DRAFT

CALL IN APPLICATION

LAND AT BOUNDARY HALL, TADLEY

# PROOF OF EVIDENCE – Local Population Estimation

Prepared by

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ON BEHALF OF CALA HOMES (SOUTH) LTD

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# Contents

## 1 Introduction

1.1 My name is Stephen Richard Brooks and I hold an MSc in Geographical Information Science. I have over 10 years' experience in a broad spectrum of geospatial analysis, including the evaluation and presentation of demographic data derived from Census information. I have been the Director of my own company, GIS & Design Solutions, since January 2010 and offer outsourced GIS Consultancy to businesses, particularly in the field of Transportation and Development Planning. I am also a member of the Association for Geographic Information.

1.2 The evidence which I have prepared and provide for this inquiry (reference APP/H1705/V/10/2124548) in this proof of evidence, is true and I confirm that the opinions expressed are my true and professional opinions.

1.3 It is widely accepted by all parties concerned that there has been a variety of population count estimations and derived growth factors throughout the planning history of the Proposed Development Site. It is however not the intention of this evidence to revisit these various iterations but it should be noted that at the time the original "advise against " development by the HSE, the objections were in part founded upon population numbers that have since been observed as flawed and subsequently revised to a much lower projection.

1.4 The purpose of this evidence is to provide an unbiased assessment of the population count surrounding the Atomic Weapons Establishment (AWE) Aldermaston site and an estimated population growth factor presented by the Health and Safety Executive/Nuclear Installations Inspectorate (HSE/NII) in June 2010. Any conclusions made are done so on the basis of the population estimates provided.

1.5 This document and its contents have been verified and agreed with Basingstoke and Dean Councils own specialist Geoff Gosling.

1.6 Finally this document should be considered in accordance with previous reporting enclosed as Boundary Hall, Tadley; Environmental Statement WSP Ref: 12269492-001 dated 28th June 2010. [Ref: 10.1]

## 2 Context of the Evidence

2.1 The HSE has, on public safety grounds, advised against the planning application to redevelop, for mixed use including residential, the Boundary Hall site adjacent to the licensed nuclear installation at the AWE Aldermaston.

2.2 One of the bases for objection is that the existence of a controlled 'Low Population Zone' around a nuclear licensed site is important and represents a buffer between the nuclear licensed site boundary and more concentrated centres of population.

2.3 The Proposed Development Site is situated within the defined Settlement Policy Boundary of Tadley and is allocated for development under Policy D3.17 of the BDBC Local Plan for a minimum of 100 dwellings with associated open space and landscaping together with employment uses. This Policy has been saved under a direction under paragraph 1 (3) of Schedule 8 to the Planning and Compulsory Purchase Act 2004. Consistent with saved Policy D3.17 CALA has undertaken extensive consultation with the Local Planning Authority (BDBC) to secure a high quality residential scheme, including much needed affordable housing.

2.4 The planning application which was submitted to BDBC on 27th November 2007 was reported to the Development Control Committee on the 1st July 2009. This delay was due to an HSE Consultation Response 'advising against' planning permission being granted. This arose during the final stages of the 13 week statutory period for the determination of the application. Following the HSE's initial consultation response the HSE have been advising BDBC on health and safety issues associated with the AWE at Aldermaston and its relationship with the Boundary Hall planning application site.

2.5 A topic of significant debate between all parties has been understanding the constraint of population numbers and growth, as summarised in the following excerpts.

- *"Current custom and practice in the UK, requires that general site demographic characteristics as they exist at the time of licensing, are maintained throughout the entire lifecycle of a plant with an allowance for future developments to account for natural growth"*. [Ref: 10.2 – page 4].
- *"Consistent with Government policy on siting at the time of licensing in July 1997, a cautious approach was adopted by the HSE/NII and it was deemed that an appropriate designation for the AWE Aldermaston and Burghfield Sites would be that they should be treated as a "remote site" ….. the demographic margins within the DEPZ for the AWE Aldermaston and Burghfield Sites, are even without the proposed Boundary Hall development, approaching unacceptable limits when judged against semi-urban population density criteria"* [Reference: Annex A HSE objection note to Basingstoke and Deane Borough Council 12th December 2008[1], [Ref: 10.3 – page A5].

2.6 There are two elements to consider with this evidence, firstly the derivation of the population data. Secondly the methodologies the HSE/NII have adopted to interrogate the population data.

2.7 The HSE have, throughout the planning process for the Proposed Development Site, presented inconsistent population counts and population growth estimations. Yet the population growth estimates were sited by the HSE as a contributory factor in 'Advising Against' the two previous planning inquiries [Ref: 10.4 Page 4, Para 14]. The population data is described in section 4.

