Economic Needs and Benefits Report

NICOL ECONOMICS

Greystoke Land

Proposed hyperscale data centre development, land off Bedmond Road, Abbots Langley, Hertfordshire

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1. Introduction and summary

Purpose of the report

1.1 This report has been commissioned by Greystoke Land Limited. It examines the economic needs and benefits case for a proposed hyperscale data centre development at Abbots Langley in Hertfordshire. It is complementary to the Planning Statement prepared by the Pegasus Group and the Alternative Sites Assessment.

1.2 Further evidence on the market and technical need for additional data centre capacity in the London area and the local area is included in the Technical Report produced by FoundDigital.

The site and development proposal

1.3 The proposed development comprises:-

> "*Demolition and clearance of existing buildings and hardstandings to allow for the construction of a data centre of up to 84,000 sqm (GEA) delivered across 2no. buildings, engineering operations and earthworks to create development platforms, site wide landscaping and the creation of a country park. The data centre buildings include ancillary offices, internal plant and equipment and emergency back-up generators and associated fuel storage. Other works include an ancillary innovation, education and training centre of up to 300 sqm, internal roads and footpaths, cycle and car parking, hard and soft landscaping, security perimeter fence, lighting, drainage, substation, and other associated works and infrastructure."*

1.4 The whole site extends to approximately 31 hectares[1].

1.5 The application site is located to the north east and east of Abbots Langley and south of the M25, between junction 21 (M1) to the east and junction 19 (A41) to the west. The site is located in the Three Rivers District Council area in Hertfordshire close to the boundaries of the Watford Borough and the St Albans City and District council areas.

Summary of key messages

1.6 The key messages from the report are as follows:

Economic and societal drivers for data centres

1) There is strong and increasing support for the role of data centres and data infrastructure in **government policy**:

- First, national policy supports and strongly encourages the development of digital technologies and the "data economy" to underpin future economic prosperity and to help address a range of societal challenges.
- Second, government policy recognises the critical importance of the UK's data infrastructure including a supply of robust and secure data centres.

[1] The whole site area comprises the data centre area (c. 10 Ha) and the country park area (c. 21 Ha)

2) Globally, across Europe and in the UK there is extremely **rapid growth** in the amount of data that is being generated and that needs to be stored. Currently, the amount of data being generated is growing exponentially, driven by the radical transformation in how people interact and how technology is used for personal, government and business activities. Data usage is currently roughly doubling every three and half years. The roll out of technologies such as machine learning, Artificial Intelligence and the Internet of Things is continuing to fuel this growth.

3) Not all data that is generated needs to be stored: around 10% of the data created is stored. Data storage requirements globally are growing at a slightly slower rate than data usage (18% pa), but still will double every five years. The rate of growth is only very slightly lower across Europe. There are a range of forecast for growth globally, with overall growth in cloud infrastructure spend running at 10% to 11% on average annually over the period 2022 to 2027.

4) Data is stored in the "core" (i.e. traditional data servers and cloud data centres), the "edge" (infrastructure such as institutional servers) and in a global collection of "endpoints" (PCs, smartphones and other information storage devices). The share of data held in the core – i.e. data centres – is growing rapidly, meaning the need for data centre capacity is growing even faster than all data storage.

5) Within data centres, there is a major shift underway from traditional enterprise data centres (serving one business) to **colocation and hyperscale centres**. Driven by the economies of scale and need for increased capacity to deal with large volumes of data, hyperscale data centres will have grown from 39% of total traffic within all data centres in 2016 to an estimated 55% by the end of 2021.

6) Hyperscale data centres will typically have of the order of 10,000 or more servers (more usually 50,000 upwards) and a typical power consumption ranging from 20 to 50 megawatts (MW) per data centre upwards. The physical building size can vary but will be upwards of 10,000 sqm (just in terms of the server rooms). At the end of 2020, about 600 hyperscale data centres were operational worldwide.

7) There are, understandably, concerns about the role data centres could play in increasing the demand for energy. However, in spite of the rapid growth in data usage (12 fold increase 2010 to 2019) and data storage (7.5 fold increase) the overall **global demand for electricity to power data centres has remained flat**. This is primarily as result of the shift to far more efficient hyperscale data centres now accounting for increasing shares of data storage, alongside other efficiency improvements.

8) In the UK, the **data-driven economy is quite clearly on the march**. There are different definitions and therefore estimates of the size of the "data economy". Recent estimates for 2016, quoted by the UK government, range from £61 billion to £73 billion or around 4% of the UK economy. All research points to a strong upward trend in the share of the data economy in the UK's economy.

9) Those sectors that directly supply the data economy (telecoms, computer programming and data services) have seen their share of national output rise from 3.8% to 5.1% over the last two decades (to around £100 billion in 2019).

10) A review of sectoral patterns of expenditure reveals the particularly strong importance of the data economy and digital services currently in the **financial services** sector, in **key professional services** sectors (legal and accountancy), in the **creative economy** (eg advertising and publishing) but also in **retailing**. Many of these sectors are crucial as sources of service sector exporting, ensuring the UK can pay its way in the future.

11) The effective access to data and use of data is becoming a **crucial factor in business success.** It underpins better business intelligence and decision-making (leading to more efficient supply chains and inventories and improved environmental performance); it supports cost-efficiencies and revenue growth; creates opportunities for product and service innovation; and it supports opportunities for entirely new business creation.

12) The global growth in data centres and data storage has been replicated, as would be expected, in the UK and, in particular, in and around London.

13) London is currently the **pre-eminent data centre location in Europe**. It accounts for the majority of data centre capacity, especially in colocation and hyperscale cloud data centres, in the UK. As a concentration of data centre capacity, it is of the order of 12 times larger than the next largest centre ("Manchester and the north") in the UK.

14) This role of London (and the UK) is a result of several factors: it is **the major global financial and business centre** in Europe; it has excellent **connectivity**; and secure and reliable **power** supplies. London also has the largest concentration of IT personnel and (now) data centre expertise in Europe.

15) The supply of data centre capacity in London has risen by over 20% per annum over the past 4 to 5 years to reach around 1,030 MW of capacity at the end of 2022 that is either installed or under construction. This might seem very rapid growth but is only in line with the growth in global data and storage.

16) On some measures, London accounts for between a third and two fifths of total capacity of the five key centres in Europe (Frankfurt, London, Amsterdam, Paris and Dublin) or "FLAP-D". London has at least 50% more installed data centra capacity than the nearest other centre in Europe (Frankfurt), although at the end of 2022 the rate of new build was greater in Frankfurt than London.

17) There are several reasons why it is important that data centres are **physically located in the UK for the benefit of our economy**: there are specific data residency requirements from some users and sectors (such as the UK government or pharmaceutical firms) in some cases for tax or regulatory reason; there are data sovereignty requirements (generally European data needs to reside in Europe due to GDPR requirements); finally there are specific current "latency" requirements for physical access for real time data users where transaction speed is critical (the financial services sector in particular at present).

18) In the future, as more economic and societal activity requires **real time data**, the physical location of data centres close to major centres of economic and societal activity will become all the more important.

Scale of future need for extra data centre capacity

19) Previous work, based on known demands from large market players, suggested that over the five years from 2023 to 2027 total extra capacity in the London area might need to grow by between 2,000 MW to 2,800 MW in round terms. This need is being driven by the sector growth drivers and hyperscalers' needs to in turn meet these demand. Such growth would amount to a stepped change in absolute scale of growth compared to the past 5 to 6 years but represents a continuation in the acceleration of annual increase in requirements for extra data centre capacity.

20) The review in the Technical Report suggest that these forecasts are reasonable and if any anything be conservative given recent developments in the use of AI. The fact that the forecast were provided up to 2027 does not suggest that demand for data centre capacity will stop or slow down after 2027. This is because the fundamental technological, societal and economic drivers will remain the same.

The location needs for hyperscale data centres

21) As explained, hyperscale data centres are becoming an ever growing part of overall data storage and play an increasingly key role in supporting the data-driven economy. Hyperscale centres can be built and operated by the main tech giants (Apple, Amazon, Microsoft, Meta, Oracle, Google, IBM etc) or by specialist operators who can then lease space out (in effect colocation wholesale or retail centres). London has not, to date, been a major location for hyperscale data centres.

22) The critical location drivers for hyperscale data centres all relate to resilience and business performance. The ability to be able to ensure continuity of service. These drivers are:

- Sufficient **size of site** to accommodate the scale of facility needed (including expansion space). This size of requirement is leading to the need to find sites of a scale that cannot be accommodated within the main urban area of London (or other more urbanised locations) except for exceptional windfall sites.
- It is critical to have access to an adequate and **reliable power supply.** As the demand for and supply of data centres has grown around London, this is increasingly becoming a critical constraint on the ability to deliver new data centres in some locations.
- Access to excellent **fibre connectivity.** It is important to be close to high capacity fibre cable networks and to have several fibre routes to ensure resilience.
- The site needs to be **physically resilient** - for instance to avoid flooding risk, or Heathrow's flight path (and associated accident risk).
- Proximity to other data centre clusters (ideally two others) with robust fibre routes to provide resilience in the event of any failure at the data centre in an "**Availability Zone**" (AZ).

1) In addition, data centre operators want to be able to have access to a strong pool of skilled staff and expert suppliers. This is why data centres tend to cluster around large metropolitan areas and existing data centre locations. Data centres also need physical proximity to key market zones and in some cases location within a particular country to meet data residency or sovereignty requirements.

2) The Technical Report explains why **proximity matters** in respect of AZs and AZ regions for cloud hyperscalers. Within an AZ the "parent" data centres needs their supporting "child" data centres to be no more than 10 km to 20 km by fibre cable. AZ regions provide the greatest resilience and require three AZs no more than 60 km apart by fibre cable[2], but with physical separation to ensure resilience.

3) The major hyperscaler operating in London have created or seeking to create AZ regions to provide maximum resilience. This places **geographical distance constraints** on the suitability of sites for large data centres that are set out in the Technical Report. The Hemel Hempstead AZ plays an important role and one where the drivers of data centres will be leading to increased demand in the future.

4) The proposed development site near Abbots Langley is an excellent location for a hyperscale data centre due to:

- Its proximity to existing hyperscale data centres providing a key "parent" facility to which it could be linked within the Hemel Hempstead Availability Zone.
- Excellent access to a resilient high quality fibre network.
- The absence of site constraints, and
- Access to power supply..

The wider benefits from the proposal

5) The primary benefit from the proposal is meeting a clear national need for ensuring the future delivery of a critical part of the UK's data infrastructure. This in turn supports the essential development of the data driven economy and underpins the changes in how the economy and society will operate.

6) In particular, there are a range of business sectors that are clustered in and around London that are crucial for national economic success. They contribute to a large share of our exports and net balance of trade in services. These are the financial services sector, the business and professional services sectors, research and development and the creative sectors (eg publishing and advertising and research). Increasingly, online retailing and other online services need access to high quality and real time data as well.

7) The growth of the data infrastructure in the UK is needed to support these sectors. Given the concentration in and around London of these sectors, this is why a London location is ideal for these sectors. Also, due to the prior cluster of data centres, London offers the benefits of local AZs creating the best possible resilience.

[2] With the optimal distance being within 35 km to 40 km. Note: these distances are not straight-line distances, rather they are distances along the routes of optical fibre cables, which in effect are shorter straight line distances on the map (as optical fibre cables do not run in straight lines from A to B).

The no development scenario

8) If there were no development of the proposed hyperscale data centre on the site at Abbots Langley, this would have a number of adverse effects for the local and wider UK economy. The data centre would provide roughly 6% of the growth in capacity needed over the next five years across the whole London area.

9) It would increase pressure for development on other locations. However, there is a severe shortage of sites of the scale and number needed for hyperscale data centres in the London area and in this AZ and others to the north west and west of London.

10) The need cannot be met by locations further afield from London elsewhere in the UK because the locational drivers for hyperscale data centres require them locating in the London region.

