

Breckland Employment Growth Study Update Report

Final Report

Breckland Council

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1.0

Introduction

- 1.1 Breckland Council commissioned Lichfields to prepare a partial update to the 2013 Breckland Employment Growth Study to inform the evidence base for the emerging Local Plan which will cover the period 2011 to 2036.
- 1.2 The 2013 Employment Growth Study (**‘2013 EGS’**) provided an understanding of the potential employment growth in Breckland District to help inform employment targets in the new Local Plan, as well as an assessment and review of existing employment land and premises. This report partially updates the 2013 Study and should be read alongside it.

Scope of Study

- 1.3 The purpose of this Study is to provide updated scenarios on the future growth potential of the **District’s economy** to support the new Local Plan. This is based on considering a range of scenarios for how the Breckland economy could change in the future, drawing upon the latest available information. It assesses the economic development needs of the District objectively in line with the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG).
- 1.4 The following three estimates of employment land demand have been updated in this report:
- 1 Growth in labour demand based on the 2016 East of England Forecasting Model (EEFM);
 - 2 Past trends in completions of B-class employment space continuing over the Local Plan period; and
 - 3 Growth in labour supply based on assumptions from the 2015 Strategic Housing Market Assessment (SHMA) for Central Norfolk prepared by Opinion Research Services (ORS).
- 1.5 An updated demand-supply balance position is set out based on Council data in relation to pipeline supply. This update focuses on quantitative factors only. A high level update to the settlement distribution analysis from the 2013 EGS is also included. It does not provide an update of market demand or qualitative factors, **nor of the ‘policy on’ employment land demand scenario** considered in the 2013 EGS.
- 1.6 Demand for B-class employment land and floorspace is considered in this report, and references to ‘employment space’ are intended to mean both these elements. Industrial space in this report includes both manufacturing and distribution uses.
- 1.7 The study also considers future projections for growth in non B-class sectors to set out how the overall economy of the area could change in the future, although does not specifically assess the space implications of these other sectors because they are planned for using different methodologies and considered by other forms of technical evidence (e.g. retail assessment).
- 1.8 An important consideration for any work of this type is that it is inevitably a point-in-time assessment. This study has incorporated the latest data and other evidence available at the time of preparation. The accuracy and sources of data derived from third party sources has not been checked or verified by Lichfields.

Structure of Report

- 1.9 The report is structured as follows:

- **Future Requirements for B Class Employment Space** (Section 2.0) – estimates future employment space requirements for B Class sectors in quantitative terms, drawing on employment forecasts and other factors;

- **Demand/Supply Balance** (Section 3.0) – assesses the balance between current land supply and future needs, in quantitative terms, by comparing forecast requirements with availability of existing sites; and
- **Conclusions** (Section 4.0) – considers the implications of the updated future employment space requirements and demand/supply balance.

2.0

Future Requirements for B Class Employment Space

2.1 This section considers future economic growth needs in Breckland drawing on a number of scenarios for the local authority. These scenarios are used to inform the analysis of the potential economic growth drivers within the District and the employment land and planning policy implications that flow from these.

Approach

2.2 The NPPF requires local authorities to, “*set out a clear economic vision and strategy for their area which positively and proactively encourages sustainable economic growth*” (para 21). In evidence base terms, this should be underpinned by “*a clear understanding of business needs within the economic markets operating in and across their area*” (para 160).

2.3 In this context, a number of potential future economic scenarios which were included in the 2013 EGS have been updated in this study to provide a framework for considering future economic growth needs and B Class employment space requirements in Breckland over the period to 2036. These scenarios draw on:

- 1 projections of employment growth in the main B class sectors (labour demand) derived from economic forecasts produced by the EEFM (2016 release);
- 2 consideration of past trends in completions of employment space based on monitoring data supplied by Breckland Council, and how these might change in the future; and
- 3 estimates of future growth of local labour supply based on demographic and housing assumptions applied in the Central Norfolk SHMA and provided by ORS.

2.4 As noted in Section 1.0, the ‘policy on’ scenario from the 2013 EGS has not been updated.

2.5 All these approaches have some limitations and careful thought needs to be given as to how appropriate each is to circumstances in Breckland. In addition, to be robust, the economic growth potential and likely demand for employment space in Breckland needs to be assessed under different future scenarios, to reflect lower or higher economic growth conditions arising in future. Although the qualitative analysis is not updated in this report, it should be noted that there are a number of qualitative factors that will also influence the future employment space requirements that need to be planned for.

a) EEFM Forecasts of Job Growth

2.6 Forecasts of job growth in Breckland for the period up to 2036 were sourced from the latest EEFM (released in August 2016), developed to project economic, demographic and housing trends in a consistent fashion across the East of England region and sub-regions. It should be noted that such forecasts tend to be most reliable at national and regional scales and consequently less so at the local economy level, but they are widely recognised as a valuable input and can indicate the broad scale and direction of economic growth in different sectors to help assess future employment space requirements.

Scenario 1: Baseline Job Growth

2.7 The forecasts of job growth by sector used here reflect recent trends and are based on projections at regional level, and how economic sectors in Breckland have fared relative to the **region’s growth in the past**. These forecasts also reflect the current post-recession economic climate, and should be viewed in the context of uncertainty surrounding future economic

growth. The projections do not specifically take into account the UK's exit from the European Union in 2019.

- 2.8 The 2016 EEFM indicates overall growth of 7,164 jobs for the District over the 25 year period, equivalent to 287 jobs per annum. Table 2.1 shows forecast change between 2011 and 2036. The 2016 EEFM forecast indicates different jobs figures for 2011 when compared to the previous version of the EEFM used for the 2013 EGS. This is likely to be a result of different modelling assumptions used in the preparation of the EEFM and revisions to official historic job figures. A detailed breakdown of the baseline EEFM forecast by sector is included at Appendix 1.

Table 2.1 Forecast Employment Change in Breckland 2011-2036

	Number of Jobs		Change 2011-2036
	2011	2036	
Manufacturing (B1c/B2)	10,039	7,385	-2,654
Distribution (B8)	4,967	4,435	-532
Offices (B1a/b)	5,873	8,266	2,393
Total B-Class Jobs	20,878	20,086	-792
Jobs in All Sectors	49,542	56,706	7,164

Source: EEFM (2016)/Lichfields analysis

- 2.9 As shown above, employment in manufacturing is expected to decrease in the period to 2036 by an average of 106 jobs per annum, although this represents more gradual decline than recorded in the preceding period 2001 to 2011. There is also expected to be a modest decline of distribution jobs, equivalent to a decrease of 21 per annum. Employment in office-based sectors is expected to increase by 2,393 from 2011 to 2036. This growth is expected to partially offset losses in the manufacturing and distribution sectors, albeit the resulting forecast for all B class uses indicates an overall reduction of 792 jobs over the period to 2036.

- 2.10 Table 2.2 presents the fastest growing sectors under this scenario, alongside those sectors expected to see a decline in employment.

Table 2.2 Employment Change by Sector, 2011-2036

EEFM Sector	Use Class	Change in Jobs (2011-2036)	% Change (2011-2036)
Employment activities	ORANGE	2,686	391%
Health & care	RED	2,356	48%
Accommodation & food services	RED	1,522	60%
Business services	GREEN	1,224	75%
Construction	ORANGE	735	16%
Education	RED	689	18%
Retail	RED	657	12%
Manufacturing - general	GREEN	-460	-20%
Manufacturing - chemicals	GREEN	-484	-46%
Agriculture	RED	-557	-23%
Manufacturing - food	GREEN	-1,049	-47%

Source: EEFM (2016)/Lichfields analysis

Key: GREEN = B class sector ORANGE = Part B class sector RED = Non B class sector

- 2.11 As shown above, employment activities, health and care and accommodation and food services are expected to drive the majority of employment growth in the District up to 2036.

Manufacturing is forecast to see the most significant decreases in employment, specifically in food, chemicals and general manufacturing. It is clear that non B use class sectors are expected to drive the majority of job growth over the study period, with B class sectors playing a much less significant role in job growth terms.

2.12 These jobs forecasts can then be converted to future employment space requirements assuming typical ratios of jobs to floorspace for the different B uses. To estimate space needs, the following average ratios have been applied:

- **Offices:** 1 job per 12.5 sqm;
- **Industry:** 1 job per 45 sqm;
- **Warehousing:** 1 job per 65 sqm for small scale warehousing (estimated to account for approximately 90% of new warehousing space in Breckland) and 1 job per 80 sqm for larger scale warehousing (accounting for 10% of new warehousing space).

2.13 These assumptions are based on Homes & Communities Agency (HCA) guidance on employment densities published in 2015.¹ In some cases, these have been updated from those used in the 2013 EGS which were based on earlier guidance. It is necessary to update the assumptions based on the more recent guidance from the HCA, which reflects the latest industry trends in terms of how space is planned, developed and utilised. Where the floorspace densities have increased, this represents businesses requiring less floorspace to accommodate employees.

2.14 An allowance of 10% is added to all positive floorspace requirements to reflect a normal level of market vacancy in employment space. Where a reduction in jobs is forecast (i.e. for manufacturing and distribution employment), the associated negative floorspace is halved, to reflect the fact that not all of this employment space is likely to be lost at the same pace as employment losses.

Table 2.3 EEFM Job Growth based Employment Space Requirements in Breckland, 2011-2036

	Floorspace (sqm)
Offices (B1a/b)	32,909
Manufacturing (B1c/B2)	-59,707
Distribution (B8)	-17,699
All B Uses	-44,497

Source: Lichfields analysis

2.15 The forecast net decrease of 792 B class jobs over a 25 year period (to 2036) which underpins this estimate of future employment space needs, is equivalent to an average decrease of 32 B class jobs each year. This is a less severe decrease than the job change that occurred in Breckland over the 10 year period 2001-2011, where EEFM data indicates that B class jobs in the District decreased by an average of 186 jobs per annum. On the basis of past performance, the above employment space forecasts could be regarded as a more optimistic estimate, albeit still showing an overall decrease in B class jobs over the study period.

b) Past Development Rates

2.16 Because they reflect market demand and actual development patterns on the ground, in some situations long term completion rates of employment floorspace can provide a reasonable basis for informing future land needs, particularly where land supply or demand has not been unduly

¹ HCA Employment Density Guide, 3rd edition, 2015.

constrained historically. However, the future demand picture may not reflect past trends and some adjustments may be needed.

Scenario 2: Past Development Rates

- 2.17 Data on past completions by B class sector up to the financial year 2016/17 were provided by Breckland Council. These have been analysed and combined with the completions data used in the 2013 EGS, meaning that the monitoring period 2004/05 to 2016/17 is covered within this analysis. This represents a reasonable period that reflects a full business cycle with periods of both economic growth and recession.

Table 2.4 Average Annual Net Completion Rates in Breckland, 2004/05 to 2016/17

Sector (Use Class)	Gross Annual Completions (sqm)	Net Annual Completions (sqm)
Office (B1a/B1b)	1,527	1,264
Manufacturing (B2)	3,465	3,053
Distribution (B8)	5,360	3,946
Unknown B1/B2/B8	5,193	4,192
Total	15,546*	12,454*

Source: Breckland Council

* Note: total completions include 'unknown B1/B2/B8' space.

- 2.18 Over this period, average annual net completions for B class uses amounted to some 12,454 sqm, broken down as shown in Table 2.4. Nearly a third (32%) of net completions were for B8 distribution space, with 25% for B2 manufacturing and 10% for B1 office space. Gross completions were slightly higher, at an average of 15,546 sqm annually, with the difference between this and the net completions (3,091 sqm p.a.) reflecting losses of employment space that have occurred over this period.

- 2.19 Compared to the past completion figures reported in the 2013 EGS, there has been a minor uplift in both gross and net completions. Annual average gross completions have increased from 14,560 sqm to 15,546 sqm (+986 sqm), while net completions have increased from 12,030 sqm to 12,454 sqm (+424 sqm). This implies that gross development rates of B class space have accelerated slightly since 2012 to drive the creation of B class jobs, however losses of employment space have offset this to lead to a more modest increase in the annual average rate of net completions.

- 2.20 One view of future growth in Breckland could simply assume that future development rates carry on at the long term average achieved in the past. If it were assumed that past net completion rates noted above continue in the 25 years between 2011 and 2036, it would equate to a need for 31,600 sqm of office space, 76,325 sqm of manufacturing space and 98,650 sqm of distribution space.

- 2.21 **In calculating the total floorspace required, the 'unknown B1/B2/B8' floorspace category has** been apportioned to the three main sectors based on the proportion of B1, B2 and B8 space completed during the monitoring period. In total, this would indicate demand for approximately 311,350 sqm of additional employment space by 2036, a figure significantly higher than that estimated using job forecasts (Table 2.5).

