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BRE Client Report

BRE Integrated Dwelling Level Housing Stock Modelling and Database for Nottingham City Council

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Executive summary

- Nottingham City Council commissioned BRE to undertake a series of modelling exercises on their housing stock which required BRE to produce an integrated stock model which includes Energy Performance Certificate (EPC)[1] data, Local Land and Property Gazetteer (LLPG) data and Housing Health and Safety Rating System (HHSRS) data provided by Nottingham. As a result of this, 55,029 addresses have had their imputed energy characteristics replaced with observed characteristics from the EPC data for the purposes of the energy model. The use of this observed data will lead to more accurate energy models for these 55,029 cases, which account for 41% of the total stock in Nottingham.
- This report describes the work and the results obtained from the integrated model and database. The database is also provided to the council to enable them to obtain specific information whenever required.
- The detailed housing stock information provided in this report will facilitate the delivery of Nottingham's housing strategy and enable a targeted intervention approach to improving housing. In addition to this there are also several relevant government policies – the Housing Act 2004, Housing Strategy Policy, Local Authority Housing Statistics (LAHS) and the Energy Companies Obligation (ECO).
- The main aims of this work were to provide estimates of:
    - The percentage of dwellings meeting each of the key indicators[2] for Nottingham overall and broken down by tenure and then mapped by Census Output Area (COA) (private sector stock only)
    - Information relating to LAHS reporting for the private sector stock - category 1 hazards and Houses in Multiple Occupation (HMOs) as well as information on EPC ratings
    - Energy efficiency variables for the private sector stock (wall and loft insulation)
    - Energy planning variables (SimpleCO_2, energy and heat demand, energy and heat cost)
- BRE Housing Stock Models were used to provide such estimates at dwelling level and focussing on private sector housing. The key indicators provide Nottingham with detailed information on the likely condition of the stock and the geographical distribution of properties of interest.
- A stock modelling approach has been developed and used by BRE for many years and the most recent 2016 models have been updated to make use of the results of the 2012 English Housing

[1] EPCs are an indication of how energy efficient a building is - with a rating from A (very efficient) to G (inefficient). They are required whenever a property is built, sold or rented.

[2] Presence of a HHSRS category 1 hazard, presence of a category 1 hazard for excess cold, presence of a category 1 hazard for falls, dwellings in disrepair, fuel poverty (10% and Low Income High Cost definitions), dwelling occupied by a low income household and SimpleSAP rating.

Survey (EHS)[3] . The new models also make more use of Ordnance Survey (OS) data. OS Address Premium is used as a basis for the list of all dwellings in the authority, and applying improved geo-modelling[4] is used to determine the dwelling type and floor area from OS Mastermap. The energy model that lies at the heart of the modelling process has been replaced with an updated model based on the 2012 version of SAP, and the methods for imputing the inputs to this model have also been upgraded, including the incorporation of some new information sources. These include the age of postcodes (to improve dwelling age data) and data from Xoserve to determine whether the dwelling is on the gas network. These dwelling level models are used to estimate the likelihood of a particular dwelling meeting the criteria for each of the key indicators. These outputs can then be mapped to provide the authority with a geographical distribution of each of the key indicators which can then be used to target resources for improving the housing stock.

- Furthermore, Nottingham provided an additional source of “local data” - Energy Performance Certificate (EPC), LLPG and HHSRS data. This data set was then incorporated into the BRE Housing Stock Model to produce an integrated housing stock database.
- The headline results are provided on the following page:

[3] 2012 is the latest available data. Prior to the 2016 models EHS 2011 data was used.

[4] The OS data has been used to update a number of the model inputs – the main value of the OS data is the ability to determine the dwelling type with much greater confidence – see Appendix B for more information.

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Headline results for Nottingham

There are 135,399 dwellings in Nottingham, 42% are owner occupied, 32% private rented and 26% social rented.

19,413 dwellings in the private sector have category 1 Housing Health and Safety Rating System (HHSRS) hazards. This equates to 19% of properties. *See full results*

9,307 dwellings in the private rented sector have category 1 HHSRS hazards. This equates to 21% of properties in the private rented sector. *See full results*

The highest concentrations of all HHSRS hazards in the private sector are found in the wards of Wollaton East and Lenton Abbey, Dales and Berridge. *See full results*

The highest concentrations of fuel poverty (Low Income High Costs definition) in the private sector are found in the wards of Dales, Berridge and Basford and for excess cold the highest concentrations are in Wollaton East and Lenton Abbey, Mapperley and Dales. *See full results*

The average SimpleSAP rating for all private sector dwellings in Nottingham is 59, which is better than both England (57) and East Midlands (56). For owner occupied stock the figure is 58 and for private rented stock it is 60. *See full results*

Maps by Census Output Area (COA) have been provided for the above key indicators. *See maps*

The total cost of mitigating category 1 hazards in Nottingham's private sector stock is estimated to be £44.3 million. *See full results*

5.9% (5,881) of *private sector* dwellings and 6.6% (2,880) of *private rented* dwellings in Nottingham are estimated to have an EPC rating below band E. *See full results*

In the private sector stock, there are an estimated 24,235 dwellings with un-insulated cavity walls and 18,014 dwellings with less than 100mm of loft insulation. *See full results*

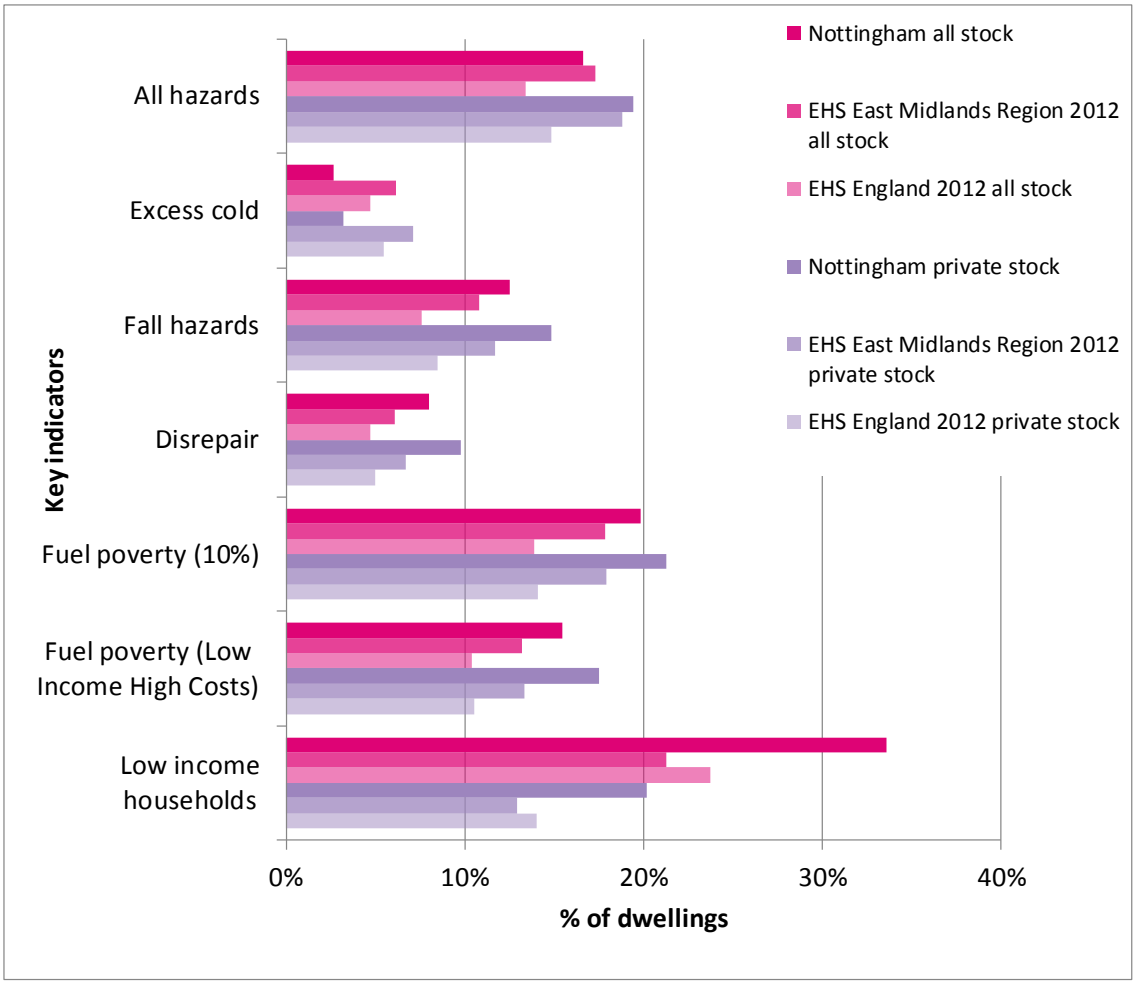
Analysis of the energy efficiency variables indicates that the owner occupied stock has the highest average figures for the majority of variables (SimpleCO_2, energy and heat demand, energy and heat cost). *See full results*

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Key illustrations of headline results

- The table below shows the results for 7 of the key indicators in Nottingham compared to regional data and England (EHS 2012) - split into all stock and private sector stock. The data shows that the performance of the housing stock in Nottingham compared to the EHS England average is generally worse with the exception of excess cold which is slightly lower in Nottingham. The high level of low income households in Nottingham is particularly noticeable which is consistent with Office for National Statistics (ONS) data showing that Nottingham has the second lowest gross disposable income in the UK[5]. There is a similar picture when comparing Nottingham to the regional average with the exception of all hazards where Nottingham performs slightly better than the regional average.

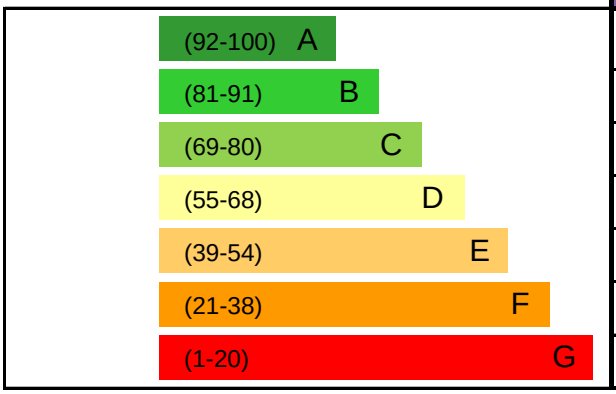
Estimates of the percentage of dwellings meeting the key indicator criteria assessed by the housing stock models and database for all stock and private sector stock – Nottingham compared to the East Midlands and England (EHS 2012)



[5]http://www.ons.gov.uk/economy/regionalaccounts/grossdisposablehouseholdincome/bulletins/regionalgrossdisposablehouseholdincomegdhi/2015-05-27#local-area-nuts3-gdhi-estimates

- The table below shows the number and percentage of Nottingham's private rented stock falling into each of the EPC ratings bands (based on SimpleSAP). The number of private rented dwellings in Nottingham with a rating below band E (i.e. bands F and G), is estimated to be 2,880 (6.6%). Compared to England, there are a greater proportion of dwellings in band B and C and a slightly lower proportion in bands F and G.

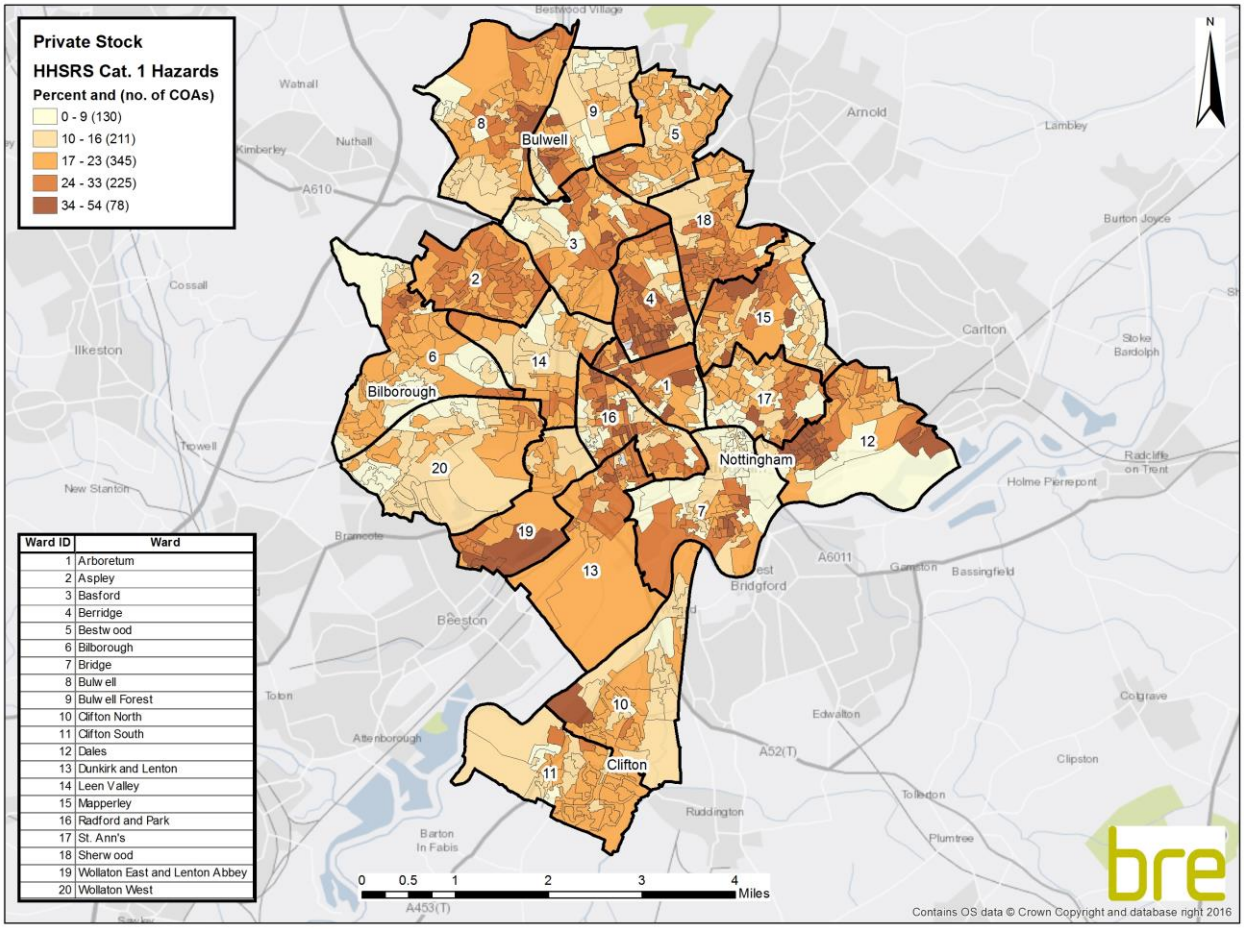
Number and percentage of Nottingham's private rented stock falling into each of the EPC ratings bands (based on SimpleSAP)



	Nottingham		2012 EHS England
	Count	Percent	Percent
(92-100) A	0	0.0%	1.0%
(81-91) B	969	2.2%	
(69-80) C	10,537	24.3%	18.9%
(55-68) D	18,299	42.2%	46.2%
(39-54) E	10,679	24.6%	24.5%
(21-38) F	2,455	5.7%	7.0%
(1-20) G	425	1.0%	2.5%

- The map overleaf shows the distribution of category 1 hazards, as defined by the Housing Health and Safety Rating System (HHSRS). The highest concentrations are scattered across the area – but the highest levels overall are seen in the wards of Wollaton East and Lenton Abbey, Dales and Berridge.

Percentage of private sector dwellings in Nottingham with the presence of a HHSRS category 1 hazard



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

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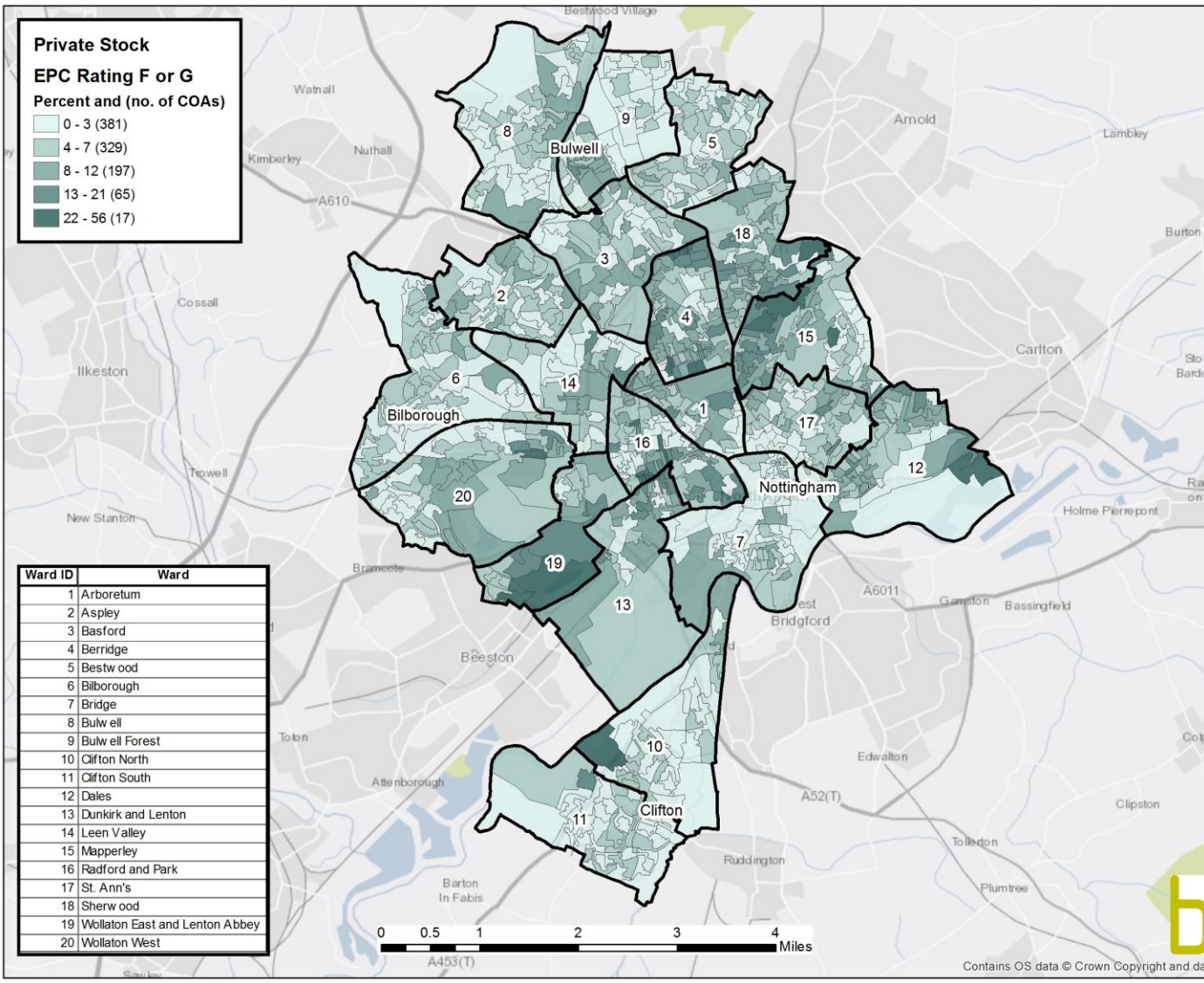
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1 Introduction

Nottingham City Council commissioned BRE to undertake a series of modelling exercises on their housing stock. BRE have integrated various data sources into the models to produce an integrated database and corresponding report. This report describes the modelling work and provides details of the results obtained from the integrated dwelling level model and database.

This current report covers the BRE Integrated Dwelling Level Stock Models and Database. Nottingham City Council provided several sources of 'local data' - Energy Performance Certificate (EPC) data, Local Land and Property Gazetteer (LLPG) data and Housing Health and Safety Rating System (HHSRS) data. As a result of this, 55,029 addresses have had their imputed energy characteristics replaced with observed characteristics from the EPC data for the purposes of the energy model. The use of this observed data will lead to more accurate energy models for these 55,029 cases, which account for 41% of the total housing stock in Nottingham.

This report describes that work and the results obtained from the integrated model and database. The integrated database is also provided to the council to enable them to obtain specific information whenever required.

The stock models and database provide the council with dwelling level information on various key housing indicators, focussing on private sector housing. The key indicators provide Nottingham City Council with detailed information on the likely condition of the stock and the geographical distribution of properties of interest. These properties are likely to be suitable targets for energy efficiency improvements or other forms of intervention, such as mitigating Housing Health and Safety Rating System (HHSRS) hazards. The key indicators are split into indicators related to house condition, energy efficiency and household vulnerability as shown in **Table 1** (see **Appendix A** for full definitions).

Table 1: Key indicators split into categories

Indicator	House condition indicators	Energy efficiency indicators	Household vulnerability indicators
Presence of HHSRS cat 1 hazard	✓		
Presence of cat 1 hazard for excess cold	✓	✓	
Presence of cat 1 hazard for falls	✓		
Dwellings in disrepair	✓		
Fuel Poverty (10% and Low income, High cost definitions)			✓
Dwellings occupied by low income households			✓
SimpleSAP rating		✓	

N.B. Presence of category 1 hazard for falls does NOT include the hazard of falling between levels

The single indicators shown in **Table 1** can also be combined within the database to provide powerful information on the housing stock, for example dwellings suffering from excess cold and also occupied by households on a low income. The true potential of the database lies in its ability to produce combined indicators such as this, as it allows council officers to explore the stock and to assess the likely scope of any programmes they might wish to implement.

It is also possible to extract other information from the database which is of use to local authorities. This information includes estimates relating to the Department for Communities and Local Government's (DCLG) Local Authority Housing Statistics (LAHS) reporting of costs of mitigating hazards, numbers of Houses in Multiple Occupation (HMOs) as well as providing information relating to Energy Performance Certificate (EPC) ratings and energy efficiency and energy planning variables.

The key indicators and other information are derived from the Housing Stock Database which is made up of a series of Dwelling Level Stock Models. The BRE Dwelling Level Stock Models have been used for many years to provide key housing indicators to local authorities. The most recent 2016 models have been updated to make use of the results of the 2012 English Housing Survey (EHS)[6] as well as making more use of Ordnance Survey (OS) data. OS Address Premium is used as a basis for the list of all dwellings in the authority, and applying improved geo-modelling[7] is used to determine the dwelling type and floor area from OS Mastermap. The energy model that lies at the heart of the modelling process has been replaced with an updated model based on the 2012 version of SAP, and the methods for imputing the inputs to this model have also been upgraded, including the incorporation of some new information sources. These include the age of postcodes (to improve dwelling age data) and data from Xoserve to

[6] 2012 is the latest available data. Prior to the 2016 models EHS 2011 data was used.

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determine whether the dwelling is on the gas network. These dwelling level models are used to estimate the likelihood of a particular dwelling meeting the criteria for each of the key indicators.

As described above, in this particular case, the database was further enhanced by the addition of local data sources which were identified by Nottingham City Council. These local data sources were incorporated into the stock models to produce the integrated database.

The information in the database can be used to ensure the council meets various policy and reporting requirements. For example, local housing authorities are required to review housing conditions in their districts in accordance with the Housing Act 2004[8].

Furthermore, having this information available will also help to facilitate the delivery of Nottingham City Council's housing strategy. It will enable a targeted intervention approach to improving housing; therefore allowing the council to concentrate their resources on housing in the poorest condition or with the greatest health impact.

1.1 Project aims

The main aim of this project was to provide data on key private sector housing indicators for Nottingham. The main aims of this work were therefore to provide estimates of:

- The percentage of dwellings meeting each of the key indicators for Nottingham overall and broken down by tenure and then mapped by Census Output Area (COA) (private sector stock only)
- Information relating to LAHS reporting for the private sector stock - category 1 hazards and HMOs, plus information on EPC ratings
- Energy efficiency variables for the private sector stock (wall and loft insulation)
- Energy planning variables (SimpleCO_2, energy and heat demand, energy and heat cost)

This report looks firstly at the policy background and why such information is important for local authorities. Secondly, it provides a brief description of the overall stock modelling approach and the integration of the local data sources. Finally, this report provides the modelling results for Nottingham covering each of the main aims above.

[7] The OS data has been used to update a number of the model inputs – the main value of the OS data is the ability to determine the dwelling type with much greater confidence – see **Appendix B** for more information.

[8] http://www.legislation.gov.uk/ukpga/2004/34/contents

2 Policy background

The detailed housing stock information provided in this report will facilitate the delivery of Nottingham's housing strategy and enable a targeted intervention approach to improving housing. This strategy needs to be set in the context of relevant government policy and legislative requirements. These polices either require reporting of housing-related data by local authorities, or the use of such data to assist in meeting policy requirements. The main policies and legislative requirements are summarised in the following sub-sections.

2.1 Housing Act 2004

The Housing Act 2004[8] requires local housing authorities to review housing statistics in their district. The requirements of the Act are wide-ranging and also refer to other legislation which between them covers the following:

- Dwellings that fail to meet the minimum standard for housings (i.e. dwellings with HHSRS category 1 hazards)
- Houses in Multiple Occupation (HMOs)
- Selective licensing of other houses
- Demolition and slum clearance
- The need for provision of assistance with housing renewal
- The need to assist with adaptation of dwellings for disabled persons

2.2 Key housing strategy policy areas and legislation

2.2.1 Private rented sector

In the report "Laying the Foundations: A Housing Strategy for England"[9] Chapters 4 and 5 focus on the private rented sector and empty homes.

New measures are being developed to deal with rogue landlords and to encourage local authorities to make full use of enforcement powers for tackling dangerous and poorly maintained dwellings. The report encourages working closely with landlords whilst still operating a robust enforcement regime (e.g. Landlord Forums and Panels across the country).

There has been significant growth in the private rented sector in Nottingham in recent years from 13% of the total stock in 2001 to 25% in 2011[10] - so that 12% of the stock has changed over that time period to now be private rented. This is higher than the change of 9% seen in England as a whole.

2.2.2 Health inequalities

The government's white paper "Choosing Health"[11] states that the key to success in health inequalities will be effective local partnerships led by local government and the NHS working to a common purpose

[9] Laying the Foundations: A Housing Strategy for England, CLG, 2011

[10] https://www.gov.uk/government/collections/dwelling-stock-including-vacants

[11] Choosing Health: Making healthy choices easier, Department of Health, 2004



and reflecting local needs. Housing is a key determinant of health, and poor housing conditions continue to cause preventable deaths and contribute to health inequalities[12]. An example in this area is the work carried out by Liverpool City Council in partnership with Liverpool Primary Care Trust – the "Healthy Homes Programme". This has identified over 3,800 hazards and led to an estimated £4.8 million investment by landlords, delivering sustainable health improvements and enhancing community wellbeing.

2.2.3 Integrated care

It has been recognised by central government that to fully address the health needs of the population, services need to become more integrated and there needs to be better communication between different providers. Housing is a key aspect of this:

"Many people with mental and physical disabilities, complex needs, long-term conditions and terminal illness also need to access different health care, social care, housing and other services, such as education, and often simultaneously"[13].

It is therefore essential that departments providing or regulating housing work with other council departments and health organisations to provide services that are integrated and take full account of the needs of the individual.

2.2.4 Public Health Outcomes Framework

The Public Health Outcomes Framework "Healthy lives, healthy people: Improving outcomes and supporting transparency"[14] sets out desired outcomes for public health and how they will be measured. Many of the measurements have links to housing, some of the more relevant being:

- Falls and injuries in over 65's
- Fuel poverty
- Excess winter deaths

2.2.5 Joint Strategic Needs Assessment (JSNA) and Joint Health and Wellbeing Strategies

The JSNA and joint health and wellbeing strategy allow health and wellbeing boards to analyse the health needs of their local population and to decide how to make best use of collective resources to achieve the priorities that are formed from these. The Department of Health document "Joint Strategic Needs Assessment and joint health and wellbeing strategies explained - Commissioning for populations" says "This will ensure better integration between public health and services such as housing and education that have considerable impact on the wider determinants of health"[15].

[12] The health impacts of poor private sector housing, LACORS, 2010

[13] Integrated Care: Our Shared Commitment, Department of Health, 2013

[14] Healthy lives, healthy people: Improving outcomes and supporting transparency, Department of Health, 2013

[15] Joint Strategic Needs Assessment and joint health and wellbeing strategies explained: Commissioning for populations, Department of Health, 2011

2.2.6 Energy Act 2011

The Energy Act 2011 requires that from 2016 reasonable requests by tenants for energy efficiency improvements will not be able to be refused. Furthermore, from 2018 it will be unlawful for landlords to rent out properties that do not reach a minimum standard of energy efficiency (likely to be set at Energy Performance Certificate rating E[16]). While there will be various caveats to these powers, they will provide a new minimum standard for rented accommodation. Part of this current project for Nottingham City Council includes provision of a private rented sector variable that should assist in identifying such dwellings.

2.2.7 Empty homes

Empty homes brought back into use will qualify for the New Homes Bonus where, for the following 6 years, the government will match fund the Council Tax on long term empty properties brought back into use. In addition, from 2012-15, £100 million of capital funding from within the Affordable Homes Programme will be available to tackle problematic[17] empty homes. Whilst the data provided by this project cannot necessarily assist with the actual identification of empty homes, the database provided would be the logical place for such information to be stored should it be gathered from other sources.

The need to bring empty private sector dwellings back into use is a key government objective that is part of a wider strategy to tackle housing affordability. It is generally accepted that in a time of housing shortage, empty dwellings represent a wasted resource.

There are a number of issues in dealing with private sector vacant dwellings including the transient nature of vacant dwellings and their difficulty of identification. Properties are being continually bought and sold, let and modernised, which means that at any given time a proportion of the stock will be naturally vacant. The only dwellings that tend to be of most interest to local authorities are those that are not turning over in the normal way.

2014 information for Nottingham collected by DCLG[18] identifies 3,954 vacant dwellings across all tenures. This represents a vacancy rate of approximately 3% in Nottingham. Furthermore, 0.9% of dwellings are long-term vacant (6 months or more) in Nottingham.

2.3 Other policy areas

The following policy areas, whilst not directly relating to environmental health services, will have an effect on demand and local authorities will need to be aware of the possible impact in their area.

2.3.1 The Housing and Planning Act 2016

The Housing and Planning Act 2016[19] introduces legislation for government to implement the sale of higher value local authority homes, starter homes, pay to stay and a number of other measures, mainly intended to promote home ownership and boost levels of housebuilding in England. Although many of the measures have yet to be implemented or come into effect, the following policy changes will have a significant impact on the way councils deliver their Housing Services:

[16] https://www.gov.uk/getting-a-green-deal-information-for-householders-and-landlords

[17] Properties that are likely to remain empty without direct financial support from government.

[18] https://www.gov.uk/government/collections/dwelling-stock-including-vacants

[19] http://www.legislation.gov.uk/ukpga/2016/22/contents/enacted/data.htm

- The introduction of Pay to Stay where households earning over £31,000 have to pay higher levels of rent for their social housing
- Extension of the Right-to-Buy scheme to housing associations through a voluntary agreement, funded by the sale of higher value council properties when they become vacant
- The ending of lifetime tenancies – all new tenants will have to sign tenancies for a fixed term up to 10 years although there will be exemptions for people with disabilities and victims of domestic abuse, and families with children under nine years old can have a tenancy that lasts until the child's 19th birthday
- Changes to planning measures so that the government can intervene where councils have not adopted a Local Plan
- To replace the need for social rented and intermediate housing on new sites with the provision of Starter Homes that are sold at a reduced cost to first time buyers
- Changing the definition of 'affordable homes' to include starter homes
- Increasing the site size threshold before affordable housing can be requested

The Act also includes a package of measures to help tackle rogue landlords in the private rented sector. This includes:

- Allowing local authorities to apply for a banning order to prevent a particular landlord/letting agent from continuing to operate where they have committed certain housing offences
- Creating a national database of rogue landlords/letting agents, which will be maintained by local authorities
- Allowing tenants or local authorities to apply for a rent repayment order where a landlord has committed certain offences (for example continuing to operate while subject to a banning order or ignoring an improvement notice). If successful the tenant (or the authority if the tenant was receiving universal credit) may be repaid up to a maximum of 12 months' rent
- Introducing a new regime giving local authorities an alternative to prosecution for offences committed under the Housing Act 2004, including all HMO offences. Effectively, local authorities will have a choice whether to prosecute or impose a penalty with a maximum fine of £30,000. The local authority can also retain the money recovered, which is not currently the case with fines imposed in the magistrates' court

2.3.2 The Welfare Reform and Work Act 2016 and the Welfare Reform Act 2012

The Welfare Reform and Work Act 2016[20] gained royal assent in March 2016. The Act introduces a duty to report to Parliament on progress made towards achieving full employment and the three million apprenticeships target in England. The Act also ensures reporting on the effect of support for troubled families and provision for social mobility, the benefit cap, social security and tax credits, loans for mortgage interest, and social housing rents. These include the following:

- Overall reduction in benefits – a four year freeze on a number of social security benefits
- Benefit cap reduction – the total amount of benefit which a family on out of work benefits can be entitled to in a year will not exceed £20,000 for couples and lone parents, and £13,400 for single claimants, except in Greater London where the cap is set at £23,000 and £15,410 respectively
- Local Housing Allowance rent cap – this is the locally agreed maximum benefit threshold for a dwelling or household type within a defined geographical area. Therefore, if rises in rent outstrip growth in income, renters may find it increasingly difficult to pay
- A 1% reduction in social rents per year for 4 years to reduce the housing benefit bill

[20] http://www.legislation.gov.uk/ukpga/2016/7/contents/enacted

In addition, the Welfare Reform Act 2012[21] (which is in parts amended by the 2016 Act discussed above) covers areas of environmental health services – in particular the sections relating to the under occupation of social housing, and the benefit cap. Whilst this will mainly affect tenants in the social rented sector it will undoubtedly have an impact on private sector services. Social tenants may find themselves being displaced into the private sector, increasing demand in this area, and the tenants of Registered Providers (RP's) and some private landlords may have greater trouble affording rent payments. If tenants are in arrears on their rental payments then authorities may be met with reluctance from landlords when requiring improvements to properties.

2.3.3 Localism Act 2011

The Localism Act allows social housing providers to offer fixed term, rather than secure lifetime, tenancies. As with the Welfare Reform Act, this has a greater direct impact on the social rented sector, however, there is some concern this may lead to greater turnover of tenancies meaning such that some traditional social tenants may find themselves in the private rented sector.

Both of these policy changes above may increase the number of vulnerable persons in private sector properties. If this occurs any properties in this sector in poor condition are likely to have a far greater negative impact on the health of those occupiers.

2.3.4 Potential increase in private rented sector properties

Policies such as the Build to Rent and the New Homes Bonus are aimed at increasing the supply of properties. As the private rented sector is already growing, it is reasonable to assume that many of the new properties being built will be rented to private tenants. Local authorities will need to be aware of the potential impact on the demand for their services and how their perception of their local area may have to change if large numbers of properties are built.

2.4 Local Authority Housing Statistics (LAHS)[22] and EPC ratings

The purpose of these statistics is twofold – firstly to provide central government with data with which to inform and monitor government strategies, policies and objectives as well as contributing to national statistics on housing, secondly, to the local authorities themselves to help manage their housing stock. Local authorities are required to complete an annual return which covers a wide range of housing-related issues. Of particular relevance to this current project is "Section F: Condition of dwelling stock" which, amongst other things, requests the following information:

- Total number of dwellings and number of private sector dwellings with category 1 HHSRS hazards and the estimated costs of mitigating these
- Estimates of the number of HMOs and the number of mandatory licensable HMOs

Whilst the LAHS no longer requires reporting of average EPC ratings of the private sector stock and the proportion below a certain rating, this information remains pertinent due to the Energy Act 2011. Under this act new rules mean that from 2018 landlords must ensure that their properties meet a minimum energy efficiency standard - which has been set at band E - by 1 April 2018[23, 24]. Furthermore, from 1

[21] http://www.legislation.gov.uk/ukpga/2012/5/contents/enacted

[22] https://www.gov.uk/government/publications/completing-local-authority-housing-statistics-2012-to-2013-guidance-notes

[23] http://www.legislation.gov.uk/uksi/2015/962/contents/made

April 2016, tenants in F and G rated dwellings may legally request an upgrade to the dwelling to a minimum of a band E.

Results relating to LAHS statistics and EPC ratings can be found in **Section 4.2**.

2.5 The Energy Company Obligation (ECO)

The Energy Companies Obligation (ECO)[25] was originally designed to sit alongside the Green Deal in situations where additional financial support was required for householders. Whilst funding for the Green Deal and the Home Improvement Fund has recently been withdrawn[26], the ECO will continue to run until March 2017. The ECO requires energy companies to assist in the installation of energy efficiency measures in Great Britain to low income and vulnerable households. Under the ECO, energy companies are obliged to meet targets expressed as carbon or costs saved (from 1 January 2013 - 31 March 2015 and recently extended to March 2017[27]). The 3 different ECO obligations are:

- Carbon Emissions Reduction Obligation (CERO)
- Carbon Saving Community Obligation (CSCO)
- Home Heating Cost Reduction Obligation (HHCRO) or Affordable Warmth

ECO2 is now underway and runs from April 2015 to March 2017 – the 3 obligations remain as above and have similar pro-rated targets as ECO but with some different definitions and routes to achieving targets.

An understanding of the ECO criteria is pivotal to building a local authority's strategy for levering in finance to improve the energy efficiency of the stock. Of particular interest are properties with HTT cavities and their role in the Carbon Emissions Reduction Obligation. Despite the recent changes in ECO2, this obligation has by far the greatest savings target attached to it and HTT cavities are a particular focus of energy company interest due to their relatively low cost to install improvements compared to solid wall insulation which is the other key criterion for CERO eligibility. The results for the basic energy efficiency variables are covered in this report and assist in the identification of dwellings which may benefit from energy efficiency improvements. Such information also provides a valuable contribution to the evidence base increasingly being required to support competitive funding bids to central government for housing improvements.

It should be noted that whilst funding for the Green Deal and the Home Improvement Fund has been withdrawn[28], the ECO will continue to run until March 2017.

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[24] Although landlords will still be able to rent out F and G rated properties after this date they will not be able to renew or sign a new contract.

[25] The Electricity and Gas (Energy Companies Obligation) Order 2012, Statutory Instrument No. 3018, 4 December 2012 (http://www.legislation.gov.uk/uksi/2012/3018/part/4/made)

[26] Funding has been withdrawn as of 23 July 2015; however, there will be no impact on existing Green Deal Finance Plans or Green Deal Home Improvement Funds -https://www.gov.uk/government/news/green-deal-finance-company-funding-to-end

[27] Although energy companies have been able to count measures delivered since October 2012 against their targets.

[28] Funding has been withdrawn as of 23 July 2015; however, there will be no impact on existing Green Deal Finance Plans or Green Deal Home Improvement Funds – hhttps://www.gov.uk/government/news/green-deal-finance-company-funding-to-end

3 Overview of the BRE Dwelling Level Housing Stock Modelling approach

3.1 Overview

This section provides a simplified overview of the BRE dwelling level housing stock modelling approach. More detail on the methodology is provided in **Appendix B**.

A stock modelling approach has been developed and used by BRE for many years and dwelling level models are used to estimate the likelihood of a particular dwelling meeting the criteria for each of the key indicators (and other outputs of interest). These outputs can then be mapped to provide the council with a geographical distribution of each of the key indicators which can then be used to target resources for improving the housing stock. The process itself is actually made up of a variety of data sources, calculations and models.

The models are principally informed by the Department for Communities and Local Government's (DCLG) English Housing Survey (EHS)[29]. The survey is not used to supply data for the database, but rather it allows the identification of patterns in the housing stock, so that this knowledge can be applied, in the form of mathematical algorithms, to impute key indicators and energy characteristics from other data available at the national level. The particular approach for Nottingham, however, makes significant use of the Experian UK Consumer Dynamics Database of dwelling and household indicators as inputs to the models. One example is the BRE SimpleCO_2 Model which is based on dwelling level inputs from Experian and expands on these using imputation techniques to provide sufficient information to calculate the likely energy efficiency of each dwelling in the stock. Some of the key housing indicators, such as HHSRS excess cold category 1 hazards and BRE's SimpleSAP[30], can be directly inferred from this data.

Furthermore, Nottingham provided additional sources of local data which were then incorporated into the BRE Housing Stock Model and Database to produce an integrated housing stock model and database. The additional data provided and how it was used is as follows:

- **EPC data** – EPCs contain data on key dwelling energy characteristics (e.g. energy demand, excess cold, SimpleSAP) and where these were available they were used in preference to the modelled data. It should be noted that to comply with bulk EPC data licencing requirements the EPC data is only used to inform the energy efficiency aspects of the model. Furthermore, geomodelling techniques mean that where a property with an EPC is linked (i.e. terraced, semi-detached or a flat) the wall type can be inferred from the EPC for all attached dwellings (and levels of insulation in the case of flats).
- **Other local data**
    - **LLPG data** – the Unique Property Reference Number (UPRN) from the LLPG was used to uniquely identify all properties, while the address details from the LLPG are used to merge the BRE models and EPC data using address matching. Furthermore, the data

[29] The most recent survey used in the housing stock models is 2011.

[30] A Simplified version of the SAP model that produces an output broadly comparable to SAP. The SimpleSAP model is distinct from both full SAP and RD SAP in that uses a smaller, simplified set of inputs.

provided contained additional tenure information (social stock) which was integrated into the model. Note that this figure was lower than the number of social dwellings provided by Experian; therefore, a list of these additional dwellings was provided to Nottingham City Council to decide which dwellings should be allocated as social stock.

- **HHSRS data** – this provides a list of work done to eliminate category 1 hazards by dwelling; it was therefore assumed that there are no category 1 hazards in these dwellings.

Figure 1 shows a simplified flow diagram of the overall BRE housing stock modelling approach and how the additional data is incorporated to produce the integrated housing stock database.

The process is made up of a series of data sources and models which, combined with various imputation and regression techniques and the application of other formulae, make up the final database. The database is essentially the main output of the modelling and provides information on the key indicators and other data requirements (e.g. energy efficiency variables). More detailed information on the data sources and models is provided in **Appendix B**, but to summarise:

The data sources are:
EHS, EPC, Experian, Ordnance Survey (OS) MasterMap, other local data (if available)

The Models are:
SimpleSAP, Fuel Poverty, HHSRS (all hazards, falls hazards and excess cold), Disrepair and Low Income Households.

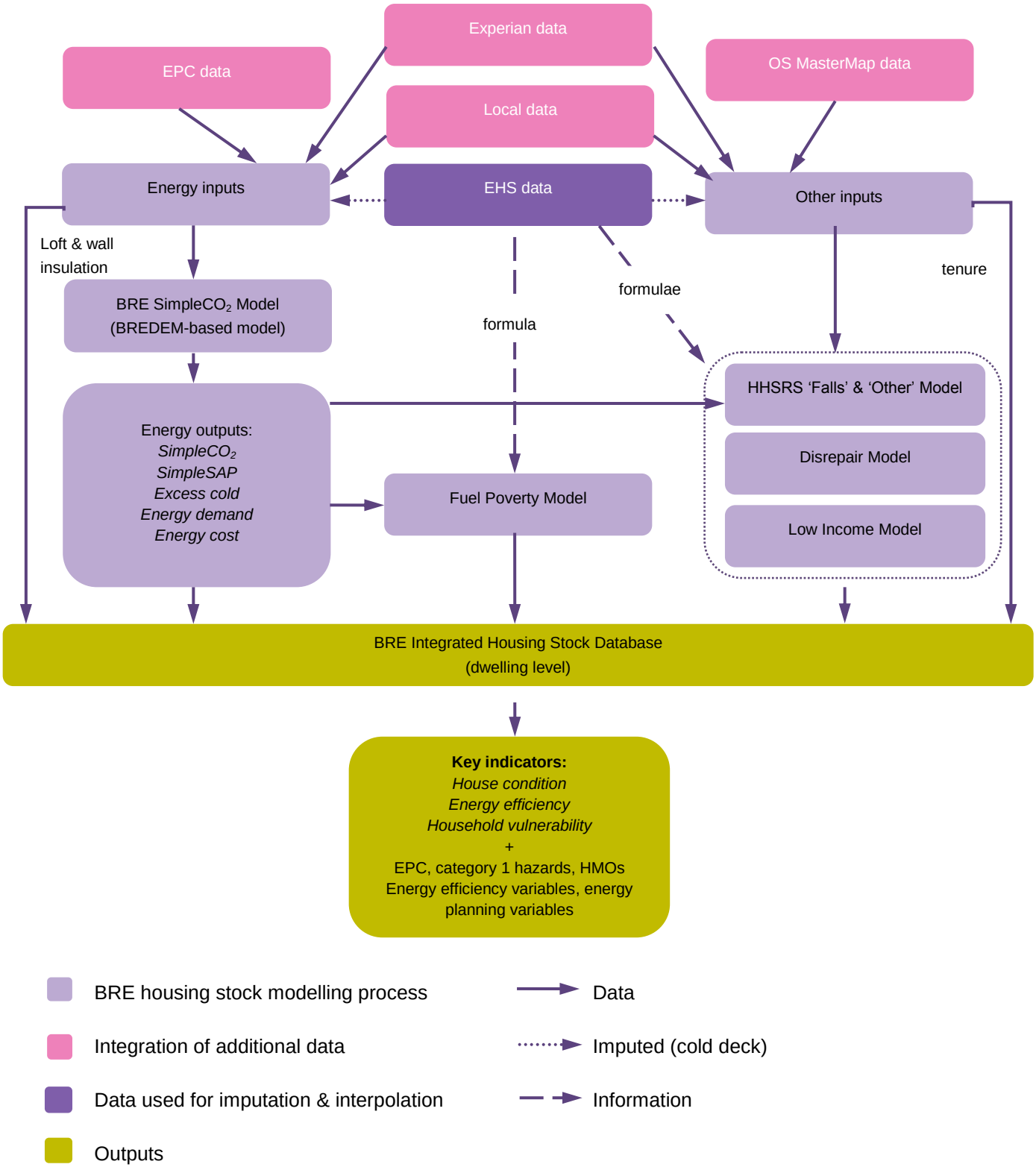
The data sources and models are linked as shown in the flow diagram and the modelling process itself can be divided into “energy inputs” and “other inputs”, which are summarised as follows:

Energy inputs - are developed from Experian, EPC and other local data sources (if available). The EHS data is used to impute (using cold deck imputation[31]) and interpolate where there are gaps in the data. The “energy inputs” are then fed into the SimpleCO_2 Model to produce the “energy outputs” for the database plus information on excess cold for the HHSRS Model and information on energy costs for the Fuel Poverty Model.

Other inputs – are developed from Experian, OS MasterMap and other local data sources. The EHS data is used to impute (using cold deck imputation[31]) and interpolate where there are gaps in the data. The “other inputs” are then fed into the HHSRS, Disrepair, and Low Income Models (note that tenure data is fed directly into the database). Information from the EHS also feeds into the Fuel Poverty, HHSRS, Disrepair and Low Income Models.

[31] Cold deck imputation is a process of assigning values in accordance with their known proportions in the stock.

Figure 1: Simplified flow diagram of overall BRE housing stock modelling approach (N.B. the EHS data is only used to inform the mathematical algorithms of the model – it does not provide data)



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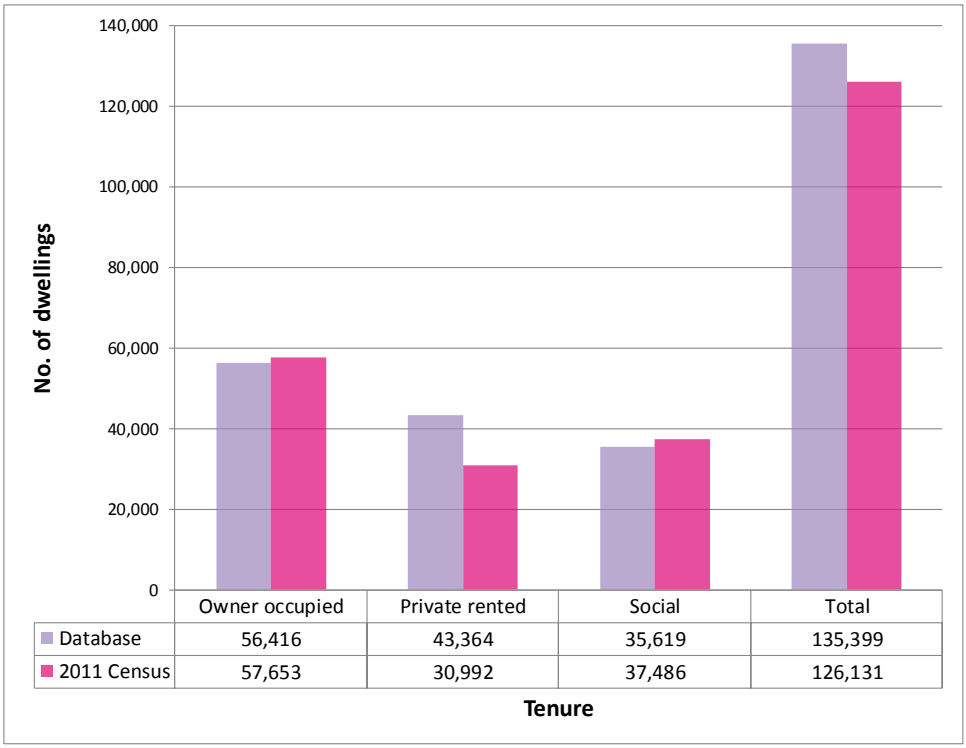
3.2 Breakdown of the housing stock by tenure - validation

Providing the results split by tenure is useful since it can have an effect on how resources and improvement policies are targeted. This report is particularly focussed on private sector stock which is made up of owner occupied and private rented dwellings. The remainder of the housing stock consists of social housing.