11) There is a strong likelihood that the major investment in the hyperscale data centre would go to **alternative competing centres in Europe**. This competition includes: (a) the established and fast growing centres in Frankfurt and Paris (which are also major competitors to London/the UK for other global technology and knowledge-based services investments); and (b) other locations such as Dublin or, increasingly, Scandinavia which have proved attractive to some hyperscale data centre operators.

12) The growth in capacity in the UK is responding to **demand and needs from the UK economy**. A lack of growth in capacity to meet this demand and need would impact on the ability of **key sectors** of the economy to perform as effectively as they could and/or increase data costs on users.

13) It is not possible to model these adverse impacts precisely but, on reasonable assumptions set out in this report, such costs to the UK economy could run into several hundreds of £s millions.

The local benefits from the proposal

14) A large data centre requires significant initial expenditure to develop buildings and to install and set up plant and equipment. The data centre then undergoes periodic expansion and renovation as the operator updates its infrastructure to meet customer demand and integrates the latest technological advances. There is, therefore, ongoing capital expenditure throughout the life of a data centre. Often repairs, replacement, and upgrade of IT equipment and infrastructure begin in year three of operation.

15) Typically, over a 7 to 10 year period from when work starts on a large data centre, the average jobs and economic activity supported by the initial and the subsequent capital expenditures can be of the same order of magnitude or even exceed those for the operational activity. The base building construction often accounts for around 20% of all capital costs (excluding land) and the purchase and installation of mechanical and electronic equipment the remaining 80%.

16) The figures that are available from elsewhere, applied to the proposed scheme when fully developed out, give very substantial estimates of total capital expenditure. The construction cost alone of the building could be the order of £700 to £800 million**,** with the total value of all the capital investment potentially being well over **£1 billion**. This level of capital expenditure will support very significant levels of jobs both on-site and in suppliers.

17) We have estimated the likely on-going operational jobs and other benefits based on the following parameters for a fully completed scheme:

- A total 96 MW of critical IT load, and
- 83,446 sqm (GEA) of buildings.

18) Based on an average of all the data sources considered, our best estimate is that when the full scheme is operational this would support around **210 full-time equivalent** (FTE) jobs on-site. However, the numbers could range from 170 up to 260 FTE jobs (or potentially higher). The employment would provide significant opportunities for training and development and links with local colleges and training providers. There also be substantial initial and ongoing, if periodic, employment associated with capital expenditure in the building, including installing and replacing the complex computing and heating, cooling and power systems.

19) Compared to the overall value of the development, there would be relatively few operational jobs created (as hyperscale data centres are highly automated). However, on average jobs in data centres are **highly paid**. The overall gross **wage bill** for the completed development (before taxes) is estimated at between **£9.7 million to £11.4 million** annually (at an average annual salary of £46,000 to £54,000 which is substantially above current average wages levels in Hertfordshire).

20) Based on current UK averages for the data services sector, the annual economic output (or Gross Value Added (GVA)) generated at the data centre could be around at least **£30 million to £33 million** (in 2019 prices and values). Given that hyperscale data centres are particularly efficient and productive, we consider that the level of economic output is likely to be well in excess of these estimates and based on evidence from Northern Virginia over £100 million in direct GVA.

21) There would be other indirect (supplier-linked) and induced (spend) "multiplier" effects that would occur across the regional areas around the development (i.e. London, the East and the South East). An overall multiplier for GVA in the range of 1.2 to 1.9 for these effects would be reasonably cautious. Using this range of overall multipliers, the overall full impact of the development would be the creation of the order of £230 to £300 million annually in GVA across London, the East and the South East's economy.

2. Data centres – an introduction

The history of data centres

2.1 Data centres have been around for many years, but their role, until recently, has been localised and business specific. The precursor to modern day data centres were the large servers (or mainframes) that were developed in the 1950s and 1960s. These provided secure data storage for industrial business or organisations in the days before the internet and network computing. Even small firms would have their own server that provided back-up data storage for the data generated within an enterprise. These were, in effect, very small and local data centres. These early data centres were often in a specific part of an enterprise's building, but in some cases were off-site for further security and backup but dedicated to the business.

2.2 When the internet took off in the 1990s and 2000s, the amount of data generated by individuals and organisations started to grow very rapidly, as did the means of internet and digital based communication. Increasingly, organisations across the private and public sectors moved to business models where data and information was shared via intranets that required data to be shared and stored somewhere secure (in what became known as enterprise data centres). In parallel, the development of social media platforms such as Facebook, Instagram, YouTube, Twitter etc led to an explosion in the amount of personal data generated and shared that also had to be stored.

2.3 During the 2000s, cloud computing became commercially available and revolutionised the nature of data centres . Cloud computing is defined as the use of "*pooled, centralised computing resources (including data storage and processing) that are provided to customers on-demand, often over the internet*"[3]. The key revolution was that third party providers were now able to store data for individuals and organisations over or in "the cloud," thereby supporting intranets and business wide platforms rather than this being done in-house. The "cloud" is something of a misnomer as this data storage actually takes place in data centres located in physical sites on the ground.

2.4 Every time a mobile phone, smart TV or computer user accesses internet services such as search engines, apps, or documents, this requires instant access to the data needed for and associated with these activities. This is as true for an on-line flight or holiday booking service as it is for the NHS App that stores Covid-19 passports or a whole range of cloud-based services from Spotify for music, to BBC iPlayer and Netflix for TV and films. It is also true for document editing and sharing platforms (such as Google Docs) and video conferencing services such as Zoom and Microsoft Teams.

2.5 The data economy and society that we now live in requires **key digital infrastructure** to operate successfully. The UK Government's National Data Strategy describes this as "*the virtualised or physical data infrastructure, systems and services that store, process and transfer data*" and explains that this includes:

- Data centres - providing the physical space to store data
- Peering and transit infrastructure - enabling the exchange of data (what is sometimes referred to cabling or fibre optic connections)
- Cloud computing - providing, as noted above, the virtualised computing resources that are accessed remotely.

[3] "Cloud Computing," POSTNOTE Number 629, The Parliamentary Office of Science and Technology (POST), June 2020

The types of data centres

2.6 There are a variety of types of data centres. The four main types of data centres which feature in the various statistics about data centres are:

- **Enterprise** data centres (that are bespoke to one firm and are a continuation of the earlier forms of data centres). They are owned and operated by the business or organisation (although elements can be provided by a third party provider).
- **Co-location** data centres that are operated by one business but are shared by several firms or groups of enterprises (also called multi-tenant data centres). This approach is sometimes referred to as "retail" colocation. A "wholesale" colocation data centre is where the data centre operator provides the whole data centre to a single third party user (who therefore does not own the data centre) and who might be a provider of cloud computing services.
- **Edge** data centres are small data centres that are located close to the edge of a network. They provide the same devices found in traditional data centres, but are contained in a smaller footprint, closer to end users and devices[4].
- **Hyperscale** data centres are a specific form of data centre used by the tech giants and major cloud and internet service firms and others.

Hyperscale data centres

2.7 The development proposal that is the subject of this application is a site for a hyperscale data centre. It is helpful for purposes of assessing need to understand the concept of hyperscale in more detail. The essential defining characteristic of hyperscale is, as the name suggests, the **size** of the data centre.

2.8 However, hyperscale characteristics relate to more than simply size. They also refer to the ability to scale up, to scale down, and to scale out to meet any data load they service. This can mean adding more computer power, as well as adding more machines, i.e., the ability to "scale out"[5]. Hyperscale data centres are typically owned and operated by one company to serve their needs (e.g., Microsoft, Google or Amazon Web Services). However, they can also be operated by companies like Equinix, CyrusOne and Digital Realty who operate hyperscale data centres and rent out capacity to many large businesses (in effect operating as hyperscale colocation data centres).

2.9 There are different ways that hyperscale size can be defined: the number of servers; the power supply needed; or the floor area of the centre. Others define hyperscale data centres by their functionality[6], rather than any size parameter. There is no single definitive definition of what is a hyperscale as opposed to an ordinary large data centre. Exploring these size parameters in turn:

[4] There is also a variant of edge data centre which is a "portable" data centre that is mobile and can be "lifted and shifted."

[5] Horizontal scaling – known as scaling out, means increasing the machines working in the network. Vertical scaling – or scaling up, adds additional power to the machines already in service. Scaling up/ Down Services & functionality means reduction in service requirement (e.g., reducing from software as a service to just bare infrastructure (SaaS to IaaS). Together this provides the ability to be agile and to scale "on demand" depending on the current and projected demand.

[6] This is the approach used by Synergy Research who track the number of hyperscale data centres.

- Number of **servers**: some definitions of hyperscale suggest that they would need a minimum of 5,000 server racks[7] but more typically they are seen as having 50,000 (or more) computing and storage servers[8].
- **Power capacity**: the typical power consumption/IT load availability in a hyperscale data centre has been described as an average of 20 to 50 megawatts (MW) per data centre[9].
- Size of **site and buildings**: the size of hyperscale data centres buildings depends on data centre configuration. One definition of the very minimum size of a hyperscale data centre is 10,000 sqft of "white space"[10]. This is consistent with the 5,000 servers at one server every two sqft of space[11]. For a 50,000 server rack data centre, the area of white space housing the servers would be 100,000 sqft (around 9,300 sqm), although this is far from constituting the whole area of the data centre building.

2.10 Hyperscale data centres require very large amounts of power reflecting their large computing capacity and workload. However, modern hyperscale data centres are **very efficient in their use of power** (data storage and usage per unit of power consumed is much higher than older and smaller data centres). The requirements of access to energy, especially green energy, are becoming critical factors in the design and locations of data centres. The data centre industry is taking sustainability very seriously with a major focus on improving the energy efficiency of data centres and processing[12]. This will be given further emphasis by new EU-wide regulations on carbon emissions that will impact on environmental standards for data centres. This will impact on data centre operators located in the UK as well: they all to some degree provide services to customers in the EU. These regulations will replace the current voluntary European Code of Conduct for Energy Efficiency.

2.11 Globally the number of hyperscale data centres is growing rapidly (see Figure 2.1). They are accounting for a **rapidly increasing share of all data centre activity**. There are definitional issues around measuring the size of total data centre activity (which can be measured in terms of revenues, data stored or MW of IT load capacity) and that of hyperscale data centres. Some recent research suggests that the global hyperscale data centre market size (i.e., total value of sales) was around $62 billion in 2021 and was forecast to grow at a compound annual growth rate (CAGR) of 29% over the period 2022 to 2030[13]. This is considerably faster than forecasts of the total data storage or data centre market.

[7] International Data Corporation (IDC) defined a data centre as hyperscale when it exceeds 5,000 servers.

