

TOWN AND COUNTRY PLANNING ACT 1990

**A PLANNING APPLICATION BY CALA HOMES (SOUTH)
LTD FOR THE REDEVELOPMENT OF LAND FOR MIXED
USE, INCLUDING RESIDENTIAL, ON ALDERMASTON
ROAD, TADLEY, ADJACENT TO THE ATOMIC
WEAPONS ESTABLISHMENT AT ALDERMASTON**

PROOF OF EVIDENCE OF

DR JOHN HIGHTON

ON BEHALF OF

THE HEALTH AND SAFETY EXECUTIVE

**Basingstoke and Deane Borough Council
Planning Application Ref: BDB 67609**

Planning Inspectorate Ref: APP/H1705/V/10/2124548

**Health & Safety Executive
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1. INTRODUCTION

1. This evidence is given on behalf of the Nuclear Installations Inspectorate of the Health and Safety Executive (HSE) by Dr John Highton, HM Principal Inspector of Nuclear Installations.

1.1 Experience and Qualifications

2. I am a Member of the Institute of Mechanical Engineers and my academic qualifications are listed in Table 1(a). To-date I have worked in the nuclear industry in the United Kingdom for over thirty years.

3. Prior to joining the Nuclear Installations Inspectorate of the Health and Safety Executive (HSE) in April 1990, I was employed by the Central Electricity Generating Board (CEGB) for twelve years. My roles and responsibilities with the CEGB are listed in Table 1(b) and included the provision of scientific and engineering technical support for the continued operation of both conventional and nuclear power generating plant.

4. Since 1997 I have held the post of Principal Inspector Nuclear Installations, Table 1(c). I have had involvement with land-use-planning and demographic issues around operational nuclear facilities, and with nuclear new build site evaluation and Strategic Siting Assessment in the United Kingdom since 2006.

1.2 Scope and Structure of the Submission

5. My evidence provides the background and justification for HSE's

position to 'advise against' the granting of planning permission by Basingstoke and Deane Borough Council (BDBC) with respect to the above planning application BDB/67609. The submission addresses those issues most relevant to UK Government siting policy, land-use planning and the analysis of demographics in the vicinity of the Aldermaston Atomic Weapons Establishment (AWE) licensed nuclear installation.

6. The evidence summarises the key stages in the development and application of demographic siting criteria in the United Kingdom and will highlight:

- Two fundamental tenets of nuclear safety: the precautionary principle, and defence-in-depth.
- The planning history for the Boundary Hall site and the position adopted by HSE with regard to residential development following a post-licensing review of demographics in the vicinity of the AWE Aldermaston nuclear site in 2006.
- The need to preserve site (demographic) characteristics and the Government siting policy statements articulated at the Connah's Quay B, Sizewell B and Hinkley Point C Public Inquiries and in other public documents and announcements.
- The significance of population weighting factors and concomitant weighted population distributions cast in the form of site population factors (SPFs).
- The interdependency of preserving site characteristics with emergency preparedness in the context of defence-in-depth.
- The requirement for nuclear safeguarding zones, concomitant Local Authority consultation criteria and arrangements for

development control.

- The current position with regard to demographics in the vicinity of the AWE Aldermaston site based on the extant population distribution.

In summary, I shall conclude that:

The proposal contravenes the well understood and settled policy that seeks to preserve the demographic characteristics of a nuclear site by developing significant new housing right up against the boundary of the AWE establishment.

The consequences of such a breach of policy which by themselves are harmful are dealt with by other witnesses.

2. BOUNDARY HALL, TADLEY

2.1 Development Site Location

7. The close proximity of the Boundary Hall proposed development site for the construction of 115 residential units in relation to the boundary of the AWE Aldermaston nuclear licensed site is illustrated in Figure 1.

2.2 Significance of Development at Boundary Hall

8. The proposed development would, on the applicant's estimate, introduce an additional 268 persons. This is a significant addition to the population closest to the nuclear installation, and further contributes to a

long term net positive increase in the extant residential population density within the 3.0 km Detailed Emergency Planning Zone (DEPZ).¹

9. Such a situation would increase the overall risk to the public in the event of an off-site release of radioactive material following a significant plant fault by:

Exposing more people to potential harm.

10. For residential locations in close proximity to the AWE site boundary, there is little or no benefit from the effects of attenuation and such locations will be subjected to the full impact of an off-site release of radioactive material in the event of a radiation emergency.