The total number of dwellings in Nottingham from the integrated database is based on OS AddressBase data; therefore the model is based on this value. The tenure split within the integrated database is derived from the purchased Experian tenure variable, as well as tenure data supplied within the council's LLPG data.

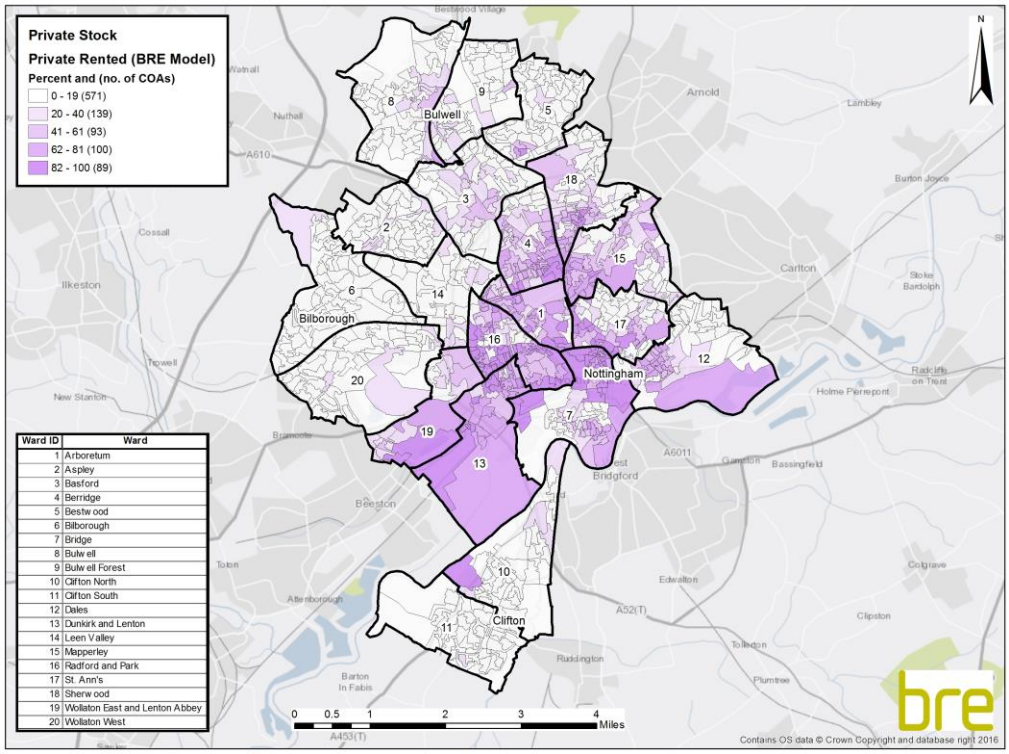
Since it is possible for private rented dwellings to become owner occupied and vice versa relatively easily, it is difficult to accurately predict the actual tenure split at any given point in time. A validation process was undertaken to compare the tenure split from the database to the 2011 Census figures[32]. The results of the validation exercise show that the differences between the tenure split from the database compared to the Census figures are relatively small, particularly for owner occupied and social stock (see **Figure 2**). **Maps 1** and **2** show that the geographical distributions look similar, again giving confidence that the integrated database provides a good overview of the housing stock in Nottingham.

Figure 2: Tenure split – comparison of BRE Housing Stock Database outputs with 2011 Census figures for Nottingham

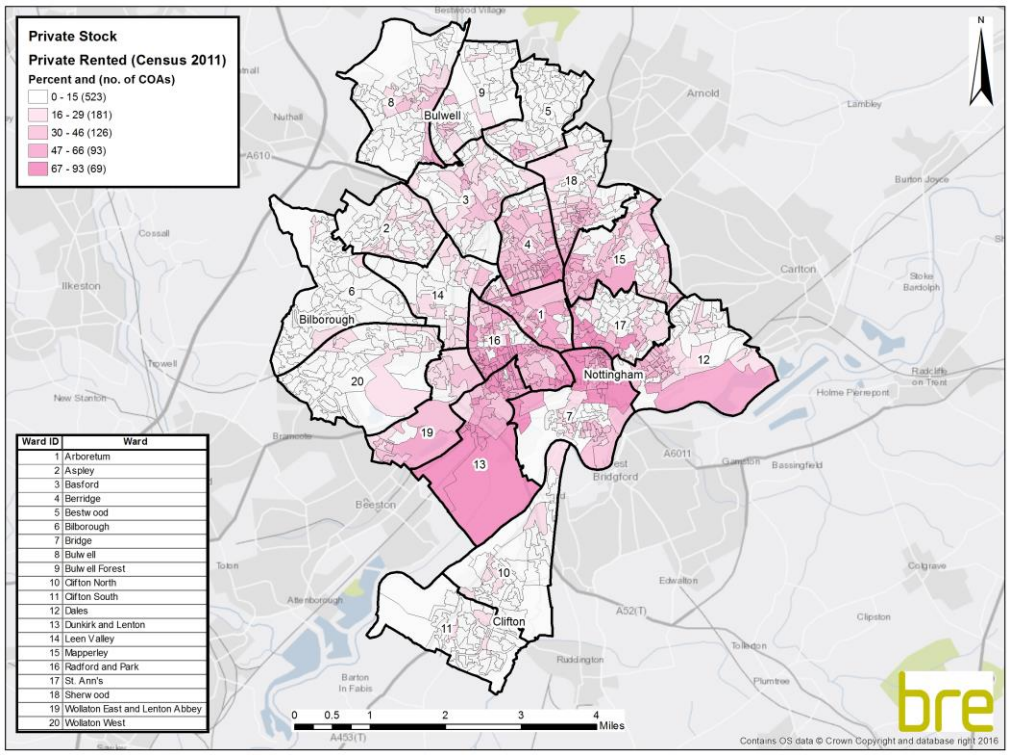


[32] http://www.ons.gov.uk/ons/datasets-and-tables/index.html

Map 1: Distribution of estimated percentage of private rented dwellings in Nottingham – based on database



Map 2: Distribution of estimated percentage of private rented dwellings in Nottingham – based on 2011 Census Data (Neighbourhood Statistics)



4 Results from the BRE Dwelling Level Housing Stock Models and Database

As described in the previous section, the housing stock modelling process consists of a series of different stock models with the main output being the database. The results in this section have been obtained from interrogating the database at the level of the local authority as a whole to give a useful overview for Nottingham. Information at ward level, however, is provided in the maps, in **Section 4.2.4** and can also be obtained from the database which has been supplied as part of this project (see **Appendix C** for instructions). The database can be interrogated at local authority, ward, medium super output area (MSOA), lower super output area (LSOA), census output area (COA), postcode or dwelling level.

The first sub-section below provides a map of the wards in Nottingham. The results are then displayed in the following sub-sections:

- Key indicators:
  - Nottingham – regional and national comparisons
  - Key indicators by tenure for Nottingham
  - Key indicators mapped by COA for Nottingham private sector stock
  - Ward level results for the key indicators
- Information relating to LAHS reporting and EPC ratings:
  - Category 1 hazards
  - HMOs
  - EPC ratings
- Energy efficiency variables for Nottingham (wall and loft insulation)
- Energy planning variables for Nottingham

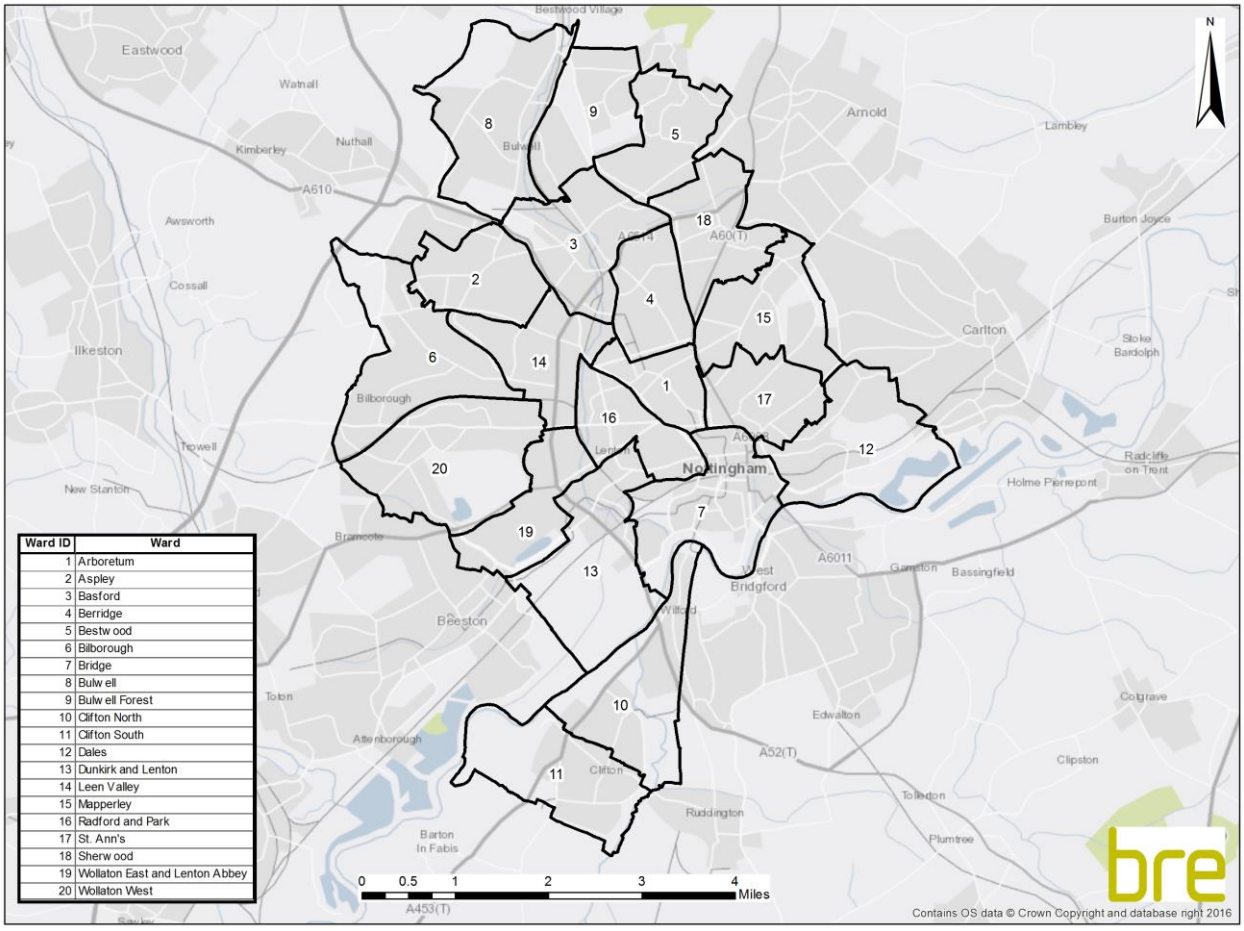
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4.1 Overview of Nottingham

Map 3 below shows the 20 wards in Nottingham. The data in the report is separated into wards and then further divided into Census Output Areas (COAs). These typically comprise around 125 households and usually include whole postcodes, which have populations that are largely similar. Where the COAs are smaller in size on the map this typically represents a more densely populated area since each COA represents a similar number of dwellings.

It should be noted that some residential addresses are not considered suitable for modelling and these have been removed. These include caravans and house boats which, whilst covered by the EHS, are quite uncommon, and the energy models and other housing indicators were not developed with dwellings such as these in mind. Residential institutions (e.g. care homes) have also been removed as it is not entirely appropriate to apply the usual models to these dwellings. The removal of these addresses may result in a COA not appearing to contain any dwellings due to the fact that all c.125 households are made up of caravans for example.

Map 3: The wards in Nottingham



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

4.2 Key indicators

4.2.1 Nottingham – regional and national comparisons

Table 2 and **Figure 3** show the results for each of the key indicators in Nottingham compared to the East Midlands region and to England (EHS 2012) and split into all stock and private sector stock. **Figure 4** shows the results of the SimpleSAP ratings.

For all stock, Nottingham performs worse than the EHS England average for all indicators (with the exception of excess cold which is slightly better). The low income households figure for Nottingham is particularly high which is consistent with Office for National Statistics (ONS) data showing that Nottingham has the second lowest gross disposable income in the UK[33] .

When comparing Nottingham to the East Midlands region, there is a similar picture with Nottingham having higher levels for all the indicators – again with the exception of excess cold, and also all hazards where Nottingham performs slightly better.

Comparing Nottingham to the EHS England average figures for the private sector stock there is a similar picture with Nottingham performing worse for the majority of hazards with the exception of excess cold. The percentage of low income households is again higher than the regional and national averages, although the difference is not as great, indicating that there are higher rates in the social stock.

The average SimpleSAP ratings in Nottingham (**Figure 4**) are better than those for the regional and England averages for both all stock and the private sector stock.

Table 2: Estimates of the numbers and percentage of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database for all stock and private sector stock – Nottingham compared to the East Midlands and England (EHS 2012)

Indicator		All stock				Private sector stock			
		Nottingham (no.)	Nottingham (%)	2012 EHS Regional (%)	2012 EHS England (%)	Nottingham (no.)	Nottingham (%)	2012 EHS Regional (%)	2012 EHS England (%)
No. of dwellings		135,399	-	-	-	99,780	-	-	-
HHSRS category 1 hazards	All hazards	22,556	17%	17%	13%	19,413	19%	19%	15%
	Excess cold	3,654	3%	6%	5%	3,233	3%	7%	5%
	Fall hazards	16,913	12%	11%	8%	14,814	15%	12%	8%
Disrepair		10,825	8%	6%	5%	9,766	10%	7%	5%
Fuel poverty (10%)		26,905	20%	18%	14%	21,215	21%	18%	14%
Fuel poverty (Low Income High Costs)		20,930	15%	13%	10%	17,504	18%	13%	11%
Low income households		45,505	34%	21%	24%	20,110	20%	13%	14%

N.B. the information on hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under 'all hazards'. The number of dwellings under 'all hazards' can therefore be less than the sum of the excess cold plus fall hazards.

[33]http://www.ons.gov.uk/economy/regionalaccounts/grossdisposablehouseholdincome/bulletins/regionalgrossdisposablehouseholdincomegdhi/2015-05-27#local-area-nuts3-gdhi-estimates

Figure 3: Estimates of the percentage of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database for all stock and private sector stock – Nottingham compared to the East Midlands and England (EHS 2012)

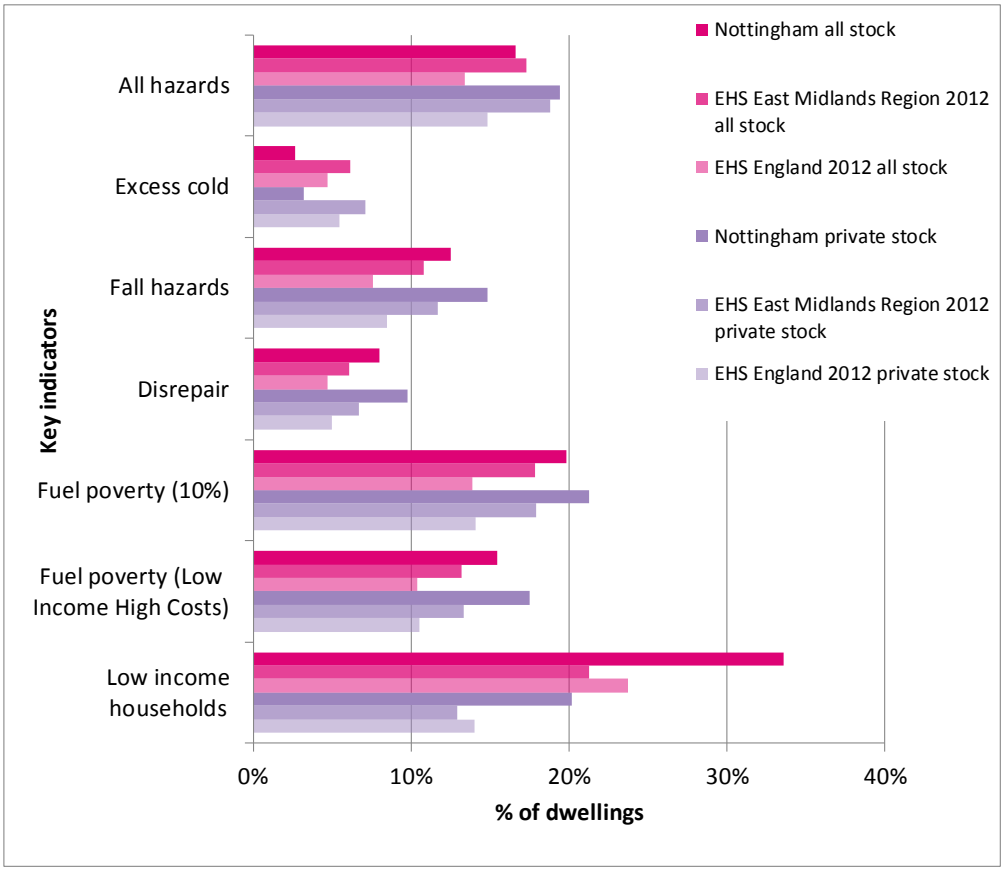
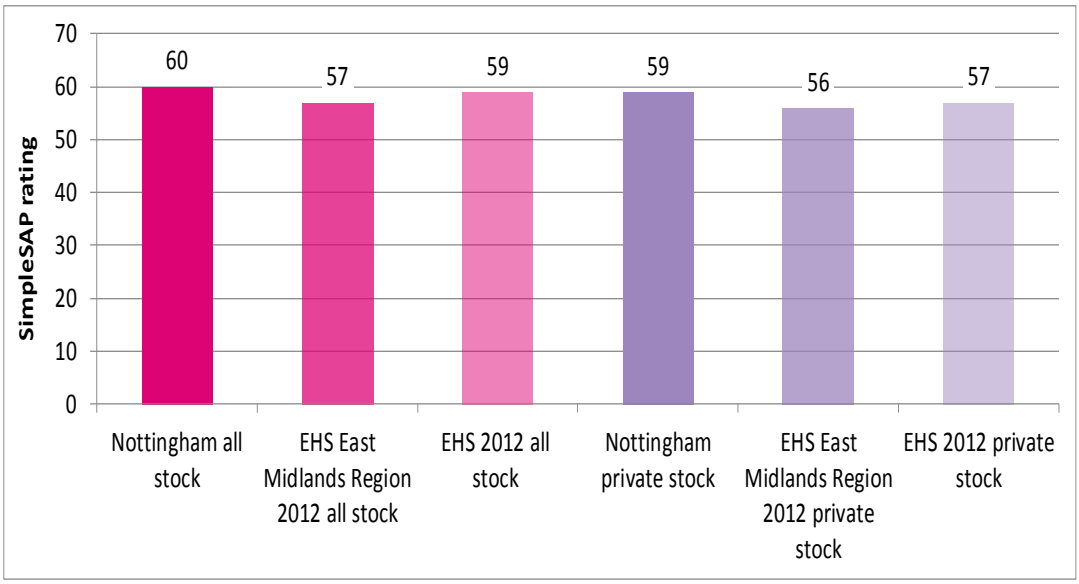


Figure 4: Average SimpleSAP ratings for all stock and private sector stock – Nottingham compared to the East Midlands and England (EHS 2012)



4.2.2 Key indicators by tenure – Nottingham

The private sector stock can be further split by tenure – owner occupied and private rented - with the difference between total private sector stock and total housing stock being the social housing stock. **Table 3** and **Figure 5** below show the results for each of the key indicators split by tenure and **Figure 6** shows the SimpleSAP ratings by tenure.

The social stock is generally better than the private sector stock across the majority of indicators including SimpleSAP. Social stock tends be more thermally efficient than the private stock partly due to the prevalence of flats, and partly due to being better insulated owing to the requirements placed on social housing providers, for example through the Decent Homes Programme. As would be expected, the social stock is worse than the private sector stock for the low income households indicator. For fuel poverty; however, the private rented tenure shows the highest levels for both definitions (although the owner occupied stock is not far behind when looking at the 10% definition).

The social data should be treated with some caution as the social rented stock, particularly when largely comprising stock owned by a single landlord, is more difficult to model than the private sector. This is because the decisions of an individual property owner usually only affect a single dwelling out of the thousands of private sector stock whereas the policies and decisions of a single landlord can have a very great effect on a large proportion of the social stock. The social rented results are therefore best considered as a benchmark which takes account of the age, type, size and tenure against which the landlord's own data could be compared.

Focussing on the tenures within the private sector stock, the private rented stock is worse than the owner occupied stock across all indicators (with the exception of average SimpleSAP). In particular levels of disrepair, fuel poverty (Low Income High Costs definition) and low income households are higher in the private rented sector.

Table 3: Estimates of the numbers and percentage of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database by tenure for Nottingham

Indicator		Private sector stock				Social stock	
		Owner occupied		Private rented			
		No.	%	No.	%	No.	%
No. of dwellings		56,416	-	43,364	-	35,619	-
HHSRS category 1 hazards	All hazards	10,106	18%	9,307	21%	3,143	9%
	Excess cold	1,568	3%	1,665	4%	421	1%
	Fall hazards	7,832	14%	6,982	16%	2,099	6%
Disrepair		3,606	6%	6,160	14%	1,059	3%
Fuel poverty (10%)		11,285	20%	9,930	23%	5,690	16%
Fuel poverty (Low Income High Costs)		7,758	14%	9,746	22%	3,426	10%
Low income households		7,500	13%	12,610	29%	25,395	71%

N.B. the information on hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under 'all hazards'. The number of dwellings under 'all hazards' can therefore be less than the sum of the excess cold plus fall hazards.

Figure 5: Estimates of the percentage of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database by tenure for Nottingham

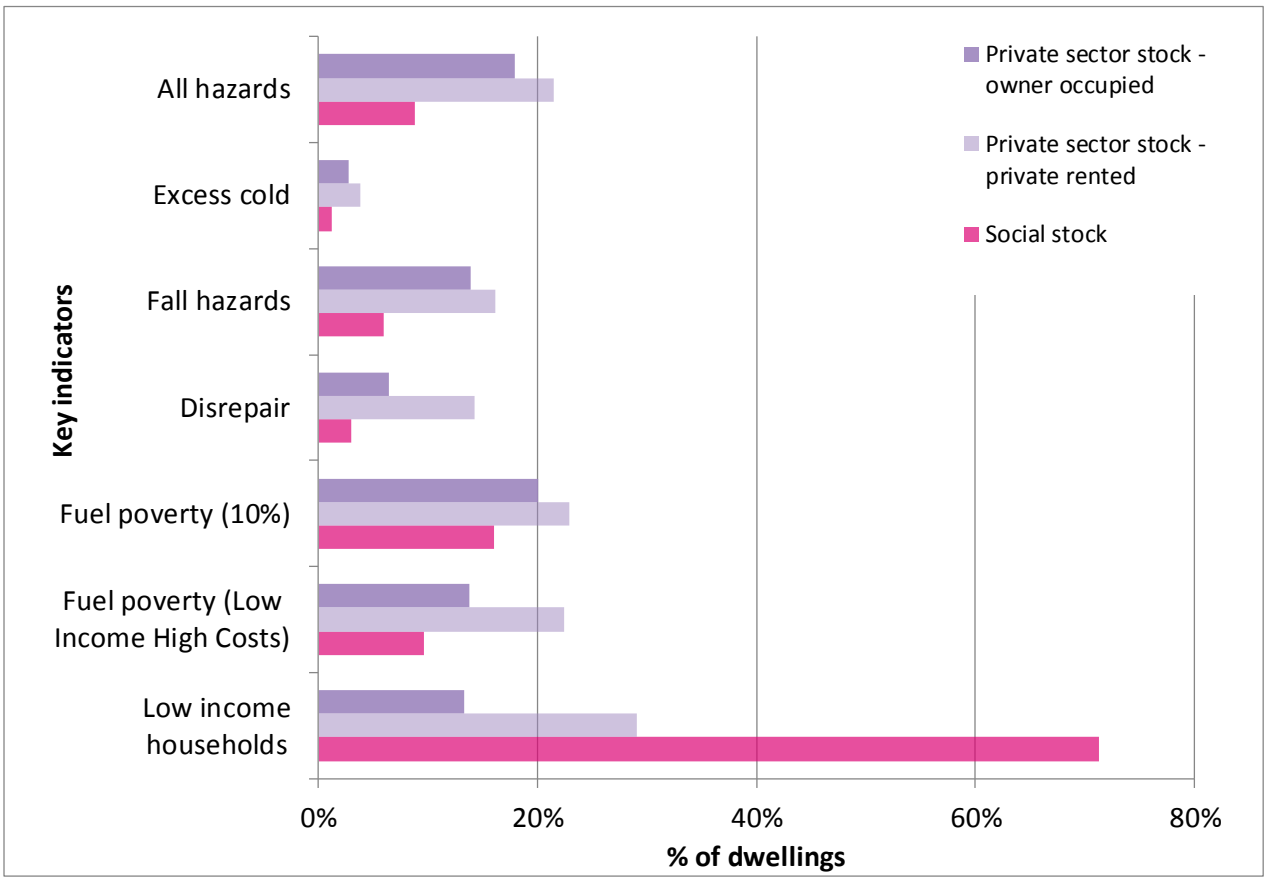
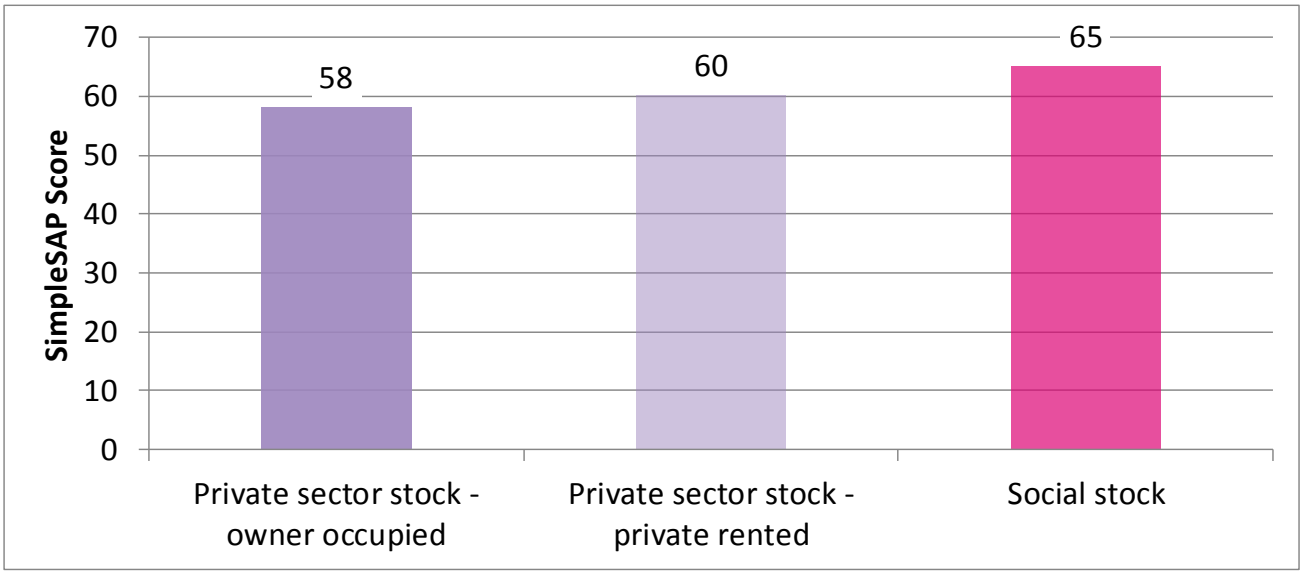


Figure 6: Average SimpleSAP ratings by tenure for Nottingham



4.2.3 Key indicators mapped by Census Output Area (COA) – Nottingham private sector stock

Some of the key indicators are also provided in map form below along with a brief description of each indicator[34], thus enabling quick observation of the geographical distribution of properties of interest. The maps show the percentages of private sector dwellings in each Census Output Area (COA) that are estimated to have each of the key indicators.

The ranges shown in the map keys are defined based on the Jenks' Natural Breaks algorithm of the COA statistics[35]. The outputs in the lightest and darkest colours on the maps show the extreme ends of the range, highlighting the best and the worst areas.

Maps at COA level are provided for the following key indicators in **Map 4** to **Map 12** below:

- **HHSRS**
  - The presence of a category 1 HHSRS hazard
  - The presence of a category 1 hazard for excess cold
  - The presence of a category 1 hazard for falls
- **Levels of disrepair**
- **Levels of fuel poverty** (Low Income High Costs and 10% definitions)
- **Low income households**
  - Dwellings occupied by low income households
  - Dwellings with a category 1 excess cold hazard that are occupied by a low income household
- **The average SimpleSAP[36] rating**

In addition, maps have been provided for HMOs, EPC ratings, energy efficiency variables (uninsulated cavity walls, solid walls, loft insulation) and energy planning variables (energy demand/cost and heat demand/cost).

These maps are extremely useful in showing the geographical distribution for single key indicators. Maps can also be produced for a combination of indicators, such as dwellings with an excess cold hazard which are also occupied by low income households, as shown in **Map 11**. **Appendix D** provides close up maps

[34] See **Appendix A** for full definitions.

[35] The natural breaks classification method is a data clustering method determining the best arrangement of values into different classes. It is achieved through minimising each class's average deviation from the class mean while maximising each class's deviation from the means of the other groups. The method seeks to reduce the variance within classes and maximise variance between classes thus ensuring groups are distinctive.

[36] Important note: Whilst it is possible to provide "SimpleSAP" ratings from the "SimpleCO_2" software, under no circumstances must these be referred to as "SAP" as the input data is insufficient to produce an estimate of SAP or even RdSAP for an individual dwelling that meets the standards required by these methodologies.

for each indicator, focussing on the areas of Central Nottingham and Clifton. The maps in the main body of this report show the private sector stock, **Appendix E** provides maps for the owner occupied and private rented stock.

The maps are produced at COA level, which is typically made up of 125 households, usually including whole postcodes and having similar sized populations. Using the first map below (**Map 4**) as an example, it can be seen that each ward is split into several COAs and, in this instance there are 78 COAs that have 34 - 54% of private sector dwellings estimated to have the presence of a category 1 hazard.

The maps also highlight the differences between areas, showing that the results for some areas are much worse than for others and these are the specific areas which might warrant attention. The maps also show that even within wards there can be large differences between the results at COA level.

4.2.3.1 HHSRS

The Housing Health and Safety Rating System (HHSRS) is a risk-based evaluation tool to help local authorities identify and protect against potential risks and hazards to health and safety from any deficiencies identified in dwellings. It was introduced under the Housing Act 2004[8] and applies to residential properties in England and Wales.

The HHSRS assesses 29 categories of housing hazard. Each hazard has a weighting which will help determine whether the property is rated as having a category 1 (serious) hazard[37].

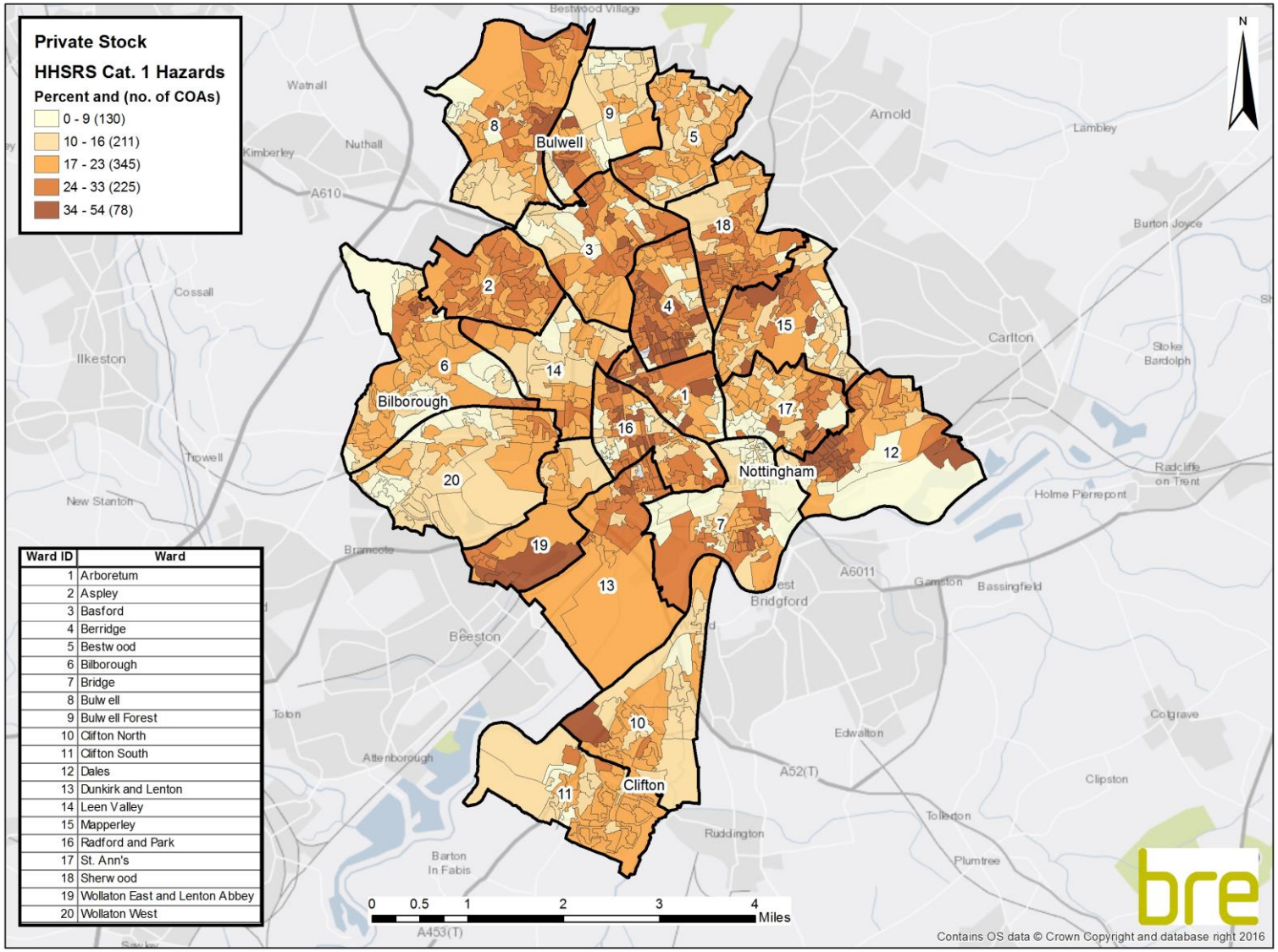
The HHSRS category 1 hazards map (**Map 4**) shows that there are concentrations of higher levels of category 1 hazards across the region. The data behind the map shows that the wards with the highest levels overall are Wollaton East and Lenton Abbey, Dales and Berridge. **Map D. 1** focusses on the urban area of Nottingham and shows that the highest concentrations are to the south of Wollaton East and Lenton Abbey ward, to the east and west of Dales ward and central and southern parts of Berridge ward. **Map D. 2** provides more detail on the Clifton area and shows comparatively lower levels of hazards in this area with the exception of higher levels to the west of Clifton North.

Looking at the hazard of excess cold, there are again concentration of higher levels scattered across the region - **Map 5**. The data behind the map shows that the highest levels overall are in Wollaton East and Lenton Abbey, Mapperley and Dales. **Map D. 3** shows these areas in more detail with the highest levels being seen to the south of Wollaton East and Lenton Abbey, central and western parts of Mapperley and to the east of Dales. **Map D. 4** shows the Clifton area in more detail and again, there are comparatively lower levels of excess cold here with the exception of higher levels to the west of Clifton North.

The distribution of fall hazards is shown in **Map 6** which indicates that the high concentrations are scattered across the city. The data behind this shows that the wards with the highest levels of fall hazards are Dales, Wollaton East and Lenton Abbey and Dunkirk and Lenton. **Map D. 5** provides more detail on these areas and shows that the highest levels are found to the west of Dales, to the south west of Wollaton East and Lenton Abbey and to the north of Dunkirk and Lenton. However there are many other areas with high levels of falls hazards, such as central parts of Aspley, and southern parts of Berridge. **Map D. 6** zooms in on the Clifton area, showing that there are relatively low levels of fall hazards here.

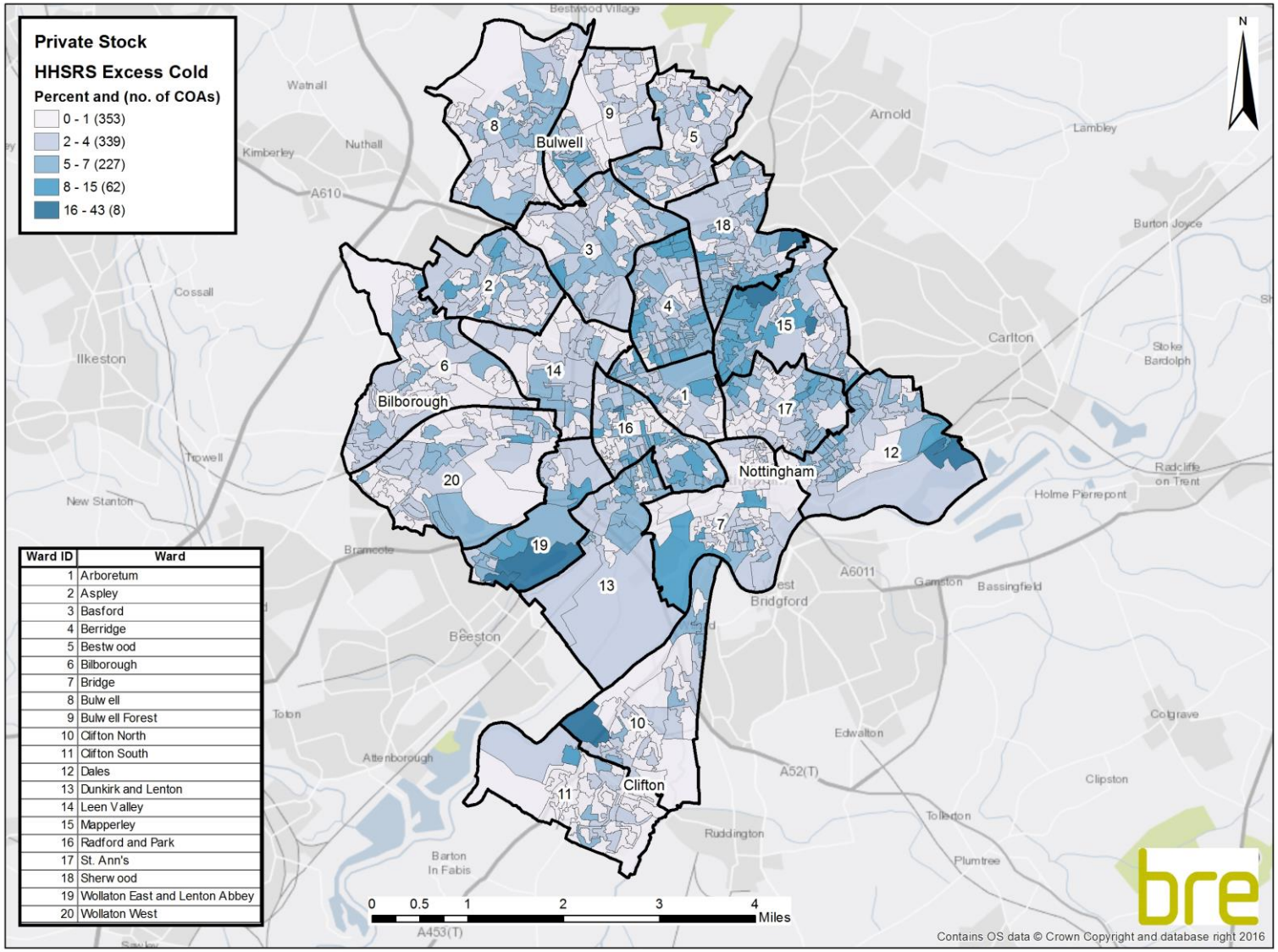
[37] Housing Health and Safety Rating System Operating Guidance, ODPM, 2006

Map 4: Percentage of private sector dwellings in Nottingham with the presence of a HHSRS category 1 hazard



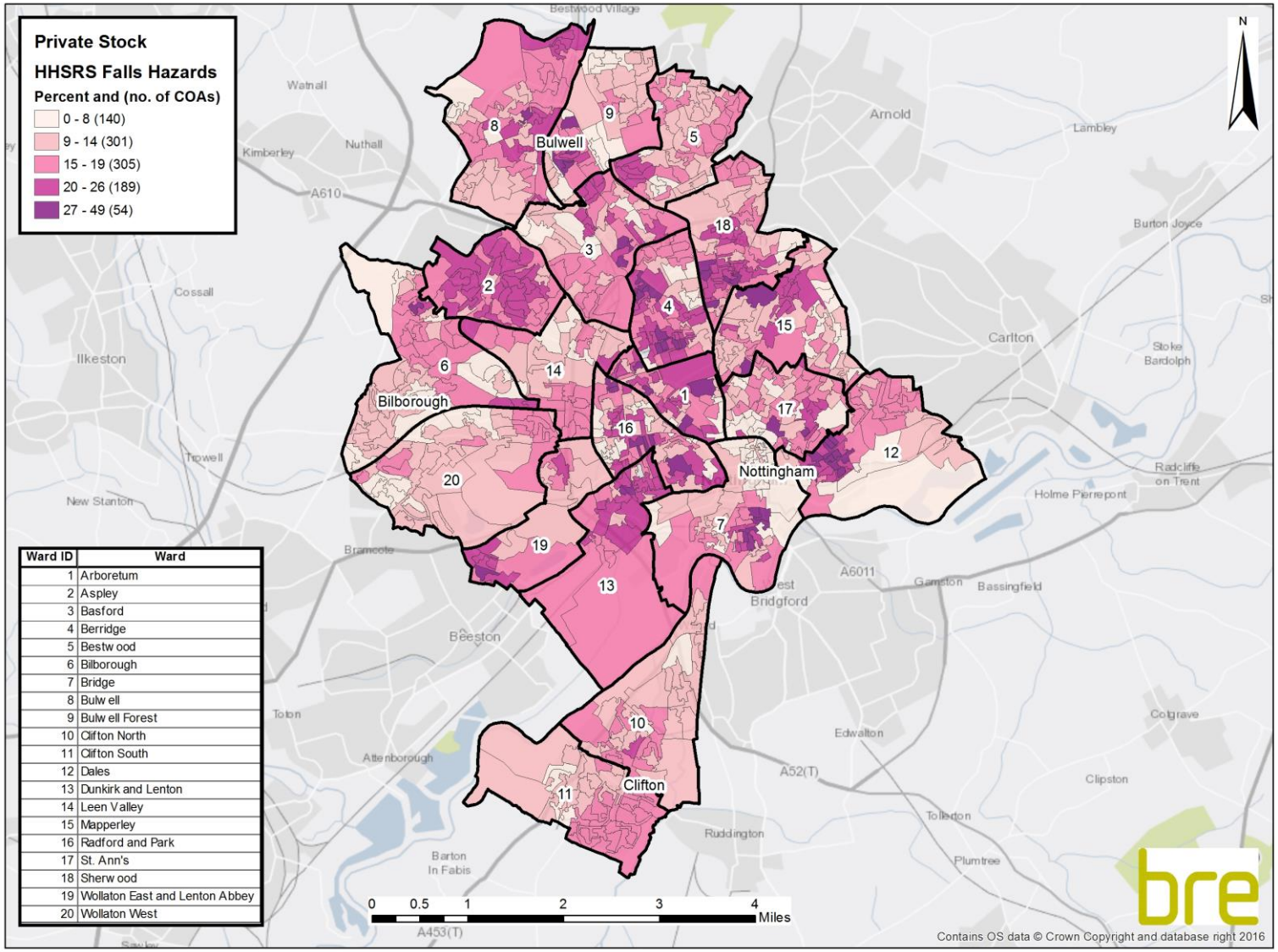
Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

Map 5: Percentage of private sector dwellings in Nottingham with the presence of a HHSRS category 1 hazard for excess cold



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

Map 6: Percentage of private sector dwellings in Nottingham with the presence of a HHSRS category 1 hazard for falls



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

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4.2.3.2 Disrepair

The disrepair indicator used in this report is based on the disrepair component of the Decent Homes Standard[38,39]. A dwelling fails the disrepair component if:

- One or more key building components are old and, because of their condition, need replacing or major repair; or
- Two or more other building components are old and, because of their condition, need replacement or major repair.

Key building components are those which, if in poor condition, could have an immediate impact on the integrity of the building and cause further deterioration in other components. They are the external components plus internal components that have potential safety implications and include:

- External walls
- Roof structure and covering
- Windows/doors
- Chimneys
- Central heating boilers
- Electrics

If any of these components are old, and need replacing or require major repair, then the dwelling is not in a reasonable state of repair.

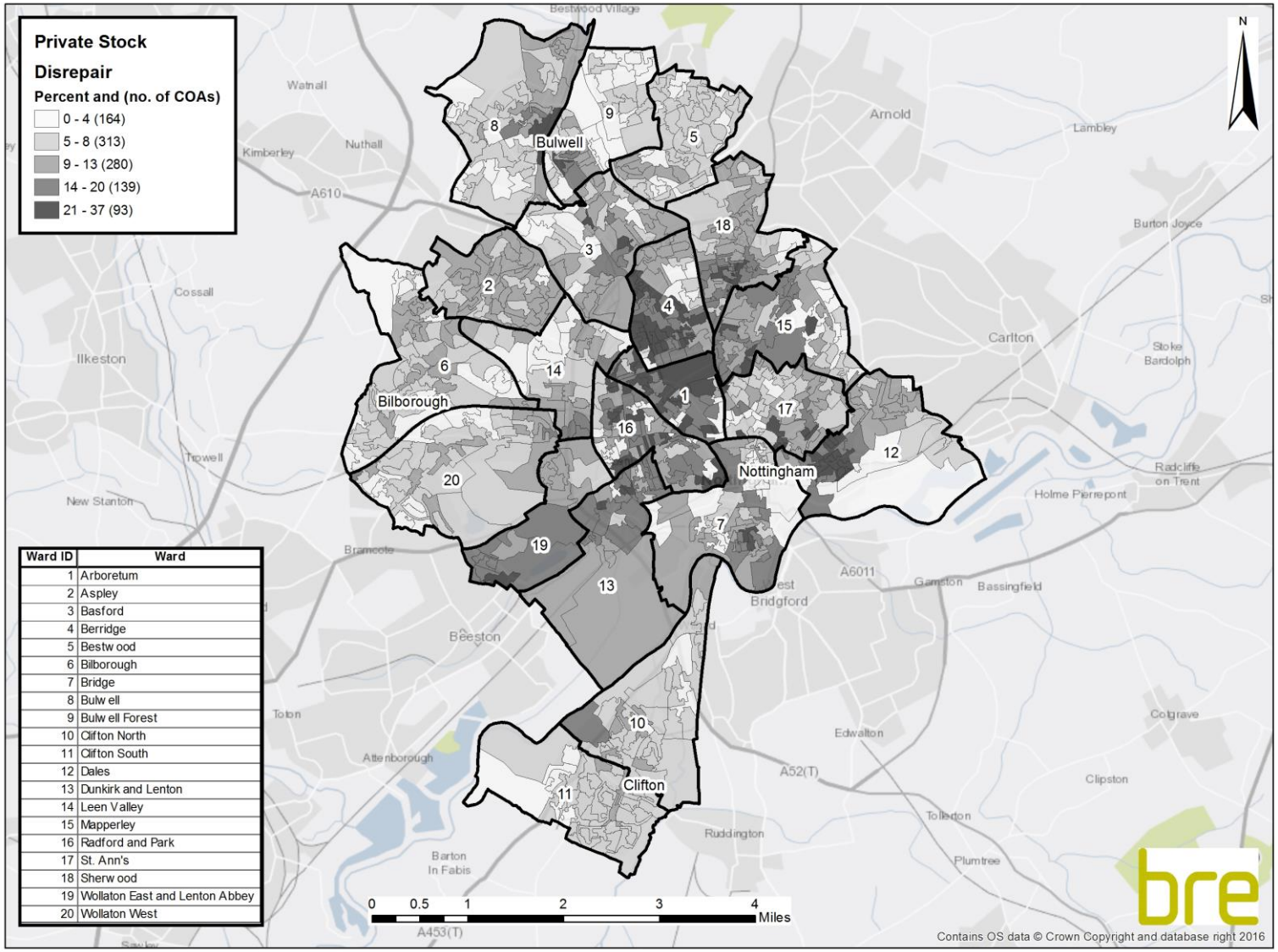
Other building components are those that have a less immediate impact on the integrity of the dwelling. Their combined effect is therefore considered, with a dwelling failing the disrepair standard if two or more elements are old and need replacing or require immediate major repair.

Map 7 shows the distribution of dwellings estimated to be in disrepair in Nottingham and indicates that there appears to be higher concentrations in the central parts of the region. The data behind the map shows that the highest levels overall are in the wards of Wollaton East and Lenton Abbey, Arboretum and Berridge. **Map D. 7** provides more detail on these areas and it can be seen that the higher levels are to the west of Wollaton East and Lenton Abbey, to the north east of Arboretum and central and southern parts of Berridge. **Map D. 8** shows the Clifton area in more detail, although levels of disrepair here are relatively low.

