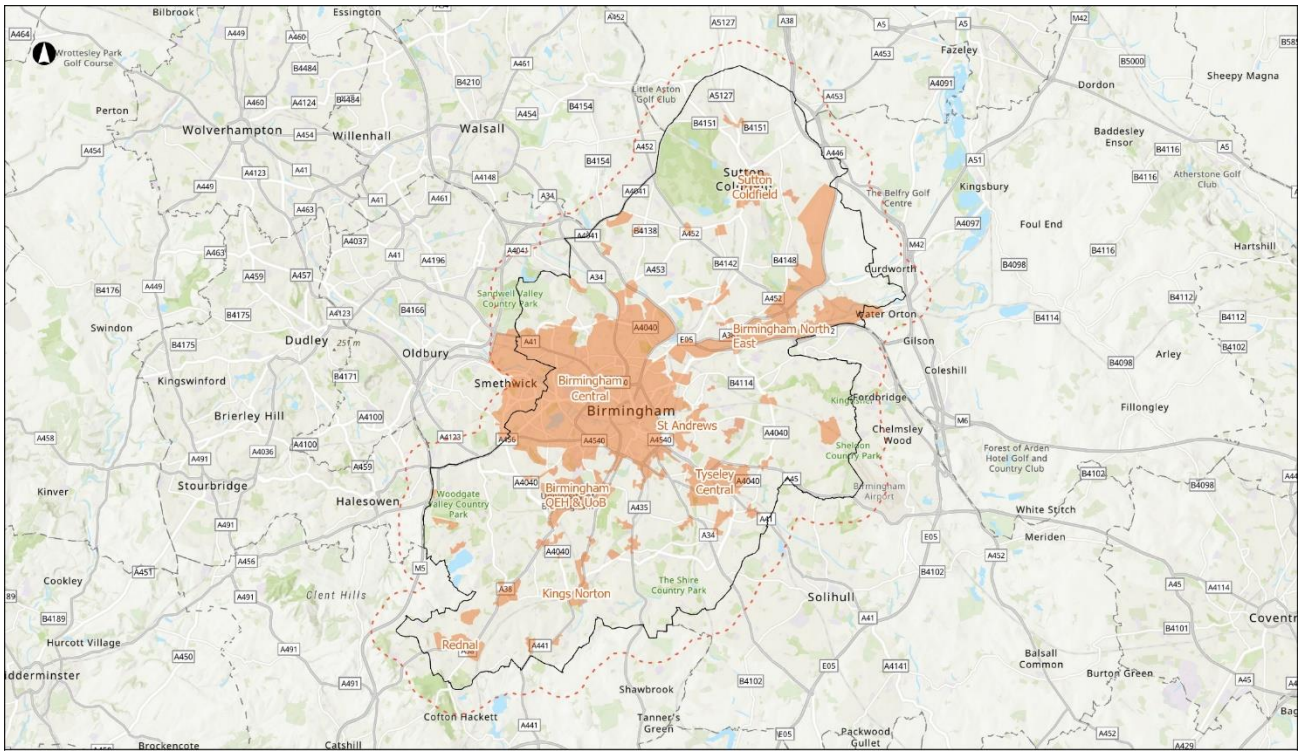
Department for Energy Security & Net Zero

Birmingham

Heat Network Zoning

Zone Opportunity Report



February 2025

Disclaimer

Please read the following licence conditions thoroughly to understand your responsibility for use of this report and data presented within it.

This report contains outputs from the Heat Network Zoning Pilot Programme. The Pilot was undertaken prior to full details of the Heat Network Zoning policy being available. Therefore, the contents, including data shown in maps, technical and economic data within the report, are likely to change and potentially sensitive information is withheld. No part of this report shall be relied upon for any business decisions.

Acknowledgements

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Contents

Executive Summary

About Birmingham: Birmingham is the second largest city in England with a population of over 1.1 million. The city aims to reduce carbon emissions to net zero by 2030.

Local Energy Policy: BCC declared a climate emergency in June 2019 and has an ambition to reduce the city's carbon emissions to net zero by 2030. The Route to Zero (R20) team works across the Council and City to support this ambition.

Existing heat networks: Multiple networks exist in the City Centre (Birmingham District Energy Company) and Edgbaston (University of Birmingham), with one planned in Tyseley. Birmingham is an Advanced Zoning Programme (AZP) city.

Zones identified: A total of 41 heat network zones were identified in Birmingham, with four considered strategic zones. The total heat demand for all buildings required to connect within these zones is around 1,700GWh/yr.

Strategic heat network zones: The strategic zones are Birmingham Central, Tyseley, Birmingham North-East, and Queen Elizabeth Hospital and University of Birmingham. The heat demand for buildings required to connect is 1,350GWh/yr.

Key heat demands: The total annual heat demand for buildings connected to the initial zone opportunities is 550GWh/yr. Some of the largest buildings include Queen Elizabeth Hospital, the University of Birmingham and city centre buildings.

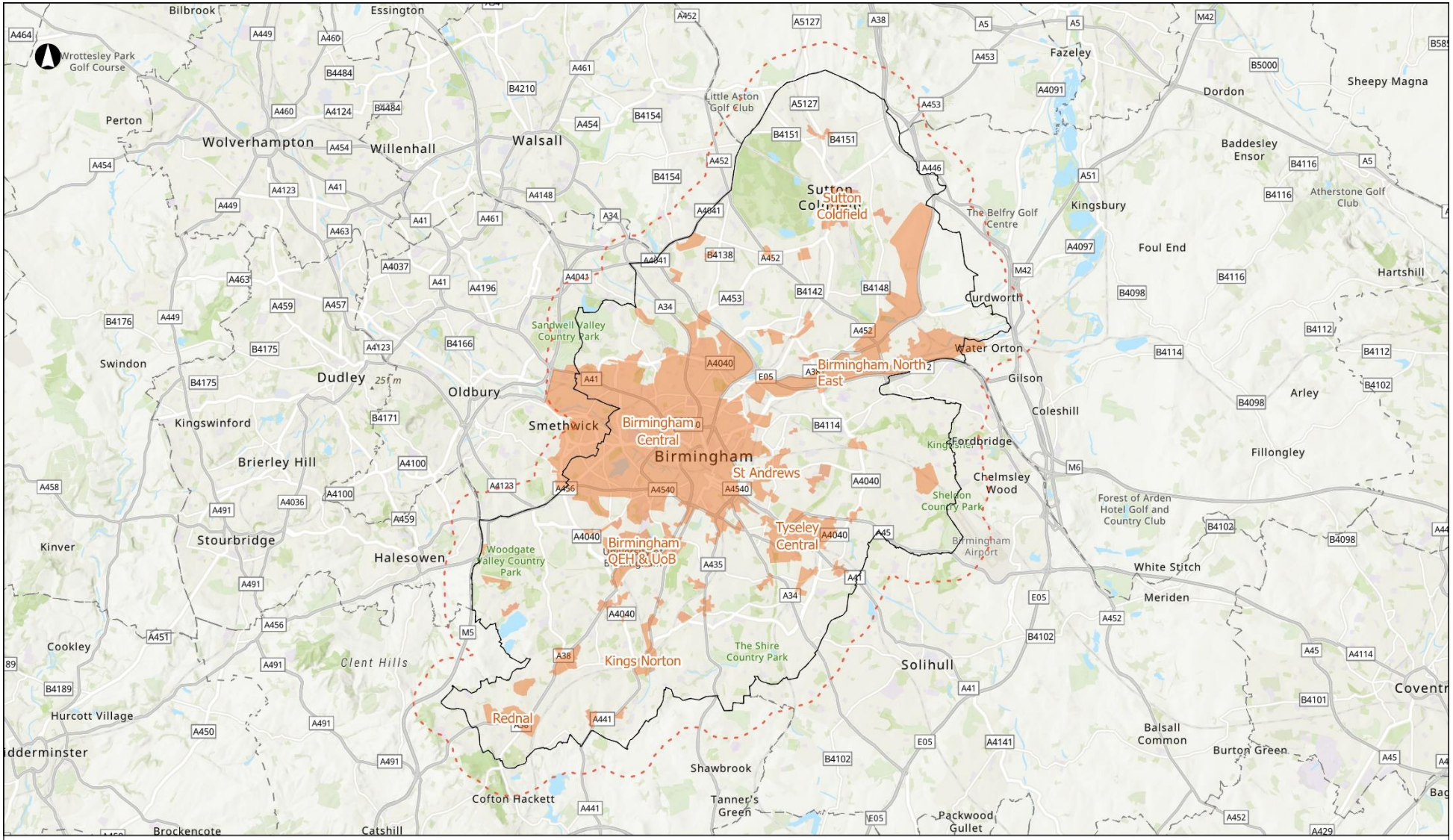
Key heat sources: Potential heat sources include energy from waste, water source heat pumps, biomass, waste water heat recovery and air source heat pumps. The Tyseley zone has an excess of heat sources available.

Estimated CapEx: The high-level estimate of capital expenditure to network all buildings required to connect in all zones is approximately £2.1bn, of which the initial zone opportunities amount to approximately £700m.

Other heat network zones: Smaller heat network zones identified in areas such as Sutton Coldfield and Bordesley East could be served by large-scale heat pumps.

Carbon savings: Initial zone opportunities identified could deliver carbon savings of more than 188ktCO_{2e} annually.

Figure 1: Overview of Heat Network Zones in Birmingham



1) Introduction

Heat networks will play a crucial role in decarbonising heat in buildings. Heat networks take heating, cooling or hot water from a central source(s) and deliver it to a variety of premises such as public buildings, shops, offices, hospitals, universities, and homes. They are also an important part of securing the UK's energy independence through local, low carbon heat sources and reducing the cost of living through efficient, affordable heating in densely populated areas. Analysis shows that heat networks could provide about 20% of total heat by 2050. They currently provide about 3%.

The Department for Energy Security and Net Zero (DESNZ) is enabling the development of heat network infrastructure through a range of targeted funding, policy and legislative support to de-risk projects and attract investment. The Energy Act 2023 establishes the regulatory framework for heat networks in Great Britain and provides powers to introduce heat network zoning in England through secondary legislation. A heat network zone (HNZ) is a formally designated geographical area in England where heat networks are expected to provide the lowest-cost solution for decarbonising heating.

Under heat network zoning, central and local government will work with industry and local stakeholders to identify and designate areas of England where heat networks are expected to be the lowest-cost solution to decarbonising heat. Heat network zoning will be essential to speeding up the development of new heat networks and we hope to catalyse growth where it's most needed.

Heat network zoning will significantly increase private sector investment in the sector by removing the barriers which currently limit the pace of developing large scale heat networks. It will also give local communities the tools to accelerate the development of heat networks in their own areas and ensure that more homes and businesses can have access to greener, cheaper heat. It also has the potential to create tens of thousands of jobs across the country.

This report shows the Pilot programme outputs for Birmingham and is intended to showcase potential heat network zones in the city. The report indicates the heat network investment opportunity at a city scale, the potential location of heat network zones, and key opportunities for initial heat network development within those potential zones

Please note that all information presented in this report, including the location of identified heat network zones, is subject to change. These are the findings of Pilot programme that were developed alongside the emerging Heat Network Zoning policy and therefore reflect our understanding at a moment in time. As the methodology improves, we will update these reports to improve our understanding of how heat network zoning may be rolled out in each area. Any potential zones that are identified fully, or partly, in an adjacent local authority area will need to be discussed further once local zone co-ordinators are established.

Heat Network Zoning Pilot Methodology

Heat network zones will be identified using a standardised national zoning methodology[1]. The Heat Network Zoning Pilot Programme (hereafter Pilot programme) set out to develop a process to identify potential zones in a consistent and standardised manner across a range of towns and cities in England. The programme was fully funded and led by DESNZ, working alongside 28 Local Authorities, and multiple consultancy firms, to develop and test this approach at a local level. As such the final outputs are supported by each Local Authority but do not reflect an approved, endorsed, or adopted position on how zones may be delivered.

Lessons from the Pilot have been used to inform the development of the Heat Network Zoning policy. This includes improvements to the identification approach itself, but also wider policy design relating to the number and size of potential zones; existing heat networks; and the impacts of the policy on a range of stakeholders. Once the response to the heat network zoning consultation is published, we will update the methodology to reflect the final policy position.

The key concepts, definitions and complementary workstreams relevant to this report are introduced below. For a fuller description of the Heat Network Zoning policy, and up to date information regarding its implementation, please visit https://www.gov.uk/government/collections/heat-network-zoning.

Heat Network Zone Identification

Heat network zones will be identified using a standardised national zoning methodology. The December 2023 consultation on Heat Network Zoning proposes that the methodology will consist of two stages:

1. a national mapping exercise (using a data-led spatial energy model – the National Zoning Model, (or NZM), to identify indicative heat network zones across England;
2. a refinement stage where relevant local stakeholders will input to the review and refinement of potential heat network zones prior to formal designation.

For the purposes of this study, indicative heat network zones have been identified using a prototype version of the NZM. These indicative zones were then refined by technical consultants with input from local stakeholders. The NZM outputs are already of considerably higher quality than those shared for this work and therefore these reports will improve over time.

This study split heat network zones into two different categories. These are **'strategic'** zones – the largest zones which are generally seen as strategically significant to developing heat networks in an area; and **'other'** zones – which are generally smaller and discrete. These are terms specific to the Pilot programme and the report focuses primarily on the strategic zones.

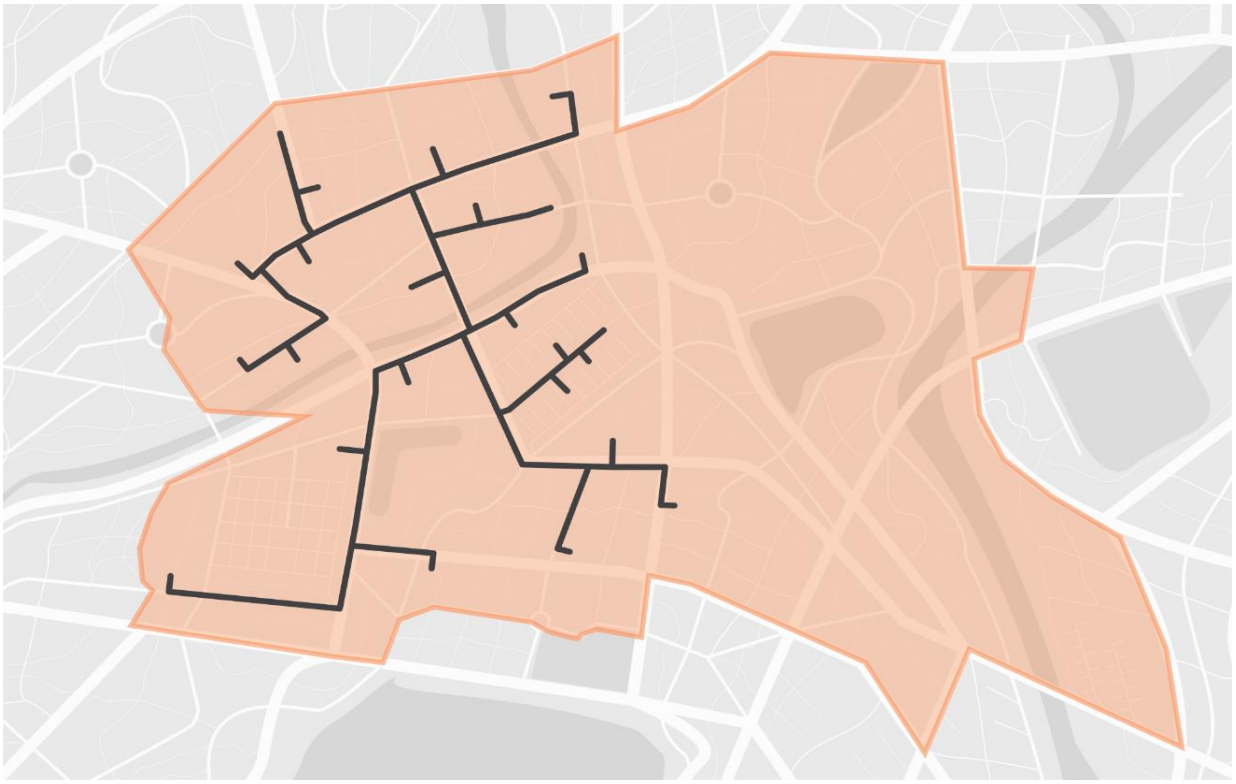
[1] More information can be found in the Heat Network Zoning Methodology Statements (Appendices 3, 4 & 5)

Initial Zone Opportunities

Alongside the identification of potential heat network zones, the Pilot programme has attempted to define areas within zones where the most attractive heat network development opportunities might exist. For the purposes of this programme *only* these are called an "initial zone opportunity" (or IZO). The approach considered economic viability, investment scale and returns, decarbonisation impact and deliverability. They were developed solely around buildings which could be required to connect[2] under the proposed Heat Network Zoning policy and did not consider potential voluntary connections.

Initial zone opportunity design targeted a linear heat density (LHD) of 4MWh/m/yr, for the existing built environment. This is considered a relatively low proxy for economic viability with the heat network sector in England. A more flexible approach was used for new development sites, where different economic success criteria are likely to be applied. To standardise the way opportunities were assessed, the IZOs presented in this report may differ from, or overlap with, existing or planned heat network infrastructure. Campus style heat networks (e.g. in hospitals or university campuses) were considered as potential heat loads with a single point connection. Figure 2 below shows an example of a heat network zone and an IZO.

Figure 2: Illustration of a Heat Network Zone (HNZ) and an Initial Zone Opportunity (IZO)



[2] The building categories being considered as required to connect include new developments, large non-domestic buildings, and communally heated residential blocks as described in Heat Network Zoning Consultation (2023)

Study Scope

This document is presented as a zone opportunity report as it was developed in advance of the final policy design. As such, the report does not include:

- references to the **central authority** or **zoning co-ordinator** roles;
- assumptions about rights of **existing heat networks,** or **zone delivery areas**;
- an options appraisal on which **routes to market** may be taken;
- calculations on the **cost of heat** (connection/tariffs) to specific buildings**;**
- any inferences as the suitability for **public/private sector delivery** unless it's matter of fact (existing network or Heat Network Investment Project/Green Heat Network Fund project);
- references to **local community benefit** or **consumer protection** (subject to a live consultation).

In the future, it is intended that a document, similar in style, will be produced to incorporate these policy design aspects and be used as a Zone Market Prospectus (ZMP) to market heat network zoning opportunities in an area. Further detail on the methodology and initial zone opportunity criteria is provided in Appendix 4 and Appendix 5.