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1 1 Demographic margins and Site definitions are presented in Chapter 16 of the Environmental Statement (12269492-001) submitted as part of this Public Inquiry.

2.8 This evidence describes the latest methodology adopted by the HSE/NII in evaluating levels of population surrounding the AWE Aldermaston site. It considers the effect of the predicted population associated with the Proposed Development and the existing population within the Detailed Emergency Planning Zone (DEPZ). The DEPZ is a radial area of set distance surrounding a nuclear installation where there is the potential for an off-site release of radioactivity that would require implementation countermeasures. The DEPZ is defined on the basis of the most significant release of radiation from an accident. The methodology adopted to interrogate the population data is described in section 5.

2.9 The constraint and accurate quantification of population numbers and their distribution at an appropriate spatial resolution can be an uncertain science. Hence this evidence presents a summary understanding of the approach adopted at AWE Aldermaston (to date) and an agreed quantum upon population numbers and growth.

## 3 Legislation, Policy and Guidance

3.1 Government siting policy is stated in the United Kingdom's Fourth National Report on compliance with Article 17: Siting of the Convention on Nuclear Safety obligations [Ref: 10.5]. It is not our intention to reiterate this policy however, paragraph 17.35 of the policy addresses the issue of proposed developments in proximity to nuclear licensed installations specifically with regards to population:

- HSE to maintain *"a database of the estimated population around nuclear installations, based upon the most recent ten-yearly population census, updated to take account of subsequent planning applications for residential developments [ref provided to rr297]. This database is used to compare the projected population, following a proposed residential development, with government demographic guidelines, before HSE advises a local authority on the acceptability of such a planning application."* [Ref: 10.5 Section 17.35].

*3.2* HSE acknowledge however that there has been "*major challenges involved in producing the database including the need for national coverage, for accuracy at small spatial scales and for representing highly variable patterns of population concentration over time (for example in retail areas)."*

3.3 For these reasons they have stated that *"the population database has to be approached as a representation of patterns of potential occupation, rather than a precise measure."* [Ref: 10.6 – front page].

3.4 Population estimations can vary according to the data from which they were derived. There are no Government guidelines regarding the use of any specific population database. However the HSE/NII have employed researchers at Staffordshire University to develop a product called the National Population Database (NPD). Having been first developed in 2004 it is now in its second iteration, National Population Database 2 (NPD2), issued 2008.

3.5 The National Population Database contains advice pertaining to the implementation of Ordnance Survey data products that are widely considered to be the most reliable and complete datasets covering the United Kingdom within the GIS industry. The NPD2 was developed primarily to model populations and aid the HSE in the provision of advice to planning authorities when considering applications for new hazardous installations vicinity.

3.6 The following table, extracted from the RR678 [Ref: 10.7] outlines the different datasets and Layers considered within the NPD.

**Table 1.1 Datasets and Layers in the National Population Database 2004**

| *Feature Dataset* | *Layer* | *Database* | |
|---|---|---|---|
| | | *Individual Point* | *100m by 100m* |
| Residential | Residential | ✓ | ✓ |
| Transport | Roads (major) | | ✓ |
| | Railway Stations | | ✓ |
| | Ports | | ✓ |
| | Airports | | ✓ |
| Sensitive and Communal Establishments | Schools | ✓ | ✓ |
| | Boarding Schools | ✓ | ✓ |
| | Care Homes | ✓ | ✓ |
| | Hospitals | ✓ | ✓ |
| | Prisons | ✓ | ✓ |
| Workplace[1] | Workplace Populations | ✓ | ✓ |
| Retail | Retail Populations | | ✓ |
| Leisure Facilities | Stadia | | ✓ |
| | Camp Sites | | ✓ |
| | Public Attractions | | ✓ |

3.7 Although there are many datasets that are included within the NPD2, the latest figures released by the HSE/NII with respect to the target site only refer to the residential (night time) population. It should be noted that within previous iterations of population estimates, the HSE/NII have included a selection of the other data layers.

3.8 Within the NPD2 the population estimates are essentially derived from Census information. Census information is the most complete population dataset available within the United Kingdom, however due to the infrequency of its capture and delay in publishing, it can quickly become out dated.

## 4 Estimating Population Data

4.1 To derive population numbers the HSE/NII have adopted a simple yet effective methodology of generating an estimated population count for any given year since an official Census. It is possible to extract the average household size for each individual Output Area from the Census. The HSE/NII have then assigned this household size to all households, derived from a more frequently updated dataset, within each Census Output Area. The process involved and the data used is described below.