Table 2.5 Employment Space Requirement Based on Past Trends Continuing, 2011 to 2036

Sector	Assumed Annual Completions Rate (sqm)	Total Floorspace Required 2011-2036 (sqm)
Office (B1a/B1b)	1,264	47,625
Manufacturing (B2)	3,053	115,050
Distribution (B8)	3,946	148,675
Unknown B1/B2/B8	4,192	-
Total	12,454	311,350

Source: Lichfields analysis

2.22 Using typical ratios of jobs to floorspace for the different B uses (as outlined above), it is possible to estimate that this additional floorspace requirement could accommodate 8,611 B class jobs over the 25 year period from 2011 to 2036, equivalent to 344 additional B class jobs per year.

2.23 This approach assumes that past trends of office development in both a relatively buoyant as well as recessionary economic period would continue unchanged, but may not fully reflect the impacts of the recent economic downturn or longer term workplace trends that could reduce future demand for office space. Conversely, it may underestimate future demand if the supply was constrained in the past, for example because of poor sites being available or infrastructure / funding factors.

c) Future Labour Supply

2.24 It is also important to consider how many jobs, and hence how much employment space, would be needed to broadly match forecast growth of the District's resident workforce. In contrast to the two preceding approaches, this forecasts the supply of labour rather than labour demand. It then indicates the amount of new jobs needed to take-up this future supply of workers and minimise local unemployment, and how much employment space would be needed to accommodate these jobs.

Scenario 3: Labour Supply (2017 SHMA)

2.25 The 2017 Central Norfolk SHMA identifies objectively assessed need (OAN) for Breckland of 612 dwellings per annum over the period 2011 to 2036.² The labour supply position equivalent to 612 dwellings per annum has been provided by ORS and the B class job requirements arising from this labour supply growth have been estimated as set out in Table 2.6. These figures take account of economic activity rates applied by the SHMA and include an allowance for current (i.e. at 2011) commuting patterns to continue.

Table 2.6 Forecast Labour Supply/Job Requirement in Breckland to 2036

	Average per year (2011-2036)	Total Change 2011-2036
Dwellings	565	14,114
Resident Working-Age Population	240	6,000
Workplace Labour supply	199	4,964
B-class Job Requirement	-69	-1,716

Source: ORS (2015)/Lichfields analysis

² Opinion Research Services (2017) Central Norfolk Strategic Housing Market Assessment 2017.

- 2.26 Table 2.6 summarises the resident and workplace labour supply resulting from this scenario. The number of workplace jobs required to support the increase in employed persons in the District assumes that one additional job would be required for each additional worker, whilst the proportion employed in B class sectors takes into account the existing and forecast share of B class jobs to total jobs in the District from the EEFM baseline employment forecast data (presented in Scenario 1).
- 2.27 Although this scenario indicates an increase in office-based jobs, the reduction in manufacturing and distribution jobs results in a negative overall job requirement for B class sectors. The key driver for this is a declining share of B class jobs as a proportion of total jobs in Breckland, as implied by the latest EEFM data. Whereas the EEFM data used for the 2013 EGS indicated a small uplift in B class jobs as a proportion of total jobs, the latest EEFM data indicates a significant reduction in this proportion over the period 2011 to 2035. This results in the negative B class job requirement identified in Table 2.6.
- 2.28 The resulting job numbers were then translated into estimated requirements for B class employment floorspace by applying the same standard employment densities used in the job growth based approach and adding a 10% vacancy allowance to positive floorspace figures.
- 2.29 Overall, future employment space requirements based on meeting the job needs of local residents would mean a B class employment floorspace requirement of -65,349 sqm by 2036 (as summarised in Table 2.7).

Table 2.7 Net B Class Floorspace Required from Labour Supply Growth

Use	Floorspace (sqm) 2011-2036
Office (B1a/B1b)	29,306
Manufacturing (B2)	-69,659
Distribution (B8)	-24,997
Total	-65,349

Source: Lichfields analysis

- 2.30 This labour supply based estimate provides a useful benchmark for comparison with labour demand approaches. One potential drawback of this approach is that no change is assumed over time in the proportion of future jobs made up by office-based employment, which might be expected to increase in future (given recent trends in the District as described in the 2013 EGS). This might underestimate future office space requirements and overestimate industrial space needs.
- 2.31 Furthermore, this scenario may also underestimate the level of in-commuting that may occur over the study period into the District. Commuting data from the 2011 Census indicates that the District has a net out-commuting rate of 17.3%³. Should the level of in-commuting increase over the period to 2036, this could further increase the supply of labour available to fill jobs in Breckland. At -1,716 jobs (or -69 per annum), the additional B class job requirement associated with the labour supply based approach is negative. On this basis, the labour supply derived **requirement potentially underestimates Breckland's future economic potential and does not appear to be an approach conducive to planning positively for growth.**

³ This refers to the net out-flow of workers as a proportion of the District's resident population

Net Employment Space Requirements

2.32 Drawing together the results from these different approaches and growth scenarios, Table 2.8 summarises the net floorspace requirement up to 2036 arising from each.

Table 2.8 Net Floorspace Requirement to 2036 for Different Growth Scenarios

Use	1. Job Growth (Baseline)	2. Past Take-up	3. Labour Supply
Office (B1a/B1b)	32,909	47,625	29,306
Manufacturing (B2)	-59,707	115,050	-69,659
Distribution (B8)	-17,699	148,675	-24,997
All B uses	-44,497	311,350	-65,349

Source: Lichfields analysis

Safety Margin

2.33 To estimate the overall requirement of employment space that should be planned for in allocating sites, and to give some flexibility of provision, it is normal to add an allowance as a safety margin for factors such as delays in some sites coming forward for development.

2.34 In a location like Breckland where land supply is relatively unconstrained and development pressure from other uses is limited, there is a need to ensure a reasonable but not over-generous additional allowance that provides for some flexibility but avoids over-provision of land. However, it also needs to reflect that there may be potential delays in some of the District's development sites coming forward for development.

2.35 The SEEPB guidance on employment land assessments recommends an allowance that is equivalent to the average time for a site to gain planning permission and be developed, typically about two years. For Breckland, the margins set out in Table 2.9 were added for B Class use (to positive net floorspace requirements only) based on two years of average net take-up which appears an appropriate level relative to the estimated scale of the original requirement and taking account of the nature of the land supply in the District. Completions of 'unknown B1/B2/B8' space were apportioned to the three individual B use classes in the same way as in Scenario 2 above.

Table 2.9 Safety Margin Allowances

Use	Average Annual Take-up (sqm)	Safety Margin Added (sqm)
Office (B1a/B1b)	1,905	3,809
Manufacturing (B2)	4,602	9,204
Distribution (B8)	5,947	11,895

Source: Lichfields analysis

Note: Past take-up of 'unknown B1/B2/B8' space was apportioned to the three main uses.

Convert to Gross Floorspace Requirements

2.36 To convert the net requirement of employment space into a gross requirement (i.e. the amount of employment space or land to be allocated/planned for), an allowance is also typically made for some replacement of ongoing losses of existing employment space that may be developed for other, non B Class uses.

2.37 Judgements were made on the suitability and degree of the allowance for future losses which it would be appropriate to apply here based on analysis of supply-side deliverability factors and

current trends in the market, using the same assumptions as the 2013 EGS. Although monitoring data on losses of employment space in Breckland is limited and only available as far back as 2004/05, analysis indicates that the District has been losing an average of approximately 3,091 sqm of B1-B8 floorspace per year (between 2004/05 and 2016/17) to other non B use classes.

- 2.38 An initial review suggests that this has mainly involved the loss of older industrial space on existing industrial estates (as opposed to loss of office space which generally tends to be located in converted residential properties or above retail units in town centres). Although manufacturing employment is forecast to decline in the District over the next 25 years (Table 2.2), market demand for industrial space in Breckland has remained strong, particularly for small scale and localised industrial activities (according to the 2013 EGS).
- 2.39 Not all losses will need to be replaced as some will reflect restructuring in the local economy as less manufacturing space is needed in future, so it has been assumed that 50% of industrial losses are replaced each year, equating to 33,784 sqm over the 25 year period. No allowance is made for replacement of office losses.
- 2.40 The resultant gross floorspace requirements incorporating these allowances are set out in Table 2.10.

Table 2.10 Gross Floorspace Requirement by Scenario to 2036 (sqm)

Use	1. Job Growth (Baseline)	2. Past Take-up	3. Labour Supply
Office (B1a/B1b)	36,719	51,435	33,116
Manufacturing (B2)	-52,082	131,879	-62,034
Distribution (B8)	8,460	186,728	1,160
All B uses	-6,903	370,042	-27,758

Source: Lichfields analysis

Estimate Land Requirement

- 2.41 The final step, for all scenarios, is to translate floorspace into land requirements for both office and industrial uses. This has been calculated by applying appropriate plot ratio assumptions to the floorspace estimates using the following assumptions and local adjustment factors to reflect the pattern of development in the District and to be consistent with the 2013 EGS:

- **Industrial** – a plot ratio of 0.4 was applied so that a 1 ha site would be needed to accommodate 4,000 sq.m of employment floorspace; and
- **Offices** – it was assumed that 70% of new floorspace would be in lower density, business park developments with a plot ratio of 0.4, with 30% in higher density town centre locations at a plot ratio of 2.0.

- 2.42 The resulting land requirements are set out in Table 2.11.

Table 2.11 Gross Land Requirement by Scenario to 2036 (ha)

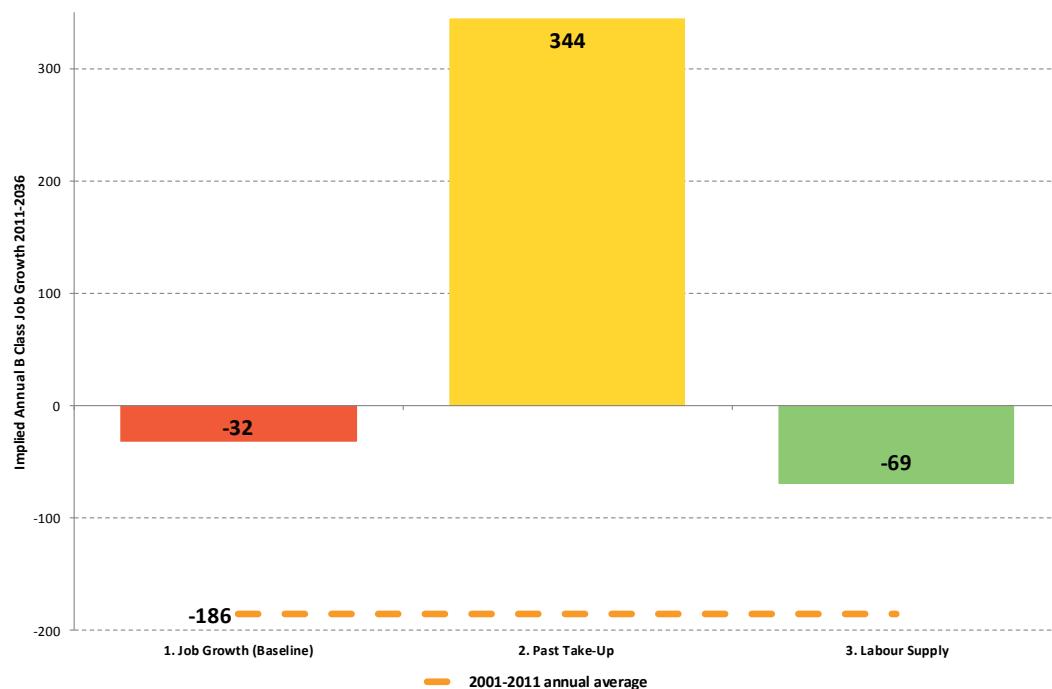
Use	1. Job Growth (Baseline)	2. Past Take-up	3. Labour Supply
Office (B1a/B1b)	7.0	9.8	6.3
Manufacturing (B2)	-13.0	33.0	-15.5
Distribution (B8)	2.1	46.7	0.3
All B uses	-3.9	89.4	-8.9

Source: Lichfields analysis

Sensitivity Tests

- 2.43 Given the range of potential requirements implied by these different estimates of future requirements, it is important to test how reasonable each appears against other factors and how sensitive they are to different assumptions.
- 2.44 It is useful to first compare the employment growth implied by these amounts of space and land with employment growth or decline seen in Breckland in recent years (Figure 2.1). The lowest estimate based on labour supply implies a reduction of 69 B class jobs annually over the 25 year period. The highest growth estimate based on past take-up implies some 344 additional B class jobs annually. These figures compare with an average reduction of 186 B class jobs in Breckland per year between 2001 and 2011, a period which includes the recent recession. The labour supply scenario lies closest to this past employment growth trend.

