Huntingdonshire, the REPD also indicates that these developments were granted prior to the restrictive planning policy introduced in the 2015 National Planning Policy Framework[74]. Since the recent change in government and removal of these restrictions in the National Planning Policy Framework[75], it is therefore assumed that this deployment pattern could potentially be achievable.

Ground-Mounted Solar

A.42 The Renewable Energy Planning Database (REPD)[76] indicates that an average of 6.6MW of solar development has become operational per year in the past 10 years within Huntingdonshire. It is therefore assumed that this pattern continues consistently.

Rooftop Solar PV

A.43 The most recent FiT statistics[77], in combination with the data on domestic and non-domestic properties within Huntingdonshire (see **Table A-1**), indicates that:

- 4.34% of domestic properties have solar PV; and
- 141 non-domestic properties have solar PV.

A.44 The FiT statistics also provide the average size of rooftop solar PV installations in Huntingdonshire:

- Domestic: 3.9 kW
- Non-domestic: 89.3 kW

[72] The number of households in 2025 was required as part of the air source heat pump business as usual scenario (see paragraph A.61).
[73] BEIS, now DESNZ (2024) Renewable Energy Planning Database: quarterly extract - January 2024. Available at: https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract
[74] House of Commons Library (2024) Planning for onshore wind. Available at: https://commonslibrary.parliament.uk/research-briefings/sn04370/. The 2015 update to the National Planning Policy Framework required that onshore wind farms could be built only where a proposal was located in a suitable area as set out in the development plan and had the backing of the local community.
[75] MHCLG (2024): Policy statement on onshore wind. Available at: https://www.gov.uk/government/publications/policy-statement-on-onshore-wind/policy-statement-on-onshore-wind
[76] BEIS, now DESNZ (2024) Renewable Energy Planning Database: quarterly extract - January 2024. Available at: https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract
[77] BEIS and DESNZ (2020) Sub-regional Feed-in Tariffs statistics: March 2019. Available at: https://www.gov.uk/government/statistical-data-sets/sub-regional-feed-in-tariffs-confirmed-on-the-cfr-statistics. Final release.

A.45 It is assumed that the majority of installations took place within 10 years in conjunction with the operation of the FiT.

A.46 It is assumed therefore that, due to some form of subsidy similar to FiT continuing:

- An additional 4.34% of dwellings will install the average domestic system size of solar PV every 10 years, as based on household projections (see paragraph A.38); and
- Another 141 non-domestic properties will install the average non-domestic system size of solar PV every 10 years (as projections of the growth of non-domestic properties are not available to calculate any increase in this deployment over time).

Hydropower

A.47 The most recent FiT statistics[78], indicates that there is 0.04MW of hydropower installations currently present within Huntingdonshire. It is assumed that no additional installations will take place going forwards.

Biomass (large electrical)

A.48 The REPD[79] indicates that there are approximately 0.3MW of operational large scale biomass installations (including anaerobic digestion) within Huntingdonshire that have been built in the past 10 years. It is therefore assumed that on average an additional 0.3 MW worth of biomass will be delivered every 10 years.

A.49 It is noted that there are different sources of biomass that have different assessed technical potentials within Huntingdonshire. The calculations presented in these scenarios assume only virgin woodfuel will be used for domestic-scale installations, and that an even mixture of the assessed biomass sources will be delivered for large scale biomass installations:

- Virgin woodfuel thermal conversion: forestry and woodland
- Virgin woodfuel thermal conversion: energy crops
- Energy from biogas (anaerobic digestion) from agricultural residues

A.50 It was assumed that the electricity generated via these sources would be through CHP with a 30% electrical efficiency[80].

A.51 It is noted that different biomass sources, including those not assessed in this study, such as the anaerobic digestion of energy crops and the use of food waste, have the potential to output different amounts of energy. Moreover, CHP units may not be used for all biomass developments and may have differing efficiencies. As such, these projected biomass calculations are high level and illustrative.

Biomass (heat)

A.52 It is assumed that 0.3 MW of large-scale biomass would be delivered every 10 years as based on the above, using an even mixture of the resources assessed for large scale biomass installations, and that only virgin woodfuel be used for domestic-scale installations (see paragraph A.48-A.49). It was assumed that the electricity generated via these sources would be through CHP with a 50% heating efficiency[81].

A.53 The most recent Renewable Heat Incentive (RHI) data[82], in combination with the data on domestic and non-domestic properties within Huntingdonshire (see **Table A-1**), indicates that:

- 0.07% of domestic properties have small-scale biomass; and

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[78] BEIS and DESNZ (2020) Sub-regional Feed-in Tariffs statistics, March 2019. Available at: https://www.gov.uk/government/statistical-data-sets/sub-regional-feed-in-tariffs-confirmed-on-the-cfr-statistics. Final release.
[79] BEIS, now DESNZ (2024) Renewable Energy Planning Database: quarterly extract - January 2024. Available at: https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract
[80] LUC and CSE (2020) Test Valley Renewable and Low Carbon Energy Study. Available at: https://www.testvalley.gov.uk/planning-and-building/planningpolicy/evidence-base/evidence-base-environment
[81] LUC and CSE (2020) Test Valley Renewable and Low Carbon Energy Study. Available at: https://www.testvalley.gov.uk/planning-and-building/planningpolicy/evidence-base/evidence-base-environment
[82] DESNZ (2024) RHI monthly deployment data: March 2024. Available at: https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-march-2024-annual-edition

- And estimated[83] 31 non-domestic properties have small-scale biomass.

A.54 Biomass is anticipated to play an increased role in future small scale heating, particularly with the phase out of new gas boilers. However, there is little information available regarding the amount of future biomass installations. Moreover, Government Boiler Upgrade Scheme statistics indicate that from May 2022 to December 2023, only 10 applications were received within the East of England region to upgrade boilers to biomass84. As such, small scale biomass heating is not considered within the deployment scenarios.

Rooftop Solar Water Heating

A.55 Rooftop solar water heating is significantly less popular than Solar PV. The most recent Renewable Heat Incentive (RHI) data[85], in combination with the data on domestic and non-domestic properties within Huntingdonshire (see **Table A-1**), indicates that:

- 0.01% of domestic properties have rooftop solar water heating; and
- Estimated[86] 1 non-domestic property has rooftop solar water heating.

A.56 It is assumed therefore that the majority of domestic rooftop solar PV installations will take priority over solar water heating, and as such solar water heating is not considered within the deployment scenarios.

Air Source Heat Pumps

A.57 The most recent Renewable Heat Incentive (RHI) data[87], in combination with the data on domestic and non-domestic properties within Huntingdonshire (see **Table A-1**), indicates that:

- 0.07% of domestic properties have an air source heat pump; and
- An estimated[88] 2 non-domestic properties have an air source heat pump.

A.58 The RHI statistics also provide the average size of air source heat pump installations in the UK:

- Domestic: 10.2 kW
- Non-domestic: 48.5 kW

A.59 It is assumed that the majority of domestic installations took place in the past 10 years and non-domestic installations in the past 13 years in conjunction with the operation of the RHI.

A.60 It is assumed therefore that, due to some form of subsidy such as the RHI continuing:

- An additional 0.07% of dwellings will install the UK average domestic system size of air source heat pumps every 10 years, as based on household projections (see paragraph A.38); and
- Another 2 non-domestic properties will install the UK average non-domestic system size of air source heat pumps every 13 years (as projections of the growth of non-domestic properties are not available to calculate any increase in this deployment over time).

A.61 In addition, it was assumed that from 2025 (see paragraph A.38) all new homes will install the UK average domestic system size of air source heat pumps, as part of the phase out of new gas boilers.

A.62 It was also assumed that the Government's Boiler Upgrade Scheme grants running from 2022-2025 will increase heat pump uptake. It was assumed that Huntingdonshire takes on their

[83] The RHI does no list these. The RHI does however provided the total number of UK installations for each technology. It also provides the total number of RHI installations within the authority (not split by technology). The proportion of UK RHI installations per technology was therefore used to estimate the total number of RHI installations for each technology within the authority.
[84] DESNZ (2024) Boiler Upgrade Scheme (BUS) monthly statistics England and Wales: December 2023. Available at: https://www.gov.uk/government/statistics/boiler-upgrade-scheme-statistics-december-2023
[85] DESNZ (2024) RHI monthly deployment data: March 2024. Available at: https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-march-2024-annual-edition
[86] The RHI does no list these. The RHI does however provided the total number of UK installations for each technology. It also provides the total number of RHI installations within the authority (not split by technology). The proportion of UK RHI installations per technology was therefore used to estimate the total number of RHI installations for each technology within the authority.
[87] DESNZ (2024) RHI monthly deployment data: March 2024. Available at: https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-march-2024-annual-edition
[88] The RHI does no list these. The RHI does however provided the total number of UK installations for each technology. It also provides the total number of RHI installations within the authority (not split by technology). The proportion of UK RHI installations per technology was therefore used to estimate the total number of RHI installations for each technology within the authority.

share (0.30% based on the Huntingdonshire proportion of UK electricity demand – see paragraph A.36) of the previously capped 90,000 heat pumps to receive grants from the government over the next 3 years[89]. It is assumed these grants may continue for the rest of the 2020s, so an overall 300,000 additional domestic pumps across the UK will be deployed via these grants. Following this, it is assumed that additional funding, lower costs of technology, and phasing out of gas boilers will continue to deploy 3000,000 new domestic heat pumps across the UK each decade, with Huntingdonshire delivering their share. It is assumed that 3.11% of total installations annually would be non-domestic installations, as based on RHI data[90]. Average domestic and non-domestic system sizes were then used to calculate heat generation potential.

A.63 To determine the annual electrical generation potential of this deployment, a capacity factor of 18.4% was used, as based on national data (see **Table A-2**).