[8] AFL Hyperscale "Hyperscale and Other Types of Data Center," May 14, 2020

[9] https://www.aflhyperscale.com/articles/now-thats-interesting/what-makes-hyperscale-hyperscale/

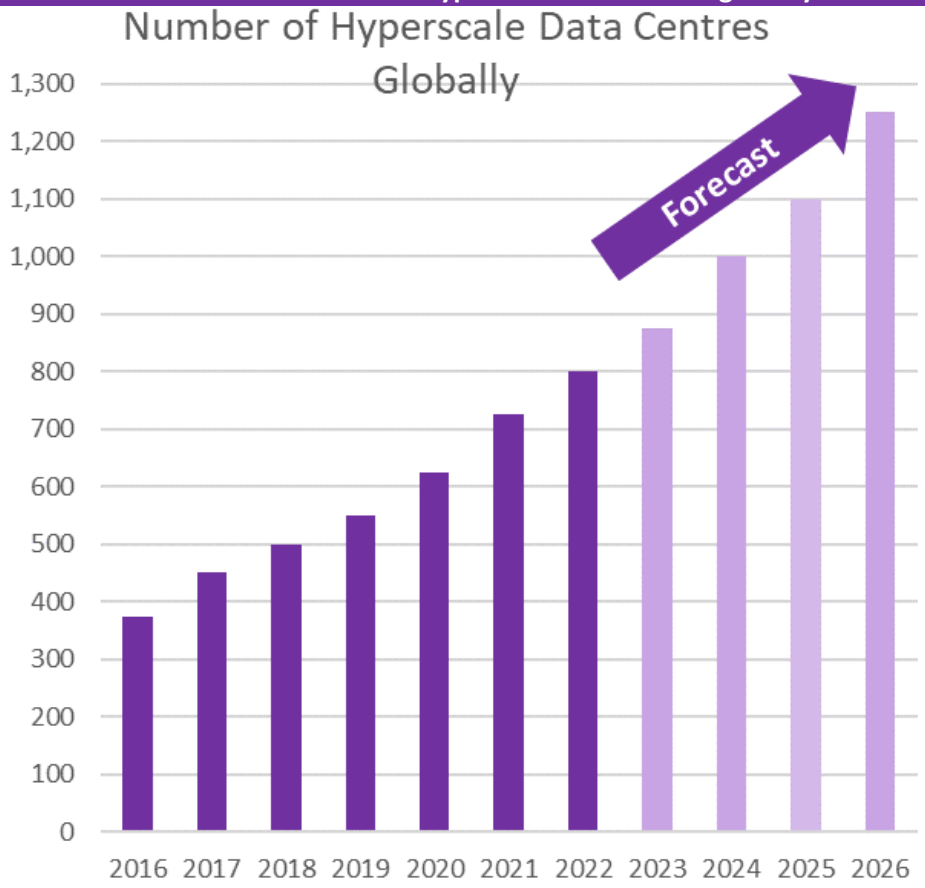
[10] That is the space devoted to the computing elements of a data centre as opposed to power supply etc.

[11] As reported in https://www.zdnet.com/article/how-hyperscale-data-centers-are-reshaping-all-of-it/

[12] The European Data Centre Association (EUDCA) has formed a Climate Neutral Data Centre Pact setting out targets for the sector.

[13] Source: summary of Precedence Research report accessed via the web December 2022

Figure 2.1: Actual and forecast number of hyperscale data centres globally



Source: our analysis of *Synergy hyperscale forecasts, March 2023. Note: data refers to end of each year*

Availability Zones and Regions

2.12 Availability Zones (or AZs) are a crucial factor in the location of many data centres especially the hyperscale data centres used by the large cloud services providers. As explained in the FoundDigital Technical Report, an AZ is a single data centre facility with a hyperscale presence of between 10 MW and 500 MW IT capacity. A hyperscaler may own the AZ outright or rent space in another facility (in full or shared) which becomes its AZ.

2.13 As further explained in the FoundDigital Technical Report an AZ Region is three (or more) AZ facilities, interconnected, and following stringent rules in terms of optical fibre distance between each facility and other interconnected facilities[14]. This provides an extremely high degree of robustness in service provision across the AZ Region.

2.14 Hyperscalers as they expand capacity to meet need will develop "child sites" that are connected to one or more AZ data centre (the "parent") which also follow stringent rules in terms of optical fibre distance between sites (of typically no more than 10 to 20 km).

2.15 Once an AZ region is established, multiple child sites can be interconnected to an AZ, providing they adhere to the optical fibre route lengths with up to 200 MW to 500 MW of IT load "hanging" (ie connected) to the parent data centre .

[14] Less than 60 km of optical fibre cable connection. As typical fibre routing is 1.3 to 1.8 times the radii (as-the-crow-flies), the effective on the ground distance between AZs in an AZ region is between 33 km to 46 km (Source: FoundDigital)

3. Policy considerations for the proposed development

Planning Policies - NPPF and PPG

3.1 There are no direct references to "data centres" in either National Planning Policy Guidance (NPPF) or national Planning Practice Guidance PPG. That is not surprising given how recently they have become visible in economic terms (unlike telecoms cabling infrastructure for instance). However, there is clear policy support of a more general nature for data centres within NPPF.

3.2 Also as stated in Paragraph 82 planning policies should be "*flexible enough to accommodate needs not anticipated in the plan, allow for new and flexible working practices (such as live-work accommodation), and to enable a rapid response to changes in economic circumstances*". It is undoubtedly the case that the speed with which the need for data centres has occurred is one that requires flexibility and represents a "change in economic circumstances". Such a need could not have been anticipated when the current Local Plan in Three Rivers was being developed, examined and adopted.

3.3 Paragraph 83 of NPPF states that "*planning policies and decisions should recognise and address the specific locational requirements of different sectors*". The list in this paragraph of the NPPF covers storage and distribution but also specifically makes reference to "*making provision for clusters or networks of knowledge and data-driven, creative or high technology industries*". It is clear that data centres are covered by this description and so are given specific support as part of Section 6 of NPPF on "*building a strong and competitive economy".*

3.4 Paragraph 114 considers communications infrastructure which of course covers digital infrastructure. It notes that "*planning policies and decisions should support the expansion of electronic communications networks, including next generation mobile technology (such as 5G) and full fibre broadband connections*" and that "*policies should set out how* ***high quality digital infrastructure****, providing access to services from a range of providers, is expected to be delivered and upgraded over time*" (our emphasis added). Although the focus of this policy statement is around mobile technology and fibre connections, it provides clear support for the wider role of all forms of digital infrastructure, which would of course include data centres. As set out later on in this report, government data and digital policy make it very clear that data centres are a key part of the UK's digital infrastructure

3.5 Paragraph 81 states that "*significant weight should be placed on the need to support economic growth and productivity*, *taking into account …. wider opportunities for development*". It emphasise that this is "*particularly important where Britain can be a global leader in driving innovation*". This is certainly the case for data centres and the digital sector more widely.

3.6 PPG provides advice on assessing economic need that is designed for the office, industrial and manufacturing use classes. Data centres are analogous in some respects to physical warehouses as both are forms of storage and data centres are generally classed as B8 uses. However, that is where the analogy ends. PPG sets out three ways of assessing economic need (para 29)[15]:

- sectoral and employment forecasts and projections which take account of likely changes in skills needed (labour demand)

[15] Paragraph: 029 Reference ID: 2a-02920190220

- demographically derived assessments of current and future local labour supply (labour supply techniques)
- analysis based on the past take-up of employment land and property and/or future property market requirements.

3.7 The first two, for obvious reasons, are not applicable to data centres. The latter one, which might be styled "market signals," is relevant to data centres. It is also worth pointing out that PPG focusses primarily on the need for local businesses and the local economy. It does not provide guidance on where there is a national level need driving property demand. However, this is where there is an analogy with what PPG describes as "*strategic [logistic] facilities serving national or regional markets*"[16]. Here it advises strategic policy-making authorities to help determine need: to engage with "*developers and occupiers to understand the changing nature of requirements in terms of the type, size and location of facilities*;" to undertake an "*analysis of market signals";* and carry out an "*analysis of economic forecasts*".

UK Economic Policy

General economic growth and support for digital sectors

3.8 The importance of the digital economy, tech sectors or digital sectors is a very strong thread that runs through all recent significant economic policies and plans from government. To summarise:

- In 2017, the government published the White Paper on a new national **Industrial Strategy**. This strategy identified as one of four "Grand Challenges" the need to put the UK at the forefront of the "*Artificial Intelligence (AI) and data revolution*." The Strategy noted that the "*data driven economy*" is typified by "*a digitally connected economy that realises significant value from connected, large scale data that can be rapidly analysed by technology to generate insights and innovation*."
- The Industrial Strategy was updated during 2021 in the new **Plan for Growth**. One of the three pillars of growth for the UK was innovation. Here the Plan emphasised the importance of "*backing the sectors and technologies that will shape the UK's future*" and stated that "*the digital and creative industry sectors are a major success story for the UK, and a critical driver of innovation and growth. We will work to ensure that these sectors can flourish by nurturing a safe, fair and open digital economy, growing more creative businesses around the country and building on our advantages in foundational technologies like AI, quantum computing and digital twins, including through the National Data Strategy and upcoming Digital Strategy*."
- The very recent **Autumn Statement** from HM Treasury emphasised the importance of boosting UK economic growth rates and that states that "*the government will ensure that those sectors which have the most potential for growth - such as **digital**, green technology and life sciences - will be supported through measures to reduce unnecessary regulation and boost innovation and growth*" (page 3, our emphasis added). The March 2023 Budget stated again that the UK's: "*digital, life sciences and creative sectors are amongst the largest in the world. The UK is on track to become a world leading science superpower, supported by the newly established Department for Science, Innovation and Technology".*

[16] Paragraph: 031 Reference ID: 2a-031-20190722

Inward investment and trade

3.9 The Department for International Trade (DIT) published a policy paper on digital trade in September 2021. This paper noted that digital trade allows British businesses to share the benefits of prosperity by:

- reaching a wider consumer base by selling online
- trading more efficiently and cost-effectively by streamlining shipping, logistics and other trading processes
- connecting and growing their workforce across different regions of the world.

3.10 The paper also notes that: "*the ability to connect digitally alongside more traditional methods also makes the supply of services more resilient to disruption*."

3.11 DIT recently released data on inward investment into the UK for 2021/22 (June 2022). This data showed a total of 1,589 projects supporting 84,759 new jobs, 7,755 safeguarded jobs and an economic value of over £7 billion. Of relevance to this Inquiry, is that nearly a third (29%) of the inward investment (as measured by number of new jobs) was in the digital sector (software and computer services and electronics and communications). The majority of other projects were in sectors of the economy with a high level of digital content/usage (such as biotechnology, creative and media, financial services etc). A review of the DIT website[17] setting out investment opportunities within the UK covers around 30 individual sectoral opportunities. Of these, at least half are ones that have a very strong data/digital linkages and/or level of usage (eg augmented reality and virtual reality, cyber security, Edtech, financial services, Fintech, medical technology, professional and business services, technology etc). This emphasises the importance of the future of the UK economy in respect of the data/digital sector.

3.12 A recent letter sent by the then Department for International Trade (DIT) to Buckinghamshire Council on 9th January 2023 specifically references the importance of attracting investment in these key sectors and the related role of data centres (that are also set out in the DIT's data centre "proposition" for inward investors).

3.13 It describes data centres being:

> *"at the heart of the UK's digital infrastructure and represent the focal point where HMG's Industrial Strategy and the Digital Strategy meet. The UK is a globally important data centre market (holding 6% of the world market share), home to the largest data centre market in Europe (holding around 25%+ of market share) and the world's second-largest commercial cluster."* and that …" *The Government's National Data Strategy and National Cyber Strategy recognises the vital and growing role of digital and data in the UK economy and has identified the need for a secure and reliable digital infrastructure to ensure the smooth functioning and to maximise the growth prospects of the economy. Data centres are a critically important part of that digital infrastructure".*

3.14 In location terms the letter states that: "*there is strong growth in the demand for data centre capacity to support the UK economy itself. As a direct result of this identified need, there is a sustained demand for sites across a corridor that includes Berkshire, Buckinghamshire, Hertfordshire, and west London*".