Figure 2.1 Annual B Class Job Growth Implied by Scenarios



Source: EEFM (2016)/Lichfields analysis

- 2.45 This indicates that all three scenarios could generate a higher level of job creation than has been achieved in the District in the recent past, albeit both the baseline job growth and labour supply scenarios indicate a reduction in B class jobs. The past take-up scenario is the only approach that generates a significant level of B class job growth, and is estimated based on the recent pattern of B class development that has occurred in Breckland over recent years. It does however assume a relatively high job density ratio for office uses in Breckland over the Plan period, which may not truly reflect the nature of office use in the District and therefore may overestimate the level of job growth that is likely to occur in these sectors.

Conclusions

- 2.46 Three different scenarios of future employment space requirements have been considered, based on a number of approaches which reflect economic growth, past development trends and potential housing supply factors. The majority of these reflect assumptions of lower future economic growth in Breckland than indicated in the 2013 EGS.

- 2.47 The overall gross space requirements related to these different scenarios range from -27,758 sqm to 370,042 sqm of all types of B class employment space to 2036, implying in broad terms a need for between -8.9 ha and 89.4 ha of employment land. In the highest (past take-up) scenario, the majority of this spatial requirement relates to industrial (B2/B8) uses. For the two lowest scenarios (baseline job growth and labour supply), the majority of the requirement relates to office (B1a/b) uses.
- 2.48 The variation in the estimates of needs reflects the different methodological basis and input assumptions that underpins each scenario:
- a **The job growth scenario reflects the EEFM's negative forecast for future B-class growth** in the District, with gains in office-based jobs offset by losses of manufacturing and distribution jobs. Consequently the employment land requirements from this scenario are negative in overall terms, particularly as office jobs can be accommodated at higher employment densities.
 - b The past take-up scenario produces the highest estimates, reflecting patterns of past development in the District over the period since 2004/05. As a market signal, this indicates relatively buoyant levels of development activity in Breckland notably for B2/B8 uses, and reflecting that there is not always a direct correlation between jobs and floorspace (i.e. there is still demand for industrial premises even as employment levels fall).
 - c The labour supply scenario – when adjusted to reflect future change in workplace labour supply – gives the lowest estimates of needs (negative). The key driver for this is a declining share of B class jobs as a proportion of total jobs in Breckland, as implied by the latest EEFM data consistent with the job growth scenario. Whereas the EEFM data used for the 2013 EGS indicated a small uplift in B class jobs as a proportion of total jobs, the latest EEFM data indicates a significant reduction in this proportion over the period 2011 to 2035. This results in the negative B class job and space requirement.
- 2.49 All scenarios indicate a requirement for additional office space by 2036. Employment growth is expected to be driven in part by a number of office based sectors, including professional services. The Council should consider planning to accommodate at least the labour supply office requirement (33,116 sqm), but with scope to plan for above this.
- 2.50 In terms of industrial space requirements, **it is recommended that the District's Local Plan** includes scope to accommodate at least the baseline job growth requirement for distribution uses (8,460 sqm), and reflecting the past take-up evidence, potentially plan for above this. This **reflects the District's existing strengths in this sector, and it is important that this** potential is not constrained by a lack of space to accommodate this growth.

3.0 Demand/Supply Balance

3.1 This section draws together the forecasts of future employment land needs in Section 2.0 and estimates of land available on the District's existing and allocated employment sites to identify any need for more provision of employment space, or surpluses of it, in quantitative terms.

Quantitative Balance

3.2 The previous section identified a need for between -27,758 sqm and 370,042 sqm of employment space up to 2036, including a modest safety margin largely to allow for delays in sites coming forward for development. The land requirements associated with these amounts of employment floorspace were estimated at between -8.9 ha and 89.4 ha.

Pipeline Supply

3.3 The pipeline supply of employment space in the District comprises sites allocated for employment development (that remain undeveloped) and other sites with extant planning permission for B class space. Based on Council monitoring data, Table 3.1 indicates that there is total pipeline supply of 128.2 ha employment land in Breckland. This is slightly more than the 116.4 ha identified in the 2013 EGS.

Table 3.1 Available Employment Space in Breckland

Source of Supply	New Employment Space					
	ha/sqm	B1	B2	B8	Mixed B *	Total
Extant Allocations **	ha	21.3	21.3	21.3	0.0	64.0
Extant Planning Permissions	ha	17.1	14.3	5.8	27.0	64.2
	sqm	18,277	23,311	8,419	74,893	124,900
Total	ha	38.5	35.6	27.1	27.0	128.2

Source: Breckland Council Monitoring Data (2017).

Note: * Mixed B-class planning permissions include those which provide for range of B-class uses but monitoring data does not detail specific floorspace quantums. ** Given the flexibility of the mixed B-class allocations in Breckland, an equal split between B1, B2 and B8 uses has been assumed.

3.4 A broad comparison of estimated demand for B Class space against all currently identified supply, as shown in Table 3.2, implies that Breckland would have sufficient employment space in quantitative terms up to 2036 to meet the needs arising from all three scenarios of future requirements. There is a significant potential surplus of space under the baseline job growth and labour supply scenarios, of 132.1 ha and 137.1 ha respectively. Under the past take-up scenario which gives the highest estimate of demand, there would be a surplus supply of 38.8 ha.

Table 3.2 Demand/Supply of B Class Employment Space in Breckland to 2036 (ha)

	1. Job Growth (Baseline)	2. Past Take-up	3. Labour Supply
Requirement for B Class Space	-3.9	89.4	-8.9
Available Employment Space		128.2	
Surplus (+)/Shortfall (-)	+132.1	+38.8	+137.1

Source: Lichfields analysis

Needs of Different Employment Uses

- 3.5 Ensuring an adequate choice of sites is important to meet the needs of different employment sectors and the aims for diversity of employment opportunities at different skills levels. Potential supply of employment space for both industrial and office uses was therefore compared with estimated requirements for these uses.
- 3.6 Table 3.3 and Figure 3.1 compare the demand and supply situations for office, manufacturing and industrial uses separately. Where pipeline supply in the form of extant planning permissions is indicated by the monitoring data as 'mixed' B space, this has been apportioned to the main B uses by Lichfields for the purposes of comparison. It should be noted, however, that the mix of uses will ultimately be determined by future implementation of permissions.
- 3.7 This indicates there is sufficient potential supply available, in quantitative terms, to meet office needs arising from all three demand estimates. The surplus ranges from 37.6 ha (past take-up) to 41.1 ha (labour supply). A surplus of supply is also identified for manufacturing space under all scenarios. The surplus ranges from 11.6 ha (past take-up) to 60.1 ha (labour supply).
- 3.8 For distribution space, there is a potential surplus under the job growth and labour supply scenarios, of 34.0 ha and 35.8 ha respectively. Under the past take-up scenario, there is a potential shortfall of 10.6 ha.

Table 3.3 Demand/Supply for Industrial and Office Space to 2036 (ha)

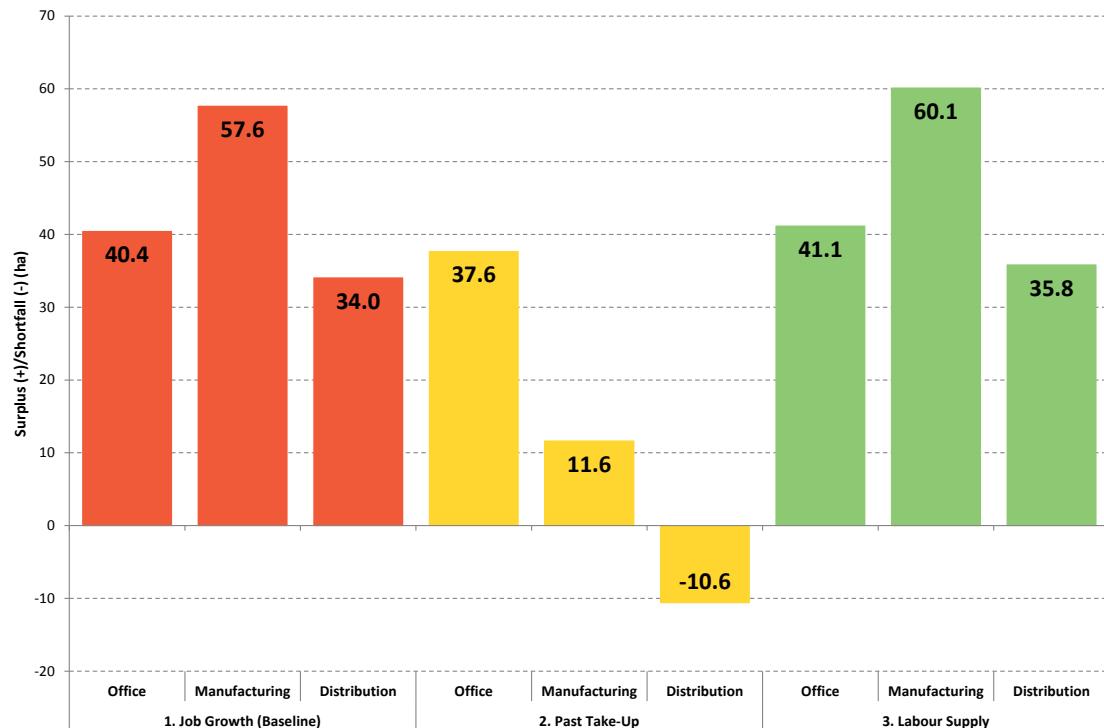
	1. Job Growth (Baseline)	2. Past Take-up	3. Labour Supply
Office			
Office space requirement	7.0	9.8	6.3
Potential supply of office space		47.4	
Surplus(+)/Shortfall(-)	+40.4	+37.6	+41.1
Manufacturing			
Manufacturing space requirement	-13.0	33.0	-15.5
Potential supply of manufacturing space		44.6	
Surplus(+)/Shortfall(-)	+57.6	+11.6	+60.1
Distribution			
Distribution space requirement	2.1	46.7	0.3
Potential supply of distribution space		36.1	
Surplus(+)/Shortfall(-)	+34.0	-10.6	+35.8

Source: Lichfields analysis

Note: Unknown or split extant permissions have been allocated equally to the three main B class uses above.

- 3.9 This overall balance position assumes that all employment allocations that remain undeveloped and outstanding planning permissions (at August 2017) come forward in full for employment development over the plan period. Any deviation from this assumption could reduce the existing surplus arising from some of the estimates of requirements of employment space, or potentially result in a deficit depending on the scale of deviation. As noted above, any variation in the exact mix of uses from that assumed could also affect the supply position for individual uses.

Figure 3.1 Forecast Surplus/Shortfall of Office, Manufacturing and Distribution Space to 2036 by Scenario



Source: Lichfields analysis

- 3.10 This suggests that, in purely quantitative terms, the identified pipeline supply as it stands provides for sufficient office and manufacturing space to meet the District's needs to 2036. For distribution space, there is a potential quantitative shortfall under the past take-up scenario.

Settlement Distribution

- 3.11 While a key aim of this EGS Update is to estimate gross employment land requirements for the District as a whole, it is also important to ensure the appropriate distribution of allocated sites across the District to meet future requirements, and to accord with market demand. As such, this section provides an overview of market views on demand for different uses, locations of stronger/weaker demand across Breckland (from the 2013 EGS) and seeks to identify where any gaps in future provision may exist.

- 3.12 A summary of the anticipated demand/supply situation over the plan period for the District's main settlement areas (as defined by the settlement hierarchy, and consistent with the 2013 EGS) is presented in Table 3.4 with a summary by settlement area provided below. Figures on the share of the District's employment space, as derived from data from the Valuation Office Agency (VOA), and the reported level of market demand by area are taken from the 2013 EGS.