Advanced Zoning Programme

The Advanced Zoning Programme (AZP) is working with 19 areas (including Birmingham) to support the construction of new zone scale heat networks as quickly as possible following the launch of heat network zoning in 2025. Amongst the programmes aims are to accelerate the delivery and construction of heat network zones; develop best practice guidance; provide project development support services; and promoting market transformation ready for the national rollout of Heat Network Zoning policy.

The programme builds upon lessons learnt from the Pilot programme and these outputs. In October 2024, DESNZ announced that ground-breaking heat network schemes in Leeds, Plymouth, Bristol, Stockport, Sheffield, and two more in London will receive prioritised support to advance to construction by the end of 2026.

AZP uses the latest zoning methodology (i.e. developed after the Pilot programme) and has undertaken further detailed development work with local stakeholders to further improve confidence and accuracy. The programme may also have applied local strategic and commercial considerations and therefore the opportunities may differ slightly from those presented here, using a national standardised approach. Where there is overlap, AZP studies should be considered more appropriate for use than the outputs from this Pilot programme.

2) Birmingham Heat Networks Context

2.1) Birmingham City Overview

Birmingham City Council (BCC) is the local government body responsible for the governance and the delivery of a wide range of services in Birmingham. BCC is a metropolitan local authority with 101 elected councillors. It is the most populated local authority in the United Kingdom, with a population of over 1.1 million.

BCC is part of the West Midlands Combined Authority (WMCA) which promotes economic development and investment in the West Midlands. The seven main local authorities in the West Midlands are: Birmingham City Council, Coventry City Council, Dudley Metropolitan Borough, Sandwell Metropolitan Borough, Solihull Metropolitan Borough, Walsall Metropolitan Borough, and the City of Wolverhampton.

Birmingham has over 110,000 social housing units, 55% of which are owned and managed by Birmingham City Council.

There is a large network of canals across the city alongside some smaller rivers. A productive Sherwood Sandstone aquifer underlies much of Birmingham. The western part of Birmingham is also situated in the floodplain of the River Rea.

In September 2023, BCC announced it was struggling to deliver its statutory services[3]. In response, BCC announced it was stopping all non-essential spending to minimise financial liabilities and the budgetary shortfall. The UK Secretary of State for the Department of Levelling Up, Housing and Communities subsequently appointed commissioners to exercise certain functions of BCC relating to finances and governance[4]. This puts significant restrictions on the activities BCC can undertake and the roles it can resource.

2.2) Birmingham Net Zero Targets and Commitments

BCC declared a climate emergency in June 2019 and committed to reducing the city's carbon emissions to net zero by 2030[5]. Proceeding this, the Route to Zero (R20) taskforce was created, which brought together council members and other stakeholders to produce a 'Route to Zero Action Plan'[6]. The plan contains a variety of policies which aim to increase the scale of change required for decarbonisation. This was endorsed by the full council in January 2021.

The Route to Zero Action Plan states the city-wide emissions are currently 4,578ktCO_{2e}. A consistent annual emissions reduction rate of -12.8% is needed to adhere to a carbon budget

[3] This was formalised through the issuing of a what is called a section 114 notice.
[4] This is part of the standard sets of procedures associated with a section 114 notice.
[5] Birmingham City Council, *The climate emergency declaration*, https://www.birmingham.gov.uk/info/50282/climate_change/2642/what_is_the_council_doing_about_climate_change
[6] Birmingham City Council. *Route to Net Zero Action plan – Call to Action,* *https://www.birmingham.gov.uk/downloads/file/18618/route_to_zero_action_plan_-_call_to_action*

of 27.5MtCO_2 between 2020-2100 for the Birmingham City region. If Birmingham's emissions were to remain at today's levels, the carbon budget would run out in seven years.

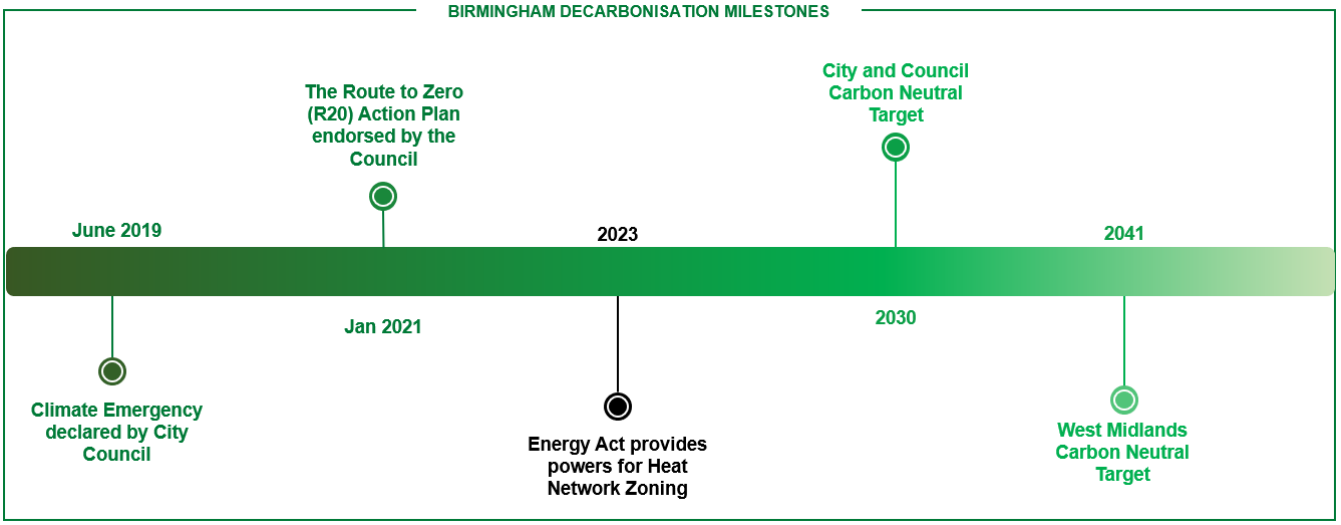
The Route to Zero Action Plan identifies several priority areas which reduce carbon and promote sustainable energy generation. The decarbonisation of heat is a key priority action, and the plan outlines a range of measures to accelerate sustainable heat generation. This includes the conversion of the existing Birmingham District Energy Company energy centres to carbon-neutral energy sources and maximising the potential of the Tyseley Environmental Enterprise District, including the Tyseley Energy Recovery Facility (ERF). Both are within the strategic heat network zones detailed in this report.

In addition to the Route to Zero Action Plan, BCC published the Our Future City Plan in 2023. BCC is keen to leverage their relationships with partners in the city to decarbonise and then expand the existing network.

BCC has been supported by the Heat Networks Delivery Unit (HNDU) in DESNZ to commission a decarbonisation and expansion roadmap for the Birmingham District Energy Company networks which are in the city centre. This roadmap identifies several new low-carbon heat sources that could replace the existing gas CHP plant and support heat supply for new connections. The roadmap has been used to inform the scope of a study that focuses on decarbonising Birmingham District Energy Company networks. At the time of writing, A Strategic Energy Partnership is also exploring heat networks in Tyseley. This is described later in the report.

Figure 3 summarises key dates for the decarbonisation of BCC and other major city stakeholders.

Figure 3: Birmingham Decarbonisation Milestones



2.3) Delivering Heat Networks in Birmingham

There are five existing heat networks in Birmingham and a small heat network serving social housing in the town of Sutton Coldfield, north of Birmingham.

The Broadstreet network, Birmingham Children's Hospital network and Aston University network are in the city centre. These heat networks are operated by the Birmingham District Energy Company. The Broadstreet network is operated on a long-term concession agreement between BCC and Bring Energy (formally Equans Urban Energy). This contract runs until 2032 from when BCC will take full ownership of the network and will have the opportunity to re-contract with Bring Energy or procure a new operator. There are separate agreements governing the respective contracts between Bring Energy and Birmingham Children's Hospital and Aston University. More detail about these networks is provided in Section 3.1.2.

The University of Birmingham (UoB) Edgbaston Campus heat network is south of the city centre and includes a small branch which extends to some buildings beyond the campus. At the Queen Elizabeth Hospital (QEH) a heat network serves the Heritage Buildings and is operated by Bring Energy. More detail about these networks is provided in Section 3.4.2.

Beyond the existing heat networks, the Tyseley Environmental Enterprise District is an industrial area of over 100 Ha south-east of the city centre. A Local Development Order is in place to encourage new low-carbon energy businesses into the area. The major stakeholders in the area include BCC, Tyseley Energy Park, the Crown Estate, and the University of Birmingham. This area is highly strategic, owing to the large volume of heat being generated, and the potential for additional heat sources to locate in this area in future (in part facilitated by the Local Development Order).

The University of Birmingham partnered with National Grid Electricity Distribution to develop a low-carbon energy plan for the area with the aim of demonstrating benefits to the electricity grid. This project was funded by the Strategic Innovation Fund, operated by Ofgem. As part of this project, three heat network developers were funded to develop high level heat network plans for the Tyseley Environmental Enterprise District. These plans use waste heat from existing and planned heat sources to supply heat to the industrial, commercial, and residential buildings in the area. The stakeholders engaged in this project are still actively pursuing the development of a heat network in this area.

Local Policies

The Birmingham Development Plan 2031 has policies in place to support the development of heat networks. Policy TP4 Low and Zero Carbon Energy Generation states that for major development applications, developers must evidence that they have investigated "existing or planned heat networks that the development could be connected to". For smaller (more than 10 but less than 200 residential units or less than 1000m^2 of non-residential development) the policy requires connection to a heat network if there is one available. A 2019 Guidance note on Sustainable Construction and Low and Zero Carbon Energy Generation provides detailed guidance on the application of this policy.

AZP

Birmingham is part of the Advance Zoning Programme. This programme aims to accelerate the delivery of a zone scale heat networks, aiming for construction start in 2026. Currently this work is progressing an Outline Business Case for BCC which identifies a route to market. The AZP work is also supporting BCC in relation to its roles defined by the heat network zoning consultation. In previous AZP work, a technical report was produced which provides additional information for many of the strategic heat network zones described in this report. This technical report covers:

- Stakeholder identification and engagement for heat sources and heat supplies.
- A viability assessment for heat offtake from the Birmingham Biopower Plant (BBPL).
- A feasibility of the interconnection between zones using heat mains, specifically Tyseley to the centre and Minworth to the centre.
- Constraints mapping including statutory undertaker reports in key locations, particularly around bridges over canals and railways.
- A concept level route and pipe sizing strategy considering pressure and thermal losses.

Please refer to Appendix 2 for further information about the evidence compiled for heat network opportunities in Birmingham. This includes a stakeholder directory and records of interactions with those stakeholders as well key studies and reports.

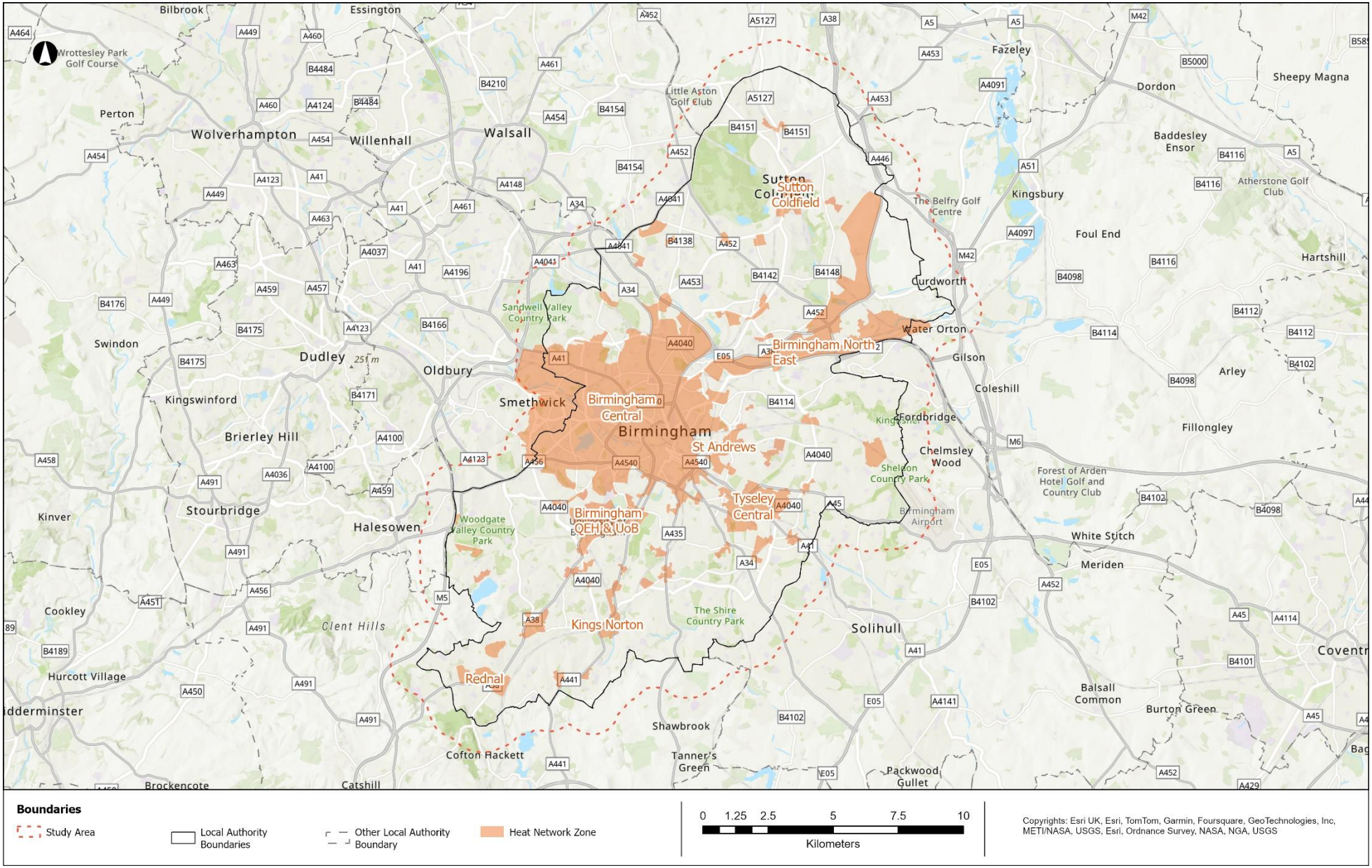
2.4) Birmingham Heat Network Zones

A total of 41 potential HNZs were identified in Birmingham, with four considered Strategic HNZs. Figure 4 shows the study area boundary as well as the boundaries of all HNZs identified within Birmingham. Strategic HNZs have been allocated a meaningful name agreed as relevant from a local perspective whilst Other HNZs have a reference number.

Please see Appendix 1 for the following maps giving more detail:

- A: City Typology Map – shows building typologies which dominate by area.
- B: Key Heat Loads Map – highlights key buildings required to connect by heat demand.
- C: Key Heat Sources Map – highlights key heat sources by type and potential energy centre locations as well as any existing district heat network energy centres.
- D: Existing / Planned Heat Networks Map – shows existing heat networks, planned extensions, and planned networks at an advanced development stage.
- E: Key Constraints Map – shows key topographical constraints identified.
- F: Off-gas Grid Areas – presents areas with differing levels of properties off the gas grid within the study area.
- G: Coal Mine Authority Map - shows area where coal mine water may be a possible heat source.

Figure 4: Heat Network Zones Identified within the Birmingham Study Area



3) Strategic Heat Network Zones

Strategic HNZs in Birmingham

This section examines the four strategic HNZs and the IZOs identified within each. This covers the key heat demands, heat sources, energy centre locations and potential constraints for each IZO identified. Heat network distribution routes are conceptual and designed to illustrate the potential size and scale of the heat network opportunity that may be realised as part of the upcoming Heat Network Zoning policy. Other heat network zones are listed in Section 4.

Table 1 below presents a high-level estimate of the scale of opportunities across Birmingham. Please refer to Appendix 4 for more detail.

Table 1: Annual Heat Demand for Buildings in All Zones, Strategic Zones and IZOs

Scope	Annual heat demand (GWh/yr)
All buildings required to connect in all zones[7]	1,700
All buildings required to connect in strategic zones	1,350
All buildings connected to the IZOs	550

Existing/planned heat networks that overlap with IZOs are described, though their locations may vary due to different approaches. The Pilot programme applied a standard set of technical and economic assumptions across each of the 28 areas that participated in the programme and uses a proxy for economic viability (see Section 1 and Appendix 4 for more detail). Existing and planned networks will often be based on more detailed design work and have taken account of strategic and commercial considerations that were relevant at the time of their development. Future iterations of this report will consider how to better align local studies whilst retaining a nationally consistent approach.

The four strategic zones are summarised below. Figure 5 illustrates the size of each, alongside the proportion of buildings that may be required to connect.

Birmingham Central is the largest potential HNZ in Birmingham with the zone representing 75% of all heat demand in the city. It has a wide range of building typologies and seven potential heat sources identified including a water source heat pump (WSHP), two existing ground source heat pumps (GSHPs) and four air source heat pumps (ASHPs). For more information, please see Section 3.1.