[38] https://www.gov.uk/government/publications/a-decent-home-definition-and-guidance

[39] There are 4 components to the Decent Homes Standard – HHSRS, disrepair, modernisation and thermal comfort

Map 7: Percentage of private sector dwellings in Nottingham in disrepair



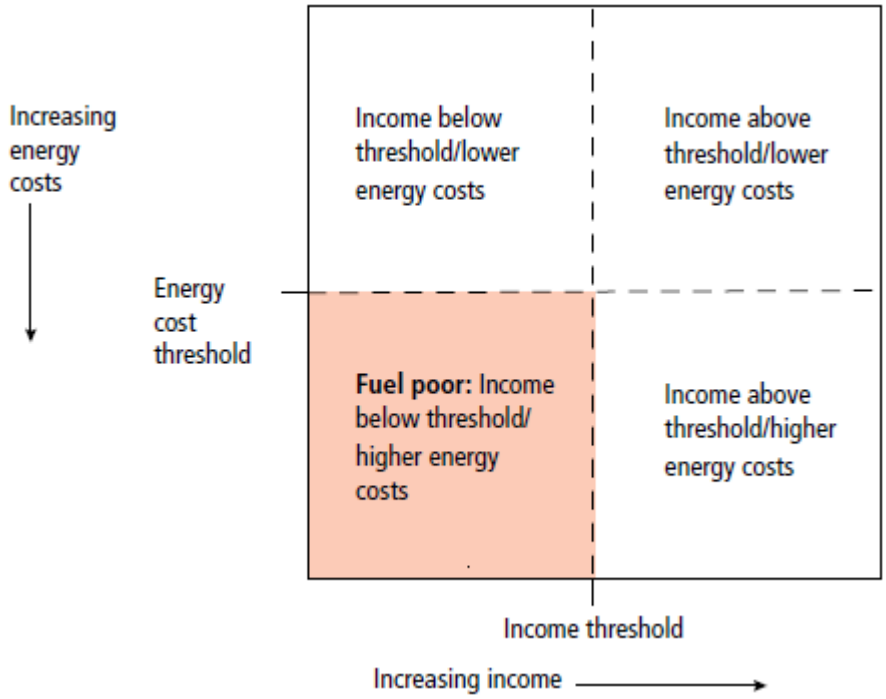
Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

4.2.3.3 Fuel poverty

This report covers both the original definition and the more recent definition of fuel poverty. The original definition states that a household is said to be in fuel poverty if it spends more than 10% of its income on fuel to maintain an adequate level of warmth (defined as 21°C for the main living area, and 18°C for other occupied rooms in the 2012 Hills Fuel Poverty Review)[40]. For the purposes of this report this is termed "fuel poverty (10%)".

Under the Low Income High Costs definition, a household is said to be in fuel poverty if they have required fuel costs that are above average (the national median level) and were they to spend that amount they would be left with a residual income below the official poverty line (see the shaded area in **Figure 7** below). For the purposes of this report this is termed "fuel poverty (Low Income High Costs)".

Figure 7: A representation of the Low Income High Costs definition of fuel poverty[40]



A report produced by DECC[41] states that under the 10% fuel poverty indicator, increasing household income potentially removes households from fuel poverty as they will be spending a smaller proportion of their income on fuel. Reducing income has the opposite effect potentially pushing households into fuel poverty. Decreasing fuel prices and/or improvements made to the energy efficiency of the home can remove households from fuel poverty, while rising prices will have the opposite effect.

As the low income high cost indicator is a relative measure, it provides a much steadier trend in the number of fuel poor households over time than the 10% indicator. Whereas an increase in income is likely to reduce the extent of fuel poverty under the 10% definition, under the low income high cost indicator, a change in income will only have an impact on fuel poverty if households with low incomes and high costs

[40] Hills, J. Getting the measure of fuel poverty - Final Report of the Fuel Poverty Review, London: LSE., 2012

[41] Fuel Poverty Report – Updated August 2013, Department of Energy and Climate Change, 2013



see relatively larger income changes (increases or decreases) than the overall average change in income.

The 10% indicator tends to be very responsive to changes in prices, such that these usually dominate the indicator, outweighing other factors such as income and energy efficiency.

Map 8 shows that, based on the Low Income High Costs definition, there are areas of higher concentrations across the region – the wards with the highest concentrations overall are Dales, Berridge and Basford. **Map D. 9** and **Map D. 10** provides more information on the urban areas.

For comparison, **Map 9** (and **Map D. 11 Map D. 12)** show the results based on the fuel poverty 10% definition - these show a broadly similar pattern to the Low Income High Costs definition.

4.2.3.3.1 What type of property is in fuel poverty under the Low Income High Costs Definition?

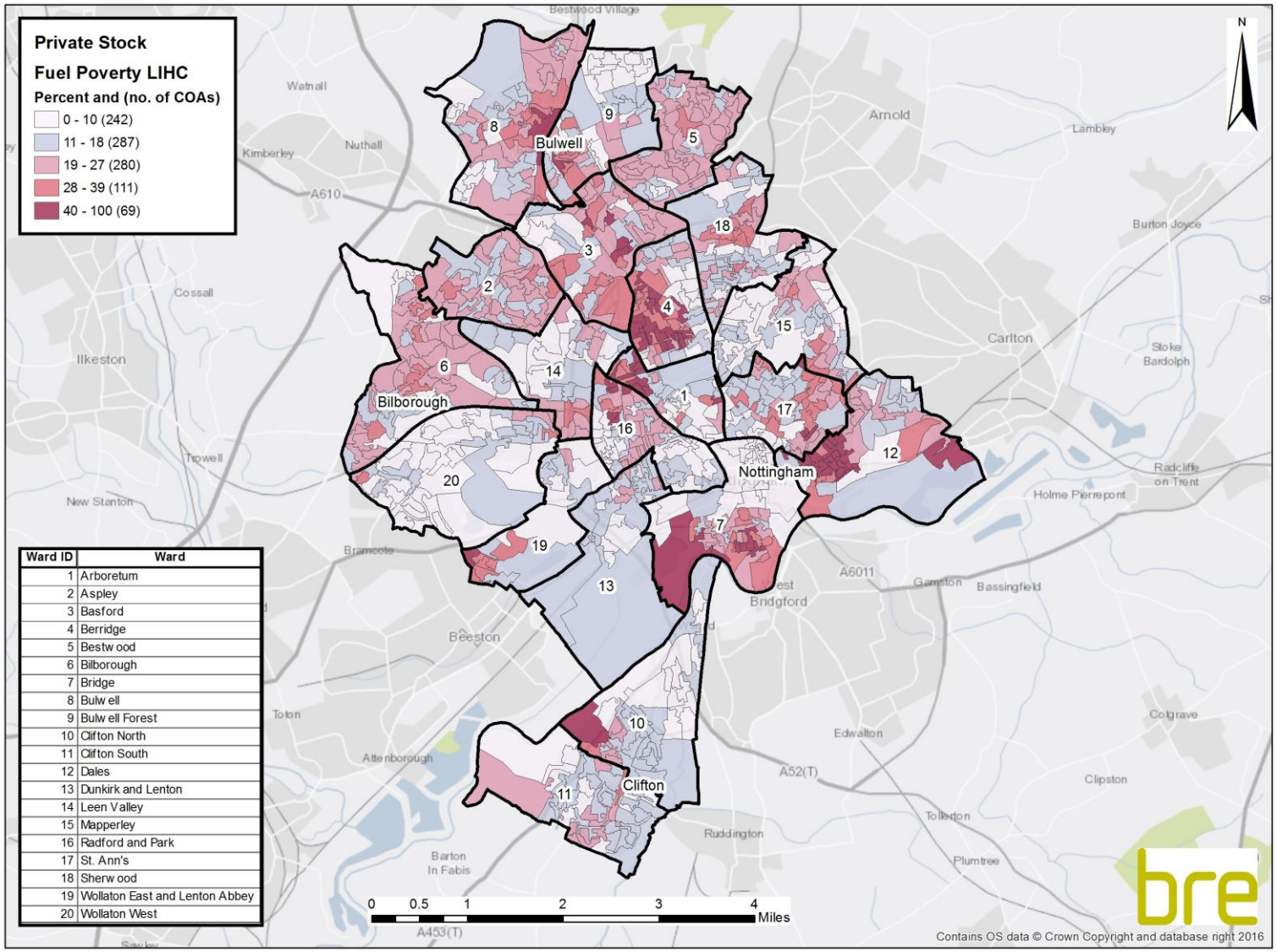
The Hills Fuel Poverty Review[40] provides useful figures that show the likely composition of a fuel poor household under this definition:

- 76% of fuel poor households have an EPC rating of E to G
- 20% of fuel poor households are rural
- 82% of fuel poor households live in houses as opposed to flats or bungalows
- A third of fuel poor households are found in a fifth of the most deprived households
- Fuel poverty is spread fairly evenly between regions, including London
- 34% of fuel poor households contain a person with a long term illness or disability
- 10% of fuel poor households contain a person over the age of 75
- 20% of fuel poor households contain a person under the age of 5

These figures should be considered when analysing the map showing the percentage of private sector dwellings in Nottingham occupied by households in fuel poverty under the Low Income High Costs definition.

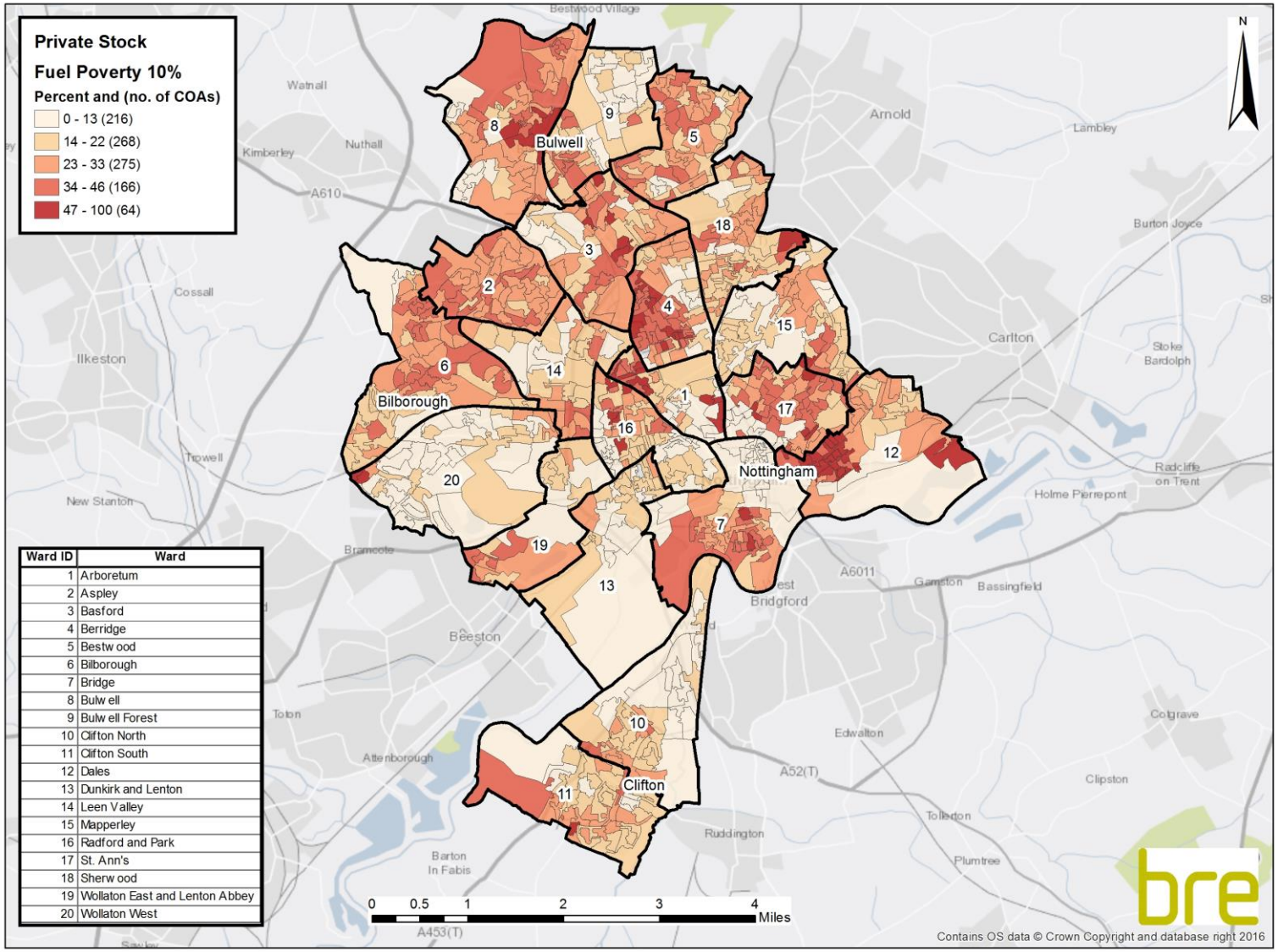
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Map 8: Percentage of private sector dwellings in Nottingham occupied by households in fuel poverty - Low Income High Costs definition



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

Map 9: Percentage of private sector dwellings in Nottingham occupied by households in fuel poverty – 10% definition



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West



4.2.3.4 Low income households

A low income household is defined as a household in receipt of:

- Income support
- Housing benefit
- Attendance allowance
- Disability living allowance
- Industrial injuries disablement benefit
- War disablement pension
- Pension credit
- Child tax credit
- Working credit

For child tax credit and working tax credit, the household is only considered a low income household if it has a relevant income of less than £15,860.

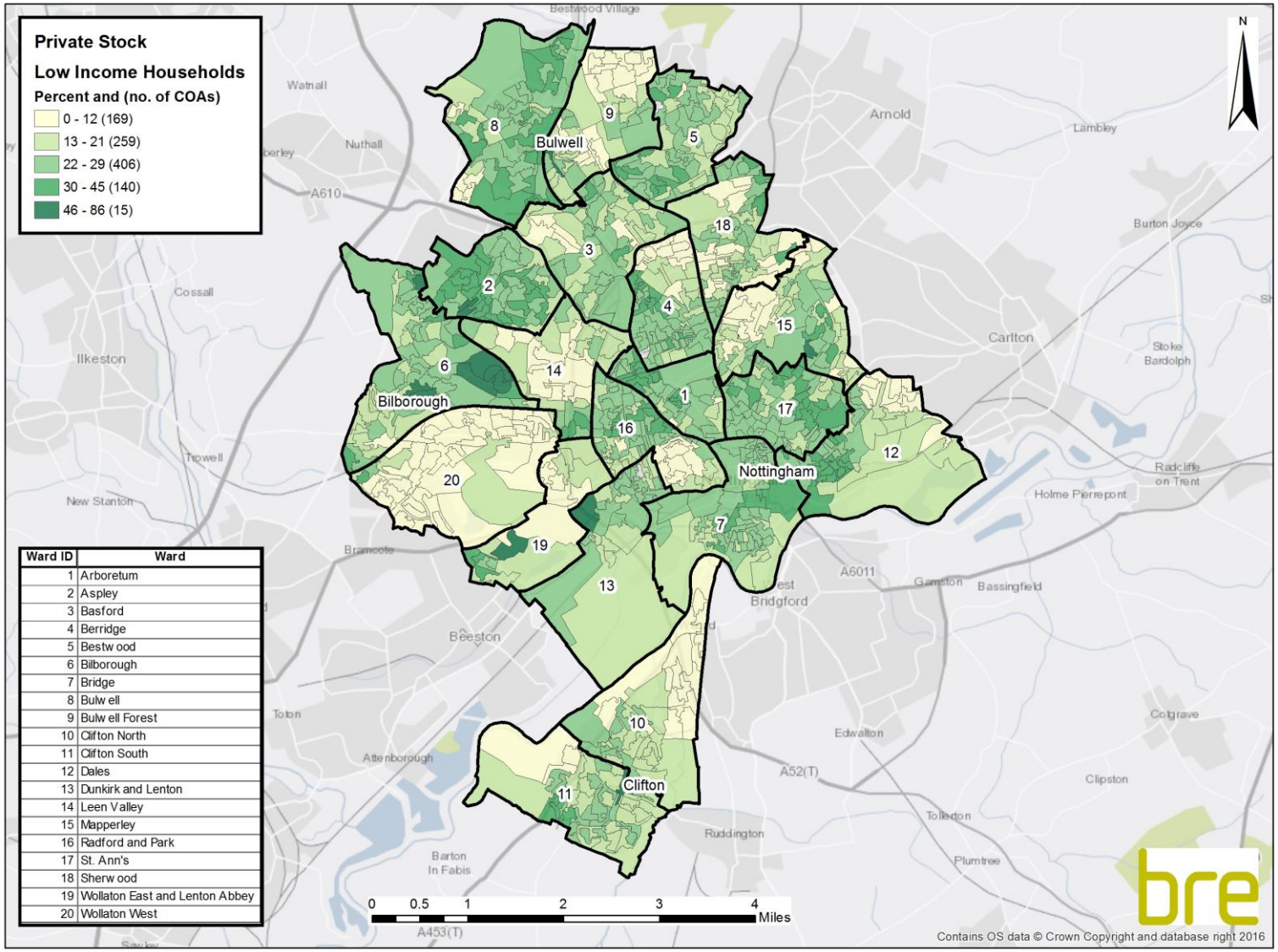
The definition also includes households in receipt of Council Tax benefit and income based Job Seekers Allowance.

The percentage of low income households in Nottingham's private sector stock is high compared to the regional and England EHS averages (20% compared to 13% and 14% respectively). **Map 10** shows that concentrations of low income households are again scattered across the region. The highest levels overall are found in the wards of Aspley, Arboretum and St Anns. **Map D. 13** shows that the highest levels are across much of Aspley, and Arboretum and to the east of St. Ann's. **Map D. 14** shows the Clifton area in more detail with Clifton South having higher levels than Clifton North.

Map 11 provides an additional layer of information, with the data for low income households being combined with HHSRS excess cold data. This provides a vital picture of where vulnerable people are likely to be living in poor housing. The map indicates that there are pockets of both low income and excess cold across the region – for example, to the south of Wollaton East and Lenton Abbey, the south west of Clifton North and the east of Dales. **Map D. 15** and **Map D. 16** zooms in on the urban areas to provide more detail.

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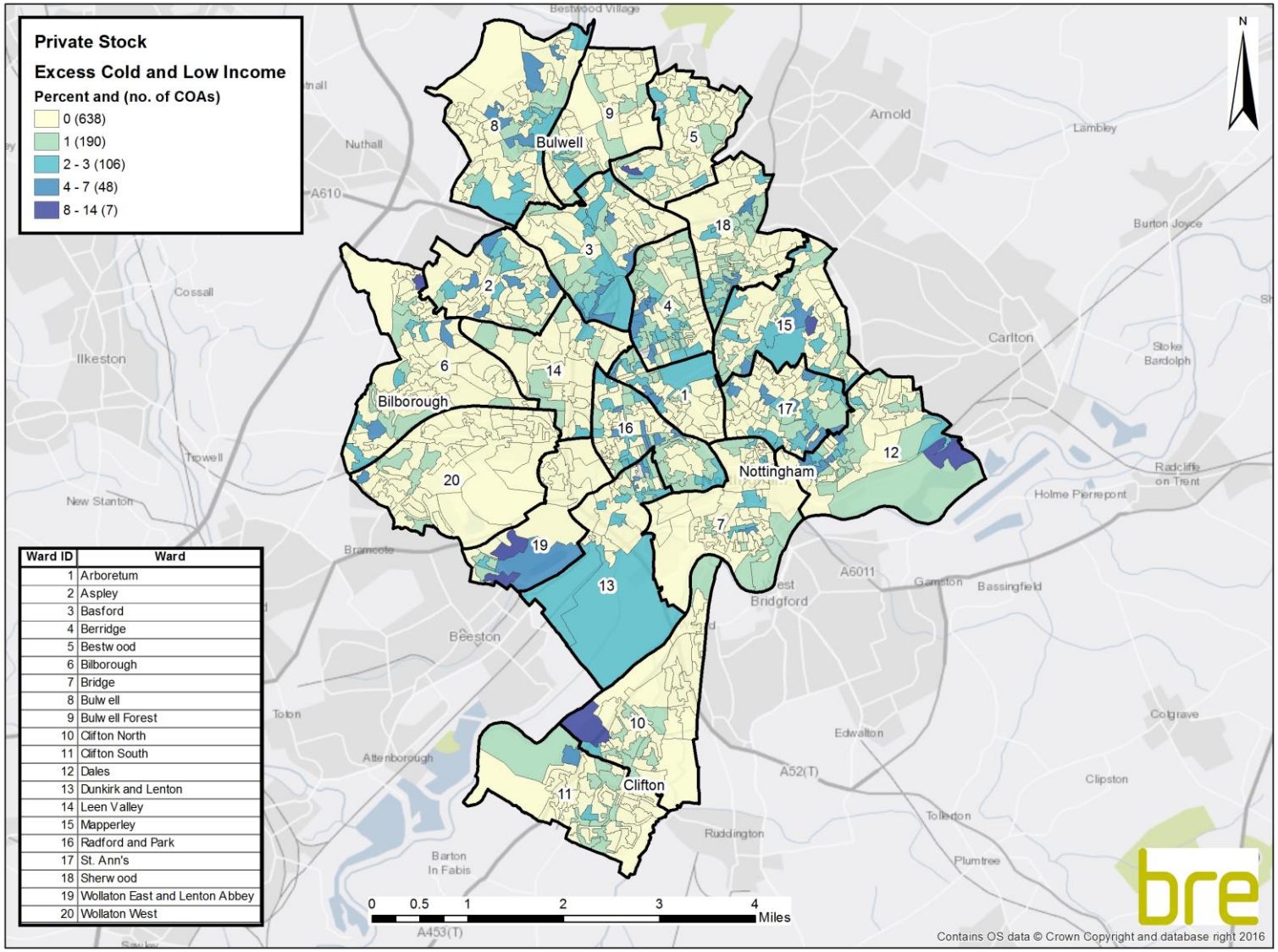
Map 10: Percentage of private sector dwellings in Nottingham occupied by low income households



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

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Map 11: Percentage of private sector dwellings in Nottingham with both the presence of a HHSRS category 1 hazard for excess cold and occupied by low income households



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
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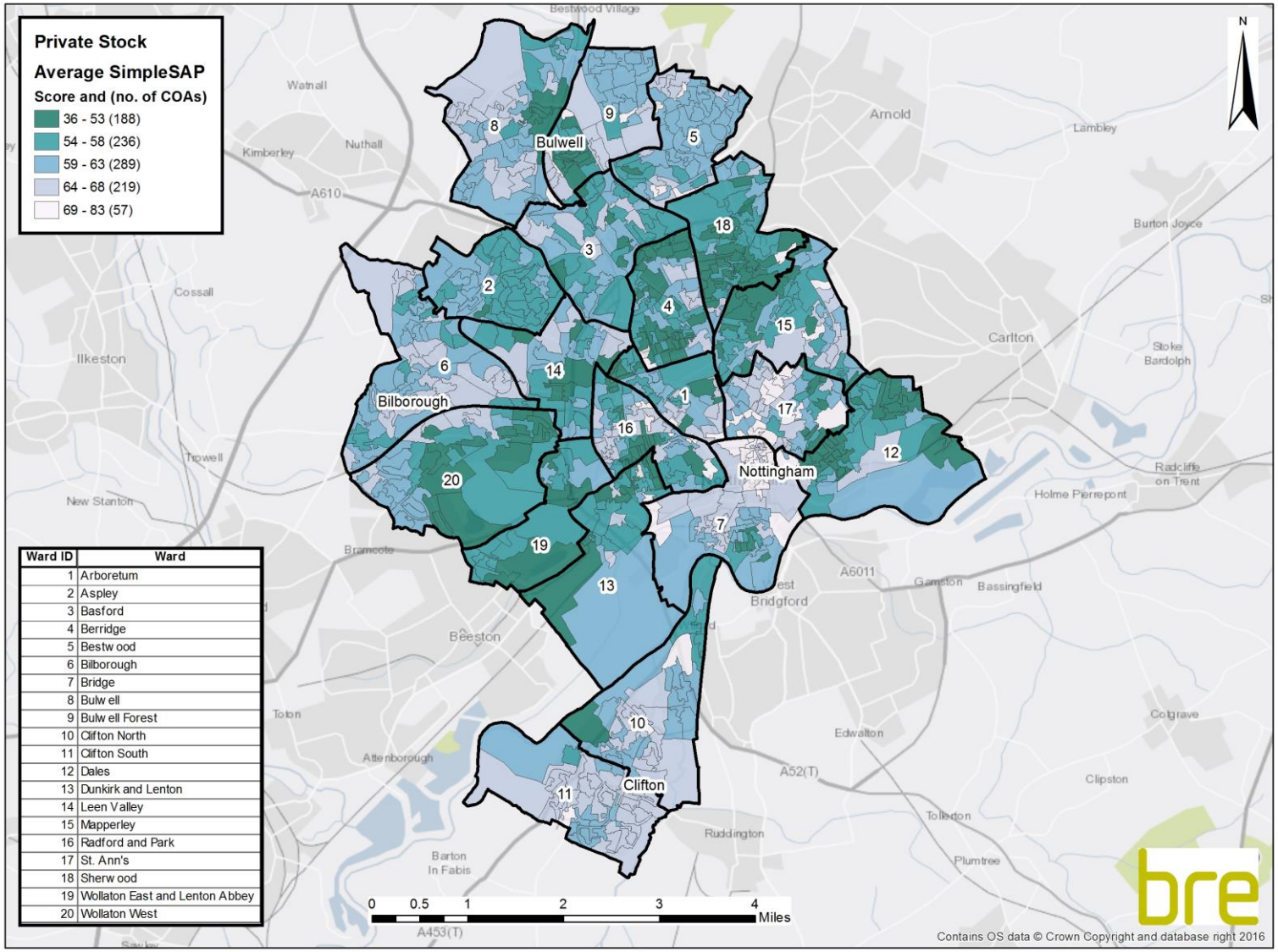


4.2.3.5 SimpleSAP

The average SimpleSAP map (**Map 12**) shows that areas with lower average SimpleSAP ratings are clustered throughout the region and, whilst there are some COAs in the towns, the majority of poor SimpleSAP ratings tend to be outside of Central Nottingham. Whilst no particular ward obviously dominates, the data behind the map shows that the wards with the lowest average SimpleSAP ratings are Wollaton East and Lenton Abbey, Dales and Sherwood. **Map D. 17** and **Map D. 18** provide more details for the Central Nottingham and Clifton areas.

Lower SimpleSAP rating can occur in areas with larger, older homes where little work has been done by the occupiers to improve energy performance. The size of the home itself is not a factor in SimpleSAP, but these homes are more likely to be semi-detached or detached, and therefore have larger heat loss areas.

Map 12: Average SimpleSAP ratings per dwelling in Nottingham private sector stock



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

4.2.4 Ward level results for the key indicators – total stock and private sector stock

The previous maps have provided a visual representation of the key indicators at Census Output Area (COA) level. The following tables provide the complete set of figures at ward level for the key indicators; firstly, for the total stock (**Table 4**) and secondly, for the private sector stock (**Table 5**). This allows a direct comparison between the wards in Nottingham.

Table 4: *Total stock* – number and percentage of dwellings failing each of the key indicators, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Arboretum	5,953	1,088 (18%)	147 (2%)	854 (14%)	819 (14%)	1,051 (18%)	878 (15%)	2,235 (38%)	62
Aspley	6,743	1,220 (18%)	125 (2%)	954 (14%)	400 (6%)	1,464 (22%)	1,067 (16%)	3,365 (50%)	59
Basford	7,362	1,209 (16%)	181 (2%)	901 (12%)	507 (7%)	1,634 (22%)	1,358 (18%)	2,529 (34%)	59
Berridge	8,174	1,929 (24%)	335 (4%)	1,339 (16%)	1,123 (14%)	2,272 (28%)	1,950 (24%)	2,312 (28%)	56
Bestwood	7,844	987 (13%)	107 (1%)	746 (10%)	303 (4%)	1,691 (22%)	1,203 (15%)	3,518 (45%)	63
Bilborough	7,474	933 (12%)	90 (1%)	713 (10%)	311 (4%)	1,517 (20%)	1,060 (14%)	3,567 (48%)	63
Bridge	8,020	1,000 (12%)	106 (1%)	790 (10%)	596 (7%)	1,320 (16%)	1,043 (13%)	2,761 (34%)	66
Bulwell	7,433	1,075 (14%)	114 (2%)	834 (11%)	386 (5%)	1,603 (22%)	1,159 (16%)	3,355 (45%)	62
Bulwell Forest	6,187	937 (15%)	121 (2%)	744 (12%)	345 (6%)	1,134 (18%)	960 (16%)	1,383 (22%)	60
Clifton North	5,995	927 (15%)	183 (3%)	669 (11%)	341 (6%)	898 (15%)	785 (13%)	1,371 (23%)	62
Clifton South	6,462	888 (14%)	90 (1%)	713 (11%)	262 (4%)	1,157 (18%)	780 (12%)	2,410 (37%)	65
Dales	7,230	1,728 (24%)	276 (4%)	1,219 (17%)	880 (12%)	2,310 (32%)	1,926 (27%)	2,452 (34%)	56
Dunkirk and Lenton	3,475	701 (20%)	117 (3%)	591 (17%)	412 (12%)	471 (14%)	419 (12%)	949 (27%)	57
Leen Valley	4,251	618 (15%)	82 (2%)	482 (11%)	256 (6%)	816 (19%)	575 (14%)	1,076 (25%)	59
Mapperley	7,801	1,360 (17%)	373 (5%)	953 (12%)	732 (9%)	1,354 (17%)	1,057 (14%)	2,000 (26%)	58
Radford and Park	8,989	1,590 (18%)	317 (4%)	1,166 (13%)	957 (11%)	1,499 (17%)	1,190 (13%)	2,680 (30%)	61
Sherwood	7,038	1,482 (21%)	246 (3%)	1,147 (16%)	754 (11%)	1,462 (21%)	1,154 (16%)	1,871 (27%)	55
St Anns	9,623	1,277 (13%)	203 (2%)	925 (10%)	626 (7%)	1,976 (21%)	1,339 (14%)	4,177 (43%)	66

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Table 4 cont.: *Total stock* – number and percentage of dwellings failing each of the key indicators, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Wollaton East and Lenton Abbey	3,247	863 (27%)	325 (10%)	574 (18%)	487 (15%)	568 (17%)	467 (14%)	824 (25%)	54
Wollaton West	6,098	744 (12%)	116 (2%)	599 (10%)	328 (5%)	708 (12%)	560 (9%)	670 (11%)	57

N.B. the information on hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under 'all hazards'. The number of dwellings under 'all hazards' can therefore be less than the sum of the excess cold plus fall hazards.

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Table 5: *Private sector stock* – number and percentage of dwellings for each of the key indicators, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Arboretum	4,252	925 (22%)	122 (3%)	749 (18%)	745 (18%)	791 (19%)	723 (17%)	1,143 (27%)	61
Aspley	3,593	835 (23%)	90 (3%)	668 (19%)	298 (8%)	1,066 (30%)	747 (21%)	1,020 (28%)	57
Basford	5,332	1,032 (19%)	149 (3%)	791 (15%)	451 (8%)	1,295 (24%)	1,127 (21%)	1,045 (20%)	58
Berridge	6,975	1,785 (26%)	314 (5%)	1,258 (18%)	1,069 (15%)	2,043 (29%)	1,782 (26%)	1,490 (21%)	55
Bestwood	4,632	750 (16%)	87 (2%)	584 (13%)	227 (5%)	1,148 (25%)	888 (19%)	1,127 (24%)	61
Bilborough	4,182	716 (17%)	72 (2%)	563 (13%)	255 (6%)	1,027 (25%)	790 (19%)	998 (24%)	61
Bridge	6,284	846 (13%)	95 (2%)	683 (11%)	541 (9%)	989 (16%)	841 (13%)	1,572 (25%)	66
Bulwell	4,473	812 (18%)	84 (2%)	654 (15%)	313 (7%)	1,118 (25%)	866 (19%)	1,062 (24%)	61
Bulwell Forest	5,261	863 (16%)	107 (2%)	699 (13%)	322 (6%)	997 (19%)	876 (17%)	726 (14%)	59
Clifton North	4,945	852 (17%)	180 (4%)	617 (12%)	312 (6%)	748 (15%)	710 (14%)	689 (14%)	60
Clifton South	4,508	740 (16%)	71 (2%)	609 (14%)	221 (5%)	868 (19%)	627 (14%)	982 (22%)	64
Dales	5,455	1,549 (28%)	260 (5%)	1,103 (20%)	809 (15%)	1,965 (36%)	1,714 (31%)	1,202 (22%)	53
Dunkirk and Lenton	2,943	658 (22%)	114 (4%)	558 (19%)	390 (13%)	405 (14%)	375 (13%)	647 (22%)	56
Leen Valley	3,474	555 (16%)	68 (2%)	444 (13%)	238 (7%)	680 (20%)	489 (14%)	509 (15%)	58
Mapperley	6,510	1,215 (19%)	330 (5%)	868 (13%)	684 (11%)	1,169 (18%)	925 (14%)	1,118 (17%)	58
Radford and Park	7,178	1,469 (20%)	306 (4%)	1,089 (15%)	902 (13%)	1,213 (17%)	1,070 (15%)	1,472 (21%)	59
Sherwood	5,881	1,362 (23%)	218 (4%)	1,071 (18%)	713 (12%)	1,274 (22%)	1,026 (17%)	1,079 (18%)	54
St Anns	5,720	944 (17%)	138 (2%)	710 (12%)	502 (9%)	1,322 (23%)	1,018 (18%)	1,502 (26%)	64

Table 5 cont.: *Private sector stock* – number and percentage of dwellings for each of the key indicators, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Wollaton East and Lenton Abbey	2,644	799 (30%)	316 (12%)	525 (20%)	465 (18%)	492 (19%)	402 (15%)	430 (16%)	52
Wollaton West	5,538	706 (13%)	112 (2%)	571 (10%)	309 (6%)	605 (11%)	508 (9%)	297 (5%)	57

N.B. the information on hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under 'all hazards'. The number of dwellings under 'all hazards' can therefore be less than the sum of the excess cold plus fall hazards.

4.3 Information relating to LAHS reporting and EPC ratings

4.3.1 Cost of mitigating category 1 hazards in the Nottingham private sector stock

Table 6 shows the total number of dwellings with HHSRS category 1 hazards in Nottingham's private sector stock, the average cost of mitigating hazards per dwelling and the total cost for mitigating all hazards within those dwellings. The costs are based on the average cost of mitigating category 1 hazards for the East Midlands using EHS 2013/14 data[42]. The EHS costs are determined following a surveyor's assessment of the hazard. For each hazard the surveyor is given a range of common treatments that they can specify in order to treat the hazard. Where quantities are required the surveyor may specify them. The treatment recommended by the surveyor is then costed using a standard set of prices.

Table 6: Estimated costs to mitigate all category 1 hazards in private sector stock, split into tenure

HHSRS cat 1 hazards	Total no. in the authority	Average cost per dwelling (£)	Total cost (£)
	19,413	2,281	44,279,112

4.3.2 Houses in Multiple Occupation (HMOs) in the Nottingham private sector stock

The Housing Act 2004 introduced a new set of definitions for HMOs in England from 6 April 2006[43]. The definition is a complex one and the bullet points below, which are adapted from web pages provided by the National HMO Network[44], provide a summary:

- An entire house or flat which is let to 3 or more tenants who form 2 or more households and who share a kitchen, bathroom or toilet
- A house which has been converted entirely into bedsits or other non-self-contained accommodation and which is let to 3 or more tenants who form two or more households and who share kitchen, bathroom or toilet facilities
- A converted house which contains one or more flats which are not wholly self-contained (i.e. the flat does not contain within it a kitchen, bathroom and toilet) and which is occupied by 3 or more tenants who form two or more households
- A building which is converted entirely into self-contained flats if the conversion did not meet the standards of the 1991 Building Regulations and more than one-third of the flats are let on short-term tenancies

[42] Note that these costs are estimated based on standardised cost assumptions intended for comparison purposes. If available, local data on costs – such as grant or loan aided works – could be used; however, this type of data is usually biased. The estimates here are therefore considered as a useful starting point.

[43] See Sections 254-258 of the Housing Act (http://www.legislation.gov.uk/ukpga/2004/34/contents)

[44] National HMO Network http://www.nationalhmonetwork.com/definition.php



To be classified as an HMO the property must be used as the tenants' only or main residence and it should be used solely or mainly to house tenants. Properties let to students and migrant workers will be treated as their only or main residence and the same will apply to properties which are used as domestic refuges.

The LAHS requires estimates of the number of HMOs and the number of mandatory licensable HMOs.

- Number of private sector HMOs
    - Modelled using specific criteria from a number of Experian data sources and information derived from the SimpleCO_2 model. The criteria include privately rented dwellings with 3 or more bedrooms occupied by male/female/mixed home sharers, mixed occupancy dwellings or classified as the following Experian Mosaic classifications:
        - Renting a room
        - Career Builders
        - Flexible Workforce
        - Bus Route Renters
        - Learners and earners
        - Student scene
- Number of mandatory licensing scheme HMOs
    - This has been modelled using the above criteria for HMOs plus the dwelling must have 3 or more storeys.

Table 7 summarises the results for the private sector stock in Nottingham, and **Map 13** and **Map 14** show the geographic distribution of HMOs and licensable HMOs, respectively. The maps show the majority of both HMOs and licensable HMOs tend to be concentrated to the north and west of central Nottingham, particularly in Arboretum, Dunkirk and Lenton and Radford and Park.

Map D. 19 to **Map D. 22** zoom in on the areas of central Nottingham and Clifton for both HMOs and licensable HMOs. As previously mentioned, ward level data on HMOs is available in the accompanying database and **Appendix C** provides guidance on how to use the database.

Table 7: Summary of HMOs within the Nottingham private sector stock

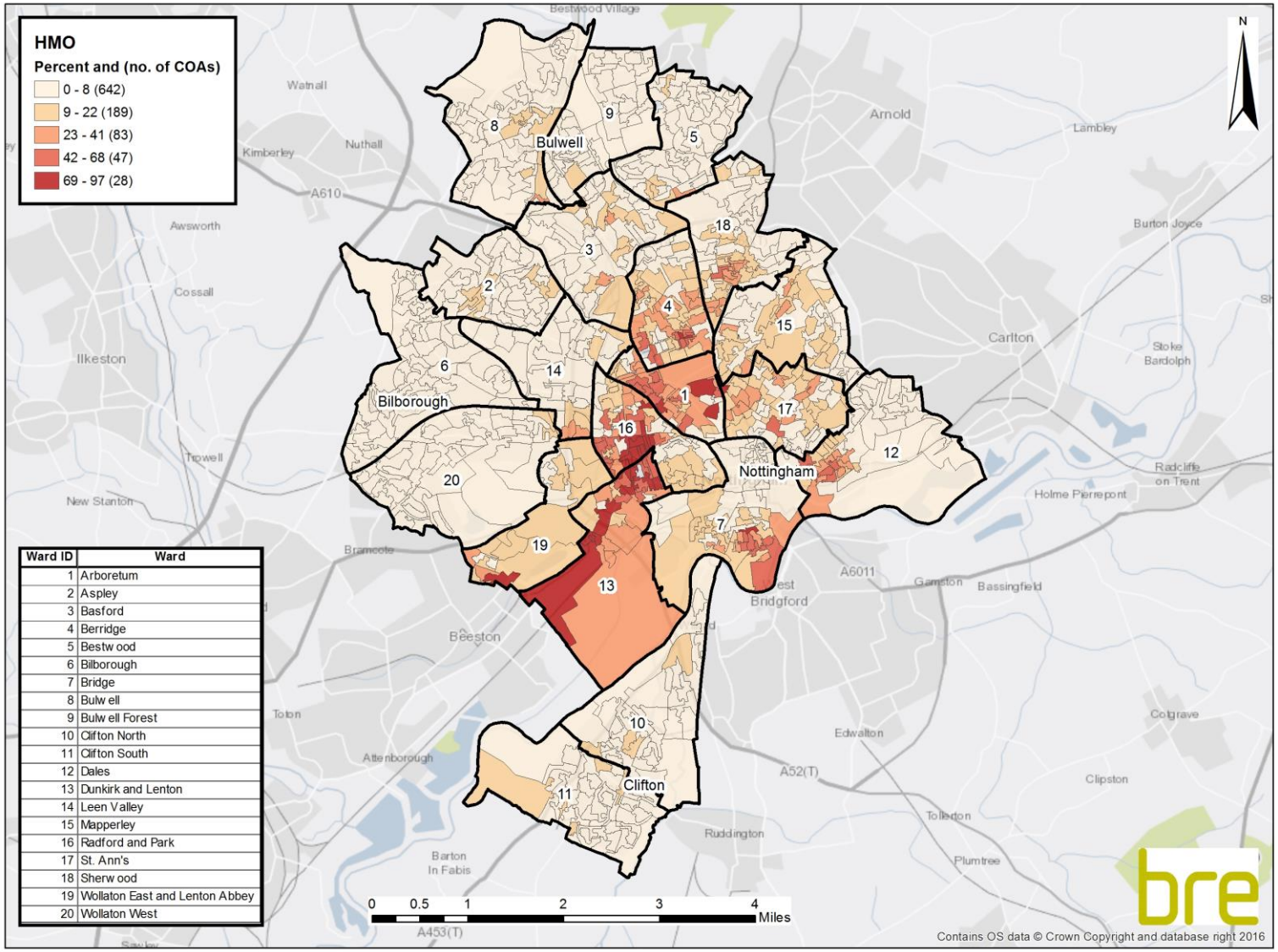
Nottingham	No. of private sector dwellings	HMOs	Mandatory Licensing Scheme HMOs
	99,780	12,372	2,585

Nottingham City Council also provided a list of licensed HMOs falling under either the mandatory (3 storeys or more with 5 or more occupants) or additional licensing (any HMO in a particular area) schemes. The total number of dwellings on this list was 3,569, which amounts to 2.6% of the total housing stock in Nottingham. The BRE HMO model estimates 12,372 HMOs across the city, 2,585 of which potentially licensable under the mandatory scheme. Of the council's register of 3,369 HMOs, 1,024 dwellings were identified by the BRE Model as HMOs. The difference between the two figures of 1,561 could be a result of the churn between multiple or single occupancy, or change in tenure. Furthermore, Nottingham Cty Council exempts some HMOs from requiring a licence such as those accredited with the ANUK / Unipol National Code of

Standards for Larger Developments, covering student accommodation NOT managed and controlled by educational establishments[45]. In any case, the dwelling level database accompanying this report could be used ot identify areas with high estimated rates of HMOs for further investigation.

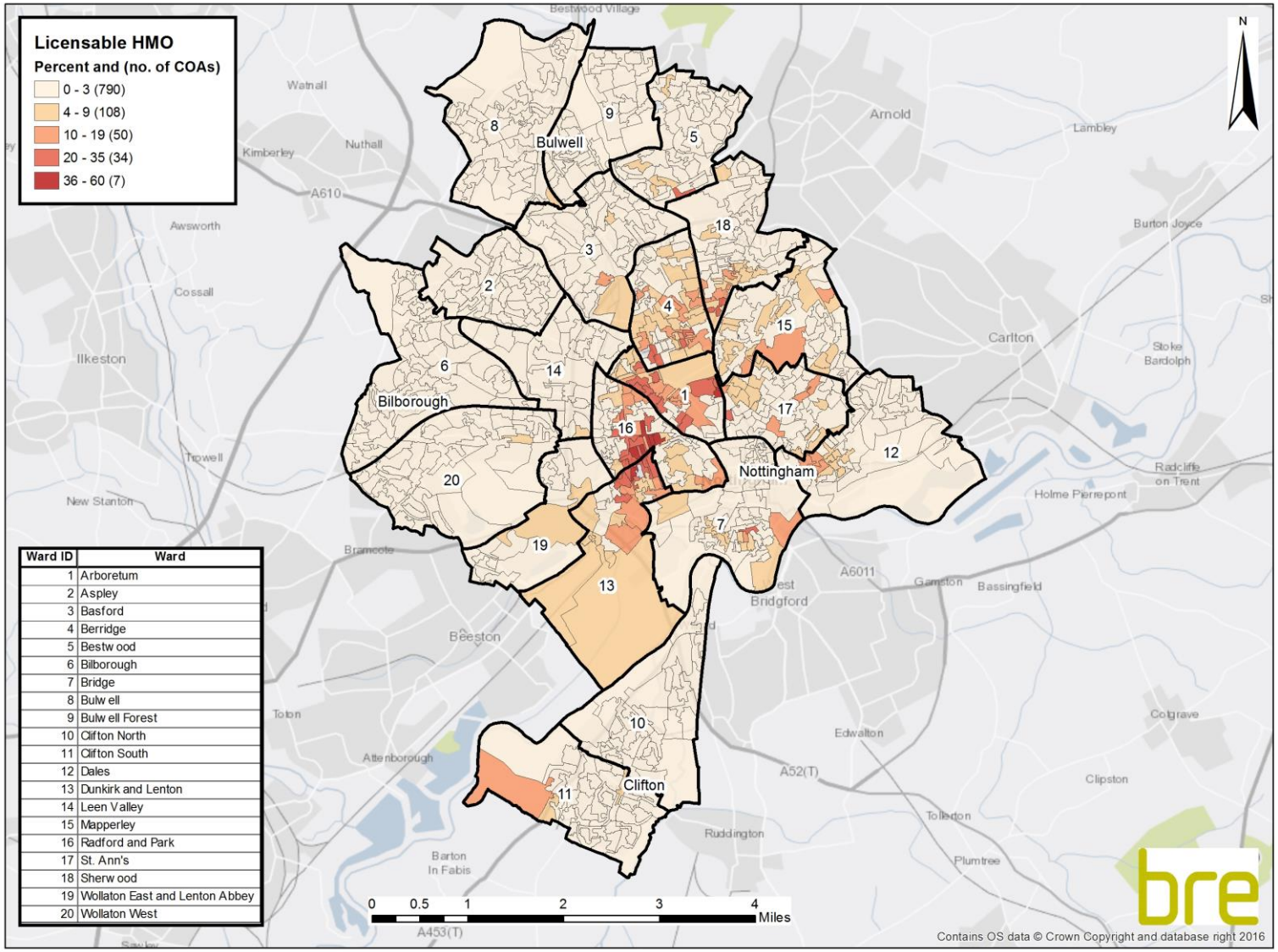
[45] http://documents.nottinghamcity.gov.uk/download/2120

Map 13: Percentage of HMOs based on all dwellings



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

Map 14: Percentage of licensable HMOs based on all dwellings



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

4.3.3 EPC ratings in the Nottingham private sector stock

An Energy Performance Certificate (EPC) is required whenever a new building is constructed, or an existing building is sold or rented out. An EPC is a measure of the energy efficiency performance of a building and is rated from band A – G, with A representing the best performance. The EPC ratings correspond to a range of SAP ratings from 1 – 100, with 100 being the best. It is possible, therefore, to give a dwelling an EPC rating based on the SAP rating.

Figure 8 below shows the bands A – G and corresponding SAP ratings in brackets. The first two columns show the number and percentage of Nottingham's private sector stock falling into each of the EPC ratings bands. The third column shows the comparable figures for the private sector stock in England.

The estimated average SimpleSAP for the private sector stock in Nottingham is 59 which corresponds to an EPC rating of D. The number of private sector dwellings with an EPC rating below band E is estimated to be 5,881 (5.9%). The distribution of EPC ratings across the bands is similar to the England figures, although Nottingham has a slightly higher proportion of dwellings in band C and a slightly lower proportion in band G.

Figure 8: Number and percentage of Nottingham's *private sector stock* falling into each of the EPC ratings bands (based on SimpleSAP), compared to England (EHS) figures *N.B. England figures report band A and B together*

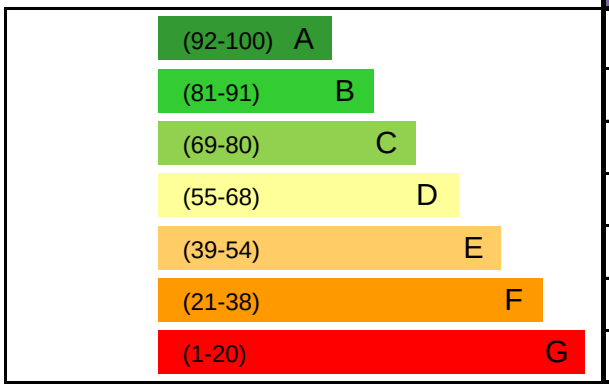
	Nottingham		2012 EHS England
	Count	Percent	Percent
(92-100) A	0	0.0%	0.6%
(81-91) B	1,133	1.1%	
(69-80) C	19,798	19.8%	14.2%
(55-68) D	47,632	47.7%	51.0%
(39-54) E	25,336	25.4%	27.3%
(21-38) F	5,070	5.1%	5.5%
(1-20) G	811	0.8%	1.5%

Under the Energy Act 2011, new rules mean that from 2018 landlords must ensure that their properties meet a minimum energy efficiency standard - which has been set at band E - by 1 April 2018[46, 47].

Figure 9 shows the breakdown of SimpleSAP results into the A – G bands for the private rented stock only and compared to the figures for this tenure in England as a whole. The number of private rented dwellings in Nottingham with a rating below band E (i.e. bands F and G), is estimated to be 2,880 (6.6%). Compared to England, there are a greater proportion of dwellings in band B and C and a slightly lower proportion in bands F and G.