Table 3.4 Comparison of Employment Land Supply and Demand to 2035 by Settlement

Location / Settlement	Existing Land Supply (ha)	Gross Past Take-up (2006-2017) (sqm)	Share of District's Employment Space (VOA)*	Reported Level of Market Demand*	Demand / Supply Balance to 2036
Attleborough and Snetterton	63.6 (50%)	41,672	15.4%	High	
Dereham	4.6 (4%)	10,042	8.9%	Moderate	
Swaffham	12.8 (10%)	2,639	2.7%	Low	
Thetford	30.3 (24%)	11,948	35.6%	High	
Watton	1.9 (1%)	12,562	6.4%	Moderate/Low	
Rural/other	15.0 (12%)	8,989	30.9%	Moderate/Low	
Total	128.2 (100%)	87,852	100.0%	Moderate	

Source: Lichfields analysis

* Taken from 2013 Employment Growth Study

Key:  = adequate supply  = over-supply

3.13 Located to the south-east of Breckland, the settlements of **Attleborough** and **Snetterton** represents some of the District's strongest market locations for industrial activity due in part to their good access to the A11 strategic route. Past take-up shows that demand for space in these locations has remained strong. Half of the District's overall supply is within the area covered by these two settlements, suggesting there will be a surplus of supply. **Dereham**, which is the second largest commercial market in Breckland, has also seen relatively strong levels of take-up in recent years. There is pipeline supply of 4.6 ha in Dereham, which is likely to be adequate to meet demand, though should demand increase over the plan period this demand/supply position could become constrained.

3.14 **Swaffham's** commercial property is relatively small in size and scale, and there has been limited take-up of employment space since 2013, so it may be over-supplied. **Thetford** has a larger commercial property market base. There have been some completions of employment floorspace in recent years, notably at Fison Way Business Park. There have also been some employment space completions in **Watton**, notably at Thrextion Road Industrial Estate. These locations therefore appear to be adequately provided for. Other locations that have seen new employment floorspace development in recent years include Roudham/Harling Road Industrial Estate and Shipdham Airfield.

Conclusions

3.15 Based on available employment land identified by Council monitoring data, Breckland has sufficient employment land in quantitative terms to meet future needs for office and manufacturing space up to 2036 under all scenarios of future growth. For warehousing space, there is a surplus under two scenarios, but a shortfall under the past take-up scenario. There is currently a higher level of supply than was identified in the 2013 EGS, which, combined with

more modest job growth forecasts, results in significant surpluses of employment space, especially for office and manufacturing uses.

4.0

Conclusions

- 4.1 The 2013 EGS identified a broad scale and type of growth arising from different approaches to **modelling the District's future employment space needs**. A similarly broad range of land scenarios have been identified in this update study. This reflects both indigenous needs arising within Breckland as well as – particularly in the case of the scenarios based on past development rates – **a degree of footloose demand which operates across the District's boundaries from the wider sub-region**. As noted in the 2013 EGS, the requirement of the NPPF to aim to at least fully meet Breckland's **employment space needs remains valid**.
- 4.2 This report does not constitute a full update of the 2013 EGS. It provides updated employment scenarios based on quantitative factors but does not provide an update to the 'policy-on' scenario and market intelligence that was presented in the original report. Both the updated job growth and labour supply scenarios are lower than the 2013 EGS, due in part to the reduction in the proportion of B class jobs indicated by the EEFM forecast. Therefore, in a policy-on context it is possible that higher growth could be achieved than indicated by the scenarios.
- 4.3 The 2013 EGS identified a need for a flexible and responsive policy framework, in order to both meet forecast quantitative requirements while also being aware of the opportunities and risks associated with particular planning policies. The emerging Local Plan should seek to plan for a choice of sites and locations to meet the needs of particular sectors and occupier needs. Some further commentary on the approach and potential options for providing for the different B-class uses are considered below.

Industrial Uses

- 4.4 The 2013 EGS notes that the industrial market in Breckland is reasonably strong, especially for smaller scale activities. This reflects its proximity to major transport routes, in particular the A11.
- 4.5 The latest EEFM forecasts (dated 2016) indicate that employment in both manufacturing and distribution will decline in Breckland over the period to 2036. This forecast equates to a gross employment space requirement of -52,082 sqm (-13.0 ha) for manufacturing and 8,460 sqm (2.1 ha) for distribution over the period 2011 to 2036. However, analysis of recent floorspace completions indicates a relatively buoyant industrial market. If these trends were to continue, the total manufacturing floorspace required would be equivalent to 131,879 sqm (33.0 ha) and the total distribution floorspace required would be 186,728 sqm (46.7 ha).
- 4.6 Considered together, manufacturing and distribution uses have lower requirements in the job growth and labour supply scenarios than the 2013 EGS. This is a result of the more pessimistic jobs forecast set out in the 2016 version of the EEFM. The updated past take-up scenario has a higher land requirement than in 2013, based on data over a longer time series. This reflects the relatively strong performance of the local economy in recent years, which, if it were to continue, would result in this higher requirement for employment space in the District. As noted in section 2.0, this indicates that there may be a basis for the Council to plan for a higher industrial space requirement than the job growth and labour supply scenarios.
- 4.7 The 2013 EGS identified a number of related policy issues for consideration, including:
- 1 **The rationalisation of the District's existing and future supply of industrial space by seeking to concentrate this space in the District's key locations of strongest market demand, such as Thetford and Attleborough;**

- 2 Adopting a more flexible approach to bringing forward employment sites in peripheral areas where demand is weaker; and
- 3 **Releasing some of the District's poorer quality and poorer performing sites in more peripheral locations.**

- 4.8 Analysis of supply for industrial uses indicates that there is pipeline supply of 44.6 ha for manufacturing uses and 36.1 ha for distribution. The updated demand/supply balance therefore indicates a potential surplus of industrial space under all three scenarios, except for distribution space where supply is more constrained, meaning there would be a shortfall of 10.6 ha under the past take-up scenario.
- 4.9 The demand/supply position has therefore changed slightly from the 2013 EGS. Though generally across the scenarios there is a quantitative surplus of space for industrial uses, there is a potential shortfall for distribution space when considered against past take-up rates.

Office Uses

- 4.10 As noted in the 2013 EGS, the office market in Breckland is relatively small and localised, lacking the critical mass to attract and sustain larger office occupiers, especially given competition from more established nearby centres such as Norwich.
- 4.11 The 2016 EEFM forecast indicates more modest employment growth within office-based sectors, albeit still the main driver of growth, which results in a lower floorspace requirement for the baseline scenario than identified in the 2013 EGS, equivalent to 36,719 sqm (7.0 ha). However, analysis of Council monitoring data indicates a relatively high level of office take-up in Breckland over recent years. If these trends were to continue over the plan period to 2036, the total office floorspace required would be 51,435 sqm (9.8 ha). For office-based sectors, the labour supply scenario results in the lowest floorspace requirement of 33,116 sqm (6.3 ha). Compared to the 2013 EGS, all three scenarios indicate higher office based requirements based on the updated evidence available.
- 4.12 Analysis of Council monitoring data for office uses indicates that there is pipeline supply of 47.4 ha. In demand/supply balance terms there is therefore a surplus of land available under all three scenarios. Within the context of this identified surplus, and as noted in the 2013 EGS, there would appear to be limited need to identify additional supply over the short term.

Appendix 1: EEFM (2016) Forecasts

Table A1. EEFM (2016) Employment Forecast for Breckland, 2011 and 2036

Sector	Employment		Change 2011-2036	% Change 2011-2036
	2011	2036		
Agriculture	2,400	1,840	-560	-23.3%
Mining & quarrying	20	10	-10	-50.0%
Manufacturing – food	2,250	1,200	-1,050	-46.7%
Manufacturing – general	2,260	1,800	-460	-20.4%
Manufacturing – chemicals only	1,060	570	-490	-46.2%
Manufacturing – pharmaceuticals	400	210	-190	-47.5%
Manufacturing – metals	840	670	-170	-20.2%
Manufacturing – transport equipment	530	570	40	7.5%
Manufacturing – electronics	390	120	-270	-69.2%
Utilities	130	80	-50	-38.5%
Waste & remediation	420	320	-100	-23.8%
Construction	4,500	5,230	730	16.2%
Wholesale	3,310	2,960	-350	-10.6%
Retail	5,710	6,370	660	11.6%
Land transport	3,170	2,820	-350	-11.0%
Water & air transport	0	10	10	100%
Accommodation & food services	2,520	4,050	1,530	60.7%
Publishing & broadcasting	120	120	0	0.0%
Telecoms	20	10	-10	-50.0%
Computer related activity	210	520	310	147.6%
Finance	500	430	-70	-14.0%
Real estate	580	1,030	450	77.6%
Professional services	2,510	2,850	340	13.5%
Research & development	60	70	10	16.7%
Business services	1,640	2,870	1,230	75.0%
Employment activities	690	3,370	2,680	388.4%
Public administration	1,990	1,710	-280	-14.1%
Education	3,750	4,440	690	18.4%
Health & care	4,880	7,240	2,360	48.4%
Arts & entertainment	1,140	1,730	590	51.8%
Other services	1,560	1,490	-70	-4.5%
Total	49,540	56,710	7,170	14.5%

Source: EEFM (August 2016)

Appendix 2: EEFM (2016) Technical Report

East of England Forecasting Model

Technical report: Model description and data sources



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1 Introduction

The East of England Forecasting Model (EEFM) was developed to project economic, demographic and housing trends in a consistent fashion and in a way that would help inform spatial economic planning in the East of England. The Model is programmed in Excel spreadsheets, allowing users to produce scenarios under which the impacts of a given scenario can be monitored.

This report provides technical information on the EEFM's coverage, methodology and data sources. (The latest forecast results are presented separately, on the Cambridgeshire Insight website.)

The Model's outputs are just one piece of evidence to assist in making strategic decisions. As in all models, forecasts are subject to margins of error which increase at more detailed geographical levels. In addition, the EEFM relies heavily on published data, with BRES/ABI employment data in particular containing multiple errors at local sector level (though the Model does attempt to correct for these.)

The EEFM is currently maintained and developed by [Cambridge Econometrics](#) (CE). CE has a long track record in the development of economic models for strategic planning and policy analysis, at global, national and sub-national level.

The outputs and associated documentation of the EEFM are available on the [Cambridgeshire Insight](#) website.

The purpose of this document is to provide a description of the Model's methodology and the data sources used, and act as a companion reference guide to the published results. It will be updated as the Model itself is developed, improved and updated. The report is structured as follows:

- Chapter 2: Description of the Model – This chapter summarises the EEFM coverage with respect to geography, time periods and linkages with other models produced by Cambridge Econometrics.
- Chapter 3: Model Overview – This chapter summarises the structure of the EEFM, and the linkages and relationships between variables.
- Chapter 4: Data Used – This chapter lists the variables in the Model, and indicates the latest data used.
- Chapter 5: Outliers and Data Validity – This chapter summarises Cambridge Econometrics' approach to anomalous data (so-called "outliers") and the methods used to check that the EEFM is internally consistent.

This report does not provide EEFM forecast results. These can be found on the Cambridgeshire Insight website www.cambridgeshireinsight.org.uk/EEFM. The detailed forecasts are set out there in Excel spreadsheets.

2 Description of the model

This chapter provides an overview of the East of England Forecasting Model (EEFM) and summarises its coverage and links to other Cambridge Econometrics models and assumptions. It also contains a list of the variables and geographies used. The forecasting methods and data sources are described in subsequent chapters.

2.1 Structure of the EEFM

The East of England Forecasting Model is a spreadsheet-based model originally designed to help inform and monitor the development and review of the East of England Regional Economic Strategy and Regional Spatial Strategy. It covers a wide range of variables, and is designed to be flexible so that alternative scenarios can be run and the impacts of different assumptions can be measured.

Key features of the Model are:

- A full database including 151 separate variables for each of the East of England's 48 pre-April 2009 local authorities, as well as for historic counties, strategic authorities, selected other local authority groupings, the East as a whole, 10 local authorities in the East Midlands and the region as a whole, 21 local authorities in the South East and the region itself, and the UK;
- Functionality to allow users to develop their own scenarios;
- A comprehensive set of tables allowing users to select and assemble data on the variables, localities, scenarios and results they want; and
- A spreadsheet system containing:
 - Linked worksheets, to facilitate faster updating;
 - Worksheets structured to generate forecasts and scenarios;
 - Worksheets designed to produce tables.

The overall Model structure captures the interdependence of the economy, demographic change and housing at a local level, as well as reflecting the impact of broader economic trends on the East of England. The employment forecasts take account of the supply and demand for labour, the demographic forecasts reflect labour market trends as they are reflected in migration (and natural change indirectly), and the housing forecasts take account of both economic and demographic factors. This structure allows scenarios which test the impact of variables upon each other – for example, the impact of housing supply on economic variables.

2.2 Geography

The Model produces forecasts for each local authority district and unitary authority in the East of England, and selected local authorities in the East Midlands and South East region to allow for LEP aggregation. For the EEFM 2016 forecasts, that equates to 79 local authorities, including the former Mid Bedfordshire and South Bedfordshire districts which have been retained at the request of regional partners. (The new Central Bedfordshire unitary authority is one of the strategic groupings for which forecasts are also provided.)