11. Furthermore, the proposed development would adversely impact upon the maintenance of a controlled low population zone around the AWE nuclear facility, contrary to the Government policy requirement to preserve site (demographic) characteristics. A controlled low population zone serves to both mitigate against the consequences of an off-site release, and facilitates emergency preparedness which are key elements of the defence-in-depth philosophy and protection principle adopted by the nuclear community worldwide and discussed in more detail below.

3 PLANNING HISTORY (BOUNDARY HALL)

12. All planning applications relevant to the Boundary Hall site are

¹ Nuclear Emergency Planning Liaison Group (NEPLG): Consolidated Guidance, Chapters 3, 8 and 9, Department of Energy and Climate Change (DECC).

listed in Table 2. Of particular note, is the pre-application inquiry ENQ/17526 dated September 2006 by Spen Hill Developments Ltd, the property arm of Tesco Stores Ltd.

3.1 Spen Hill Developments Ltd

13. The pre-application inquiry ENQ/17526 by Spen Hill Developments Ltd (Agent NAI Fuller Peiser) in September 2006, for residential development (136 Units) of Boundary Hall site, was a driver for a review of demographics in the vicinity of the AWE Aldermaston nuclear site.

14. The 2006 review of demographics resulted in revised nuclear safeguarding zones (Figure 2) and consultation criteria being prescribed and communicated to all relevant Local Authorities as appropriate, in February 2007. Section G.2 of Appendix G shows that this information was at the time, promptly forwarded to the Head of Transport and Planning, and the Development Control Manager of Basingstoke and Deane Borough Council (BDBC).

15. A letter of objection from HSE to the Spen Hill development dated 20 October 2006 was subsequently lodged with BDBC which was forwarded to NAI Fuller Peiser by BDBC under a covering letter dated 23 October 2006, (Appendix H).

16. HSE Nuclear Inspectors subsequently responded to a request from NAI Fuller Peiser (Nicola Forster, 6 November 2006), for additional information relating to HSE's objection to the proposed Boundary Hall residential development, and the implications of the AWE Aldermaston nuclear safeguarding zone(s).

17. Application BDB/65066 was withdrawn by Spen Hill Developments Ltd on 26 February 2007 prior to any further detailed exchanges with HSE Nuclear Inspectors.

3.2 CALA Homes (South) Ltd

18. HSE first became aware of the Boundary Hall planning application BDB/67609 by CALA Homes (South) Ltd as a result of a communication from the AWE Aldermaston Site Planning Liaison Manager on the 11 February 2008 (Appendix I).

19. Although a number of pre-application meetings between representatives of CALA Homes (South) Ltd and BDBC were held (Appendix I), it is apparent that HSE's previous position with regard to the residential development of the Boundary Hall site by Spen Hill Developments was not considered a material issue, and consequently HSE's concerns do not appear to have been known to the applicant. This is particularly noteworthy since the 20 June 2007 meeting between CALA Homes (South) Ltd and BDBC, was attended by Nicola Forster of NAI Fuller Peiser, the Agent for Spen Hill Developments Ltd planning application in 2006.

It is disappointing that HSE Nuclear Inspectors were not directly involved earlier in the determination of this application and/or that the longstanding and consistent concerns of the Executive were not drawn to the relevant parties attention.

4. NUCLEAR SAFETY

20. Requirements for nuclear safety are intended to ensure adequate protection of site personnel, the public and the environment from the effects of ionizing radiation arising from the operation of nuclear facilities. Two fundamental tenets of nuclear safety, the precautionary principle, and defence-in-depth are discussed below.

4.1 Precautionary Principle ²

21. Although there is no universally accepted definition of the precautionary principle, it does have correspondence with the complementary principles of 'protection' and 'prevention' in a nuclear safety context. In the face of uncertainty, the precautionary principle requires action favouring protection such that:

Measures should be taken to prevent foreseeable harm.

4.2 Defence-in-Depth ³

22. The concept of defence-in-depth provides a means to protect against, and manage unknowns and uncertainties in the operation of a nuclear facility by conservatism, with successive layers of independent barriers to prevent, protect and/or to mitigate the release of radioactive substances into the environment. Defence-in-depth which is concerned with the protection of the public, workers and the environment, is

² C. Stoiber, A. Baer, N. Pelzer and W. Tonhauser (2003), Handbook on Nuclear Law, STI/PUB/1160, July 2003, International Atomic Energy Agency, Vienna.

³ IAEA (1996), Defence in Depth in Nuclear Safety, INSAG-10, International Nuclear Safety Advisory Group, International Atomic Energy Agency, Vienna.

fundamental to the safe operation of a nuclear facility. The strategy for defence-in-depth is twofold: first, to prevent accidents and second if prevention fails, protection to limit the potential consequences of accidents.