Ambitious Scenario

A.64 As based on the Climate Change Committee's 6th Carbon Budget Balanced Net Zero Pathway scenario[91], the ambitious scenario requires that 80% of the electricity demand in Huntingdonshire is met by renewable sources.

Wind and Ground-Mounted Solar

A.65 By 2050, the generation of electricity from rooftop solar PV, biomass and hydropower is anticipated to provide 33% of total electricity demand (see the below scenarios). It is anticipated that generation by wind and ground-mounded solar will contribute to the remainder of the 2050 electricity demand (47%) in order to meet 80% of generation from renewables.

A.66 The REPD[92] and most recent FiT statistics[93], indicate that there is 127.37GWh of electricity from existing and consented wind developments per year and 126.87 GWh of electricity from existing and consented ground mounted solar developments per year. It was assumed that these trends of renewable development would continue and that the proportion of wind and solar delivered by 2050 would reflect this. It was therefore assumed that an additional 217 GWh/year capacity (2.5% of the total identified technical potential) of wind development and 216 GWh/year (0.67% of the total identified technical potential) of ground mounted solar development would be delivered in order to deliver the 47% of the total electricity demand in 2050 required. This results in the following deployment by 2050:

- Wind: 344 GWh per year, 22% of 2050 electricity demand.
- Solar: 342 GWh per year, 22% of 2050 electricity demand.

A.67 To determine the delivery of wind and solar generation by 2046, this value was scaled in proportion to anticipated demand growth (see paragraph A.37).

Rooftop Solar PV

A.68 It was assumed that, as a result of subsidies and/or policy, such as the emerging Future Home Standard, that the following could be delivered by 2050:

- Domestic: 75% of households in 2050 with rooftop solar PV installations.
- Non-domestic: 15% of existing non-domestic buildings with rooftop solar PV installations (as projections of the growth of non-domestic properties are not available to calculate any increase in this deployment over time).

A.69 It was assumed that all new installations would be the size of the current average domestic and non-domestic rooftop PV installations (see paragraph A.43).

[89] BBC (2021) Heat pump grants worth £5,000 to replace gas boilers not enough, say critics. Available at: https://www.bbc.co.uk/news/business-56959045. BEIS (2022) Boiler Upgrade Scheme. Available at: https://www.gov.uk/guidance/check-if-you-may-be-eligible-for-the-boiler-upgrade-scheme-from-april-2022
[90] DESNZ (2024) RHI monthly deployment data: March 2024. Available at: https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-march-2024-annual-edition
[91] Climate Change Committee (2020) The charts and data behind the 6th Carbon Budget reports. Available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/
[92] BEIS, now DESNZ (2024) Renewable Energy Planning Database: quarterly extract - January 2024. Available at: https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract
[93] BEIS and DESNZ (2020) Sub-regional Feed-in Tariffs statistics: March 2019. Available at: https://www.gov.uk/government/statistical-data-sets/sub-regional-feed-in-tariffs-confirmed-on-the-cfr-statistics. Final release.

A.70 To determine the delivery of rooftop solar PV generation by 2046, this total generation in 2050 was scaled in proportion to anticipated demand growth (see paragraph A.37).

Hydropower

A.71 It was anticipated that the maximum assessed technical potential for hydropower within Huntingdonshire (see paragraph A.16) could be delivered any time up to 2050.

Biomass (large electrical)

A.72 The National Grid Future Emissions Scenarios[34] Holistic Transition Pathway was considered, as this scenario meets net zero by 2050 and includes the highest renewable capacity proportion. This outlines that by 2050, 33TWh/year of electricity demand will be met by bioresources (including energy from bioresource waste). It was assumed that Huntingdonshire takes on its share, as based on its proportion of electricity demand (see paragraph A.36), of this generation by 2050.

A.73 To determine the delivery of biomass by 2046, this total generation in 2050 was scaled in proportion to anticipated demand growth (see paragraph A.37).

Biomass (heat)

It is assumed that Huntingdonshire takes on its share, as based on its proportion of electricity demand (see paragraph A.36), of UK biomass electricity generation by 2050 (see paragraph A.72). To calculate the amount of heat that could be produced by this generation, it was assumed that this large-scale generation will take place via CHP, with a 30% electrical efficiency and a 50% heating efficiency[35]. The limitations regarding this assumption are outlined in paragraph A.51

A.74 To determine the delivery of biomass by 2046, this total generation in 2050 was scaled in proportion to anticipated demand growth (see paragraph A.37).

A.75 Due to lack of information, as noted in paragraph A.544, small scale biomass heating is not considered within the deployment scenarios.

Rooftop Solar Water Heating

A.76 As noted above in paragraph A.56, it was assumed that rooftop solar PV installations will take priority over solar water heating, and as such solar water heating is not considered within the deployment scenarios.

Air Source Heat Pumps

A.77 The government's Heat and Building Strategy[36] sets out that 600,000 heat pumps a year will be deployed up to 2030, and that, following this, 1.7 million heat pumps will be deployed annually. It is assumed that Huntingdonshire takes on its share of this deployment, as based on its proportion of electricity demand (see paragraph A.36).

A.78 It is assumed that the deployment will be proportional to the domestic/non-domestic ratio of existing installations:

- Domestic: It is assumed 96.9% of installations will be UK average domestic system size air source heat pumps (see paragraph A.59), until the point where all projected households in 2050 have installed a heat pump.
- Non-domestic: It is assumed 3.11% of installations will be UK average non-domestic system size air source heat pumps (see paragraph A.59).

[34] National Grid (2024) Future Energy Scenarios. Available at: https://www.nationalgrideso.com/future-energy/future-energy-scenarios-fes

[35] Average CHP efficiencies estimated from prior research undertaken by CSE – LUC and CSE (2020) Test Valley Renewable and Low Carbon Energy Study. Available at: https://www.testvalley.gov.uk/planning-and-building/planningpolicy/evidence-base/evidence-base-environment.

[36] Department for Business, Energy & Industrial Strategy (2021) Heat and buildings strategy. Available at: https://www.gov.uk/government/publications/heat-and-buildings-strategy

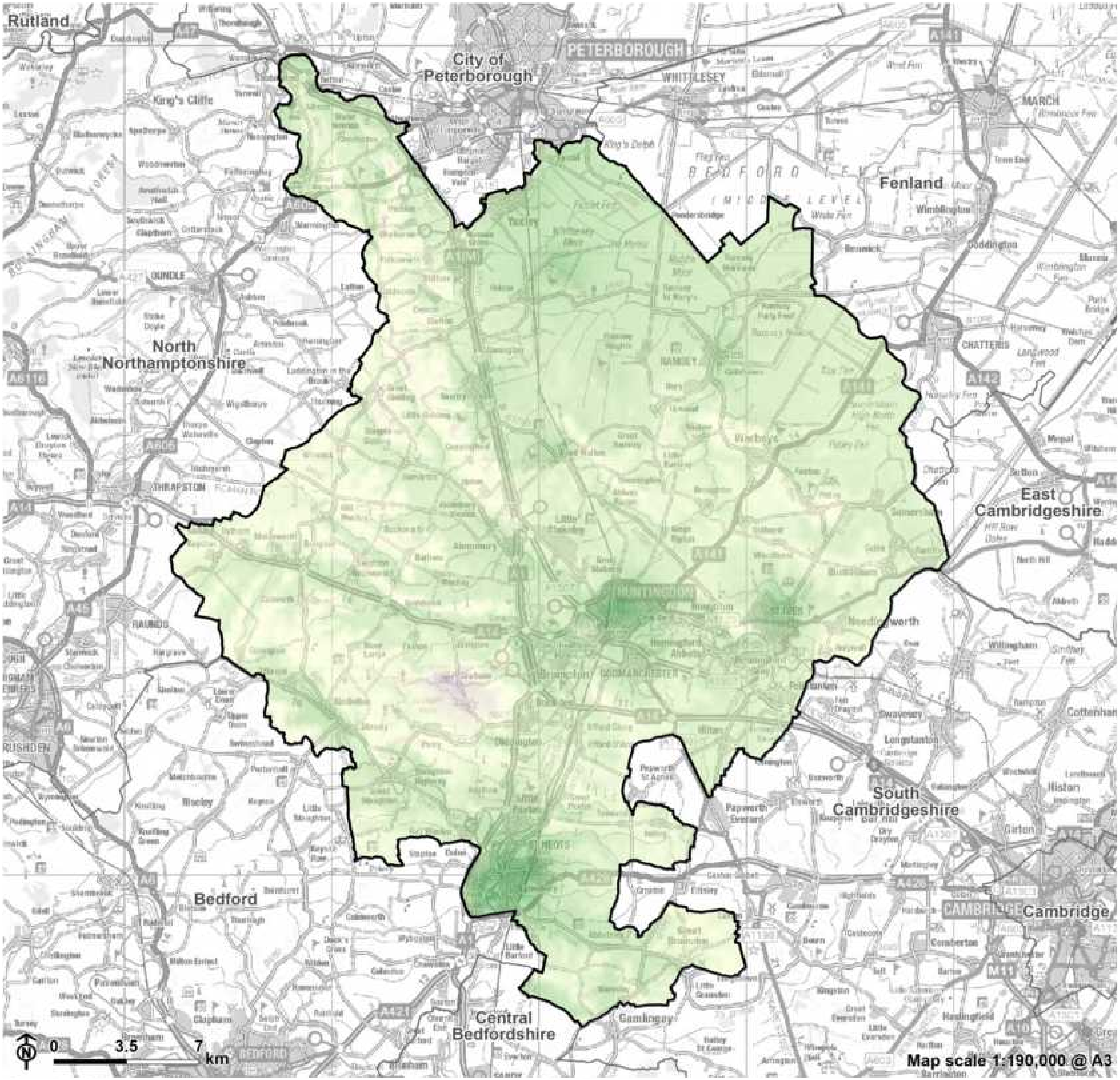
Appendix B

Wind Maps

Renewable Energy Assessment
Huntingdonshire District Council

LUC

Figure B1: Wind Constraints - Wind speed at 50m above ground level



Huntingdonshire District

Neighbouring Local Authority

Wind speed at 50m above ground level

7.8 m/s

6.0 m/s

Notes:

Global Wind Atlas 3.0, a free, web-based application developed, owned and operated by the Technical University of Denmark (DTU). The Global Wind Atlas 3.0 is released in partnership with the World Bank Group, utilizing data provided by Vortex, using funding provided by the Energy Sector Management Assistance Program (ESMAP). For additional infomation: https://globalwindatlas.info.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12713_Wind_Figures 12/06/2024 EB:spears_d

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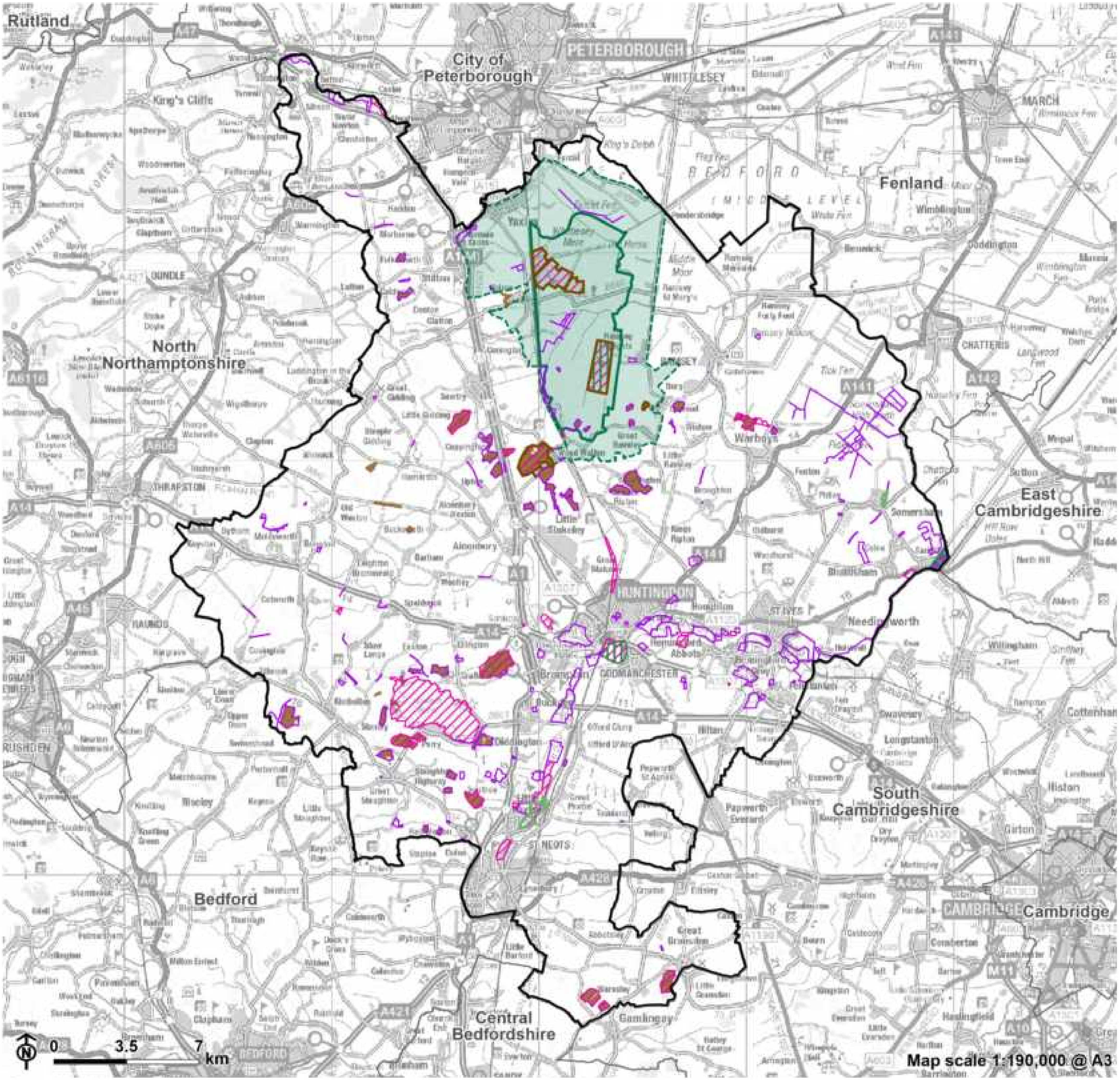
Figure B2: Wind constraints - Natural heritage constraints

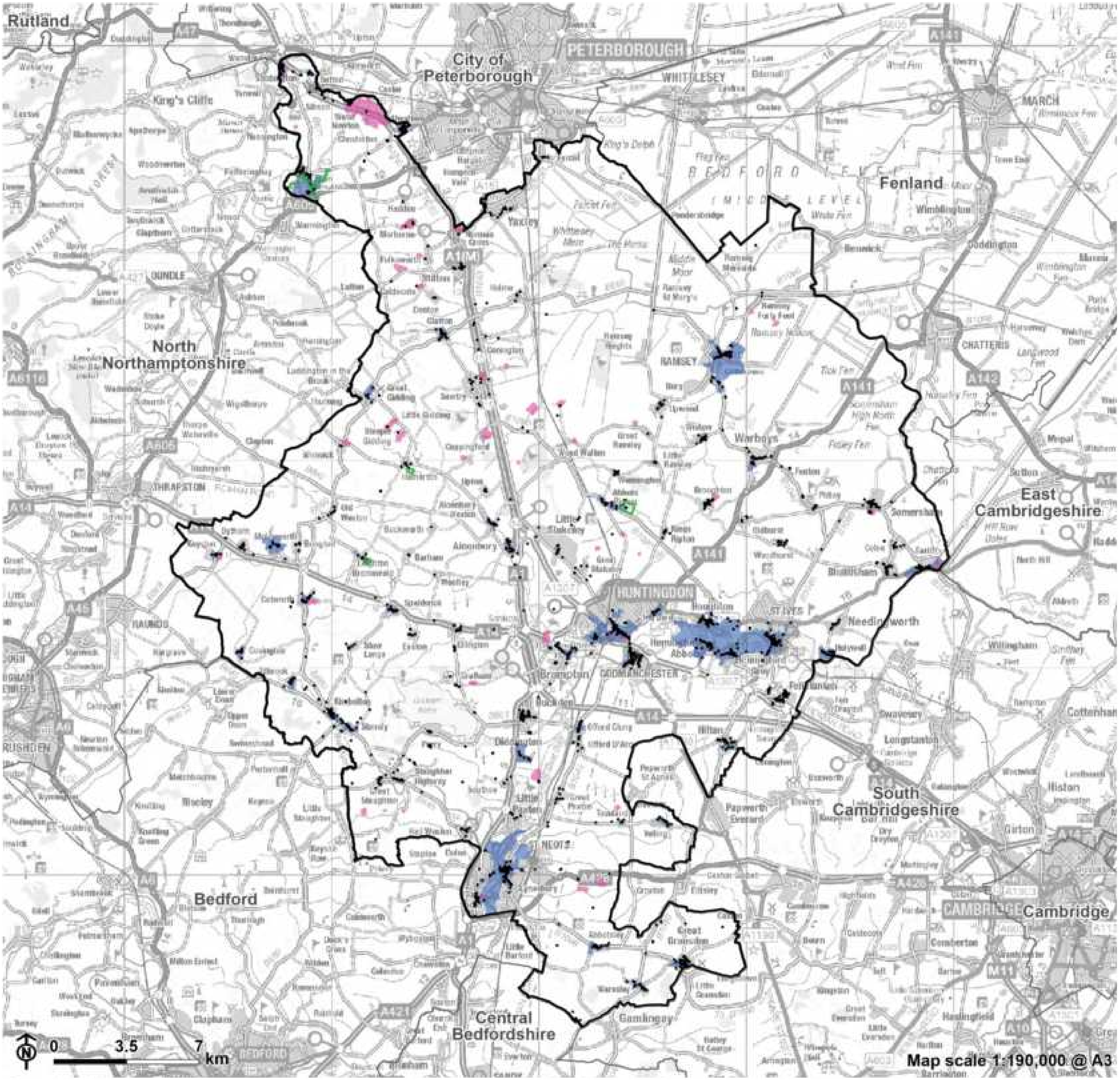


- Huntingdonshire District
- Neighbouring Local Authority
- Ramsar site
- Special Protection Area
- Special Area of Conservation
- Site of Special Scientific Interest
- National Nature Reserve
- Local Nature Reserve
- Ancient woodland
- County Wildlife Site
- The Great Fen
- The Great Fen - Landscape and Visual setting

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Figure B3: Wind constraints - Cultural heritage constraints



- Huntingdonshire District
- Neighbouring Local Authority
- Registered Parks and Gardens
- Listed building
- Conservation area
- Scheduled monument