Forecasts are also available for selected groupings of local authority districts and unitaries. These were decided in consultation with regional partners through the EEFM Model Steering Group, and also include Local Enterprise Partnerships (LEPs). For a full list of the groupings available, refer to the EEFM section of the Cambridgeshire Insight website.

In addition to these geographies, forecasts for the East of England, East Midlands and South East regions, and for the UK, are available.

2.3 Time periods

The EEFM is constructed on an annual basis. Historic data for most variables has been collected over 20 years to provide a basis for estimating the relationships between variables and for forecasting future trends. Forecasts are currently made up to 2045, reflecting the available global, national and regional forecasts. But the longer-term forecasts should be treated with some caution, as unforeseen - but inevitable - future change in the underlying drivers will affect forecast accuracy. Medium-term forecasts are actually more likely to be better approximations than shorter-term ones, as we can usually be more confident about medium-term trends than about short-term random fluctuations around the trend.

2.4 Things to remember when using the model

EEFM forecasts are based on observed past trends only

Past trends reflect past infrastructure and policy environments. Even where major new investments or policy changes are known and have actually started, they can only affect EEFM forecasts to the extent that they are reflected in the currently available data. If they have not yet impacted on the available data, they will not be reflected in the forecasts.

There are two sets of exceptional circumstances in which the currently available data need to be supplemented by other information. The first is where there are concerns about data quality. This issue is explored in Chapter 5. The second is where the Model produces unrealistic forecasts - for example, continuing an employment decline in a particular sector in a particular area until it reaches zero or even negative values. Manual adjustments to the Model are necessary in these situations, and here professional judgement inevitably comes into play. This is discussed further below.

The forecasts are unconstrained

The EEFM forecasts are unconstrained, which means that the forecast numbers do not take into account any policy or other constraints that might prevent their actual realisation on the ground. Forecasts of the demand for dwellings, for example, are the outcome of projected changes in employment, population, etc. If, in reality, planning constraints were to prevent this demand being satisfied, the associated forecast levels of GVA, employment, population, etc. would be less likely to occur.

The forecasts are subject to margins of error

As with all kinds of forecasting, there are margins of error associated with the results which tend to widen over time. Furthermore, the quality and reliability of data decreases at more detailed levels of geography. Under current data-quality

conditions, models are most helpful for identifying trends, average growth rates and broad differentials between areas, sectors, etc. Accordingly, users are encouraged to focus on the patterns over time, not figures for individual years.

Reality is more complex than any model

Several of the modelled relationships are complicated and their treatment in the EEFM is necessarily simplified, despite its large size. In particular, the demand for housing is complex and not all the factors may be fully captured. Questions such as whether migrants' apparent willingness to live at higher densities than the existing population is merely a temporary state which requires much more investigation.

Forecasting models will not all agree

The EEFM's baseline forecasts can be compared with other published forecasts, but close agreement should not be expected and sometimes there can be wide divergences. These can arise from even small differences in underlying assumptions and in the timing and definitions of the data used. But with an awareness of these factors, the EEFM forecasts provide a useful starting point for an understanding of regional and local economic trends in the East of England, particularly when the baseline is accompanied by alternative scenario forecasts with which it can be compared.

2.5 Coverage

Later chapters provide more detailed information on the data used in the EEFM and how the linkages in the Model are used for the forecasting and scenario work. The list below gives an overview of the variables covered by the Model:

Demography

- Population
 - Total
 - Working age (defined as all people aged 16-64)
 - Young (defined as all persons aged 0-15)
 - Elderly (all people aged 65+)
- Migration (Note: domestic and international migration are not differentiated in the EEFM at either the regional or the local level.)
- Natural increase

Labour market

- Employee jobs by 31 sectors (workplace-based, SIC 2007 based)
 - Agriculture & fishing (**SIC 01-03**)
 - Mining & quarrying (**SIC 05-09**)
 - Food manufacturing (**SIC 10-12**)
 - General manufacturing (**SIC 13-18, 31-33**)
 - Chemicals excl. pharmaceuticals (**SIC 19-23, excluding 21**)
 - Pharmaceuticals (**SIC 21**)
 - Metals manufacturing (**SIC 24-25**)
 - Transport equipment, machinery & equipment, etc (**SIC 28-30**)
 - Electronics (**SIC 26-27**)
 - Utilities (**SIC 35-37**)
 - Waste & remediation (**SIC 38-39**)
 - Construction (**SIC 41-43**)

- Wholesale (**SIC 45-46**)
- Retail (**SIC 47**)
- Land transport (**SIC 49, 52-53**)
- Water & air transport (**SIC 50-51**)
- Hotels & restaurants (**SIC 55-56**)
- Publishing & broadcasting (**SIC 58-60**)
- Telecoms (**SIC 61**)
- Computer related activities (**SIC 62-63**)
- Finance (**SIC 64-66**)
- Real estate (**SIC 68**)
- Professional services excl. R&D activities (**SIC 69-75 excluding 72**)
- Research & development (**SIC 72**)
- Business services excl. employment activities (**SIC 77-82 excluding 78**)
- Employment activities (**SIC 78**)
- Public administration (**SIC 84**)
- Education (**SIC 85**)
- Health & care (**SIC 86-88**)
- Arts & entertainment (**SIC 90-93**)
- Other services (**SIC 94-99**)
- Employee jobs – full time and part time by 31 sectors (workplace-based)
- Self-employed jobs by 31 sectors (workplace-based)
- Total employment (employee jobs plus self-employed jobs) by 31 sectors (workplace-based)
- Total number of people employed in an area (consistent with 2001 and 2011 Census points)
- Total number of an area's residents who are employed (consistent with 2001 and 2011 Census points)
- Employment rate of an area's residents (aged 16-74, consistent with 2001 and 2011 Census points)
- Net commuting (number of people employed in an area, minus the number of that area's residents who are employed)
- Unemployed (claimant and ILO)

Output

- GVA by 31 sectors (£m, workplace-based, 2011 prices for the EEFM 2016 forecasts). Note that ownership of dwellings (imputed rents as defined in the Blue Book) is now included within real estate sector.
- Productivity by 31 sectors (per job, including both employee and self-employed jobs)

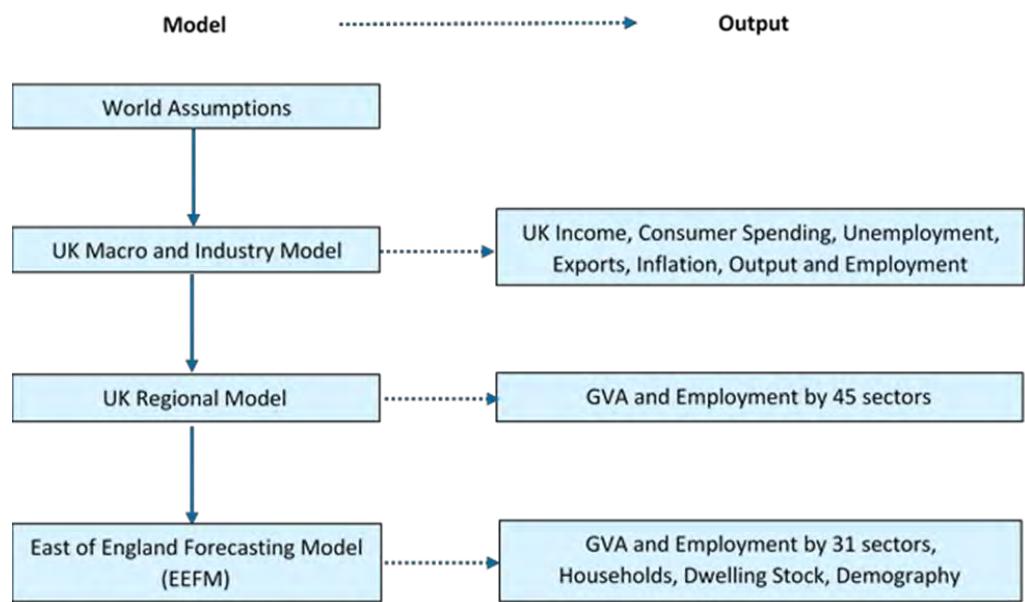
Housing

- Households
- Demand for dwellings

2.6 Links with other models

An important feature of the EEFM is its links to other Cambridge Econometrics forecasting models, ensuring that all EEFM forecasts are consistent with Cambridge Econometrics' world, UK national and UK regional forecasts. The links are summarised in Figure 2.1.

Figure 2.1 Links with Cambridge Econometrics' suite of models



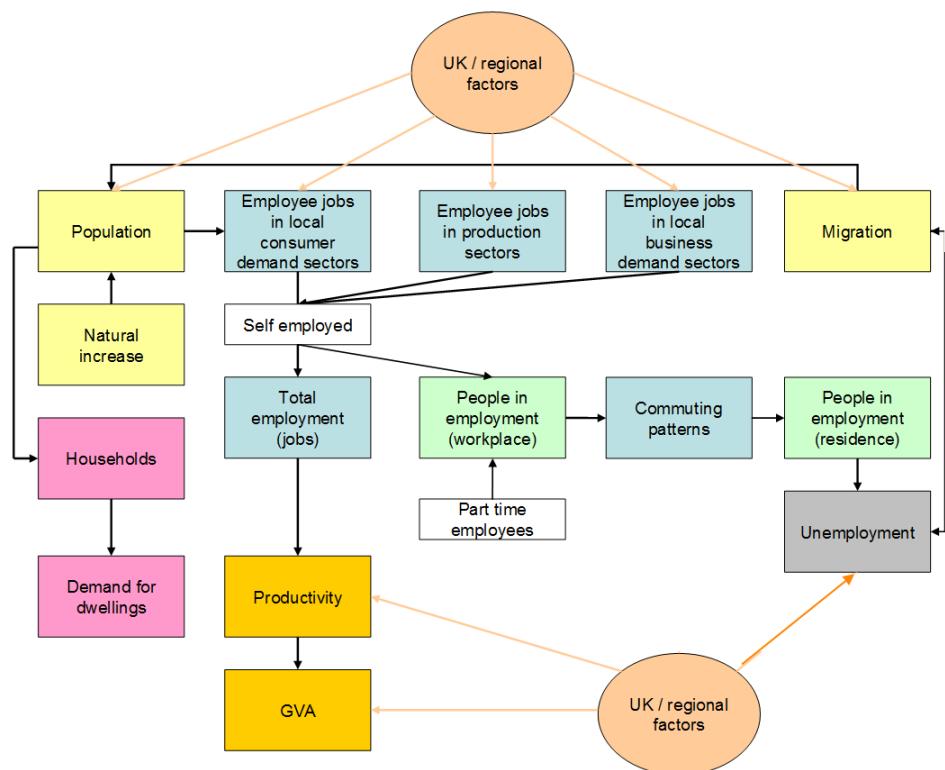
3 Model overview

The structure and data inputs of Cambridge Econometrics' UK Regional Model, which underpins the EEFM, is not set out here. But it can be obtained from Cambridge Econometrics on request.

3.1 Variables in the EEFM

The EEFM is very large, with numerous economic, demographic and housing indicators. Each of these variables is linked to others within the Model, and many key variables are also linked to others in the wider Cambridge Econometrics suite of models. The main internal relationships between variables are encapsulated in Figure 3.1, and the forecasting methodology for each element in the Model is then summarised.

Figure 3.1 Main relationships between variables in the EEFM



3.2 Economic variables

Workplace employees (jobs)

The total number of employee jobs in an area, whether full- or part-time. These can be taken by residents or by commuters from outside. Note that this is a measure of jobs, not workers, so if one person has two part-time jobs, for example, they are counted twice.

This is forecast separately in every area for each of the 31 sectors listed on pages 9 and 10. The forecasts begin with something called a “location quotient” (LQ). This is a ratio which summarises the concentration of a particular sector in a particular area, relative to the regional average. So an LQ of 0.8 (or 80%) for a given sector and area means that that sector is under-represented in the

area. An LQ of 1.25 (or 125%) means that the sector is overrepresented in the area.

The EEFM contains location quotients for every local authority in the East region including the additional local authorities in the East Midlands and South East region required to construct LEP aggregates, for each of the 31 sectors, and for every year since 1991. Forecast trends in the LQs are based on how they have changed over time. So if the LQ for a given sector in a given area has been rising in recent years, the forecasts will project this to continue, and vice versa. LQs which have been stable for a long time (including at zero) will be forecast to remain so.