23. Defence-in-depth is structured in five levels, Table 3. If one level were to fail, the subsequent level comes into play, and so on. Special attention needs to be paid to hazards that could potentially impair several levels of defence, such as fire, flooding or earthquakes.

24. The final level of protection, Level 5 in Table 3 is concerned with 'averted dose' to workers and public and provides for:

Mitigation of radiological consequences of significant releases of radioactive materials.

25. The possibility cannot be discounted no matter how remote, that emergency arrangements can be compromised on the day. The existence of a controlled 'Low Population Zone' around a nuclear licensed site is an important element in the mitigation of radiological consequences and represents a buffer between the nuclear licensed site boundary, and more concentrated centres of population. It is the only effective non-engineered (passive) means of restricting exposure of the local population to radiation in the event of a potential release of radioactive material into the environment following a significant plant fault.

26. Such an approach derives from, and is consistent with, the overarching Government policy adopted in the early days of the nuclear

power programme in the United Kingdom to preserve site (demographic) characteristics and that in the event of a reactor accident, ACSNI(78)P4:⁴

Very few people would be exposed to extreme risks.

5. NUCLEAR SAFEGUARDING ZONES

27. International guidelines and practices provide the basis for assessing and maintaining population levels in the vicinity of nuclear installations, determined by safeguarding zones set at increasing distance from the installation. Safeguarding zones were set in the United Kingdom at the start of the civil nuclear energy Magnox reactor programme in the early 1960s, to ensure that new development would be so controlled to avoid significant increases in population to the detriment of emergency arrangements and to provide mitigation against the consequences of a significant release of radioactive material.

28. In accordance with Government policy, once a decision has been taken to accept a site for nuclear licensing, new development which is permitted subsequently in the vicinity does not result in the population around the nuclear licensed site unacceptably rising :

The danger is that over a period of time individual items of development, in themselves quite unobjectionable on safety grounds, would together result in an increase in population

⁴ ACSNI(78)P4: The Development of Siting Policy for Nuclear Power Stations in the UK, Advisory Committee on the Safety of Nuclear Installations, October 1978.

near a nuclear facility which could not be regarded as acceptable.

*Minister of Housing and Local Government,
Letter dated 6 June 1961 (Appendix C).*

29. The June 1961 letter by the then Minister of Housing and Local Government, identified three safeguarding zones (inner, middle and outer) around each site and local councils were instructed to consult the Minister on certain proposed developments within each of the three zones. At that time, the inner and middle zones were based on nominal 1 and 2 mile radii, with the contours adjusted to avoid cutting through centres of population and to follow natural boundaries. The furthestmost boundary of the outer zone was specified as being 5 miles in radial extent (illustrated in Appendix C: §C3).

30. The basis for the 1, 2 and 5 mile zones and the population increments associated with them, was the need to ensure the Government's siting policy was not invalidated by increases in the population around the site. It was considered that the controls given by the above safeguarding zones would be sufficient to ensure that creep in population growth around the sites would not take place without the knowledge of the regulators.

5.1 Advanced Gas-cooled Reactor Sites – Hansard (1970)

31. For Advanced Gas-cooled Reactors (AGRs) in concrete pressure vessels, safeguarding zones and concomitant consultation criteria were prescribed at the outset of the AGR reactor programme to restrict residential and commercial developments in an area comprising inner

and outer zones up to two miles from the site, with the inner zone set at a nominal $\frac{2}{3}$ mile from the reactor, Hansard: 23 March 1970, (Appendix A herein refers).

5.2 Consultation Criteria

32. For the AWE Aldermaston site and the safeguarding zones illustrated in Figure 2, the following consultation criteria has applied, for the purpose of development control since February 2007, (Appendix G):

There is a need to refer to HSE proposed developments that will increase the extant population according to the following consultation criteria:

Inner Zone *Any development leading to an increase in residential accommodation, or likely to cause an influx of non-residential population.*

Middle Zone *Development providing residential accommodation, permanent or temporary, for more than 50 people or likely to cause an influx of non-residential population exceeding 50 people.*

Outer Zone *Development likely to lead to an increase of 500 people in the population at any place.*

5.3 Government Circular 04/00 – Nuclear Installations

33. The guidance offered by Government Circular 04/00 to Local Authorities for proposed developments in the vicinity of nuclear installations, is particularly noteworthy at this juncture (Appendix E):

A17. With regard to proposed developments in the vicinity of licensed nuclear installations, the consultation requirements can vary between sites. The present administrative arrangements will therefore continue to apply, under which HSE specify for each such site a relevant consultation zone and the type of developments on which it should be consulted.