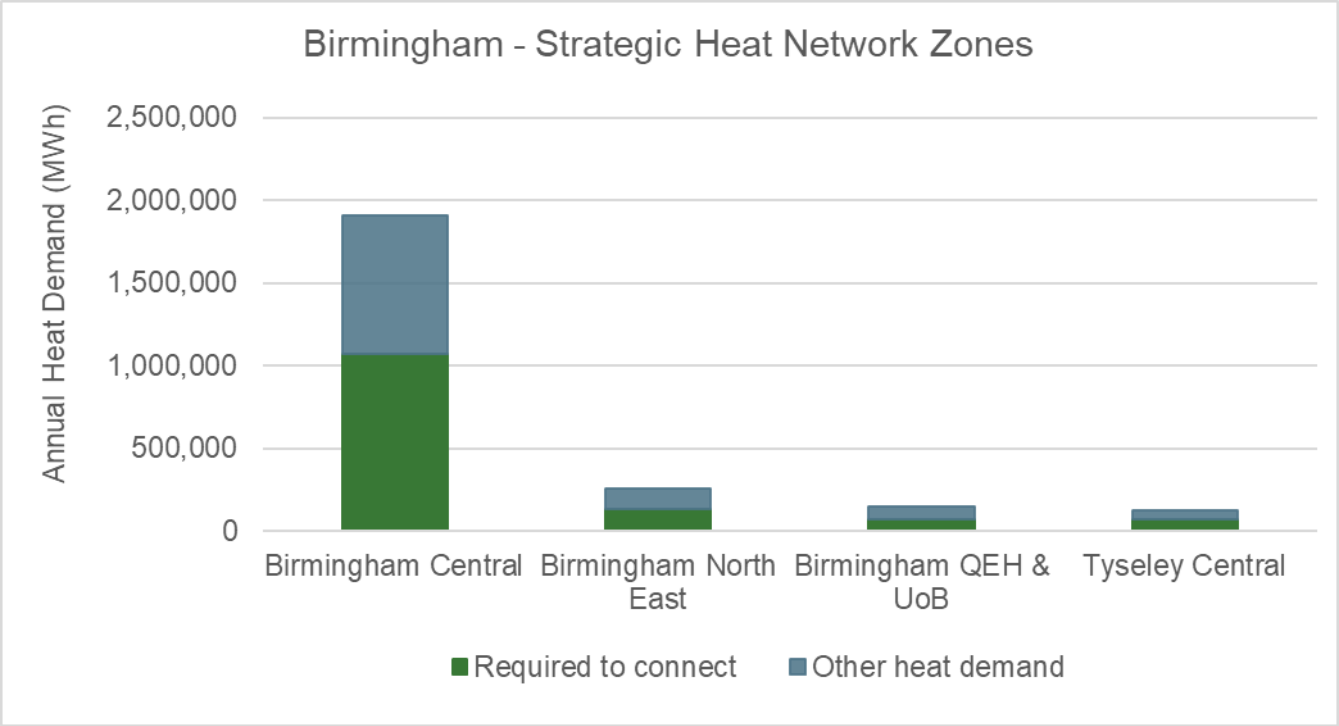
[7] Row 1 is an estimate of heat demand across buildings required to connect in all zones identified. Row 2 is as per row 1, but only within strategic zones. Row 3 includes buildings connected to the IZOs described and largely comprise of buildings potentially required to connect. Figures are generally rounded up to the nearest 25 or 50GWh/yr. Figures are generally rounded up to the nearest 25 or 50GWh/yr.

Tyseley Central is an industrial area located approximately 5km south-east of the city centre. This zone is strategically important due to several heat sources which provide a surplus of waste heat which could be transported into the city centre via a transmission line. These heat sources include Tyseley Energy Recovery Facility (ERF), a biomass power plant and a data centre. For more information, please see Section 3.2.

Birmingham North East is a large, predominantly industrial zone to the north-east of the city centre. This zone is strategically important due to the presence of a large sewage treatment works, from which up to 700GWh/yr of low-carbon heat could potentially be recovered from the discharge flow. For more information, please see Section 3.3.

Queen Elizabeth Hospital and University of Birmingham is located 4km south-west of Birmingham city centre and is the smallest of the four strategic zones, encompassing the University of Birmingham Edgbaston Campus, Queen Elizabeth Hospital, the Birmingham Women's Hospital, and Priory Hospital. For more information, please see Section 3.4.

Figure 5: Summary of Heat Demands in all Strategic HNZs Identified



3.1) Birmingham Central

3.1.1) Birmingham Central – HNZ Summary

Birmingham Central is a large zone with a range of building typologies, heat sources and land uses. It is the largest zone in Birmingham and represents 75% of all heat demand in the city.

The Birmingham Central zone is formed primarily of Birmingham city centre, which is bounded by the A4540 ring road. This central area of the zone includes Colmore Row, with the southern area encompassing the new development of Smithfield, the Chinese Quarter and the Gay Village surrounding Hurst Street. The northwestern area of the zone extends towards the BCC boundary with Sandwell. There are 2,352 buildings potentially required to connect in the Birmingham central HNZ, and includes Birmingham New Street Station, the Bullring Shopping Centre, and a new development called Smithfield.

The heat demand in the Birmingham Central zone is significantly larger than the available zone heat supply. However, the Tyseley ERF (and other existing and future sources in Tyseley) and Minworth Sewage Treatment Works sites are close enough that they could in principle provide heat to support the zone heat supply deficit.

3.1.2) Birmingham Central - Existing Heat Networks

There are three operational heat networks and one early stage proposed heat network development in Birmingham Central, as described below. Please refer to Appendix 1: Map D to see the location of the operational heat networks and planned expansions. Early stage proposed heat networks are described below but not shown on this map as their viability is not yet established.

Operational Heat Networks and Planned Expansions

The following operational heat networks and planned expansions have been identified within this HNZ. The total length of pipe for all networks is 12km. These networks serve approximately 30 buildings, representing a total heat demand of 70GWh/yr.

The Birmingham District Energy Company (BDEC) is a working partnership between Bring Energy (formerly Equans Urban Energy) and different partners. BDEC operates three heat network schemes, each a partnership between different commercial entities:

- Broadstreet Heat Network has a concession arrangement between BCC and Bring Energy.
- Aston Heat Network has a concession arrangement between Aston University and Bring Energy.
- Birmingham Children’s Hospital heat network has a ‘back-to-back’ concession with BCC.
- Birmingham New Street Station has a concession arrangement with Network Rail who own the energy centre.

The Broadstreet network has four heat inputs; a gas CHP unit at the International Convention Centre; a gas CHP at the Utilita Birmingham Arena; a gas CHP (which also has a GSHP for cooling) at the Library of Birmingham; and a gas CHP at Birmingham New Street Station.

The Aston heat network is heated by a 3MW gas CHP plant located on the Aston University campus.

The Birmingham Children's Hospital network is the smallest of the three heat networks and is supplied by a single CHP engine located within the hospital. The network received PSDS funding (in Phase 3) to install a GSHP to provide heat to a new hospital building on the site.

The three heat network schemes are not physically connected to each other, and they operate at different temperatures. The contracts are all due to expire in the early 2030's (at different dates). The high carbon factor of the heat supplied presents a challenge to connect new buildings to these networks.

Proposed Heat Networks – Early stage

Smithfield Connection

There is a plan to connect the BDEC Broadstreet network to a new development called Smithfield. The plan proposes that the Smithfield development Phase 1 delivery is served by a combination of ASHPs located on site with connection to BDEC for back up and resilience. Future phases may also connect and even supply low carbon heat into BDEC.

Birmingham District Energy Company Expansion and Decarbonisation

BCC has commissioned an expansion and decarbonisation roadmap for the BDEC networks. The roadmap includes carbon intensity targets, and recommendations for achieving them, alongside enabling all parties to meet organisational carbon objectives. The report also presents three growth scenarios for the network, the largest of which expands beyond the Birmingham Central IZO and fills a significant proportion of the HNZ.

Table 2: Birmingham District Energy Company Decarbonisation and Expansion Key Metrics

Growth Scenario	Annual Demand (GWh)	Heat Sources	Estimated CapEx	Construction Start Date
Low	74	Data Centre and ASHPs	£16m	2026
Medium	176	WSHP (Edgbaston Reservoir)	£62m	
High	661	WSHPs (reservoir, river, STW)	£545m	

3.1.3) Birmingham Central - Initial Zone Opportunities

A single IZO was identified in Birmingham Central zone. Potential routing[8] for the IZO is shown in Figure 6 and summary statistics provided in Table 3.

Table 3: Birmingham Central - Summary Statistics for Initial Zone Opportunities[9]

CapEx	Heat	Network	CO_{2e} savings	Linear Heat Density	Heat Sources
~£325m	>250GWh/yr	>40km	~40ktCO_{2e}/yr	6.7MWh/m	ASHPs and WSHPs

The IZO covers a large area of the city centre including the northeastern part where Aston University and Birmingham City University are located. The IZO connects to 445 building potentially required to connect, representing 260GWh/yr of heat demand.

The IZO has an existing heat network operator who operate three heat network schemes located in the heart of the city centre. These schemes provide heat to several BCC owned buildings, Birmingham Children's Hospital, and Aston University. BCC has commissioned a study to evaluate the decarbonisation and expansion of the existing network. This study covers a significant portion of the zone and is described in Section 3.1.2.

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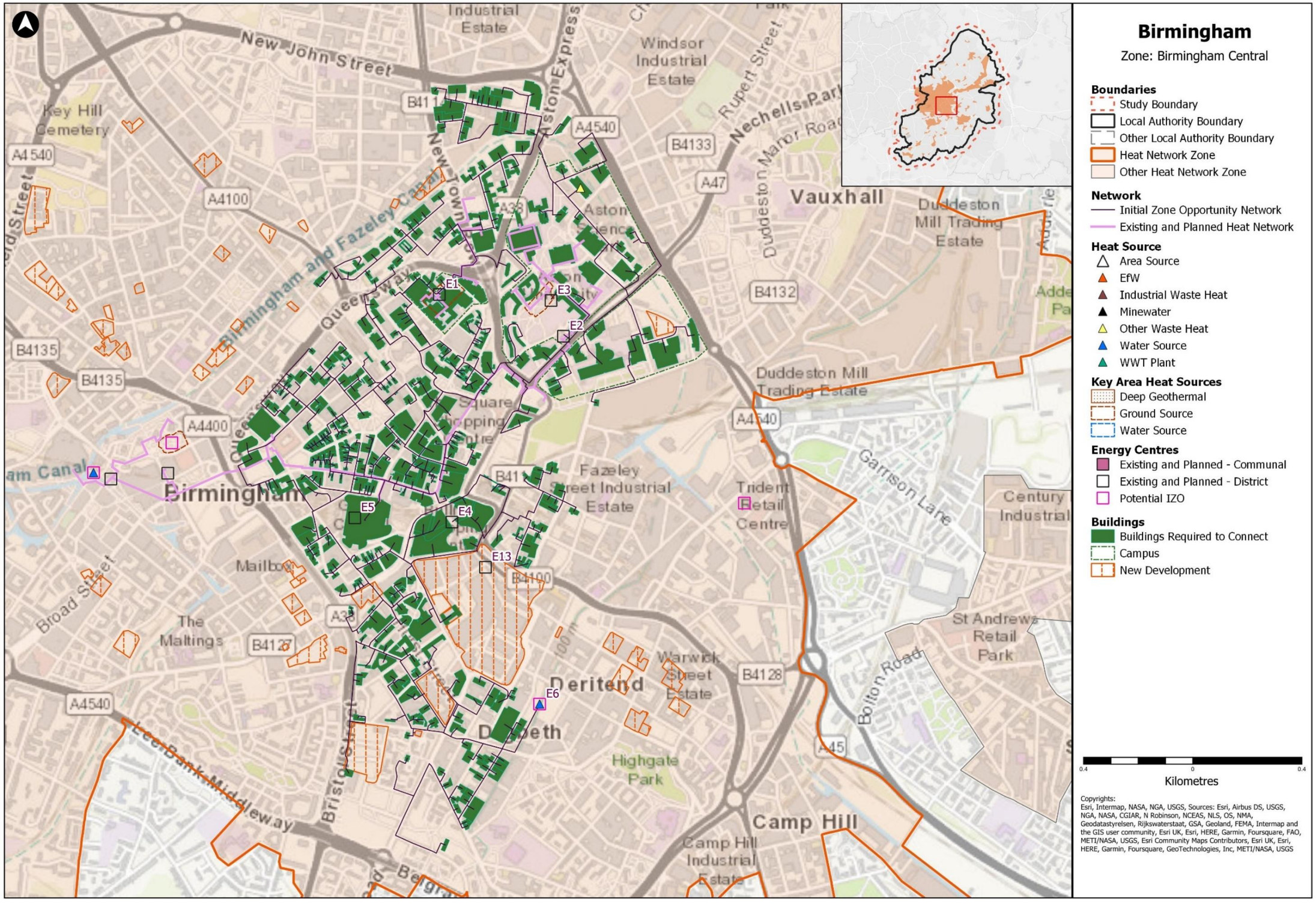
[8] Routes can be expected to change as a better understanding of local constraints is developed through design.
[9] Please see Appendix 3 – Glossary, "Specific definitions" of the main report for definitions related to this table.

Figure 6: Initial Zone Opportunities in Birmingham Central HNZ



3.1.4) Birmingham Central – IZO Heat Demands

The heat demands identified within the IZO are described below. The Pilot programme used several sources including local data collected from building owners; national energy demand datasets; benchmarks applied via the National Zoning Model (NZM); and a standardised approach to estimate the potential heat demands of new development sites. More information is provided in Appendix 4.

Where there are different values between datasets, the methodology prioritised the use of the early prototype version of the National Zoning Model, for consistency. This has led to an overestimation of some commercial and light industrial heat demands presented in this report. Large anchor loads that are already connected to existing district-scale heat networks are not listed.

The IZO comprises predominantly non-domestic commercial buildings. There are 439 buildings potentially required to connect within the IZO and it has a total heat demand of 260GWh/yr. As shown in Figure 7, 75% of loads in the Birmingham Central IZO are non-domestic, 10% are residential and 10% are new developments. Fewer than 5% of buildings fall into the other categories.

The zone includes large new developments which should be considered when developing plans for the IZO and other heat networks. The new Smithfield development area, owned by BCC and Lendlease, as well as the New Monaco development are situated south of the IZO and would make ideal anchor loads for a heat network. This could join other heat demands in Digbeth, the Chinese Quarter and the Gay Village surrounding Hurst Street.

The key heat demands for buildings potentially required to connect in the IZO are provided in Table 4. The largest single heat user identified, is the Network Rail operated Birmingham New Street Station. This building contains an existing gas-fired CHP heating system.

Figure 7: Birmingham Central - Categorisation of Heat Demand for Buildings Required to Connect in the IZO

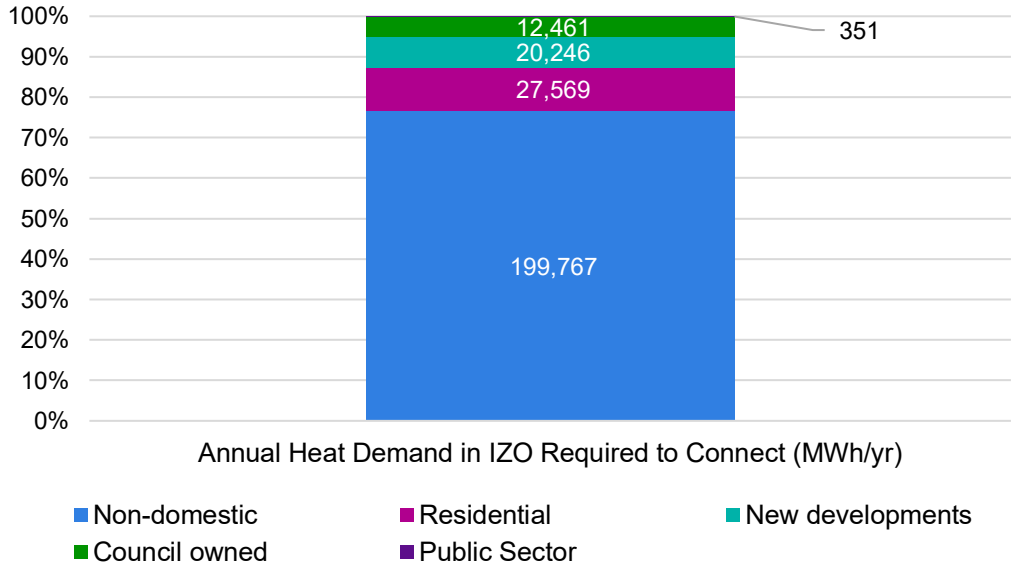


Table 4: Birmingham Central - Key Heat Demands Required to Connect in the IZO[10]

Building name	Building category	Number of connections	Annual Heat Demand (MWh)	Data Source
Birmingham New Street Station	Non-Domestic	1	14,650	Other benchmark
Bullring Shopping Centre West	Non-Domestic	1	7,100	Other benchmark
Smithfield Development	New Developments	1	6,550	Other benchmark
Millenium Point	Non-Domestic	1	5,850	Other benchmark
Bullring Shopping Centre East	Non-Domestic	1	5,800	Other benchmark
New Monaco Development	New Developments	1	5,500	Other benchmark
House of Frasier	Non-Domestic	1	4,300	Other benchmark
Eastside Locks Development	New Developments	1	4,150	Other benchmark
Cannon House	Non-Domestic	1	3,200	Other benchmark
Colmore Plaza	Non-Domestic	1	3,100	Other benchmark

3.1.5) Birmingham Central – IZO Heat Sources

Seven heat sources have been identified as potential options to supply the Birmingham Central IZO. These are a 5MWth river WSHP, a new GSHP at Birmingham Children's Hospital, a new GSHP at Aston University, and four ASHPs which could be installed in either new or existing energy centres. These sources are estimated to be able to provide approximately 23MW_{th} of heat supply.

[10] Please refer to Appendix 3 for definitions related to building categories in Table 4.

Table 5 and Table 6 summarise the key heat sources and potential energy centre locations identified for the IZO. These are also shown in Figure 6 in Section 3.1.3 and in Appendix 1: Maps C and G.

A zone heat deficit of approximately 42MW$_{th}$ has been identified. This deficit is expected to be met by location agnostic ASHPs. However, there are alternative heat sources such as a large open loop GSHP which could extract heat from the aquifer beneath the city centre, or the deficit could be met from heat imported into the IZO from the Tyseley or North East zones.

Table 5: Birmingham Central - Key Heat Source Opportunities for the IZO

Heat source type	Full opportunity capacity (kW$_p$)	Temperature (ºC)	Potential Energy Centre (Ref number)
WSHP River Rea	5,000	10 ºC	E6
GSHP Birmingham Children's Hospital energy centre	Unknown	12 ºC	E1
ASHP Aston energy centre	2,200	8 ºC	E2
GSHP Aston University	1,200	12 ºC	E3
ASHP Bullring	2,800	8 ºC	E4
ASHP Birmingham New Street Station energy centre	2,800	8 ºC	E5
ASHP Smithfield energy centre	7,000	8 ºC	E13

Several ASHPs could be located within existing energy centres which serve the existing BDEC network and it may therefore be advantageous for the IZO to interconnect with the BDEC network to capitalise on these heat sources. Other AHSPs/ heat sources are new, for example the new ASHP at Smithfield, or a new Aston University energy centre. These could be the starting point of new networks which expand into the IZO, connecting with the existing network in the future.

Table 6: Birmingham Central - Potential IZO Energy Centre Locations

EC Ref Number	Site type	Size (m^2)	Ownership	Heat Source
E1	Building	300	Birmingham Children's Hospital	GSHP
E2	Building	650	Aston University	ASHP
E3	Building	300	Aston University	GSHP
E4	Building	900	Birmingham Alliance (Hammerson Plc)	ASHP
E5	Building	900	National Rail	ASHP
E6	Land	700	BCC/ Canal and Rivers Trust	WSHP
E13	Land	800	BCC/ Lendlease	ASHP

3.1.6) Birmingham Central – IZO Heat Distribution

The approach to developing the heat network route considered economic viability, investment scale and returns, decarbonisation impact and deliverability. These criteria were applied in a standardised manner across all opportunities identified in the Pilot programme and therefore may not reflect detailed designs or proposed routes identified in more detailed feasibility work. Routing within the site boundary of a building or campus may not have been included if insufficient information was available. The IZO routing was developed solely around buildings which could be required to connect and did not consider potential voluntary connections.

