

The Clay Research Group

RESEARCH AREAS

Climate Change ♦ Data Analysis ♦ Electrical Resistivity Tomography
Time Domain Reflectometry ♦ BioSciences ♦ Ground Movement
Soil Testing Techniques ♦ Telemetry ♦ Numerical Modelling
Ground Remediation Techniques ♦ Risk Analysis
Mapping ♦ Software Analysis Tools
Artificial Intelligence



October 2026

Issue 257

The Clay Research Group

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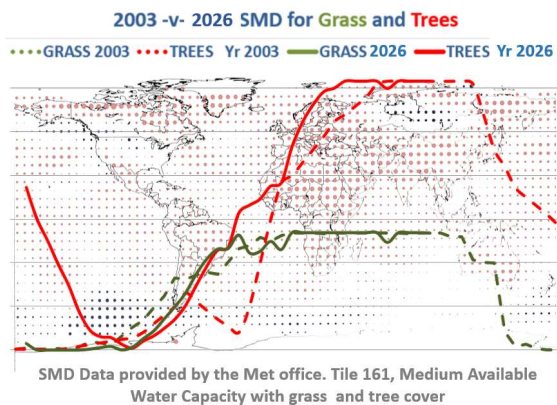
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Subsidence Risk Analysis by District
Harborough

SMD Graph



SMD graph for Met Office tile 161 plotting the correlation between the SMD for a surge year (2003) and the current year in soils with medium water capacity.

Claim numbers have risen considerably towards the end of August due to the period of record-breaking dry weather.

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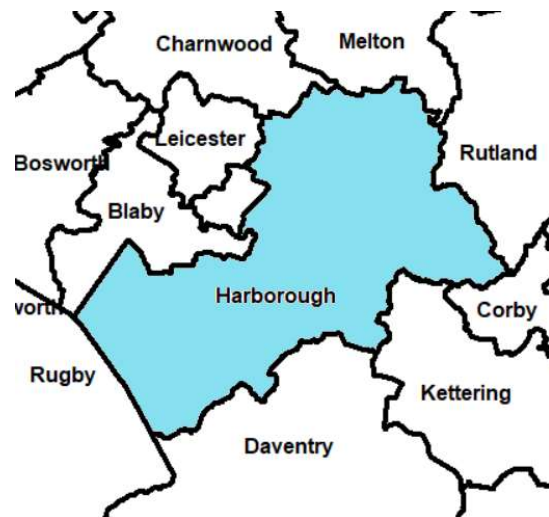
www.theclayresearchgroup.org

clayresearchgroup@gmail.com

District and Sector Risk

Harborough is situated in Leicestershire. It has an area of 591km² and a population of around 105,000.

It is the subject of the 'Risk by District' series in this month's edition. Its geology comprises widespread areas of Till overlying predominantly Lower Lias - see Page 7.



The risk maps are built from a data sample covering four claim years, including one surge and three 'normal' years.

SMD Updated

The Met Office have reported some minor amendments to the SMD data due to an outage of synoptic observation station data overnight on 2-3 September. The data has now been corrected and updated.

Contributions Welcome

We welcome articles and comments from readers. If you have a contribution, please Email us at: clayresearchgroup@gmail.com



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ChatGPT Explains the Soil Moisture Deficit



Question to ChatGPT

What is the Met Offices 'Soil Moisture Deficit' and what are the maximum values for grass and trees?

Response:

The UK Met Office's Soil Moisture Deficit (SMD) is a measure, expressed in millimetres (mm), of how much water would need to be added to the soil to restore it to field capacity — the moisture level the soil retains after excess water has drained away.

In simple terms, the higher the SMD, the drier the soil. The Met Office calculates SMD using its MORECS (Meteorological Office Rainfall and Evaporation Calculation System) model, which accounts for rainfall, evaporation, soil properties and land cover. It produces estimates for different types of land use, including grassland, deciduous woodland and coniferous woodland.



Met Office

What are the maximum SMD values for grass and trees?

There is an important distinction between the maximum value the model can produce and the highest value recorded in a particular location or year.