A18. Where the local planning authority is in any doubt about whether HSE should be consulted in a particular case, it is advised to contact the appropriate HSE Area Office.

It is noteworthy that this advice is applicable to licensed nuclear installations generally.

6. PRESERVATION OF SITE CHARACTERISTICS

34. The objective of Government's policy on demographics and the siting of licensed nuclear installation is to limit radiological consequences to the public in the unlikely event of a serious nuclear accident. This policy which has been carried forward by the Department of Energy and Climate Change in the draft National Policy Statement for Nuclear Power Generation (Appendix F), is a measure of prudence over

and above the stringent regulatory requirements imposed on nuclear operators to prevent such accidents. The fundamental aim is to:

Preserve the general characteristics of the area around the nuclear site throughout its lifecycle, and to ensure that the basis on which the site is licensed is not undermined.

DECC (2009) Draft National Policy Statement.

35. This safeguard is designed specifically to avoid the situations post licensing of a nuclear facility, where:⁵

- (a) More people may be exposed to potential harm from the operation of the nuclear facility by uncontrolled residential development in the safeguarding zone(s).
- (b) The cumulative effect of subsequent population growth might reach a level such that it harms the resource capability of those parties responsible for the provision of appropriate countermeasures in the event of a radiation emergency.

36. Note that the ability of those parties responsible for the provision of appropriate countermeasures in the event of a radiation emergency is very much a dynamic, and should be subject to monitoring and constant review to avoid degradation of the arrangements which underpinned the licensing basis.

⁵ ACNSI (88)P1, The Siting of Nuclear Installations in the United Kingdom, February 1988, Advisory Committee on the Safety of Nuclear Installations, February 1988.

6.1 Hansard (1988) Demographic Criteria Nuclear Installations

37. Demographic criteria developed originally in the late 1960s are used as guidelines for controlling development in the vicinity of nuclear installations:

... Once a site has been accepted for nuclear licensing, arrangements are made to ensure that residential and industrial developments are so controlled that the general characteristics of the site are preserved, and therefore local authorities consult the inspectorate with regard to any proposed development which might lead to an increase in population close to the site. Limiting criteria based upon population distribution are used only for guidance and the inspectorate would not necessarily insist on rigid adherence to them. Other unquantifiable factors are also taken into account.

The limiting criteria are in the form of cumulative weighted population out to various distances all around the site and in any 30 degree sector. To assess a site against the criteria at a certain distance, the population for a given distance band is multiplied by the appropriate weighting factor and the values up to the distance being evaluated are added together.

Hansard, 11 March 1988 (Appendix A)

38. Although the aforementioned Ministerial statement is focussed on Magnox and AGR power reactor sites, ACSNI(1988)P5 repeats a well

understood proposition, namely that the framework would apply to non-reactor nuclear facilities also:⁶

The Inspectorate would use a similar framework to develop a siting policy for other nuclear installations such as chemical plants, waste stores and dry fuel stores.

ACSNI(1988)P5, June 1988.

For these purposes the Aldermaston AWE site would constitute ‘other nuclear installations’.

39. Further, and consistent with this longstanding approach, a paper presented to July 2008 meeting of the Nuclear Safety Advisory Committee (NuSAC) demonstrated to the satisfaction of the NuSAC members that the conceptual cumulative weighted population model upon which the Hansard (1988) demographic criteria is based, was readily extendible to non-reactor nuclear facilities (NNFs) when cast in terms of Site Population Factors (SPFs).^{7, 8}

40. NuSAC endorsed the proposals in the 2008 paper for application to new-build nuclear plant and noted the applicability of the methodology cast in terms of SPFs to non-reactor nuclear facilities.

41. For the definition of SPFs, the relevant extracts from Openshaw (1986) are provided in Appendix M herein. An application of

⁶ ACSNI(1988)P5, The Development of Siting Policy for Nuclear Power Stations in the UK: Development of the Proposals, Advisory Committee on the Safety of Nuclear Installations, June 1988.

⁷ NuSAC(2008)P12 (and Addendum), The Siting of Nuclear Installations in the United Kingdom, Nuclear Safety Advisory Committee, 3 July 2008.

⁸ Openshaw S. (1986), Nuclear Power: Siting and Safety, Routledge and Kegan Paul. Site population factors (SPFs) are defined on pp 207-209.

the SPF based policy to nuclear installations generally, only requires a knowledge of the attenuation rate associated with an off-site release of radioactive material, and the population distribution around the site within a 30 kilometre radius, Figure 3.

42. It is important to note that application of the above methodology to a nuclear installation, is neither risk informed nor risk based.