The purpose of the concept heat network route is to define the scale, potential routing and identified associated constraints within the zone. Further work will be required to undertake a more detailed route assessment to take account of the buried utilities, building connections and other local strategic and local planning considerations. Table 7 shows the network statistics for the IZO including the network length and associated cost. Please see Appendix 5 for related methodology statements and assumptions.

The heat distribution network within the Birmingham Central IZO is shown in Figure 6. The IZO stretches across the dense city centre, and it is anticipated that there will be significant congestion of existing services beneath many of the roadways and footpaths.

Table 7: Birmingham Central - Indicative Heat Network Statistics for the IZO

IZO Heat Network description	Network length (km)	Network cost (£m)
Birmingham Central	40	150

3.1.7) Birmingham Central – IZO Key Constraints and Mitigations

[C1] Rail crossings: Birmingham New Street Station occupies the centre of the zone. The station is below ground level and must be crossed either by (a) using road bridges (b) utilising an existing pipe bridge currently used by the Birmingham District Energy Company network, or (c) taking a suboptimal route around the station to avoid the crossing. Option (a) would require a feasibility assessment to check the suitability of the bridges to accommodate the heat network pipework (size and weight) and provide confirmation of the proposed route. Option (b) would require both a feasibility assessment to understand spatial and weight constraints on the existing bridge, and further consideration of the administrative arrangements associated with utilising a crossing already occupied by another heat network.

[C2] Underground rail and tram crossings: The Birmingham Central zone contains both underground rail lines, and above ground tram lines. The proposed IZO route must cross both constraints simultaneously on Upper Bull Street. A feasibility assessment would be required to understand the structural and spatial factors that would determine whether such a crossing could be made and provide confirmation of the proposed route.

[C3] Road crossings: The Birmingham Central zone is traversed by numerous multi-lane highways which cut through the proposed IZO route at three locations. Specifically, these are:

- The proposed route would cross four lanes at the crossroads junction of James Watt Queensway and Jennens Road;
- The proposed route would make three crossings of the multilane, multilevel junction traversed by Lancaster Circus Flyover; and
- A six lane, two level crossing across Lancaster Street.

Implementing each of these crossings would require feasibility studies to understand footway depth, bridge strengthening requirements, and constraints presented by existing buried utilities.

[C4] Canal crossings: The Birmingham Central zone hosts 35km of canals, which the proposed IZO route may cross at two points:

- Jennens Road, over Ashted Tunnel; and,
- Corporation street, over Birmingham and Fazeley Canal.

Both crossings would a require feasibility assessment to check the suitability of the bridges to accommodate the heat network pipework (size and weight), with consideration to footway depth. This is required to provide confirmation of the proposed route.

3.2) Tyseley Central

3.2.1) Tyseley Central – HNZ Summary

Tyseley Central is located approximately 5km south-east of the city centre. It is strategically important due to the number of heat sources in the area, including an ERF, biomass power plant, a data centre, and several other energy related industries. This zone therefore has a large surplus of waste heat, which could be transported into the Birmingham Central zone to serve an identified zone heat supply deficit.

There are active heat network developers investigating this zone. They have ambitions to submit applications to the Green Heat Network Fund (GHNF) and deliver the start of a heat network shortly after.

There is a Strategic Alliance of stakeholders in Tyseley, which BCC are part of. Other partners include the University of Birmingham, the Crown Estate, and Tyseley Energy Park (who are the developer and landowner). This presents an existing channel which heat network zoning coordination activities can use to align several large stakeholders to common and mutually beneficial objectives. One objective of the Strategic Alliance is to encourage the development of new businesses and industry in the area. They are a major stakeholder and can therefore aid with the connection of heat demands (existing or future development) and securing heat sources (existing or future heat sources).

Within this zone, there are 157 buildings identified as potentially required to connect, and 73GWh/yr of heat demand.

3.2.2) Tyseley Central - Existing Heat Networks

Proposed Heat Networks – Late stage

Tyseley Environmental Enterprise District

The Tyseley Environmental Enterprise District (TEED), also known as the Green Energy and Innovation Quarter is an area of over 100Ha, where new low-carbon energy businesses and development are being encouraged. In 2023, the Strategic Alliance partnered with National Grid Electricity Distribution, which was awarded funding by the Strategic Innovation Fund, to develop a low-carbon energy plan for the area with the aim of demonstrating benefits to the electricity grid. The Strategic Innovation Fund, an Ofgem programme delivered in partnership with Innovate UK, supports the transition to net zero as part of Ofgem’s network price controls (RIIO-2).

As part of the Strategic Innovation Fund’s low-carbon energy plan, three major heat network developers established heat network plans which propose using waste heat from existing and planned sources within the Tyseley area. The plans describe a range of scales of heat network and energy infrastructure investments, ranging from £30m to £250m of capital investment, and serving heat demand of between 50GWh/yr and 120 GWh/yr.

Although the Strategic Innovation Fund project concluded in Q4 2023, interest in this area from heat network developers remains, particularly given the large volume of waste heat supply present. Multiple heat network developers continue to be interested in securing GHNF funding to deliver a heat network in the area.

The Tyseley area is a focus of the AZP in Birmingham and therefore is likely to progress at pace.

3.2.3) Tyseley Central – Initial Zone Opportunities

A single IZO was identified in the Tyseley Zone. Potential routing[11] for the IZO is shown in Figure 8 and summary statistics provided in Table 8.

Table 8: Birmingham Tyseley Central - Summary Statistics for Initial Zone Opportunities[12]

CapEx	Heat	Network	CO_2e savings	Linear Heat Density	Heat Sources
~£150m	>50GWh/yr	~25km	>5ktCO_{2e}/yr	2.9MWh/m	ERF and Biomass

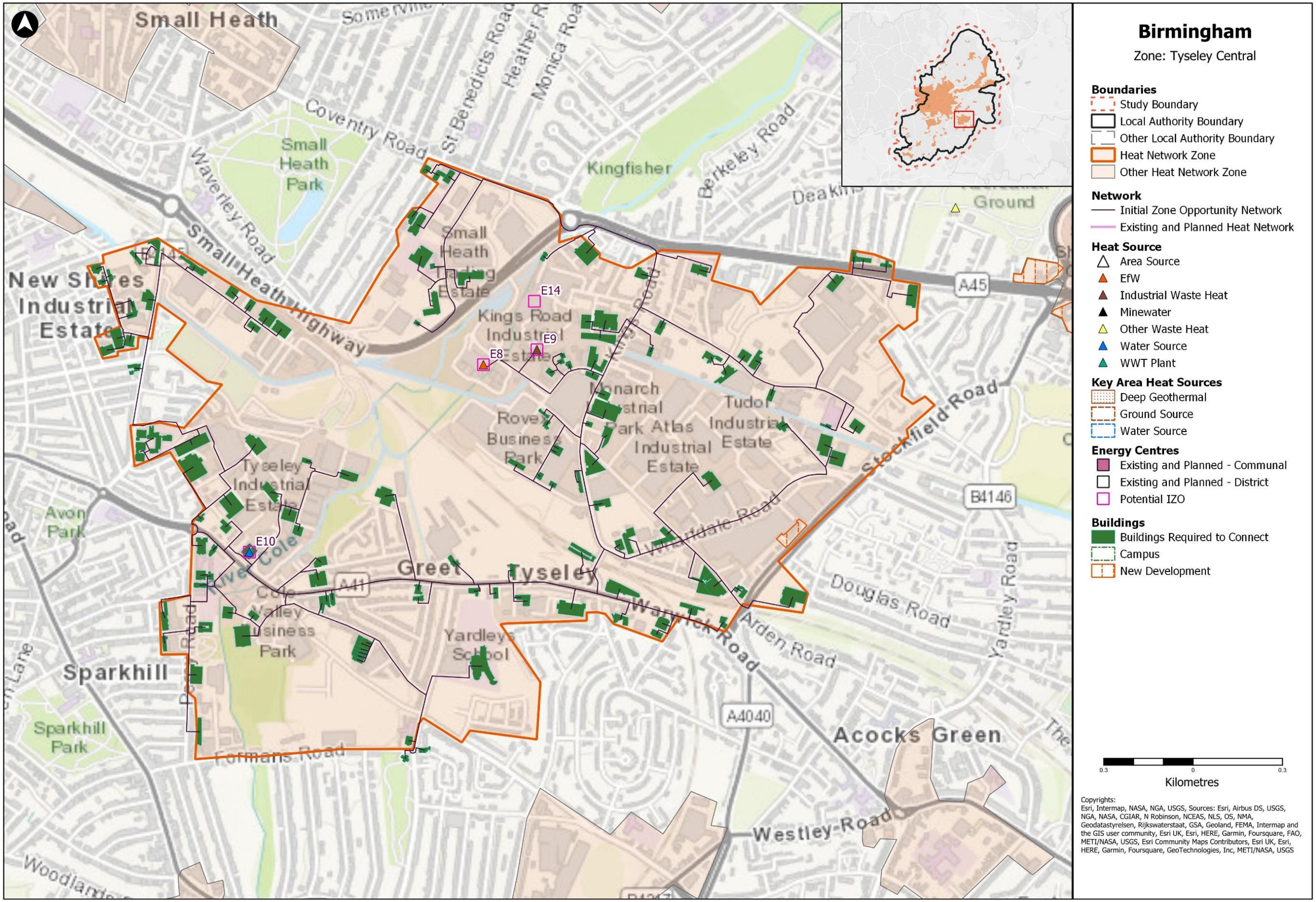
The IZO presents an immediate opportunity for delivery due to the presence of existing heat sources and engaged stakeholders. The IZO has been identified due to active interest in the area by multiple heat network developers, and the existing strategic relationships including the Strategic Alliance. Leveraging these relationships could facilitate the acquisition of land, encourage, and secure new heat supplies and connect heat sources. Additionally, several large heat source opportunities, including an ERF, a biomass plant and a data centre, exist near the IZO.

This IZO is strategically important given the volume of heat supply present in Tyseley is greater than the local demand, therefore presenting an opportunity to export excess heat from this zone to serve the heat supply deficit in the Birmingham Central zone.

The plans to deliver heat networks in Tyseley should be coordinated to aid heat network zoning delivery in the city more widely. This would involve ensuring that this IZO plans to expand in such a way as to capture all available heat and allow significant export of excess heat into the Birmingham Central Zone.

[11] Routes can be expected to change as a better understanding of local constraints is developed through design.
[12] Please see Appendix 3 – Glossary, “Specific definitions” of the main report for definitions related to Table 8.

Figure 8: Initial Zone Opportunity in Tyseley Central HNZ



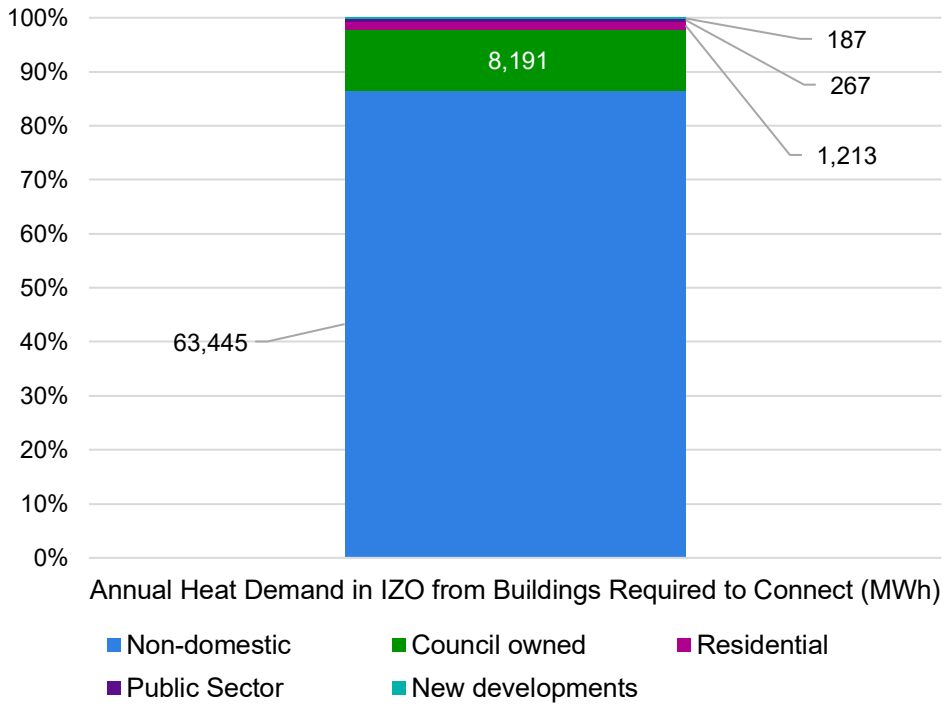
3.2.4) Tyseley Central – IZO Heat Demands

The Birmingham Tyseley Central IZO comprises predominantly industrial buildings. There are 156 buildings potentially required to connect with a total heat demand of 73 GWh/yr[13]. The largest anchor loads for a heat network development in this IZO are shown in Table 9. However, more detailed feasibility work in the area is required to better understand potential heat demand[14].

As shown in Figure 9, approximately 80% of loads in the Tyseley Central IZO are non-domestic, 15% are council owned, with fewer than 5% of buildings falling into the other categories. As presented, the largest single heat demand is Yardleys School, with a heat demand of approximately 1.4GWh/yr.

The Strategic Alliance includes organisations looking to develop land for new industrial and commercial purposes. Although there are no definitive plans for what these developments may be, this stakeholder group should be engaged as there may be future developments which would be suitable heat off-takers for a future heat network.

Figure 9: Tyseley Central - Categorisation of Heat Demand for Buildings Required to Connect in IZO



[13] Please refer to section 3.1.4 for a description of IZO heat demands.
[14] The preliminary NZM outputs used for this assessment over-estimate heat demand for industrial buildings and often misclassify buildings as industrial. For example, the prototype NZM might classify a multi-story car park or a warehouse as an industrial building with a large heat demand. WSP rectified some of the most severe errors, however the figures presented here are likely to be overestimates of heat demand. This has been corrected in future versions of the NZM.

Table 9: Tyseley Central - Key Heat Demands Required to Connect in the IZO[15]

Building name	Building category	Number of connections	Annual Heat Demand (MWh)	Data Source
Yardleys School	Council owned	1	1,400	Benchmark (NZM)
Kalsi Plastics North	Non-domestic	1	1,300	Benchmark (NZM)
Andel Plastics	Non-domestic	1	1,000	Benchmark (NZM)
Kalsi Plastics South	Non-domestic	1	1,000	Benchmark (NZM)
Ark Boulton Academy	Council owned	1	950	Benchmark (NZM)
Mecca Bingo Club	Non-domestic	1	950	Benchmark (NZM)
Autodesk	Non-domestic	1	900	Benchmark (NZM)
Jeavons Eurotir	Non-domestic	1	800	Benchmark (NZM)
Argos Small Heath	Non-domestic	1	750	Benchmark (NZM)
SCC Cole Valley 2	Non-domestic	1	750	Benchmark (NZM)

3.2.5) Tyseley Central – IZO Heat sources

Tyseley Central has several existing and planned industrial heat sources. Each heat source has certain challenges associated with connection, but the zone still has significant opportunities for the generation of large volumes of heat for a heat network.

Table 10 and Table 11 summarise the key heat sources and potential energy centre locations identified. These are also shown in the zone-level map in Figure 8 and Appendix 1: Map C.

[15] Please refer to Appendix 3 for definitions related to building categories in Table 9.

Table 10: Tyseley Central - Key Heat Source Opportunities for the IZO

Heat source type	Full opportunity capacity (kW_p)	Temperature (ºC)	Potential Energy Centre (Ref number)
Biomass Birmingham Biomass Power Limited Waste Heat	20,000	20-40 ºC	Land proximate to Veolia ERF/BBPL plant (E9)
ERF Tyseley ERF	4,000	20-40 ºC	Tyseley Energy Park, Hay Mills, Birmingham, (E8)
Data Centre SCC data centre	6,000	20-40 ºC	Land proximate to SCC data centre, Westwood Ave, Tyseley, Birmingham (E10)

The Birmingham Biomass Power Ltd (BBPL) plant is a biomass electricity generation plant, currently owned and operated by Gravis. There is potential for 20MWth low temperature heat offtake from the plant's air cooled condensers (ACCs). A study has identified that a higher temperature heat offtake would be lower cost than the low temperature heat offtake from the ACC, however this would likely impact the commercial operating model and thus potentially rule out that option until the mid-2030s.

The Tyseley ERF is owned by BCC and operated by Veolia. The site has a contract to operate until 2035. Veolia estimate 4MW may be available if heat is extracted from the ACC, with the design of the heat offtake plant requiring careful consideration to ensure technical and commercial feasibility.

Both the Birmingham Biogas Power Ltd site and BCC/Veolia site are spatially constrained, so a heat network connected energy centre, housing WSHPs, would need to be built offsite to increase heat taken from the ACCs. One potential site is indicated in Figure 8 (E14).

It is estimated that there is up to 6MW of rejected heat available at the SCC data centre site, which is in the south-west of the Tyseley Central HNZ. Expected technological changes to cooling systems (namely the introduction of liquid cooling systems) are likely to make heat offtake from this site more attractive in the future.

As described in Section 3.1.2, the Strategic Alliance are looking to develop land for new industrial and commercial purposes. Although there are no definitive plans, this stakeholder group should be engaged as they may be able to create a favourable environment for energy intensive industries to locate themselves in this IZO, presenting opportunities to supply heat into a network.

Other potential heat offtake opportunities within Tyseley which are not described here include the future Hay Hall Pyrolysis Plant, and the energy centre at the University of Birmingham's National Centre for the Decarbonisation of Heat (NCDH).

Table 11 lists potential energy centre locations for heat sources in Tyseley Central. E8, E9 and E10 are all associated with an existing heat source. For each of these sources, an energy centre consisting of pumping, storage and heat pumps would be required assuming heat offtake from all sources is not high enough for direct injection into a network.