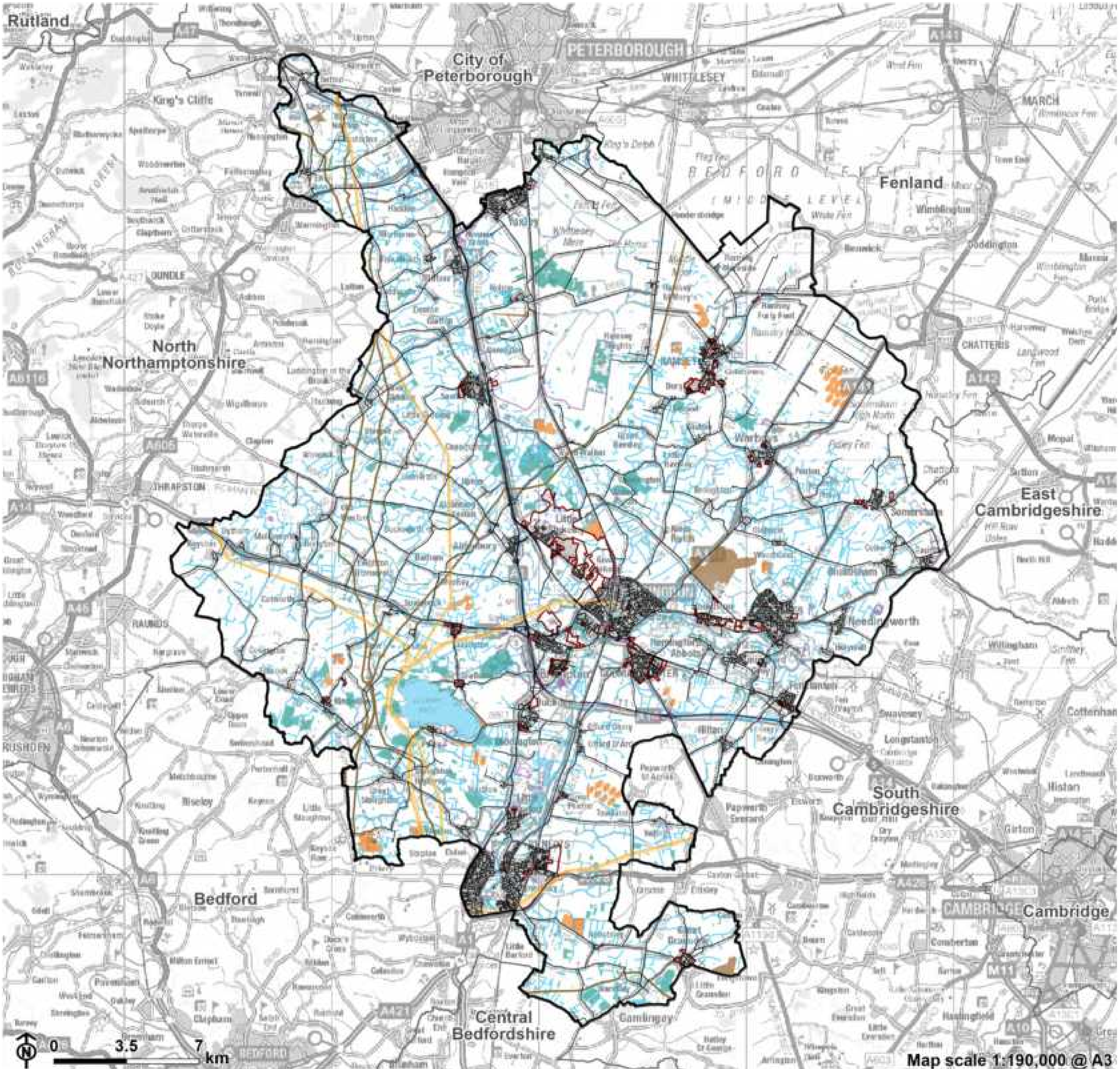
Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Renewable Energy Assessment
Huntingdonshire District Council

LUC

Figure B4: Wind constraints - Physical constraints



- Huntingdonshire District
- Neighbouring Local Authority
- Roads and railways
- Electricity line
- Gas pipeline
- Building
- Airports and airfields
- Watercourses and water bodies
- Existing renewable development
- Slope above 15%
- Woodland
- Future developments, safeguarded land and employment sites

Notes:

MOD land is not shown in the figure but was included as a constraint in the assessment.

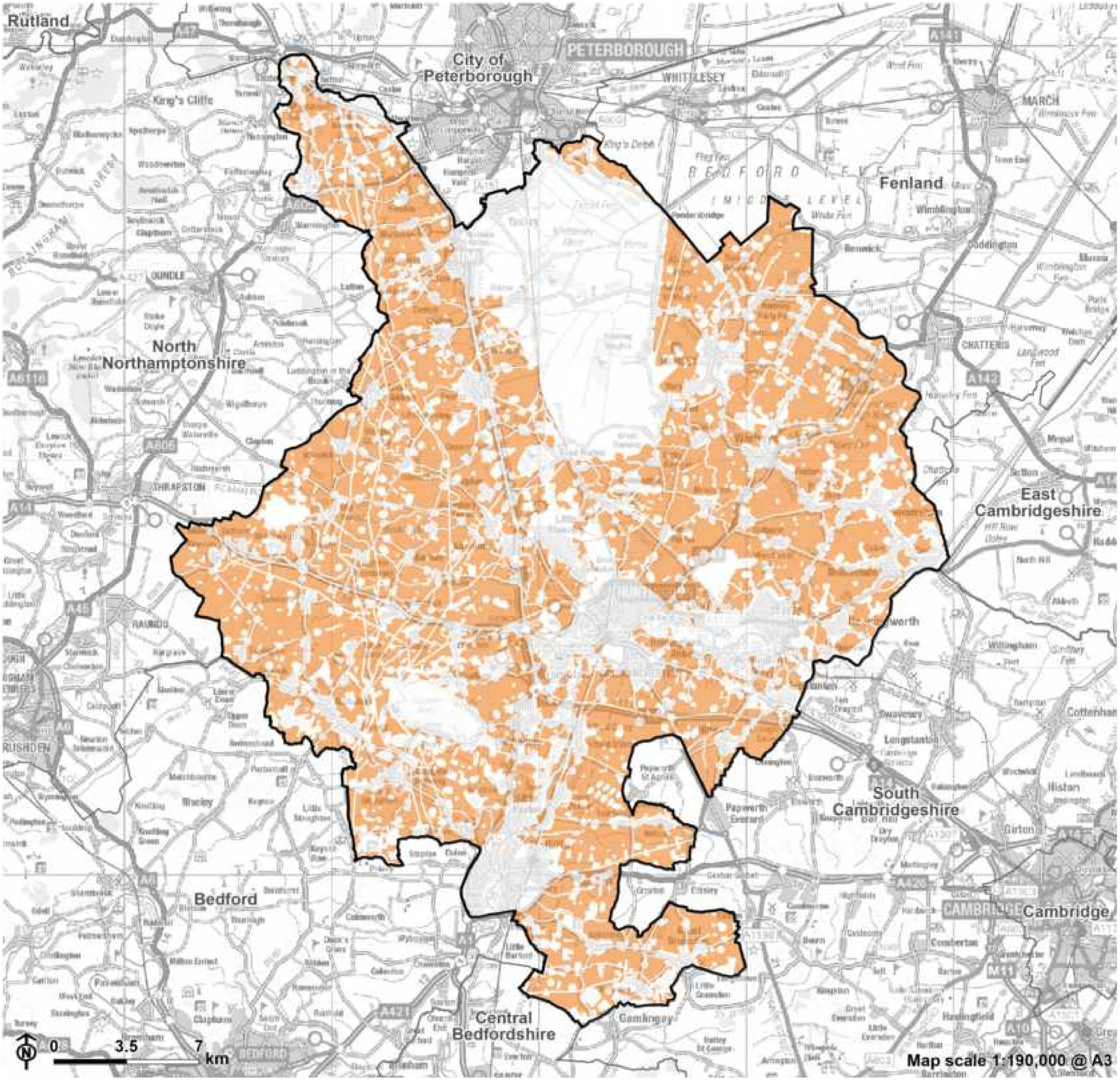
No areas in Huntingdonshire were found to have a windspeed less than 5 m/s.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12713_Wind_Figures 12/06/2024 EB:spears_d

Renewable Energy Assessment
Huntingdonshire District Council

Figure B5: Opportunities and constraints: Small scale (25-60m tip height) wind development



Huntingdonshire District

Neighbouring Local Authority

Technical potential within Huntingdonshire

Technical potential for small wind

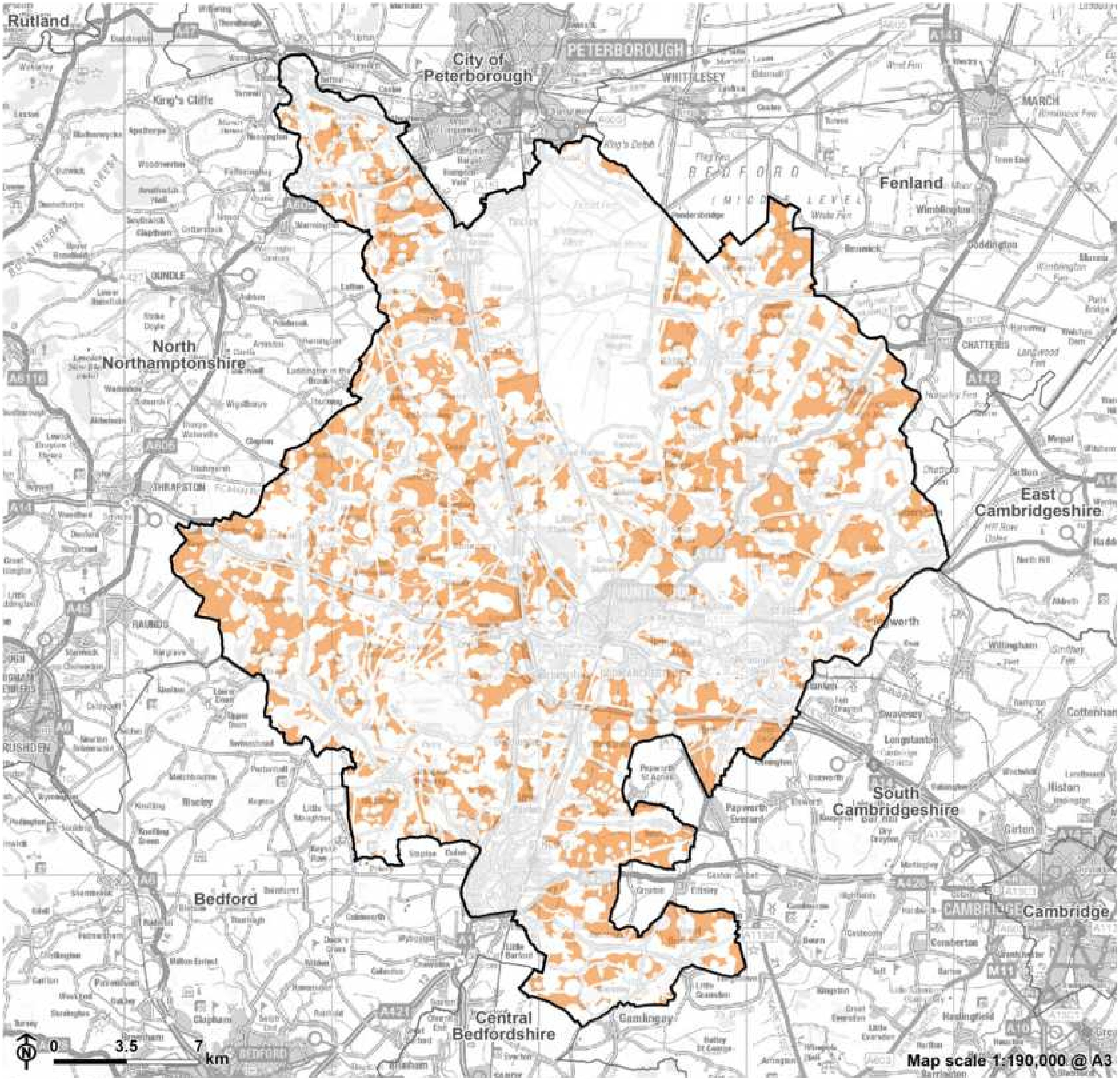
Constrained area for small wind: no technical potential