43. The Hansard (1988) cumulative weighted population limits for Magnox and AGR reactor sites have correspondence with the remote and semi-urban site reference densities respectively, in Table 4 . The attenuation rate, given by an inverse power law with exponent 1.5 describes the variation of population weighting factors (w) with radial distance (r) from the site, Openshaw (1986: p208):

$$w = r^{-1.5}$$

41. Figure 4 illustrates the influence of the population weighting factors as a function of increasing radius from the site, on the percentage contribution of successive one kilometre distance bands to the cumulative weighted population limit.

42. Consistent with previous Advisory Committee on Safety of Nuclear Installations (ACSNI) publications, the Hansard (1988) cumulative weighted population limits for both Magnox and AGR assume a generic exclusion zone of 1 km or $\frac{2}{3}$ mile (its imperial equivalent), see Figures 5 and 6 extracted from ACSNI(88)P1 and ACSNI(78)P4 respectively. Consequently as shown in Figure 4, weighting factors only have a marked influence on cumulative population limits at distances greater than two kilometres from the site.

43. The semi-urban population density limits in Table 4 have been carried forward by DECC as exclusionary criteria in their Strategic Siting Assessment (SSA) for new-build nuclear power plants, (Appendix F).

44. It should be noted that the AGR semi-urban demographic criteria for the siting of nuclear installations now represents the least constraining criteria in the United Kingdom.

6.2 Connah's Quay Public Inquiry (1971)

43. The Connah's Quay B Public Inquiry provided one of the first public airings of Government Siting Policy, (Appendix B). The Inquiry served to provide an example of the rationale behind the requirement for development control post licensing, to preserve site demographic characteristics in the immediate vicinity of a nuclear licensed site consistent with the concept of defence-in-depth.

44. The statement submitted by the Department of Trade and Industry (DTI) in 1971, highlighted the strong interdependence between development control post licensing and emergency preparedness to provide mitigation of radiological consequences in the event of a significant release of radioactive material. Nuclear safeguarding zones were proposed consistent with the 23 March 1970 entry in Hansard (Appendix A) to restrict residential development in an area up to 2 miles from the reactor site over the entire life of the station (Table 1 and Figure 2 of the DTI statement in Appendix B herein refers) and that the long term regional development plan for East Flintshire would need corresponding modification.

45. With regards to development control in the immediate vicinity of a nuclear facility, the interpretation of UK Government siting policy articulated in paragraph 51 of Professor Lichfield's proof of evidence (Appendix B: §B2) is particularly noteworthy.

§51. I accept that this means that near the power station site population growth as proposed in currently operative development plans will not be compatible with the power station: that within a zone up to 2 miles from the power station no further permissions should be given and the development plans would need corresponding modification. This does not mean that growth in East Flintshire, even at a rate above recent trends, is prevented. It is not, it would be guided into areas outside the 2 mile zone.

*Professor Lichfield, Proof of Evidence, March 1971
Connah's Quay Public Inquiry.*

46. The site characteristic (alternative distribution) in Figure 2 of the DTI statement, (Section B1 of Appendix B), provides a graphic illustration of the practical application of the policy to preserve site characteristics (Figure 7 herein refers).

6.3 Sizewell 'B' and Hinkley Point 'C' Public Inquiries

47. As stated at the Sizewell 'B' and Hinkley Point 'C' public inquiries, current nuclear siting policy in the United Kingdom, requires that the

general site demographic characteristics as they exist at the time of licensing, are maintained throughout the entire life cycle of the plant with a built-in allowance for future developments to account for natural growth (excess births over deaths) whilst restricting inward migration, Appendices C and D herein refer.

48. This siting policy is reflected in the guidance and consultation criteria placed on the HSE web site for developments in the safeguarding zones of nuclear installations in the United Kingdom.⁹

49. For residential, industrial, commercial and institutional developments therefore, planning control guidelines are in place with local authorities to ensure that the general site characteristics are preserved. The arrangements put in place for Aldermaston at the time of civil nuclear licensing are described further in Section 7 below.

..... A site is acceptable only if the surrounding population together with any likely future development remains consistent with the siting policy. For this purpose a proposed site is assessed by comparing the expected future population around it with established criteria using a standardising method which lays greater emphasis on population densities close to the site than on those further away.

..... The distribution of population around a site is also an important factor in the assessment. Others are the location of schools and hospitals, local communications, population

⁹ <http://www.hse.gov.uk/landuseplanning/nuclear.htm>

mobility and any other special features which might affect emergency countermeasures which might be necessary should an accident occur. Once a site has been accepted for a nuclear station, arrangements are made to ensure that residential and industrial developments are so controlled that the general site characteristics of the site are preserved, and local authorities consult the Inspectorate with regard to any proposed new development falling outside guidelines which have been laid down. These guidelines were laid down in letters sent by the Department of the Environment in 1961 to local authorities.