[17] https://www.great.gov.uk/international/content/investment/sectors/

UK Digital Strategy

3.15 The UK Government's specific digital ambitions are set out in the UK Digital Strategy. This was originally published in May 2017 (before the Industrial Strategy White Paper). A new version of the strategy was launched in June 2022. This sets out six overall priorities and 24 sub-priorities (that are summarised in Box 3.1):

Box 3.1: UK Digital Strategy, 2022	
1/ Digital foundations	1.1 World class and secure digital infrastructure 1.2 Unlocking the power of data 18 1.3 A light-touch and pro-innovation regulatory regime 1.4 Security and the digital economy
2/ Ideas and intellectual property	2.1 Supporting universities to develop new ideas and technologies 2.2 Incentivising businesses to innovate 2.3 Innovation in the NHS
3/ Digital skills and talent	3.1 Strengthening the digital education pipeline 3.2 Increasing awareness of pathways into digital occupations 3.3 Developing advanced digital skills 3.4 Lifelong digital skills 3.5 Collaborating with the private and third sector on digital skills 3.6 Attracting the brightest and best globally
4/ Financing digital growth	4.1 Seed investment 4.2 Early stage and scale-up investment 4.3 Making the UK the global tech IPO capital
5/ The whole UK: spreading prosperity and levelling up	5.1 Supporting the UK's businesses through digital adoption 5.2 Improving public services 5.3 Supporting access to public procurement opportunities 5.4 Levelling up our regional economies 5.5 Supporting net zero
6/ Enhancing the UK's place in the world	6.1 Global leadership: Governance and values 6.2 Promoting digital exports and inward investment 6.3 Achieving our priorities through international partnerships

3.16 As well as showing the breadth and importance of the digital sector to the economy and society the digital strategy also highlights the importance of data centres in several areas:

- As part of ensuring a "world class and secure digital infrastructure" (1.1)
- To help promote digital expertise and attract inwards investment (6.2) (of which the proposed Abbots Langley data centre would be an example).

UK National Data Strategy

3.17 The aim of the National Data Strategy (NDS) is: "*to drive the collective vision that will support the UK to build a world-leading data economy*." It is an evolving strategy that was started in June 2019 with a "call for evidence", leading to publication of a consultation draft in September 2020 which was updated in December 2020.

3.18 This strategy includes a clear acknowledgement of the role of data centres in supporting the digital economy and the UK economy. The strategy sets out five priority areas of action for government (or "missions") which are:

1) Unlocking the value of data across the economy

2) Securing a pro-growth and trusted data regime

3) Transforming government's use of data to drive efficiency and improve public services

4) Ensuring the security and resilience of the infrastructure on which data relies

5) Championing the international flow of data.

3.19 The fourth mission is of very particular relevance to this project. The government states here that:

> "The use of data is now a central part of modern life, so we need to make sure that the infrastructure underpinning it is safe and secure. **The infrastructure on which data relies is a vital national asset that needs to be protected from security risks and other concerns, such as service disruption. Interruption to data-driven services and activities can cause disruption to businesses, organisations and public services**. While these are also commercial risks to manage, the **government has a responsibility to ensure that data and its supporting infrastructure is resilient in the face of established, new and emerging risks, protecting the economy as it grows**." [our emphasis added]

3.20 The NDS specifically notes that the: "infrastructure on which data relies is the virtualised or physical data infrastructure, systems and services that store, process and transfer data. This includes **data centres (that provide the physical space to store data)**, peering and transit infrastructure (that enable the exchange of data), and cloud computing that provides virtualised computing resources (for example servers, software, databases, data analytics) that are accessed remotely." [our emphasis added, page 23].

3.21 The government consulted on the NDS between September and December 2020; in May 2021 it published its response to the consultation. The response states that the "*consultation feedback has confirmed that the framework we set out in the National Data Strategy is fit for purpose and that we must now take action to ensure that we make the most of data's many opportunities*." A number of points were made in respect of data centres in the response:

- The importance of considering the environmental footprint of increased data use, for example the carbon emissions generated by data centres.
- Also, the importance of the government's role in ensuring the security and resilience of the data infrastructure was highlighted in the consultation responses. The government's response to this point noted that critical staff working in data centres had been "*granted key worker status, demonstrating the importance of the sector and its maintenance*" (page 19).

UK National Cyber Strategy

3.22 The National Cyber Strategy (NCS) was published in February 2022. The purpose of this strategy is to set out the government's "*plan to ensure that the UK remains confident, capable and resilient in this fast-moving digital world; and that we continue to adapt, innovate and invest in order to protect and promote our interests in cyberspace*." The NCS was of course prepared against a backdrop of increased cyber-attacks globally by hostile states and criminal actors and so concerns about UK security as well as cyber security at the level of businesses and individuals.

3.23 The NCS vision for the UK in 2030 is that it "will continue to be a leading responsible and democratic cyber power, able to protect and promote our interests in and through cyberspace in support of national goals" (para 5, page 11). There are four national goals (page 11) which are described as:

1) A more secure and resilient nation, better prepared for evolving threats and risks and using our cyber capabilities to protect citizens against crime, fraud and state threats.

2) An innovative, prosperous digital economy, with opportunity more evenly spread across the country and our diverse population.

3) A Science and Tech Superpower, securely harnessing transformative technologies in support of a greener, healthier society.

4) A more influential and valued partner on the global stage, shaping the future frontiers of an open and stable international order while maintaining our freedom of action in cyberspace.

3.24 The NCS makes a number of points relevant to data centres:

- First it emphasises the rapidly increasing importance of digital and cyberspace to all aspects of life "exponential advances in technology combined with decreasing costs have made the world more connected than ever before, driving extraordinary opportunity, innovation and progress." It notes that "the coronavirus (COVID-19) pandemic has accelerated this trend, but we are likely still in the early stages of a long-term structural shift" …. "cyberspace is now integral to our future security and prosperity" (para 1, page 10)
- Second, it highlights the opportunity but also dependency that this creates. In drivers for change it notes that "the coming decade will see the continued rapid expansion of data and digital connectivity to almost every aspect of our lives. Huge global growth in Internet access and usage, underpinned by data and the infrastructure upon which data use relies, is creating new markets and increasing convenience, choice and efficiency. But it also makes countries much more dependent on interconnected digital system" (para 33, page 29)
- Third, as with the NDS it emphasises the importance of ensuring that "the infrastructure on which our data use relies is **secure and resilient**. This infrastructure is a vital national asset – one that supports our economy, delivers public services and drives growth," we *will take a greater role in ensuring that data is sufficiently protected when processed, in transit, or stored at scale, for example in external data centres*." (para 111, page 71, our emphasis added).

Conclusions

3.25 There is much that can be drawn from this review of government policy that is highly relevant to the importance of data centres:

1) First, the recognition of the importance of the digital economy to UK prosperity and effective functioning of our public services, government and society.

2) Second, further recognition that this role is becoming ever more important, presenting great opportunities and also challenges.

3) Third, the importance of a secure and reliable digital infrastructure to ensure the smooth functioning and maximise the growth prospects of the economy.

4) Fourth, a recognition that data centres are a critically important part of that digital infrastructure.

4. Evidence on current and future need for data centres

Relationship between data and the economy

4.1 The growing importance of data to businesses is being driven by several mechanisms, with potential for overlaps between them[18]. The mechanisms are:

- **Improved business intelligence and decision-making.** The generation of ever-greater volumes of data provides the potential for the development of more detailed insights into a wide range of issues and challenges facing businesses. These include better insights into customer behaviour and market trends; more efficient procurement and management of supply chains and inventories; improved environmental performance; more cost-effective compliance with labour market, environmental and other forms of regulation; and better identification and management of business threats and risks.
- **Cost-efficiencies and revenue growth**. In sectors such as manufacturing and construction, efficiencies can be achieved through better procurement, better utilisation of machines and vehicles, and the identification and elimination of wasted resources and energy used in production.
- **Opportunities for product and service innovation** and related opportunities for new business creation.

Value of the data economy

4.2 The UK government, as we have shown, acknowledges the importance of the "data economy"[19]. There are a variety of ranges of estimates of the importance of the overall UK "data economy" that have been produced, using different definitions and methodologies (see Box 4.1). The two approaches used actually produce estimates that are similar in their orders of magnitude at around 4% of the UK economy. In both cases the research finds that this is a proportion that is growing fast. A review of these data sources for Department for Culture, Media and Sport (DCMS)[20] concluded that the evidence "*is backed by both primary research (market surveys) and publicly available statistical data*." However, the review noted that the data used was "outdated" and that its validity "*depends wholly on the definition of 'Data Economy' used".* The review noted that actual value of the UK data economy in 2016 may have ranged somewhere between £61 billion and £73 billion (a £12 billion difference), and that this value could be considerably different in 2019.

[18] Drawn from the "Data Economy Report," Digital Realty, May 2018

[19] DCMS define the digital economy as "*economic activity featuring digital technologies, and changes to market activities based on the influence and changes digitalisation brings*". They note that the term "*data economy, while more specific, is often used interchangeably, and covers the direct, indirect, and induced effects that the use and selling of data has on the economy as a whole. It involves the generation, collection, storage, processing, distribution, analysis elaboration, delivery, and exploitation of data enabled by digital technologies*". DCMS (2020)

[20] National Data Strategy: Review of commonly quoted statistics, Policy Lab, June 2019

Box 4.1: Definitions and estimates of the data or digital economy

Estimate 1. The "**data economy**" here is defined as the economic value created by the storage, retrieval and analysis - via sophisticated software and other tools - of large volumes of highly detailed business and organisational data at very high speeds [1]. This analysis calculated that the overall value of the data economy in the UK in 2016 was around £73 billion or 4.2% of total Gross Value Added (GVA). It was estimated to have grown from £55 billion or 3.6% of the economy in 2012.

Estimate 2: The "**data market** "is the marketplace where digital data is exchanged as "products" or "services" as a result of the use of raw data. The work defines its value as the aggregate value of the demand of digital data without measuring the direct, indirect and induced impacts of data in the economy. The value of the data market includes imports (data products and services bought on the global digital market from suppliers not based in Europe) and excludes the exports of the European data companies[2].

Estimate 3: The "**data economy"** is measured by the overall impacts of the data market on the economy. It involves the generation, collection, storage, processing, distribution, analysis elaboration, delivery, and exploitation of data enabled by digital technologies. The data economy also includes the direct, indirect, and induced effects of the data market on the economy [2]. In 2020 this is estimated at around £79 billion or 4.2% of UK GDP. The data economy has been growing at a much faster rate than GDP and is forecast to rise to between 5.4% to 7.8% of GDP by 2025.

Sources: (1) Development Economics, commissioned by Digital Realty in "The Data Economy Report 2018"; (2) European Commission (2020), The European Data Market Monitoring Tool, Key Facts & Figures, First Policy Conclusions, Data Landscape and Quantified Stories, D2.9 Final Study Report, 2020

4.3 There have been several other attempts made to value the data or digital economy (or parts of it such as "big data"). The challenge faced by any estimate is the fact that the use of data is now so interwoven in the fabric of the economy that it is very hard to disentangle the role it plays in economic value creation (alongside all the other factors). There are two basic ways of measuring the value of the "data economy":

- First, by the value of the economic output of the sales of goods and services of the sector (the Gross Value Added or GVA it creates).
- Second, by the role provision of data services and analysis plays in aiding the creation of economic value across the whole economy.

4.4 The first approach can be measured broadly by the economic output of the three sectors that most closely correspond to the provision of services for the data economy. These are: "telecommunications", "computer programming and consultancy" and "information services" (see Table 4.1 below).

Table 4.1: Sectoral definitions covering the provision of data related services

Standard Industrial Classification code	Sector name
61	Telecommunications
62	Computer programming and consultancy
63	Information service activities
All above	**Data economy provision sectors**
58	Publishing activities
59	Motion picture, video and TV programme production
60	Programming and broadcasting activities
All 58 to 63, Section J	**Information and communication (ICT) sector**

Source: UK Standard Industrial Codes (2007), ONS

4.5 In 2021, the total economic output of these three sectors was **£100 billion** or about 5% of total UK GVA. The largest contribution is from "computer programming and consultancy" (covering all forms of software services) followed by telecommunications. The whole ICT sector (also covering publishing and media as well) generated **£136 billion** in GVA or 6.5% of the UK total. The activities of data centres, if they are separated out from wider business activity (e.g., colocation data centres), would fall within SIC 63 "information services", whose economic output was **£10.8 billion** in 2020).

4.6 Important data activities are of course in some cases carried out **in-house** by business (enterprise data centres for instance or in-house IT departments). In these instances, the economic activity associated with them would be captured in other sectors of the economy and not by these figures.