Land cover	Maximum SMD
Grass	No single universal maximum; depends on the soil and model configuration
Deciduous trees	Can exceed 300 mm in extreme conditions
Coniferous trees	Depends on the modelled soil and land-cover parameters

For a practical benchmark, a 2026 industry dashboard reports that the MORECS deciduous-tree series for one south-east England grid square reached 332.4 mm, described as the model ceiling for that series. This is a reported operational value, not a universal maximum for every tree-covered location.



geobear.com

... continued



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I would be cautious about quoting a single figure as the Met Office's official maximum for grass and trees: I could not verify a definitive Met Office publication specifying one universal maximum for each land-cover type.

Why this matters for domestic subsidence

- Grass SMD is useful for monitoring general seasonal soil drying.
- Deciduous-tree SMD is often more relevant to root-induced clay shrinkage because trees can extract moisture from deeper soil layers.
- The same SMD does not imply the same subsidence risk everywhere. Clay mineralogy, soil depth, tree species, rooting depth, rainfall history and building foundations all affect the response.
- SMD is an indicator, not a direct measurement of clay shrinkage or building movement. MORECS estimates soil moisture conditions across grid squares, rather than measuring the moisture beneath an individual house.



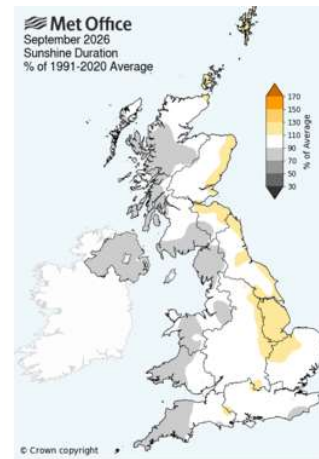
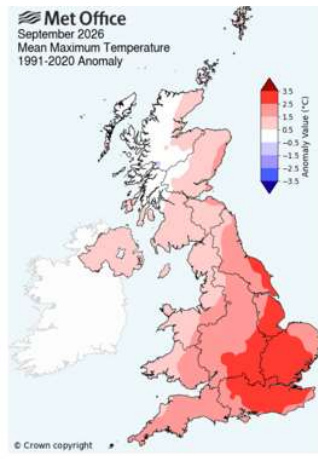
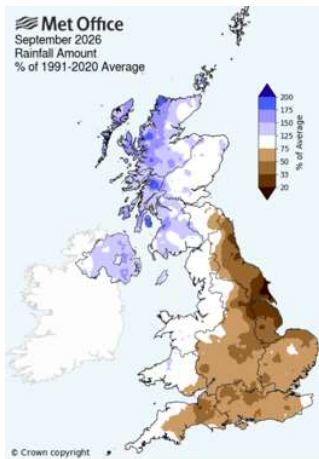
For your subsidence research, I would therefore keep grass and deciduous-tree SMD as separate data series, record the relevant MORECS grid square and week ending, and compare the readings with historical claim surges. That provides a more defensible basis for analysis than treating one SMD threshold as a universal trigger.



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Met Office Anomaly Maps for September 2026

Anomaly maps from the Met Office web site for the month of September 2026 comparing data with the 1991 – 2020 average reproduced below. The absence of rainfall in many parts of the country, high temperatures and sunshine duration continue to reinforce the risk of high claim numbers and a significant increase in claim costs.



Weather Profiles Triggering Surge

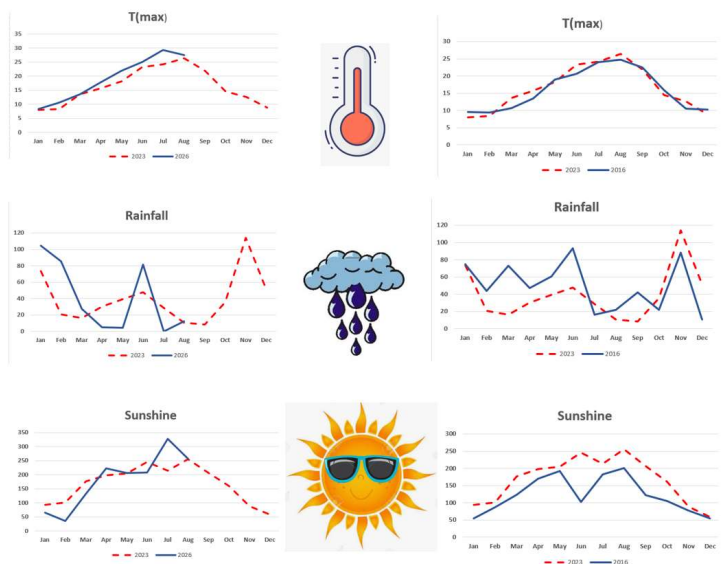
Right, profiles comparing maximum temperatures, rainfall and hours of sunshine provided by the Met Office from their weather station at Heathrow.