### *4.2 Census Data*

4.2.1 An Output Area is the smallest geographical area for which Census data is released and has a recommended size of 125 households. It is widely considered by GIS analysts that statistical averages derived from such Census Output Area data can be considered a good representation of demographical trends in an area. However as with all statistical averages, they are best employed when assessing trends in an area, rather than specific values.

4.2.2 The average household size has been calculated by the HSE/NII by dividing the total resident population within each Output Area by the total number of households within the corresponding Output Area [Ref: 10.8].

4.2.3 As noted in paragraph 3.8, Census data is purely a snapshot of the national demographic profile on one particular day in 2001 and may therefore become out dated with changes in births, deaths, migration, development, economy affecting numbers. Therefore to calculate a more up to date population estimate, it is best to multiply the average household size with the most latest dataset of household locations.

### *4.3 Identifying Households*

4.3.1 The complete recollection of Census data is too onerous to repeat more frequently than every 10 years, therefore the NPD adopts a very useful approach for updating one particular aspect of the data, number of households. There are a variety of sources for updated household number information with varying degrees of accuracy, however the NPD uses a data source considered within the industry to be most reliable, the Ordnance Survey (OS).

4.3.2 The original NPD (2004) used an Ordnance Survey product called AddressPoint®[Ref: 10.9]. AddressPoint® was developed in the 1990s by the OS when it added geographical coordinates to the Royal Mail® Postcode Address File (PAF®). The NPD uses this data to filter out residential delivery points from business addresses. Although there are some acknowledged issues with this process, it was still considered to be the best way of identifying residential addresses at the time of release.

4.3.3 The NPD2 (2008) now however uses a revised Ordnance Survey product called MasterMap® Address Layer [Ref: 10.10] which was also based upon the Royal Mail® Postcode Address File (PAF®). It also includes some enhanced attribution to increase accuracy when identifying residential delivery points. The OS released quarterly updates to this Address Layer but, following recommendations from the NPD guidance, it was recommended that these updates were only implemented annually. An exact revision schedule has never been published by the HSE/NII.

4.3.4 In 2006 the Ordnance Survey released Address Layer 2 [Ref: 10.10] as a more refined, more accurate database of addresses that again contained significantly more attributes that increased the reliability of identifying residential delivery address locations.

4.3.5 The HSE/NII did not upgrade to Address Layer 2 until May 2010 following a meeting with representatives of CALA Homes. Reasons given for the HSE/NII not upgrading sooner were to do with data license restrictions and the cost of implementing the newer data.

4.3.6 It is understood by BDBC and representatives of CALA Homes that the HSE/NII are now using Address Layer 2 as the basis for estimating population.

4.3.7 The date of issue (version) for either Address Layer or Address Layer 2 that were being used in population estimations by the HSE/NII was never published.

*4.4 Estimating Population from Average Household Size*

4.4.1 The NPD combines data from more frequently updated OS data to assess the number of households within each Census Output Area. The NPD then makes a simple assumption that the average household size will remain relatively stable between Censuses. It then multiples the number of households from the new data with the average household size data from the Census to determine if there has been any growth or reduction in population numbers within an Output Area.

4.4.2 The following example is for illustrative purposes only:

- Data extracted from 2001 Census:

  Output Area A had a residential population of 150, divided between 100 households giving an average household size of 1.5

  Output Area B had a residential population of 350, divided between 100 households giving an average household size of 3.5

- In 2008, Address Layer data shows that household numbers in each Output Area has increased by 50 Households. This has the following effect on estimated population count:

  Output Area A: Average household size (1.5) multiplied by revised household count (150) equates to an estimated resident population of 225, an increase of 75 residents.

  Output Area B: Average household size (3.5) multiplied by revised household count (150) equates to an estimated resident population of 525, an increase of 175 residents.

4.4.3 Therefore depending in which Census Output Area the development is located will determine the impact that the new development will have within the HSE methodology. As Census boundary lines often follow topographic features (roads, railways, rivers etc.) it is possible that whilst a development may not be feasible on one side of a road, simply moving it across the road (and therefore into a different Census Output Area) the development becomes feasible according to HSE Methodology.

4.4.4 Taking a broader view, the methodology adopted by the NPD would therefore over estimate new residential developments within some Output Areas and under estimate new residential developments within others. However, when evaluating trends across larger areas (Districts, Boroughs, Counties) these discrepancies will be greatly reduced and the methodology produces more reliable results. The NPD guidance [Ref: 10.6] notes that *"the population database has to be approached as a representation of patterns of potential occupation, rather than a precise measure."*.

*4.5 Estimating Population Growth*

4.5.1 In order to estimate population growth, an analyst must have access to a current dataset and a

comparative dataset from an earlier date.