The distribution of dwellings with EPC ratings below band E is shown in **Map 15** and maps zooming in on each of the areas of Nottingham are provided in **Map D. 23** and **Map D. 24**. These are for the private rented stock only, since this is affected by the new rules on minimum standards. Under the legislation these properties would not be eligible to be rented out after 2018.

Figure 9: Number and percentage of Nottingham's *private rented stock* falling into each of the EPC ratings bands (based on SimpleSAP), compared to England (EHS) figures *N.B. England figures report band A and B together*

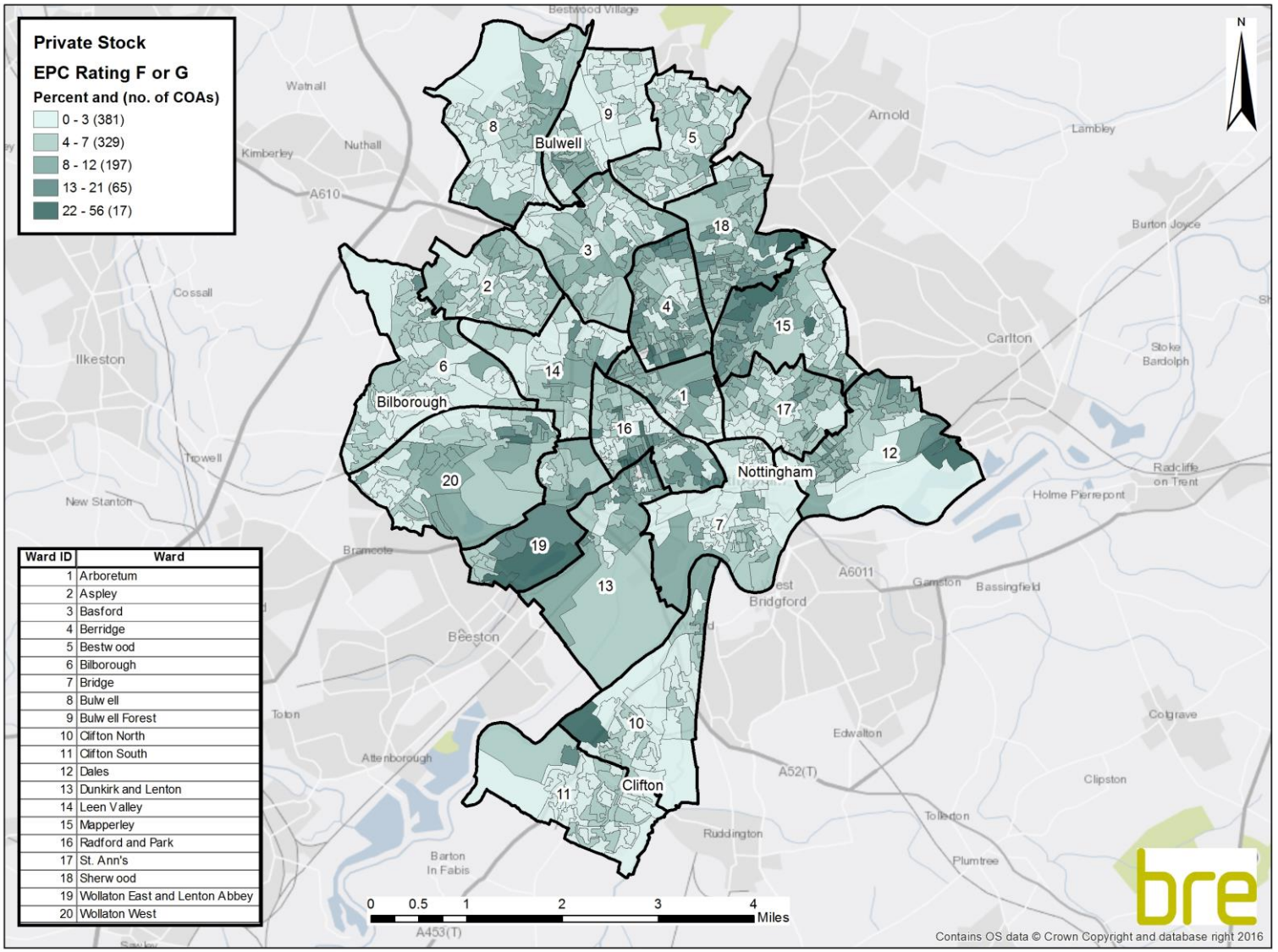


	Nottingham		2012 EHS England
	Count	Percent	Percent
(92-100) A	0	0.0%	1.0%
(81-91) B	969	2.2%	
(69-80) C	10,537	24.3%	18.9%
(55-68) D	18,299	42.2%	46.2%
(39-54) E	10,679	24.6%	24.5%
(21-38) F	2,455	5.7%	7.0%
(1-20) G	425	1.0%	2.5%

[46] http://www.legislation.gov.uk/uksi/2015/962/contents/made

[47] Although landlords will still be able to rent out F and G rated properties after this date they will not be able to renew or sign a new contract.

Map 15: Distribution of dwellings with F or G EPC ratings in the private rented



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestw ood
6	Bilborough
7	Bridge
8	Bulw ell
9	Bulw ell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherw ood
19	Wollaton East and Lenton Abbey
20	Wollaton West

stock

4.4 Energy efficiency variables for Nottingham

Section 2.5 provides an overview of the ECO policy – two of the main energy efficiency improvements that fall under these policies are insulation of cavity walls and lofts. An understanding of the numbers and geographical distribution of dwellings which would be suitable for such improvements is a useful step in targeting resources in Nottingham. The BRE Models have been used to determine the following variables for Nottingham:

- Wall type and presence of cavity wall insulation
  - Solid wall
  - Insulated cavity wall
  - Un-insulated cavity wall

- Presence and level of loft insulation
  - No loft
  - Loft with no insulation
  - Level of loft insulation – 50, 100, 150, 200, 250+ mm loft insulation

Table 8 and **Table 9** show the modelled results in terms of the numbers and percentages of dwellings in Nottingham's private sector stock for walls and lofts respectively (ward level data can be obtained from the database supplied alongside this report). They also show the percentage figures for the East Midlands region and for England overall to enable comparison. The results indicate that a proportion of the private sector stock in Nottingham could benefit from energy efficiency improvements with an estimated 24,235 dwellings (24%) having un-insulated cavity walls. Furthermore, there are an estimated 18,014 dwellings (18% of Nottingham's private sector stock) which have less than 100mm of loft insulation with 8,698 (9%) having no loft insulation at all. In Nottingham, it is estimated that 55% of the housing stock have cavity walls; whilst this is similar to the regional and national figures, it is estimated that a greater proportion of these have been insulated in Nottingham. However, there are still opportunities for implementing ECO in dwellings without cavity wall insulation which still represent over a quarter of the housing stock. These types of dwellings are likely to be of particular interest to ECO providers and the distribution of these dwellings is shown in **Map 16** to **Map 18** with maps zooming in on the urban area of Central Nottingham and Clifton provided in **Appendix D**.

Map 16 shows that the prevalence of un-insulated cavities is scattered throughout the city with lower levels generally seen in the Clifton area to the south of the region. **Map D. 25** and **Map D. 26** shows the COAs with the highest levels in the urban area of Central Nottingham and Clifton again there are no particular patterns.

Map 17 shows that there are pockets of areas with solid walls distributed throughout the region with a noticeable north-south distribution of higher levels in areas such as the east of Bulwell, the west of Bulwell Forest and then the wards towards the north of Nottingham such as Arboretum and Berridge. The Clifton area to the south has a lower level of solid wall dwellings. **Map D. 27** and **Map D. 28** zoom in on Central Nottingham and Clifton to provide more detail for these areas.

Map 18 shows that areas with lower levels of loft insulation (100mm or less) are scattered throughout the city with some of the worst areas being in COAs in Berridge and Dunkirk and Lenton, for example. Again, the Clifton area to the south has relatively low levels of poor loft insulation. **Map D. 29** and **Map D. 30** show Central Nottingham and Clifton in more detail.

Table 8: Estimates of the numbers and percentage of dwellings for each of the energy efficiency variables assessed for the private sector stock in Nottingham and compared to the East Midlands region and national figure (EHS 2012)

Variable		Private stock		2012 EHS Regional (private stock)	2012 EHS England (private stock)
		No.	%	%	%
No. of private sector dwellings		99,780	-	-	-
Wall type	Solid	39,939	40%	32%	33%
	Insulated cavity	30,894	31%	42%	38%
	Un-insulated cavity	24,235	24%	26%	29%
% of cavity walls only that are uninsulated		-	44%	38%	43%

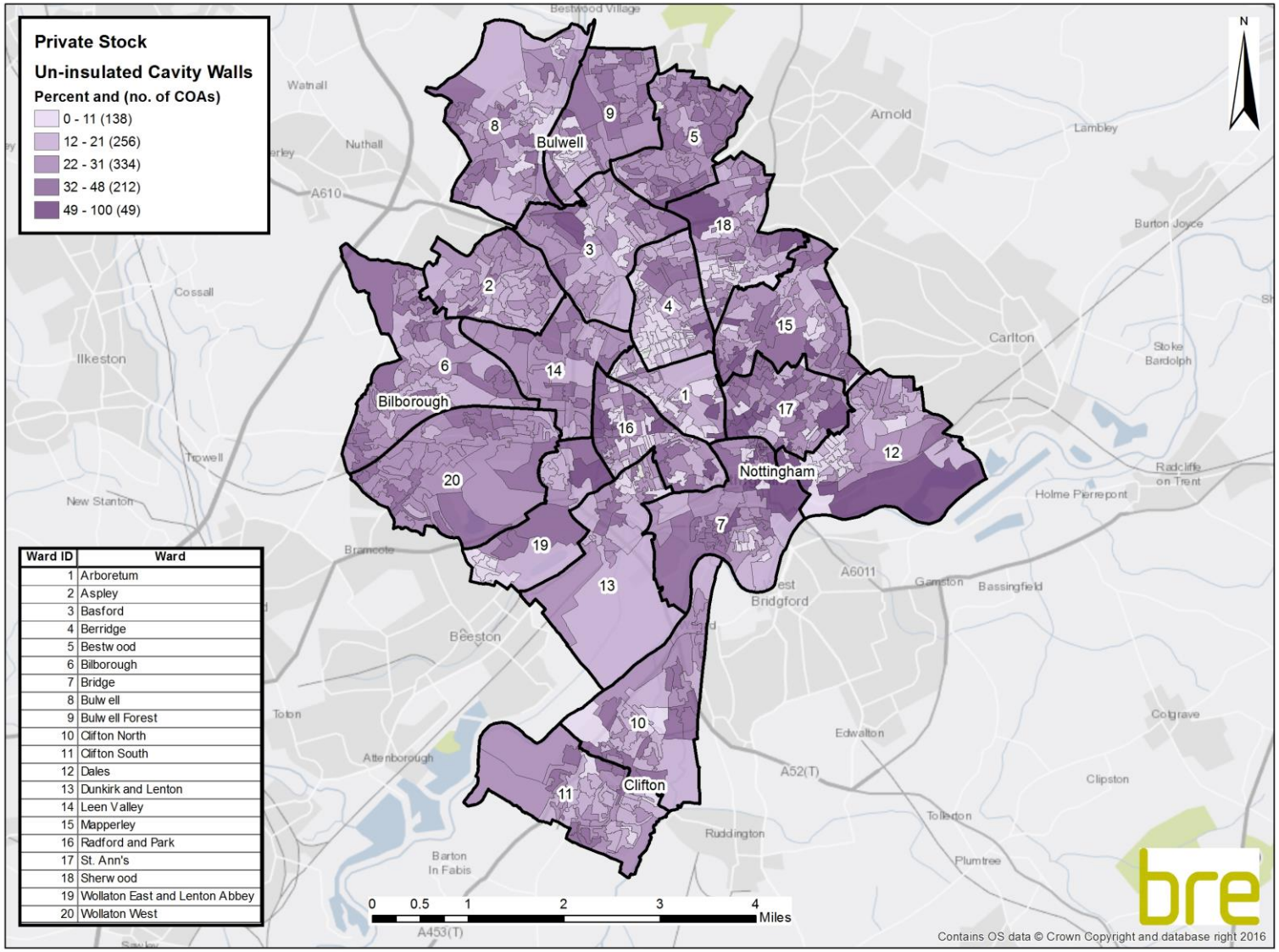
N.B. the different wall types do not add up to the total number of private sector dwellings due to the small number of timber-frame and stone buildings

Table 9: Estimates of the numbers and percentage of dwellings for each of the energy efficiency variables for lofts assessed for the private sector stock in Nottingham and compared to the East Midlands region and national figure (EHS 2012)

Variable		Private stock		2012 EHS Regional (private stock)	2012 EHS England (private stock)
		No.	%	%	%
No. of private sector dwellings		99,780	-	-	-
Level of loft insulation	No loft	13,030	13%	4%	9%
	No insulation	8,698	9%	4%	4%
	50mm	9,316	9%	2%	2%
	100mm	16,049	16%	17%	14%
	150mm	15,154	15%	24%	23%
	200mm	10,711	11%	12%	12%
	250+mm	26,822	27%	37%	34%
Less than 100mm		18,014	18%	5%	7%

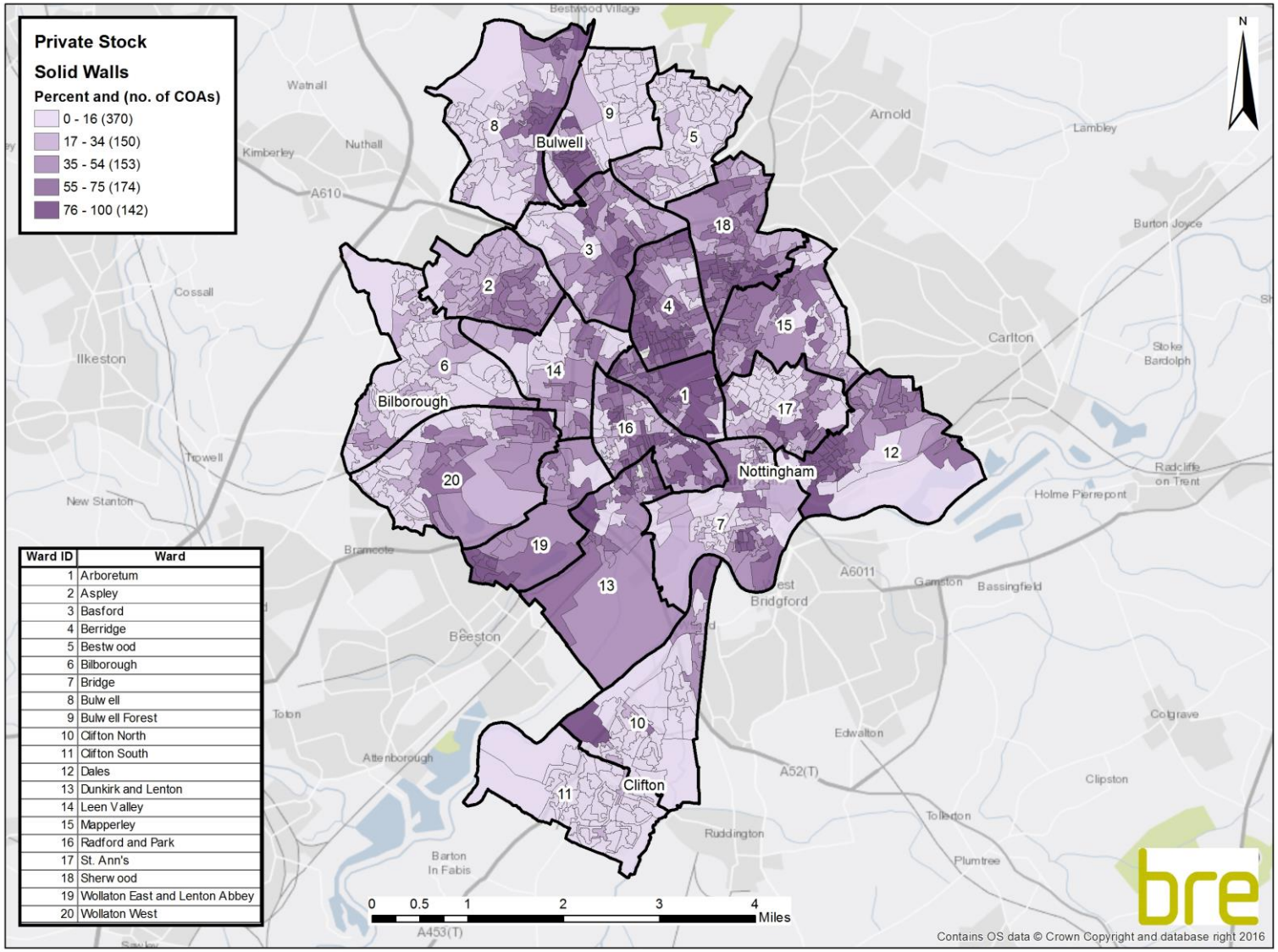
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Map 16: Energy efficiency variables - percentage of private sector dwellings in Nottingham with un-insulated cavity walls



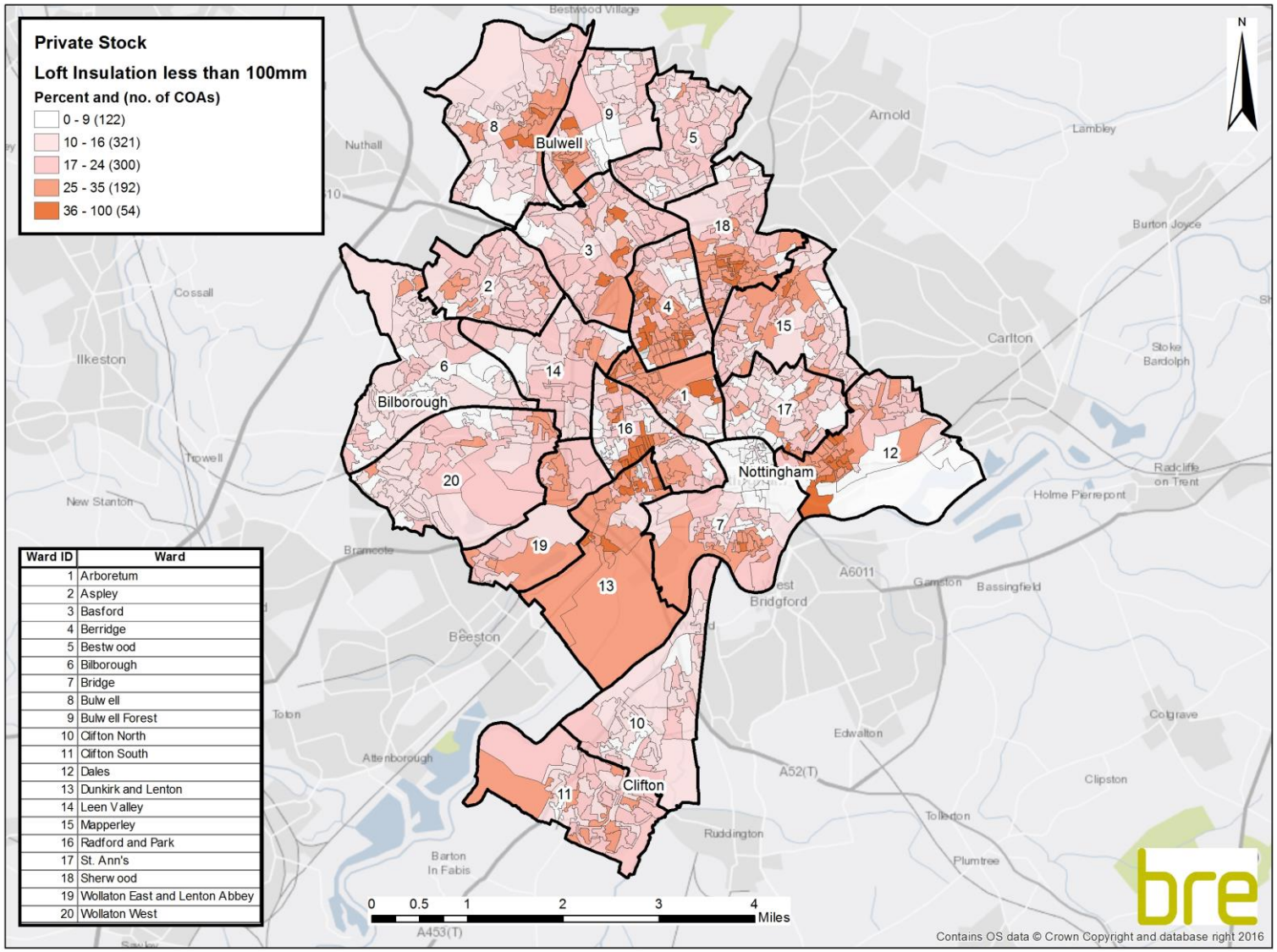
Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

Map 17: Energy efficiency variables - percentage of private sector dwellings in Nottingham with solid walls



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

Map 18: Energy efficiency variables – percentage of private sector dwellings in Nottingham with less than 100mm or no loft insulation



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

4.5 Energy planning variables for Nottingham

In addition to the energy efficiency key indicators, the "energy outputs" part of the housing stock modelling approach (see **Figure 1**) provides the database with estimates of a number of other energy efficiency variables. These variables are: SimpleSAP, notional SimpleCO_2, notional energy demand and cost, notional heat demand and cost. **Table 10** shows the energy efficiency variables in terms of the average figure per dwelling in Nottingham, split by tenure. It is clear that the owner occupied stock has the highest average figures for the majority of the variables below (with the exception of electricity demand and cost which is higher in the private rented sector which may be due to there being more flats in this sector which tend to be more likely to have electric/storage heaters) which may, in part, be due to owner occupied dwellings being larger than those in the other tenures. Such information provides a useful picture of the local housing stock and can also be useful in planning infrastructure projects such as district heating schemes, or for projects seeking to lever in ECO funding.

Table 10: Modelled data for average energy planning variables per dwelling by tenure in Nottingham

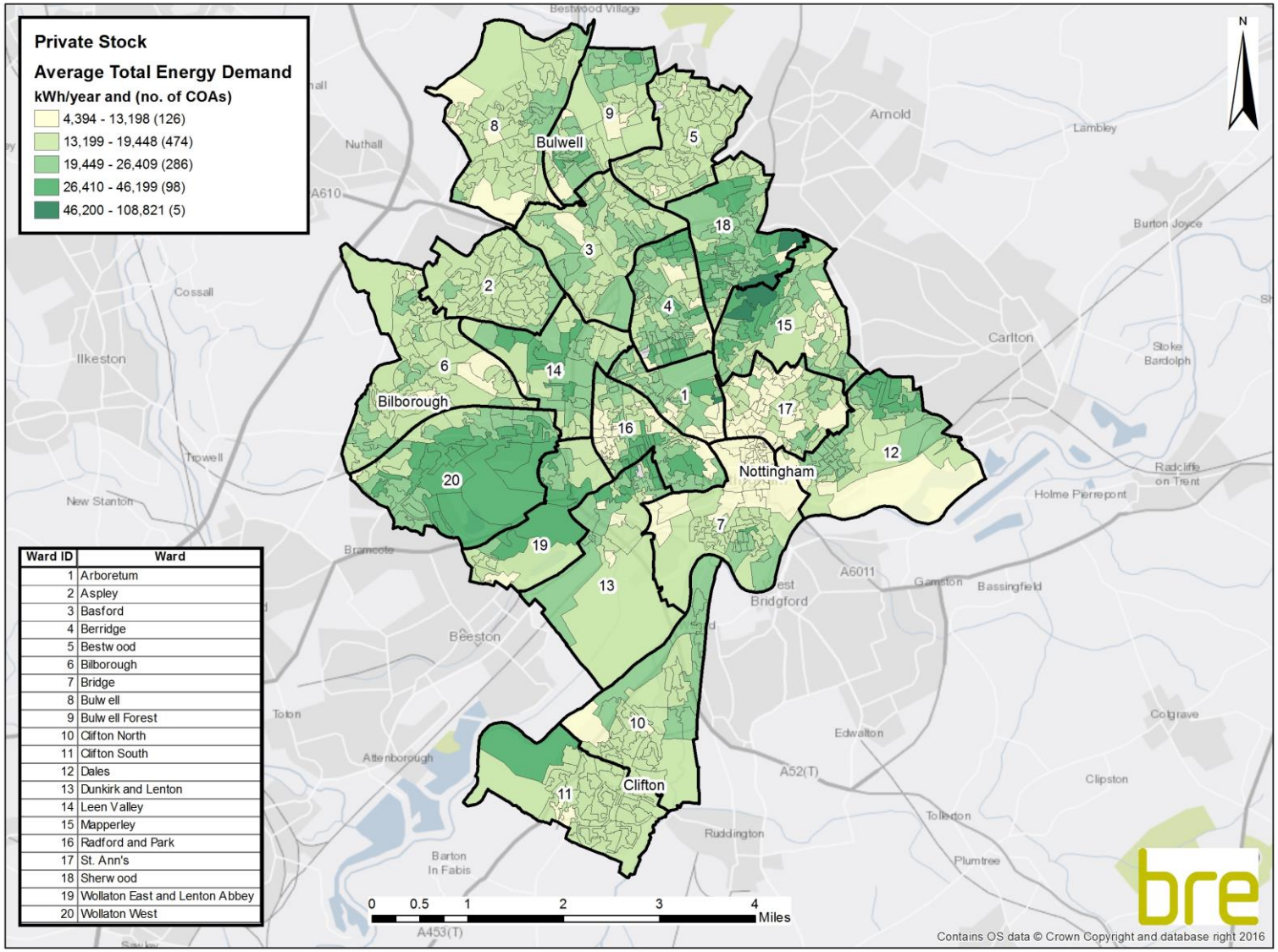
Variable	Tenure		
	Owner occupied	Private rented	Social
No. of dwellings	56,416	43,364	35,619
SimpleSAP	58	60	65
SimpleCO_2 (t/yr)	4.99	4.31	3.34
Energy demand (kWh/yr)	21,131	16,627	13,452
Energy cost (£/yr)	962	840	678
Electricity demand (KWh)	1,251	2,216	1,238
Electricity cost (£)	146	233	136
Heat demand (kWh/yr)	12,063	9,598	7,341
Heat cost (£/yr)	600	503	357

Map 19 and **Map 20** show the average total energy demand and the average total energy cost per year for Nottingham. Both maps show similar patterns since higher energy demand is generally likely to result in higher energy costs. In general energy demand and cost seems to be higher in the more rural areas away from the centre of Nottingham which is most likely a result of there being larger detached houses in these areas. **Map D. 31** to **Map D. 34** provide more detail for the Central Nottingham and Clifton areas.

Map 21 and **Map 22** show the average total heat demand and the average total heating cost per year for Nottingham. These show a similar pattern to the energy demand and energy cost maps. **Map D. 35** to **Map D. 38** focus in on the areas of Central Nottingham and Clifton.

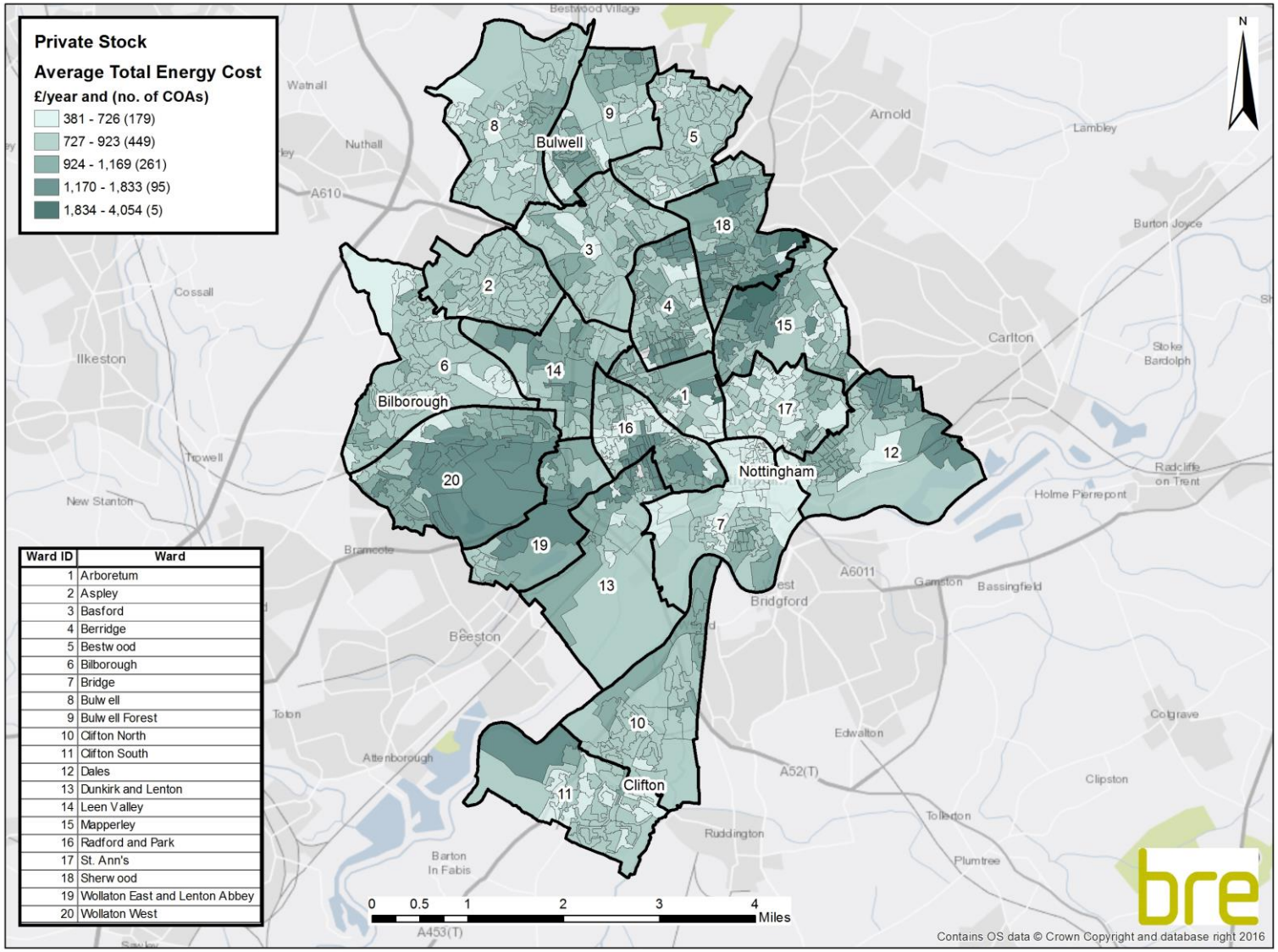
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Map 19: Average total energy demand (kWh/year) – private sector stock



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

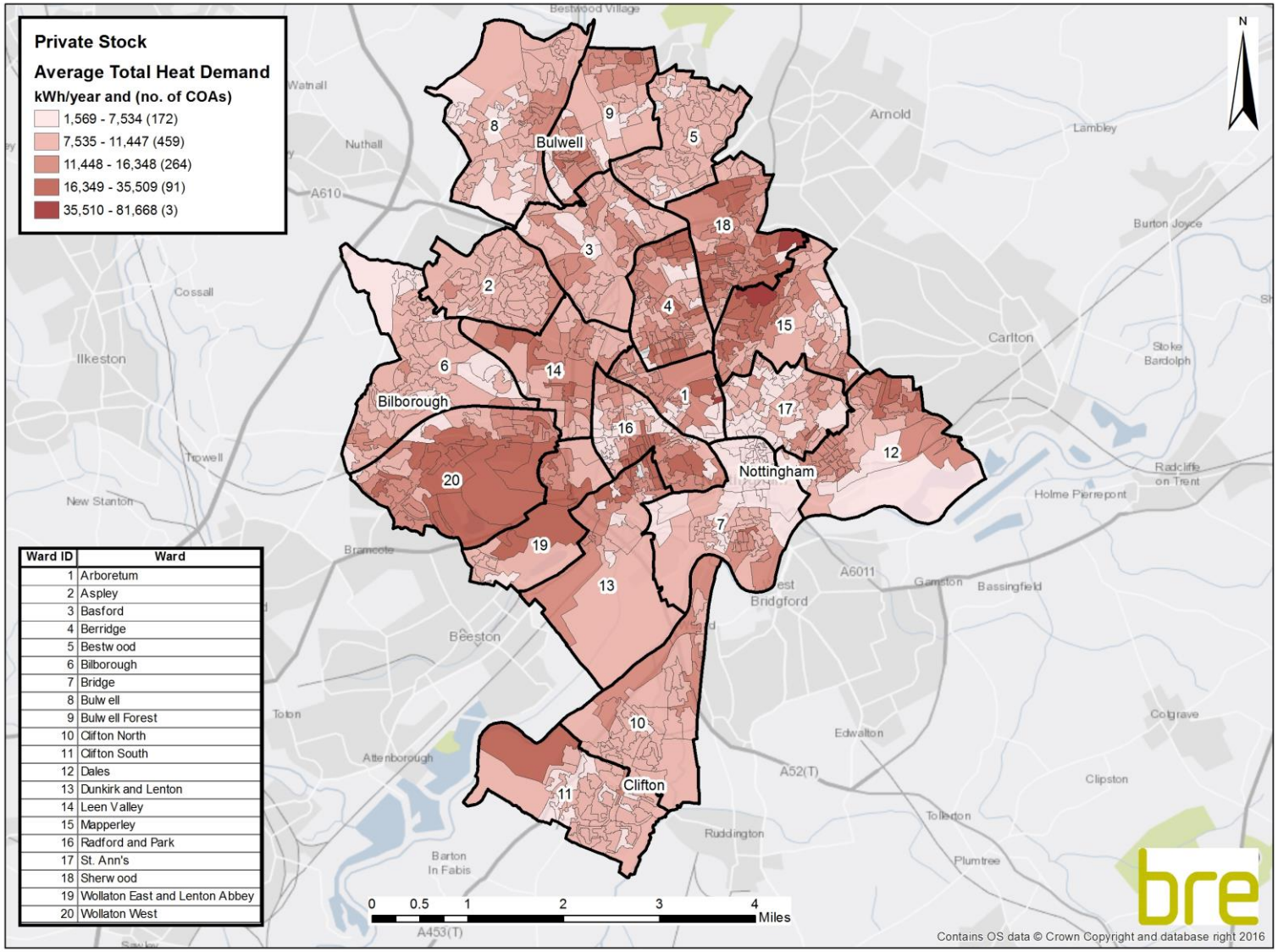
Map 20: Average total energy cost (£/year) – private sector stock



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

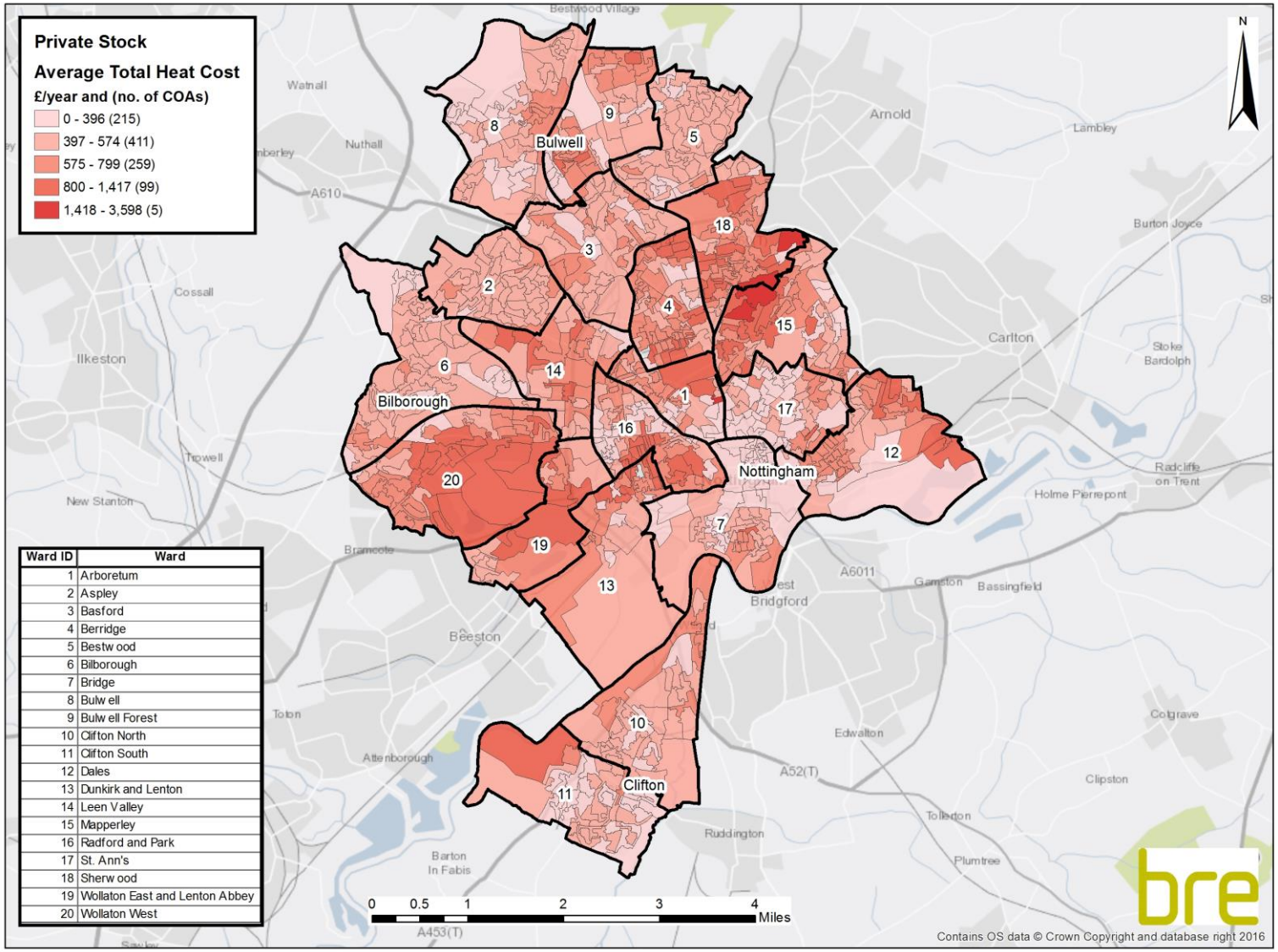
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Map 21: Average total heat demand (kWh/year) – private sector stock



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

Map 22: Average total heat cost (£/year) – private sector stock



Ward ID	Ward
1	Arboretum
2	Aspley
3	Basford
4	Berridge
5	Bestwood
6	Bilborough
7	Bridge
8	Bulwell
9	Bulwell Forest
10	Clifton North
11	Clifton South
12	Dales
13	Dunkirk and Lenton
14	Leen Valley
15	Mapperley
16	Radford and Park
17	St. Ann's
18	Sherwood
19	Wollaton East and Lenton Abbey
20	Wollaton West

5 Conclusion and recommendations

5.1 Conclusion

Nottingham City Council commissioned BRE to undertake a series of modelling exercises on their housing stock to provide an integrated housing stock database, making use of available local data sources (EPC, LLPG and HHSRS data) which have been integrated into BRE's standard housing stock database. The integration of these data sources serves to further increase the accuracy of the models by removing the need to rely on imputed data for the 55,029 cases where EPC data is available, and instead using observed data from the surveys. This leads to more accurate SimpleSAP ratings, more accurate excess cold data (and therefore HHSRS data), and more accurate fuel poverty data for around 41% of the stock in Nottingham. Furthermore, due to the geomodelling based on EPC data, an additional 31% of the stock had the wall type (and insulation levels in the case of flats) updated.

This report describes the modelling work and provides details of the results obtained from the dwelling level model and database. The database is also provided to the council to enable them to obtain specific information whenever required.

The integrated stock models and database provide the council with dwelling level information, focussing on private sector housing, for the following:

- The percentage of dwellings meeting each of the key indicators for Nottingham overall and broken down by tenure and then mapped by COA (private sector stock only)
- Information relating to LAHS reporting for the private sector stock - category 1 hazards and HMOs as well as information on EPC ratings
- Energy efficiency for the private sector stock (wall and loft insulation)
- Energy planning variables

Some of the key findings of this report are as follows:

- Nottingham generally performs worse than England for the majority of indicators (with the exception of excess cold and SimpleSAP)
- The private rented sector is generally worse than other tenures across all the key indicators
- 6.6% of dwellings in the private rented sector are estimated to have an EPC below band E. Under proposed legislation these properties would not be eligible to be rented out after 2018.

Such information will facilitate the decision making process for targeting resources to improve the condition of housing and to prevent ill health resulting from poor housing conditions. Furthermore, the results of this project provide Nottingham with information which will assist in housing policy and strategy development whether these are inspired locally, arise from obligations under the Housing Act 2004 or as responses to government initiatives such as DCLG's Housing Strategy Policy and ECO.

5.2 Recommendations

Programmes designed to tackle disrepair for example group repair schemes, regeneration or enforcement interventions could be considered with a focus on areas of greatest disrepair such as the ward of Wollaton East and Lenton Abbey with an estimated 18% of private sector homes in disrepair and 30% containing category 1 hazards. These findings could be combined with local intelligence to help identify areas for targeting assistance for physical improvements to private sector stock and the environment. Furthermore, programmes aimed at increasing household income through job creation,

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benefit entitlement checks and other initiatives should also be considered, with a particular focus on areas containing high proportions of low income households like Aspley (28%), Arboretum (27%) and St Ann's (26%).

The use of additional local data in this project has enhanced the housing stock models and database. The addition of any further local data, were it to become available, would potentially further enhance the models and database.

Examples of such data are:

- **Local repair schemes**

Data from any local repair schemes, including the use of repair grants, could be used to enhance the Disrepair Model.

- **Local energy improvement schemes**

Any local schemes to improve the energy efficiency of dwellings, including national schemes for which local data has been made available to Nottingham, could be used to further enhance the energy models (SimpleSAP, excess cold, fuel poverty).

Furthermore, it would be possible to provide Nottingham City Council with an analysis of the condition of the housing stock and its health impact, through a Health Impact Assessment (HIA). The report would also provide a cost benefit analysis of mitigating Housing Health and Safety hazards within the stock.

Further assistance can be provided in the form of a Healthy Homes Advisory Service. This involves assisting the local authority in using the data from stock modelling and the health impact assessment to proactively assist vulnerable residents living in the poorest quality housing in the local authority area. The toolkit will allow Nottingham to target the poorest quality housing and maximise the joint working opportunities with health and community groups in the area.

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Appendix A Definitions of the key indicators

1. **House condition indicators**
   a. **The presence of a category 1 hazard under the Housing Health and Safety Rating System (HHSRS) – reflecting both condition and thermal efficiency**
   Homes posing a category 1 hazard under the HHSRS – the system includes 29 hazards in the home categorised into category 1 – band A to C (serious) or category 2 – band D onwards (other) based on a weighted evaluation tool. Note that this includes the hazard of excess cold which is also included as one of the energy efficiency indicators.

   The 29 hazards are:

1 Damp and mould growth	16 Food safety
2 Excess cold	17 Personal hygiene, Sanitation and Drainage
3 Excess heat	18 Water supply
4 Asbestos	19 Falls associated with baths etc.
5 Biocides	20 Falling on level surfaces etc.
6 Carbon Monoxide and fuel combustion products	21 Falling on stairs etc.
7 Lead	22 Falling between levels
8 Radiation	23 Electrical hazards
9 Uncombusted fuel gas	24 Fire
10 Volatile Organic Compounds	25 Flames, hot surfaces etc.
11 Crowding and space	26 Collision and entrapment
12 Entry by intruders	27 Explosions
13 Lighting	28 Position and operability of amenities etc.
14 Noise	29 Structural collapse and falling elements
15 Domestic hygiene, Pests and Refuse	

   b. **The presence of a category 1 hazard for falls (includes "falls associated with baths", "falling on the level" and "falling on stairs")**
   The HHSRS Falls Model includes the 3 different falls hazards where the vulnerable person is over 60 as listed above.

   c. **Dwellings in disrepair (based on the former Decent Homes Standard criteria for Disrepair)**
   The previous Decent Homes Standard states that a dwelling fails this criterion if it is not found to be in a reasonable state of repair. This is assessed by looking at the age of the dwelling and the condition of a range of building components including walls, roofs, windows, doors, electrics and heating systems).

2. **Energy efficiency indicators:**
   a. **The presence of a category 1 hazard for excess cold (using SAP ratings as a proxy measure in the same manner as the English House Condition Survey)**
   This hazard looks at households where there is a threat to health arising from sub-optimal indoor temperatures. The HHSRS assessment is based on the most low income group for this hazard – persons aged 65 years or over (note that the assessment requires the hazard to

be present and potentially affect a person in the low income age group should they occupy that dwelling. The assessment does not take account of the age of the person actually occupying that dwelling at that particular point in time).

The English Housing Survey (EHS) does not measure the actual temperatures achieved in each dwelling and therefore the presence of this hazard is measured by using the SAP rating as a proxy. Dwellings with a SAP rating of less than 31.5 (SAP 2005 methodology) are considered to be suffering from a category 1 excess cold hazard.

b. An estimate of the SAP rating which, to emphasise its origin from a reduced set of input variables, is referred to as "SimpleSAP"

The Standard Assessment Procedure (SAP) is the UK Government's standard methodology for home energy cost ratings. SAP ratings allow comparisons of energy efficiency to be made, and can show the likely improvements to a dwelling in terms of energy use. The Building Regulations require a SAP assessment to be carried out for all new dwellings and conversions. Local authorities, housing associations, and other landlords also use SAP ratings to estimate the energy efficiency of existing housing. The version on which the Average SAP rating model is based is SAP 2012.

The SAP ratings give a measure of the annual unit energy cost of space and water heating for the dwelling under a standard regime, assuming specific heating patterns and room temperatures. The fuel prices used are the same as those specified in SAP 2012. The SAP takes into account a range of factors that contribute to energy efficiency, which include:

- Thermal insulation of the building fabric
- The shape and exposed surfaces of the dwelling
- Efficiency and control of the heating system
- The fuel used for space and water heating
- Ventilation and solar gain characteristics of the dwelling

3. Household vulnerability indicators:

a. Fuel poverty - 10% definition

This definition states that a household is said to be in fuel poverty if it spends more than 10% of its income on fuel to maintain an adequate level of warmth (usually defined as 21^{o}C for the main living area, and 18^{o}C for other occupied rooms). This broad definition of fuel costs also includes modelled spending on water heating, lights, appliances and cooking.

The fuel poverty ratio is defined as:

$$\textit{Fuel poverty ratio} = \frac{\textit{Fuel costs (usage * price)}}{\textit{Full income}}$$

If this ratio is greater than 0.1 then the household is in fuel poverty.

The definition of full income is the official headline figure and in addition to the basic income measure, it includes income related directly to housing (i.e. Housing Benefit, Income Support for Mortgage Interest (ISMI), Mortgage Payment Protection Insurance (MPPI), Council Tax Benefit (CTB)).



Fuel costs are modelled, rather than based on actual spending. They are calculated by combining the fuel requirements of the household with the corresponding fuel prices. The key goal in the modelling is to ensure that the household achieves the adequate level of warmth set out in the definition of fuel poverty whilst also meeting their other domestic fuel requirements.

b. Fuel poverty - Low Income High Costs definition

The government has recently set out a new definition of fuel poverty which it intends to adopt under the Low Income High Costs (LIHC) framework[48]. Under the new definition, a household is said to be in fuel poverty if:

- They have required fuel costs that are above average (the national median level)
- Were they to spend that amount they would be left with a residual income below the official poverty line

c. Dwellings occupied by a low income household

A household in receipt of:

- Income support
- Housing benefit
- Attendance allowance
- Disability living allowance
- Industrial injuries disablement benefit
- War disablement pension
- Pension credit
- Child tax credit
- Working credit

For child tax credit and working tax credit, the household is only considered a low income household if it has a relevant income of less than £15,860.

The definition also includes households in receipt of Council Tax benefit and income based Job Seekers Allowance.

[48] https://www.gov.uk/government/collections/fuel-poverty-statistics

Appendix B Methodology for the BRE Integrated Dwelling Level Housing Stock Modelling approach

This Appendix provides a more detailed description of the models which make up the overall housing stock modelling approach and feed into the database. The process is made up of a series of data sources and Models which, combined with various imputation and regression techniques and the application of other formulae, make up the final database. The database is essentially the main output of the modelling and provides information on the key indicators and other data requirements (e.g. energy efficiency variables). An overview of the approach and a simplified flow diagram are provided in **Section 3** of this report.