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12713_Wind_Figures 17/06/2024 EB:spears_d

Figure B6: Opportunities and constraints: Medium scale (60-100m tip height) wind development



Huntingdonshire District
Neighbouring Local Authority

Technical potential within Huntingdonshire

Technical potential for medium wind
Constrained area for medium wind: no technical potential

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

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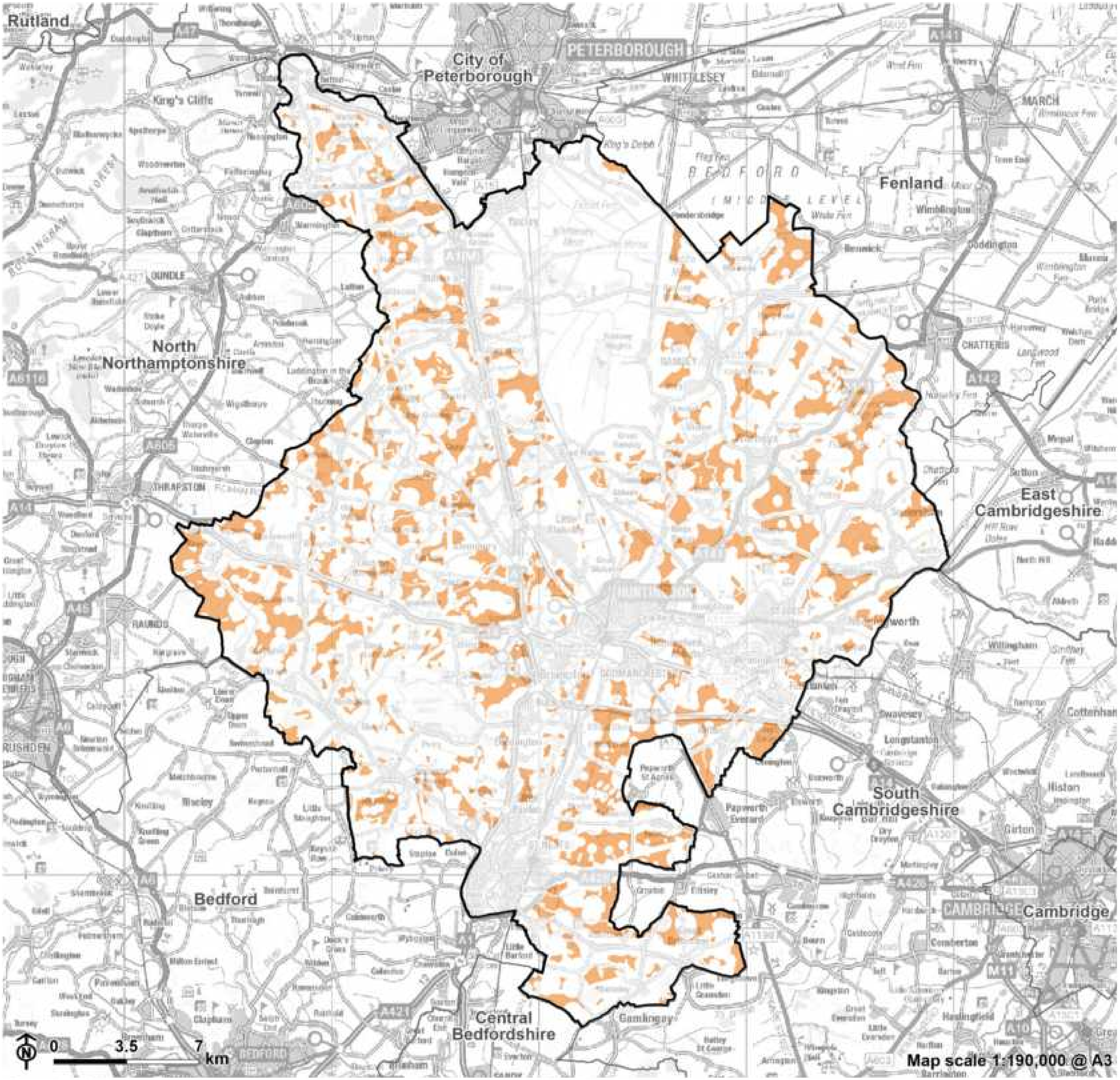
Figure B7: Opportunities and constraints: Large scale (100-150m tip height) wind development



- Huntingdonshire District
- Neighbouring Local Authority

Technical potential within Huntingdonshire

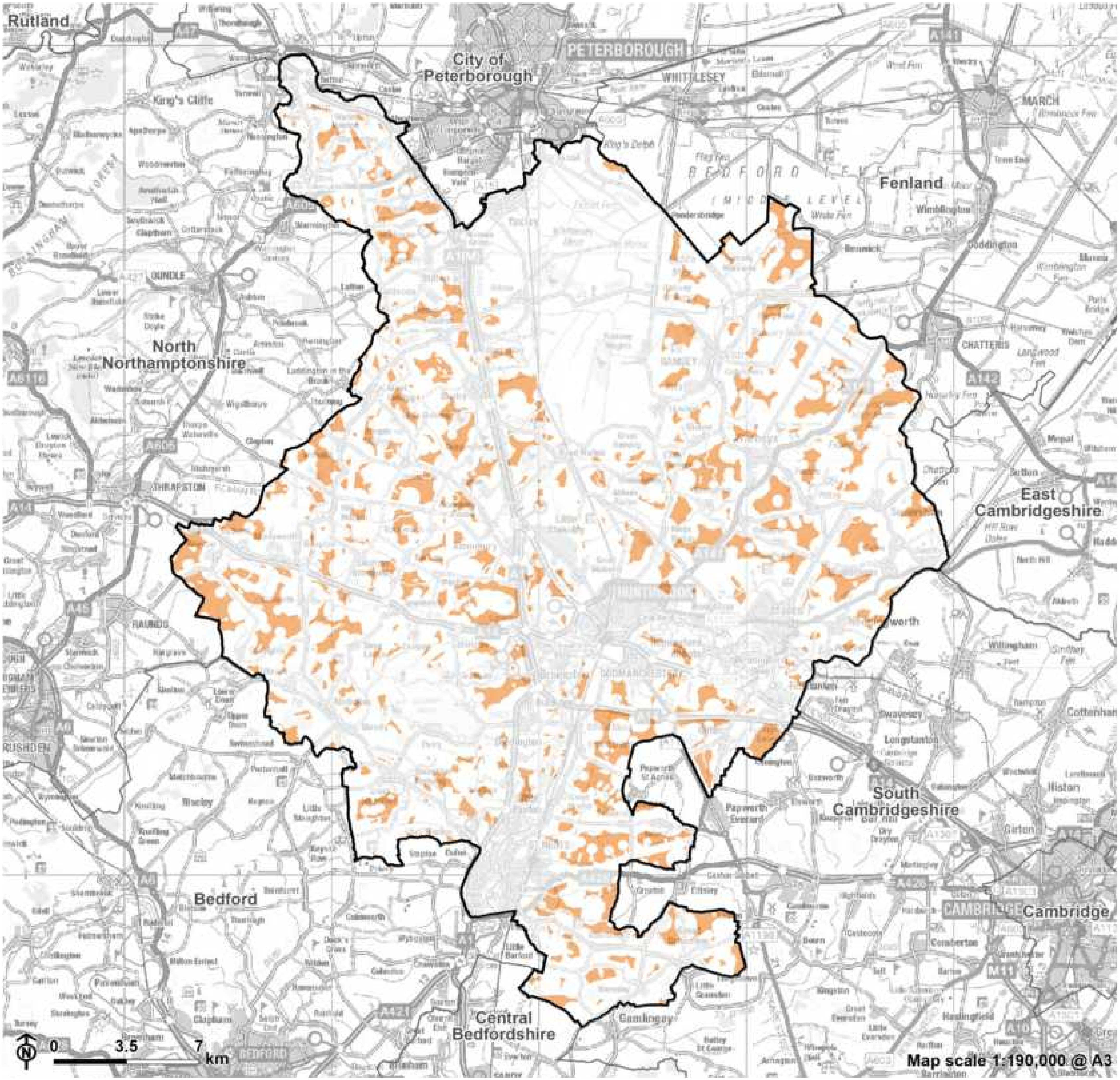
- Technical potential for large wind
- Constrained area for large wind: no technical potential