4.5.2 The methodology for estimating average household sizes, as described in section 4.2 is relatively stable between Censuses and therefore can be considered a reliable means of comparison.

4.5.3 In contrast the data used to derive residential delivery points, as described in section 4.3 has changed considerably over time. Unlike the basic Census variables, the ability to map and analyse geospatial point data on a large scale has only really been possible with the evolution of Geographical Information Systems (GIS) over the last two decades. Therefore access to reliable historical digital datasets that specify accurate residential delivery points is also limited. Changes in how all digital data is collected, stored, updated and disseminated have had considerable impact on computing in general, not least within GIS. As data accuracy and reliability increase, so to do the quality and quantity of data attribution. These improvements mean that digital geographic data is constantly evolving and being superseded.

4.5.4 The most accurate data available today for determining residential delivery point locations was not available at the 1991 Census. As OS AddressPoint® was only developed in the 1990s; any comparison made to the 1991 Census would require an alternative process.

4.5.5 In 1995 the HSE commissioned WS Atkins to produce an estimation of population in the area surrounding AWE Aldermaston as a point based dataset. The results from this analysis were, until November 2009, used by the HSE as a basis for calculating growth, siting in excess of 300% population increase in some areas close to AWE Aldermaston. Independent challenge of the 1995 data prompted HSE/NII to review the WS Atkins data.

*4.6* In November 2009 the HSE/NII consequently presented a paper to BDBC and representatives of CALA Homes, entitled 'Critique of WS Atkins (1995) Report on Population Change Estimate' [Ref: 10.11]. This paper was dated 2008 and was considered an appendix to the NPD2 document discussed in paragraph 4.3.3 of this evidence. It concluded that the data used for the basis of the WS Atkins report was *"...not fit for purpose..."* and that *"retrospective estimates calculated by HSL have suggested that the population in (1995) was generally higher than modelled".*

4.6.1 Following a review of this WS Atkins data [Ref: 10.11], the HSE/NII have subsequently quoted much lower population area increases. The latest available population growth estimate is only circa 3% for the same corresponding area that was previously suggested at over 300%. In July 2010, the HSE/NII confirmed that they have only calculated growth for two sectors covering Tadley. They do not have data available to evaluate the effects of growth all around AWE Aldermaston, suggesting that the growth factor is no longer a significant issue. In the absence of a reliable point-based residential household dataset, the only comparative dataset remaining is the areal Census geography.

*4.7 Summary*

4.7.1 With the HSE now adopting OS Address Layer 2 data, they are adopting the latest postal address database considered by many GIS professionals to be the most accurate and reliable that is available within the UK.

4.7.2 The methodology adopted by the HSE to multiply up to date household numbers by Census derived average household sizes is deemed as reasonable when analysing trends over wide geographic areas, such as districts, boroughs or counties. Any evaluation or interrogation of results at smaller scales, such as individual Output Areas or postcodes, lends doubt over the accuracy of results.

4.7.3 The fact that the HSE have not attempted to analyse all around site population growth suggests that the HSE/NII no longer consider growth to be a significant factor for this site. The flaws identified in the historical data have cast doubt over the reliability of any suggestion of any precise measurement of population growth at any geographical resolution finer than Output Areas.

4.7.4 For the purpose of evaluating the local populations around the AWE site the HSE/NII have retained the population estimation data as a point based dataset. The HSE/NII has assigned the average household size to all households that fall within the geographic confines of each Output Area. This has enabled the HSE/NII to interrogate the data using a separate methodology more suited for evaluating data surrounding a specific location, rather than being confined to Output Area geographies. This process is described in section 5 of this proof of evidence.

## 5 Interrogating population data within the HSE Model

5.1.1 There have been two significant variations to the methodology employed in estimating the potentially affected population as adopted by the HSE/NII to date. These approaches have been driven by the configuration of the HSE's siting models as presented to date and their evolution throughout the CALA Homes application.

5.1.2 It was understood that the HSE/NII were, until November 2009, only using the first of the methodologies described below. Since November 2009 the HSE/NII have only been using a second methodology. Details of the first methodology have been included below in order to demonstrate the difference between the two methods.

5.1.3 In summary it must be recognised that any estimate of population, including growth and distribution, requires consideration of the geographical area across which an estimate is to be made. To reiterate, any change in the geographical area across which a population count is made will affect the estimate of population.

5.1.4 Please further note that the names given to the two different methodologies described in this chapter ('Single Origin' and 'Multiple Origin') are not HSE/NII nomenclature but are provided solely to illustrate the key variations between the two approaches. It is pertinent to note that both methodologies and associated data were designed to *"model populations and aid HSE in the provision of advice to planning authorities for new hazardous installations in their vicinity"* [Ref: 10.6]. The difference between the models is the area across which population numbers are actually expressed.