4.7 There have been various attempts to estimate the value of the role data can and will play in the UK and global economy which are reviewed for this report. These estimates include ones that suggest:

- Data will benefit the UK economy by up to £241 billion between 2015 and 2020[21].
- Global GDP will be up to 14% higher in 2030 as a result of the accelerating development and take-up of AI[22].

4.8 The task of trying to put an estimate on the value of data for the UK economy is becoming an increasingly difficult and, arguably, a less than useful exercise. It is similar to trying to assess the value of the transport or the energy supply infrastructure. These are components of **critical infrastructure** that support the whole economy and if the infrastructure is not adequate this will both constrain the economy and the effective functioning of society (as recent events have shown). However, in contrast to more traditional forms of infrastructure, the role of the digital/data infrastructure is becoming increasingly more important as the way our society and economy functions is changing.

4.9 We have reviewed the most recent statistical and economic evidence on the importance of data to different sectors of the economy. To do this, we have assessed the relative importance of purchases of data/digital services (in their broadest sense) by different sectors of the UK economy (see Figure 4.1). The sectors shown in the figures all have above average shares of purchases[23] compared to the all-sector average (of 4.3% of inputs being these digital related services). This is an indicator of the relative importance of data and digital services to these sectors. The analysis shows:

- The key importance of data to the financial services sector and the professional services sectors (legal, accountancy etc).
- The importance to head offices and management consultancy.
- The importance to publishing and advertising and market research (covering parts of the creative sector).
- The importance to retailing and to a lesser degree wholesaling and sales of motor vehicles (where data and access to data is becoming more important all the time).

[21] CEBR (2016) as quoted in the UK Government Digital Strategy 2017 (DCMS 2017)

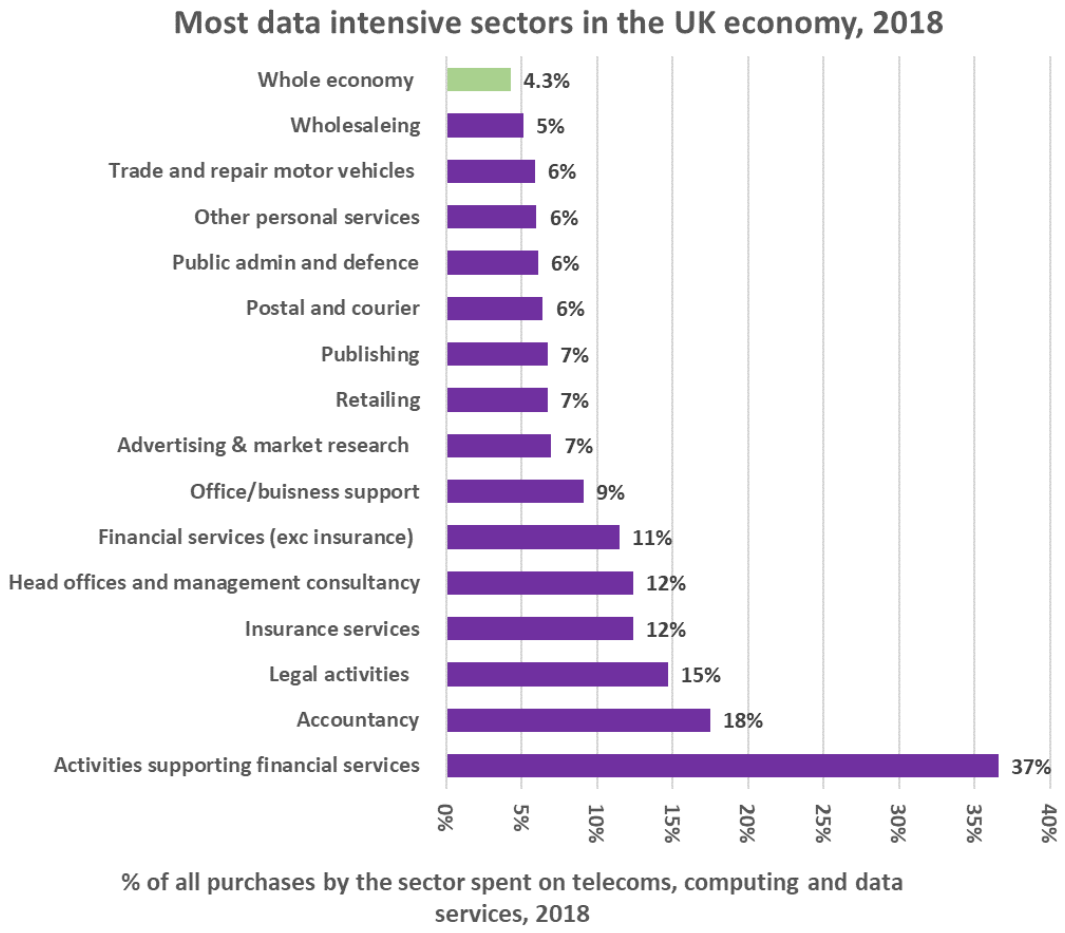
[22] "Sizing the prize, PwC's Global Artificial Intelligence Study: Exploiting the AI Revolution" PwC, September 2017

[23] The data/digital sectors themselves are of course excluded.

4.10 Many of these sectors are critical to the future success of the UK economy and account for a large share of UK exports. In 2019, the ICT sector and the professional and businesses services sector accounted for £104 billion in exports from the UK and had a net balance of trade of £47 billion. This represents 15% of all UK exports and 33% of all UK services exports[24].

4.11 The following data is for 2018, the most recent year for which reliable data is available. It shows the importance of data-related activity to a wide range of economic sectors. By 2023 (i.e. five years later), the overall amount spent on digital/data services will almost certainly have risen (as a measure of importance), but the broad pattern of concentration by sectors is likely to have remained the same.

Figure 4.1: Assessment of most data intensive/data using sectors of the economy in 2018



Source: Nicol Economics analysis of ONS Supply and Use Tables, 1997 – 2018, October 2020

[24] Nicol Economics analysis of UK Trade Statistics (International Trade in Services, 2019, ONS, January 2021) and UK Trade in Numbers, Department for International Trade, February 2021

4.12 There are strong technological and other drivers that are increasing the demand and need for data globally and in the UK. These drivers are also well documented in the various government strategies covered in the previous section and also the FoundDigital Technical Report. In summary they include:

- The rise of **cloud computing** where data and applications are held in the "cloud" and accessed by workers and individuals remotely using applications and data stored in data centres.
- The growth of the **Internet of Things** (the increase in the use of connected devices and the proliferation of smart sensors and meters), the move to smart technologies (including in the future driverless cars etc).
- The rise of **data analytics** (or sometimes called Big Data) requiring the analysis of large and very complex data sets.
- The rapid growth of **Artificial Intelligence/Machine Learning** which requires very substantial levels of computer processing power. The very recent arrival of ChatGPT and other "AI chatbots" has and will rapidly transform demand for a whole new host of digital services. It is also true that the use of AI in data centres will help them become more efficient.

4.13 These trends are impacting on all sectors of the economy and parts of society. Hence, access to data is becoming increasingly essential for a successful and effectively functioning economy.

Drivers for the location of data centres to meet societal and business needs

4.14 The growth in data centres is responding to the economic, societal and technological drivers. Where additional data centre capacity needs to be located to meet this rapidly growing need is covered below.

At a country level

4.15 Data centre capacity growth globally has been driven by where the major centres of economic activity in the most data hungry sectors are located. The greatest concentration of data centre capacity and of hyperscale data centres is the USA, and within the USA is in Northern Virginia. At a European level, there are five well-established central data centre hubs: Frankfurt, London, Amsterdam, Paris and Dublin (sometimes called FLAP-D).

4.16 There are several logical reasons why these cities/countries have become the centre of gravity for data centres in Europe: their large populations, their prime and large business districts, being major financial hubs and locations for large corporate organisations, and availability of utilities, technology and transportation[25]. These five cities represent the top five locations in Europe for business and data centres in terms of scale, number of data centres, MW of IT load and high-speed network connectivity. Within this group, London has been the pre-eminent location for data centres, driven by its critical economic and business base and accounts for 37% of all installed data centre capacity at the end of 2022 and 35% of capacity plus data centres under construction[26]. .

[25] The exception to this is Dublin, it has become a major centre in large part because of its location facing the US and main Atlantic fibre cables and acts as a landfall/first point of storage for data transition between the USA and Europe

[26] Based on information contained in JLL (2023)

4.17 There are also specific **legal** and **security** requirements that drive the need to have UK-based data centres to hold data for UK businesses and residents. These are explained in a recent report on European data centres by Savills[27]. There are three interrelated but different concepts:

- **Data residency** is where a business or other organisation specifies that their data is stored in a specific geographical location of their choice for policy reasons.
- **Data sovereignty** refers to the country's laws on where data is stored. In the EU, the General Data Protection Regulation (GDPR) law became applicable to all member states in May 2018 including the UK[28]. The GDPR provides for the free flow of non-personal data within the Union to enhance the competitiveness of its digital economy. Importantly, it also allows for the flow of data to third party countries if the receiving country's laws comply with the GDPR's rules.
- **Data localisation** is the most stringent concept of the three. It refers to legal obligations requiring that data created within a country's borders remains in situ and does not travel outside the jurisdiction.

4.18 There was concern, post-Brexit, that the UK and EU would not be able to agree on data protection and security equivalence arrangements (meaning that UK based data centres could not necessarily house data from the EU and vice versa). However, in June 2021 the EU and the UK agreed data equivalence (or a data "adequacy agreement")[29] and this has removed this immediate concern for data centres and other sectors of the economy in the UK and the EU. However, the new adequacy agreement has a sunset clause and so will need to be renewed after four years (i.e. 2025).

4.19 UK government concerns over cyber security are likely to see requirements to ensure that data pertaining to critical infrastructure is held (and processed) in the UK to ensure that data security considerations can be applied to this data and the companies holding it. The push in the National Cyber Strategy is to increase the resilience and security of data. It requires that this data is stored in the UK's jurisdiction otherwise the UK legal framework will not necessarily apply.

4.20 These drivers collectively mean that there are large elements of data pertaining to the UK economy and UK society that do and will need to be **stored within the UK** in UK-based data centres. DIT point out that these security/privacy factors will "*drive cloud service providers to store their personal data **within the country** in order to avoid or mitigate against unauthorised access and manipulation of critical data infrastructure*" (our emphasis added).

At a city level

4.21 The drivers for location **within** a country vary by type of data centre but are similar to those at a country level (apart from specific data security or sovereignty/residency requirements and latency/availability zones which are discussed later). A useful TechUK report explores the role of London and notes, "*London is a key factor in the success of the UK data centre market*". It also notes that London is dominant in Europe as it is the major global financial and business centre and the data centre sector has benefited from the presence of "*demanding customers*", which led to a co-evolution in technical and operational capabilities.

[27] Savills (2020)

[28] The UK has, in effect, translated GDPR into UK law.

[29] https://www.gov.uk/government/news/eu-adopts-adequacy-decisions-allowing-data-to-continue-flowing-freely-to-the-uk and https://ec.europa.eu/commission/presscorner/detail/en/ip_21_3183

4.22 The fact that London has a world class financial sector and a world class data centre industry is no coincidence. In terms of speed and bandwidth, London also has diversity in its offerings – multiple suppliers and options for all business models in a truly competitive market.

4.23 TechUK attributes London's pre-eminence within the UK (and Europe) overall to three things ("age", "beauty" and "experience"):

- *Age*: the **first mover advantage** where by being first, London attracted key players and around them a complex ecosystem supporting data centres has developed. This has also led to the de-facto creation of "availability zones" due to the pre-existing clustering of data centres.
- *Beauty*: the attractiveness of London for **investors and for skilled staff** seeking a career in the sector.
- *Experience*: the report highlights London's **world class expertise** in investment, finance, design, engineering, construction, technical brokerage, procurement, compliance and energy management.