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Renewable Energy Assessment
Huntingdonshire District Council

Figure B8: Opportunities and constraints: Very large scale (150-220m tip height) wind development



Huntingdonshire District

Neighbouring Local Authority

Technical potential within Huntingdonshire

Technical potential for very large wind

Constrained area for very large wind: no technical potential

Notes:

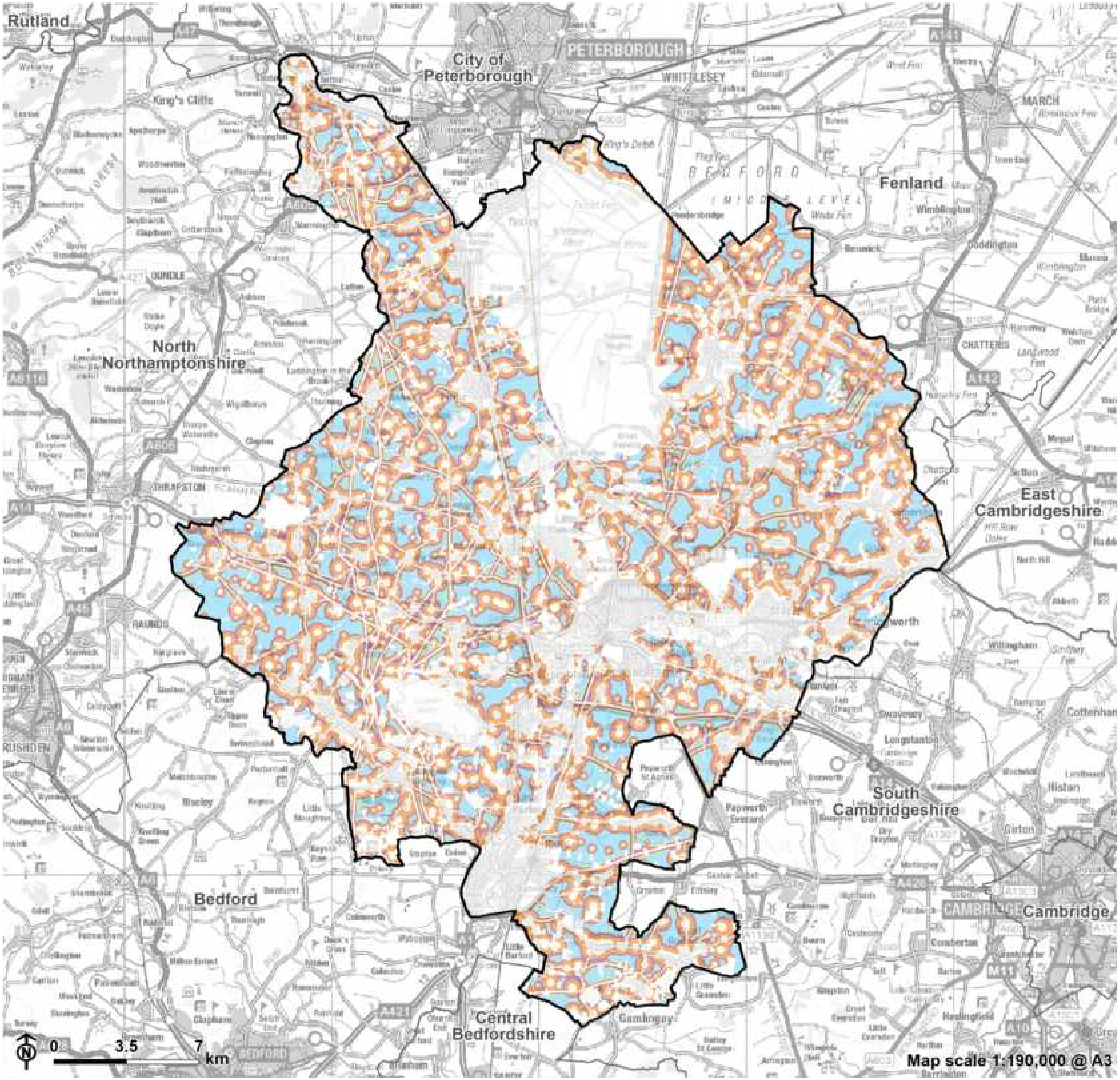
Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12713_Wind_Figures 17/06/2024 EB:spears_d

Renewable Energy Assessment
Huntingdonshire District Council

LUC

Figure B9: Opportunities and constraints: All scales of wind development



Huntingdonshire District

Neighbouring Local Authority

Technically suitable areas within Huntingdonshire

Suitable area for all turbine scales (25-220m tip height)

Suitable area for small to large turbines (25-150m tip height) only

Suitable area for small to medium turbines (25-100m tip height) only

Suitable area for small turbines (25-60m tip height) only

No technical potential

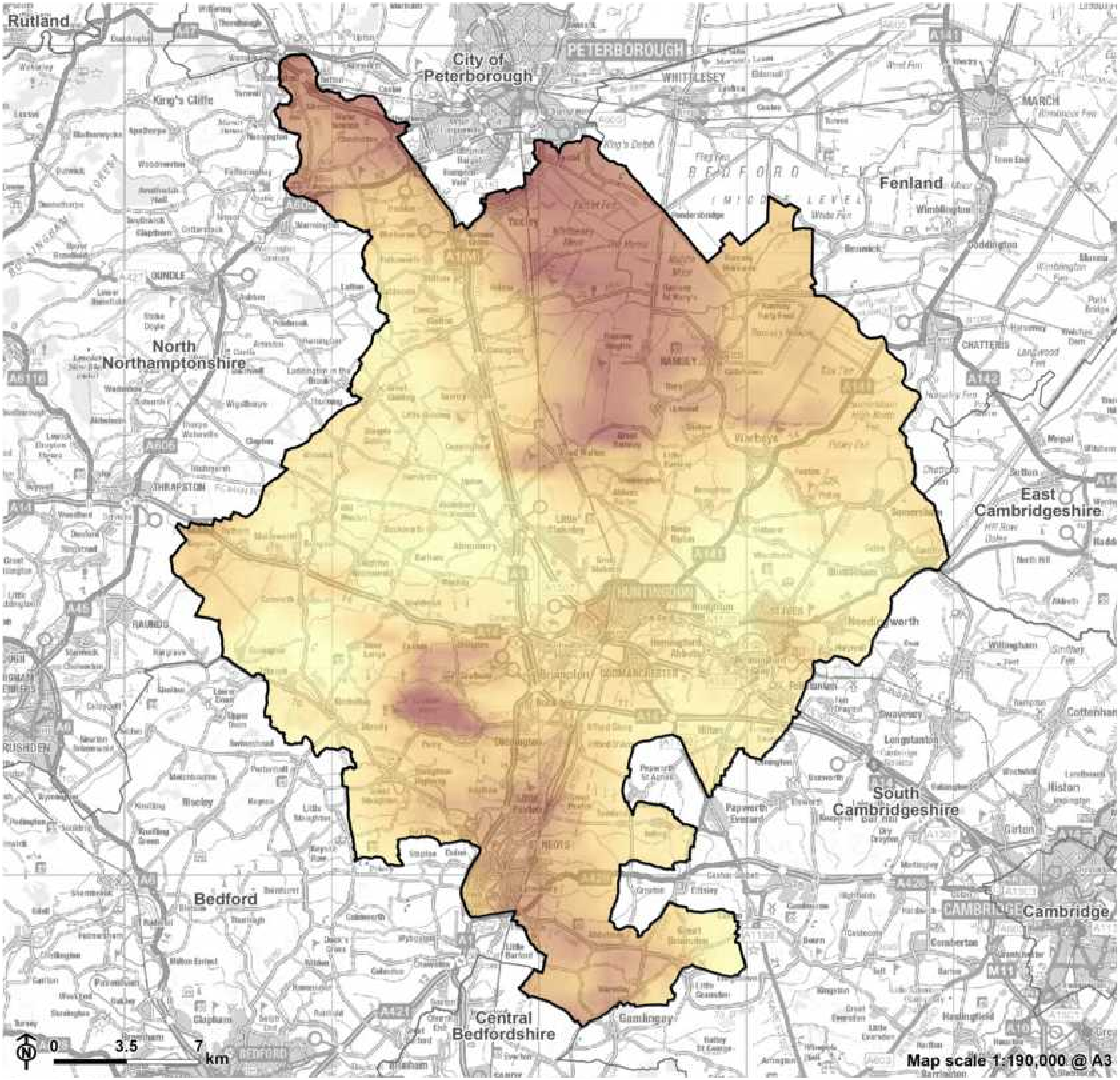
Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Appendix C