The series on the left compares the current year (blue) with 2003, a surge year (red) for subsidence claims. The column on the right compares 2016, a year with low claim numbers, with 2003. ABI data lists 54k claims in 2003 and 15k in 2016.

The temperature in 2016 was a few degrees below 2003 levels. There was considerably more rainfall early in the year and fewer hours of sunshine.

In contrast, 2026 was slightly warmer for all of the early months, with less rainfall in April, May and July and longer hours of sunshine in April and July.

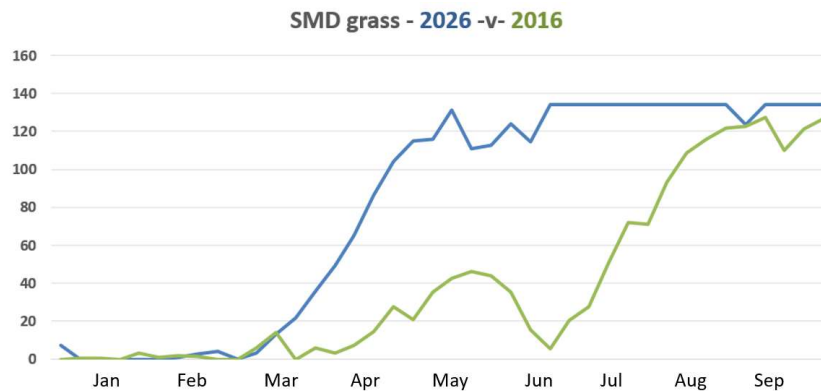
Unsurprisingly, the best indicators of a possible surge are high temperatures, low rainfall and long hours of sunshine. Whether we can build a predictive model based on this data is another matter.



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The Value of Soil Moisture Deficit Data

The chart below plots the Soil Moisture Deficit (SMD), comparing this year with 2016 (a low claims year). The threat of 2026 being a busy year is provided early.



Drying of the ground commenced in March this year, with values exceeding 100mm at the beginning of May. In 2016 soil drying was irregular but commencing months later, peaking in October. More comparisons between surge and normal years in next month's edition.

BGS News

The BGS have been modelling the influence of an increase in the levels of greenhouse gas on the frequency of subsidence claims and the outcomes are outlined in their latest News bulletin on the web:

<https://www.bgs.ac.uk/news/latest-research-emphasises-climate-related-subsidence-risk-to-millions-of-british-homes/>

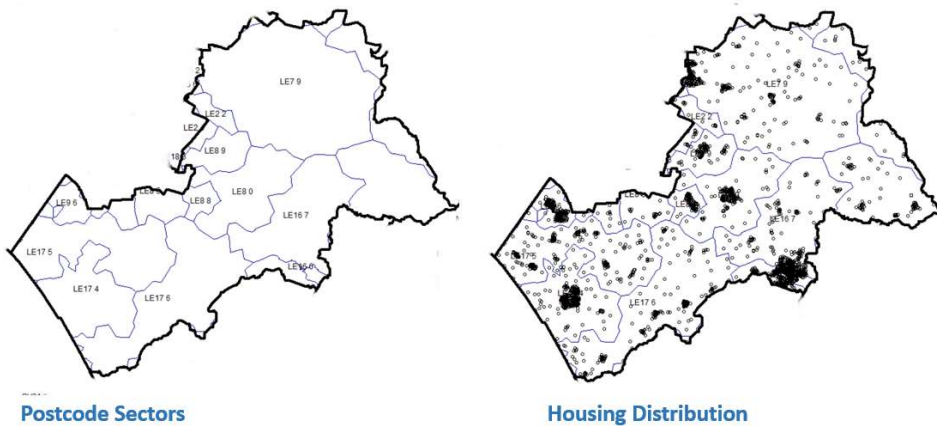
They explain in detail how they arrive at the following modelled increase in risk in the BGS GeoClimate Shrink–Swell dataset which lists the following:

- *over 4.2 million properties could be affected under the high emissions scenario RCP 8.5, which is the most pessimistic scenario*
- *around 500 000 properties could be affected under the low emissions scenario RCP 2.6, which is the emissions scenario aligned to the Paris Agreement.*
- *over 1.8 million properties could be affected under the medium emissions scenario RCP 4.5; current global emissions trajectories are closest to this intermediate scenario*



Sector and housing distribution across the district (left, using full postcode as a proxy) helps to clarify the significance of the risk maps on the following pages. Are there simply more claims in a sector because there are more houses?

HARBOROUGH

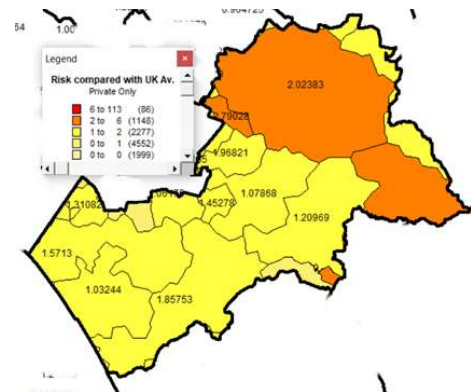


Distribution of postcode sectors and housing stock using full postcode as a proxy. Across the UK each sector covers around 3,000 houses on average and full postcodes include around 15 – 20 houses on average, although there are large variations.

The relative risk across the borough at postcode sector level is revealed using a frequency calculation (number of claims divided by private housing population), rather than a 'claim count' value.

In terms of risk, Harborough is rated 36th out of 413 districts in the UK from the sample analysed and is around 1.872x the risk of the UK average, or 0.485 on a normalised 0 - 1 scale.

From the sample we hold, sectors are rated for the risk of domestic subsidence compared with the UK average – see map, right. This map plots the average risk including the



Sector risk compared to UK average from the sample analysed.



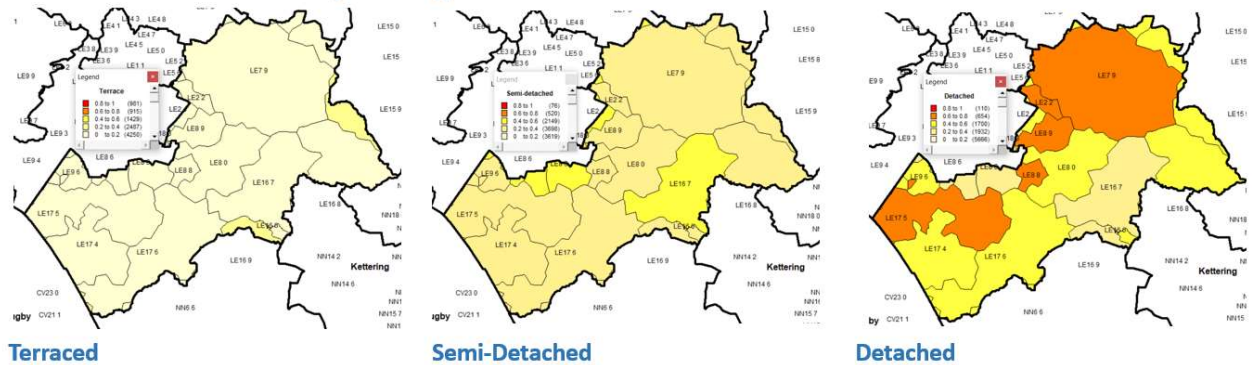
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Harborough - Properties by Style and Ownership

Below, the general distribution of properties by style of construction, distinguishing between terraced, semi-detached and detached. Unfortunately, the more useful data – property age - is missing at sector level.