Table 11: Tyseley Central - Potential IZO Energy Centre Locations

Ref #	Site type	Name	Size (m^2)	Ownership	Heat Source
E8	Building	Tyseley ERF	Unknown	BCC (contracted to Veolia)	ERF and ACC
E9	Building	BBPL Biomass Plant	Unknown	Gravis	Biomass powered steam turbine and ACC
E10	Building	SCC Data centre	Unknown	SCC	Data centre waste heat
E14	Building	New energy centre	Unknown	Tyseley Energy Park / University of Birmingham	ACC waste heat from E8 and E9

3.2.6) Tyseley Central – IZO Heat Distribution

Table 12 shows the network statistics for the IZO including the network length and associated costs. Please refer to Section 3.1.6 and Appendix 5 for the assumptions used.

The IZO network route is shown in Figure 8. This IZO is in an area with many industrial buildings, many of which have land around the perimeters of buildings which could be used to route pipework, potentially reducing the length required in certain circumstances. As described previously, Tyseley is a strategically important zone due to the presence of several large heat sources. These sources could supply heat into the city centre via a 4.5km strategic heat main.

Table 12: Tyseley Central - Indicative Heat Network Statistics for the IZO

IZO Heat Network description	Network length (km)	Network cost (£m)
Tyseley Central	25	75

3.2.7) Tyseley Central – IZO Key Constraints and Mitigations

[C5] Canal crossings: The Grand Union Canal runs through the Tyseley Central zone from east to west and is crossed 3 times by the proposed network route via existing road bridges. The constraints are not described individually here, due to their similar nature. Each crossing would require a feasibility assessment to check the suitability of the bridges to accommodate the heat network pipework (size and weight) and provide confirmation of the proposed route.

[C6] Rail crossings: The Birmingham to Stratford and Chiltern Main Lines cut through the centre of the zone, from the south-east, at Tyseley Station. The proposed network route crosses both lines utilising a single road bridge to the south-east of the station. The crossings would require a feasibility assessment to check the suitability of the bridges to accommodate the heat network pipework (size and weight) and provide confirmation of the proposed route.

3.3) Birmingham North East

3.3.1) North East – HNZ Summary

Birmingham North East is a large, predominantly industrial zone located north-east of the city centre. The zone contains a large Sewage Treatment Works (STW), which presents an opportunity to recover a very large quantity of low-carbon heat from the discharge flow. This work has estimated that potentially up to 700GWh/yr of heat could be recovered from this plant. This represents approximately 48% of Birmingham's overall waste heat supply capacity and therefore makes this zone strategically important. This zone is also identified in the Birmingham AZP report.

3.3.2) North East - Existing Heat Networks

There are no existing or planned heat network developments in this zone. There is however a 2018 HNDU funded masterplan for the Langley and Peddimore development area, located in the north-east of the zone. This masterplan study investigated the viability of a heat network to serve the scheme, which is currently under construction and proposes to deliver 6,000 new homes and 71ha of employment land between 2020 and 2030. Later reports discounted the heat network option in favour of gas-fired boilers, although some residential blocks may have communal heating systems. Therefore, the heat network plan has been superseded, and the new development is not presented as connecting to the IZO identified in this report.

3.3.3) North East – Initial Zone Opportunities

A single IZO was identified in the North East zone. Potential routing[16] for the IZO is shown in Figure 10 and summary statistics provided in Table 13.

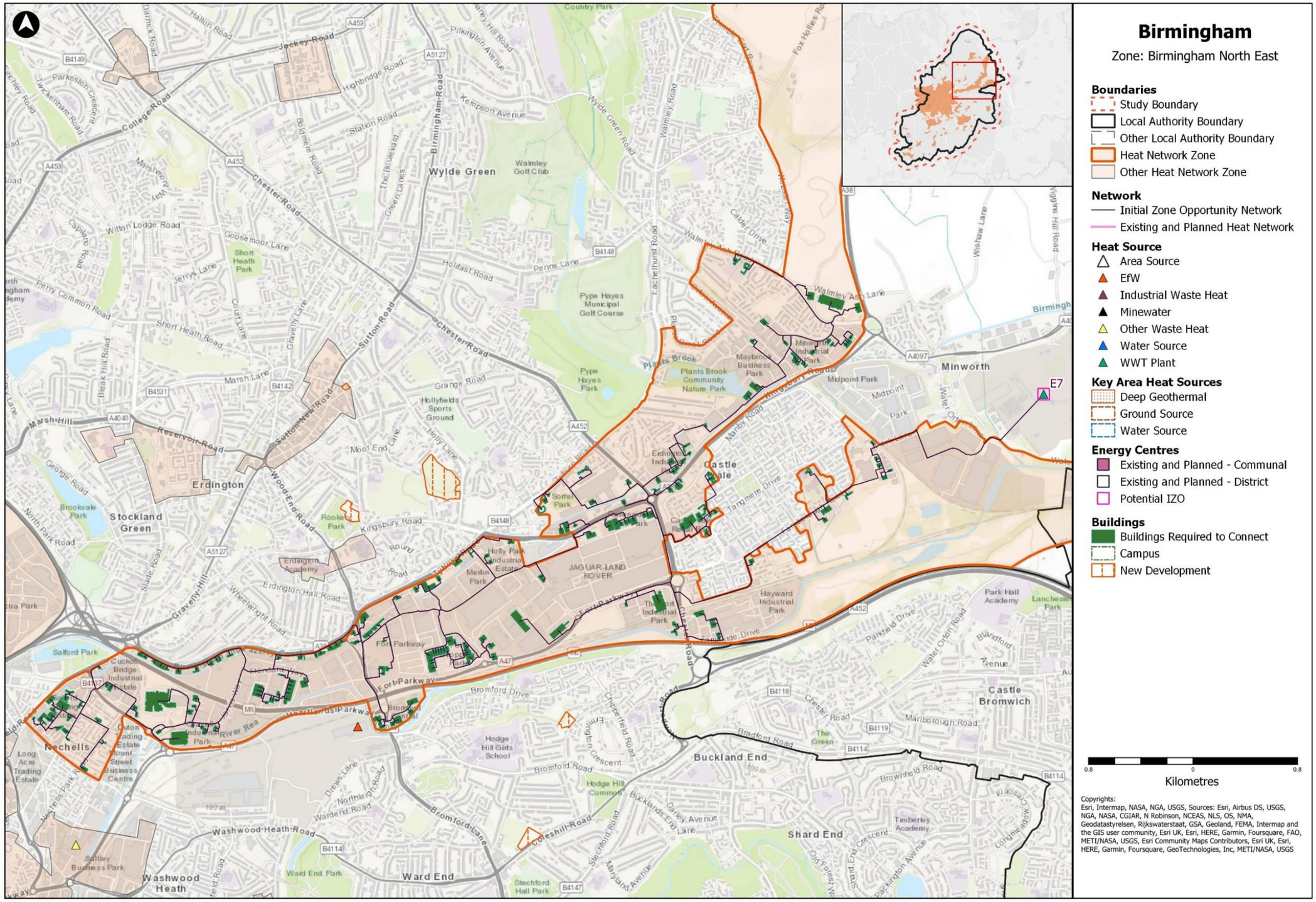
Table 13: North East - Summary Statistics for Initial Zone Opportunities[17]

CapEx	Heat	Network	CO_{2e} savings	Linear Heat Density	Heat Sources
~£200m	~150GWh/yr	>40 km	>20ktCO_{2e}/yr	3.3MWh/m	Minworth STW

The IZO covers the entirety of the HNZ and comprises mostly industrial buildings. There are 220 buildings potentially required to connect within the IZO, with a heat demand of 135GWh/yr. The IZO is supplied by the Severn Trent Minworth STW, a significant potential heat source with an estimated capacity of 87.5MW. The STW is identified as one of the largest available heat sources in Birmingham and presents a strategic opportunity to export low-carbon heat beyond the boundaries of this zone as the volume of heat exceeds the local heat demand.

[16] Routes can be expected to change as a better understanding of local constraints is developed through design.
[17] Please see Appendix 3 – Glossary, "Specific definitions" of the main report for definitions related to Table 13.

Figure 10: Initial Zone Opportunity in North East HNZ

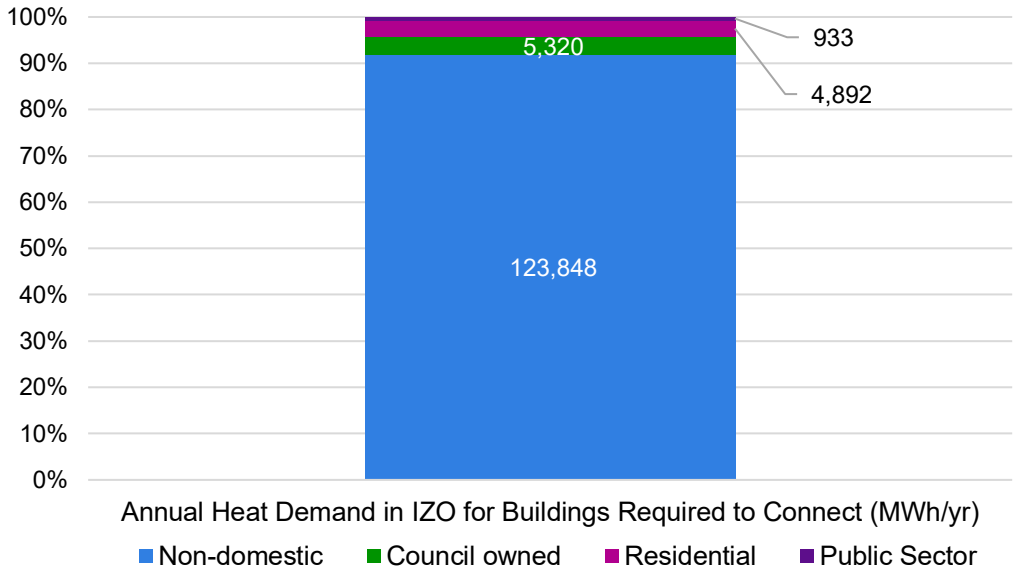


3.3.4) North East – IZO Heat Demands

The Birmingham North East IZO comprises predominantly industrial buildings. There are 220 buildings potentially required to connect within the IZO, with a total heat demand of 135GWh/yr[18]. The largest anchor loads are shown in Table 14 below. However, more detailed feasibility work in the area is required to better understand potential heat demand[19].

As shown in Figure 11 approximately 90% of loads in the IZO are non-domestic. There are very few residential, council-owned, or new developments. The most significant single heat demand is Star City, a large leisure and entertainment venue, with an estimated heat demand of approximately 11GWh/yr. The rest of the largest heat demand demands are predominantly large industrial or retail buildings.

Figure 11: North East - Categorisation of Heat Demand for Buildings Required to Connect in IZO



[18] Please refer to section 3.1.4 for a description of IZO heat demands.
[19] The preliminary NZM outputs used for this assessment over-estimate heat demand for industrial buildings and often misclassify buildings as industrial. For example, the prototype NZM might classify a multi-story car park or a warehouse as an industrial building with a large heat demand. WSP rectified some of the most severe errors, however the figures presented here are likely to be overestimates of heat demand. This has been corrected in future versions of the NZM.

Table 14: North East - Key Heat Demands for Buildings Required to Connect in the IZO[20]

Building name	Building category	Number of connections	Annual Heat Demand (MWh)	Data Source
Star City	Non-domestic	1	11,400	Benchmark (NZM)
Fort Dunlop	Non-domestic	1	4,800	Benchmark (NZM)
Costco	Non-domestic	1	3,900	Benchmark (NZM)
Stadco	Non-domestic	1	3,250	Benchmark (NZM)
ASDA	Non-domestic	1	3,150	Benchmark (NZM)
B&Q	Non-domestic	1	2,500	Benchmark (NZM)
Sainsburys	Non-domestic	1	1,200	Benchmark (NZM)
Buzz Bingo	Non-domestic	1	950	Benchmark (NZM)
Greenwood Academy	Council Owned	1	950	Benchmark (NZM)
Land Rover, Birmingham North	Non-domestic	1	850	Benchmark (NZM)

3.3.5) North East – IZO Heat Sources

Table 15 and Table 16 summarise the key heat sources and potential energy centre locations identified. These are also shown in Figure 10 in Section 3.1.3.and in Appendix 1: Map C.

The main source identified in the zone is the Minworth STW, owned and operated by Severn Trent Water. Heat could be taken from the plant outflow, where treated water is discharged into the River Tame, and upgraded via a WSHP. There is land available for a large energy centre in this location. The temperature of the treated water at this point is typically 13°C, and the mean flow rate is 5200 l/s.

[20] Please refer to Appendix 3 for definitions related to building categories in Table 14.

Table 15: North East - Key Heat Source Opportunities for the IZO

Heat source type	Full opportunity capacity (kW_p)	Temperature (ºC)	Potential Energy Centre Location (Ref number)
WSHP - Minworth STW	87,500	13ºC	Minworth STW discharge channel (E7)

Table 16: North East - Potential IZO Energy Centre Locations

EC Ref Number	Site type	Size (m^2)	Ownership	Heat Source
E7	Land	4,000	Severn Trent Water	WSHP – Minworth STW

3.3.6) North East – IZO Heat Distribution

Table 17 shows the network statistics for the IZO including the network length and associated costs. Please refer to Section 3.1.6 and Appendix 5 for the assumptions used.

The IZO network route is shown in Figure 10. This IZO is in an area with many industrial buildings, many of which have land around the perimeters of buildings which could be used to route pipework, potentially reducing the length required in certain circumstances. As described previously, the zone is strategically important due to the presence of the largest single heat source within Birmingham. This source could supply heat into the city centre via a 12km strategic heat main.

Table 17: North East - Indicative Heat Network Statistics for the IZO

IZO Heat Network description	Network length (km)	Network cost (£m)
North East	40	100

3.3.7) North East – IZO Key Constraints and Mitigations

[C7] Canal crossings: The Birmingham and Fazeley Canal runs through the north of the zone and is crossed five times by the proposed IZO route via existing road bridges. The constraints are not described individually here, due to their similar nature. Each crossing would require a feasibility assessment to check the suitability of the bridges to accommodate the heat network pipework (size and weight) and provide confirmation of the proposed route, and options for utilising these existing bridges as crossings.

[C8] Rail crossings: The Derby to Birmingham railway line runs across the south of the zone and the proposed IZO route crosses it via road bridges on the A452 and Bromford Lane. Both crossings would require a feasibility assessment to check the suitability of the bridges to accommodate the heat network pipework (size and weight) and provide confirmation of the proposed route.

3.4) Queen Elizabeth Hospital and the University of Birmingham

3.4.1) Queen Elizabeth Hospital and the University of Birmingham – HNZ Summary

The Queen Elizabeth Hospital and the University of Birmingham zone is the smallest of the four strategic zones, encompassing the University of Birmingham Edgbaston Campus, Queen Elizabeth Hospital Heritage site, Queen Elizabeth Hospital, Women's Hospital, and extending east towards the Priory Hospital. The zone is located 4km south-west of Birmingham city centre and is intersected by both the Birmingham and Gloucester, and cross-city railway lines.

The zone contains 204 buildings potentially required to connect, with a heat demand of 75GWh/yr, of which 72 GWh (96%) is associated with hospital buildings. The zone is expected to be served primarily by ASHPs, which will need to be installed within new energy centres.

The zone contains existing heat networks on both the University of Birmingham and Queen Elizabeth Heritage site. Full development of the zone includes the interconnection of the existing networks, connecting buildings potentially required to connect as new heat demands to the network, and decarbonising the heat supply.

Whilst proven routes exist for establishing interconnection between the Queen Elizabeth Heritage site and the University of Birmingham networks, each site will require de-steaming, which will involve full primary distribution system replacement.

3.4.2) Queen Elizabeth Hospital and the University of Birmingham - Existing Heat Networks

There are two operational heat networks in the University of Birmingham and Queen Elizabeth Hospital zone (see Appendix 1: Map D).

Operational Heat Networks and Planned Expansions

University of Birmingham

Most buildings located in the centre of the University of Birmingham's Edgbaston Campus are supplied heat by either a steam network, or a 1930s medium temperature hot water network operating at 110/90ºC flow and return. Both networks are served by a gas CHP and backup gas boiler plant located in the University's energy centre, with a proportion of the steam being used to supply heat to the medium temperature hot water network. Whilst there is no chilled water network, building-level absorption chillers utilise steam for chilled water generation during summer months. The southernmost area of the campus hosts a low temperature hot water main operating at a flow temperature of 70ºC, which serves the sports centre and various halls of residence. At present, the network is not served by low-carbon heat sources, though it is expected that in the future the decommissioning of the fossil fuel generators in the University's energy centre will free space for the installation of ASHPs. The heat demand of the medium low temperature and steam networks combined is 40GWh/yr, whilst the approximate heat demand on the low temperature how water network main is 3.1GWh/yr.

Queen Elizabeth Hospital Heritage Network
Buildings located on the Queen Elizabeth Hospital Heritage site are supplied heat by a steam network served by three gas boilers located in car park D, which is located on the Heritage site. The network serves a heat demand of approximately 20 GWh/yr. The Queen Elizabeth Hospital Heritage network originally served 12 connections, including the Women's Hospital, which is now served separately from the network by its own 375kW gas CHP and four 1.3 MW gas boilers. For clarity, the remaining 11 connections are treated as one bulk connection to the IZO and are not considered individually.

3.4.3) Queen Elizabeth Hospital and the University of Birmingham – Initial Zone Opportunities

A single IZO was identified In the Queen Elizabeth Hospital and the University of Birmingham zone. Potential routing[21] for the IZO is shown in Figure 12 and summary statistics provided in Table 18.