*R.D. Anthony, Chief Inspector Nuclear Installations
Sizewell 'B' Public Inquiry, Daily Transcripts Days 56-60*

6.4 Convention on Nuclear Safety¹⁰

50. The United Kingdom's Fifth National Report on compliance with the Convention on Nuclear Safety obligations contains the following:

17.30. In March 1988, the Secretary of State for Energy stated that once a site has been accepted for a nuclear station, arrangements are to be made to ensure that residential and industrial developments are so controlled that the general characteristics of the site are preserved. The planning processes (see above) require that the all relevant issues are addressed and discussed. The process also facilitates inputs

¹⁰ DECC (2010), The United Kingdom's Fifth National Report on Compliance with the Convention on Nuclear Safety Obligations, Department of Energy and Climate Change, September 2010.

from the public and interested groups. HSE must be satisfied that the size, nature and distribution of the population around the site are properly taken into consideration. If planning permission is granted for the site, there will be planning controls to ensure that significant and unacceptable population growth does not occur.

Article 17 - Siting, §17.30

51. Although the above safeguard against unacceptable population growth is directed at nuclear power plants, the Foreword to the United Kingdom's Fifth National Report makes it clear that:

The report only covers land based civil nuclear power plant as defined in Article 2 of the Convention. The safety of other UK nuclear facilities that fall outside the scope of this Convention are also regulated to the same standards, so as to ensure that they are operated in a manner that maintains a high level of safety.

This is consistent with my long understanding of the policy and the consistent practice of HSE on this issue.

7. AWE ALDERMASTON NUCLEAR SAFEGUARDING ZONES

52. At the time of initial civil nuclear licensing of the AWE Aldermaston and Burghfield sites in July 1997 and subsequent relicensing in April 2000 following a changeover in the management from Hunting BRAE to AWE plc, safeguarding zones were prescribed for

both sites. A meeting to discuss land use planning arrangements in the safeguarding zones was held on the 4 February 1999, hosted by HSE's Chemical Hazards and Installations Division (CHID) - Basingstoke Office (Appendix J herein refers).

53. The following organisations were represented at the 4 February 1999 meeting:

- The Nuclear Safety Directorate,
- Basingstoke and Deane Borough Council,
- West Berkshire District Council,
- Hampshire County Council, and
- Wokingham Borough Council.

54. As a result of the 4 February 1999 meeting, HSE's CHID office dispatched a letter dated 18 February 1999, to Basingstoke and Deane Borough Council stating that HSE would wish to be consulted for any relevant applications within 3.0 kilometres of the nuclear licensed site. A subsequent meeting was held on the 12 May 1999 to establish a process for reviewing the potential impact of new developments on the emergency arrangements for the Aldermaston and Burghfield sites. The outcome of the 12 May 1999 meeting was communicated to HSE by AWE in a letter dated 21 May 1999 (Appendix J herein refers).

55. As stated earlier in Section 3.1, a review of the demographics and consultation criteria around the AWE Aldermaston and Burghfield sites was undertaken by HSE in 2006. All local authorities around both sites were advised of revised safeguarding zones in February 2007, (Appendix G herein refers). Consultation criteria for developments

within each of the safeguarding zones given earlier in Section 5.2, were aligned with the guidelines laid down in the June 1961 letter from the Minister of Housing and Local Government (Appendix C: §C.1).

56. At the 12 May 1999 meeting between AWE and Basingstoke and Deane Borough Council, concerns were voiced that there could be a 'drip feed' of small developments which could eventually result in a large increase in population within the safeguarding zone and the associated problems which would ensue, (Appendix J). Issues relating to emergency preparedness and response raised by the 'blue light services' and AWE at that meeting are equally valid now in 2010 as they were in May 1999, perhaps even more so.

8. SITE CHARACTERISTICS AND SITE POPULATION FACTORS

57. The underlying methodology adopted by HSE to determine site characteristics, has been examined previously at both the Sizewell 'B' and Hinkley Point 'C' public inquiries and more recently in a paper presented to the Nuclear Safety Advisory Committee in July 2008. The methodology has also been utilised to characterise and advise on the viability of the nominated sites for new-build reactor plant in England and Wales, in support of the Strategic Siting Assessment undertaken by DECC in 2009.