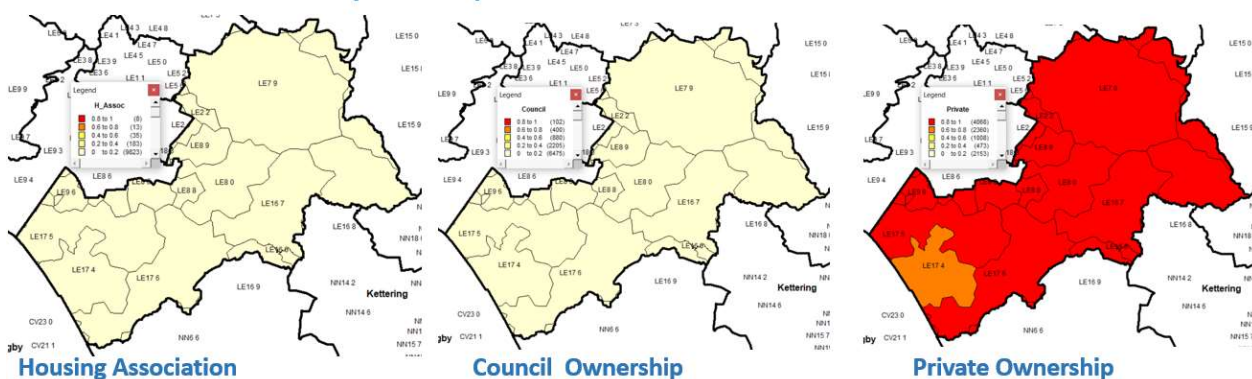
Risk increases with age of property and the model can be further refined if this information is provided by the homeowner at the time of taking out the policy.

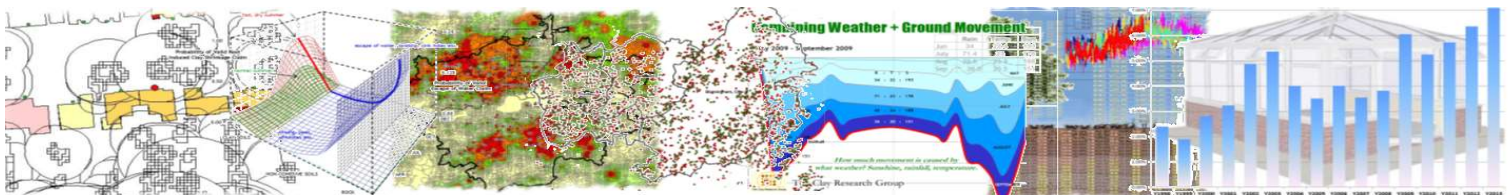
HARBOROUGH - Distribution by House Type



Distribution by ownership is shown below. The maps suggest predominantly detached properties and private ownership across the district.

HARBOROUGH - Distribution by Ownership



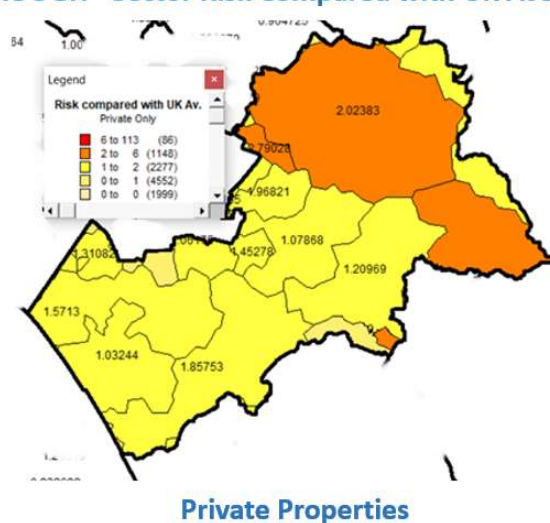


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Harborough - Frequencies & Probabilities

Below, mapping the risk of subsidence by ownership. Claims frequency that includes council and housing association properties delivers a misleading value of risk as they self-insure. The following show the normalised risk for the private housing population.

HARBOROUGH - Sector Risk Compared with UK Average



To reiterate, a reversal of rates for valid-v-declined by season is a characteristic of the underlying geology. For clay soils, the probability of a claim being declined in the summer is usually low, and in the winter, it is high.