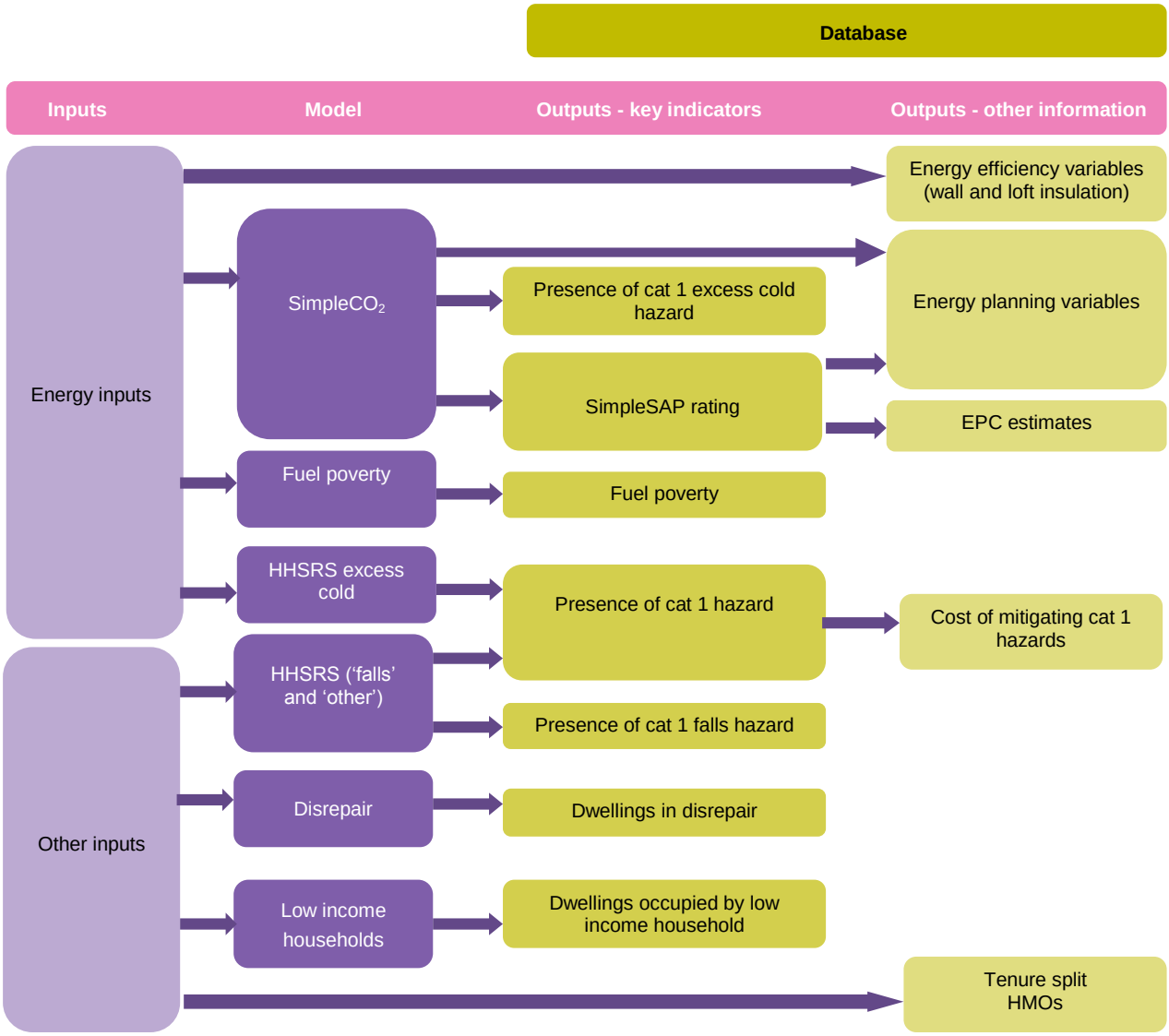
The models making up the overall housing stock modelling approach are:

- SimpleCO_2 Model
- Fuel Poverty Model
- HHSRS (all hazards, falls hazards and excess cold) Models
- Disrepair Model
- Low Income Households Model

Figure B.1 shows the data flows for the stock modelling approach, showing which models each of the outputs in the database (split into the key indicators and other information) come from. The exception is the energy efficiency variables (if used) which come directly from the energy inputs, and the tenure and HMO data (if used) which come directly from the other inputs.

Section B.1 describes the SimpleCO_2 Model in more detail, **Section B.2** provides more information on the other four models and **Section B.3** gives details of the OS MasterMap/geomodelling approach.

Figure B.1: Simplified data flow for the housing stock modelling approach



B.1 BRE SimpleCO_2 Model

BRE have developed a variant of the BREDEM[49] software, named "SimpleCO_2", that can calculate outputs from a reduced set of input variables. These outputs are indicative of the full BREDEM outputs and the minimum set of variables the software accepts is information on:

- Tenure
- Dwelling type
- Location of flat (if a flat)
- Dwelling age
- Number of storeys
- Number of rooms
- Loft insulation
- Level of double glazing
- Main heating type
- Boiler type (if a boiler driven system)
- Heating fuel
- Heating system
- Heating controls
- Water heating
- Hot water cylinder insulation
- Solar hot water
- PV panels
- Internal floor area

The Experian UK Consumer Dynamics Database is used as a source for some of these variables (tenure, dwelling age) and they are converted into a suitable format for the SimpleCO_2 software. The dwelling type is derived using information from OS Mastermap and the number of storeys from OS experimental height data. The remaining pieces of data are inferred from the EHS using other tenure, dwelling age and type, other Experian data (number of bedrooms), other OS data (i.e. dwelling footprint) and data from Xoserve[50] which indicates whether the dwelling is in a postcode which is on the gas network. As the characteristics of a dwelling cannot be determined through access to observed data, a technique known as cold deck imputation is undertaken. This is a process of assigning values in accordance with their known proportions in the stock. For example, this technique is used for predicting heating fuels because the Xoserve data only confirms whether a dwelling is on the gas network or not. Fuel used by dwellings not on the gas network is unknown, so in most cases this information will be assigned using probabilistic methods. The process is actually far more complex e.g. dwellings with particular characteristics such as larger dwellings are more likely to be assigned with oil as a fuel than smaller dwellings.

[49] Building Research Establishment Domestic Energy Model, BRE are the original developers of this model which calculates the energy costs of a dwelling based on measures of building characteristics (assuming a standard heating and living regime). The model has a number of outputs including an estimate of the SAP rating and carbon emissions.

[50] Xoserve is jointly owned by the five major gas distribution Network companies and National Grid's gas transmission business. It provides transportation transactional services on behalf of all the major gas Network transportation companies.

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The reason for taking this approach is to ensure that the national proportions in the data source are the same as those found in the stock nationally (as predicted by the EHS or other national survey). Whilst there is the possibility that some values assigned will be incorrect for a particular dwelling (as part of the assignment process has to be random) they ensure that examples of some of the more unusual types of dwelling that will be present in the stock are included.

Whilst this approach is an entirely sensible and commonly adopted approach to dealing with missing data in databases intended for strategic use, it raises issues where one of the intended uses is planning implementation measures. It must therefore be kept in mind at all times that the data provided represents the most likely status of the dwelling, but that the actual status may be quite different. That said, where EPC data has been used, the energy models (which use EPC data) are likely to be more accurate.

It is important to note that some variables have been entirely assigned using cold decking imputation techniques. These include presence of cavity wall insulation and thickness of loft insulation as there is no reliable database with national coverage for these variables.

The "SimpleCO_2" software takes the combination of Experian and imputed data and calculates the "SimpleSAP" rating for each dwelling in the national database. The calculated "SimpleSAP" ratings are the basis of the estimates of SAP and excess cold. How the other key variables are derived is discussed later in this Appendix.

Because the estimates of "SimpleSAP" etc. are calculated from modelled data it is not possible to guarantee the figures. They do, however, provide the best estimates that we are aware can be achieved from a data source with national coverage and ready availability. The input data could, however, be improved in its:

- accuracy for example through correcting erroneous values,
- depth of coverage, for example by providing more detailed information on age of dwellings,
- breadth by providing additional input variables such as insulation.

Improving any of these would enhance the accuracy of the output variables and for this reason it is always worth considering utilising additional information sources where they are available. Using EPC data will go some way towards meeting these improvements by providing more accurate data.

B.2 Housing Condition and Low Income Household Models

This section provides further information on the remaining four models – fuel poverty, HHSRS, disrepair and low income households. These models are discussed together since the approach used for each one is broadly the same.

These models are not based solely on the thermal characteristics of the dwelling, and in some cases are not based on these characteristics at all. A top down methodology has been employed for these models, using data from the EHS and statistical techniques, such as logistic regression, to determine the combination of variables which are most strongly associated with failure of each standard. Formulae have been developed by BRE to predict the likelihood of failure based on certain inputs. The formulae are then applied to the variables in the national Experian dataset to provide a likelihood of failure for each dwelling. Each individual case is then assigned a failure/compliance indicator based on its likelihood of failure and on the expected number of dwellings that will fail the standard within a given geographic area. Thus if the aggregate values for a census output area are that 60% of the dwellings in the area fail a particular standard then 60% of the dwellings with the highest failure probabilities will be assigned as failures and the remaining 40% as passes.

The presence of a category 1 hazard failure is the only exception to this as it is found by combining excess cold, fall hazards and other hazards such that failure of any one of these hazards leads to failure of the standard.

B.3 Integrating local data sources

As mentioned in the main body of the report, Nottingham identified a number sources of data which were used to update the BRE dwelling level models to provide an integrated database. Their data sources were:

- Energy Performance Certificates (EPCs)
- Local Land and Property Gazetteer (LLPG)
- Housing Health and Safety Rating System (HHSRS)

To allow these data sources to be linked to the BRE Dwelling Level Stock Models, an address matching exercise was required to link each address to the Experian address key. Address matching is rarely 100% successful due to a number of factors including:

- Incomplete address or postcodes
- Variations in how the address is written e.g. Flat 1 or Ground floor flat
- Additions to the main dwelling e.g. annexes or out-buildings

Experience indicates that, for address files in good order, match rates are around 75% - 95%. **Table B.1** provides the address matching results for the three data sources provided by Nottingham and the resulting impact on the modelling process.

Table B.1: Address matching results and impact on the modelling process

Data source	Total no. of records	No. (and %) of addresses matched	Notes / impact on the modelling process
EPC data	65,353 – total received	55,029 (85% of de-duplicated)	Data de-duplicated for multiple EPCs – 65,054 remaining Matched to LLPG by UDPRN – 55,029 – i.e. final number matched to modelled data and useable
LLPG data	135,910	135,339 (100% - no duplicates)	Final number used after unwanted BLPU classes removed – 135,339
HHSRS data	307	261 (90%)	Duplicates removed – 292 remaining Matched to LLPG - 261

The database was also updated using the Ordnance Survey (OS) MasterMap data which enables the measurement of the footprint of the building and provides information on the number of residential addresses within the building, and to see which other buildings each address is attached to or geographically close to. In addition, HMO data provided by the council has been included in the database.

The stage at which the local data sources are included in the modelling process depends on whether or not the data includes information which can be used as an input into the SimpleCO_2 model. The simplified flow diagram in **Figure 1** in the main report shows how these data sources are integrated into the standard modelling approach.

The following sections consider each of the data sources and how they are used to update the SimpleCO_2 inputs and/or stock model outputs.

EPC data

If there are discrepancies in the energy data for the same dwelling case, arising from different energy data sources, then, if available, the EPC data will be used. If no EPC data source is available for that case, then the data with the most recent date will be taken.

Some of the energy data provided includes tenure data, in which case the database has been updated accordingly. However EPC cases do not include tenure data, they only include the reason for the EPC.

Therefore:

- If the reason given was a sale then the dwelling was assumed to be owner occupied.
- If the reason given was re-letting and the tenure of the let was specified (i.e. private or social) then the tenure was changed to that indicated.
- If the reason for the sale did not indicate tenure then the tenure was left unchanged.

It is important to note that the modified tenure created from the EPC data should only ever be used for work relating to energy efficiency and carbon reduction. This is a legal requirement stemming from the collection of the data, and is a licence condition of the data suppliers, Landmark. For this reason the tenure variable supplied in the database is NOT based on EPC data; however, the calculations used to determine the SimpleSAP rating and other energy characteristics of the dwelling do make use of the EPC tenure.

Where the energy data provides information on loft insulation, wall insulation, the location of a flat within a block and floor area this information will be used in favour of any imputed information, as long as the OS data is in agreement with the dwelling type.

Where energy data on wall type is present for a dwelling in a block of flats, terrace or semi-detached, that data is extrapolated to the rest of the block or terrace. If multiple dwellings with energy data are present then the most common wall type is used. Note that where the energy data indicates a wall type that is not the predominant one, this data will not be overwritten with the predominant type – the data reported in the energy database will always be used even if this results in two different wall types being present in a terrace or a block of flats.

For flats it is assumed that all flats in the block will have the same level of double glazing and as the case for which we have energy data for. If there are multiple flats in the block with energy data showing different levels of double glazing, an average will be used.

It is assumed that all flats in a block share the same heating type, boiler type if present, fuel type and heating controls. Where there are multiple types present, the predominant type is used. Flats are assumed to have the same hot water source, and if one flat benefits from solar hot water it is assumed that all flats in the block do.

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B.4 OS MasterMap information

The OS data has been used to update a number of the SimpleCO_2 model inputs. The most valuable use of the OS data is the ability to determine the dwelling type with much greater confidence.

The existing dwelling type is replaced with a new dwelling type derived from OS data. By looking at the number of residential address points it can be inferred whether the building is a house or block of flats (houses have one residential address point and blocks of flats have two or more).

Houses - where the dwelling is a house the number of other buildings it is attached to can be observed and the following assumptions made:

- If there are no other dwellings attached, the house is detached.
- If two dwellings are joined to one another, but not to any other dwellings, they are semi-detached.
- If they are attached to two or more other dwellings, they are mid terraced.
- If they are attached to only one dwelling, but that dwelling is a mid-terrace, they are an end-terrace.

Flats - if the building is a block of flats, its exact nature is determined by its age and the number of flats in the block and the following assumptions made:

- If there are between two and four flats in the block (inclusive) and the dwelling was built before 1980 then it is a conversion.
- Otherwise it is purpose built.

This information can also be used to reconcile discrepancies within blocks of flats, terraced and semi-detached houses. These discrepancies occur in variables such as dwelling age, location of flat in block, number of storeys, loft insulation, wall insulation, wall type and floor area.

Looking at dwelling age, although the OS data does not itself provide any information on age, it does allow reconciliation of age data within semi-detached, terraces and blocks of flats.

Where a group of buildings are all attached in some way, such as a terrace, it is logical to assume that they were built at the same time. Therefore the age of each building is replaced with the most common age among those present. Where the most common age occurs in equal numbers, this is resolved by looking at the average age of houses in the same postcode.

If one dwelling has an age that is notably newer than its neighbours, then the age is not changed, as it is assumed that the original dwelling was destroyed and rebuilt.

Figure B. 2 and **Figure B. 3** below show how the initial base data is adjusted using the OS data to produce more consistent and reliable results.

Considering the number of storeys and the location of a flat in its block, if the OS data reveals that the dwelling type is significantly different from the original value – specifically if a house becomes a flat, or vice versa then the variables are adjusted. If this is the case a new location for the flat within the block or the number of storeys will be imputed using the same method as before, but taking into account the revised dwelling type.

Similarly with floor area, loft insulation and wall type - if the dwelling type or location of a flat within a block changes as a result of OS data then the variables are calculated using the same method of imputation as the original models, but taking into account the new data.

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Figure B. 2: Dwelling level map showing the base data, prior to using the OS data

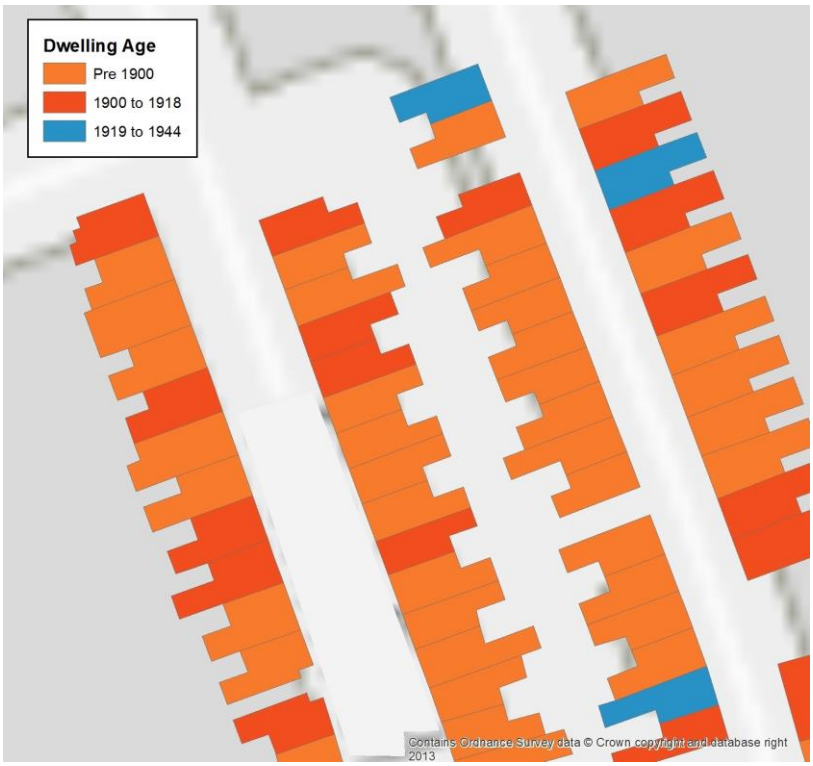
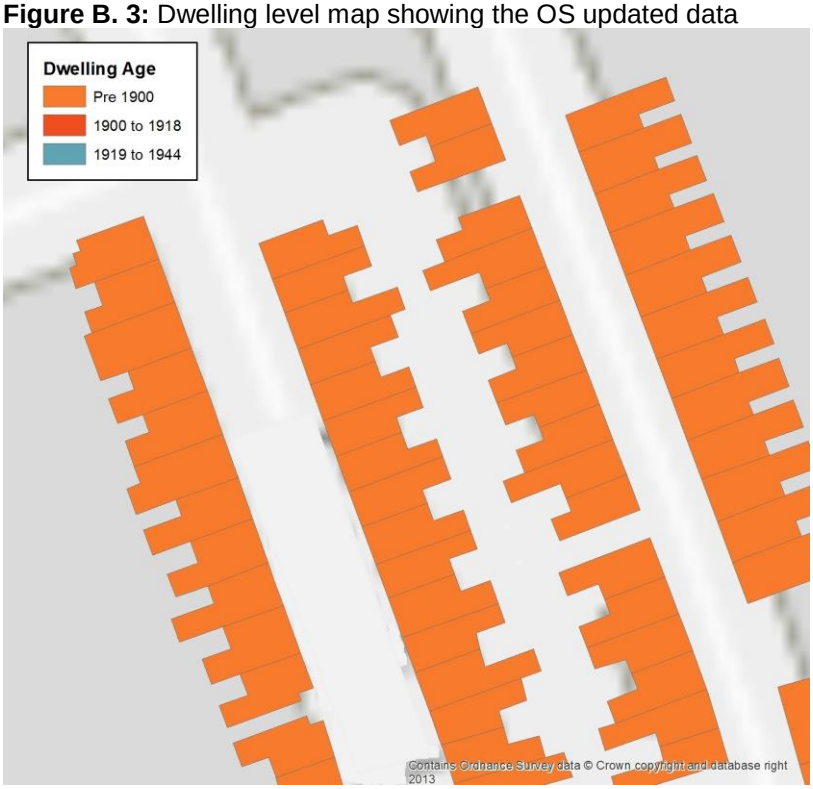


Figure B. 3: Dwelling level map showing the OS updated data



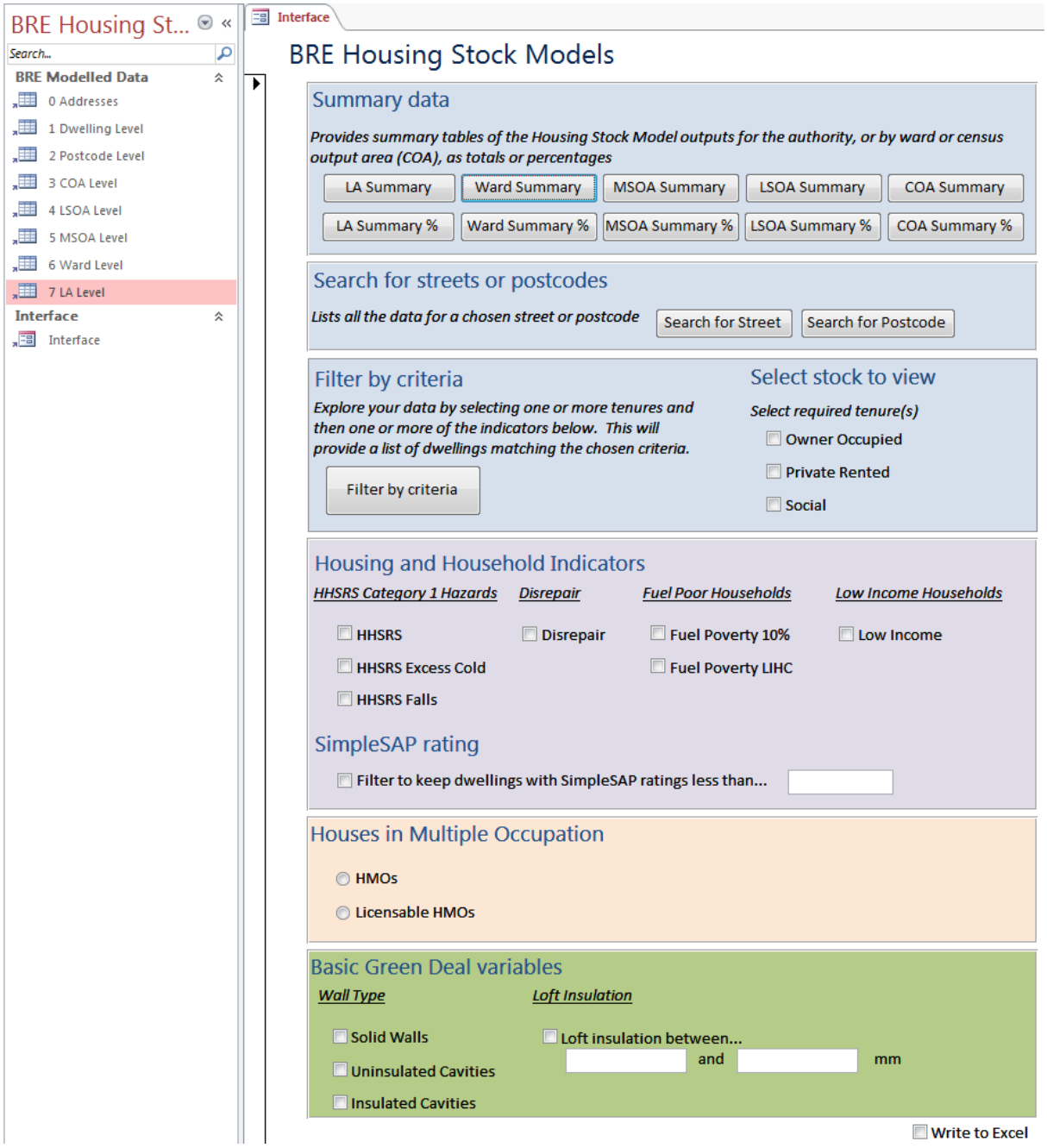
Appendix C Using the BRE Integrated Dwelling Level Housing Stock Database

The BRE Integrated Dwelling Level Housing Stock Database is the final output of the overall stock modelling approach described in **Section 3** and **Appendix B**. The database has been designed to provide local authorities with a number of different options for summarising or investigating their data and generating lists of properties of interest. This Appendix provides details of how to use the database.

C.1 Overview

The database will automatically open on the interface screen as shown in **Figure C. 1**. On the left hand side of the database is a vertical column known as the “navigational pane”.

Figure C. 1: BRE dwelling level housing sock database – opening interface screen



Under the heading “BRE Integrated Models” there are a number of tables which hold the BRE housing stock model data, plus one table holding the EPC data used in the modelling, and one table holding the metadata that identifies the extent of EPC use and cloned cases. The tables are as follows (note that tables in the database with the UPRN in the first column can be used to match the address details to the housing stock model data if required):

Table C. 1: Summary of information provided in each table in the database

Table Name	Description	Unique ID
0 Address Information	Address details (building names, house numbers, postcodes), COA, LSOA, MSOA and ward for each address	Yes
1 Dwelling Level	Dwelling level housing stock model data and Experian tenure variable[51]. SimpleSAP results: score out of 100 All other indicators: 0 = pass the standard, 1 = fail	Yes
2 Postcode Level	Summary information and statistics for each of the aggregated levels specified. 5 “stock levels” are provided – all, private, owner occupied, private rented, social	No
3 COA Level		
4 LSOA Level		
5 MSOA Level		
6 Ward Level		
7 LA Level		

C.2 Using the database

The rest of the screen is the main interface which has been developed with a number of standard queries that will present the user with information likely to be of use when reviewing data in order to design a housing stock strategy. There are 3 main sections to the interface: “Summary data”, “Search for street or postcode” and “Filter by criteria”. These sections are described in more detail below.

[51] If the Experian tenure variable has been purchased

C2.1 "Summary data"

These options allow the user to generate summaries of their data at different levels of aggregation. The three different levels of aggregation are;

- Local authority
- Ward
- MSOA
- LSOA
- COA

There are two types of summaries available at each level - totals and percentages:

- Totals give the user the total number of dwellings that fail a particular standard, for example, the total number of dwellings that have a HHSRS category 1 hazard in the authority.
- Percentages tell the user the percentage of dwellings that fail a criterion, for example, the percentage of dwellings suffering from HHSRS category 1 excess cold hazards.

C2.2 "Search for streets or postcodes"

These options allow the user to search for particular areas, either by street name or postcode. By clicking on a search button the user will be asked to type in either a street or postcode. A table will then be shown which provides a list of all dwellings in the street or postcode requested.

If the full name of the street is not known, wildcard characters can be used to search for close matches. A wildcard character is one that can stand in for any other letter or group of letters. Access uses an asterisk (*) as the wildcard character. For example entering "Abbey*" will return any street name starting with "Abbey", for example, "Abbey Road", "Abbey Close", "Abbeyfield" etc. Wildcard characters can be used at both the beginning and the end of the search text. For example, by entering "*Abbey*" would find "Abbey Road", "Old Abbey Road" etc.

The street names used are those provided in the Local Land and Property Gazetteer. It can sometimes be the case that a street name can be written differently across databases (e.g. "Rose Wood Close" or "Rosewood Close"). If a road name does not appear to be present, try using wildcard characters to check for alternatives.

The postcode search facility works in a similar manner. Entering "BN15 0AD" will find all dwellings in that exact post code, but entering "BN15*" will find all dwellings whose postcode begins with BN15.

Note: always close the results of an existing search before starting a new one. Clicking the button when the results of an existing search are still open will simply return to the results of that search. A search, or any other table, can be closed by clicking the "x" in the top right corner of the table window.

C2.3 "Filter by criteria"

This section allows the user to select dwellings based on one or more criteria / key indicators of interest.

First, the user needs to select which tenure(s)[52] they are interested in by using the "Select stock to view" on the right hand side of the box.

[52] If the Experian tenure variable has not been purchased this section is locked and only private sector stock is shown.



The default setting is that no tenures are selected, so the user will need to select at least one in order to get any results. Multiple tenures can be selected, so for the results for all the private stock select both owner occupied and private rented.

Once one or more of the tenures has been selected, choose one or more of the indicators of interest either by selecting an indicator e.g. HHSRS Cat.1 hazards will return dwelling with fail HHSRS, or for SimpleSAP enter a rating to select dwellings on and below the rating.

Once a tenure(s) and indicator(s) have been selected clicking the ‘Filter by criteria’ button will return the addresses matching the chosen criteria.

As with the searches, close the results of an existing selection before starting a new one.

C.3 Creating Excel files

Whilst it is possible to copy the data from any of the queries accessed from the interface screen, an option has been added to make this process easier. To output results to Excel click the “Write to Excel” check box at the bottom right of the screen. As long as this box is checked, clicking any of the summary data, search or criteria selection buttons will cause the resulting data to be written to Excel instead of being displayed.

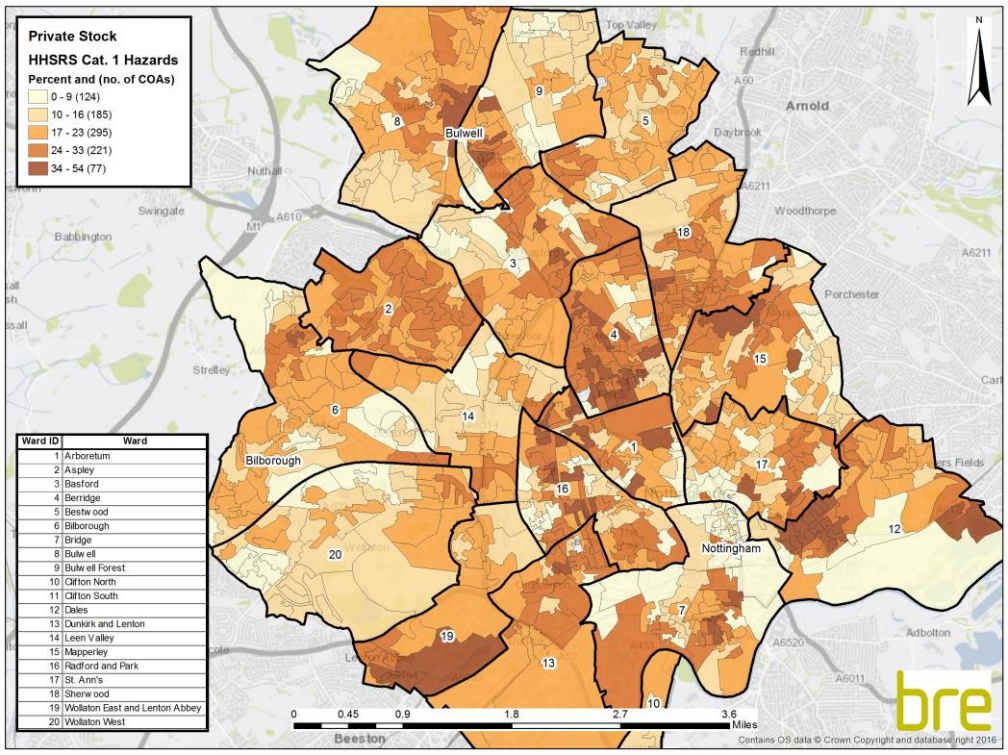
If this option is selected when any button is clicked the database requests a format for the output data. Once the appropriate file format is selected, click “OK” and choose a file name and location and click “OK” to save the file. This function means it is possible to rapidly export summary tables for inclusion in reports, or lists of dwellings which can be used to target improvement programmes.

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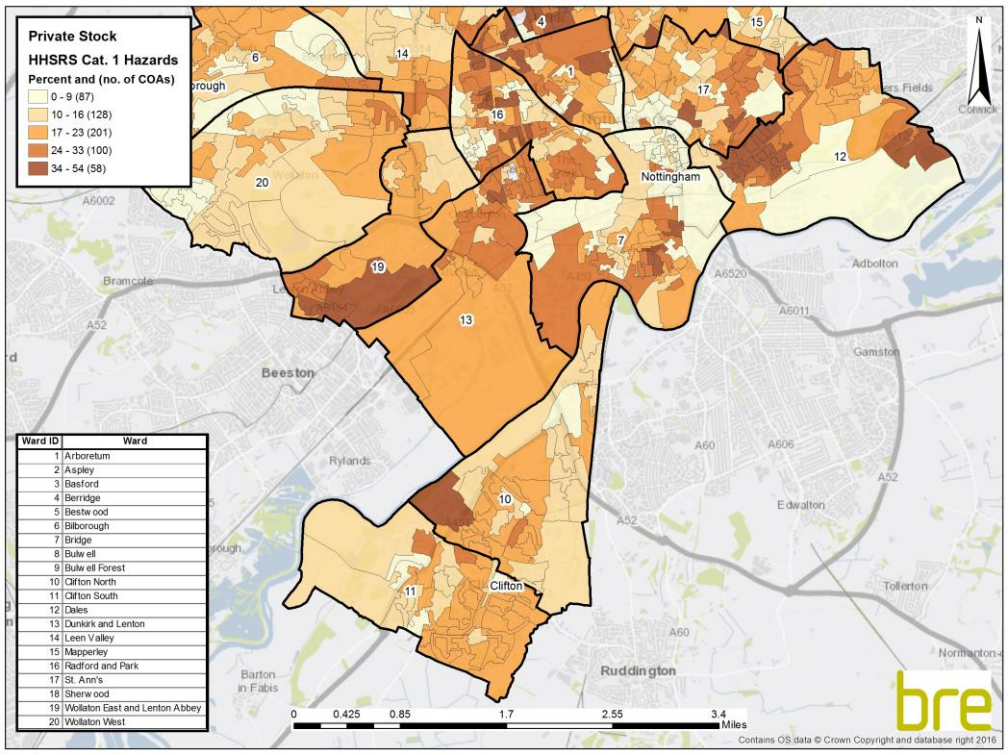
Appendix D Additional maps

This Appendix provides close up maps of some of the more urban areas of Nottingham –close up maps for each indicator, focussing on the areas of Central Nottingham and Clifton. These maps show the clear urban – rural divide in many of the housing indicators. The larger maps included above in the report do not always allow for the appreciation that smaller and denser COAs in urban areas are very different in their hazards to the surrounding rural COAs which are larger and are immediately more eye-catching.

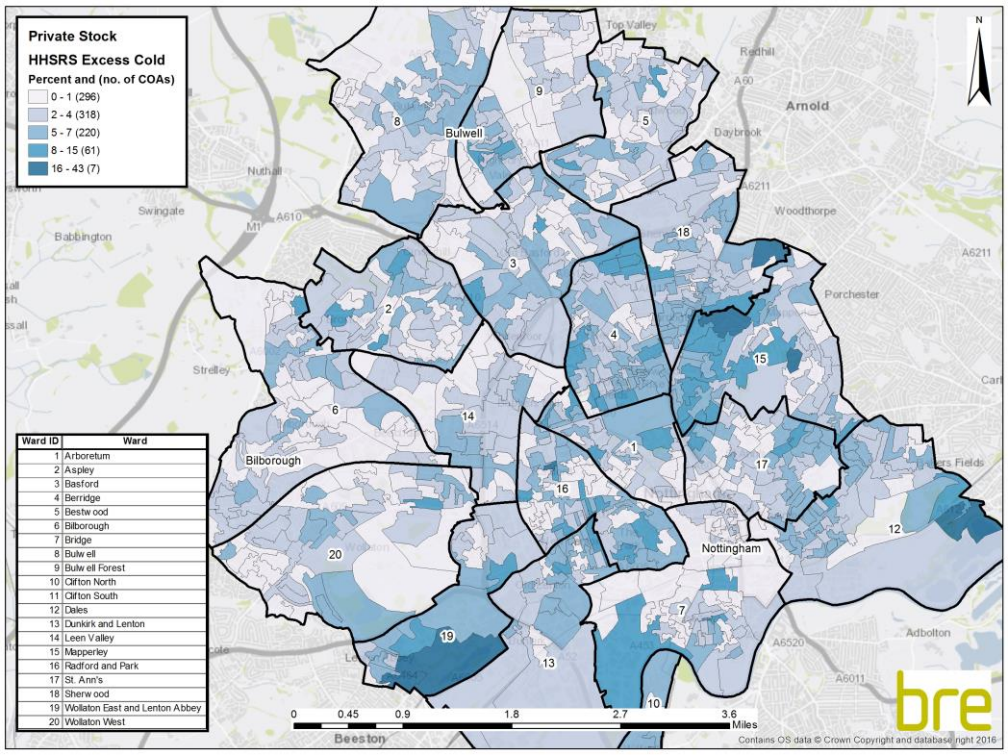
Map D. 1: Central Nottingham category 1 hazards – private stock *Return to main report*



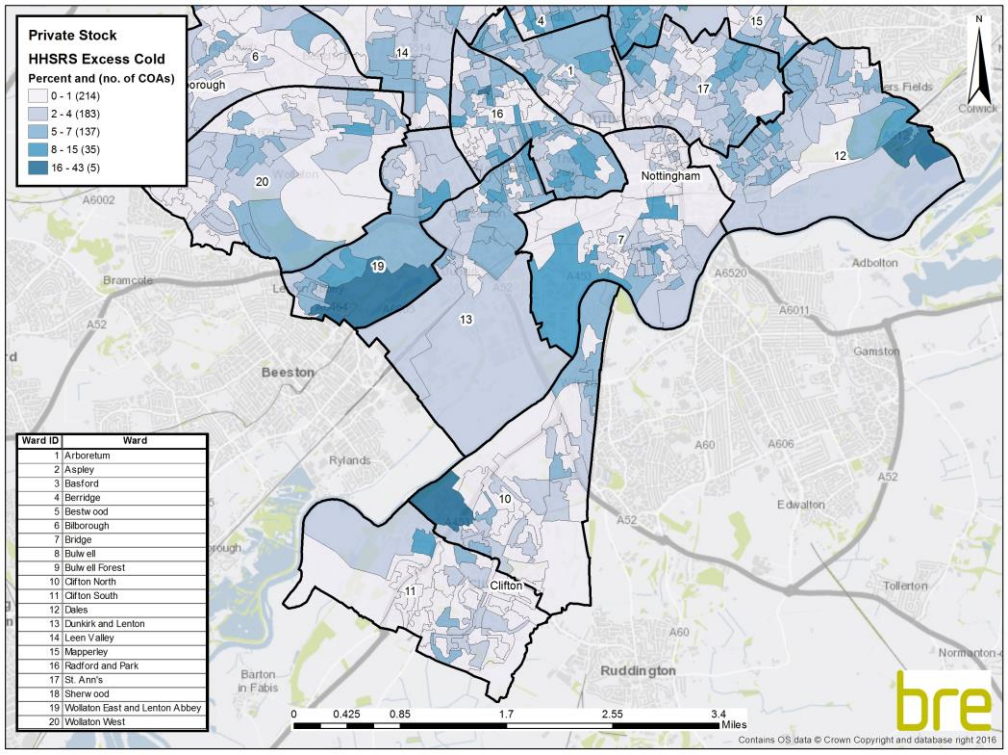
Map D. 2: Clifton category 1 hazards – private stock *Return to main report*



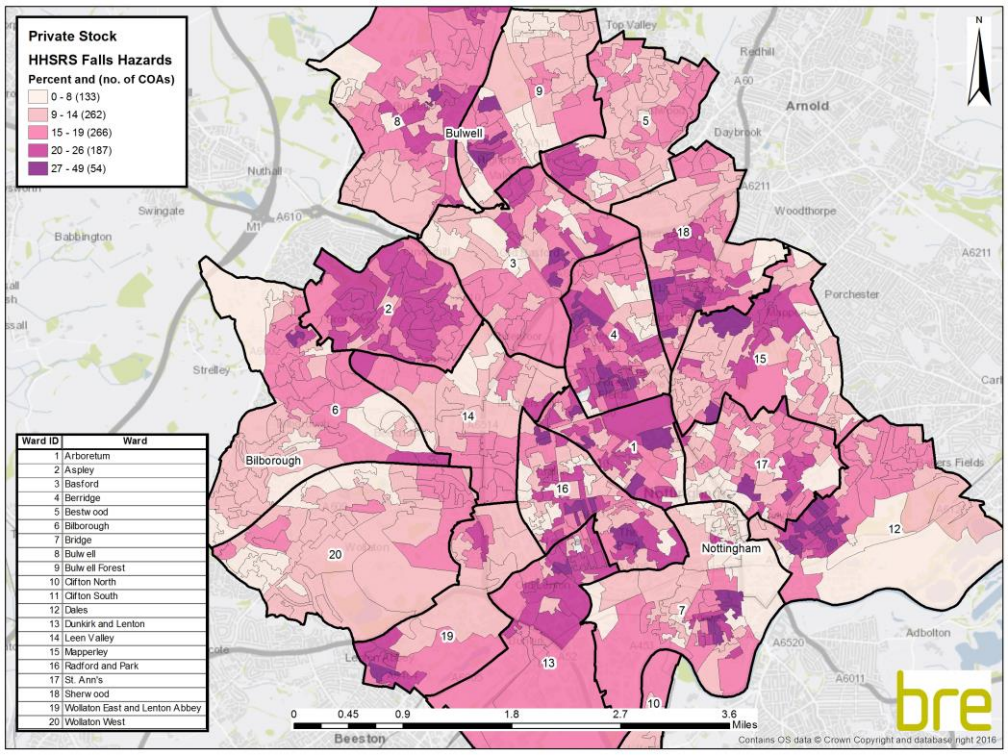
Map D. 3: Central Nottingham households with excess cold – private stock *Return to main report*



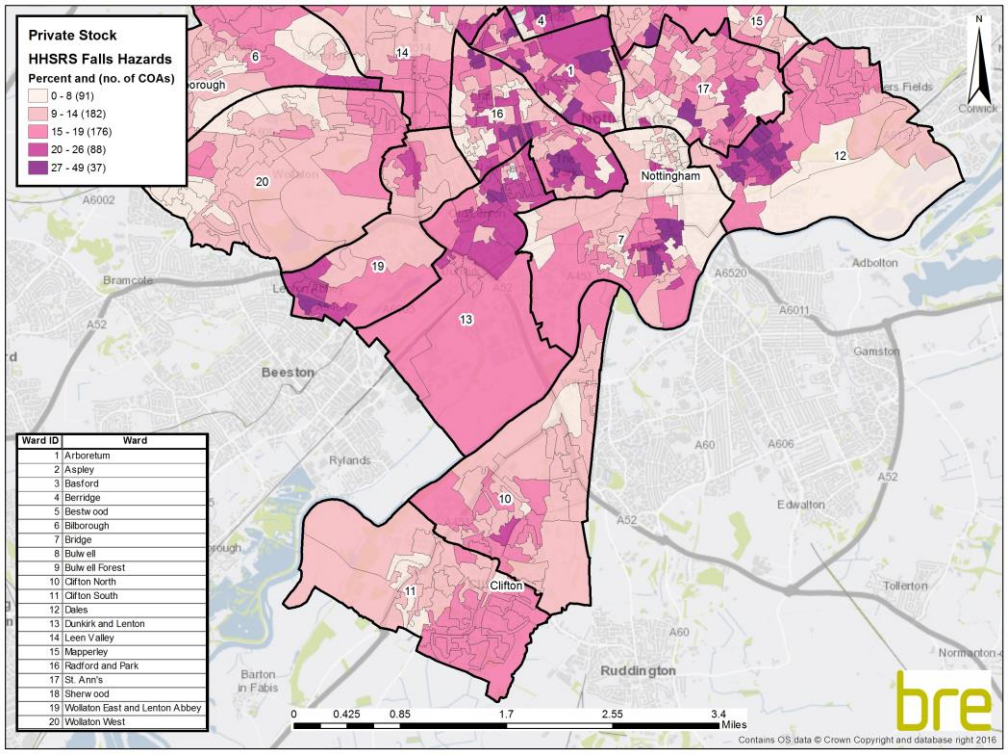
Map D. 4: Clifton households with excess cold – private stock *Return to main report*



Map D. 5: Central Nottingham households with falls hazards – private stock *Return to main report*



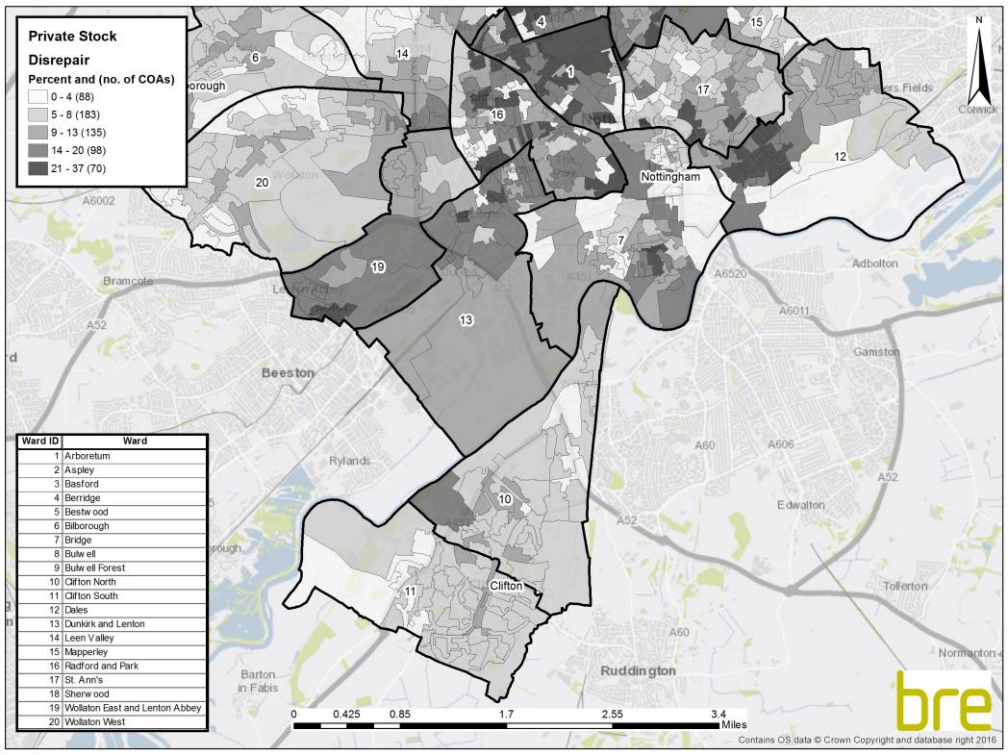
Map D. 6: Clifton households with falls hazards – private stock *Return to main report*



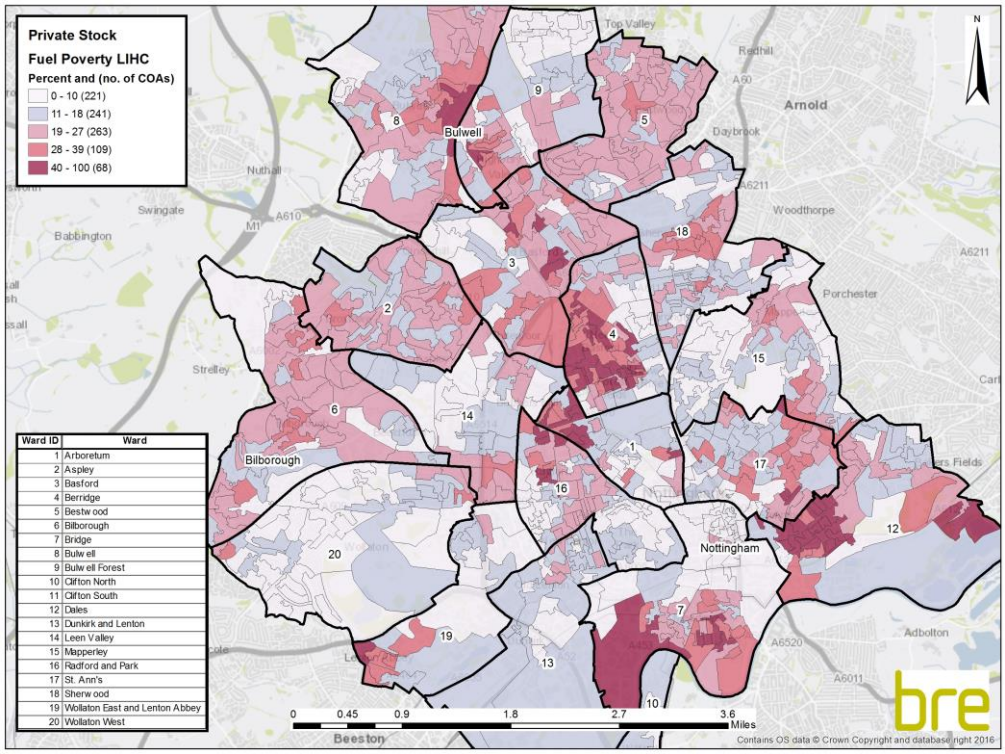
Map D. 7: Central Nottingham households in disrepair – private stock *Return to main report*



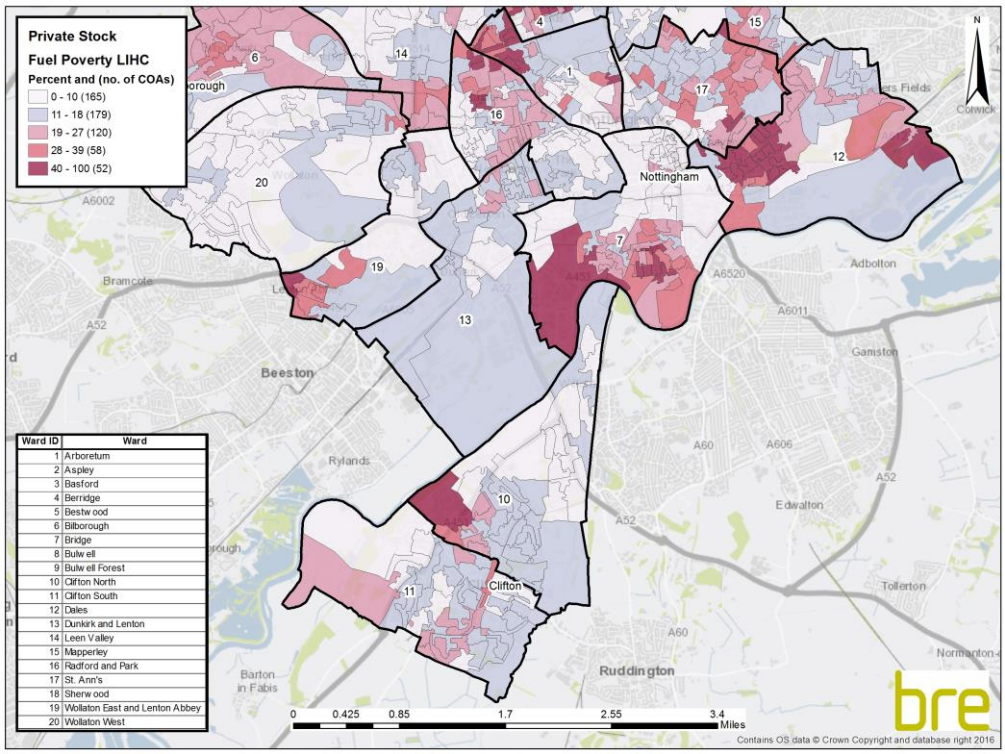
Map D. 8: Clifton households in disrepair – private stock *Return to main report*