### *5.2 The Single Origin Approach*

5.2.1 The methodology presented by the HSE/NII that included a quantification of population was first based on the assumption that there would be a single point of release of a hazardous material. To assess its impacts upon surrounding population this single origin methodology divided the surrounding area into predefined radial distance bands originating from a presumed incident location. These radial distance bands were then further divided into twelve 30° sectors, creating a polar grid around an origin (presumed location of incident) within which population would be assessed (compliant with NuSAC (2008) P12 Addendum) [Ref: 10.2]. For the purpose of this document, the individual areas that are created when the radial distance bands are divided up into the sectors will be referred to as 'cells'. An illustration is presented in Figure 1 on the following page.

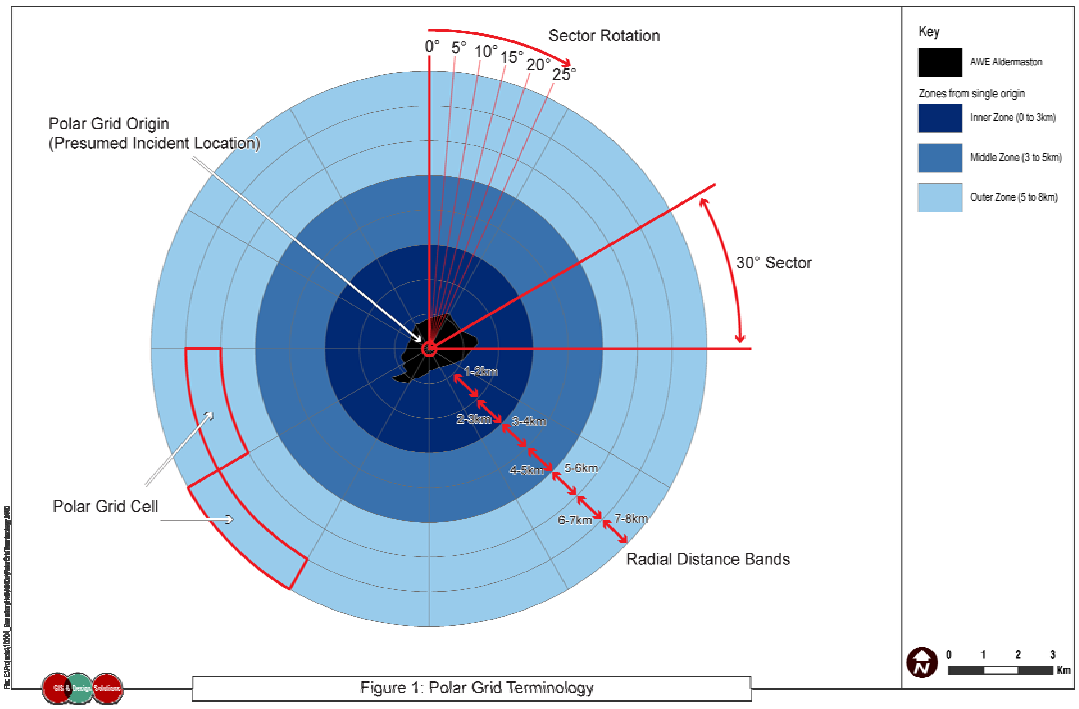

Figure 1: Polar Grid Terminology

5.2.2 Any change in distance band interval, alteration of polar grid origin or grid rotation will logically change the population being captured within each cell for assessment and therefore the significance of any later modelling in assessing the significance of an incident upon a cell. This is discussed in more detail in Chapter 16. It must be noted that multiple origins, changing radial distance bands and sector rotations have to date all been delivered by the HSE consequently affecting the interpretation of available demographic margins by Basingstoke and Deane Borough Council. These changes have been delivered by the HSE in an iterative fashion by way we understand of model sensitivity testing and scenario running.

*5.3 The Multiple Origin Approach (HSE terminology "Site Characterisation Approach")*

5.3.1 The difference in this second approach is that the HSE now considers multiple potential incident locations (origins) across the site as increasingly protective and providing a more robust Depth in defence model. The precise location of potential incident locations is a matter of national security and therefore has to date not been disclosed. In response to this, the HSE/NII have developed a multiple origin approach that evaluates the entire site at 100m grid intervals to provide a site overview without having to disclose any specific potential incident location. The polar grid of the single origin approach (figure 15.1) has essentially been superimposed across the site at 100m intervals equating to circa 400 origins.

5.3.2 By its very nature, the multiple origin approach extends the DEPZ that is 3km from a single origin to a DEPZ that is effectively 3km from the AWE Aldermaston site boundary and hence is inclusive of a greater number of people, having increased the area affected. Figure 2 demonstrates the difference in the two approaches.