Three forms of location quotient are used in the EEFM. In the first, the LQ is based on *an area's share of the region's employees in a particular sector*. This is most appropriate for sectors which are essentially independent of the local economy (e.g., manufacturing). Their activities are largely driven by regional, national or international suppliers and customers, and the goods and services they produce are typically traded over long distances. The EEFM treats the following sectors in this way:

- Agriculture
- Mining & quarrying
- Food manufacturing
- General manufacturing
- Chemicals excluding pharmaceuticals
- Pharmaceuticals
- Metals manufacturing
- Transport equipment, machinery & equipment, etc.
- Electronics
- Utilities
- Waste & remediation
- Water & air transport
- Publishing & broadcasting
- Telecoms
- Computer related activity
- Research & development
- Other services

For this group, the local employee growth forecasts in the EEFM come from the interaction of the relevant LQ forecasts with the regional sector employee forecasts from Cambridge Econometrics' UK Regional Model. To take a hypothetical example, if the UK Regional Model forecasts a 5% increase in air transport employees in the East of England, this filters down to the local area forecasts in the EEFM. If the LQ for air transport in a given area is forecast to remain stable, the employee forecasts for air transport in that area will tend to show a 5% increase. (In absolute terms, this means many new jobs in areas

with high LQs and relatively few in areas with low LQs.) If the LQ is forecast to increase (or decrease) in an area, the local employee growth forecasts for air transport will tend to be more than (or less than) 5%.

The LQ in an area can also be based on the number of employees in a given sector *per head of the local population*, relative to the regional average. This is most appropriate for sectors in which employment change is primarily (but rarely exclusively) driven by changes in the local population (e.g., health and education). In the EEFM, this group includes:

- Wholesale
- Retailing
- Hotels & restaurants
- Public administration
- Education
- Health & care
- Arts & entertainment

For this group, the local employee growth forecasts in the EEFM come from the interaction of the relevant LQ forecasts with the demographic forecasts for the area (which are also in the EEFM) and for the region as a whole (from the Regional Model). To take the example of education, consider an area which has an education LQ of 1.3 (or 130%) - perhaps because it has a university. Suppose that that LQ has been unchanged for a long time and is forecast to stay the same. And suppose that the area's population is also forecast to remain stable. But if the region's population is forecast to increase, education employees in this area will have to increase as well to keep the equation in balance (all other things being equal). This makes sense inasmuch as the area's education institutions clearly serve a market wider than the local area.

Finally, a sector's LQ can be based on the number of its employees *relative to all jobs in the area*, relative to the regional average. This is most appropriate for sectors where changes in employment arise primarily from changes in *total* employment locally - where the latter is effectively a proxy for business activity. (As might be expected, business services sectors tend to be in this group.) In the EEFM, the following are included:

- Construction
- Land transport
- Finance
- Real estate
- Professional services
- Business services
- Employment activities

In this group, the local employee growth forecasts in the EEFM come from the interaction of the relevant LQ forecasts with the regional sector employment forecasts from the Regional Model.

Cambridgeshire County Council and Cambridge Econometrics encourage Local Authorities to view and give feedback on the forecast trends for their areas. We regard such feedback as essential to ensure the EEFM is as credible and as accurate as possible. To that end, a consultation with Local Authorities is carried out before publication of each new forecast. Chapter 5 (Table 5.1) records the instances where local intelligence on employment trends has been used to modify initial EEFM assumptions.

Full-time and part-time employment

The total number of jobs in an area, broken down into full- and part-time jobs.

East of England shares of part-time employees among all employees in the 31 EEFM sectors (which are trend forecasts linked to regional and national projections) are applied to the workplace employee estimates described above. Full-time employees are simply the total of employees minus the part-time employees for each of the 31 sectors.

Workplace self-employment (jobs)

The total number of self-employed jobs in an area.

Self-employment data for the East of England in Cambridge Econometrics' UK Regional Model comes from ONS's Quarterly Workforce jobs.

Self-employment data for local authorities is Census-based, and scaled to the East of England self-employed jobs estimates from the UK Regional Model. It is broken down by the 31 EEFM sectors. The sectors are forecast using the growth in the sectoral employees in employment data and the estimates are scaled to the UK Regional Model's estimate of self-employment by sector for the East of England.

Total workplace employment (people)

This is the total number of people in employment in an area, including both residents and commuters. A person who has more than one job is only counted once, so total workplace employed people is smaller than total workplace employment.

The employment data from the Business Register and Employment Survey (BRES) over the years 2008-14 (and the Annual Business Inquiry (ABI) for earlier years) which is used in the Model measures jobs rather than workers. Because a model aiming to simulate housing demand needs to focus on people, we have to convert the total number of jobs in an area into numbers of employed people.

The 2001 and 2011 Census' give the number of people in employment in an area. For other years, we use BRES/ABI data to estimate residents in employment using the full-time and part-time projections (see above). Individuals are assumed to hold only one full-time job each. Part-time jobs are assumed to account for 0.75 of a full-time job. A simple adjustment is made to scale the indicator so it is consistent with the Census.

This measure is not forecast directly, but is derived from the forecasts of jobs discussed above.

Total workplace employment (jobs)

The total number of employee jobs and self-employed jobs in an area. These can be taken by residents or commuters from outside. Note that this includes all full- and part-time jobs, so if someone has two part-time jobs, they are counted twice.

This is not forecast separately in the EEFM, but derived by summing the workplace-based employee jobs and self-employed jobs forecasts described above, and then adding in a constant for the Armed Forces (see below). (Note: Armed Forces data are added to the public administration & defence sector.)

Residence employment

The total number of employed people living in an area. This includes residents who commute elsewhere to work.

Residence employment is based on a commuting matrix taken from the 2011 Census. This matrix tells us, for any given area, where its residents work. Using this information, each available job (see workplace employment (people) above) is allocated to a resident of one of the authorities with which the area has commuting links, in proportion to the strength of that link. This method assumes that commuting patterns do not change over time.

Net Commuting

The number of people commuting into an area for work, less the number of residents commuting out.

Net commuting requires no specific forecasting method. It is the residual between an area's residence-based and workplace-based estimates of numbers of people in employment. (These variables are used to check the realism of the EEFM's workplace- and residence-based employment forecasts, and can occasionally lead to manual adjustments to the Model.)

Our broad assumption is that commuting flows over the forecast period are in line with past trends. Major changes in transport infrastructure, or significant new housebuilding in an area, may bring about changes in commuting patterns, but as indicated in Chapter 2, the EEFM can only take account of such changes if they are reflected in the available data.

Claimant unemployed

The total number of people in an area without a job and claiming unemployment benefits.

The number of unemployed people in area i is projected as:

- the previous year's value
- plus $\beta_{1i} X$ (projected change in working-age population)
- minus $\beta_{2i} X$ (projected change in resident employment)

The two coefficients for each local area (β_{1i} and β_{2i}) were estimated based on unemployment, working age population and resident employment data over the period 1992-2014. All coefficients are less than one, reflecting the fact that many people adding to the local working age population go into education (e.g., students) or directly into employment (e.g., by moving to the area specifically to

take up a new job), and the fact that many new job vacancies in the area will not necessarily be filled by the local unemployed (e.g. migrants, commuters).

ILO unemployment (a wider measure of unemployment that includes those who are actively seeking employment but are not claiming unemployment benefit) is also included in the Model and comes from the Annual Population Survey. This data is available from 2004 and is both back-cast and forecast, using growth rates in the claimant series.

Gross Value Added (GVA)

The total sum of income generated in an area over a specified period, usually a year. It is the sum of wages, profits and rents. An alternative and equivalent definition is the value of gross output less purchases of intermediate goods and services.

GVA forecasts are available for 31 sectors. Previously, a sector entitled ‘ownership of dwellings’ (imputed rents in the ONS National Accounts) was excluded from the overall business services sector and published as its own sector. In Summer 2011, the ONS changed its methodology to publish data which included imputed rents within the business services sector. To remain consistent with National data, the EEFM now includes this measure of GVA within the real estate sector.

Sub-regionally, limited sector GVA data is available at NUTS 3 level (i.e. for unitaries and shire counties) but not for local authorities. Our initial forecasts at this level are obtained by multiplying forecast regional GVA per job in a sector (from the UK Regional Model) by forecast total workplace employment (jobs) in that sector (from the EEFM) for each local authority.

These initial forecasts are then subject to two adjustments. The first is for wage differentials (from ONS’s Annual Survey of Hours and Earnings), which has the effect of increasing GVA disproportionately in areas where wages are higher. The second scales local sector GVA to the most recent published NUTS 3 level GVA estimates for the relevant base year (2011).

Productivity

GVA divided by total workplace employment (jobs). It measures the average amount of income generated in each area by every person working there.

Productivity estimates do not require specific forecasting. They are simply forecast sector GVA divided by forecast total jobs (both employee and self-employed) in that sector.

Relative productivity is simply productivity in a specified area, divided by productivity in the region. A relative productivity value greater than 1.0 implies that productivity in that area (and sector) is higher than the regional average, and vice versa.

3.3 Demographic variables

Total population

The total number of people living in an area.

All population data is taken from ONS’s mid-year estimates (MYE) to 2014, and the ONS 2012-based population projections are used thereafter. At local level,

total population is forecast as last year's population plus natural increase plus net migration (domestic and international).

Working age population

The total number of people in an area that are aged 16-64.

Working age population for the region is based on the 2012-based ONS subnational population projections (SNPP).

For local areas, forecast working age population is forecast total population multiplied by a ratio of working age to total population. This ratio is forecast for each year of the forecast period, and calculated as the *previous year's* ratio multiplied by the growth in the ratio regionally according to the ONS (2012-based) projections.

Young population

The total number of children in an area (defined as all people aged 0-15).

The population aged under 16 years is forecast at local authority level using an annual ratio of children to working age people. This ratio is forecast for each year of the forecast period, and calculated as the *previous year's* ratio multiplied by the growth in the ratio regionally according to the GAD (2012-based) projections. The regional forecast for this variable is simply the sum of these local area forecasts.

Elderly population

The total number of elderly people in a given area (defined as all people aged 65+).

The local elderly population forecasts are simply the residual of the total population when the young and working age populations are subtracted. The regional forecast for this variable is simply the sum of these local area forecasts.

Migration

The net flow of people moving into and out of an area, whether this be to/from other parts of the region, the UK or the world. A negative number signifies a net outflow of people from an area, a positive number a net inflow.

- Regional migration:

This comes from Cambridge Econometrics' assumptions for net migration into the East of England.

Total net migration into the region in any given year is based on 2012-based ONS subnational population projections.

- Local migration:

Migration data is sourced from ONS's population mid-year estimates 'Components of Change' data. At local authority level, the number of migrants is the sum of two components: *economic migrants* and *non-economic migrants*.

The number of *economic migrants* into each area in any given year equals:

- previous year's working age population
- **multiplied by** $[0.01 + 0.29 \text{ (if the area's by the coast, otherwise 0)} - (0.16 \times \text{previous year's relative unemployment rate differential from the region unemployment rate})]$ where the unemployment rate has working age population as the denominator)
- This formula implies that the number of migrants into a district will equate to 1% of last year's working age population if the area is not by the coast and the difference between local and regional unemployment rate then was zero. To illustrate with a worked example, in an area not by the coast with 100,000 working age people and a 0.1pp positive difference in relative unemployment rate, net migration the following year will be $100,000 \times [0.01 - (0.16 \times 0.1)]$, or $100,000 \times [0.01 - 0.016]$, or $100,000 \times -0.006$, or -600.

So any change in employment or population in the EEFM which affects unemployment - whether the change is externally-sourced or internally generated within the Model - will affect net migration.

Non-economic migrants are set as a constant - unique to every area - for all future years. The constant for a given local authority is selected on the basis that it both reflects the actual population trend for the area over 1991-2011 (from ONS) and implies a local employment rate trend consistent with that for the region as a whole.

3.4 Housing variables

Households

The total number of households (as defined in official statistics) in an area.

Demand for dwellings

The total number of dwellings (as defined in official statistics) in an area.

The initial household data are as presented in the official DCLG series. The initial dwellings data are the stock data presented in the official DCLG series (table 125 provides total dwelling stock, whilst table 615 provides vacant stock, the residual between these series therefore represents occupied dwelling stock).

The method for forecasting the dwelling stock and the number of households is a three stage process. To produce *household* forecasts, we divide the household population (which is calculated as the total population minus institutional population) by household size, which is in turn based on official DCLG projections.

We then forecast the number of *occupied* dwellings by applying the growth rate in households in a particular year to occupied dwellings in the previous year.

Having calculated occupied dwellings, we use the previous year's ratio of total to occupied dwellings in order to project *total* dwelling stock in a particular year. We call this "*demand for dwellings*." It is intended to proxy dwelling stock, but it is not a conventional stock or supply figure. Rather it tries to estimate what stock might be needed to maintain current occupation ratios in the context of a higher population.

3.5 Carbon emissions

Industry, commercial & energy emissions

The amount of CO2 emissions produced by the industrial, commercial & energy sector in an area in any given year.