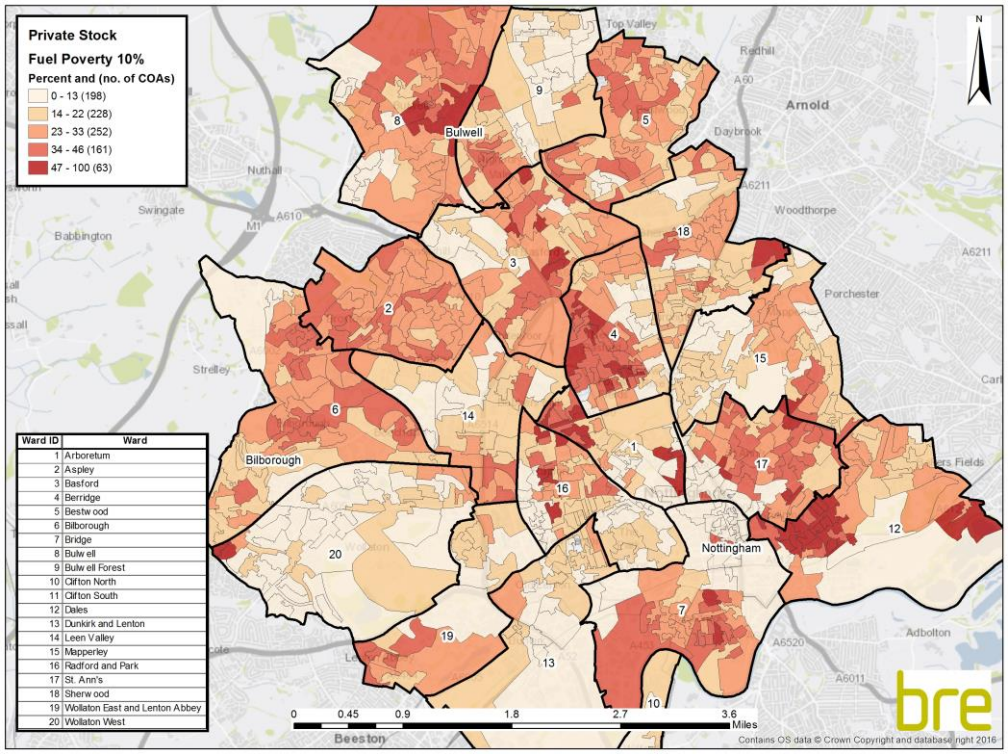
Map D. 9: Central Nottingham households in fuel poverty (LIHC definition) – private stock *Return to main report*



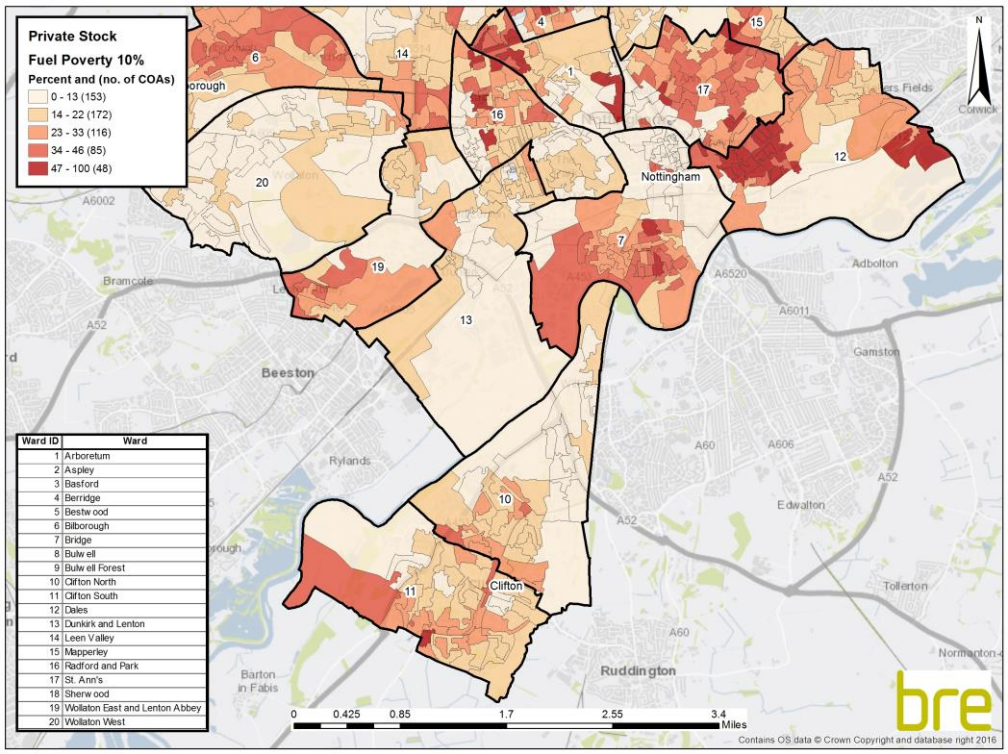
Map D. 10: Clifton households in fuel poverty (LIHC definition) – private stock *Return to main report*



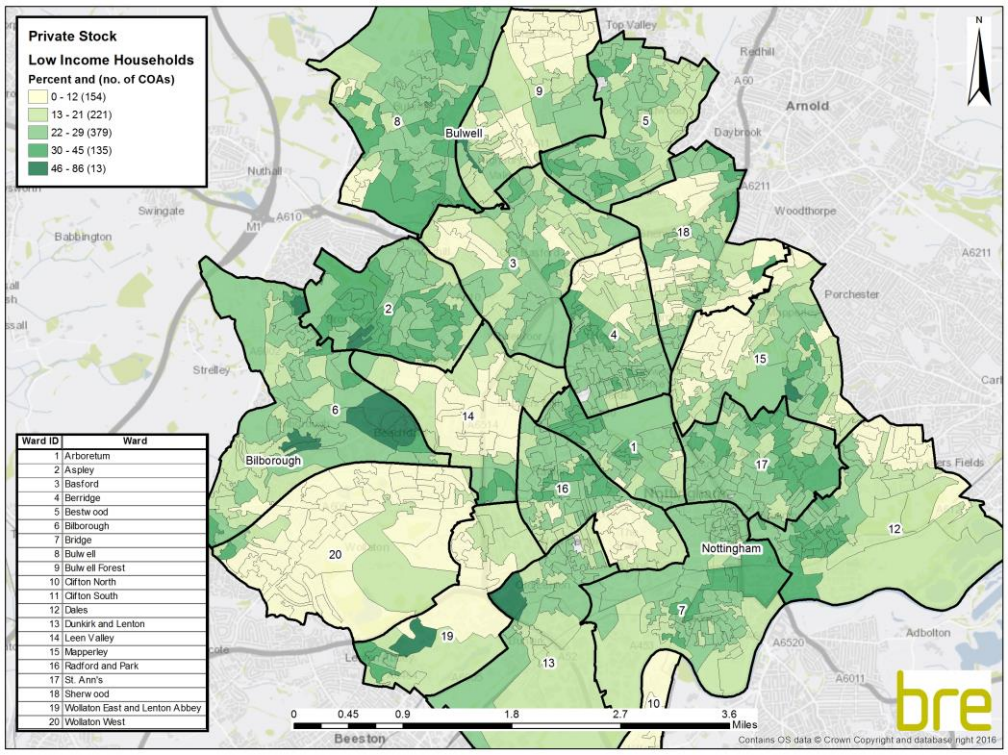
Map D. 11: Central Nottingham households in fuel poverty (10% definition) – private stock *Return to main report*



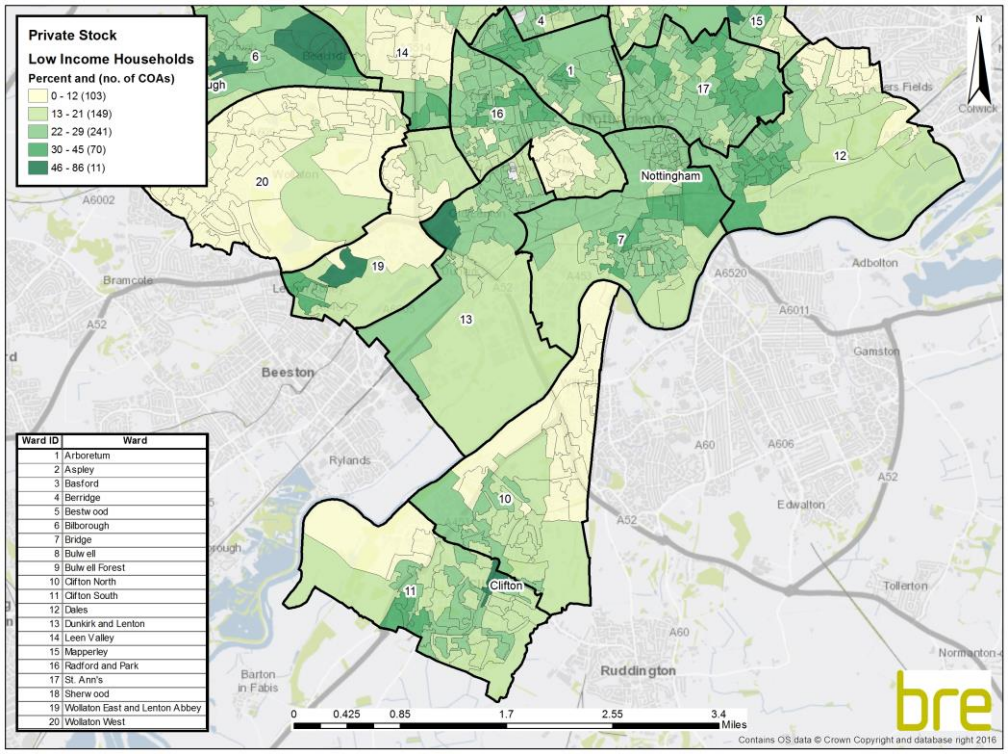
Map D. 12: Clifton households in fuel poverty (10% definition) – private stock *Return to main report*



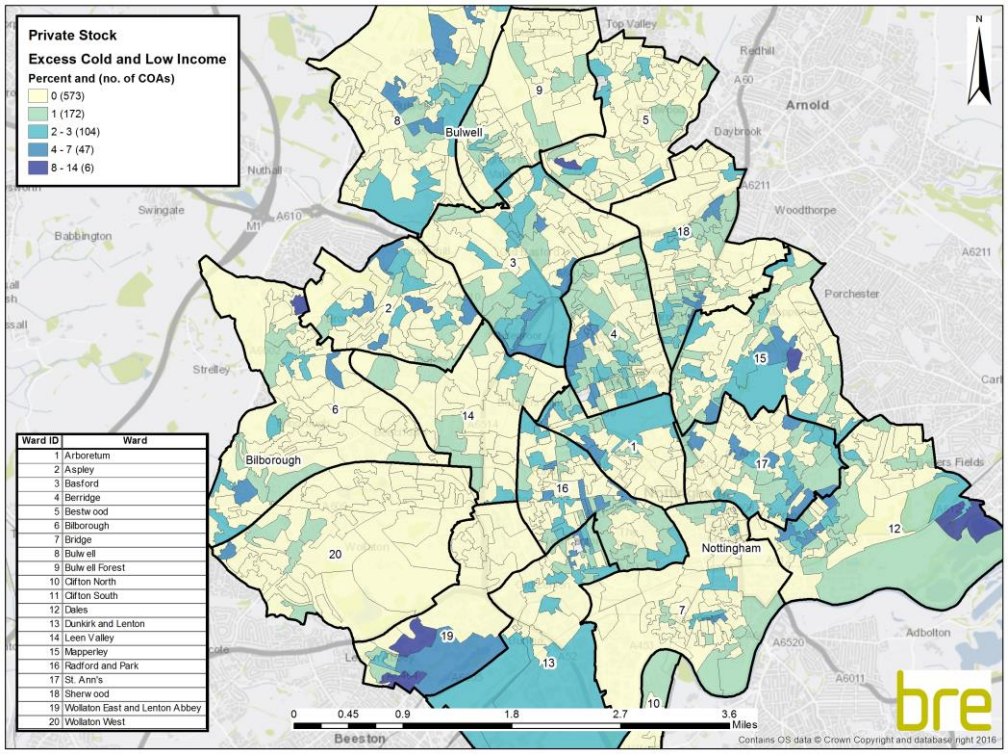
Map D. 13: Central Nottingham households in low income – private stock *Return to main report*



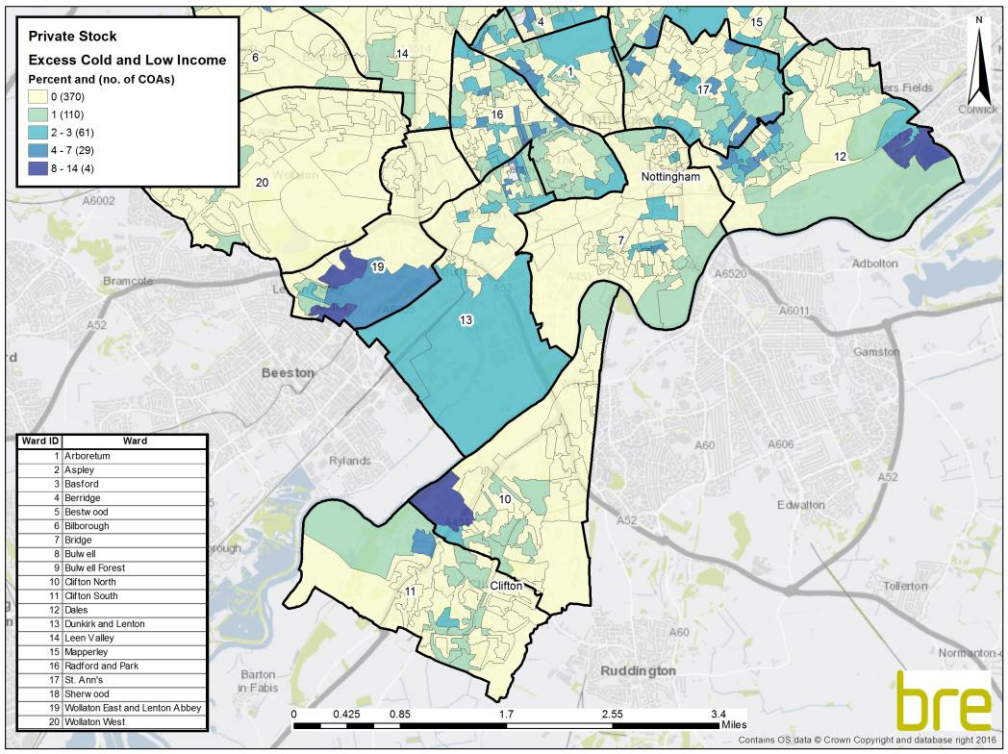
Map D. 14: Clifton households in low income – private stock *Return to main report*



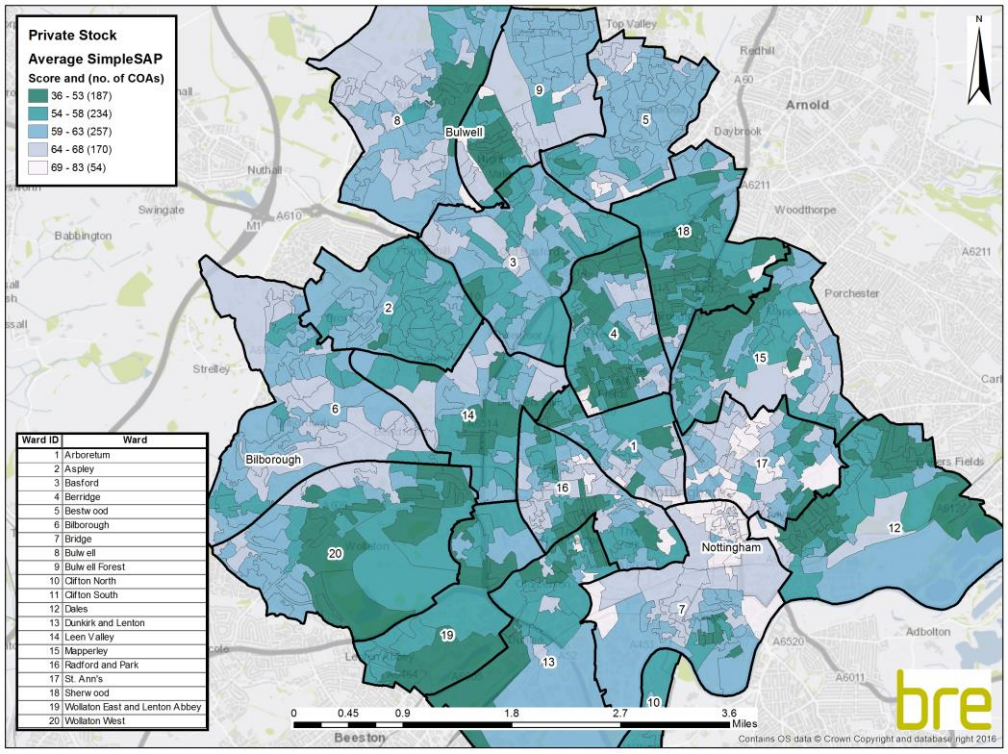
Map D. 15: Central Nottingham households with excess cold and in low income – private stock *Return to main report*



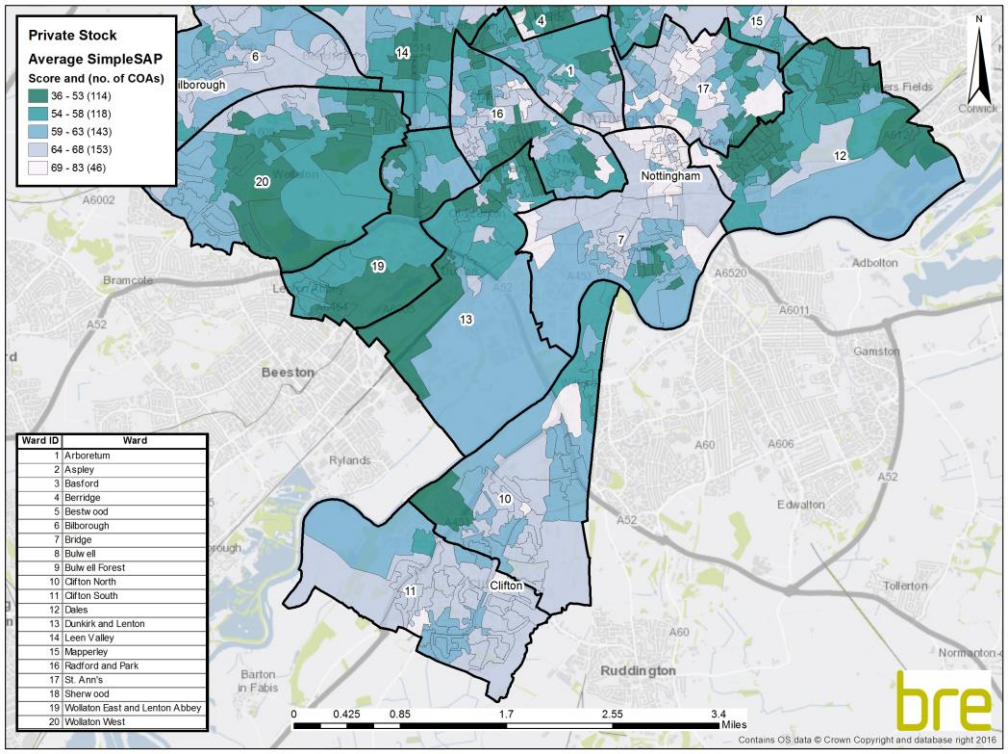
Map D. 16: Clifton households with excess cold and in low income – private stock *Return to main report*



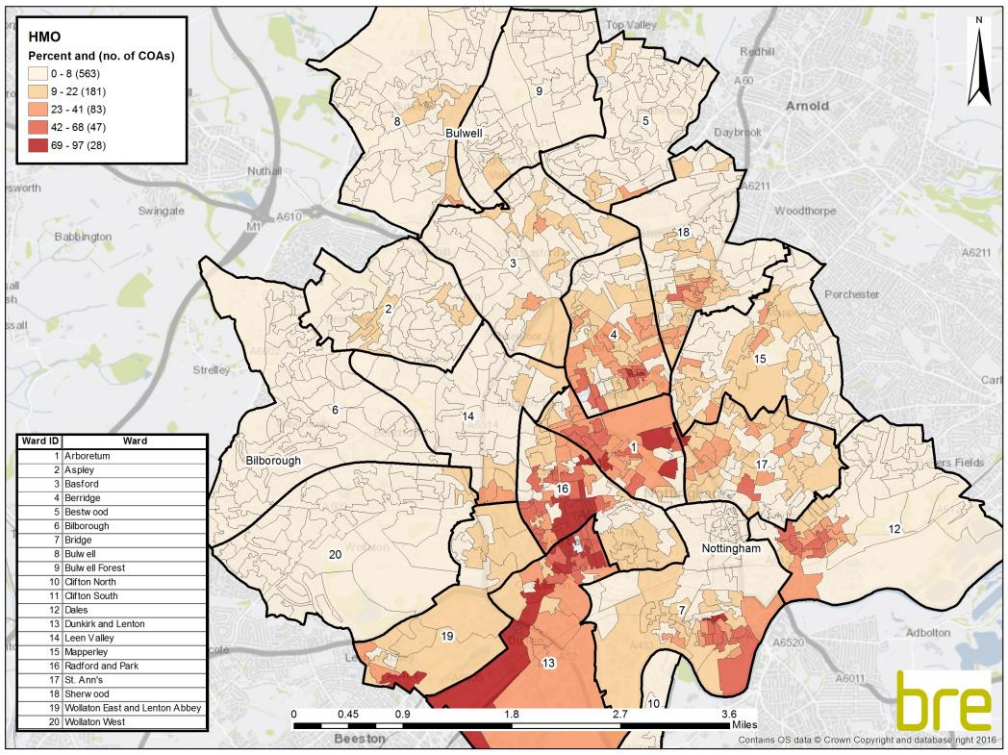
Map D. 17: Central Nottingham average SimpleSAP households – private stock *Return to main report*



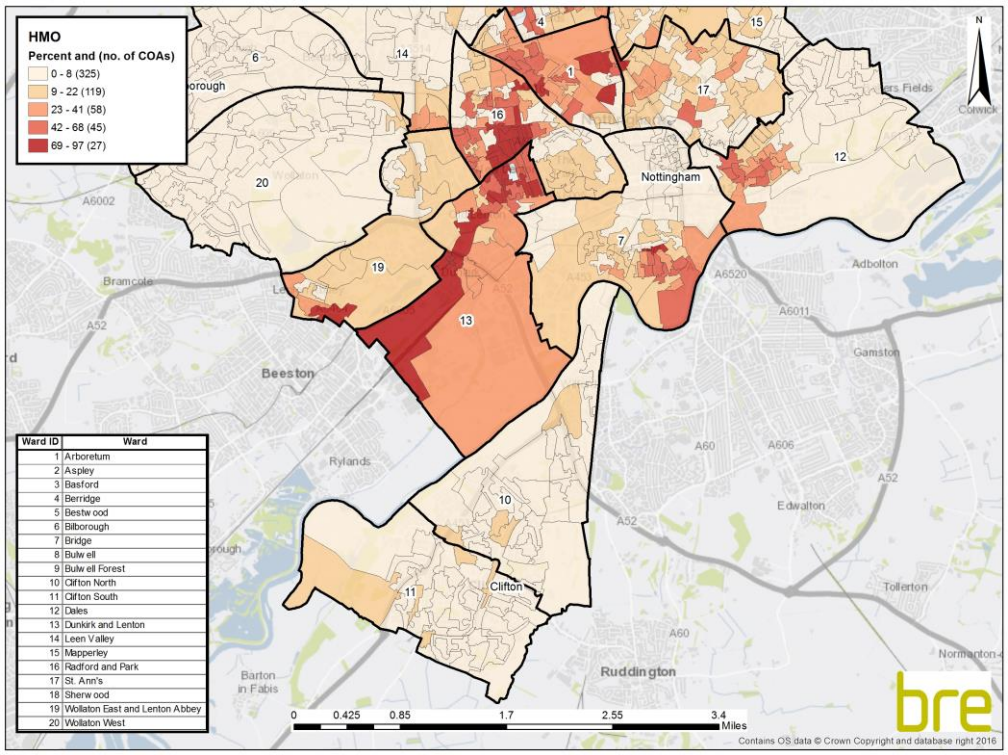
Map D. 18: Clifton average SimpleSAP households – private stock *Return to main report*



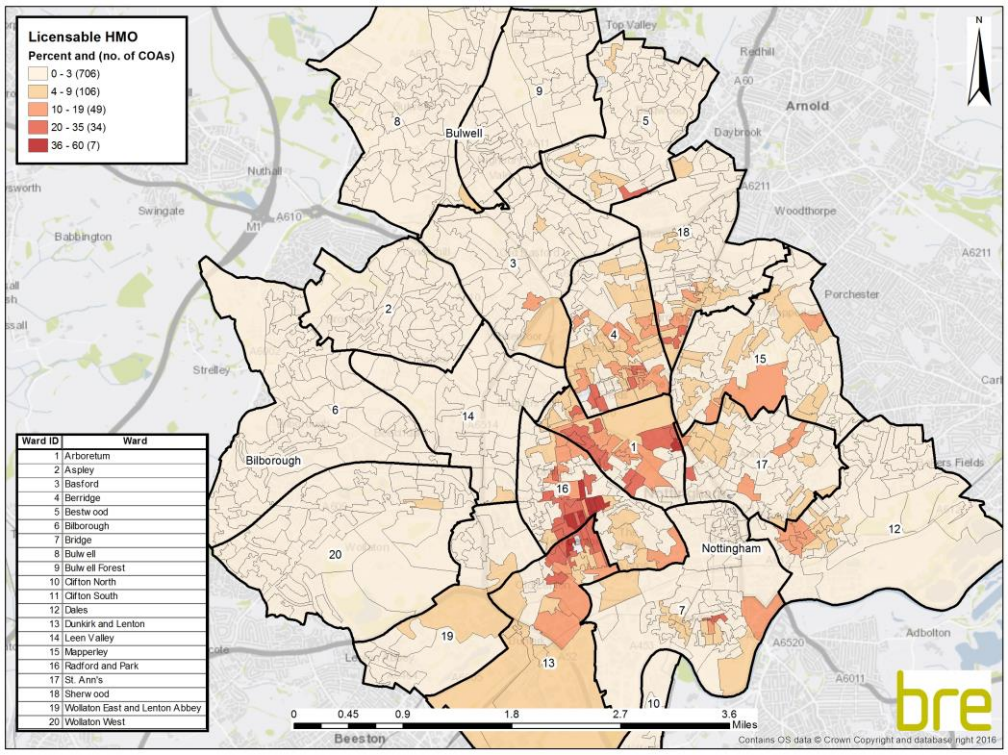
Map D. 19: Central Nottingham HMOs *Return to main report*



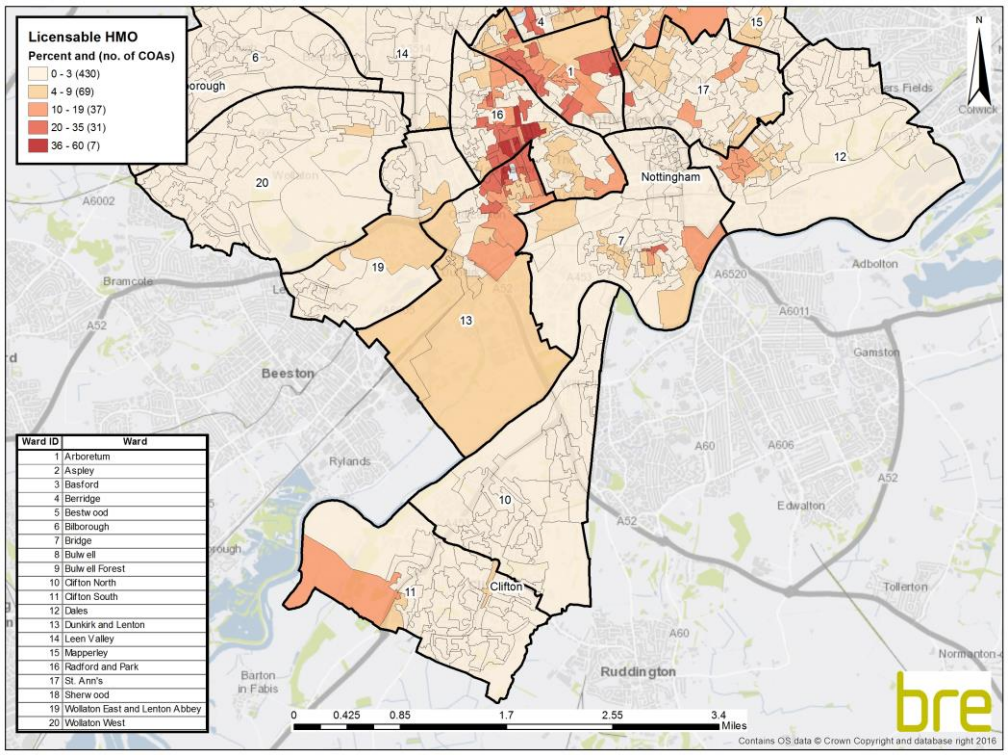
Map D. 20: Clifton HMOs *Return to main report*



Map D. 21: Central Nottingham licensable HMOs *Return to main report*



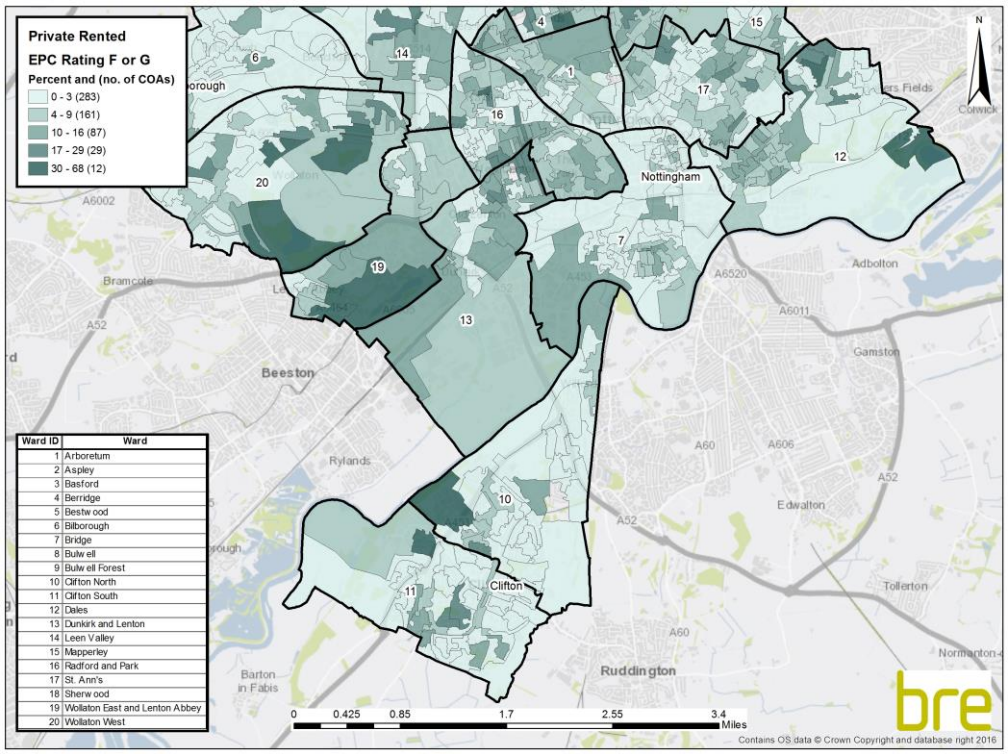
Map D. 22: Clifton licensable HMOs – private stock *Return to main report*



Map D. 23: Central Nottingham households with EPC ratings F or G – private rented *Return to main report*



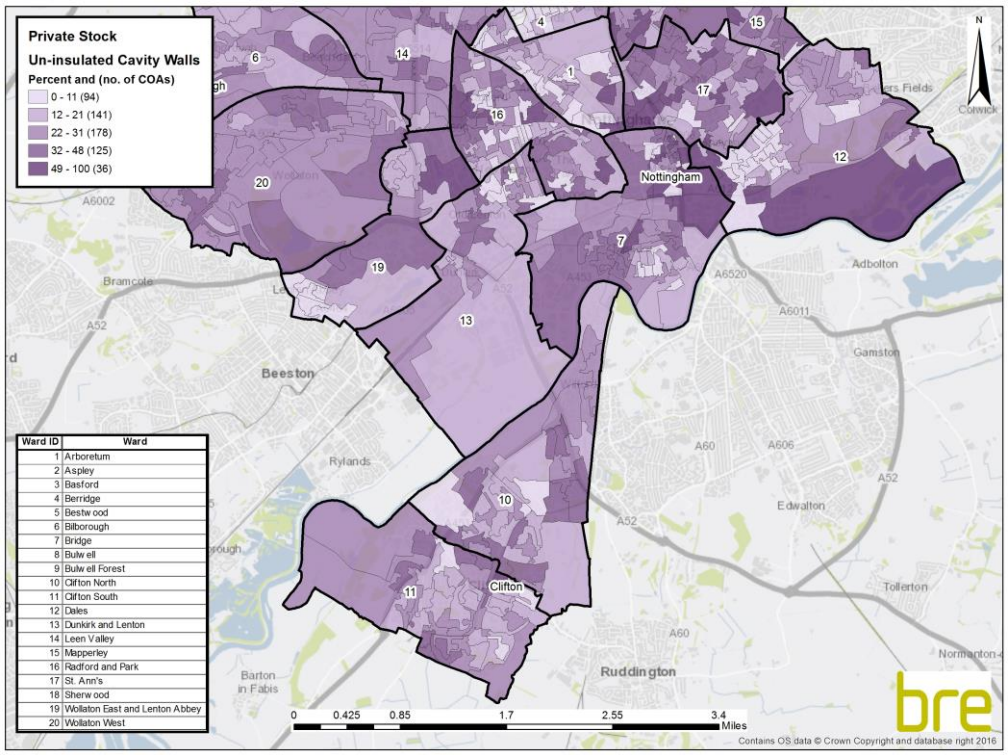
Map D. 24: Clifton households with EPC ratings F or G – private rented *Return to main report*



Map D. 25: Central Nottingham un-insulated cavity wall households - private stock *Return to main report*



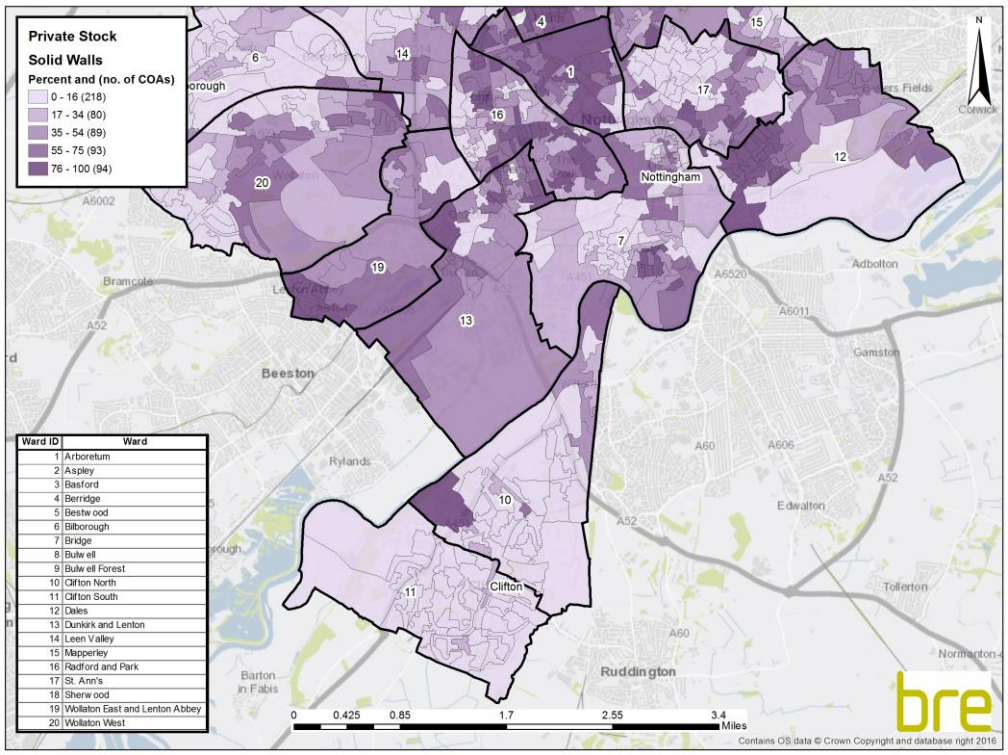
Map D. 26: Clifton un-insulated cavity wall households – private stock *Return to main report*



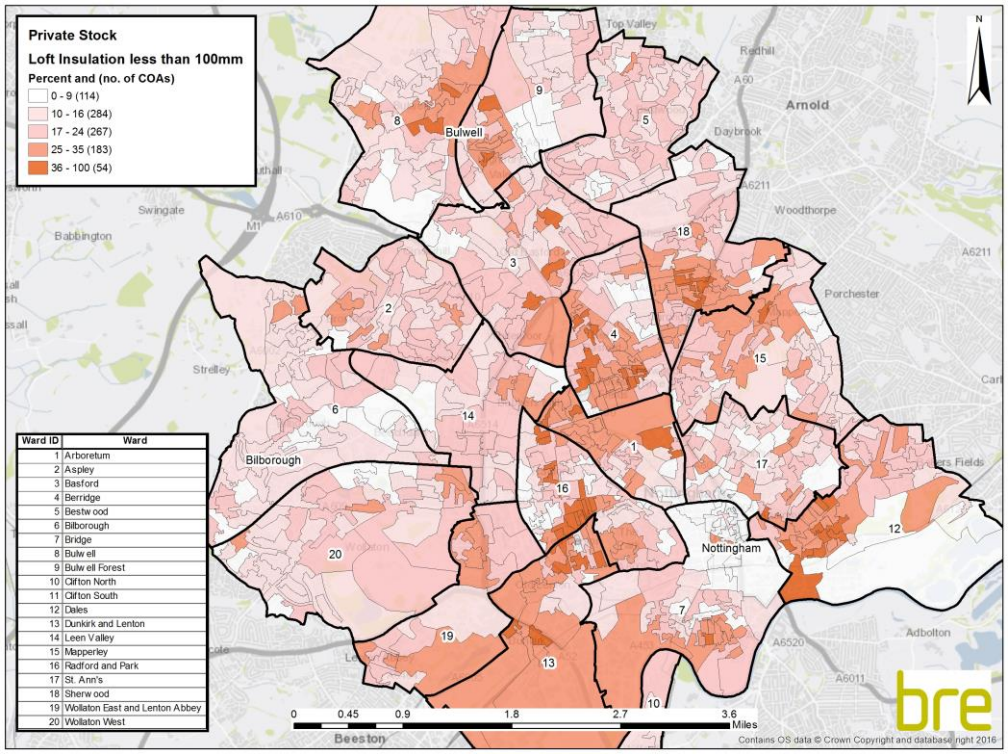
Map D. 27: Central Nottingham solid wall households – private stock *Return to main report*



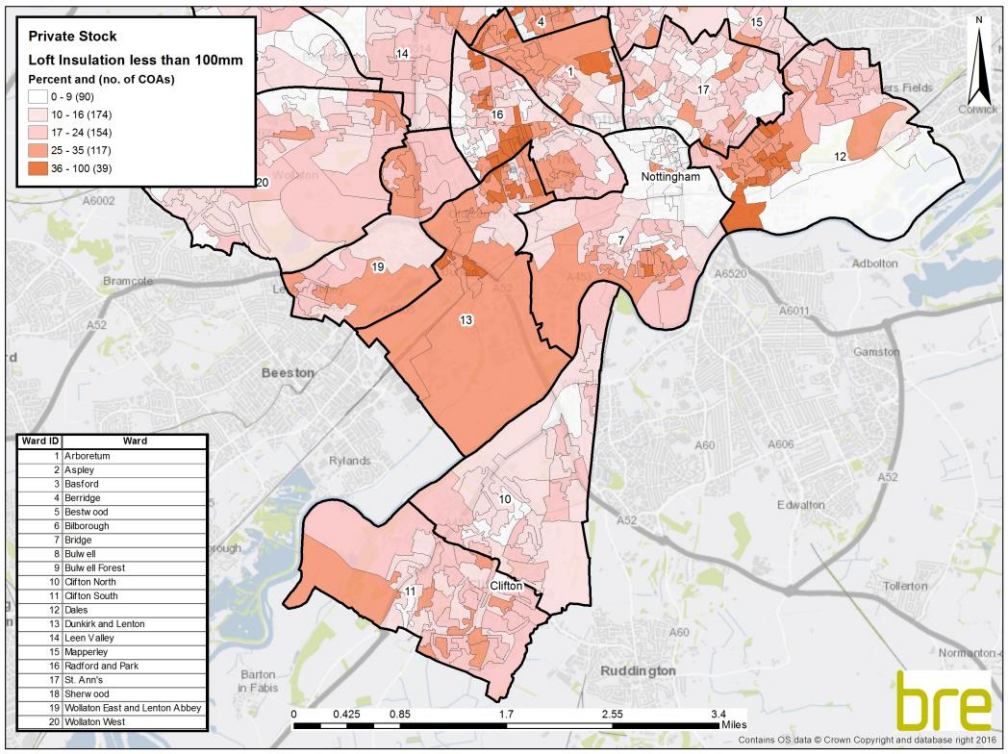
Map D. 28: Clifton solid wall households – private stock *Return to main report*



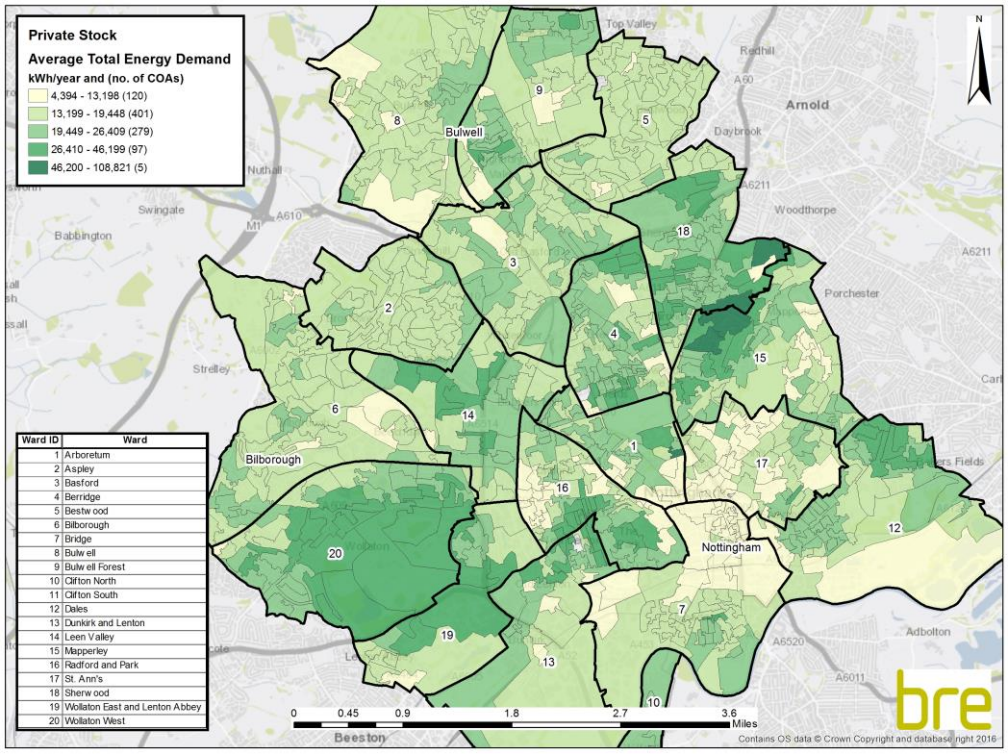
Map D. 29: Central Nottingham households with less than 100mm loft insulation – private stock *Return to main report*



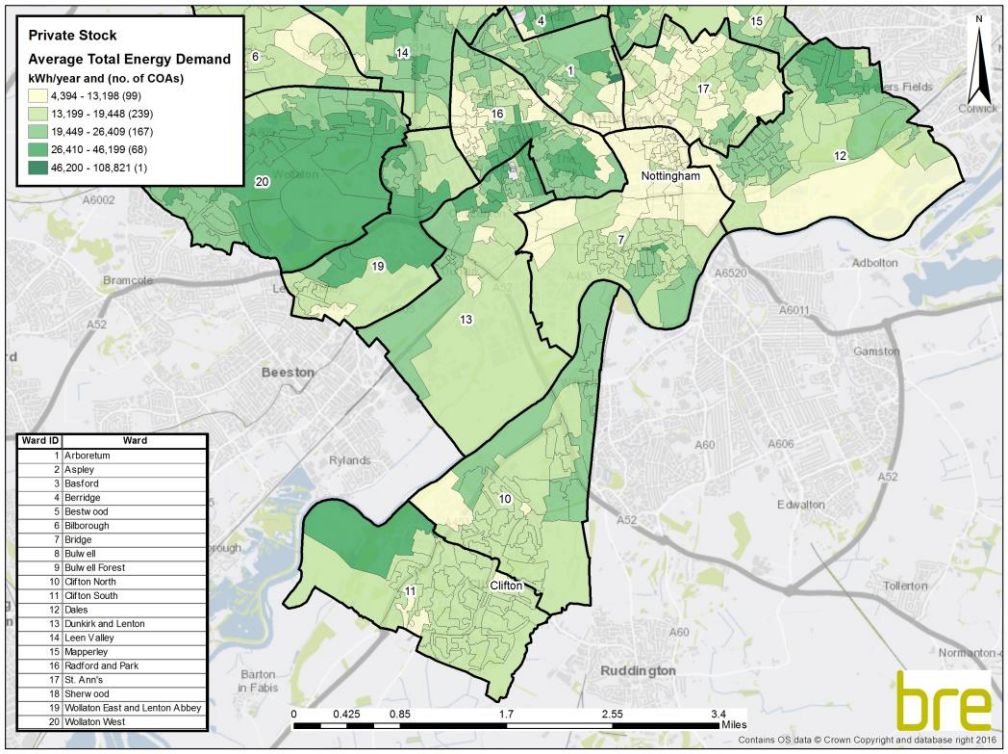
Map D. 30: Clifton households with less than 100mm loft insulation – private stock *Return to main report*



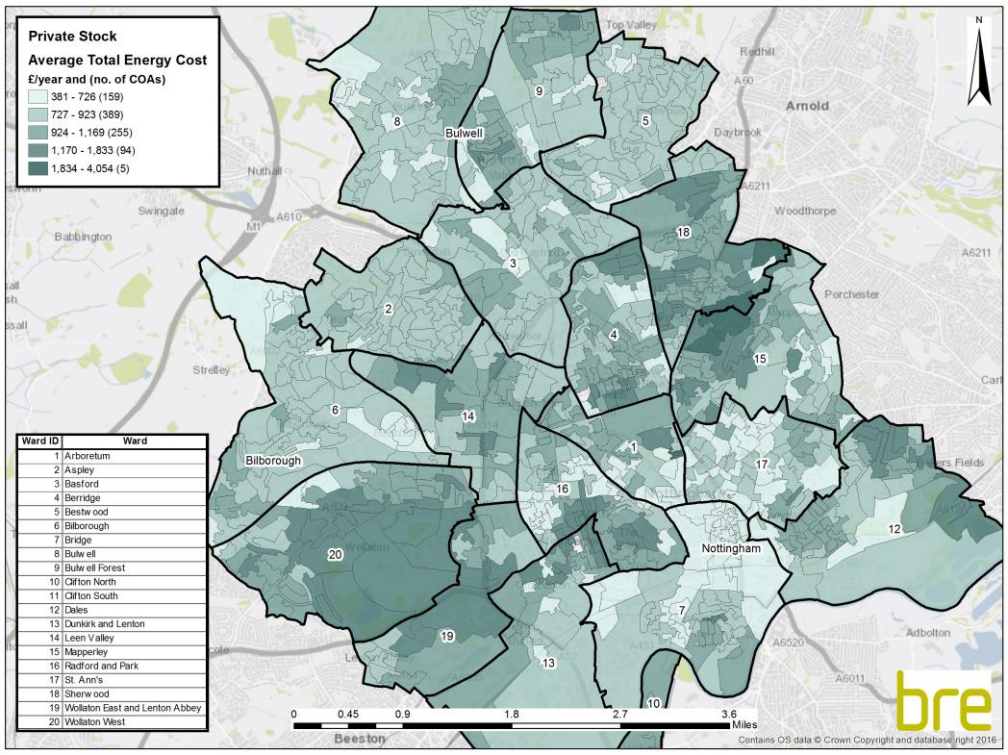
Map D. 31: Central Nottingham total energy demand – private stock *Return to main report*