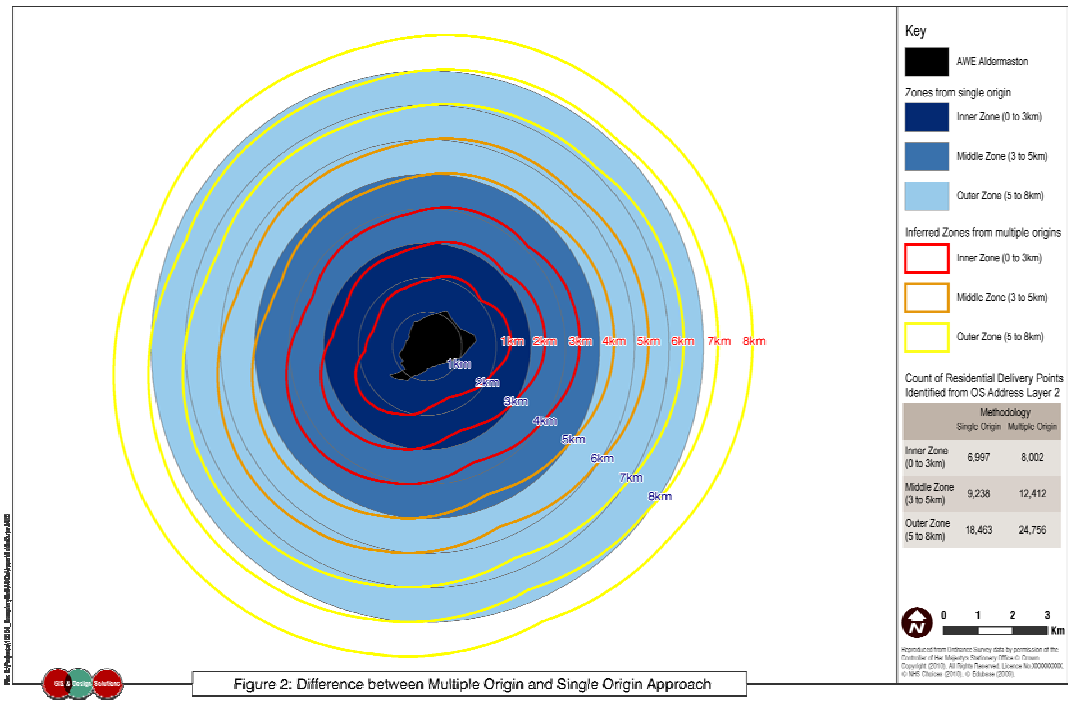


Figure 2: Difference between Multiple Origin and Single Origin Approach

5.3.3 The following table highlights the difference in area within each of the radial bands, for each of the methods. It is clear to see from these figures that the multiple origin methodology is significantly larger for each radial band. When you calculate population statistics using a larger geographical area, it would be expected that the estimated population would also be greater.

| **Radial Band** | **Single Origin Methodology (Area Sq Km)** | **Multiple Origin Methodology (Area Sq Km)** |
|---|---|---|
| 1 | 3.1 | 12.7 |
| 2 | 9.4 | 16.3 |
| 3 | 15.8 | 22.5 |
| 4 | 22 | 28.8 |
| 5 | 28.3 | 35.1 |
| 6 | 34.6 | 41.4 |
| 7 | 40.8 | 47.7 |
| 8 | 47.1 | 54 |

*5.4 Summary of Methodology adopted by the HSE/NII*

5.4.1 The application and validity of the above approaches is discussed in the Proof of Evidence prepared by Dr Michael Thorne (MTA/P0057/2010-1:Issue 2), however it is important to note that the latest population estimation presented in June 2010 is less than half of the permitted all-around site population according to Hansard (1988) [Ref: 10.12]. The sector containing the Proposed Development is also less than half of the maximum permitted 30° Sector limit outlined in Hansard (1988).

5.5 As noted in paragraph 5.2.2, any change in the distance band interval, alteration of polar grid origin or grid rotation will logically change the population being captured within each cell for assessment. It should also be noted that if the physical distribution of population changes then this too would logically impact on the estimation of population, even if the parameters described in paragraph

5.2.2 remain unchanged. To reiterate, changes to the dataset from which population distribution is derived (household locations) will have an impact on the population estimates.

5.6 Chapter 15 of the Environmental Statement (12269492-001) details the historical variations in HSE/NII population estimations. To summarise, population estimates quoted and calculated have varied considerably between January 2007 to June 2010, as illustrated in tables 15.1 and 15.2, reinforcing the levels of uncertainty in analysing population at the spatial resolution implied/required here. On the basis of using the most recent data as being the most accurate representation, the population growth calculated from HSE/NII data since 1991, depending on the sector rotation being applied, is now only≈3.2% within the sector containing the Proposed Development.