Table 18: Queen Elizabeth Hospital and the University of Birmingham - Summary statistics for Initial Zone Opportunities[22]

CapEx	Heat	Network	CO_{2e} savings	Linear Heat Density	Heat Sources
~£50m	~100GWh/yr	~4km	~15ktCO_{2e}/yr	21.5MWh/m	ASHPs

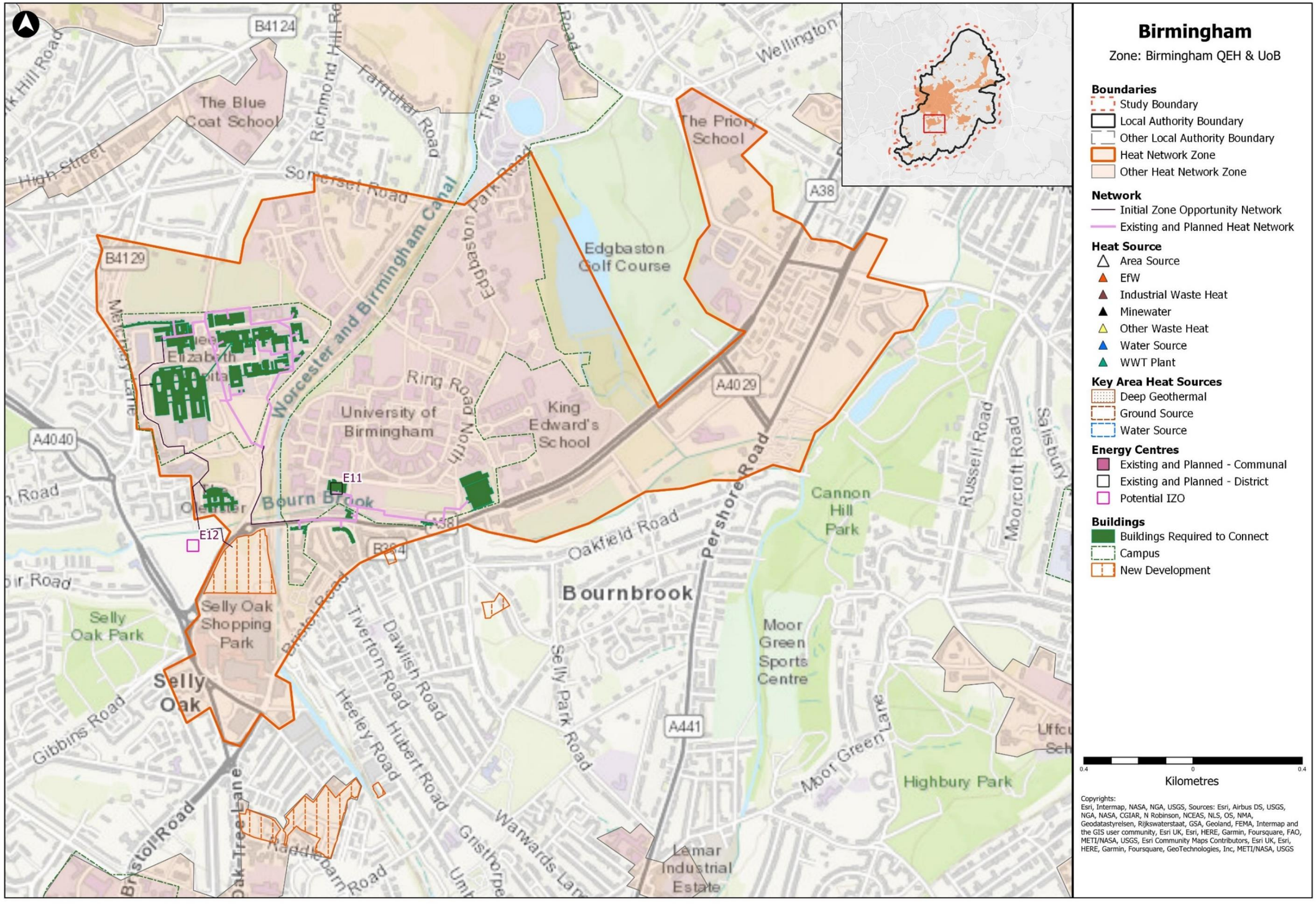
The identified IZO presents an opportunity to decarbonise a large quantity of high-density heat demand with potentially minimum additional pipework. This is because most of the network utilises the existing University of Birmingham and Queen Elizabeth Hospital Heritage heat network routes.

The IZO also presents the opportunity to integrate an existing feasibility study into a wider IZO heat network. The Selly Oak Heat Network Feasibility Study (2016) identified the opportunity for a gas CHP-led low-temperature hot water network serving Birmingham Women's Hospital, Queen Elizabeth Hospital, the Barberry Centre, the Oleaster Centre, and The Life Sciences Centre. Due to its high linear heat density and good techno-economic performance at feasibility, this route has been integrated into the IZO.

The IZO identified serves a heat demand of 100GWh/yr with a linear heat density of 21MWh/m although note that this is larger than expected as it excludes the existing network pipe lengths. Whilst not in proximity of any known low-carbon or waste heat sources, adequate land area is available for an energy centre adjacent to the IZO and there is scope to co-locate ASHP plant across existing plantrooms.

[21] Routes can be expected to change as a better understanding of local constraints is developed through design.
[22] Please see Appendix 3 – Glossary, "Specific definitions" of the main report for definitions related to Table 18.

Figure 12: Initial Zone Opportunity in Queen Elizabeth Hospital and the University of Birmingham HNZ

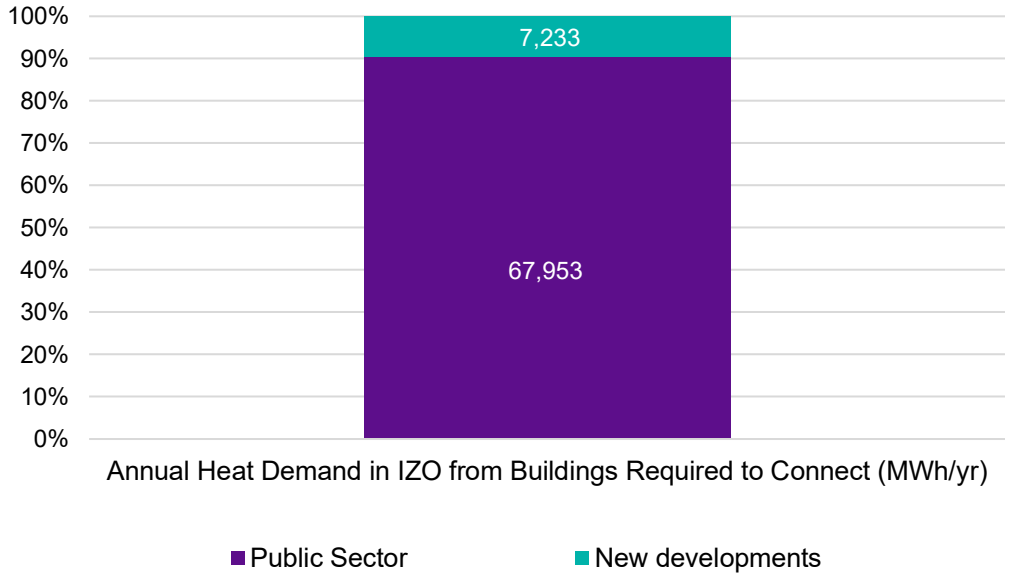


3.4.4) Queen Elizabeth Hospital and the University of Birmingham – IZO Heat Demands

The IZO comprises of predominantly public sector buildings, accounting for 90% of the total demand (see Figure 13). This is due to the hospital and university campus loads. The Battery Park and Life Sciences new developments contribute a further 7.2GWh/yr[23], which represents a mix of student accommodation, retail, research, and commercial office space.

There are 18 buildings potentially required to connect within the IZO (excluding new development connections), with a total heat demand of 75GWh/yr. The key loads for a heat network development in this IZO are shown in Table 19. The most significant single heat demand is the Queen Elizabeth Hospital Building, which has a heat demand of approximately 32.5GWh/yr and is not currently on any heat network. The second largest heat demand is the Queen Elizabeth Hospital Heritage network, which accounts for 20.5GWh/yr of total network demand (note that this network serves the heat demand of 11 connections via steam distribution). The low temperature hot water branch of the University of Birmingham Network serves 3.1GWh/yr, and. Birmingham Women's Hospital (which is not currently networked) has a heat demand of 9.1 GWh/yr.

Figure 13: Queen Elizabeth Hospital and the University of Birmingham - Categorisation of Heat Demand for Buildings Required to Connect in IZO



[23] Please refer to section 3.1.4 for a description of IZO heat demands.

Table 19: Queen Elizabeth Hospital and the University of Birmingham - Key Heat Demands Required to Connect in the IZO[24]

Building name	Building category	Number of connections	Annual Heat Demand (MWh)	Data Source
Queen Elizabeth Hospital Heritage Site	Public Sector	10	20,500	Benchmark (NZM)
Queen Elizabeth Hospital Building	Public Sector	1	32,550	'Metered'
University of Birmingham LTHW existing Network Connection	Public Sector	6	3,100	Benchmark (NZM)
Battery Park & Life Sciences	New Development	1	7,250	Pilot Methodology
Women's Hospital	Public Sector	1	9,100	'Metered'

3.4.5) Queen Elizabeth Hospital and the University of Birmingham – IZO Heat Sources

There are numerous existing energy centres with the potential to host ASHPs. In addition to existing energy centre sites, a 14,000m^2 brownfield site directly to the west of the Health Innovation Campus and within 50m of the proposed IZO route could be utilised for the location of a new energy centre housing the 9.9MW ASHP capacity required to serve the IZO.

Table 20 and Table 21 summarise the key heat sources and potential energy centre locations identified. These are also shown in Figure 12 in Section 3.4.3 and on Appendix 1: Map C.

Table 20: Queen Elizabeth Hospital and the University of Birmingham - Key Heat Source Opportunities for the IZO

Heat source type	Full opportunity capacity (kW_p)	Temperature (ºC)	Potential Energy Centre (Ref number)
ASHP	9,900	8ºC	E12

[24] Please refer to Appendix 3 for definitions related to building categories in Table 19.

Table 21: Queen Elizabeth Hospital and the University of Birmingham - Potential IZO Energy Centre Locations

EC Ref Number	Site type	Size (m^2)	Ownership	Heat Source
E11	EC Building	2,700	University	ASHP
E12	Land	14,000	Unknown	ASHP

3.4.6) Queen Elizabeth Hospital and the University of Birmingham - Heat Distribution

Table 22 shows the network statistics for the IZO including the network length and associated costs. Please refer to Section 3.1.6 and Appendix 5 for the assumptions used.

The proposed IZO distribution network utilises the existing heat network pipes serving the Queen Elizabeth Hospital Heritage heat network and the University of Birmingham's low temperature hot water network branch. The proposed routing follows Mindelsohn Way and Mindelsohn Crescent, which are situated to the west of the Queen Elizabeth Hospital. The pipe runs along Aston Webb Boulevard and New Fosse Way that link the two networks. This equates to a network length of 4km, with a projected cost to the developer of £7m.

Table 22: Queen Elizabeth Hospital and the University of Birmingham - Indicative Heat Network Statistics for the IZO

IZO Heat Network description	Network length (km)	Network cost (£m)
Queen Elizabeth Hospital / The University of Birmingham	4	7

3.4.7) Queen Elizabeth Hospital and the University of Birmingham – Key Constraints and Mitigations

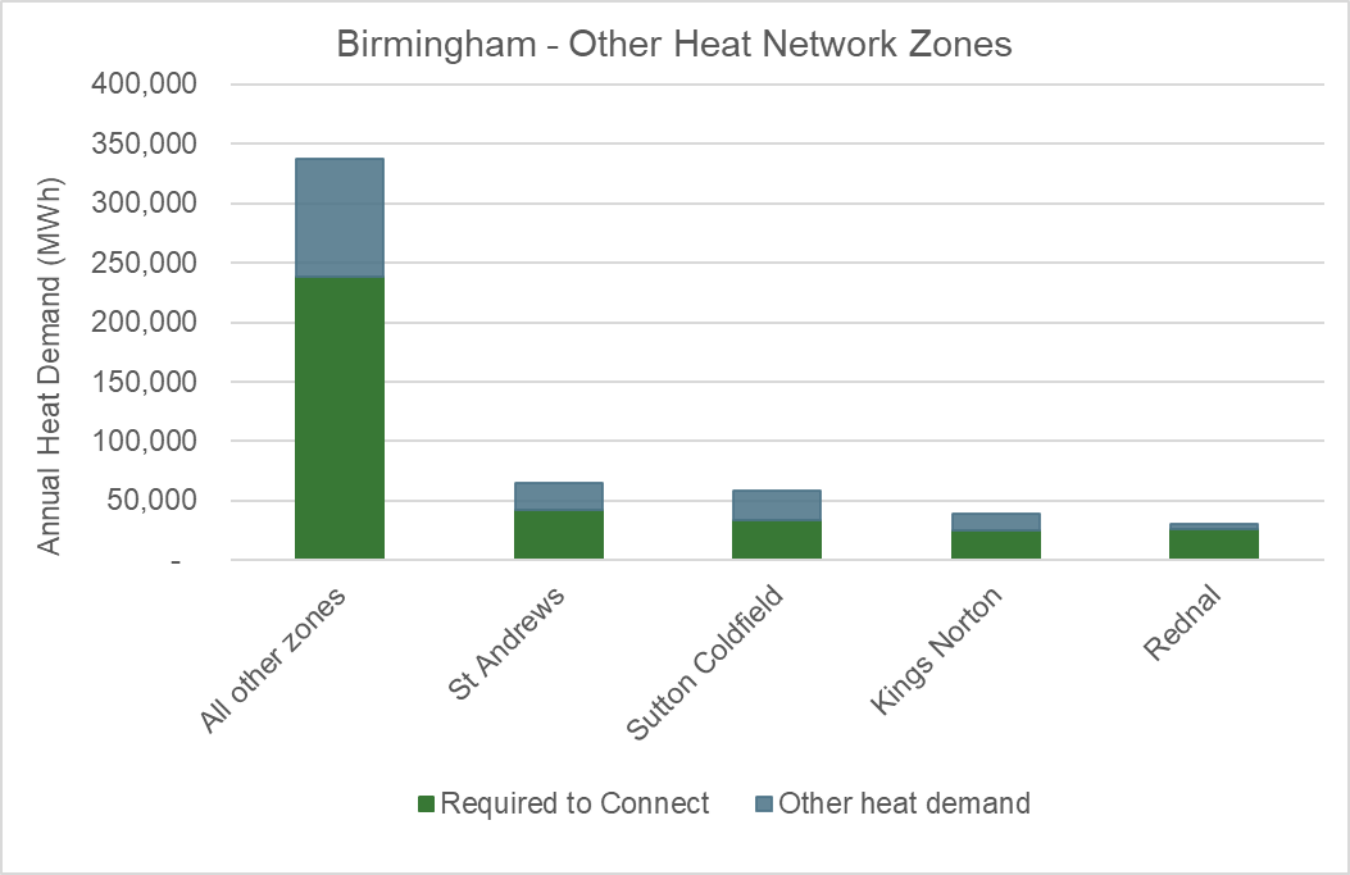
There are no major constraints identified for the proposed IZO network route.

4) Other Heat Network Zones

This section describes the 'Other' potential heat network zones that were identified in Birmingham. These are areas where heat networks were deemed to offer the lowest carbon route to decarbonising heat but are often much smaller or discrete in nature than the 'Strategic' heat network zones identified. The approach taken in the Pilot programme did not apply a minimum threshold for zone identification and therefore future work will need to consider factors such as size and aggregation to ensure efficient and effective delivery of heat networks in the area.

Figure 13 illustrates the total annual heat demand, and the proportion of which is associated with buildings that may be required to connect within each zone. A map of all zones can be found in Figure 4.

Figure 13: Total Heat Demand and Proportion Required to Connect in Other HNZs



St Andrews: is situated in Bordesley Green, east of the city centre, and is not considered strategic because of its smaller size. The area is dominated by industrial and retail buildings and contains key anchor loads such as South and City College (4GWh/yr), Bordesley Green Girls School and Sixth Form (2GWh/yr), and Wyndcliffe Primary School (900MWh/yr). It is likely that the Tyseley ERF located in the Tyseley Central zone would have sufficient capacity to act as the primary heat supply, however there would not be enough spare capacity to serve this zone if the strategic zones were to utilise this same source.

Sutton Coldfield: is situated across Sutton Coldfield Town Centre and is not considered strategic because of its smaller size. The area contains predominantly commercial and retail buildings and the key anchor loads include Good Hope Hospital (5GWh/yr), Birmingham Metropolitan College (2GWh/yr), and Plantsbrook School (750MWh/yr). The Severn Trent Water Minworth STW could potentially serve this zone also, however there would not be enough spare capacity to serve this zone if the strategic zones were to utilise this same source.

Kings Norton: is situated near the southern Birmingham local authority boundary in Lifford. The area is dominated by commercial and retail buildings and contains key anchor loads such as University Hospitals Birmingham (UHB Med) (3GWh/yr), Alexanders Wharf (600MWh/yr), and Lakeside Business Centre (650MWh/yr). There are no known existing low-carbon sources in the proximity of this zone. The closest known heat source is the Tyseley ERF 6.5km away.

Rednal: is situated south-west of Birmingham. The area has no predominant building typology and contains key anchor loads such as Colmers Sixth Form College (2GWh/yr), Empire Birmingham Great Park (2GWh/yr), Reaside Clinic (1GWh/yr) and Alexanders Wharf (600MWh/yr). There are no known existing low-carbon sources in the proximity of this zone. The closest heat source is the Tyseley ERF 12km away.

All other zones: cover various smaller zones that are not considered strategic across Birmingham. The area is dominated by office, educational, and retail buildings and contains key anchor loads such as Birmingham Heartlands Hospital (30GWh/yr), The Royal Orthopaedic Hospital (4GWh/yr), and King Edward VI Comprehensive High School for Boys (4GWh/yr).