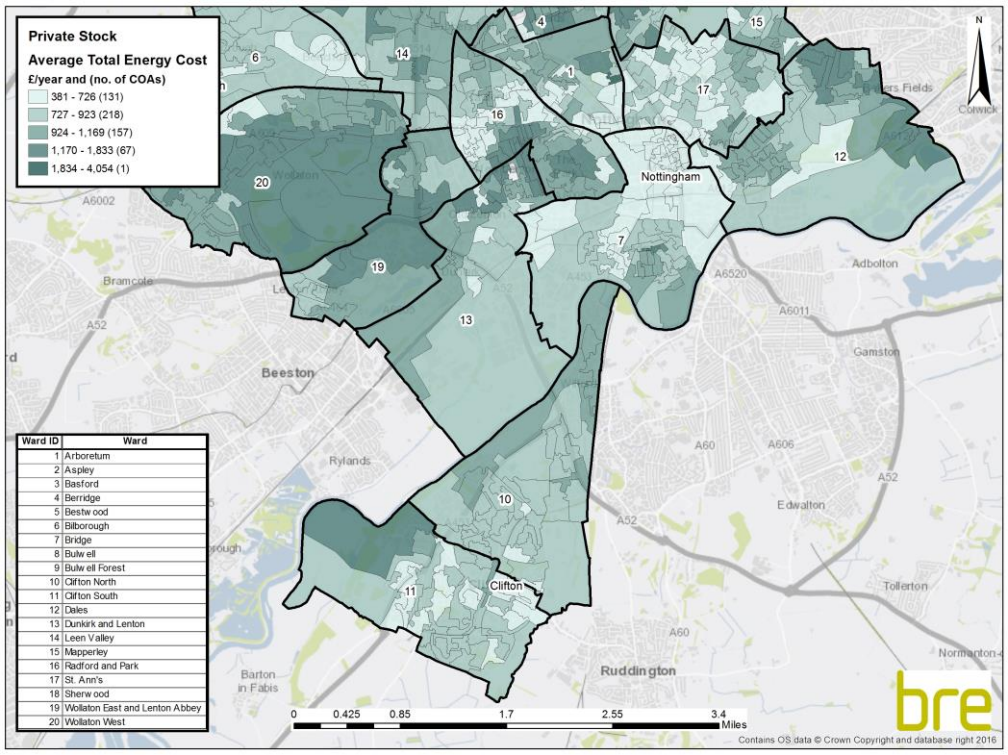
Map D. 32: Clifton total energy demand – private stock *Return to main report*



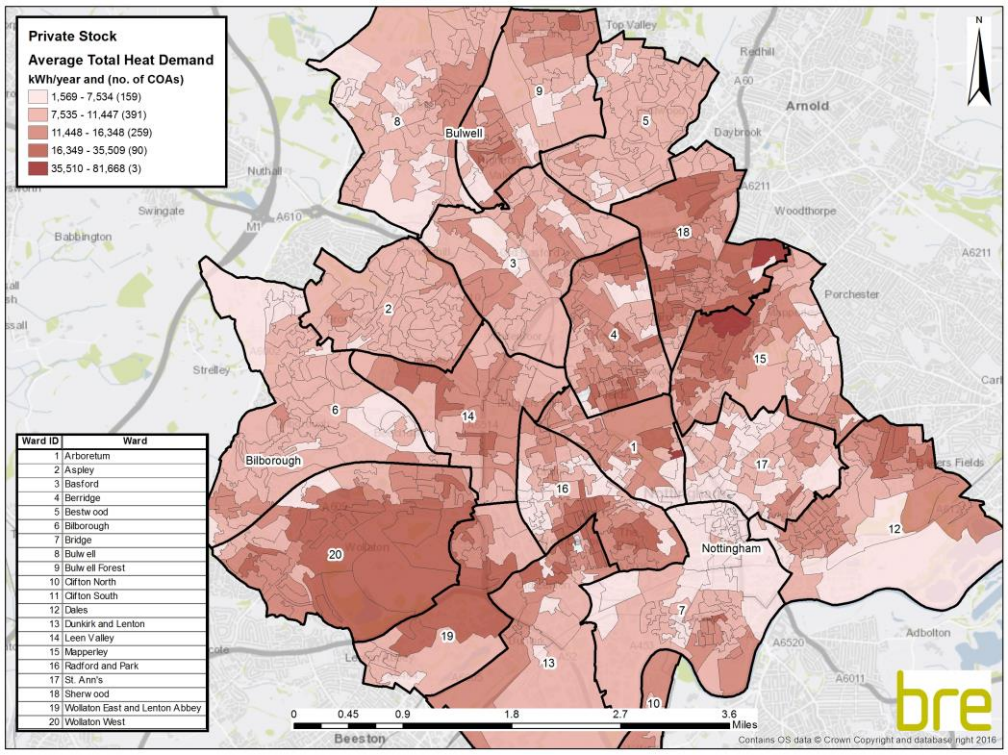
Map D. 33: Central Nottingham total energy cost – private stock *Return to main report*



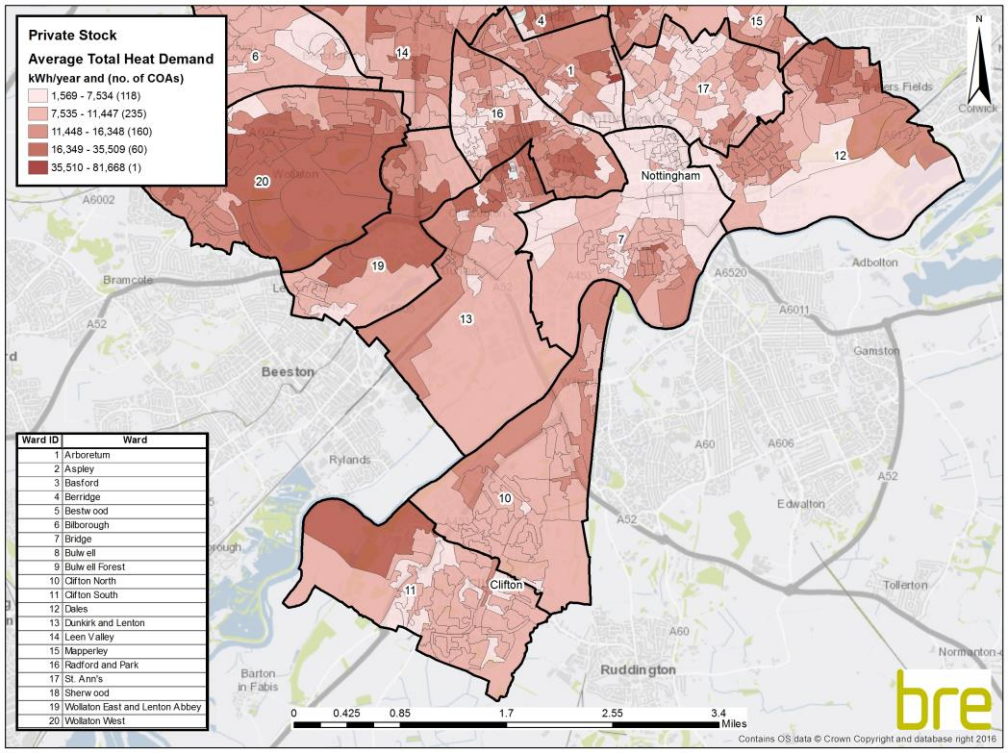
Map D. 34: Clifton total energy cost – private stock *Return to main report*



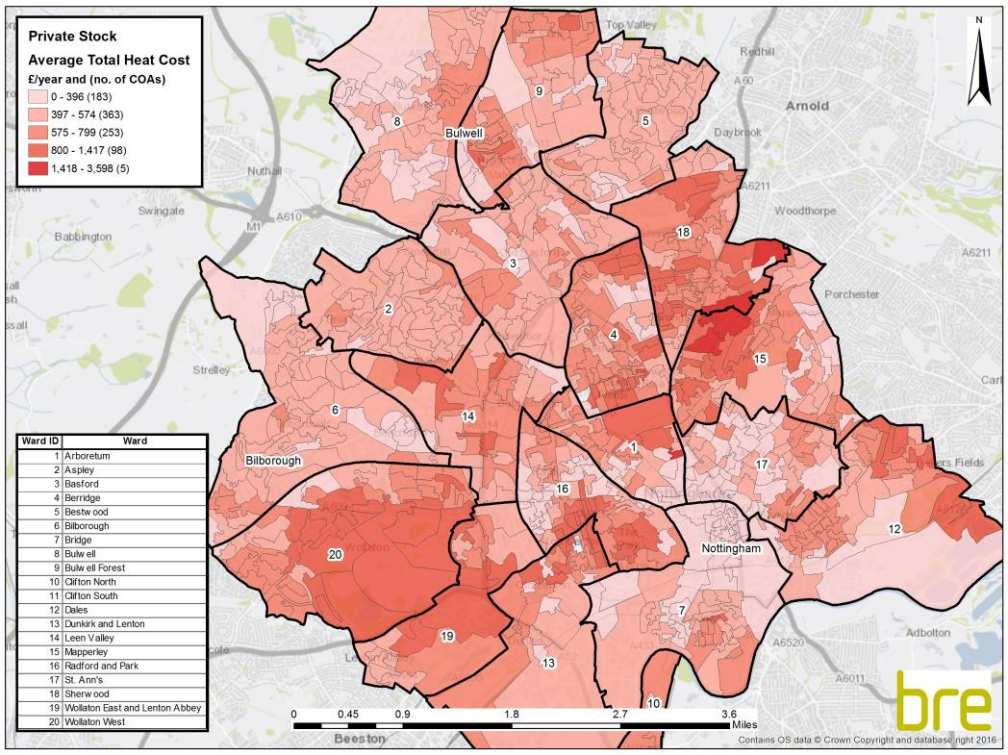
Map D. 35: Central Nottingham total heat demand – private stock *Return to main report*



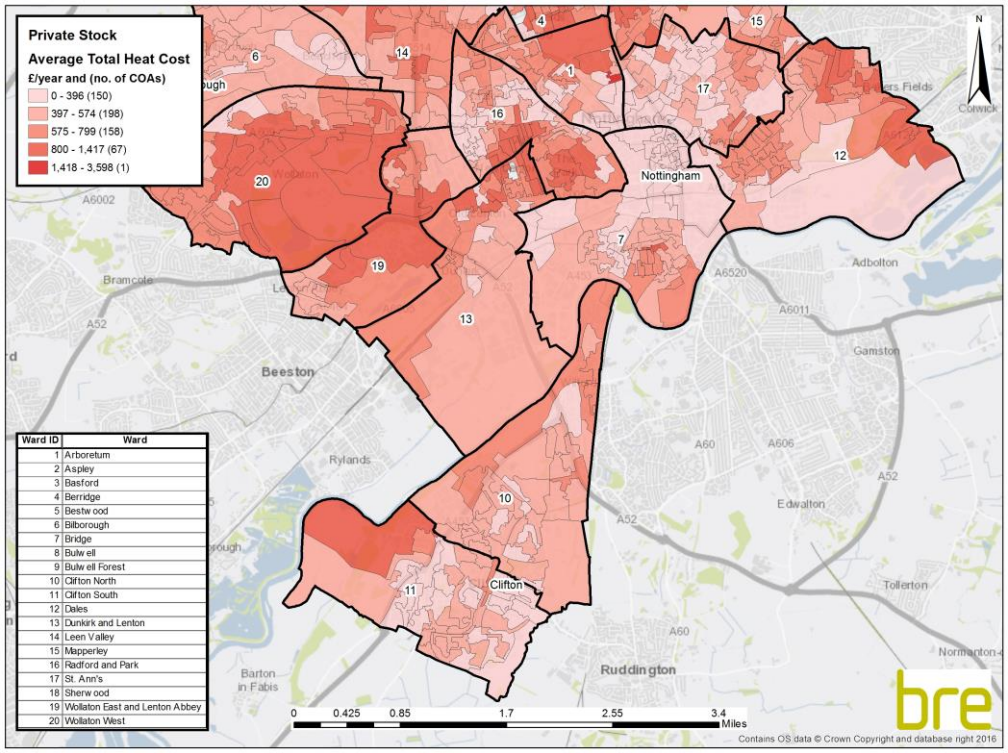
Map D. 36: Clifton total heat demand – private stock *Return to main report*



Map D. 37: Central Nottingham total heat cost – private stock *Return to main report*



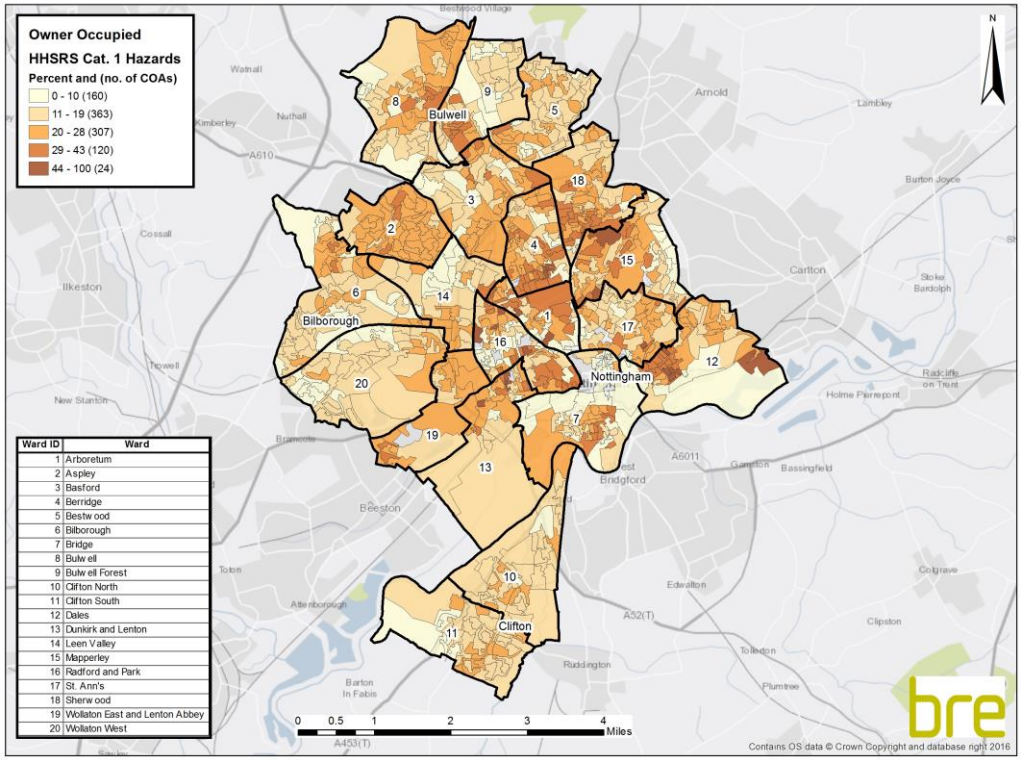
Map D. 38: Clifton total heat cost – private stock *Return to main report*



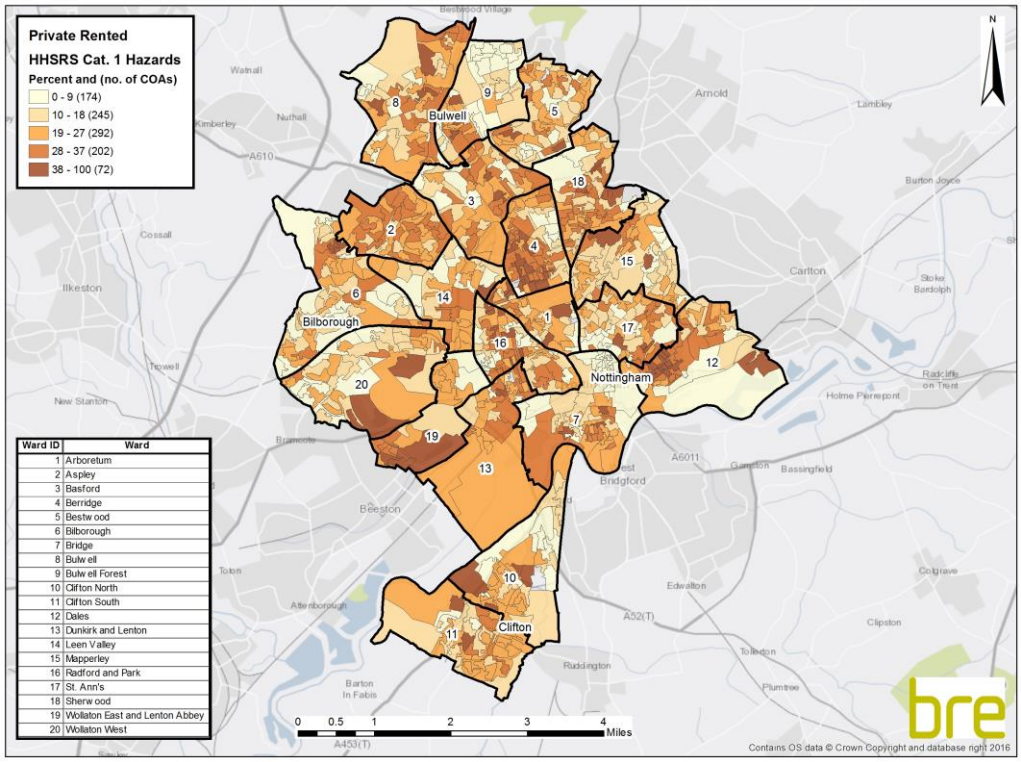
Appendix E Owner occupied and private rented sector maps

This Appendix provides maps for the owner occupied and private rented sector.

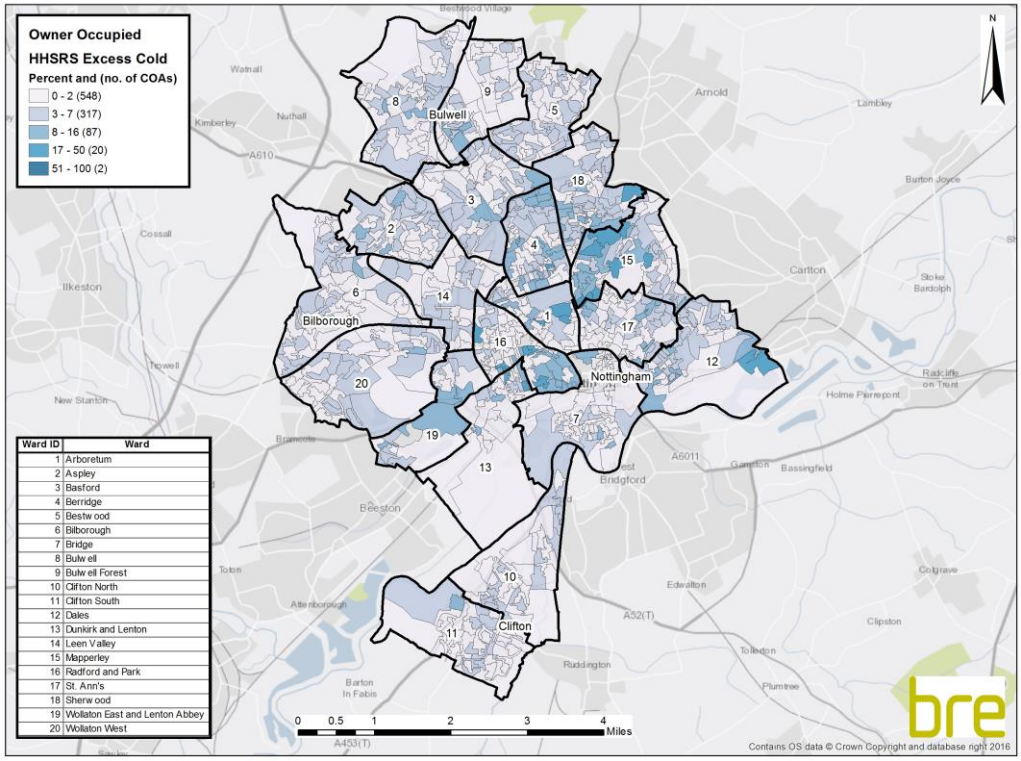
Map E. 1: Category 1 hazards – owner occupied stock *Return to main report*



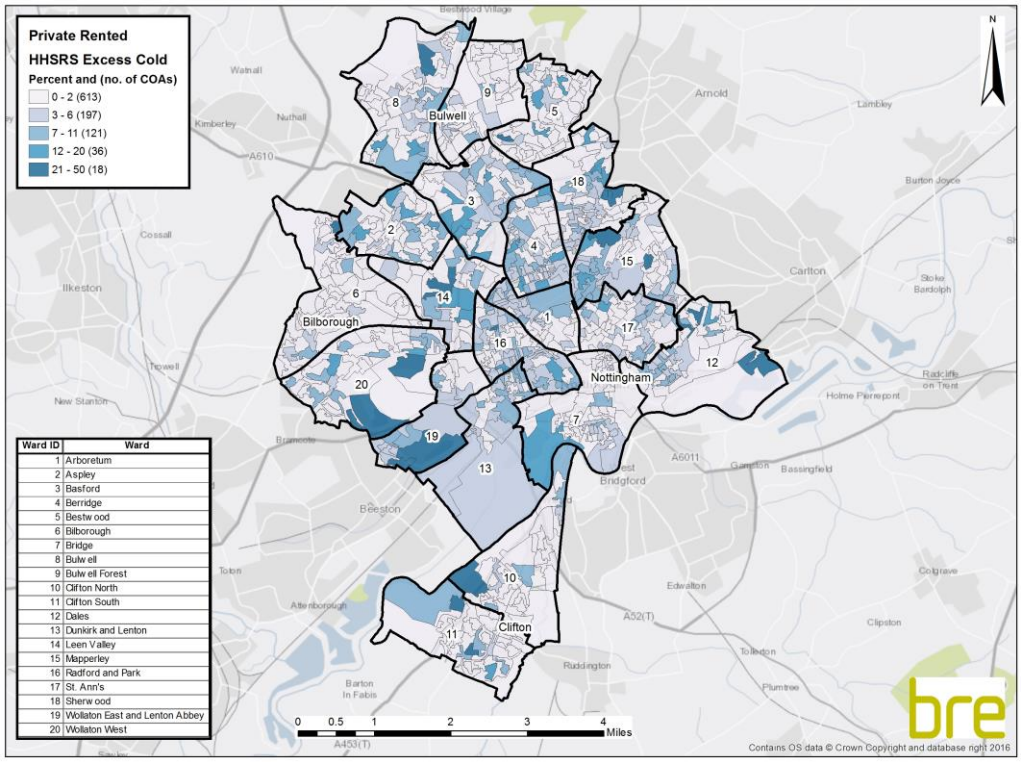
Map E. 2: Category 1 hazards – private rented stock *Return to main report*



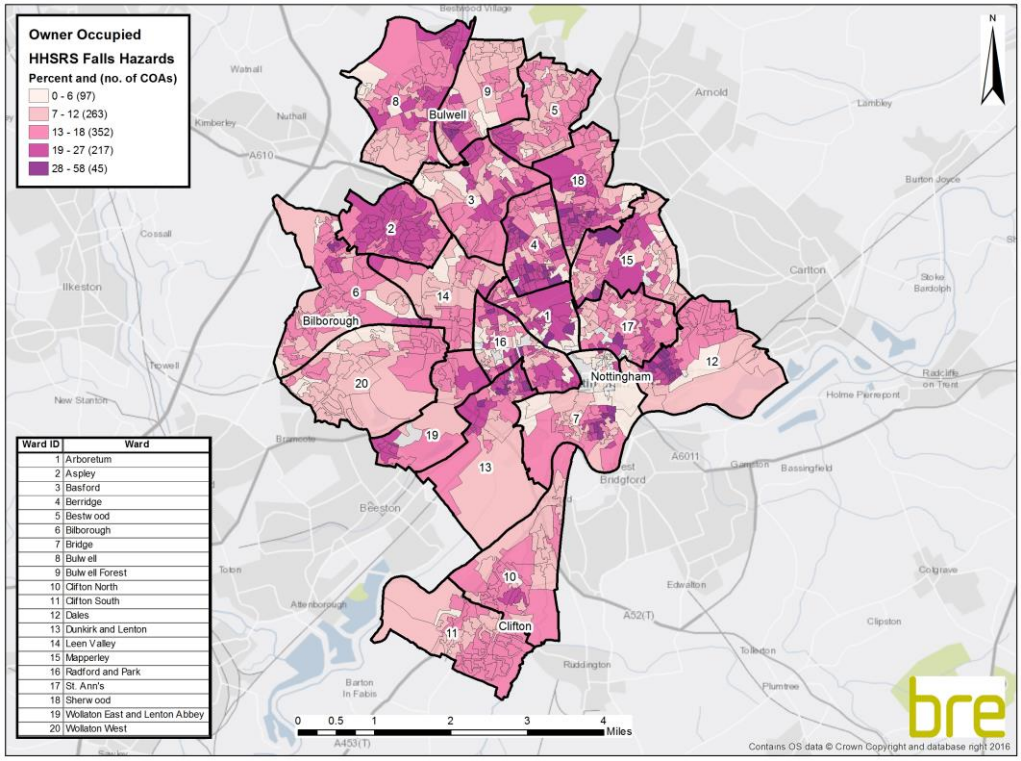
Map E. 3: Households with excess cold – owner occupied stock *Return to main report*



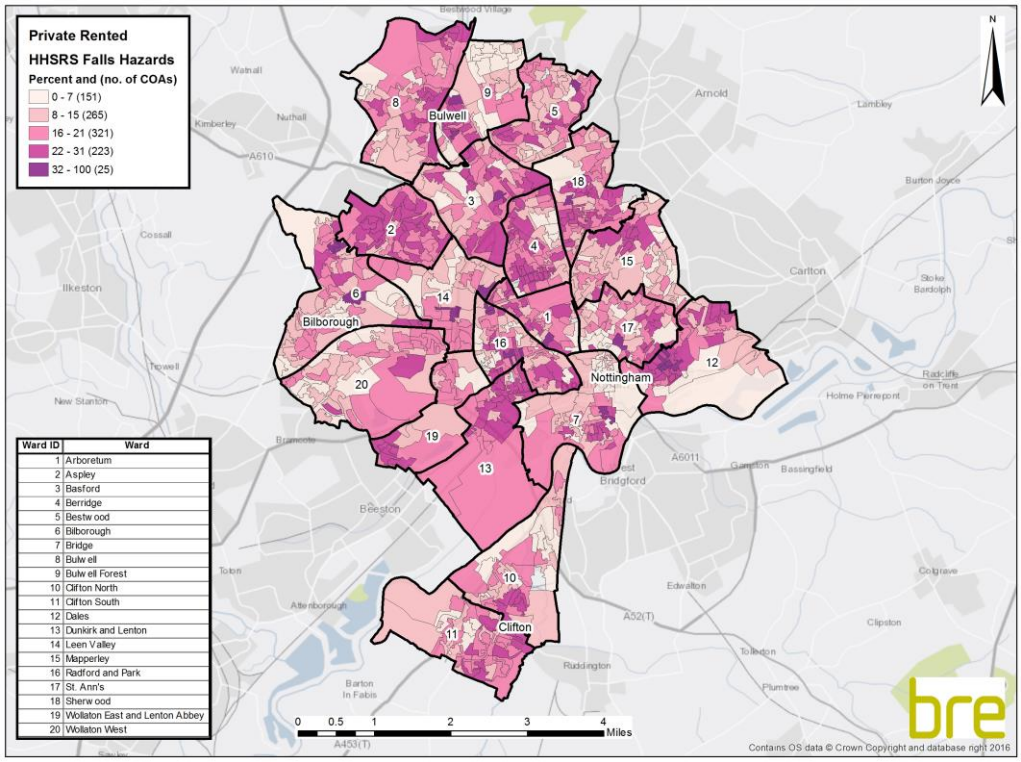
Map E. 4: Households with excess cold – private rented stock *Return to main report*



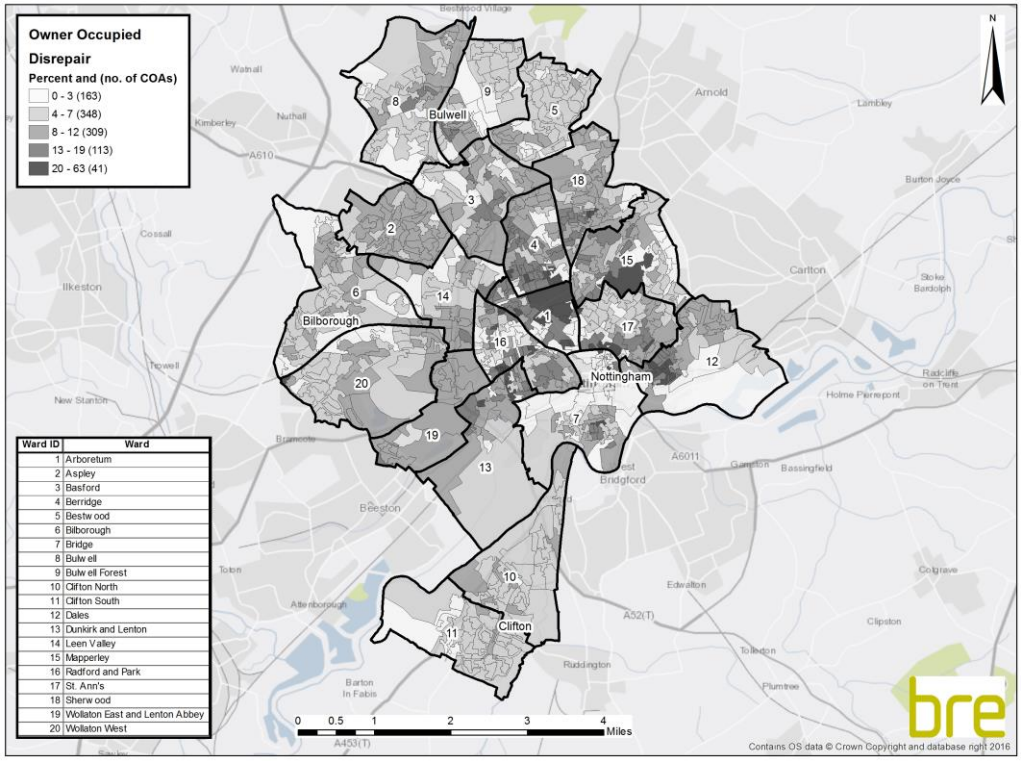
Map E. 5: Households with falls hazards – owner occupied stock *Return to main report*



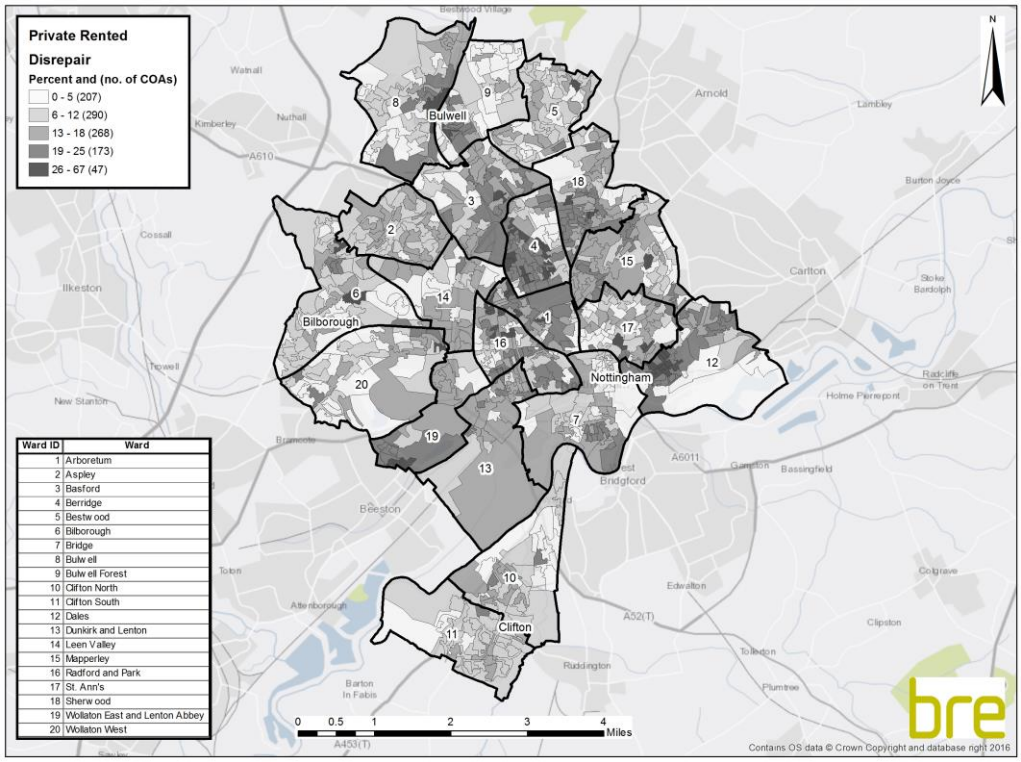
Map E. 6: Households with falls hazards – private rented stock *Return to main report*



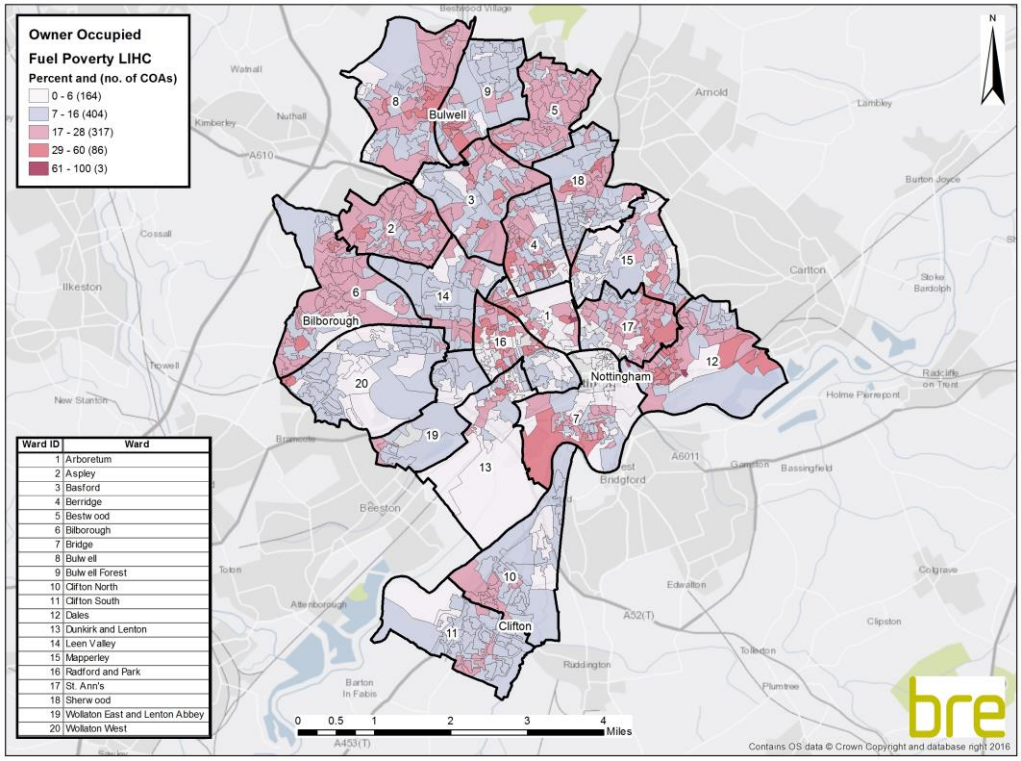
Map E. 7: Households in disrepair – owner occupied stock *Return to main report*



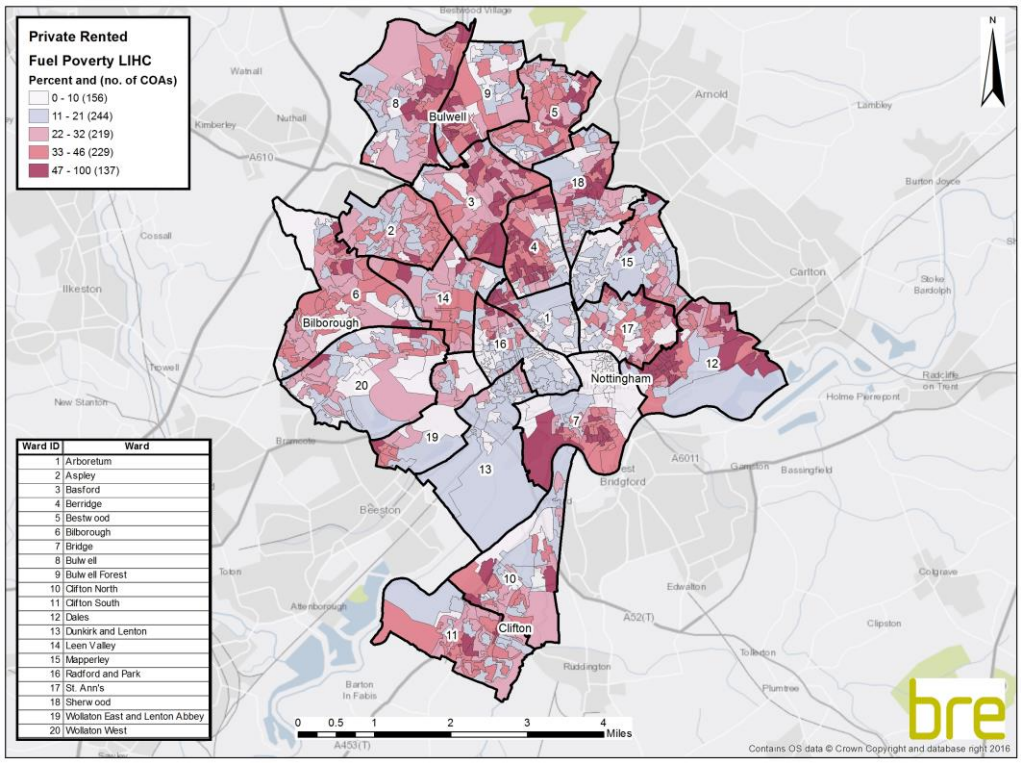
Map E. 8: Households in disrepair – private rented stock *Return to main report*



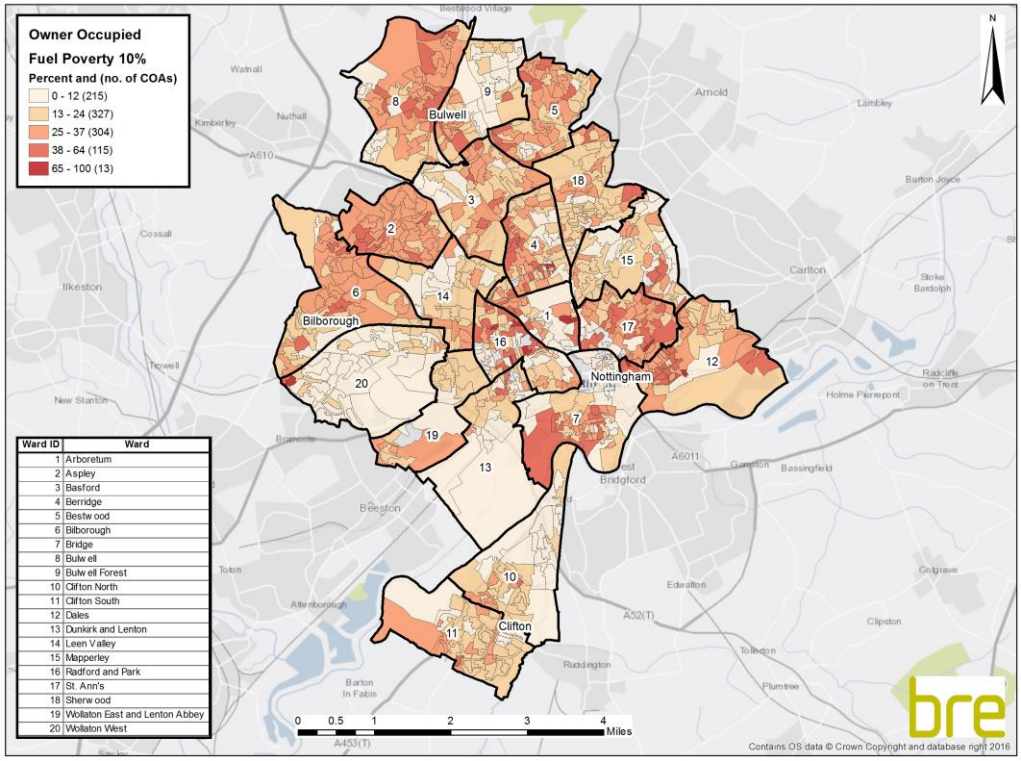
Map E. 9: Households in fuel poverty (LIHC definition) – owner occupied stock *Return to main report*



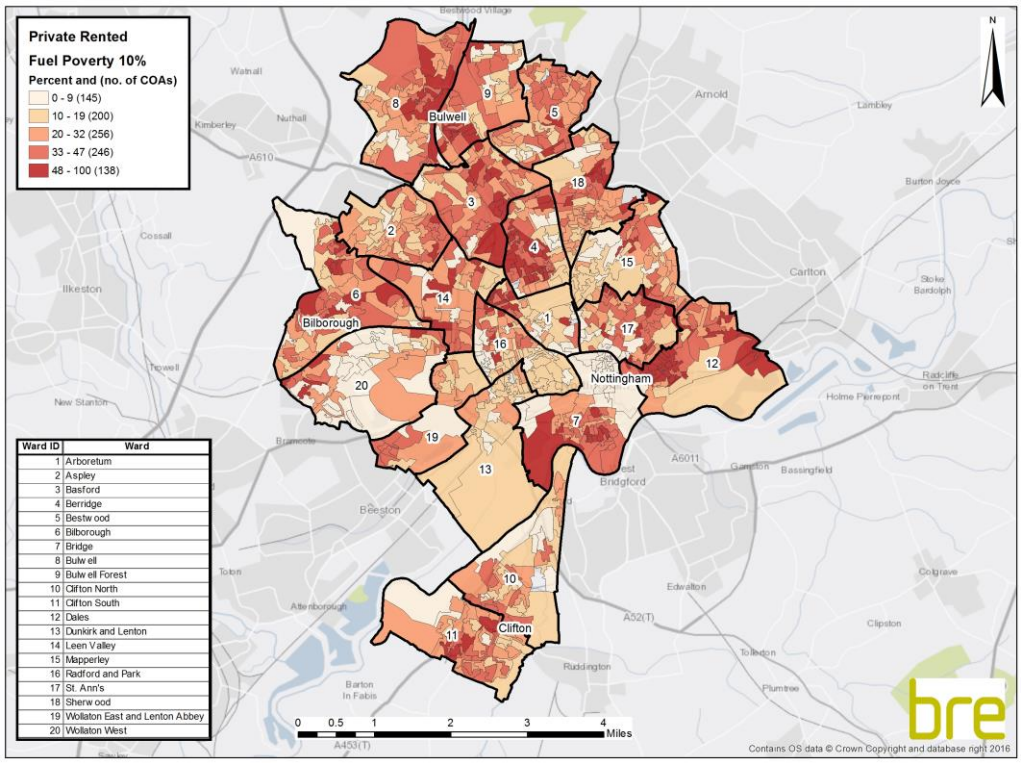
Map E. 10: Households in fuel poverty (LIHC definition) – private rented stock *Return to main report*



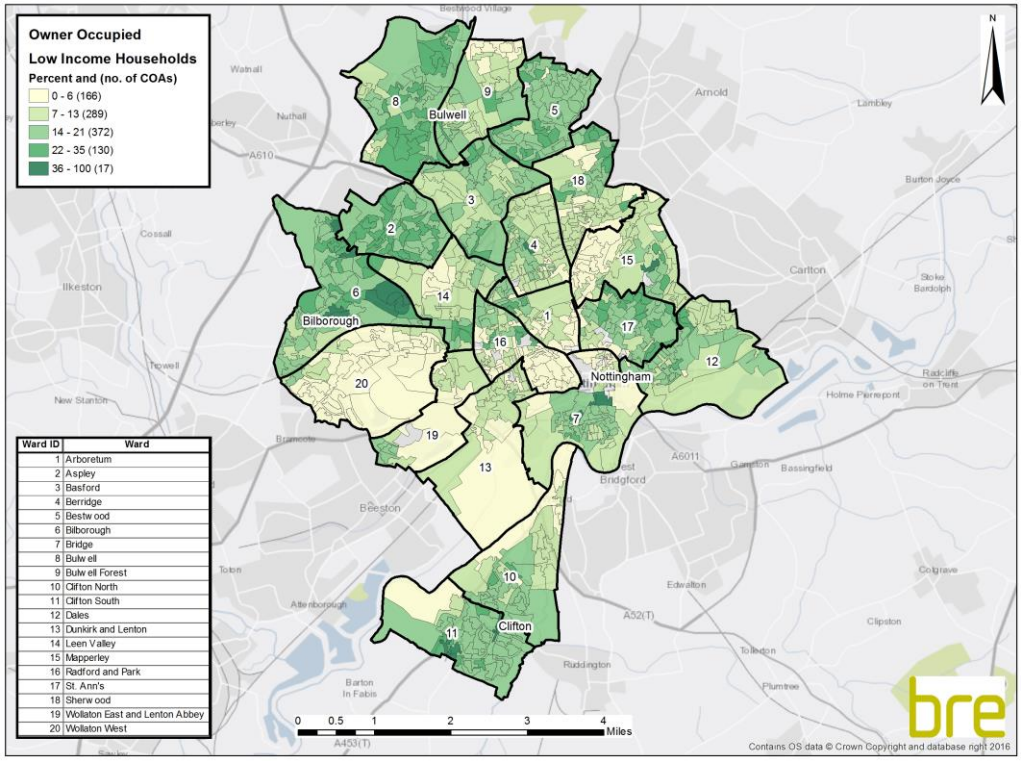
Map E. 11: Households in fuel poverty (10% definition) – owner occupied stock *Return to main report*



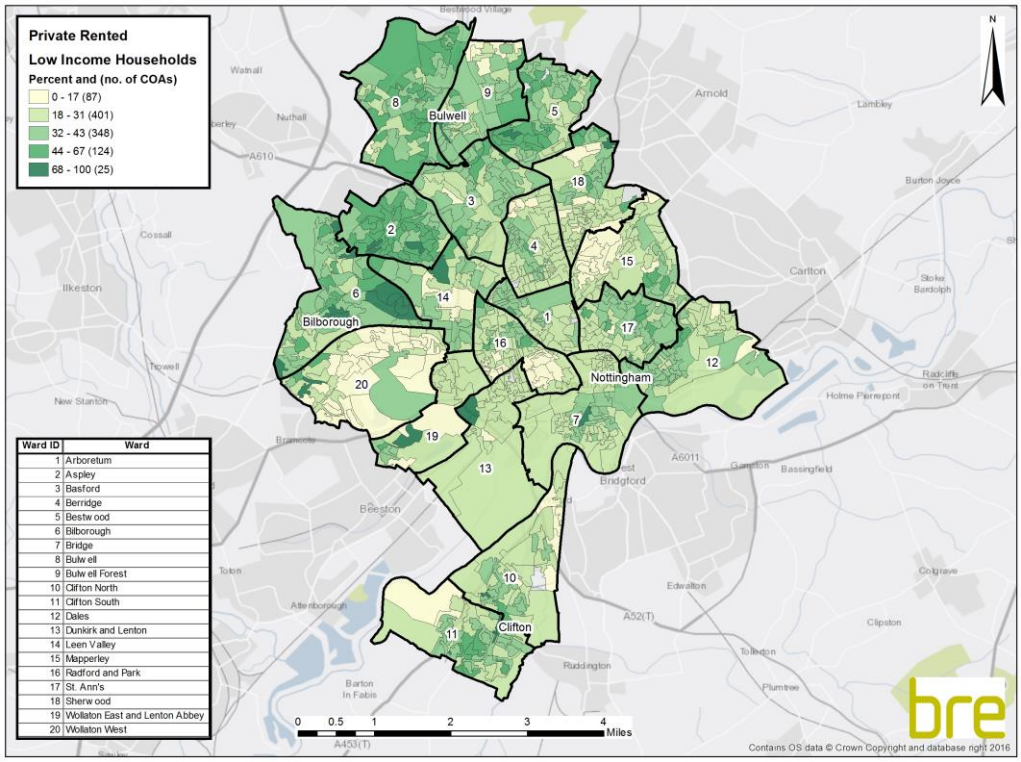
Map E. 12: Households in fuel poverty (10% definition) – private rented stock *Return to main report*



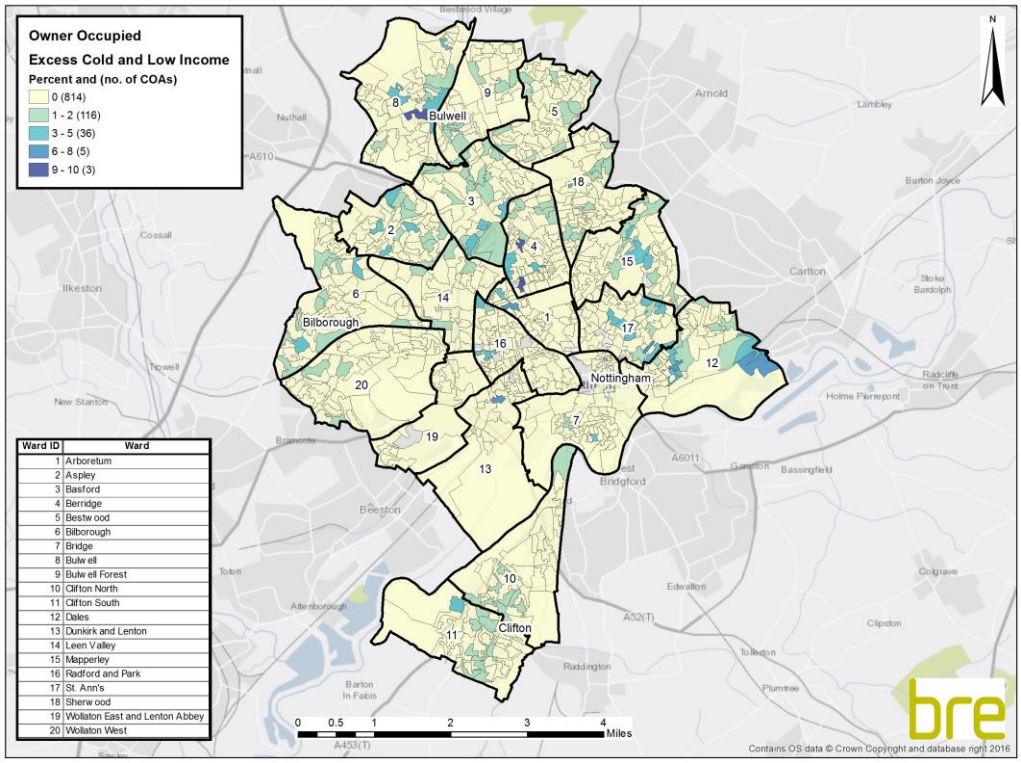
Map E. 13: Households in low income – owner occupied stock *Return to main report*