## 6 Towards an Agreed Position on Population

6.1 To reiterate, any accurate quantum of population is bound by uncertainty (see section 5.4). However, based on the latest information provided by HSE/NII and from meetings between HSE/NII, BDBC together with representatives of CALA Homes, the following can be confirmed as an agreed position concerning population data and population estimations.

1 OS AddressLayer 2 contains the best representation of residential delivery points and is now being used by HSE/NII (June 2010);

2 Based on the information from OS AddressLayer 2 (June 2010), population growth is significantly lower than previously suggested by HSE/NII;

3 Following the decision to use OS AddressLayer 2, population growth for the sector containing the Proposed Development, is just ≈3.2% since 1995.

4 HSE/NII have not produced revised population estimates for 1995 for an all-around site scenario so there are no growth estimates available to inform how much growth has occurred .

5 In summary, the only population estimates considered by all parties to be robust enough to allow comparative growth calculations are for the sector containing the Proposed Development, up to 3km.

6.2 Summary statistics are presented in tables 1 and 2 below:

| Table 1 | 30° Sector containing proposed development (up to 3km) | | |
|---|---|---|---|
| Area (as per HSE spreadsheet) | 2.3562 | | |
| | Sector Rotation | Population (all numbers are unweighted) | Population Density per sq km |
| 1991 Census Interpretation - WS Atkins (1995) | 25° | 1,338 | 568 |
| Jan 2007 HSE/NII Population Estimate **(0 to 2 Mile only)** | 0° | 2,943 | N/A |
| Dec 2008 HSE/NII Population Estimate | 25° | 5,800 | 2,462 |
| 1991 Census Interpretation – WSP (2009) | 25° | 4,364 | 1,852 |
| 2001 Census Interpretation – WSP (2009) | 25° | 4,781 | 2,029 |
| Feb 2009 HSE/NII Population Estimate (Known to includes Proposed Development at Boundary Hall site) | 10° | 3,205 | 1,360 |
| Nov 2009 HSE/NII revised 1995 population estimates | 25° | 5,055 | 2,145 |
| 2010 HSE / NII Population Estimate (AddressLayer) | 25° | 5,185 | 2,201 |
| 2010 HSE / NII Population Estimate (AddressLayer 2) | 25° | 5,213 | 2,213 |
| HANSARD (1988) Semi-Urban limit for one 30° Sector within the 3km DEPZ[2] | N/A | 11,780 | 5000 |

2 Assumes a Hansard Semi Urban limit for comparative purposes yet HSE now report that the target site is neither Remote nor Semi Urban within its classification – [Ref: 10.13]

| Table 2 | DEPZ (up to 3km, all Sectors) | |
|---|---|---|
| Area (as per HSE spread sheet) | 28.2744 | |
| | Population | Population Density per sq km |
| 1991 Census Interpretation - WS Atkins (1995) | 13,078 | 463 |
| Jan 2007 HSE/NII Population Estimate **(0 to 2 Mile only)** | 16,954 | N/A |
| Dec 2008 HSE/NII Population Estimate | 19,196 | 679 |
| 1991 Census Interpretation – WSP (2009) | 15,164 | 536 |
| 2001 Census Interpretation – WSP (2009) | 15,879 | 562 |
| Feb 2009 HSE/NII Population Estimate (Known to include Proposed Development at Boundary Hall site) | 19,195 | 679 |
| 2010 HSE / NII Population Estimate (AddressLayer) | 16,939 | 599 |
| 2010 HSE / NII Population Estimate (AddressLayer 2) | 17,059 | 603 |
| HANSARD (1988) Semi-Urban limit for entire 3km DEPZ | 35,350 | 1,250 |

6.3 These tables illustrate that the unweighted population density around the site and within the sector of concern irrespective of the different approaches adopted all reside below a semi urban limit, noting that the applicability of such limits is however discussed in Chapter 16 of the Environmental Statement (12269492-001).

## 7 Sources of residual yet acceptable uncertainty

7.1 Although there are elements of common ground outlined in section 6, there are still elements of uncertainty relating to the population figures.

6 The HSE/NII assumes that average household size defined in the 10 yearly Census is applicable until it is superseded by a more recent Census.

7 The population density within the Census Output Area containing the Proposed Development Site in 2001 was 2.51.

8 BDBC have indicated that their own assessment of 2009 average household size is in decline according to Mr Bill Flood Memo [Ref: 10.14].