4.24 Outside London in the UK, the next main centre for data centres is Manchester or "Manchester and the North". In 2021 Knight Frank identify 50 data centre properties with 74 MW of built capacity, 5 MW under construction and 55 MW planned or 134 MW total capacity In this area. To put this in context this was **just 8% of the capacity of the London market**. In the Manchester area, the average size of the data centres is also much smaller (25% of the average size of those in London). The 5 MW under construction in Manchester was just 3% of the amount under construction in London. In the Manchester market area, enterprise data centres are much more significant in relative terms than colocation data centres (33% of all capacity compared to just 7% for London) reflecting the different nature of the market there.

4.25 Locations outside London do and will have a role to play in providing data centre capacity for the UK (for instance is respect of data centres focussing on back-up). However, they are not attractive to large hyperscale data centres wishing to locate in the UK. So, although it would be desirable in terms of the wider levelling up policy agenda, there is only a very **limited prospect of a large scale data centre such as the proposed development locating outside the London area**. The development of data centre capacity in the UK has been, is and will continue to be **entirely market driven.** The UK government does not plan to direct where data centres locate or itself support or set up data centres. Therefore the development of capacity in the UK has to work with market drivers and commercial considerations.

4.26 The DIT data centre proposition document, although promoting the whole UK, identifies very clearly the benefits of location in London (and the South East[30]) related to:

- Access to the largest labour pool of talent (page 14)
- The concentration of Internet Exchange Points in London (7 out of the UK's 16)
- The range of specific local strengths of London as a location (page 34).

4.27 Finally, the DIT letter to Buckinghamshire Council referred to previously highlights that there is "*sustained demand for sites across a corridor that includes Berkshire, Buckinghamshire, Hertfordshire, and west London*".

[30] For reasons of government policy, the strengths of each of the UK regions is highlighted in this document, but from a market perspective for a US tech company for instance the areas around London are effectively part of London in its widest sense (so there is little practical distinction between London and the South East)

At a local level

4.28 The specific local site-specific locational drivers for hyperscale data centres and reasons why a location in the Hemel Hempstead Availability Zone (AZ) is important are set out in the Technical Report by FoundDigital. In summary to enable the overall growth in data centre capacity around London there needs to be extra capacity developed in this AZ to ensure a balance of capacity amongst hyperscalers across different AZs.

Future data centre capacity need

4.29 It is obvious from the assessment by the UK government of the vital and growing importance of data to the UK economy (see section 3 earlier) and from our summary above about economic and societal drivers that there is and will be a rapidly growing need for data centre capacity to meet these needs. It is also clear that the great bulk of this need will have to be met in the wider London area. There is inevitably a degree of uncertainty about the precise rate of growth of demand in the future. Many estimates of past capacity growth and estimates of future European-wide or global growth have been running at around 20% pa (for all data centre capacity or for co-location data centres).

4.30 At a European level, Savills (December 2022) reported there is "*an insufficient pipeline of data centre development planned for Europe over the next three years to meet the forecasted increase in demand*[31]." Savills estimate that the number of data centres will need to increase by almost 2.5 times, through the construction of more than 3,000 data centres, providing almost 20,750 MW, to meet demand in 2025.

4.31 An up-to-date assessment of the need for data centres was carried out recently for Greystoke Land by JLL[32]. This suggests that the overall demand for data centre capacity in London could increase by between 2,250 MW to 3,100 MW over the six years 2022 to 2027 inclusive (this is the cumulative extra capacity) and 2,040 MW to 2,800 MW over the five years 2023 to 2027. The rate of growth of capacity needed that is forecast is, after 2023, around 20% each year. The Technical Report indicates that in London there is around 1 GW of live capacity and a further 1.9 GW of capacity either newly signed capacity or under construction. In that context, these forecasts of future need seem quite reasonable (and some of the future need is of course will in part met by what is under construction).

4.32 This is in line with global forecasts of the growth in data storage needs and the actual historic growth in overall data centre capacity (colocation) in London. The Technical Report from FoundDigital suggests that these forecasts of need are realistic and, given the explosion in use of AI evidence by ChatGPT and the growth of mobile IoT (Internet of Things)[33], may even be conservative.

4.33 It is important to note that the selection of the forecasting period to 2027 does not indicate that growth will stop or slow down beyond this period. Rather five to six years is a typical horizon for forecasting property needs.

[31] Note: Europe in this report refers to the EMA area (Europe, Middle East and Africa)

[32] Technical Note, West London Technology Park, Jones Lange LaSalle Developments Ltd, January 2023

[33] Driving the growth of Machine to Machine (M2M) connections

UK economic position and current prospects

4.34 The proposed development and its economic boost, which is very substantial, needs to be set against the current state and prospects for the UK economy. These are, as has been widely reported, particularly poor at present. Due to a combination of factors[34], the UK is entering a period of near recession with growth prospects for the next few years being particularly poor by historic standards (and compared to our international competitors). The recent Office for Budgetary Responsibility (OBR) report[35] that accompanied the 2023 Budget set out that, taking account of the impact of the measures in the Budget, the UK is expected to see:

- An overall contraction of the economy by 0.2% in 2023 compared to 2022 followed by a slow recovery.
- The unemployment rate rising from 3.5% (Q3 2022) to reach 5% by mid-2024
- Real living standard in the UK falling on average by 6% over 2022 and 2023.

4.35 There is in imperative to find ways of boosting economic growth in the short and medium term, not least because this will help increase tax revenues and so the sustainability of the UK's public finances.

Conclusions

4.36 There are several key conclusions that can be drawn from this review of need and location drivers:

1) First, the role and importance of data in the economy is growing rapidly.

2) Second, data now underpins almost every area of the UK economy and its importance is concentrated in key sectors of UK economy that are central to its growth prospects (the digital sector of course, but in particular, financial services, professional and business services, creative/media and head office functions).

3) Third, there are specific reasons why data centre capacity needs to grow to meet the needs for data that is stored for UK users in the UK.

4) Fourth, there are strong locational drivers as to why data centres are clustered in and around London. Other UK locations have a role to play but not for large scale increases in capacity. London is where the majority of future data centre capacity for the UK economy will need to be located, given that the provision of data centre capacity is market driven.

5) Fifth, forecasts for future needs for hyperscale data centre capacity indicate that across London this could be between 2,040 MW to 2,800 MW over the five years 2023 to 2027. The review in the Technical Report suggest that these are reasonable and if any anything be conservative given recent developments in the use of AI.

6) Sixth, in locational terms the Technical Report explains why there is a need to provide increased capacity in the Hemel Hempstead AZ to meet future needs of existing hyperscalers and new entrants to the market as part of meeting the wider London need.

[34] Long term productivity issues, a particularly hard economic impact of Covid on the economy and labour market, the energy crisis and increased cost of energy and many other products and, argued by many, longer term effects of Brexit on trade performance.

[35] Economic and Fiscal Outlook, March 2023

7) Finally, the UK economy is in a period of recession and faces a period of sluggish economic growth according to the latest forecasts when new investment is sorely needed.

5. The economic benefits from the proposed development

5.1 The economic benefits from the proposed development considered cover:

1) The benefits in terms of economic injection and employment that would stem from the **construction** of the proposed new data centre.

2) The **local level** economic benefits (for Three Rivers, Hertfordshire and surroundings areas) that would stem from the operation of the data centre.

3) The critical **wider benefits** to the UK economy from meeting the need for an expansion of data centre capacity.

5.2 The likely jobs and other benefits are estimated using the following parameters that are based on the fully completed scheme (given the very high demand and need for data centres this is an entirely reasonable approach). These parameters are:

- A total 96 MW of IT load supplied
- A total of 83,446 sqm of buildings (GEA).

Sources of information

5.3 To estimate the direct on-site job benefits we have explored a wide range of evidence on existing and planned schemes and on data centres as a whole. The list of sources used is summarised in Box 5.1.

Box 5.1: Sources used to estimate economic impacts of the proposed new data centre

Source	Comments
Magnum Economics (2022)	Estimates of the importance of data centres in North Virginia to the State economy of Virginia for the Northern Virginia Technology Council (NVTC).
Oxford Economics (2018)	Study of the economic benefits of six major Google data centres in six different states in the USA. For comparability, the direct operational jobs figures only and the areas of the data centres are used.
Copenhagen Economics (2019)	A study of the forecasts benefits of a proposed new hyperscale Google data centre (now built) in Denmark. The forecasts of direct operational jobs are used.
Menon Economics (2017)	Includes an assessment of the forecast direct jobs numbers for a new data centre in Norway with three computer halls each “approximately 30,000 sqm with an installed electrical power of just above 30 MW”.
Broxbourne Borough Council (2019 and 2020) and RPS (2018)	Job estimates for the new Google hyperscale data centre that has recently received planning permission at a site in Cheshunt in Hertfordshire. The updated job estimates were 200 to 300 FTE jobs for a 62,200 sqm data centre.
Dutch Data Centre Association (DDCA) (2018, 2019 and 2020)	Produce estimates of total jobs, total area and total power of colocation data centres for these three years. Averages are taken the from these.

Box 5.1: Sources used to estimate economic impacts of the proposed new data centre	
Source	**Comments**
IDA (2018)	Study by Grant Thornton for the Ireland Development Agency of the economic footprints of data centres in Ireland (which are focussed on hyperscale data centres).

5.4 The recent research for Northern Virginia (the world's largest concentration of data centres) sheds light on the nature of supply chains and associated knock-on, ripple or multiplier jobs and economic activity. As explained below, Northern Virginia is a larger area than Hertfordshire, but smaller than the whole South East or the East of England. Clearly the labour market and structure of the economy is not the same in Northern Virginia as Hertfordshire. However, there are definitely strong parallels in the scales of the different economies.

Economic impacts from the construction of the data centre

5.5 A 96 MW load hyperscale data centre represents a **very substantial investment for the UK**. A large data centre requires at first very significant expenditure in the initial set-up phase in both buildings and plant and equipment. The data centre then undergoes periodic expansion and renovation as the operator updates its infrastructure to meet customer demand and integrate the latest technological advances. There is, therefore, ongoing capital expenditure throughout the life of a data centre. Often repairs, replacement, and upgrade of IT equipment and infrastructure begin in year three of operation.

5.6 This means that it is difficult to capture the total role of capital expenditure in economic value and jobs creation. For this reason, many economic estimates use average capital expenditure for a data centre over time to assess the average annual or total economic contribution spread over a number of years. Typically, for the estimates reviewed, over a 7 to 10 year period from when work starts on a large data centre, the average (or cumulative total) jobs and economic activity supported by the initial and the subsequent capital expenditures can be of the same order of magnitude or even exceed those for the operational activity .

5.7 Work by the US Chamber of Commerce[36] helpfully set out the cost components of data centres. The USCoC explains the construction of a "typical" data centre covers:

- Base building construction - architectural, planning and design, building permits, local taxes, land excavation and grading, roadways, tie-ins to utilities, and the building shell (around 20% of all capital costs excluding land).
- Mechanical and electronic equipment purchases and installation - costs include mechanical and electronic equipment (account for an estimated 75% to 80% of the initial capital costs).

5.8 A more detailed breakdown is that the cost components of construction comprise:

- Land and building shell (15% to 20%): covering building shell, raised floor.
- Electrical systems (40% to 45%): covering electrical backup generator, batteries, power distribution unit (PDU), uninterruptible power supply (UPS), switchgear/transformers.
- HVAC/mechanical/cooling Systems (15% to 20%): covering computer room air conditioner, computer room air handler, air cooled chillers, chilled water storage and pipes.
- Building fit-out (20% to 25%): covering lobby / entrance, meet-me room, shipping & receiving area.

[36] USCoC (2017)

5.9 It is important to note that these are construction costs elements only and exclude professional fees. These cost elements also exclude servers, data storage equipment, and networking devices that are not attached to the building shell.