Data for the amount of CO2 emissions produced by the industry, commercial & energy sector is published by the Department of Energy and Climate Change (DECC) by local authority.

Local authority CO2 emissions forecasts within the industry, commercial & energy sectors were produced by first creating UK carbon weights by industrial sector. This was done using sectoral employment and carbon emissions forecasts from the DECC projections to 2035, and projections from the Energy-Economy-Environment Modelling Laboratory's Price-Induced Market Equilibrium System (PRIMES) energy system model thereafter. By dividing the emissions in a sector by the number of people in employment in that sector, then dividing this by the emissions for the average UK worker (total UK emissions divided by total UK employment), we are able to get weights showing how carbon intensive specific sectors are.

For each local authority, we then calculate a carbon weighted employment figure based on what the employment breakdown in that area is. So a district which employs significantly more of their workforce in the emissions intensive chemicals and processing industries sector would be forecast to have a higher carbon weighted employment figure than a district which had a large agricultural sector.

This carbon weighted figure is then multiplied by the average emissions per UK employee, to give a pre-adjusted industrial & commercial emissions forecast. The pre-adjusted forecast also takes into account emissions from the energy sector. These emissions are based on the DECC and PRIMES projections, and we have modelled the energy sector as having no employees as such. Otherwise, we could have a problem where a district with a high number of energy sector employees could be a head office and not really emitting much carbon. So we share the energy sector emissions across districts by multiplying UK energy sector emissions by each district's share of total UK employment.

Finally, we adjust our forecasts based on scaling factors capturing the differences between our calculations for 2005-13 and the 2005-13 DECC data.

Domestic emissions

The total number of emissions produced by households in an area in any given year.

Data for the amount of CO2 emissions produced by the domestic sector is published by the Department of Energy and Climate Change (DECC) by local authority.

Local authority CO2 emissions forecasts within the domestic sector are assumed to be a function of population i.e. more people means more households and therefore more domestic energy use. We have calculated the UK average level of domestic emissions per person by taking the total UK household emissions from the DECC and PRIMES projections and dividing by UK total population. Then we applied this UK domestic emissions per person

ratio to the local authority population forecasts in the EEFM to estimate a pre-adjusted domestic emissions forecast by local authority. Then we adjusted the forecasts based on scaling factors capturing the differences between our calculations for 2005-13 and the DECC data during the same years.

Transport emissions

The total number of emissions produced by the transport sector in an area in any given year.

Data for the amount of CO₂ emissions produced by the transport sector is published by the Department of Energy and Climate Change (DECC) by local authority.

Local authority CO₂ emissions forecasts within the transport sector are assumed to be a function of GVA (for example, more output means more transport use and therefore more emissions from transport). We have calculated the UK average level of transport emissions per unit of GVA by taking the total UK transport emissions from the DECC and PRIMES projections and dividing by UK total GVA from Cambridge Econometrics' UK Regional Model. Then we applied this UK transport emissions per person ratio to the local authority GVA forecasts in the EEFM to estimate a pre-adjusted transport emissions forecast by local authority. Then we adjusted the forecasts based on scaling factors capturing the differences between our calculations for 2005-13 and the DECC data during the same years.

Land use, land use change and forestry (LULUCF) emissions

The total number of emissions produced via land use (e.g. deforestation, emissions from soils, etc.) in an area in any given year.

Data for the amount of CO₂ emissions produced by the LULUCF sector is published by the Department of Energy and Climate Change (DECC) by local authority.

Local authority CO₂ emissions forecasts within the LULUCF sector are assumed to be a function of land area i.e. more land gives more potential for deforestation, emissions from soils, etc. We have taken land area data, measured in hectares, from the UK Standard Area Measurements for 2007, and assumed that these values have not changed over time. Then we took UK LULUCF emissions data from DECC for 2005-13, and DEFRA forecasts for 2015 and 2020. For the years in between, we assumed a straight line and extrapolated annual data points and beyond 2020 we assumed a continuation of the trend. Then, using data from DECC for 2005-13, we projected the local authority LULUCF emissions by taking the previous year's emissions, and adding the local authority share (calculated by taking each area's share of total UK land area) of the net change in UK LULUCF emissions in each year.

Total emissions

The total number of CO₂ emissions produced in an area in any given year.

This is calculated as an aggregate of industry, commercial & energy emissions, domestic emissions, transport emissions and LULUCF emissions.

4 Data sources

4.1 Labour market

Employees in employment

Description: Annual average employee job estimates

Data: 1991 – 1995 Annual Employment Survey (AES)
 1995 – 1997 Annual Employment Survey rescaled to ABI
 1998 – 2008 Annual Business Inquiry (ABI)
 2008 – 2014 Business Register and Employment Survey (BRES)

Full-time/part-time split

Description: Annual average full-time and part-time employee job estimates consistent with the employee job estimates above.

Data: 1991 - 1995 Annual Employment Survey (AES)
 1995 - 1997 Annual Employment Survey rescaled to ABI
 1998 - 2008 Annual Business Inquiry (ABI)
 2008 – 2014 Business Register and Employment Survey (BRES)

Self-employment

Description: Annual average self-employment job estimates

Data: ONS Workforce Jobs (WFJ)
 Census 2001 and 2011 for local area estimates

Employees in Armed Forces

Description: Annual average estimate of employees in UK regular Armed Forces stationed in the UK

Data: DASA, ONS Workforce Jobs

Unemployment

Description: Annual average claimant count unemployment – seasonally adjusted

Data: Local authorities: Nomis – Claimant count with rates and proportions
 Region: Nomis – Claimant count with rates and proportions

Residence-based employment

Description: Number of people resident in an area who are in employment (irrespective of where they work)

Data: Local authorities: Census of Population (2001 and 2011)
 Annual Population Survey (APS)
 Region: Census of Population (2001 and 2011)
 Annual Population Survey (APS)

Total workplace employment (people)

Description: the number of people who work in an area (irrespective of where they live)

Data: Local authorities: Census of Population
 Region: Census of Population

4.2 Commuting

Description: The number of people that travel into, and out of, an area for work

Data: Local authorities: Constructed by Cambridge Econometrics, Census of Population
 Region: Constructed by Cambridge Econometrics, Census of Population

4.3 Demography

Population – total

Description: total population, all ages

Data: Local authorities: National Statistics, mid-year population estimates
 Region: National Statistics, mid-year population estimates

Working age population

Description: defined as all people aged 16-64

Data: Local authorities: National Statistics, mid-year population estimates
 Region: National Statistics, mid-year population estimates

Young population

Description: population aged 0-15

Data: Local authorities: National Statistics, mid-year population estimates
 Region: National Statistics, mid-year population estimates

Elderly population

Description: defined as all people aged 65+

Data: Local authorities: National Statistics, mid-year population estimates
 Region: National Statistics, mid-year population estimates

Net migration and other changes

Description: net migration flows to/from an area, including other changes (e.g. boundary adjustments, prisoner movements, boarding school pupils, etc)

Data: Local authorities: National Statistics, components of change
 Region: National Statistics, components of change

Natural increase

Description: the numbers of births minus deaths

Data: Local authorities: National Statistics, components of change

Region: National Statistics, components of change

4.4 Output

GVA

Description: Gross Value Added in real 2011 prices

Data: Local authorities: Constructed by Cambridge Econometrics, Regional Accounts
 Region: National Statistics, Regional Accounts

4.5 Housing

Demand for dwellings

Description: Stock of dwellings.

Data: Local authorities: DCLG – dwelling stock estimates

Number of households

Description: Households

Data: Estimated by Cambridge Econometrics

4.6 Carbon emissions

Industry, commercial & energy emissions

Description: CO2 emissions from the industry, commercial & energy sectors

Data: Local authorities: DECC – Full local CO2 emissions estimates

Domestic emissions

Description: CO2 emissions from the domestic sector

Data: Local authorities: DECC – Full local CO2 emissions estimates

Transport emissions

Description: CO2 emissions from the transport sector

Data: Local authorities: DECC – Full local CO2 emissions estimates

LULUCF emissions

Description: CO2 emissions from the land use, land use change and forestry (LULUCF) sector

Data: Local authorities: DECC – Full local CO2 emissions estimates

Total emissions

Description: Total CO2 emissions

Data: Local authorities: DECC – Full local CO2 emissions estimates

5 Outliers and data validity

Official data (e.g. BRES employment data) are incorporated unchanged into the EEFM, as the crucial starting point upon which local economic data are founded. Data is then adjusted to be consistent with key regional and national series which offer more timely information around recent economic trends. This process allows Model users to reference key variables at the published source, however as data are adjusted this means that users cannot reference data directly, although the broad levels will remain consistent with the published source.

However, in some cases the data can be anomalous - so-called "outliers." This could be because of errors in measuring or recording it. Or perhaps the data is "true" but reflects an unusual circumstance and so does not accurately represent the local situation or local trends. Because of the smaller numbers of observations, data-reporting errors or unusual "outlier" values can be a particular problem at more detailed levels of analysis - for example, when looking at individual sectors in individual local authorities.

This section explores these issues in respect of the BRES (note: prior to 2008, ABI data is used and subject to similar levels of volatility), and outlines Cambridge Econometrics' approach to BRES data outliers. In summary, this is to keep them unchanged within the EEFM spreadsheets, but to adjust them when making forecasts such that the first year of a forecast would incorporate a correction for an outlier value in the BRES data in a previous year.

5.1 BRES outliers

The latest published BRES data is for 2014 and was released in September 2015. Since BRES data is collected by survey whereby individuals/firms complete the questionnaires, there can sometimes be significant discontinuities in the sector data at local level from year to year. Such discontinuities may - or may not - reflect real events. Consider the effects on the data series of an incomplete return from a firm - or an error interpreting or recording it - in one year preceded (or followed) by a complete or correct return in the previous (or subsequent) year. Any recorded change in employees associated with this would be fictitious, and any trend extrapolated from it into the future would be misleading. But equally, a dramatic change could reflect the opening, expansion, contraction or closure of a major business in an area (with potential longer-term effects on other local businesses).

If a discontinuity occurred in say 2008, but was corrected in 2009, producing a "spike" in the time-series data, it can essentially be ignored as it will not affect the forecasting process. Equally, if it were confirmed the following year, it would suggest a 'real' change in the local economy has indeed taken place. In the meantime, local authorities' input is vital to identify whether discontinuities in the data reflect 'real' events or not.

Focussing on the 2 digit SIC 2007 sectors for employee jobs at local authority level, we identified discontinuities showing **more than a 10% change in number of employees in a single year where this change involved more**

than 1,000 employees. These outliers were sent to appropriate local authority representatives for their reaction and input.

Cambridge Econometrics' response to this consultation was as follows: where we were satisfied that a discontinuity genuinely reflected the opening or closure of a firm, or major expansion or contraction, we accepted the change as the correct starting point for the EEFM forecasts. But if we were given evidence by consultees that there was an error in the BRES data or that an outlier gave a misleading picture of the local situation in some way, we corrected for the discontinuity in the first year of the forecast. (In the absence of any information about a discontinuity, we accepted it, in line with our working principle outlined above.)

Table 5.1 sets out those local authorities and sectors where adjustments were made to 2014 BRES data, showing the size and direction of the correction.

Table 5.1 Adjustments made to 2014 BRES data used in setting forecasts

Local authority	Sector	Correction
Braintree	Education	Up by approximately 900 employee jobs
Breckland	Employment activities	Down by approximately 1,200 employee jobs
Broadland	Finance	Up by approximately 1,300 employee jobs
Harlow	Business services	Down by approximately 1,900 employee jobs
Ipswich	Education	Up by approximately 1,100 employee jobs
Norwich	Employment activities	Down by approximately 400 employee jobs
Norwich	Business services	Up by approximately 2,900 employee jobs
St Albans	Business services	Down by approximately 1,200 employee jobs
St Edmundsbury	Business services	Down by approximately 5,800 employee jobs

Notes: The amount of jobs by which a sector has been adjusted does not necessarily reflect the size of the observed anomaly in the BRES data, as the 2014 adjusted value also includes an element of the trend employee growth that would have occurred if the correction had not been made.

5.2 Data checking and validity procedures

A vital foundation of any economic modelling and forecasting work is ensuring that data is correctly sourced and accurately fed into the model. Cambridge Econometrics has a policy of meticulously summing checking variables and carrying out visual checks throughout the process of updating the EEFM to ensure that the data is fully internally consistent.

Data is entered electronically from original official sources and is checked automatically to make sure identities are maintained. It is also checked visually to assess whether trends look plausible and magnitudes are correct.