9 The concurrency of the data containing the underlying residential delivery point is uncertain. The HSE/NII have not documented the concurrency, however from meetings with HSE/NII, CALA representatives and BDBC it is understood that information presented in May and June 2010 uses residential delivery point data from 2009.

10 Neither the single origin approach nor the multiple origin approach consider transient populations in their population estimates.

11 HSE/NII indicated in an email (15/06/2010) [Ref: 10.13] that *"the constraint limit for population has a natural growth allowance built in, hence the need for development control"*. In relation to the Heysham plant there is an allowance that *"natural growth in broad terms was about 1% per annum over the design life of the Heysham plant"*.

7.2 Accepting that quantifying population and growth will always be bound by a degree of uncertainty the population estimates presented by HSE/NII in June 2010 may be adopted. They include potentially conservative assumptions and are considered consequently as an acceptable assessment of population utilising the most appropriate data available.

## 8 Summary

8.1 The HSE acknowledge that there has been "*major challenges involved in producing a database including the need for national coverage, for accuracy at small spatial scales and for representing highly variable patterns of population concentration over time*".

8.2 The HSE *"requires that general site demographic characteristics as they exist at the time of licensing, are maintained throughout the entire lifecycle of a plant with an allowance for future developments to account for natural growth*".

8.3 A "cautious approach" was adopted by the HSE at the time of licensing (1997) with respect to available demographic margins.

8.4 Annex A HSE objection note to Basingstoke and Deane Borough Council 12th December 2008, [Ref: 10.3] refers to "unacceptable demographic margins".

8.5 The HSE have previously reported gross overestimations of population growth within the Tadley application process and that of Shyshack Lane rendering uncertainty towards the assessment of available demographic margins, and which in retrospect have been unintentionally misleading.

8.6 The approach to growth rate estimates have now however been confirmed and to be in agreement with the method and quantum of Basingstoke and Deane Borough Council's own officers estimates.

8.7 At the time of licensing the demographic margin, defined as remote, was likely to have already been exceeded. The selection of siting limits is discussed however in Chapter 16 of the Environmental Statement (12269492-001).

8.8 Yet in summary the increase in proposed population is deemed insignificant at ≈3.2% within the 30° sector containing the Proposed Development and ≈1.6% assuming all around site to 3km radius.

8.9 Finally, the figures presented within this Section 6 have been based, for ease and clarity upon understanding population radiating from a single origin. Latest modelling of weighted population for estimating available demographic margins by the HSE (see Chapter 16 of Environmental Statement (12269492-001)) have however only recently applied the multiple origin (site characterisation) approach. As the geographical location of population does not change consensus can however be applied to the population figures in the multiple origin models as can estimates of growth. The effect of applying multiple origins extends however the DEPZ that is 3km from a single origin to a DEPZ that is effectively 3km from the AWE Aldermaston site boundary and hence is inclusive of a greater number of people, having increased the area affected. In essence however population growth can be stated as low irrespective of the form of any subsequent distance dependent population weighting models applied (Chapter 16 of the Environmental Statement (12269492-001)). Population quantum will also remain the same it is instead the boundary conditions of the distance dependent population weighting models capturing more population (wider areas considered) that affects subsequent projected out turns of available demographic margin (again see Chapter 16 of the Environmental Statement (12269492-001) for a more detailed understanding of such weighting modelling).

## 9 Glossary

| Term | Definition |
|---|---|
| Address Layer | A geographical dataset from the Ordnance Survey based on the Royal Mail Postcode Address File. Released 200? |
| Address Layer 2 | A geographical dataset from the Ordnance Survey based on the Royal Mail Postcode Address File and Ordnance Survey MasterMap data. Released 200?. |
| Address Point | A geographical dataset from the Ordnance Survey based on the Royal Mail Postcode Address File. Released 200? |
| Attributes | Non geographical data that is associated to a geographical object within a Geographical Information System in order to allow non-spatial interrogation of an object. For example “Find all objects from table 'URBAN_AREAS' where field 'NAME' equals 'Basingstoke'” |
| BDBC | Basingstoke & Deane Borough Council |
| Census Output Area | A geographical area designed for the collection and publication of Census Statistics at its smallest size. They were introduced for the 2001 Census. |
| DEPZ | Detailed Emergency Planning Zone |
| GIS | GIS is a system of hardware and software used for storage, retrieval, mapping, and analysis of geographic data. |
| HSE | Health & Safety Executive |
| NII | The Nuclear Installations Inspectorate of the Health & Safety Executive |
| NPD | National Population Database |
| NPD2 | National Population Database 2: Updated by Staffordshire University in 2008 |
| OS | Ordnance Survey |
| PAF | Postcode Address File |

## 10 References


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