58. Figures 8 and 9 provide an illustration of the application to the nominated new-build reactor sites juxtaposed to the AGR nuclear power stations at Heysham and Hartlepool respectively. Also shown is the maximum derived SPF for the existing stations, based on the new plant

reference density limits given in Table 4 with the 30 kilometre polar grid centred on the reactor buildings in each case.

59. The semi-urban criteria given in Table 4, were derived originally on the basis that the population around the Heysham and Hartlepool AGR sites represented the benchmark for an acceptable upper bound for Sector and Site limits respectively, and consequently semi-urban population density limits have been retained by DECC, as exclusionary criteria in their Strategic Siting Assessment.

60. The Table given below, shows that substantial margins remain to this day around both the Heysham and Hartlepool sites consistent with Government policy to preserve site characteristics.

SPF _{max} × Reference Density = Maximum Population Density			
	Site Population Factor (SPF _{max})	Maximum Population Density (persons/km ²)	Percentage of Semi-Urban Limit
Heysham (Sector limit)	2.225	3708	74.17
Hartlepool (Site limit)	1.536	640	51.20

8.1 AWE Aldermaston Site Characterisation

61. For application to AWE Aldermaston, the purpose of site characterisation is twofold:

- First, it identifies those areas within the nuclear site boundary which are most limiting in terms of the consequences relating to the potential off-site release of radioactive material into the environment.

- Second, it identifies those geographical locations external to the nuclear site boundary which most influence the SPFs within the nuclear site boundary.

62. Since the nuclear site licence allows AWE Aldermaston to conduct its operations at any location within the site boundary subject to appropriate regulatory control, it is necessary to undertake site characterization for all locations within the AWE nuclear site boundary:

As you are aware Aldermaston is a Nuclear Licensed Site and is therefore able to hold radioactive material anywhere within the nuclear site boundary subject to the relevant regulatory permissions. Hence locations of potential radioactive source areas effectively amounts to the whole of the Licensed site.

*AWE letter 20 July 2010 to Wedlake Bell,
Appendix L herein refers.*

63. For the purpose of site characterization, the AWE Aldermaston site is overlaid with a 100m x 100m cell grid as illustrated in Figure 10, and the methodology described below is applied. Site population factors (SPFs) are determined for each 100m x 100m grid cell lying within or on the AWE site boundary in a manner similar to that described by Openshaw (1986). For immediate reference, Appendix M herein provides the relevant extracts from Openshaw (1986).

- Weighted population distributions are determined using a polar grid, 30 kilometre in radial extent with the origin placed at the centroid of each 100m x 100m grid cell. The polar grid comprises 12 x 30° sectors with radial distance bands set at 1 kilometre intervals as shown in Figure 3.
- Each 100m x 100m grid cell is coded according to the derived value of SPF_{max} for the most limiting 30° Sector (or site if applicable) determined with sector rotation in 5° increments, for all radii up to 30 kilometres from the centroid of the grid cell. For the purpose of illustration, Table 6 lists the derived SPFs for the assessment location depicted in Figure 12, with the maximum SPF highlighted.
- The grid cells coded red in Figure 10, for which SPF_{max} exceeds 3.0, indicates that the semi-urban density criteria have been exceeded. As set out above, It should be noted that the AGR semi-urban demographic criteria represents the least constraining population density criteria in the United Kingdom, and have previously only been applied to concrete pressure vessel Advanced Gas Cooled Reactor nuclear licensed sites in the United Kingdom.

64. Inspection of the results presented in Appendix K, shows that two locations external to the AWE site are highlighted by this analysis for restrictions on residential or institutional development, Heath End and Boundary Hall (Tadley), Figure 11. Both residential locations are in close proximity to the AWE site boundary, where full exposure to the consequences of a potential release of radioactive material following a

significant plant fault is greatest since there is little benefit from the effects of attenuation.

9. AWE ALDERMASTON - POPULATION CHANGE ESTIMATES

65. It is important to note at the outset that estimates for population growth around the AWE Aldermaston site did not feature in HSE's original deliberations to 'advise against' the Boundary Hall planning application BDB/67609 by CALA Homes. HSE's position was informed by demographics analyses originally undertaken in 2006 (which led to revised consultation arrangements in 2007) and subsequently confirmed in 2008. In the following Sections, population estimates for 2010 accommodate the most recent April/May updates to the UK National Population Database made available to HSE by the Health and Safety Laboratory, Buxton.¹¹

66. The AWE site assessment location shown in Figure 12 and depicted in Figures 13 and 14, is purely representative and has been utilised solely for the purpose of undertaking detailed sensitivity studies on permanent and temporary population groupings as an aid to judgement. The results presented and discussed below are based exclusively on night-time resident populations. Table 5 is an extract from the 2010 AWE Aldermaston population dataset for the location shown in Figure 12.