There are a number of key identities in the EEFM which must hold for the Model to be fully realised, and we have a spreadsheet within it designed specifically to check that this is the case. These identities are:

- Employee jobs by sector = total employee jobs
- Self-employed jobs by sector = total self-employed jobs
- Employment by sector = total employment
- All indicators in each local authority = Eastern totals (note that this does not apply to productivity and unemployment/resident employment rates)

- Total employment = employee jobs + self-employed jobs + HM Armed Forces
- Total population = working age population + young population + elderly population
- Change in population = net migration + natural increase
- People-based employment = net commuting + resident-based employment
- Labour force = employment + unemployment

There are two principal methods that we apply to our models to ensure variables add up correctly over the forecast period:

- 1 **Scaling:** it is often the case that model input or output variables which are theoretically identical actually have different values. This is usually due to errors or incompleteness in the underlying data or methodological differences in gathering them. Scaling is the process by which two such variables are made equal by raising one to the value of the other, and the procedure can either be multiplicative or additive. Additive scaling takes the difference between the variables and adds it pro rata to the components of the lower of the two (for example, to local authority values when the total of these is less than a regional value to which it should theoretically be equal). Multiplicative scaling takes the ratio of the “target” total to the actual total, and multiplies each component of the actual total by that ratio. In this way, the actual total is shifted upwards (or downwards) to meet a target total which it should theoretically equal.
- 2 **Residual:** this procedure is used when the value of one component (or a small number of them) can be approximately deduced from the known values of other components and a known total. For example, estimating full time jobs as the residual between total jobs and part time jobs.

6 Employment land use methodology

This chapter outlines our methodology for calculating employment land use forecasts under the 2016 update of the East of England Forecasting Model (EEFM).

6.1 Key outputs

The summary outputs under the employment land module for EEFM 2016 for the East of England and each district include:

- Industrial floorspace (B1c/B2), thousands m²
- Warehouse floorspace (B8), thousands m²
- Office floorspace (B1a/b), thousands m²

Detailed outputs including the variables above split by sector are available on the website.

6.2 Measure of employment

The employment forecasts used in the calculation to estimate employment land requirements are:

- Jobs-based
- Workplace-based
- Full-time equivalents (estimated as the number of full-time employed, plus 75% of the number of part-time employed)

6.3 Employment densities

The employment densities used within the EEFM are based on the Employment Densities Guide, published in 2010¹, which provides guidelines on employment densities by use class. The guide presents densities on a range of different floorspace measures: gross external area (GEA), gross internal area (GIA) or net internal area (NIA). Therefore, it has been necessary to convert all employment densities to the same measure - GIA.

Table 6.1 Employment densities by use, 2010 guide

Use	Use class	Use Type	Area per FTE (m ²)	Floor Area Basis	Comment on potential variation
Industrial	B2	General	36	GIA	Range of 18-60 m ²
Industrial	B1 (c)	Light Industry (Business Park)	47	NIA	
Warehouse & Distribution	B8	General	70	GEA	Range of 25-115 m ²
Warehouse & Distribution	B8	Large Scale and High Bay Warehousing	80	GEA	

¹ Employment Densities Guide, Homes & Communities Agency, 2010

Office	B1 (a)	General Office	12	NIA
Office	B1 (a)	Call Centres	8	NIA
Office	B1 (a)	IT/Data Centres	47	NIA
Office	B1 (a)	Business Park	10	NIA
Office	B1 (a)	Serviced Office	10	NIA

The following employment densities have been adopted for Industry and Warehousing, based on the general use types. The GEA for warehousing has been converted to GIA by using the CLG's Regional Spatial Strategy and Local Development Framework Core Output Indicators – Update 2/2008 guidance² which assumes a 3.75% difference.

For office use, the HCA guidance states that the GIA is typically 15-20% higher than net internal space. Using this figure this provides an employment density range for general office of 13.8 m² - 14.4 m².

Table 6.2 Employment densities – industry, warehousing and office (GIA)

Use	Use type	Density: Area per FTE (m ²)	Notes:
Industry	B1c/B2	36	Uses General Industry
Warehousing	B8	67	Uses General Warehousing
Offices	B1	14 (based on the average of the 13.8-14.4 range)	Uses General Office

For detailed office uses the same process has been followed for call centres, business parks and serviced office whilst office headquarters are assumed to follow the general employment land density. As the guidance does not provide densities for R&D, science parks and small businesses uses these are assumed to follow the original densities from the 2001 guide. An alternative could be to use the B1c density, given the earlier employment land density guide showed densities for these uses similar to light industry. However, this would result in an overall density of around 60m², which seems very high when compared to the 2001 densities and is very close to the warehousing density.

Overall the following employment densities for detailed office use are used.

Table 6.3 Employment densities detailed office use

Use	Sub-use	Density: Area per FTE (m ²)	Notes:
Office	B1b use split: Science park & Small business units	32	Based on 2001 density guide
	High tech R&D	29	
	B1a split: General office	14	Based on NIA densities adjusted to GIA (average range of 15-20%)
	Serviced business centre & Business park	13	
	Call centre	10	

² <https://www.gov.uk/government/publications/employment-densities-guide>

6.4 Allocating employment sectors to use classes

In order to forecast employment land it is necessary to convert the employment sector forecasts into office, warehousing and industrial uses. As the model provides employment sector forecasts by 31 sectors in total (comprising one or several 2 digit SIC codes) we have allocated each sector across the use classes in differing proportions. This analysis has been largely based on reviewing each SIC code in detail and judging the overall proportion that could be expected to be in industry, warehousing or office uses based on our knowledge of the East of England's economy. This is not an exact science as the classification of economic activities does not always lend itself to a straightforward allocation.

The EEFM sectors are mapped to use classes in differing proportions, as outlined in Table 6.4. Those sectors marked with a * need careful consideration given the nature of the activities undertaken, namely:

- Waste and remediation - we have allocated 97% of these activities to industry use to capture waste treatment activities (based on employee share in BRES by detailed SIC codes).
- Construction - we have not included construction in B-use, however, we are aware that often this is classified as industry use.
- Wholesale trade and repair of motor vehicles and motorcycles - we have allocated 75% of this sector to warehousing based on the share of wholesale warehousing activities in the BRES numbers. The remaining 25% associated with the repair of motor vehicles has been allocated to industry.
- Land transport - we have allocated 39% of this sector to warehousing based on the share of warehousing and support activities for transportation in the employee BRES numbers.
- Professional services - we have allocated 96% of this sector to offices. We have excluded veterinary activities based on the share of employees in the BRES numbers.
- Business services - we have allocated 93% of this sector to offices. We have excluded travel agency, tour operator and other reservation services based on the share of employees in the BRES numbers.
- Employment activities - given that this sector includes temporary workers that may work in any industry we have allocated employment based on the weighted shares of all the other sectors' allocations to industry, warehousing and offices.
- Publishing & broadcasting activities - we have allocated all publishing activity to industry. For motion picture, video and television programme production, sound recording and music publishing activities which captures the production side of film and TV we have assigned 80% to warehousing given the large scale production sets often required and 20% to office use. For programming and broadcasting activities which incorporates broadcasting activities which are most likely to be studio based we have assigned 80% of these activities to office use and 20% to warehousing use. The proportions are then scaled depending on the relative employment shares in the BRES data.

- Telecoms - we have allocated 80% of telecoms to warehousing and the remaining 20% to offices.
- Public administration - we have allocated 61% of this sector to offices to take account of the share of general public administration activities; regulation of the activities of providing health care, education, cultural services and other social services, excluding social security; regulation of and contribution to more efficient operation of businesses; and foreign affairs. We have excluded defence activities; justice and judicial activities; public order and safety activities; fire service activities; and compulsory social security activities. The shares are based on the BRES data.

We would appreciate feedback on these sectors or any others, bearing in mind that a simple calculation is applied across the East of England. Densities and allocations are static across the decades in the spreadsheets, as we have made no assumptions about the impacts of changing working practices. We have applied assumptions across the whole region, rather than reflecting any local circumstances. An interactive version of the spreadsheets is available so that users can apply their own assumptions to reflect any specific local circumstances. Please see the Cambridgeshire Insight website for more information.

Table 6.4 Allocation of employment sectors by use class, SIC07

SIC code	SIC description	Industry	Warehousing	Office
		B1c/B2	B8	B1
01-03	Agriculture			
05-09	Mining and quarrying			
10-12	Food manufacturing	100%		
13-18, 31-33	General manufacturing	100%		
19-23 excl	Chemicals excl.	100%		
21	pharmaceuticals			
21	Pharmaceuticals	100%		
24-25	Metals manufacturing	100%		
28-30	Transport equipment, machinery & equipment	100%		
26-27	Electronics	100%		
35-37	Utilities			
38-39*	Waste and remediation	97%		
41-43*	Construction			
45-46*	Wholesale	25%	75%	
47	Retail			
49, 52-53*	Land transport		39%	
50-51	Water and air transport			
55-56	Hotels and restaurants			
58-60*	Publishing and broadcasting	66%	23%	11%
61*	Telecoms		80%	20%
62-63	Computer related activity			100%
64-66	Finance			100%
68	Real estate			100%

69-75 excl	Professional services			96%
72*				
72	Research & development			100%
77-82 excl	Business services			93%
78*				
78*	Employment activities	12%	8%	22%
84*	Public administration			61%
85	Education			
86-88	Health and care			
90-93	Arts and entertainment			
94-99	Other services			

6.5 Detailed office uses

The sectors with some element of office use have also been assigned into the more detailed breakdown of office uses as shown in Table 6.5 below. Again, we would appreciate any feedback on these allocations.

Table 6.5 Allocation of office employment sectors by detailed office use classes, SIC07

SIC code	SIC description	Offices	Split by:								
			B1	B1b	B1b Small business units	Science Park & Tech/R&D	B1a	B1a General Office	B1a Park	Serviced Business Centre & Business Park	Call Centre
58-60	Publishing and broadcasting	11%	0%	0%		0%	11%	0%	0%	0%	0%
61	Telecoms	20%	0%	0%		0%	20%	0%	0%	0%	0%
62-63	Computer related activity	100%	0%	0%		0%	30%	60%	10%	10%	10%
64-66	Finance	100%	0%	0%		0%	100%	0%	0%	0%	0%
68	Real estate	100%	0%	0%		0%	90%	10%	0%	0%	0%
69-75 excl	Professional services	96%	7%	7%		7%	79%	2%	1%	1%	1%
72											
72	Research & development	100%	20%	60%		10%	10%	0%	0%	0%	0%
77-82 excl	Business services	93%	71%	1%		9%	4%	9%	9%	9%	9%
78											
78	Employment activities	22%	5%	1%		13%	2%	1%	1%	1%	1%
84	Public administration	61%	0%	0%		61%	0%	0%	0%	0%	0%

Appendix 3: Definition of B Class Sectors

The method used for re-categorising the employment forecasts by sector into B-Class uses is summarised below.

Table A3. Apportionment of B Class Sector to Land Uses

Sector	Proportion of Jobs by Use Class		
	B1 office	B2 industrial	B8 warehousing
Agriculture, Forestry & Fishing	Non B-Class		
Extraction & Mining	Non B-Class		
Food, Drink & Tobacco	0%	100%	0%
Textiles & Clothing	0%	100%	0%
Wood & Paper	0%	100%	0%
Printing and Recorded Media	0%	100%	0%
Fuel Refining	0%	100%	0%
Chemicals	0%	100%	0%
Pharmaceuticals	0%	100%	0%
Non-Metallic Products	0%	100%	0%
Metal Products	0%	100%	0%
Computer & Electronic Products	0%	100%	0%
Machinery & Equipment	0%	100%	0%
Transport Equipment	0%	100%	0%
Other Manufacturing	0%	100%	0%
Utilities	61%		
Construction of Buildings	Non B-Class		
Civil Engineering	Non B-Class		
Specialised Construction Activities	0%	45%	0%
Wholesale	0%	26%	74%
Retail	Non B-Class		
Accommodation & Food Services	Non B-Class		
Land Transport, Storage & Post	0%	0%	80%
Air & Water Transport	Non B-Class		
Recreation	Non B-Class		
Media Activities	100%	0%	0%
Telecoms	100%	0%	0%
Computing & Information Services	100%	0%	0%
Finance	100%	0%	0%
Insurance & Pensions	100%	0%	0%
Real Estate	100%	0%	0%
Professional Services	100%	0%	0%
Administrative & Supportive Services	6%	0%	0%
Other Private Services	Non B-Class		
Public Administration & Defence	10%	0%	0%
Education	Non B-Class		
Health	Non B-Class		
Residential Care & Social Work	Non B-Class		

Source: EEFM/Lichfields analysis

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