In this case, the values reflect the presence and influence of the underlying geology with non-shrinkable soils accounting for a higher proportion of Escape of Water claims throughout the year.

Liability by Season - HARBOROUGH

District	valid summer clay	valid summer EoW	Declinature Rate (summer)	valid winter clay	valid winter EoW	Declinature Rate (winter)
Harborough	71%	7%	22%	1%	16%	83%

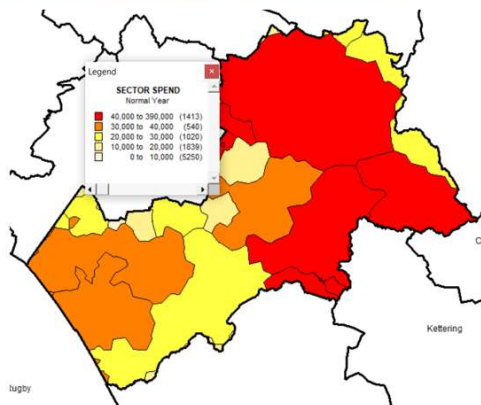


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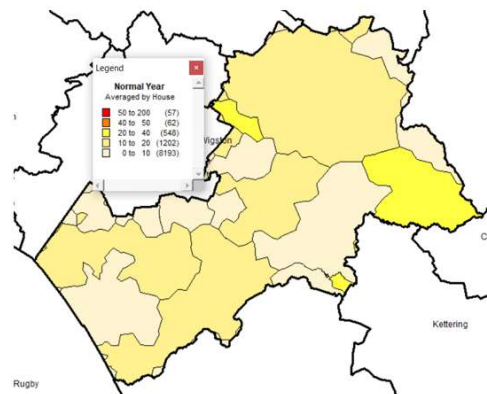
Aggregate Subsidence Claim Spend by Postcode Sector and Household in Normal & Surge Years

The maps below show the aggregated claim cost from the sample per postcode sector for both normal (top) and surge (bottom) years. The figures will vary by the insurer's exposure, claim sample and distribution of course.

NORMAL YEAR SPEND – HARBOROUGH



Spend by Sector

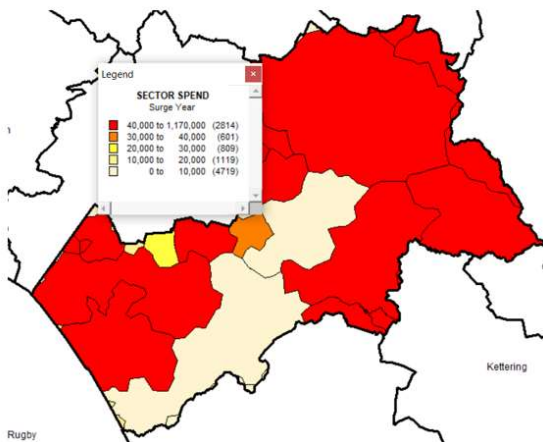


Spend Averaged Over Private Housing Population

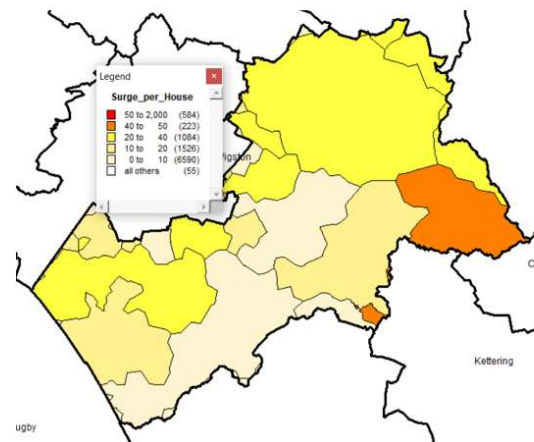
The images to the left in both examples (above and below) represent gross sector spend and those to the right, sector spend averaged across private housing population to derive a notional premium per house for the subsidence peril.

In this case, the absence of any distinct difference between surge and normal years reflects the geology.

SPEND in SURGE – HARBOROUGH



Spend by Sector



Spend Averaged over Private Housing Population