Ground Mounted Solar Maps

Figure C1: Annual solar irradiance



Huntingdonshire District
Neighbouring Local Authority

Annual solar irradiance

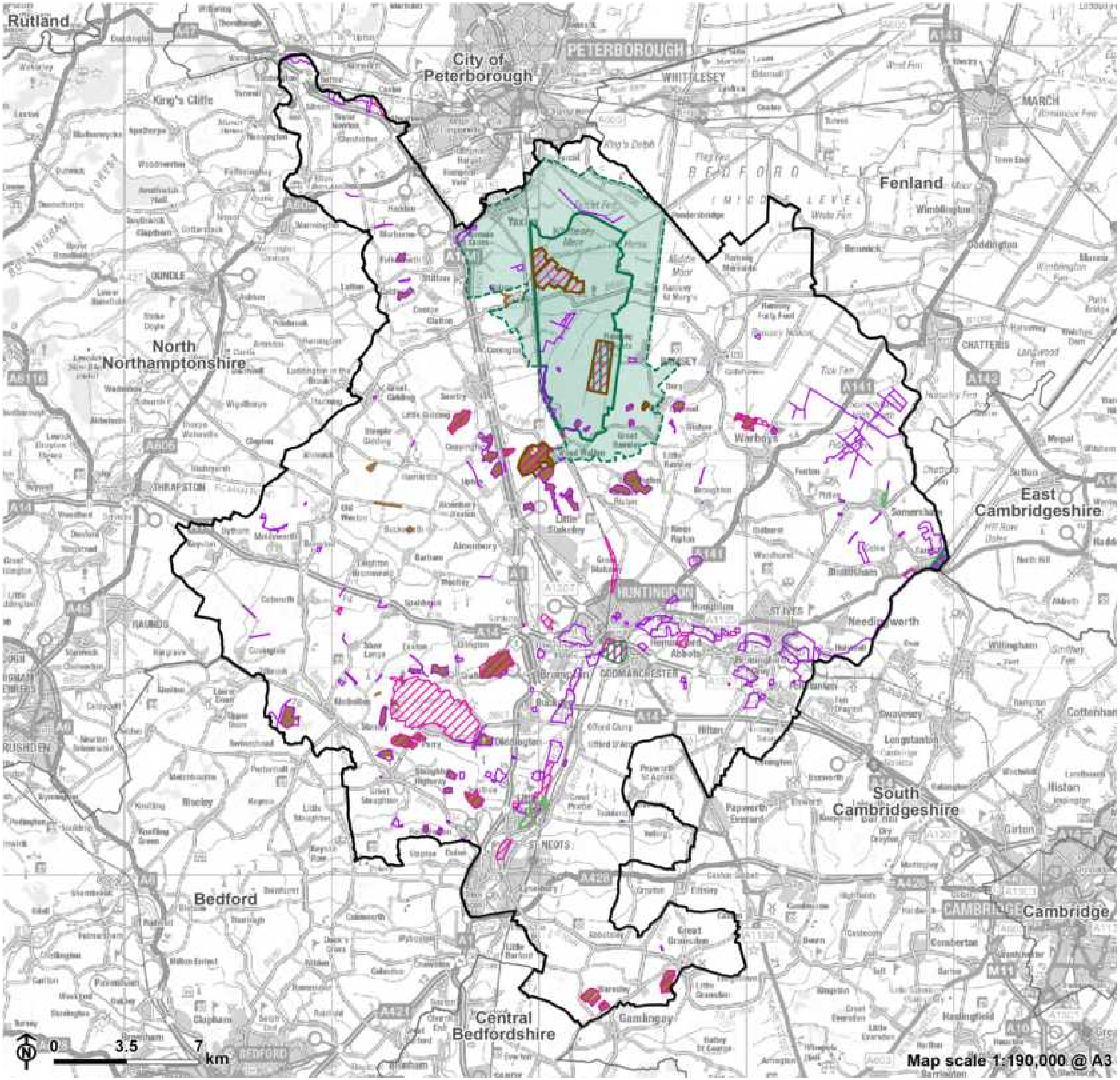
1030 kWh/kWp
1010 kWh/kWp

Notes:

Global Solar Atlas 2.0 is a free, web-based application, developed and operated by the company Solargis s.r.o on behalf of the World Bank Group, utilising Solargis data, with funding provided by the Energy Sector Management Assistance Program (ESMAP). For additional information: https://globalsolaratlas.info.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Figure C2: Solar constraints - Natural heritage constraints



- Huntingdonshire District
- Neighbouring Local Authority
- Ramsar site
- Special Protection Area
- Special Area of Conservation
- Site of Special Scientific Interest
- National Nature Reserve
- Local Nature Reserve
- Ancient woodland
- County Wildlife Site
- The Great Fen
- The Great Fen - Landscape and Visual setting

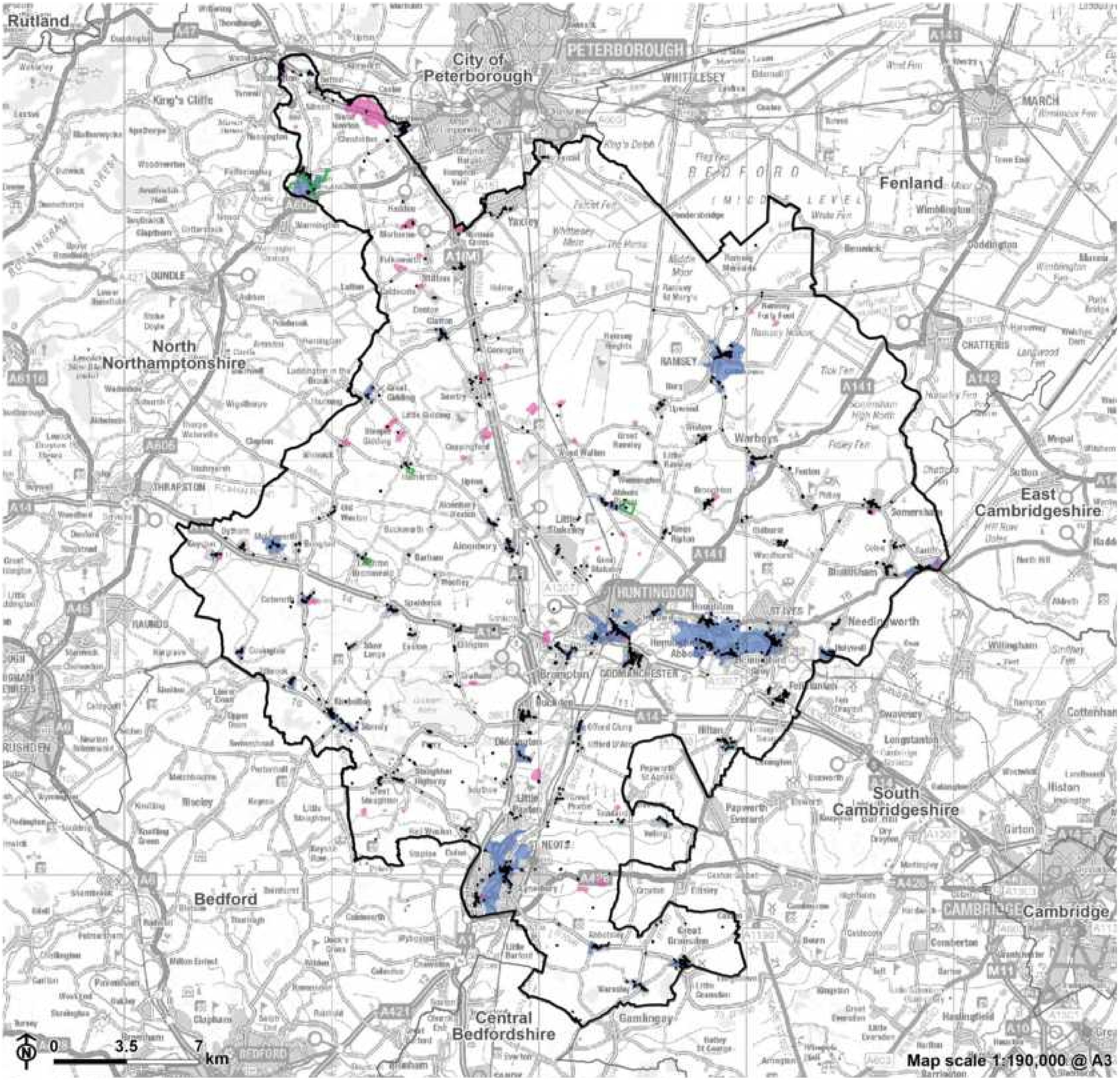
Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Renewable Energy Assessment
Huntingdonshire District Council

Figure C3: Solar constraints - Cultural heritage constraints

- Huntingdonshire District
- Neighbouring Local Authority
- Registered Parks and Gardens
- Listed building
- Conservation area
- Scheduled monument



Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Renewable Energy Assessment
Huntingdonshire District Council

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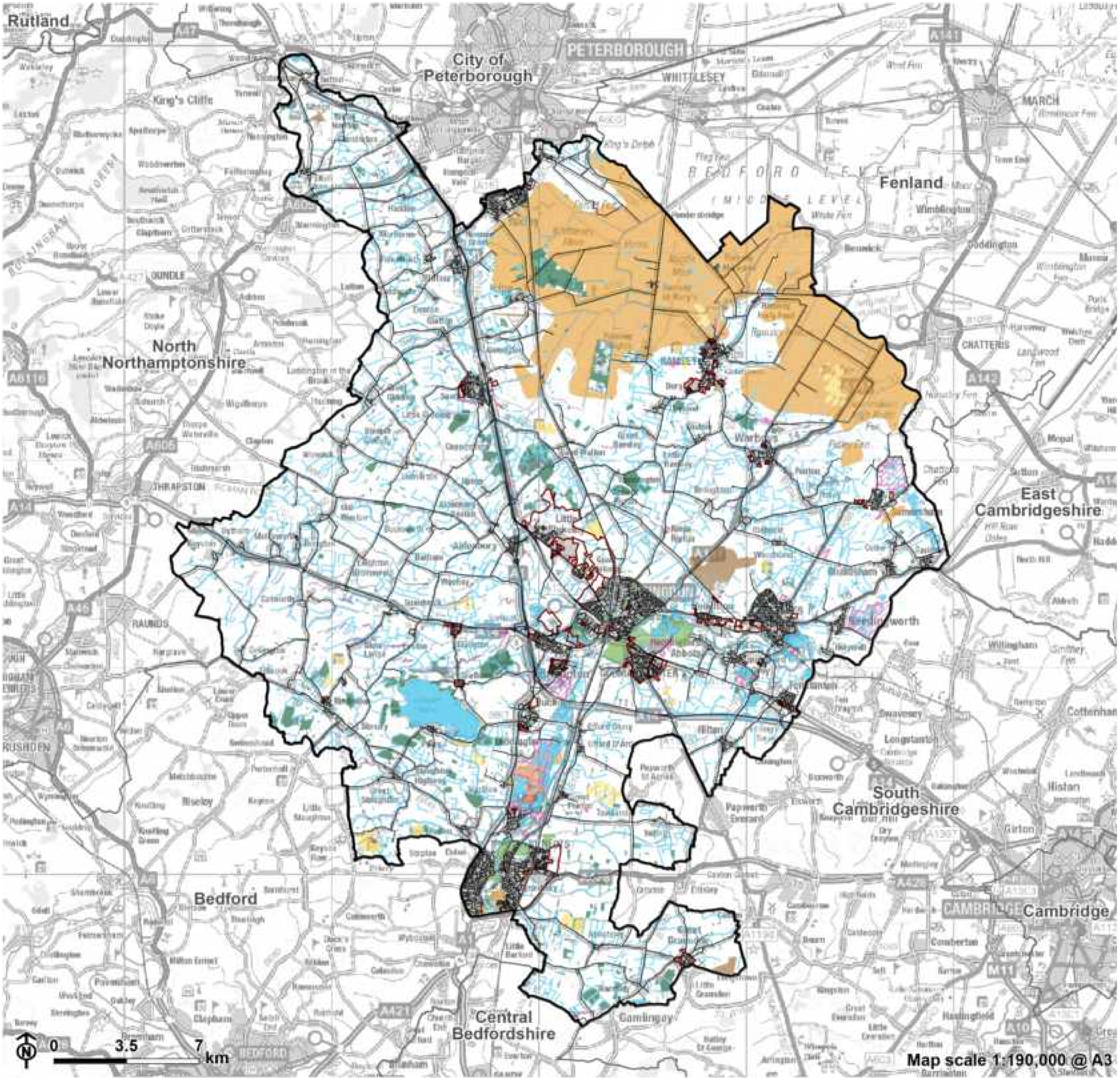
Figure C4: Solar constraints - Physical, land use and infrastructure