5.10 The most recent international data centre cost benchmarking by Turner and Townsend suggests that, in 2022, data centre building costs in London are around $9.8 per watt. This is almost identical in dollar prices to the cost of building a data centre in Northern Virginia the world's largest data centre location ($9.80 for London $9.79 for Northern Virginia). This figure applied to the proposed scheme gives an estimate of around **£750 million to £820 construction cost** (or roughly £0.75 to £0.8 billion) when fully developed[37].

5.11 Other sector rules of thumb are that the current costs to build a data centre (in North America) are $600 to $1,100 per sqft (gross) or $7 million to $12 million per megawatt of commissioned IT load. Applied to the proposed development[38], these rules of thumb would produce total construction costs alone (before future phases of expansion or renewal) of from around £450 million to £900 million. Averaged across all these estimates, produces a central estimate of construction costs in 2023 prices of **around £700 million**. This figure is not the total value of the investment as it excludes the very substantial cost of the computing, networking and communications kit likely to bring the total value of the investment well over £1 billion.

Table 5.1: Estimates of the construction cost* of the proposed data centre development at Abbots Langley

Based on cost per:	Lower £ms	Higher £ms
Gross sqft of building area (US)	£431	£790
MW IT load (US)	£538	£922
London specific costs based on MW of IT load (T&T)	£753	£818
Average of all of above values	**£709**	
Notes: * **excludes** (1) servers and other IT equipment not attached to the building; (2) professional fees; (3) and also excludes cost of wider landscaping and new road and other services access.		

5.12 This level of capital expenditure will support very substantial levels of jobs both on-site and in suppliers. The research mentioned previously for Northern Virginia showed that for every 100 direct construction jobs a further 65 were supported elsewhere by supply chain and multiplier effects in the State of Virginia and that every $200,000 (roughly £160,000) of economic output on construction (i.e., construction activity) supported one job. Applying these values to the proposed development and estimate that the completed scheme could support:

- Around 5,600 person years of direct employment associated with the construction (both on and off-site).
- A total of 9,300 person years of employment across the UK economy taking into account supply chain and multiplier effects.

[37] $9.8 per watt is currently equivalent to £7.84 per watt at current (end April 20223 exchange rates (£1=$1.25) and times 96 MW gives an approximate construction cost of £753 million in late 2022 prices. The higher figure applies the £ to $ exchange rage when the T&T estimates were produced (October 2022) which was then around £1 to $1.15; however this exchange rate was impacted by the turbulence in the financial markets at the time and the average rate for 2022 was £1 to $1.23 which is closer to the April 2023 rate

[38] As noted earlier, construction costs per MW are very similar as between London and Northern Virginia so this is a reasonable approach.

Local economic impacts from the operation of the data centre

5.13 Data centres are very large scale and capital intensive projects that involve a high degree of energy and IT infrastructure. They are highly automated forms of economic activity but still do require significant numbers of skilled and well-paid on-site staff to ensure they can remain operational at all times. The number of staff and types of jobs will depend ultimately on the precise form of the data centre and who operates it. The estimates of direct on-site job benefits use the wide range of evidence on existing and planned schemes and on data centres as a whole summarised earlier in Box 5.1.

Direct on-site jobs created

5.14 These sources have been drawn on to estimate a range of parameters for the number of FTE on-site jobs per 1 MW of installed electricity capacity or per 10,000 sqm of space. As would be expected, given the different size, type and purpose of data centres there is a wide range of values across the various sources used. The estimates therefore taken the averages of these estimates of parameters and ranges and then apply this to the scale of the proposed Abbots Langley data centre.

5.15 The average of all the data sources used points to a best estimate of around **210 FTE jobs** when the scheme is fully operational. However, given the variability in the evidence, the actual figure is likely to fall within the range of 170 to 260 FTE jobs.

Table 5.2: Estimates of FTE Jobs in the Abbots Langley Data Centre

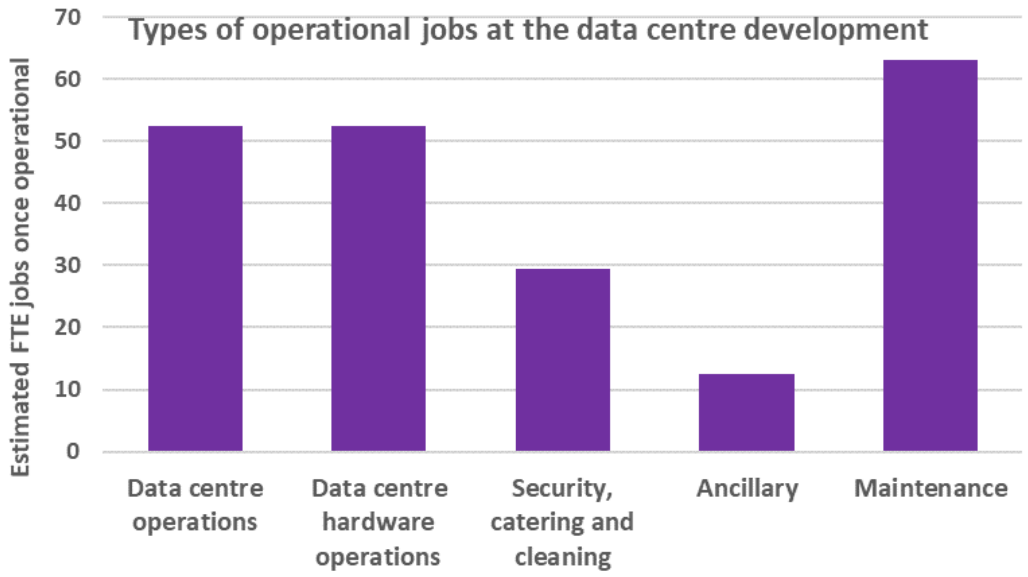
Range	Based on using…				Average of both	
	Floor area (sqm GEA)		**IT Load (MW)**			
	Total FTE	Rounded	Total FTE	Rounded	Total FTE	Rounded
Lower	154	150	196	200	175	170
Mid-range	**188**	**190**	**239**	**240**	**213**	**210**
Higher	231	230	294	290	262	260

Source: estimates by Nicol Economics based on parameters from other data centres

5.16 The jobs at the development would include a considerable number of highly skilled and well-paid jobs. The types of jobs supported would, based on evidence from elsewhere, fall into four broad categories (see Figure 5.1):

- Data centre operations: facilities management, mechanical engineers, electrical engineers and systems technicians (around 25%)
- Data centre hardware operations: network engineers and hardware engineers (also around 25%)
- Security, catering and cleaning (around 15%)
- Ancillary and maintenance (around 35%).

Figure 5.1: Estimates of types of operational jobs at Abbots Langley data centre



Source: Nicol Economics analysis

Wages paid

5.17 The research draws on up to date information on wage levels from a range of information sources that best cover these types of jobs in a location that is very close to London, in order to estimate the total annual wages bill. This is based on the following evidence:

- For all **IT/computing** staff (hardware and software) the higher level was based on the latest online information (April 2021) on average (mean) wages specifically for data centres[39] in London which is £63,750 as of April 2023[40]. The lower level is based on the average (mean) salaries for full-time workers for the telecommunications sector in 2019 and 2022[41] for London, Eastern region and the South East (£54,200).
- For **security/cleaning/ancillary** staff the lower figure is based on average (mean) 2019 and 2022 full time salary for sectors covering cleaning and security in London, the Eastern region and the South East (£31,900)[42]; the higher figure is based on just the building services sector in 2022 (£33,100) in London, the Eastern region and the South East.
- Finally for **maintenance** staff the lower figure is based on data from the "specialised construction activities" sector (which covers maintenance) for London and the South East (£41,600), the higher figure is based on the average (mean) full-time wage for the whole construction sector for London and the South East (£52,400).

5.18 The overall gross wage bill for the completed development (before taxes) was therefore estimated at between **£9.6 to £11.4 million** annually for the central estimate of 210 FTE jobs.

[39] As posted on https://www.totaljobs.com/jobs/data-centre

[40] Sourced from totaljobs.com and cwjobs; the all-UK comparable figure is £56,000

[41] From the Annual Survey of Hours and Earnings (ASHE) sourced by the ONS website, the average for 1019 and 2022 used due to movements in data between the years

[42] From ASHE for Sectors SIC 81, "Services to Buildings and Landscape Activities" and 80, "Security and Investigation Activities" for London and South East

Figure 5.2: Estimated wage bill from the operation of the proposed Abbots Langley data centre

Source: Nicol Economics analysis

5.19 The research on Northern Virginia referred to above suggests that the average wage/benefits cost for workers in the data centre sector is around £130,000 in sterling equivalent. The average (mean) wages assumed that is paid to workers in operating the proposed data centre therefore **may be understated.**

5.20 These overall average wage levels across all operational jobs in the proposed data centre (ranging from £45,000 to £54,000 per FTE job) are significantly above average wage levels of the Hertfordshire economy. In 2022 for full-time workers working in Hertfordshire these were £35,000 (median) and £41,000 (mean).

Direct Gross Value Added (GVA) created

5.21 As explained earlier, data centres are extremely capital intensive forms of economic activity resulting from the costs of construction and the value of the equipment located within a data centre. There is limited robust data on the economic value of the output from data centres (in part because they are a very new form of economic activity). In the UK, the closest approximation is the data on the "data processing and hosting" sector (SIC 63.11). In 2020, according to the Annual Business Survey (ABS)[43], the total amount of GVA (economic output) from the information services sector (SIC 63) was £10.8 billion of which the data processing and hosting sector accounted for £7.1 billion[44].

[43] The ABS is an annual sample survey of approximately 73,000 businesses across the United Kingdom by the ONS. The ABS draws its sample from the Inter-Departmental Business Register (IDBR).

[44] The total estimated value of GVA from SIC 61 to 63 (what is referred to as the "data/information economy" in this report) was £110 billion.

5.22 The GVA per job filled in 2019 was £140,000 for the whole information services sector (SIC 63) and around £130,000 for the "data processing and hosting" sector (SIC 63.11). These figures for GVA per job have been applied to the job estimates to get a lower bound estimate for the **direct economic value** that will be created by the data centre. Using the ratio of FTE to all employees in the Information Services sector in 2019[45], the GVA generated (in 2019 prices and values) would be around **£30 to £33 million** of direct contribution to the local Hertfordshire economy (as this is where the economic value is generated).

5.23 However, given the highly capital intensive nature of the proposed development we have also looked at the estimate for Northern Virginia of the direct economic output produced per job in data centres there which are comparable in terms of scale, this was around $600,000 (or £480,000) per job in 2021. Using this higher figure of GVA per job leads to a much larger estimate of **£84 million to £126 million** in direct GVA, with a mid-range figure of around £102 million. Given the scale and capital intensity of the proposed development this range is the more robust one to use for a measure of the direct GVA generated by the development in Hertfordshire.

5.24 A widely quoted figure is the range of £397 million to £436 million of GVA on average for each new data centre. This is an often quoted range that is based on earlier research for Digital Realty. This report stated that in the UK (in 2018) "*the average amount of GVA per data centre is estimated to lie been £291 million and £320 million*" and that newly built data centres "*add between £397 million and £436 million pa [in GVA]"* (both page 81).

5.25 This estimate included the wider contribution that data centres make to the whole "data economy" not just the direct GVA generated by the data centres themselves (in terms of the value of the sales minus inputs). It is also the case that the concept of an "average" data centre is not always very helpful given their considerable variation in size. Therefore, although this estimate is valuable in pointing out the order of magnitude of benefits generated by a new data centre, it is not comparable to the ones produced above which are solely for direct GVA.

Other indirect and induced economic effects

5.26 All forms of economic activity produce wider benefits via so-called **multiplier effects**. These stem from: supply chain effects ("indirect impacts"); and from the jobs and economic activity supported by the wages of those employed directly and indirectly ("induced impacts"). The scale of these effects depends on a wide range of factors: the nature and location of key purchases by the data centre; the area of impact considered (the larger the area the bigger will be these effect); and the economic base of the surrounding area (if businesses there are able to provide the key inputs and purchases or if these need to be supplied from further afield or abroad).