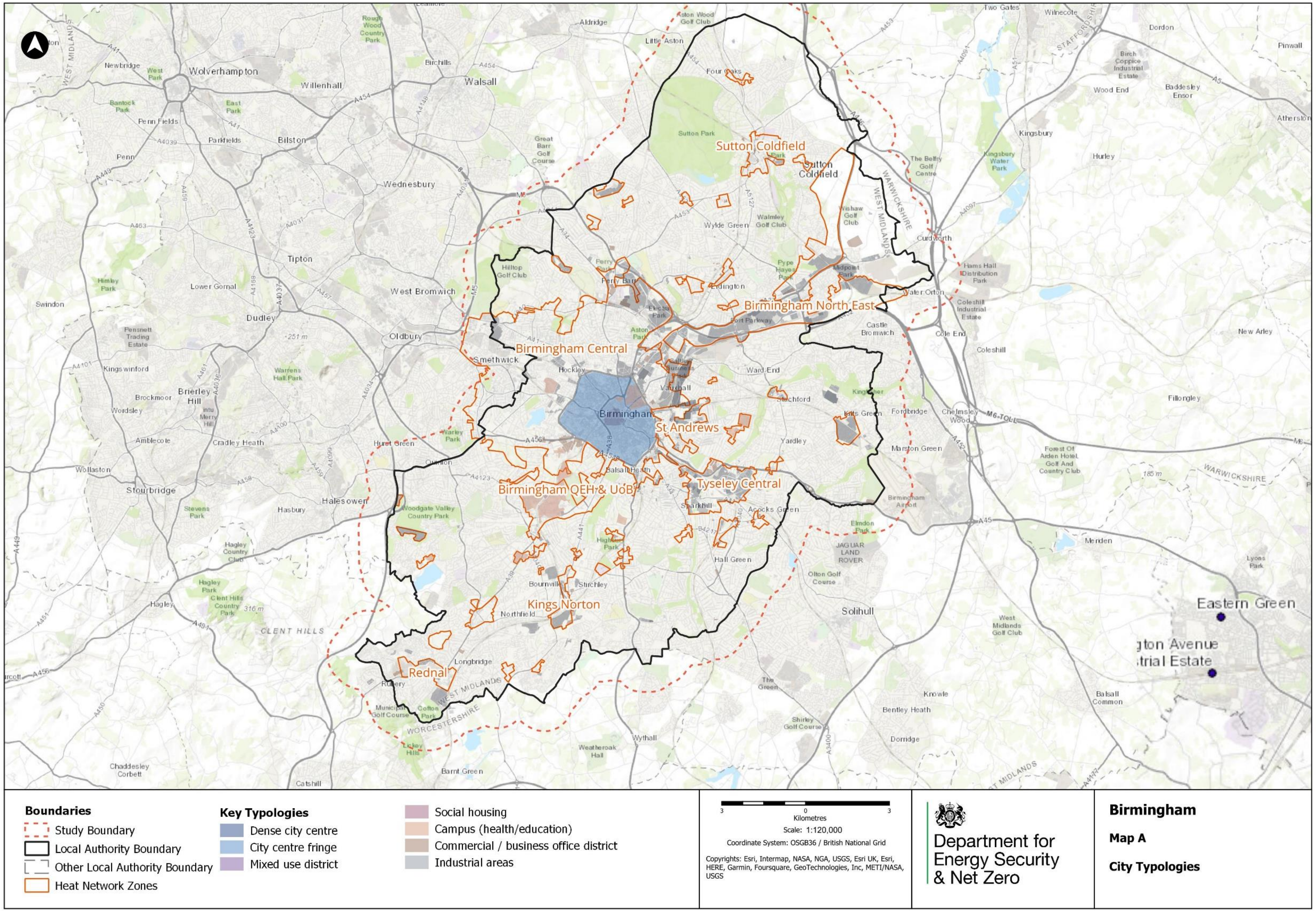
Appendix 1: Maps and Legends

This section provides guidance on interpreting the icons and legends used throughout this report and Maps A-G that follow:

Legend / icon	Relevant map(s)	What this represents on the map	Comments on interpretation
	Report maps	Study boundary	Extends 1km beyond Local Authority boundary to include cross boundary opportunities
	Report maps	Local Authority boundary	
	Report maps	Other Local Authority boundary	
	Report maps	Heat network zones	This includes both Strategic HNZs and Other HNZs.
	Report maps	Other heat network zones	Smaller or discrete heat network zone opportunities
	Report maps	New developments	New development within heat network zones and IZOs that will still be in construction post-2025
	Report maps	Heat network zone name / reference number	‘Strategic’ zones are named; ‘Other’ zones are represented by a reference number
	Report maps	Buildings potentially required to connect	Buildings that could be required to connect (as described in the HNZ Consultation 2023)
	Report maps	Campuses	Multiple buildings owned and operated by the same organisation (e.g. Universities, Hospitals)
	Report maps	Initial Zone Opportunity concept network route	Conceptual heat network pipe routes between buildings that could be required to connect
	Report maps	Existing and Planned Heat Networks	Known existing or planned heat network pipe routes as provided by local stakeholders
	Report maps	Potential energy centre - IZO	Potential energy centre location for an IZO (see section 3)
	Report maps	Existing/planned energy centre - Communal HNs	‘Communal’ energy centres are those operated within a single building or across a campus
	Report maps	Existing/planned energy centre - District HNs	‘District’ energy centres supply multiple buildings across multiple sites
Appendix 1: A – Typology map			
	Appendix 1: Map A	Dense City Centre	Locally recognised as the City or Town centre, where buildings development is most dense
	Appendix 1: Map A	City Centre Fringe	Around the City or Town Centre or at its outskirts, where both building density reduces
	Appendix 1: Map A	Mixed Use District	A variety of building typologies, with no single typology prevailing in the area
	Appendix 1: Map A	Social Housing	Public, private and third sector social housing
	Appendix 1: Map A	Campus (health / education)	Buildings that are owned and operated together (e.g. Universities, Hospitals)

	Appendix 1: Map A	Commercial / business office	Public & private office space
	Appendix 1: Map A	Industrial areas	Primarily used for manufacturing, engineering, and warehousing
Appendix 1: B – Key heat demands			
	Appendix 1: Map B	Top 10 Heat Demands	The largest (anchor) heat loads within the Pilot programme study area (see Section 3)
	Appendix 1: Map B	Local Authority	Buildings owned or operated by the Local Authority
	Appendix 1: Map B	Other public sector	Other buildings owned or operated by the public sector (e.g. hospital, universities, Govt. estates)
	Appendix 1: Map B	Residential with existing communal heating	Residential buildings with existing communal heating systems installed
	Appendix 1: Map B	Non-domestic private	Non-domestic private buildings (e.g. commercial, offices)
	Appendix 1: Map B	Industrial	Mixed industrial sites (e.g. light or heavy industry, manufacturing, warehouses and distribution)
400 - 600	Appendix 1: Map B	Building heat demand (MWh/yr)	Circle size increases with size of heat demand
Appendix 1: C – Key Heat Sources and Potential Energy Centres			
	Appendix 1: Map C	EfW plant	**Point heat sources** have known or likely points of heat offtake/abstraction Mine water and water source ‘points’ indicate potential abstraction points. Other waste heat sources include sewers, electrical substations and other sources of heat. See section 3 for more detail on heat source capacities, where known. On the City-level Map C only, the heat waste symbol is sized according to its scale in GWh/yr
	Appendix 1: Map C	Industrial Waste Heat	
	Appendix 1: Map C	Mine water	
	Appendix 1: Map C	Other Waste Heat	
	Appendix 1: Map C	Water Source	
	Appendix 1: Map C	Waste Water Treatment	
	Appendix 1: Map C	Deep geothermal or mine water heat	**Area heat sources** differ from point-heat sources in that the exact location for extracting heat from the resource is not yet determined
	Appendix 1: Map C	Ground source	
	Appendix 1: Map C	Water source	
Appendix 1: D – Existing and planned heat networks			
	Appendix 1: Map D	Existing and planned heat networks	At this scale the route of an existing HN cannot be displayed, so an area outline is used instead
Appendix 1: E – Physical constraints			
	Appendix 1: Map E	Key constraints	Key heat network routing constraints as described in section 3

A. Birmingham Typology Map



This document was prepared by on behalf of DESNZ in connection with the Heat Network Zoning Pilot Programme. It takes into account DESNZ' particular instructions and requirements and addresses priorities at the time of publication. This document is not intended for, and should not be relied on by, any third party and no responsibility is undertaken to any third party in relation to it.

B. Key Heat Demands

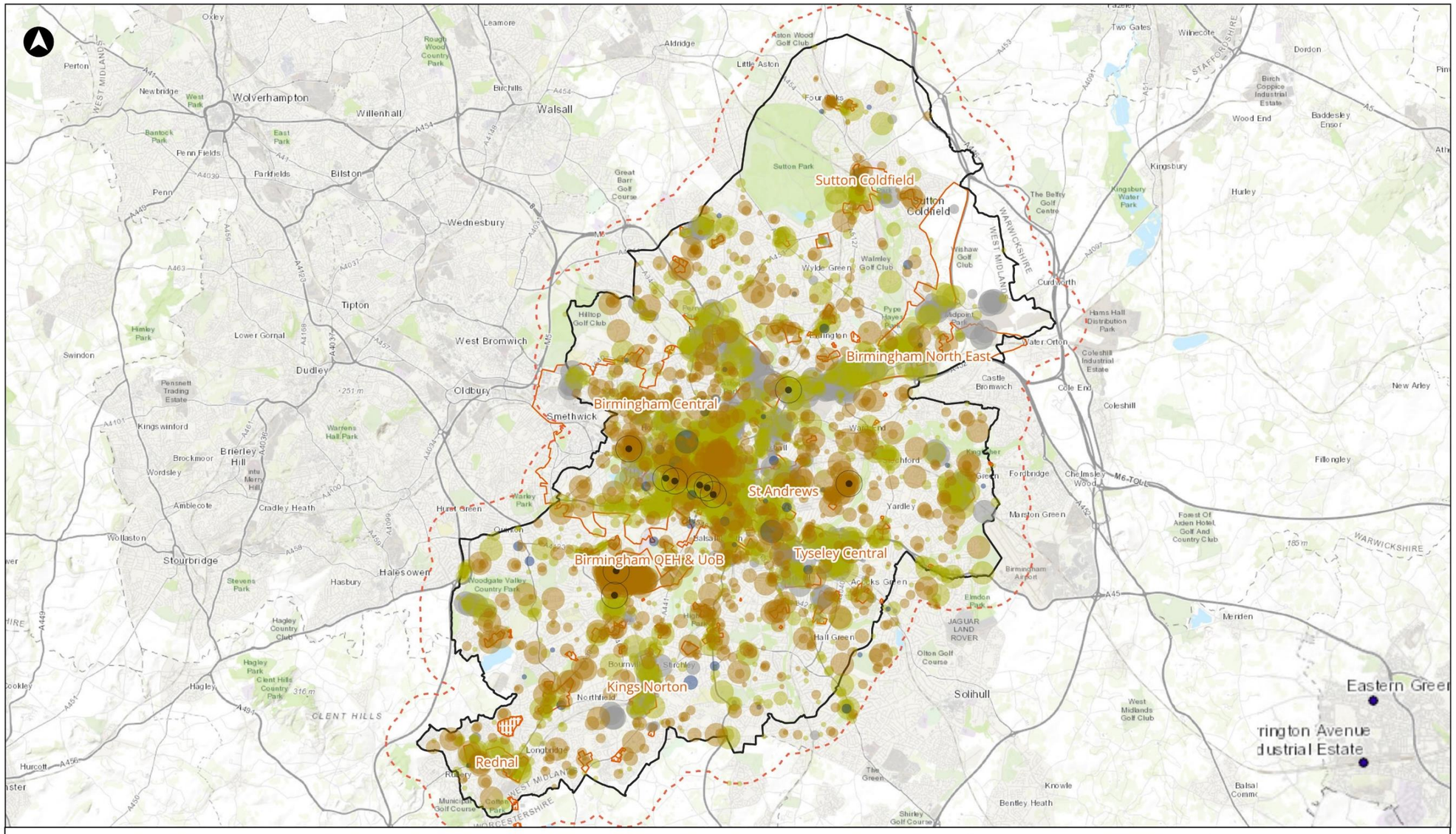
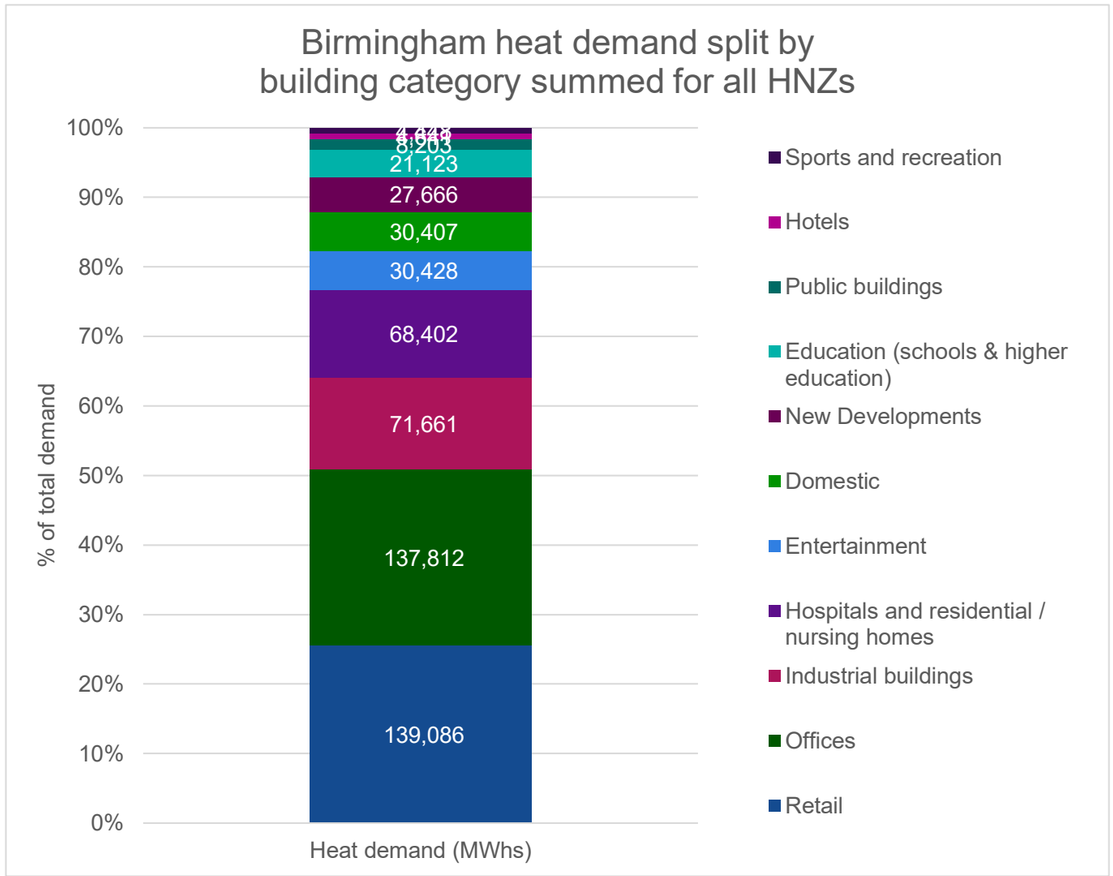


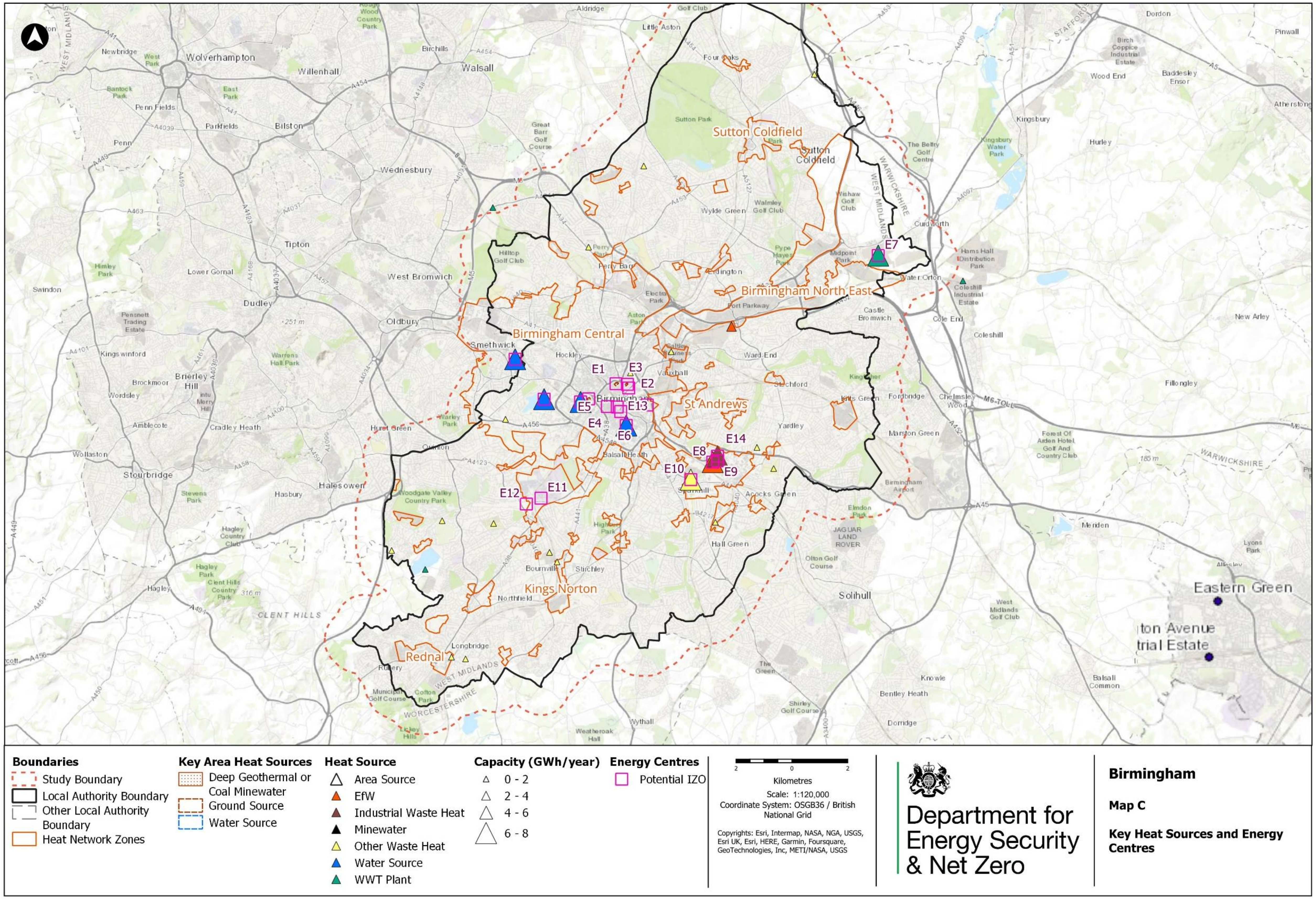
Table 23: Heat Demand split further by building categories across all Initial Zone Opportunities identified in Strategic HNZs in the Study Area

Building category	Number of buildings required to connect in this category	Annual Heat Demand of buildings required to connect across IZOs (MWh)
Domestic	80	30,407
Education (schools & higher education)	39	21,123
Entertainment	50	30,428
Hospitals and residential / nursing homes	21	68,402
Hotels	11	4,641
Industrial buildings	138	71,661
Offices	269	137,812
Public buildings	21	8,203
Retail	195	139,086
Sports and recreation	9	4,448
New Developments	8	27,666
Totals	**841**	**543,876**



Note: In Birmingham there are 4 Strategic HNZs with a total of 4 IZOs identified across them. The table and graph above summarise and categorise the heat demand for buildings required to connect to these IZOs.