- Huntingdonshire District
- Neighbouring Local Authority
- Roads and railways
- Building
- Airports and airfields
- Watercourses and water bodies
- Existing renewable development
- Slope above 15° or slope above 7° and north-east to north-west aspect
- Designated open space
- Woodland
- Future developments, safeguarded land and employment sites
- Mineral and waste site
- Grade 1 agricultural land

Notes:

MOD land is not shown in the figure but was included as a constraint in the assessment.

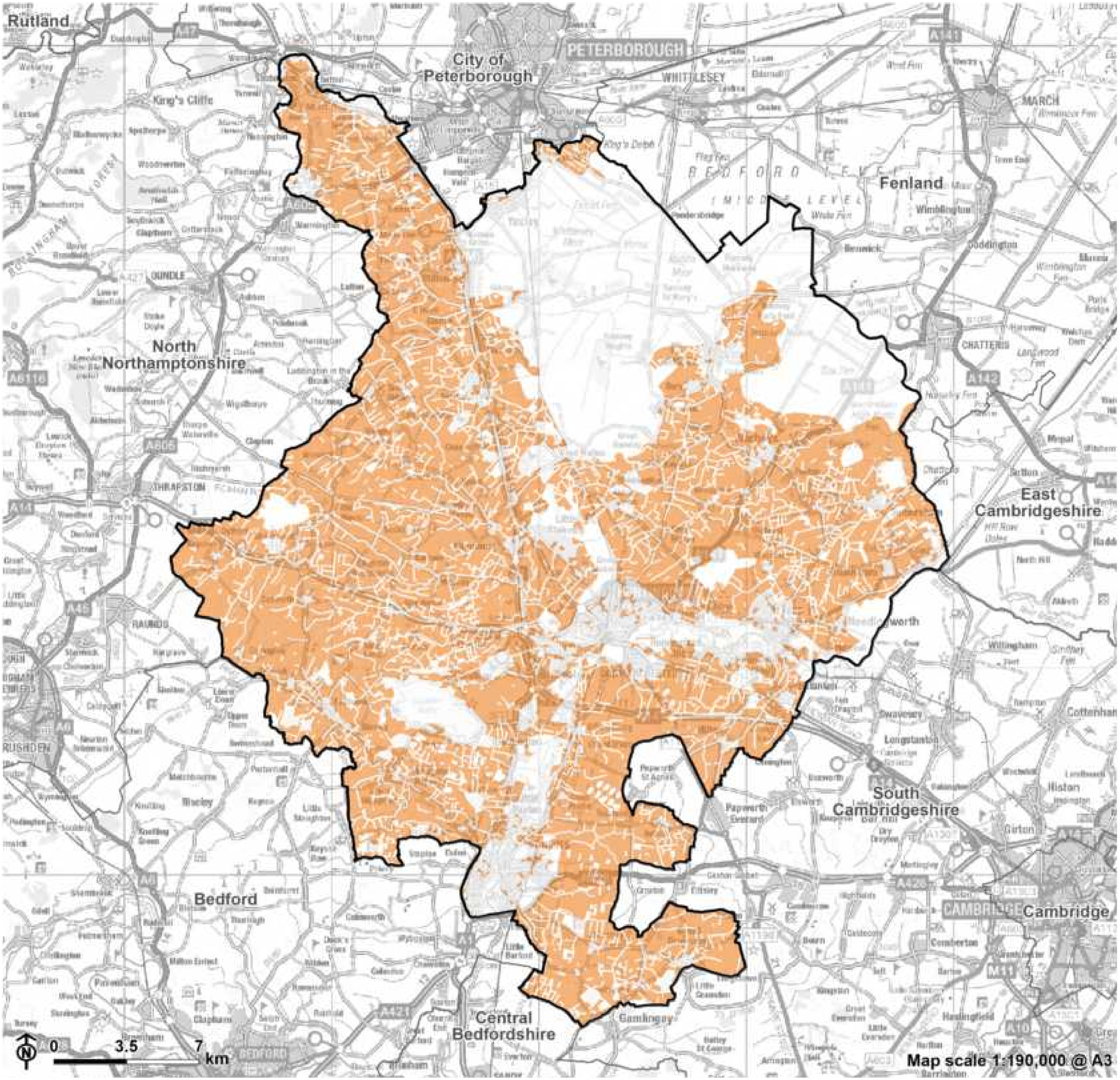
Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12713_Solar_Figures 12/06/2024 EB:spears_d

Renewable Energy Assessment
Huntingdonshire District Council

LUC

Figure C5: Opportunities and constraints: Solar development



Huntingdonshire District

Neighbouring Local Authority

Technical potential within Huntingdonshire

Area with potential for solar development

Constrained area for solar development: no technical potential

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12713_Solar_Figures 12/06/2024 EB:spears_d

References

1 IPCC (2018) Global Warming of 1.5°C [online]

2 Committee on Climate Change (2020) The Sixth Carbon Budget: The UK's path to Net Zero [pdf]

3 HM Government (2008) Climate Change Act 2008, c.27 [online]. Available at: https://www.legislation.gov.uk/ukpga/2008/27/contents

4 HM Government (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019 [online]. Available at: https://www.legislation.gov.uk/uksi/2019/1056/contents/made

5 Department for Energy Security and Net Zero (2024) Available at: https://www.gov.uk/government/news/new-publicly-owned-national-energy-system-operator-to-pave-the-way-to-a-clean-energy-future

6 Department for Energy Security and Net Zero (2023) Powering up Britain [online]

7 The EU Energy Union is a project of the European Commission to coordinate the transformation of European energy supply. On 31st January 2020, the UK left the EU and is no longer part of the Energy Union. However, there are still UK policies and measures in force relating to the five dimensions of the EU's Energy Union.

8 Department for Transport (2020) Government takes historic step towards net-zero with end of sale of new petrol and diesel cars by 2030 [online]

9 Department for Business, Energy and Industrial Strategy (2021) UK government announces major expansion of heat networks in latest step to power homes with green energy [online]

10 Department for Business, Energy and Industrial Strategy (2021) Plans unveiled to decarbonise UK power system by 2035 [online]

11 Department for Energy Security and Net Zero (2024) Great British Energy founding statement

12 Ministry of Housing, Communities and local Government (2024) Proposed reforms to the National Planning Policy Framework and other changes to the planning system [online]

13 Department for Energy Security and Net Zero (2024) Policy statement on onshore wind [online]

14 UK Parliament (May 2024) Solar and protecting our Food Security and Best and Most Versatile (BMV) Land

15 Department for Energy Security and Net Zero (2024) Policy statement on onshore wind [online]

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28 To mitigate impacts on the productivity of wind turbines located close to one another caused by wind turbulence, it is standard practice for developers to maintain an oval of separation between turbines that is equal to 5 times the turbine rotor diameter (the cross sectional dimension of the circle swept by the rotating blades) on the long axis, and 3 times the rotor diameter on the short axis.

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31 Ofgem (2024) Average gas and electricity usage. Assuming an average home uses 2,700kWh per electricity year.

32 Encon (2024) Calculation of CO2 offsetting. Assuming one tonne of CO*2* can be offset by 31 to 46 trees. The median of 38.5 trees per tonne of CO*2* was used.

33 The transmission network refers to the highest voltage electricity network in the UK – the ‘motorway network’ of the energy world - it transmits large quantities of electricity over long distances via wires carried on a system of

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42 This assumes: 100% wind potential, 100% GM solar potential, 100% rooftop solar potential (assuming all roofspace used for solar PV as this is a more popular technology than solar water heating), 100% slurry potential (assuming all used for CHP), 100% woodfuel potential (assuming all used for CHP), 100% energy crops potential (assuming 80% miscanthus, 20% SRC, all used for CHP). This is not realistic as technologies will require the same land-take in places to be delivered, and so deployable will likely be much lower.

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106 The RHI does no list these. The RHI does however provided the total number of UK installations for each technology. It also provides the total number of RHI installations within the authority (not split by technology). The proportion of UK RHI installations per technology was therefore used to estimate the total number of RHI installations for each technology within the authority.

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