5.27 It is not possible to assess the precise scale and location of these effects for the proposed project. However, there are useful indicators of the potential scale of these effects at the level of the UK or regional (London and the South East) economy:

- The research from the recent study on data centres in Northern Virginia showed that the multipliers (ratio of indirect and induced effects to direct effects) were 4.1, 1.9 and 1.9 for jobs, wages and GVA respectively (at the level of the State of Virginia[46]).

[45] The last robust data pre-Covid

[46] The GDP of the State of Virginia was around $557 billion dollars in 2019 or roughly a fifth (20%) of the size of the UK economy £2,170 billion (its population at 9 million is about 13% of the UK's population)

- A study by Oxford Economics[47] for Google estimated the indirect effects at a US state level to be around 0.94 indirect jobs for every one direct job in a Google data centre.
- The estimates for the country of Norway were an overall multiplier of 1.22 for jobs and 1.25 for GDP (and for just indirect effects around 0.7 for jobs and 0.8 for economic value)[48].

5.28 The size of these two economies considered (Virginia and Norway) range from around 14% to 20% of the whole UK economy and 37% to 51% of the whole combined economies of London and the South East[49]. Therefore, it is reasonable to assume that these scales of relative indirect and induced multiplier effects would occur (and could well be higher) at the level of the regional areas around the proposed development. This is because the size of the London and South East combined economy is comparable to these other economies on which estimates are based.

5.29 A report for Google in the US by Oxford Economics found that for every 1 direct job employed by Google there were 4.9 jobs elsewhere in the whole US economy. However, in the interests of caution we have used such larger multiplier estimates to assess the upper end of the potential range.

5.30 Therefore, an overall multiplier for GVA of 1.0 to 1.2 (or around 0.6 to 0.7 for supply chain effects only) would be reasonable to apply for the bottom end of the range and one of nearer 2.0 to the top end of the range. Using these assumptions, the overall full impact of the development would be the creation of around **£230 million to £300 million** annually in overall economic activity (i.e., GVA) across London, the Eastern and the South East economies. For jobs, the total impact would range from around **400 up to 1,300 FTE extra jobs** across London and the wider South East[50].

Table 5.3: Estimates of overall jobs and GVA creation by the proposed new data centre for the London, East and the South East area (2021 prices)

Type of economic effect	Jobs (FTEs)		GVA (£s millions)	
	Lower	Higher	Lower	Higher
Direct (A)	175	262	£102	£102
Indirect and induced (or multiplier effects) (B)	213	1,021	£128	£197
Total (C=A+B)	388	1,283	£231	£300
Rounded	390	1,280	**£230**	**£300**

Source: Nicol Economics estimates applying parameters from other studies. Notes: these assume the development is fully built out; these are the gross effects and assume the economic benefits are fully realised, they do not take into account any possible displacement or substitution (crowding out) effects in the labour market

Location of job and supply chain benefits

5.31 The development site is located in the local authority area of Three Rivers in Hertfordshire. This is where the direct economic activity will take place and jobs located. However, the site is located close to other parts of Hertfordshire, parts of Buckinghamshire and the London Boroughs of Barnet, Harrow and Hillingdon. There are likely to be different travel to work patterns depending on the type of jobs, the hours worked and even the age of the employee.

[47] Oxford Economics (2018) but ranged from 0.7 in South Carolina up to 1.35 in Georgia.

[48] The GDP of the whole country of Norway was around $403 billion dollars in 2019 or roughly a fifth (14%) of the size of the UK economy £2,172 billion (its population at 5.3 million was about 13% of the UK's population)

[49] In 2019 these two regions accounted for 37% of all UK GVA (£470 billion for London, £290 billion for the South East out of a total for the UK of £1,980). Sourced from ONS Regional Gross Value Added (balanced) by industry, May 2021

[50] Note: there is a larger variance for the jobs multiplier than for the GVA multiplier

5.32 It is difficult to say with any degree of certainty how many of the jobs would be taken by residents of Three Rivers or Hertfordshire more widely. In 2021, Hertfordshire accounted for around 50% and 44% respectively of the overall number of jobs and of people of working age in the combined overall area of Hertfordshire, Buckinghamshire, and the London Boroughs of Barnet, Harrow and Hillingdon. In our experience, this gives a good indication as to what proportion of the jobs could, potentially, be filled by residents of Hertfordshire (with residents of Three Rivers, Watford and St Albans local authority districts being the most proximate to the proposed development).

5.33 The proposed development will benefit surrounding areas as these are locations where workers will live and also locations where firms involved in the wider supply chain will be located.

5.34 Much will depend on the skills mix of the jobs and of the residents of surrounding areas as well as approaches to recruitment and training. At present, there is very strong demand for people involved in the development and operation of data centres in the UK (not surprising given the rapid growth in the sector). There is a very significant opportunity to develop training and other skills programmes or support existing activity to maximise the chances, especially for young people, to access these opportunities. The Applicant will seek to engage early with officers at the Local Planning Authority to discuss how this can be secured through Section 106 planning obligations.

Support for the economy prosperity of the UK

5.35 We have considered the economic benefits from the proposed development so far purely in terms of it as an investment and capital project and then provider of employment and on-going economic value. However, the most important benefit from the proposed development is the contribution to **meeting the UK's need for data centres** and so supporting wider economic growth, improved productivity, and current and future societal needs.

5.36 Data centre capacity is part of the critical digital or data infrastructure that currently underpins the UK economy. Its importance to the UK economy increases year on year. The various government strategies and policy document covered in Section 3 of this report make this point abundantly clear.

5.37 The proposed development at 96 MW of installed IT capacity is substantial and so will make a **considerable contribution to the growing need for data centres** of the right type in the right location. To put this in context the capacity provided by the proposed development would represent around:

- 9% of all current capacity (either installed or under construction) in early 2023 in the London area[51].
- Around 6% of earlier forecast of average growth of IT load in need for new data centre capacity (largely hyperscale) in the London area from 2023 to 2027 (inclusive).

5.38 As the evidence makes clear, there is very strong growth in the demand and need for large scale data centre capacity in the London area to serve the needs of the UK economy.

Consequences of not providing capacity to meet need

5.39 There are three wider consequences of not approving this proposed development and so adding considerable extra data centre capacity

- First, a substantial investment of well over £1 billion will be lost with the concomitant investment and jobs that are sorely needed by the UK economy. Data centre providers

[51] JLL (2023) identifies 905.7 MW of installed capacity and 121.7 MW under construction

continually consider locations across Europe and indeed globally. If this investment does not occur then there is a clear risk that a hyperscale data centre will be developed somewhere else in Europe (likely at another FALP-D location). This would lead to both a loss of possible investment and, critically, the loss of much needed extra data centre capacity in the UK.

- Secondly, the failure to provide additional capacity will **restrict the growth of our increasingly data driven economy**. There is a need for UK based capacity to meet data storage and regulatory requirements as well as to provide proximity to data for sectors where real time access is critical.
- Finally, there are **key sectors** of the economy that are critical for future growth and that are highly data dependent including but by no means limited to financial services. The ability of these sectors and businesses to operate competitively and to grow will be impacted by any deficiency in data storage capacity (such as higher latency, increased costs etc).

5.40 As explained in Section 4 there are several drivers which mean that for the benefit of the UK economy data **needs to be stored in data centres in the UK**:

- (1) the security/sovereignty reasons; and
- (2) quality of service reasons.

5.41 In theory that latter set of drivers could be addressed by extra data capacity at locations outside the UK/London (i.e., other FALP-D centres) however this would lead to a **reduction in the quality of service** due to latency (speed of service). The relationship between data usage, the speed and reliance of data, and economy activity is highly complex. It is difficult to assess with any degree of precision the impact of a future lack of UK/London data capacity on the UK economy. The effects would be a large number of small scale factors rather than one single one off event.

5.42 As set out earlier in Section 4, the value in 2020 of the UK Information Services sector (covering data centres) was £10.8 billion, this will have continued to rise as the role of data centres and use of data expands in absolute and relative terms. Also, in 2018 the whole UK economy, excluding the IT and telecoms sector itself purchased some £71.8 billion of services from the IT sector in its broadest sense[52], of this total £47.2 billion was purchased by the most IT/data intensive sectors.

Table 5.4: Impacts of changes in UK productivity of IT services costs

Total value of purchases of IT services, data intensive sectors 2018= £47.2 billion	Modelled productivity/cost effect (£ms)						
	%	0.25%	0.20%	0.15%	0.10%	0.075%	0.05%
	1 in every xxx	400	500	667	1,000	1,333	2,000
	Annual cost	£118	£94	£71	£47	£35	£24
	5-year cost	£590	£472	£354	£236	£177	£118
	10-year cost	£1,179	£943	£707	£472	£354	£236

Source: our calculations. Note: 2018 prices and values

5.43 It therefore only takes a very marginal increase in the cost or value of these services to generate a very large economic impact. Table 5.4 shows these potential effects. Even a tiny 0.05% change (just 1 in 2,000) would produce a £24 million pa increased cost/reduced value across the whole of these sectors in the UK economy, rising to £118 million over 5 years. These figures will understate the likely future role of a diminution of data centre capacity and so service levels for the UK economy because the importance of effective and speedy access to data has risen and will rise over time.

[52] Telecommunications, computer programming, consultancy and related activities and information service activities

6. Conclusions

6.1 The principal conclusions from this report are as follows:

1) The government recognises the vital and growing role of digital activity and data in the UK economy and has identified the need for a **secure and reliable digital infrastructure** to ensure the smooth functioning and to maximise the growth prospects of the economy. Data centres are a critical part of that digital infrastructure.

2) The UK and London relies on data intensive economic sectors as increasingly **key drivers** for the economy and as a source of net exports to the rest of the world and of inward investment.

3) There is very **strong growth in the need for data centres** globally, in Europe and in the UK. This is driven by powerful technological and societal trends as the economy becomes increasingly focused on the creation and use of data. London is the key centre at present for the location of data centres in the UK and, indeed, Europe. There is strong growth in demand for extra data centre capacity in the London areas especially for hyperscale data centres.

4) The proposed development would be a very **substantial capital investment** indeed. The full scheme would have a construction cost alone of around £700 million and total project value well over £1 billion. This would support c. 5,600 person years of direct employment associated with the construction (both on and off-site) and a total of 9,300 person years of employment across the UK economy taking into account supply chain and multiplier effects

5) The fully completed development would **support significant numbers of well paid jobs** in Hertfordshire that would be accessible to residents of Three Rivers and surrounding districts. A mid-range, cautious estimate is that the completed development would support 210 FTE jobs, a wage bill of around £10 to £11 million and annual direct GVA of some £100 million.

6) Taking into account wider economic effects via suppliers and spend of wages in the local economies, the proposed data centre would support of the order of £230 to £300 million in GVA and 400 to 1,300 FTE jobs across the London, the East and South East economies.

7) The development would support and strengthen the **existing cluster and digital eco-system** related to data centres and associated digital technologies that has developed in and around London - an area in which the UK is now one of the global leaders. It would therefore support directly key sectors which are targets for export growth and inward investment activity.

8) If there were no development of the proposed hyperscale data centre on the site at Abbots Langley, this would have a number of **adverse effects** for the local and wider UK economy. The data centre will provide of the order of nearly 6% of the growth in capacity needed over the next five years across the London area.

9) The growth in capacity in the UK is responding to demand and needs from the UK economy. A lack of growth in capacity to meet this demand and need would impact on the **ability of key sectors of the economy to perform effectively** and/or increase data costs for users. It is not possible to model these impacts precisely but, on reasonable assumptions, the cost to the UK economy could run into several hundreds of £s millions.

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