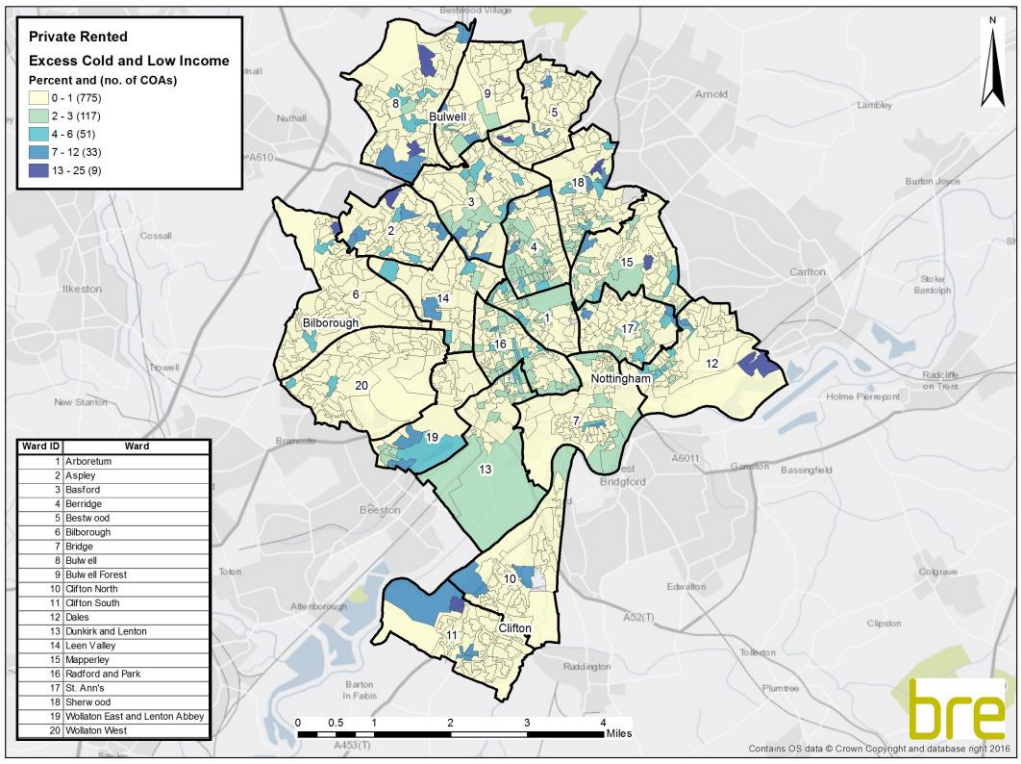
Map E. 14: Households in low income – private rented stock *Return to main report*



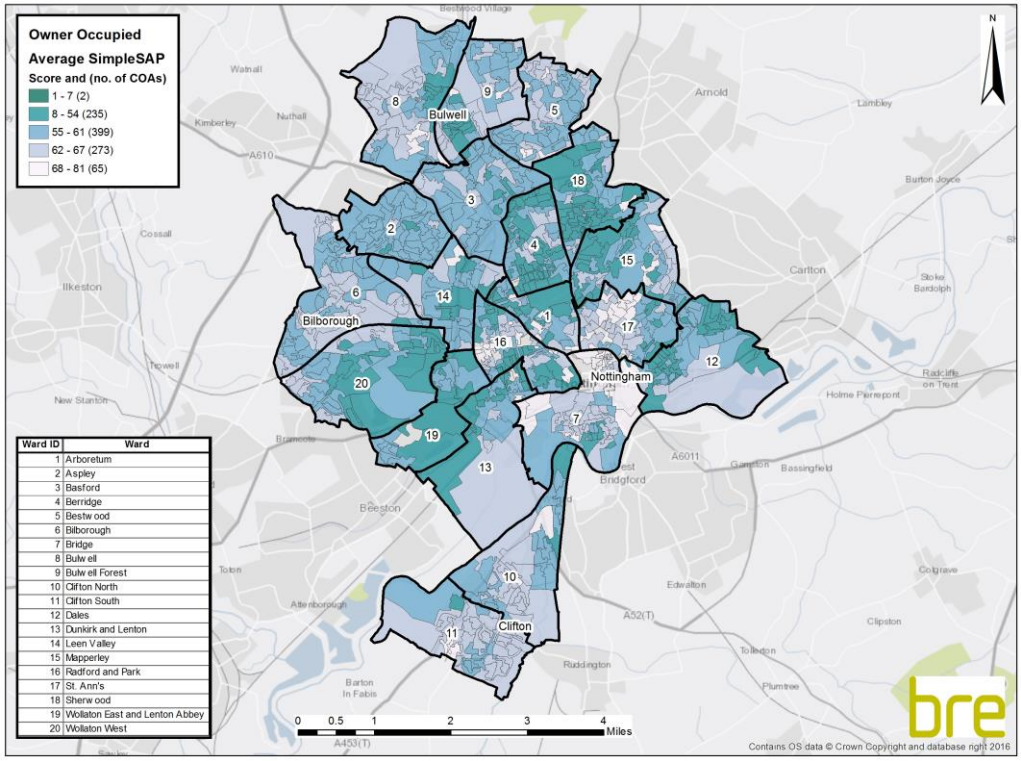
Map E. 15: Households with excess cold and in low income – owner occupied stock *Return to main report*



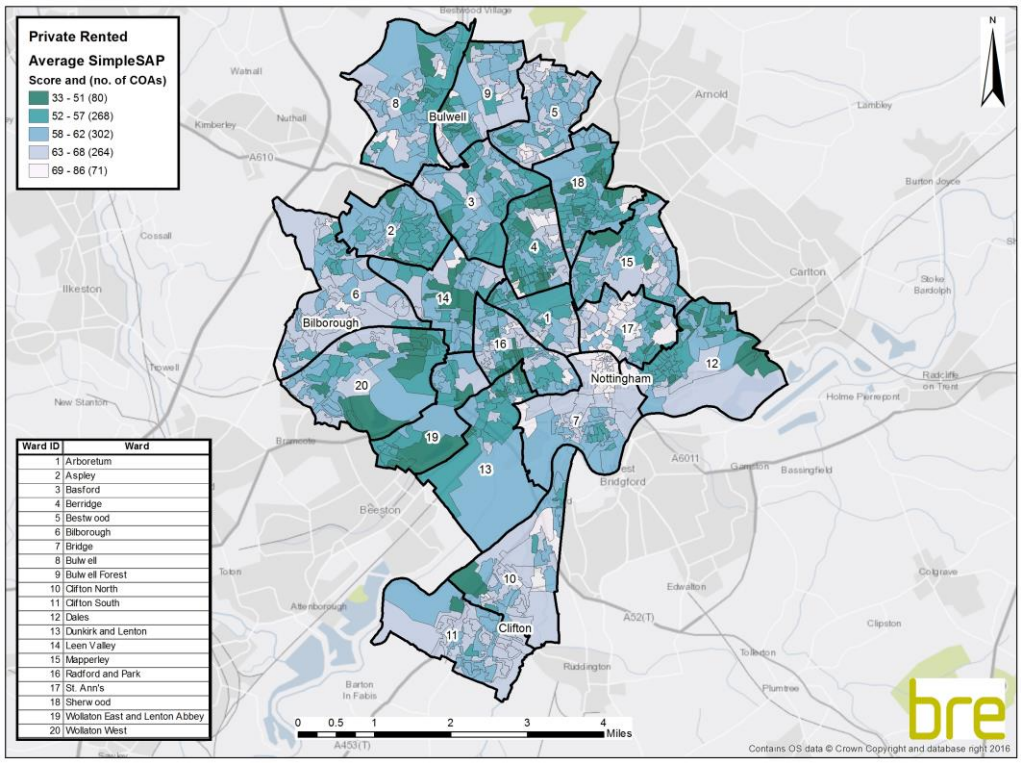
Map E. 16: Households with excess cold and in low income – private rented stock *Return to main report*



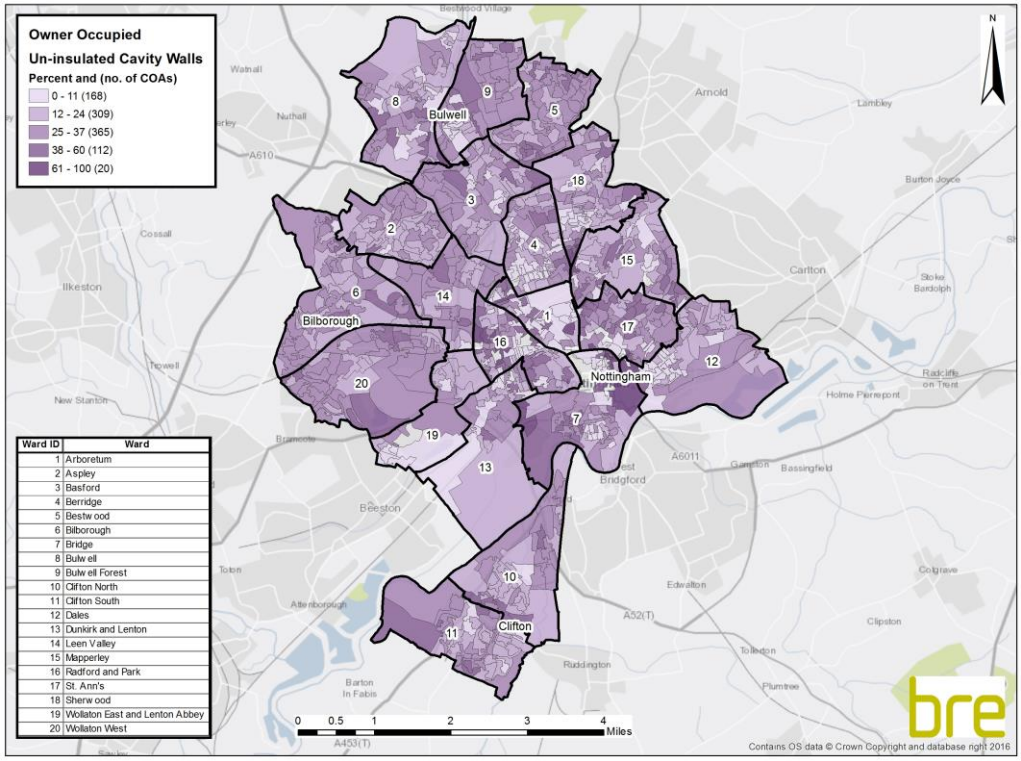
Map E. 17: Average SimpleSAP households – owner occupied stock *Return to main report*



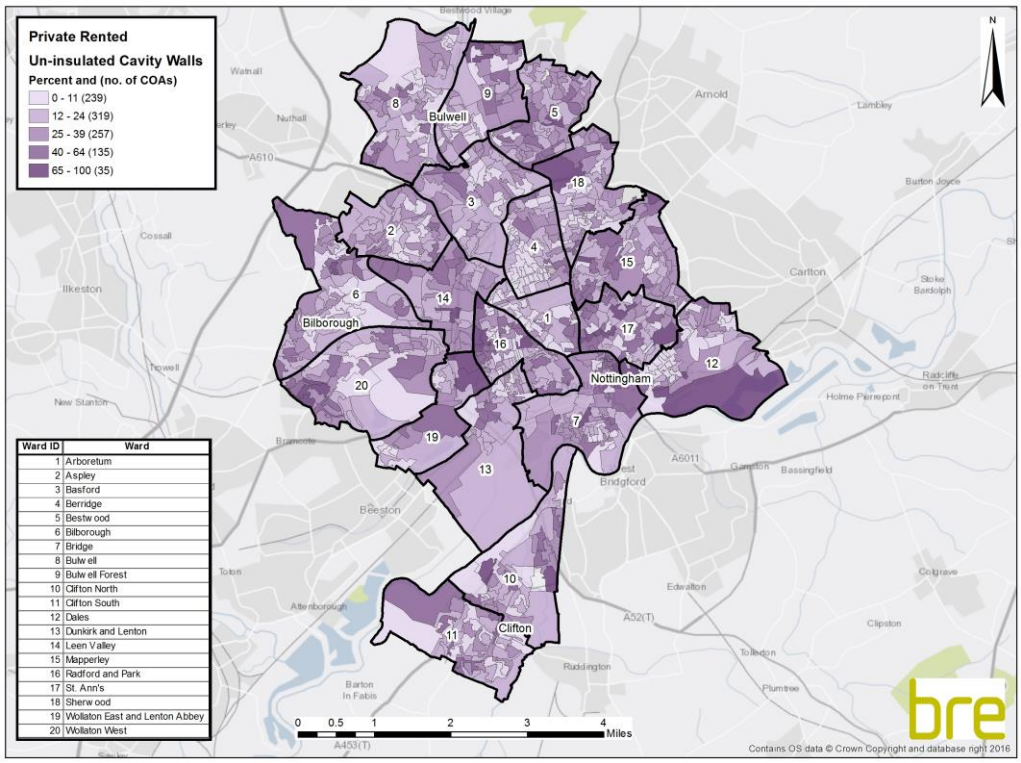
Map E. 18: Average SimpleSAP households – private rented stock *Return to main report*



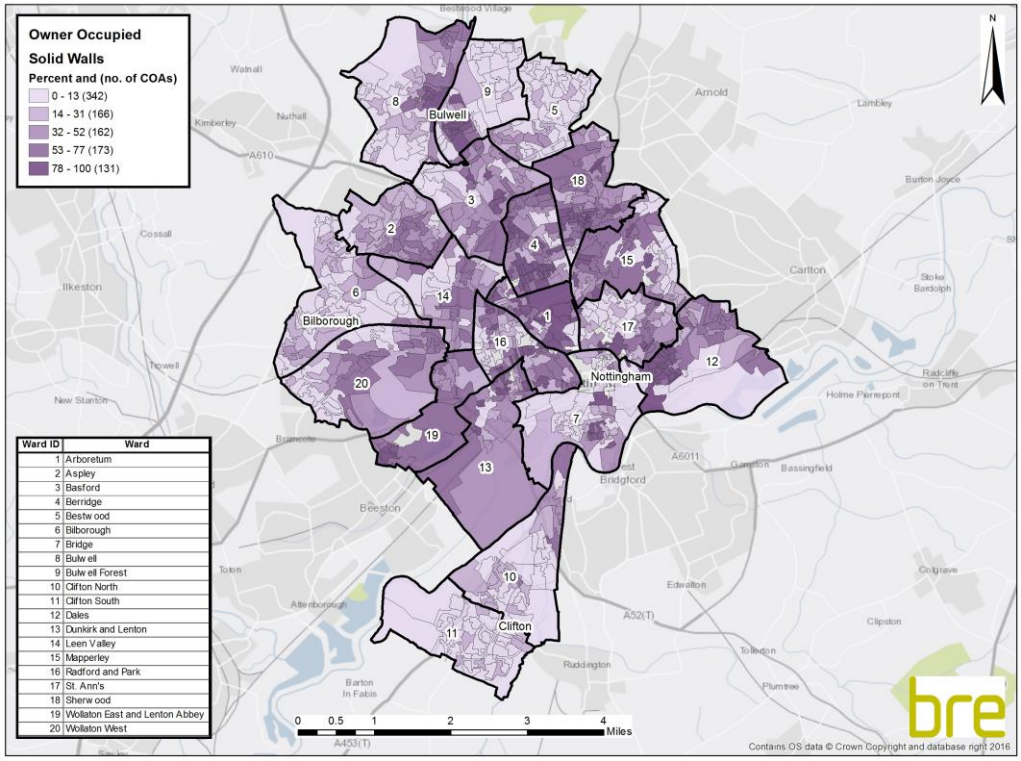
Map E. 19: Un-insulated cavity wall households - owner occupied stock *Return to main report*



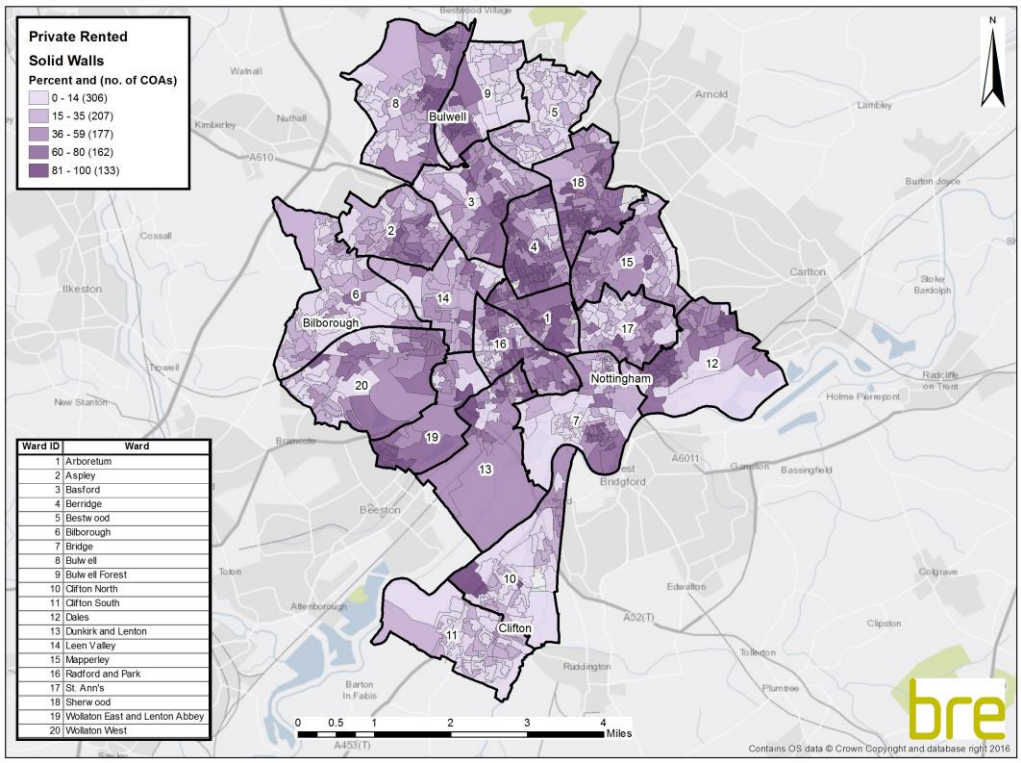
Map E. 20: Un-insulated cavity wall households – private rented stock *Return to main report*



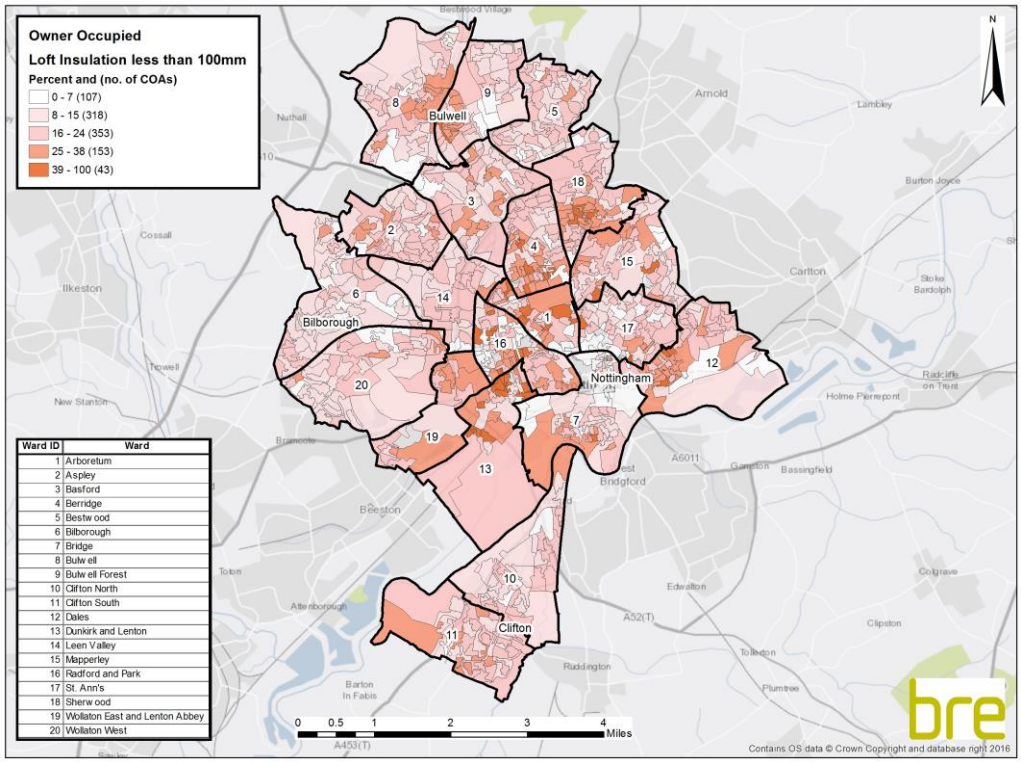
Map E. 21: Solid wall households – owner occupied stock *Return to main report*



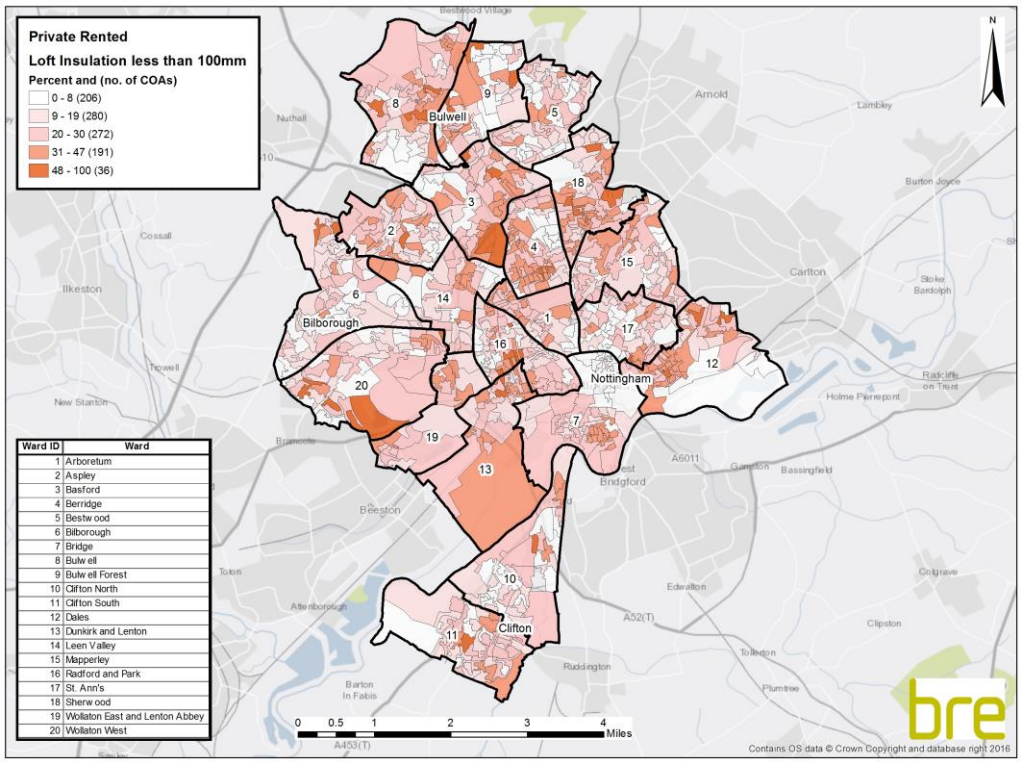
Map E. 22: Solid wall households – private rented stock *Return to main report*



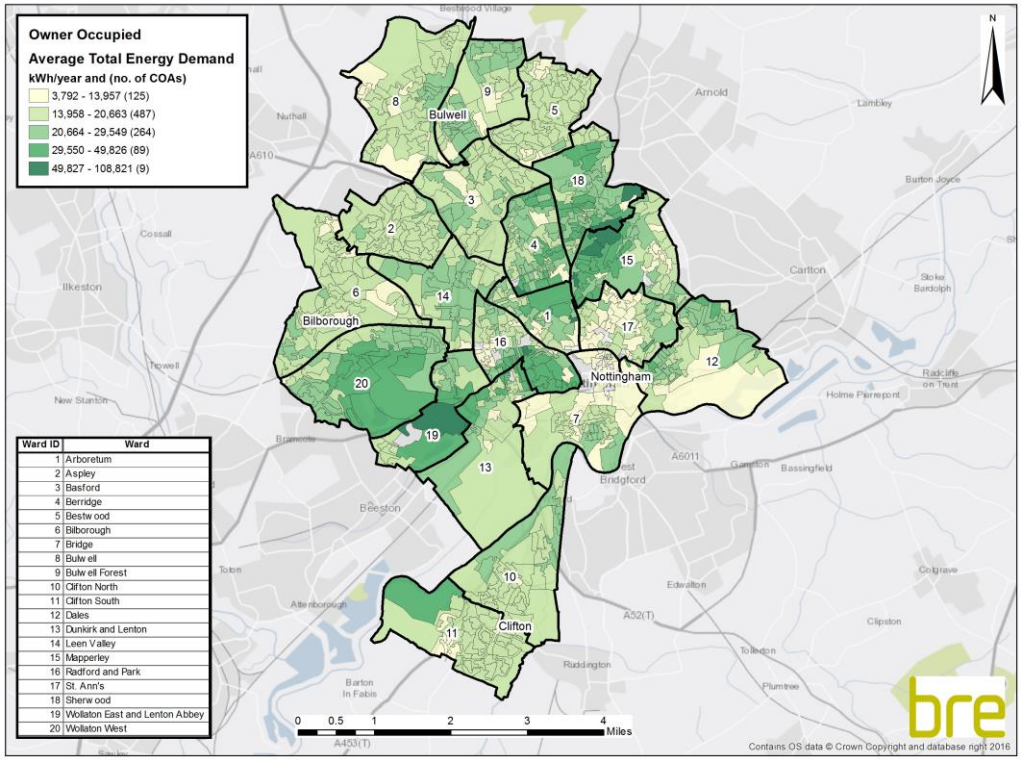
Map E. 23: Households with less than 100mm loft insulation – owner occupied stock *Return to main report*



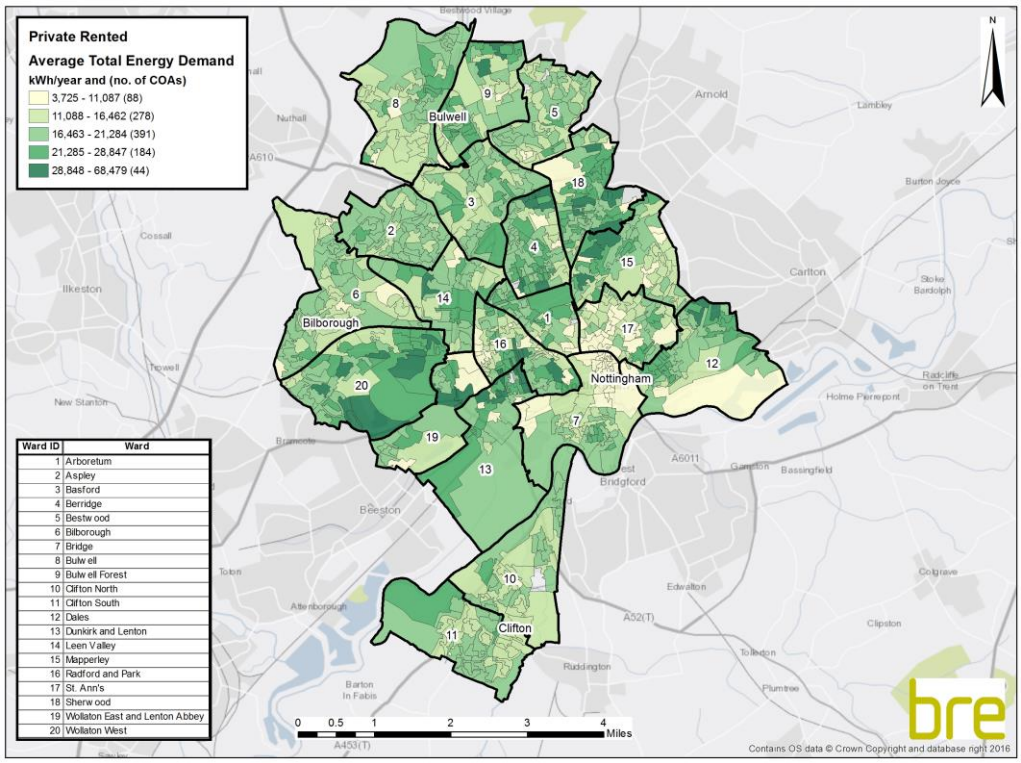
Map E. 24: Households with less than 100mm loft insulation – private rented stock *Return to main report*



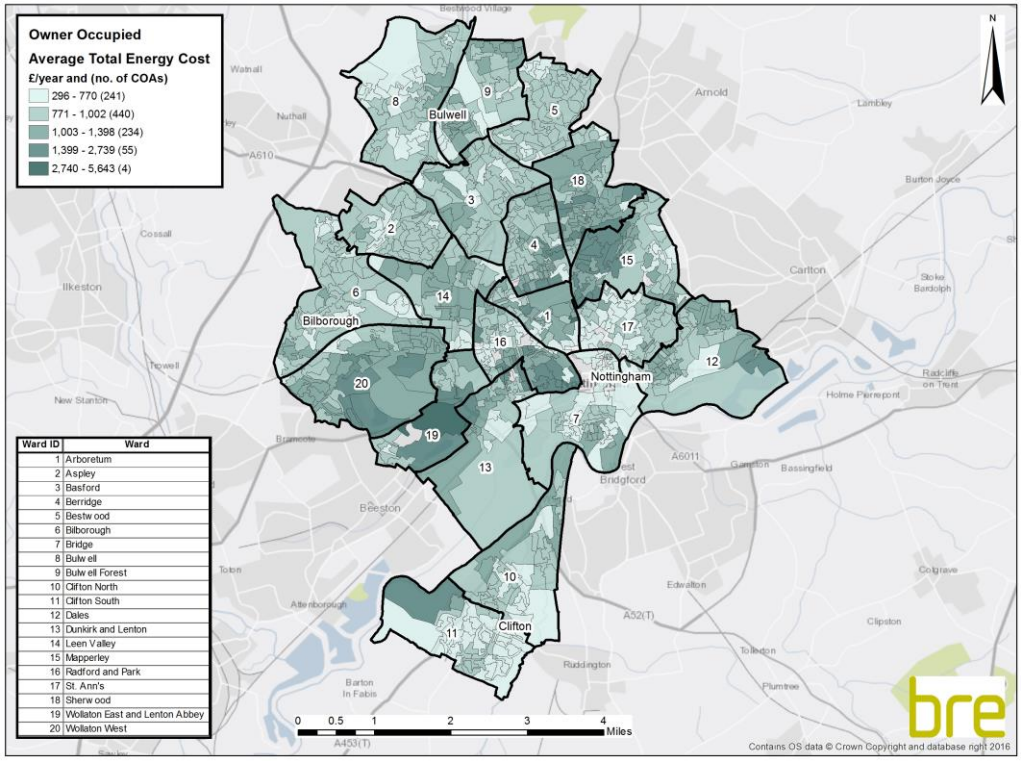
Map E. 25: Total energy demand – owner occupied stock *Return to main report*



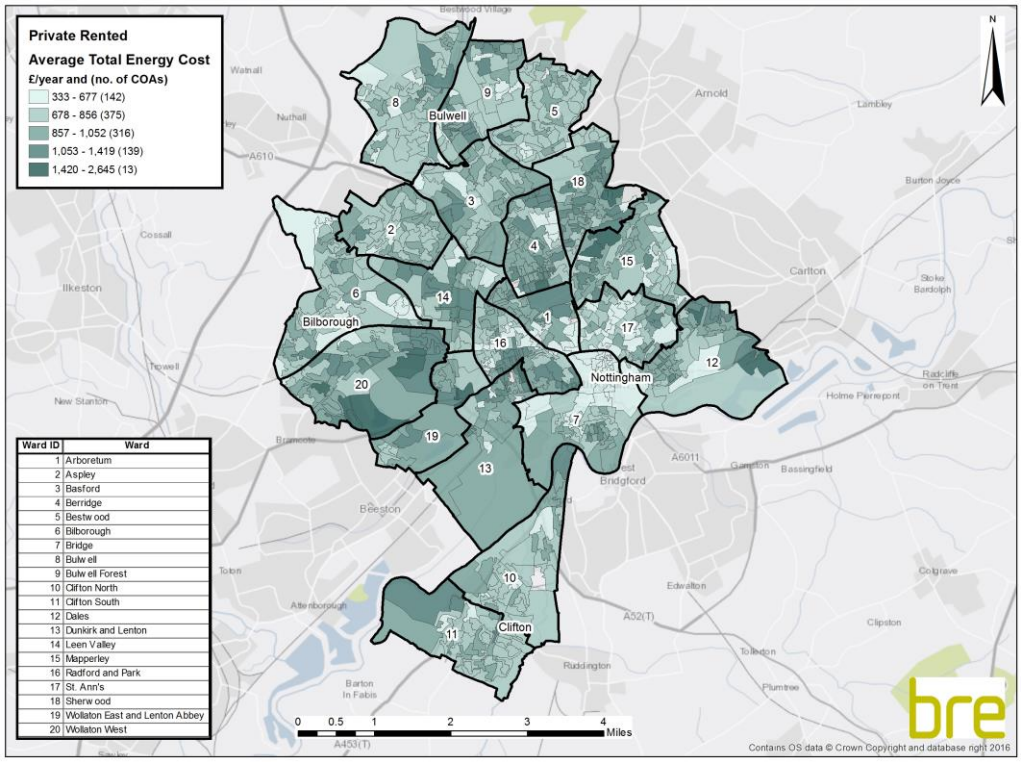
Map E. 26: Total energy demand – private rented stock *Return to main report*



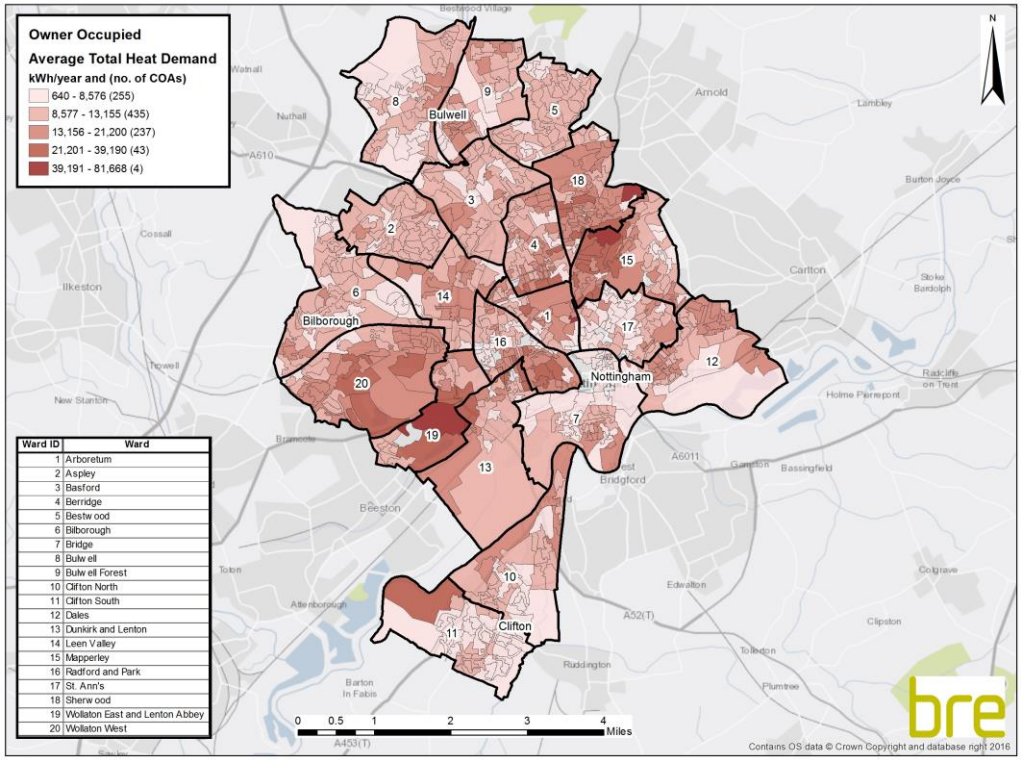
Map E. 27: Total energy cost – owner occupied stock *Return to main report*



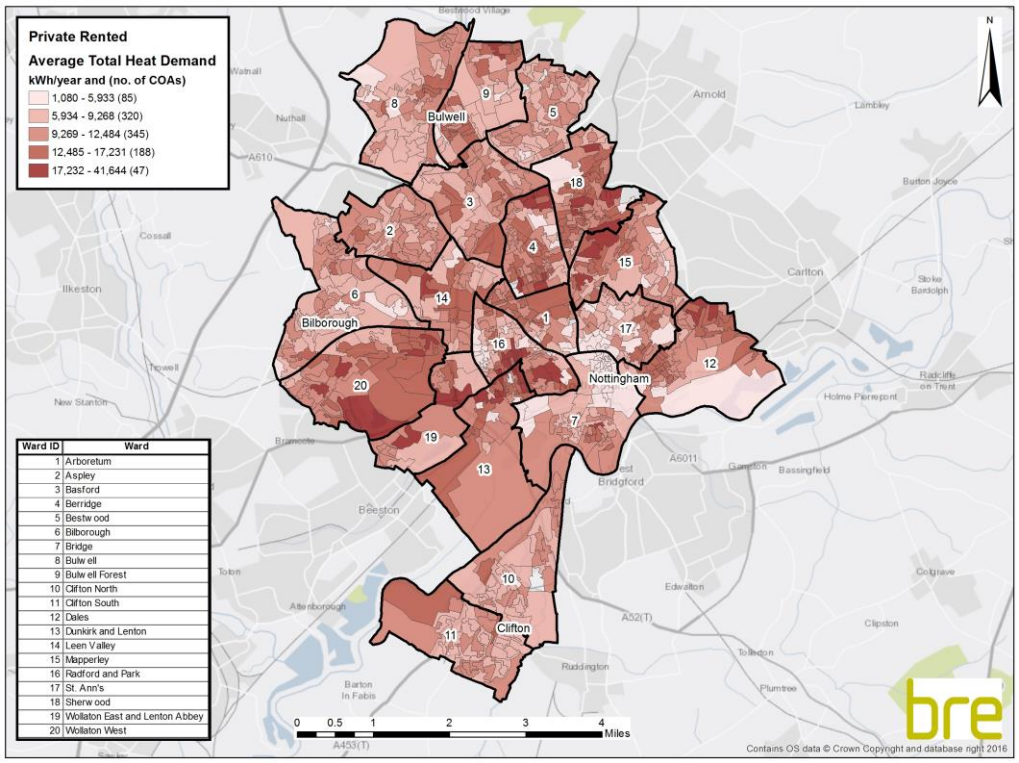
Map E. 28: Total energy cost – private rented stock *Return to main report*



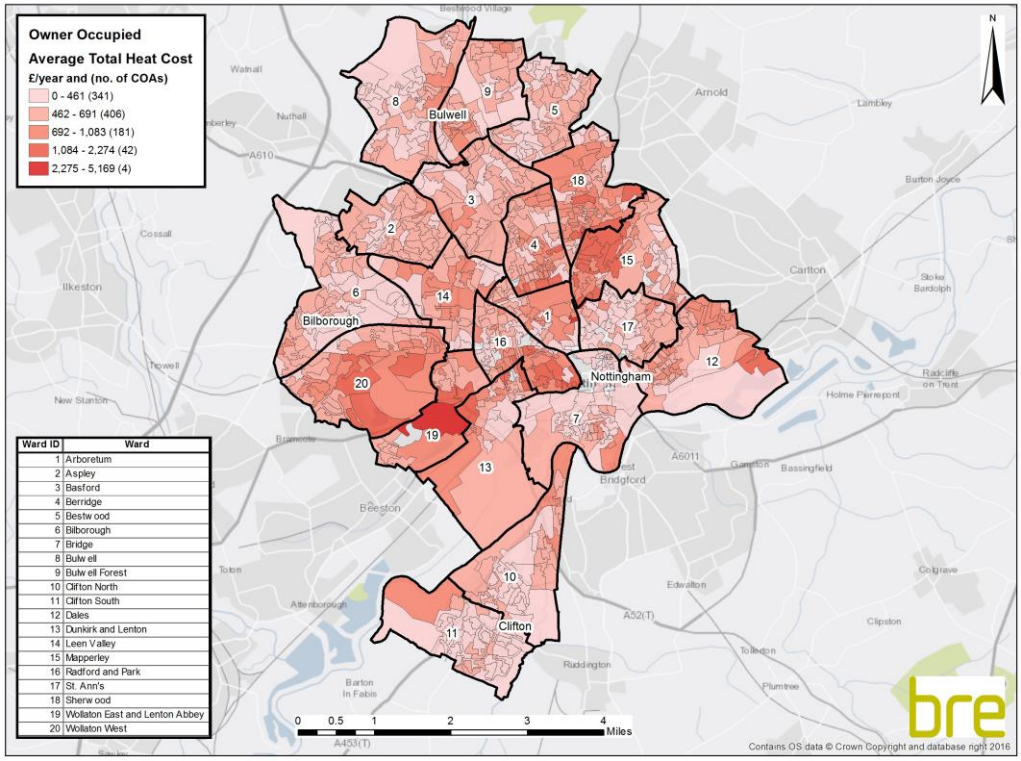
Map E. 29: Total heat demand – owner occupied stock *Return to main report*



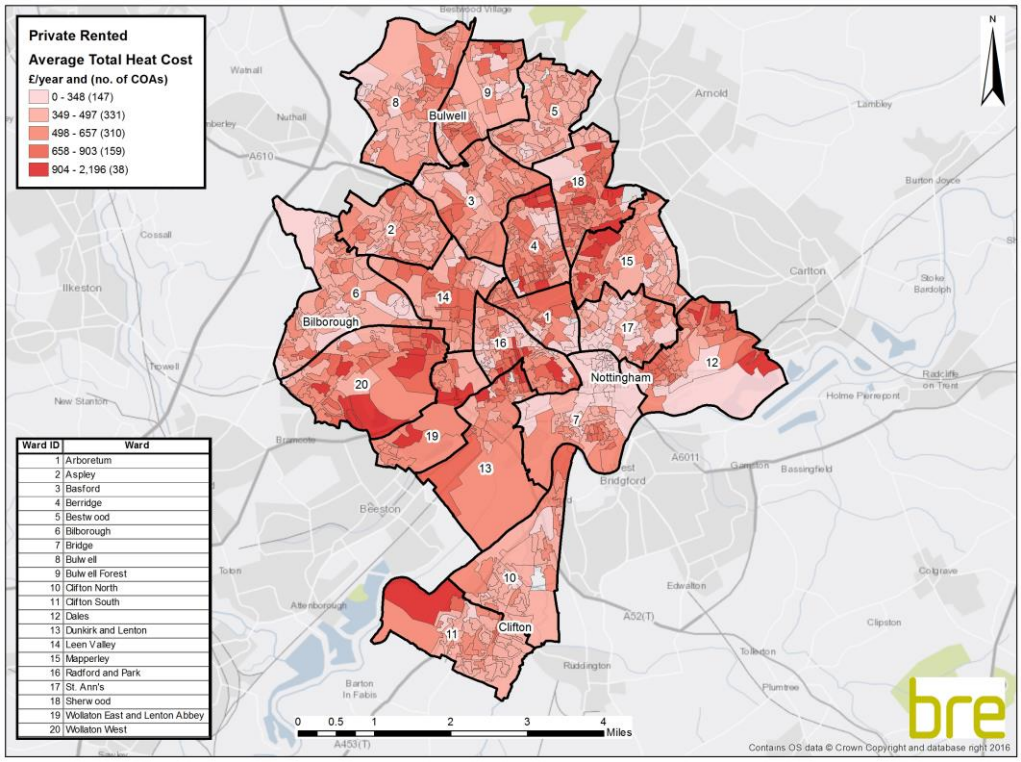
Map E. 30: Total heat demand – private rented stock *Return to main report*



Map E. 31: Total heat cost – owner occupied stock *Return to main report*



Map E. 32: Total heat cost – private stock *Return to main report*



Glossary of terms

BREDEM	BRE Domestic Energy Model
Category 1 hazard	Hazards with a HHSRS score of > 1,000. A dwelling with a category 1 hazard is considered to fail the minimum statutory standard for housing
CLG	Department for Communities and Local Government
COA	Census Output Area
	Designed for statistical purposes, built from postcode units, approximately 125 households
DCLG	Department for Communities and Local Government
Disrepair	Based on former Decent Homes Standard criteria which states that a dwelling fails this if it is not in a reasonable state of repair – this is based on the dwelling age and condition of a range of building components including walls, roofs, windows, doors, electrics and heating systems
ECO	Energy Companies Obligation
	Places legal obligations on the larger energy suppliers to deliver energy efficiency measures to domestic energy users
EHS	English Housing Survey
	A continuous national survey commissioned by the Department for Communities and Local Government (DCLG). It collects information about people's housing circumstances and the condition and energy efficiency of housing in England
EPC	Energy Performance Certificate
	Present the energy efficiency of domestic properties on a scale of A (most efficient) to G (least efficient)
Fuel poverty	The original definition of fuel poverty states that a household is in fuel poverty if it needs to spend more than 10% of their income on fuel to maintain an adequate level of warmth (10% definition). The new definition now adopted by government is that a household is said to be in fuel poverty if they have fuel costs that are above average and were they to spend that amount they would be left with a residual income below the official poverty line (Low Income High Costs definition)
GIS	Geographic Information System
	A system designed to capture, store, manipulate, analyse, manage and present spatial or geographical data
HHSRS	Housing Health and Safety Rating System
	A risk assessment tool to help local authorities identify and protect against potential risks and hazards to health and safety related deficiencies in dwellings, covering 29 categories of hazards

HIA	Health Impact Assessment A formal method of assessing the impact of a project, procedure or strategy on the health of a population
HMO	Houses in Multiple Occupation An entire house or flat which is let to 3 or more tenants who form 2 or more households and who share a kitchen, bathroom or toilet A house which has been converted entirely into bedsits or other non-self-contained accommodation and which is let to 3 or more tenants who form two or more households and who share kitchen, bathroom or toilet facilities A converted house which contains one or more flats which are not wholly self-contained (i.e. the flat does not contain within it a kitchen, bathroom and toilet) and which is occupied by 3 or more tenants who form two or more households A building which is converted entirely into self-contained flats if the conversion did not meet the standards of the 1991 Building Regulations and more than one-third of the flats are let on short-term tenancies In order to be an HMO the property must be used as the tenants' only or main residence and it should be used solely or mainly to house tenants. Properties let to students and migrant workers will be treated as their only or main residence and the same will apply to properties which are used as domestic refuges
HSM	Housing Stock Model Desktop based modelling used to determine the condition of the housing stock
Jenks' Natural Breaks	The natural breaks classification method is a data clustering method determining the best arrangement of values into different classes. It is achieved through minimising each class's average deviation from the class mean while maximising each class's deviation from the means of the other groups. The method seeks to reduce the variance within classes and maximise variance between classes thus ensuring groups are distinctive
JSNA	Joint Strategic Needs Assessment An assessment of the current and future health and social care needs of the local community
LACORs	Local Authority Coordinators of Regulatory Services – now renamed Local Government Regulation
LAHS	Local Authority Housing Statistics National statistics on housing owned and managed by local authorities
LIHC	Low Income High Cost

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	Measure of fuel poverty, considers a household to be in fuel poverty if required fuel costs are above average, or if they were to spend that amount they would be left with a residual income below the official poverty line
LLPG	Local Land and Property Gazetteer
	An address database maintained by local authorities
LSOA	Lower Super Output Area
	Designed for statistical purposes, built from census output areas, approximately 400 households
MSOA	Medium Super Output Area
	Designed for statistical purposes, built from lower super output areas, approximately 2,000 households
NHS	National Health Service
Older people	People over 65 for the excess cold hazard, people over 60 for the fire and fall hazards (excl. falling between levels)
OS	Ordnance Survey
Poor housing	Dwellings where a category 1 hazard is present
Private sector housing	Housing not owned by the local authority or a housing association
SAP	Standard Assessment Procedure
	Method system for measurement of energy rating of residential buildings.
SimpleSAP	An estimate of a residential dwelling's likely SAP score, it is not based on the full required range of data for a SAP calculation or a reduced data SAP calculation (RDSAP), it should only ever be considered an estimate of the SAP score, and used as a guide
UPRN	Unique Property Reference Number
	A unique 12 digit number assigned to every unit of land and property recorded by local authorities as part of their LLPG
Vulnerable persons	Persons who are more likely to be affected by the particular hazard as defined by the HHSRS Operating Guidance

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