C. Key Heat Sources and Potential Energy Centres



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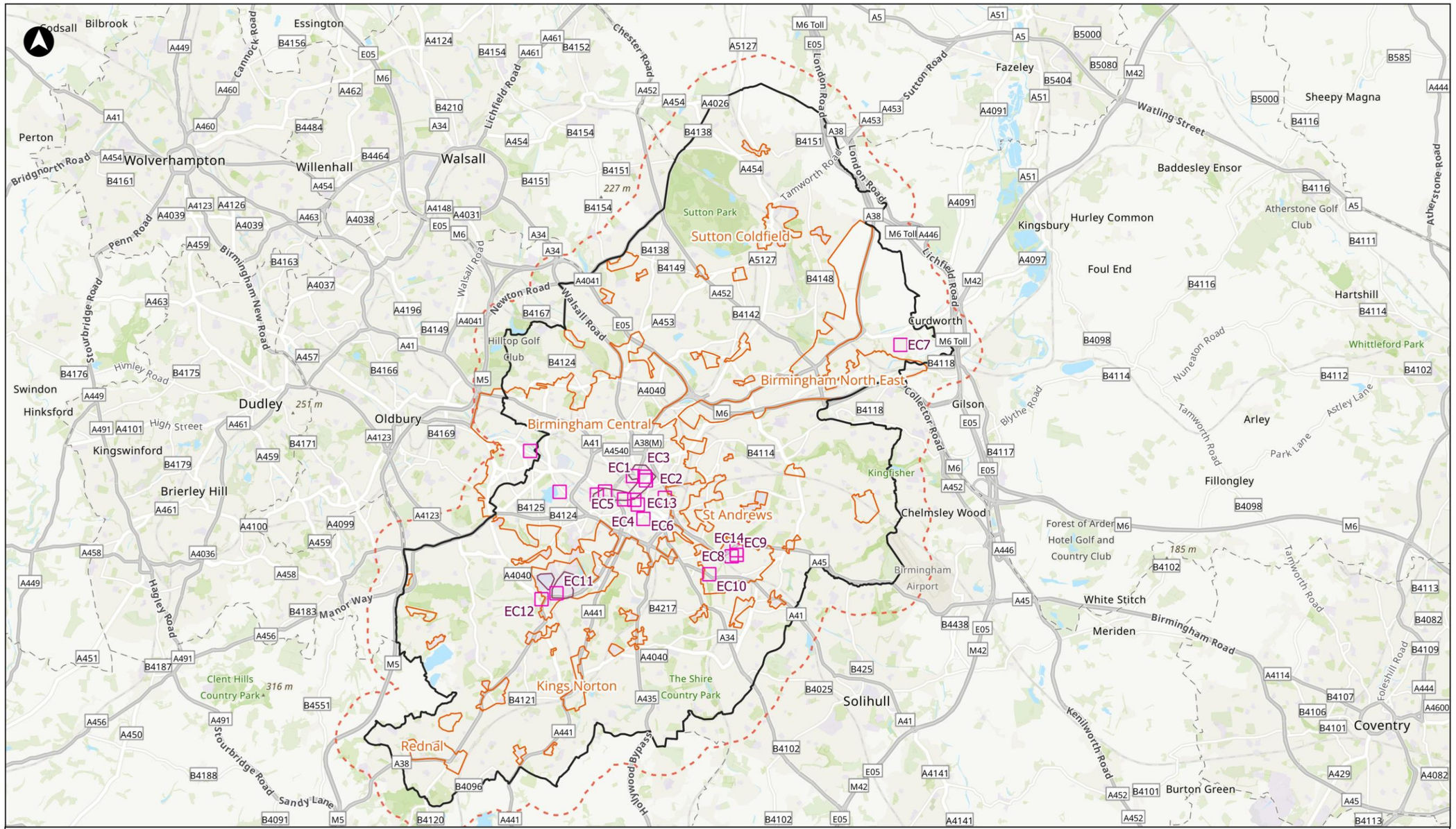
D. Existing and Planned Heat Networks



Boundaries
- Study Boundary
- Local Authority Boundary
- Other Local Authority Boundary
- Heat Network Zones

Existing and Planned Heat Networks

Energy Centres
- Potential IZO site

8 0 8
Kilometres
Scale: 1:130,000
Coordinate System: OSGB36 / British National Grid

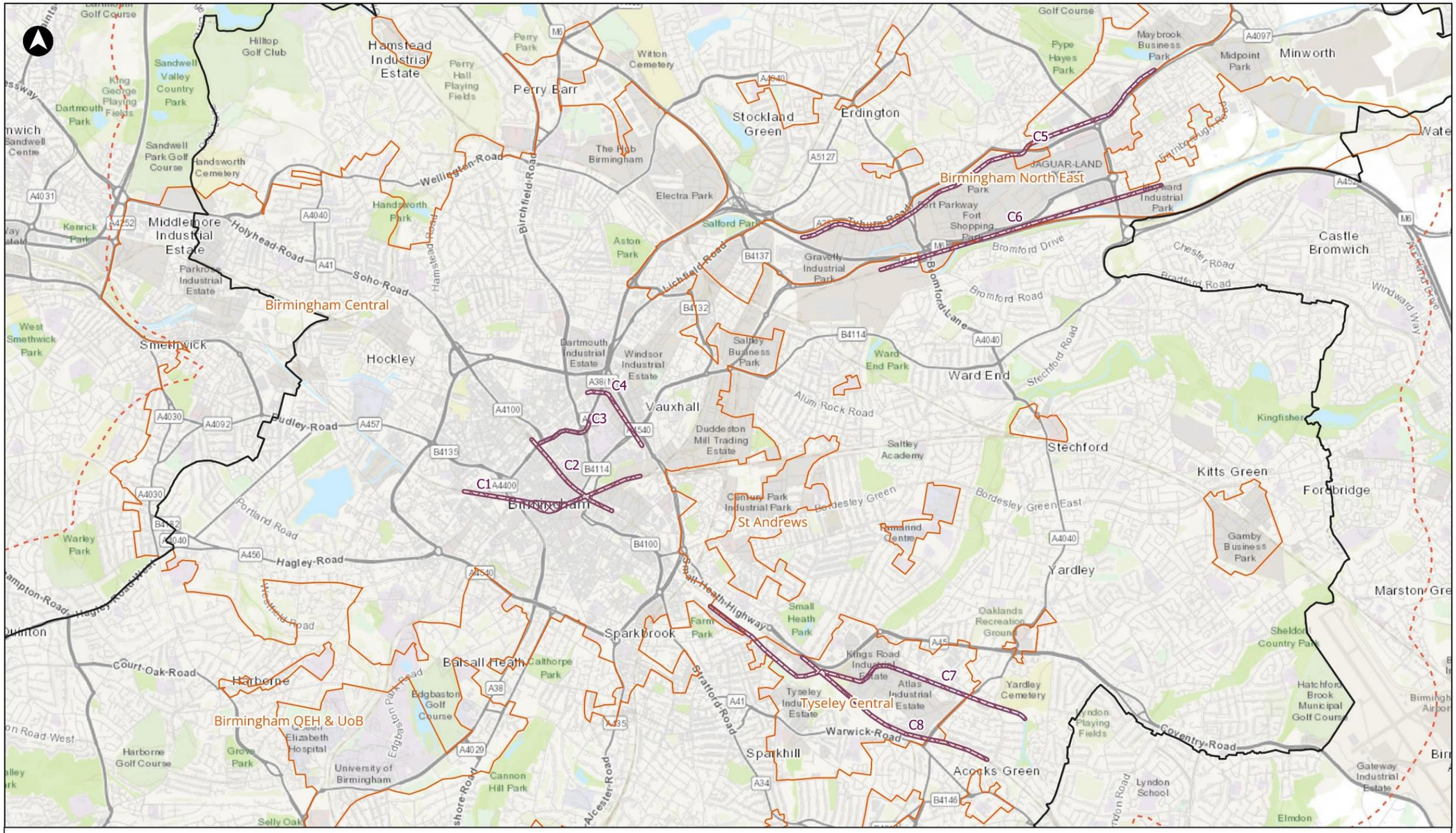
Department for Energy Security & Net Zero

Birmingham

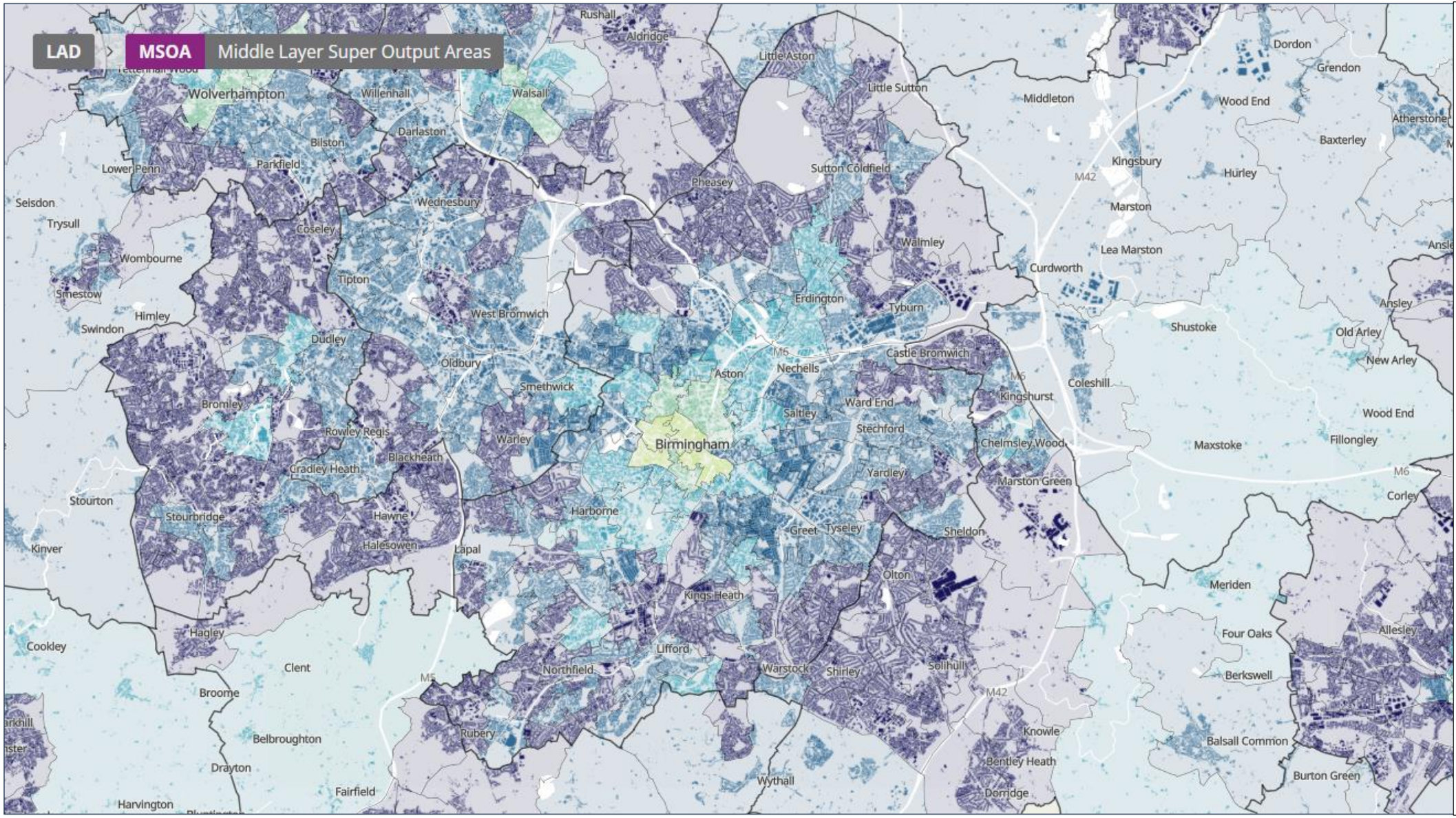
Map D

Existing and Planned Heat Networks

E. Physical Constraints

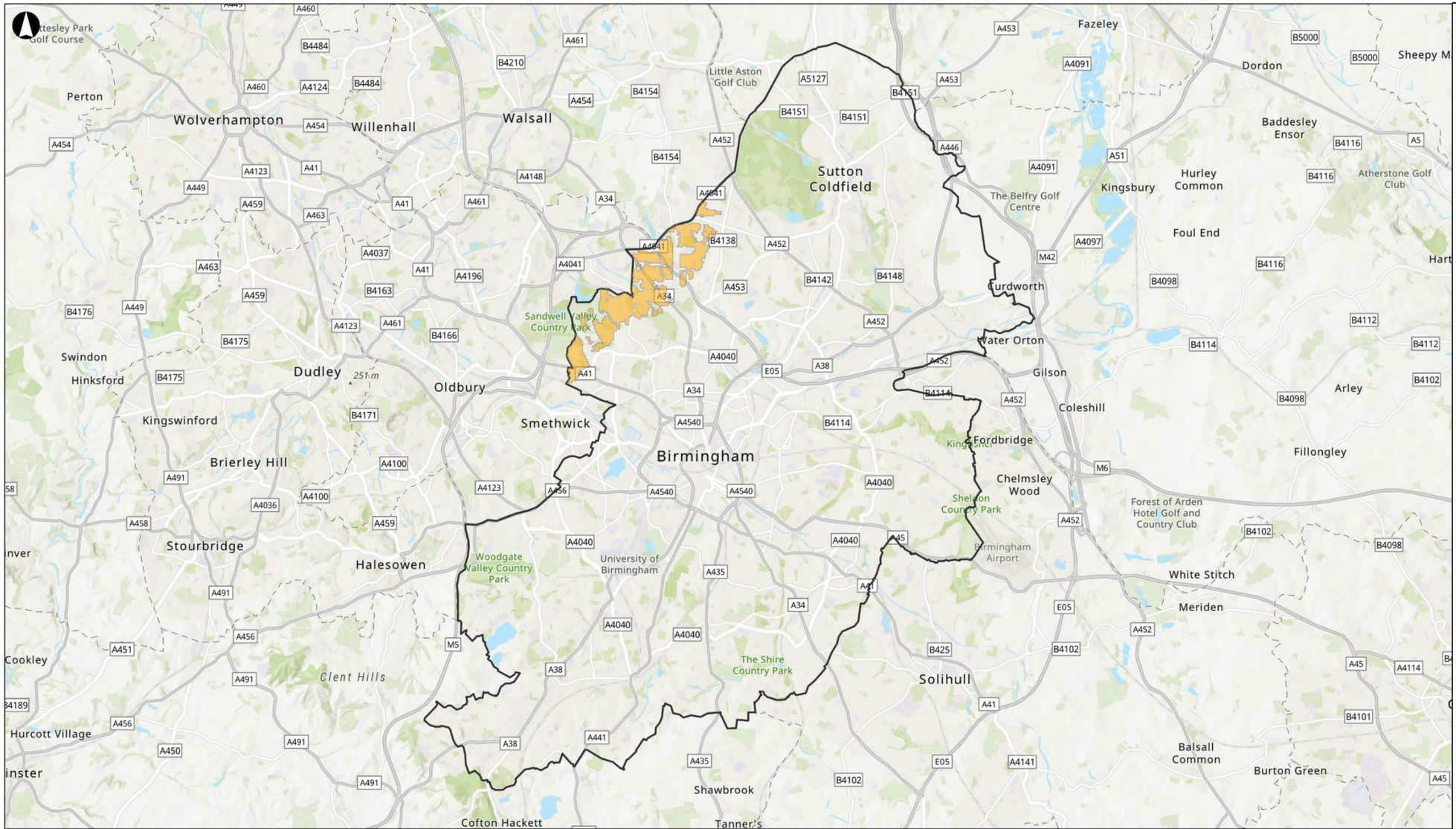


F. Off-Gas Grid Areas in Birmingham



Credit: This is an excerpt from the ONS Census Maps 2021 which is available to explore online. The data shown is subject to Crown copyright protection, is published under the Open Government Licence (OGL) and embeds map data which is copyright of Ordnance Survey and Street maps.

G. Coal Mine Water Map



This mine-water heat opportunity map, developed by The Coal Authority, provides an indication of where water from former mine workings could potentially be extracted to provide a source of heat to supply heat networks. The areas of historic coal mine workings within the Local Authority boundary were assessed and several factors, such as depth to workings and water levels, were analysed to identify areas of potential opportunity and classified as either 'Good', 'Possible' or 'Challenging'. This opportunity map can be used in combination with plans for heat network projects to identify specific locations where more detailed feasibility studies could be undertaken

Appendix 2: Data Room Resources

Throughout the delivery of the Pilot programme, information resources have been compiled for future use in relation to the development of heat network zones.

These resources will remain restricted to DESNZ and the local authority. This is to ensure that the department remains within its Data Privacy Notice as shared with stakeholders providing the information. GIS outputs are not being published alongside the report as they are subject to change.

Table 24: Pilot Programme Standardised Information Resources

Information resource	Description of resource
Stakeholder Directory	A directory listing key stakeholders identified and approached during the Pilot programme, including organisation name, address, or website, contact names, work title and contact details.
Stakeholder meetings log and records	A log of key meetings held and related meeting records.
Datasets Directory	A list of datasets / reports shared by stakeholders cross-referencing who provided the item from the stakeholder directory and a description of the dataset.
Geospatial packages and related geo-coded datasets	Geo-coded datasets and descriptions related to maps produced in this report.

Table 25: Pilot Programme Study-Area-Specific Information Resources

Information resource	Description of resource
SHLAA	Birmingham Strategic Housing Land Availability Assessment, 2019, BCC
BCC Land Developments Constraints Mapping	BCC provided GIS layers showing conservation constraints on land development, 2022, BCC
Birmingham Decentralised Energy Mapping Report	Previous cluster study focussing on the Birmingham LA regions, 2014, Buro Happold
Tyseley Heat Networks – Part 1, Techno-Economic Feasibility Study	Feasibility study for heat network development in Tyseley, 2016, Sweco & Carbon Trust
Birmingham Development Plan 2031	BCC plan for sustainable growth, BCC, 2017

Information resource	Description of resource
Selly Oak Heat Network Feasibility Study Report	Feasibility Study looking at the development of a DH network between Birmingham Women's Hospital and the Health Innovation Campus, 2016, WSP
CHP advice Report for the University of Birmingham	CHP Development report for the University of Birmingham used in conjunction with more recent reports and discussions to inform understanding of the University of Birmingham DH network, 2005, Carbon Trust
AZP Report	Advanced Zoning Programme Report presenting package of technical information on heat sources, heat demands, heat network routing and zone delivery plan.

This publication is available from: https://www.gov.uk/government/collections/heat-networks

If you need a version of this document in a more accessible format, please email alt.formats@energysecurity.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.