67. It should be noted however, that for a complete analysis there is a requirement to include care home residents, boarding school pupils, hospital patients and other long term institutional residents such as

¹¹ GIS Team, Mathematical Sciences, Health and Safety Laboratory, Buxton. Appendix Z herein refers.

prison inmates and detention centres in the fixed/permanent population category. Furthermore, it is incumbent on the nuclear regulator to include in the temporary population category, an allowance for both short term and long term transient populations when undertaking a comprehensive analysis of demographics in the vicinity of a nuclear facility.¹²

9.1 Population Change Estimates (1991-2010)

68. In Sector 7 of Figure 13, the estimated population change between 1991 (2466 persons) and 2010 (2890 persons) is 17.2 per cent in the (0 - 2) km distance band which contains the Boundary Hall development site. The addition of 268 persons from the proposed Boundary Hall development would significantly increase the population change estimate for this AWE site boundary location from 17.2 per cent to 28.1 per cent.

69. Similarly for Sector 6 of Figure 14, the estimated population change between 1991 (2527 persons) and 2010 (2930 persons) is 15.9 per cent in the (0 - 2) km distance band which contains the Boundary Hall development site. The addition of 268 persons from the proposed Boundary Hall development increases the population change estimate from 15.9 per cent to 26.6 per cent.

70. These figures are very significant because as other witnesses establish the very proximity of the Boundary Hall to the perimeter of the nuclear installation significantly enhances the potential consequences

¹² IAEA (2002), Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants, Safety Guide NS-G-3.2, International Atomic Energy Agency, Vienna.

for human health and emergency response in the event of a release. They certainly do not constitute a preservation of the sites demographic characteristics.

71. The Boundary Hall development of 268 persons would therefore, further compromise the extant Government policy to preserve site (demographic) characteristics around a nuclear facility for the reasons discussed earlier in Section 6.

10 CRITIQUE OF CHAPTER 16 (ENVIRONMENTAL STATEMENT)

71. In Chapter 12 of the Applicant's Environmental Statement there is an attempt to establish inter alia, that if the Hansard population constraints are relevant then they are not breached by the proposed development.

72. This Section provides a critique of Chapter 16 (Application of Guidance on the Control of Developments around Nuclear Installations). The main points are summarised below:

- (a) The assessment is a wholly partial and misleading one. The Boundary Hall development of 286 persons would further compromise the extant Government policy to preserve site (demographic characteristics around a nuclear facility. The overall population change would approach 30 per cent for the Boundary Hall geographical location if the CALA Homes development were to go ahead.
- (b) For residential locations in close proximity to the AWE site

boundary such as that proposed for Boundary Hall, there is little benefit from attenuation and such locations would be subjected to the full impact of an off-site release of radioactive material in the event of a radiation emergency, thus significantly increasing the potential for harm.

- (c) The application of Government policy consistent with the Hansard (1988) model, requires the consideration of cumulative weighted populations distributions when making judgements about population limits, to account for the effects of atmospheric dispersion. Reference densities calculated using non-weighted population distributions are not therefore appropriate for nuclear applications.
- (d) The purpose of site characterisation is twofold and is not restricted to the analysis of new-build reactor sites:
 - It identifies those areas within the nuclear site boundary which are most limiting in terms of the consequences relating to the potential off-site release of radioactive material into the environment.
 - It identifies those geographical locations external to the nuclear site boundary which most influence the SPFs within the nuclear site boundary, as an aid to judgement for development control.
- (e) The semi-urban criteria which represents the least restrictive reference population density applied thus far to a nuclear facility in the United Kingdom, is in fact exceeded by a significant degree for

the AWE Aldermaston site, as confirmed by the results presented in Appendix K. It should also be noted that these results are restricted to a consideration of night-time residents and make no allowance for additional permanent or temporary population contributions.

- (f) Arguments presented in Chapter 16 in relation to the consideration of wind rose data are not of relevance to a nuclear facility where the duration of a release may be prolonged. A nuclear site is characterised by conservative assumptions with regard to meteorological conditions and wind speed. Of particular note is the observation by Openshaw (1986) that:

Public safety should not have to depend on the assumption that at the precise moment when all engineered safety measures fail, the wind direction and meteorology happen to be favourable.

Openshaw (1986: 292.)

- (g) Further, the NuSAC 2008 paper demonstrated to the satisfaction of the NuSAC members that the Hansard (1988) model was readily extendible to non-reactor nuclear facilities (NNFs) when cast in terms of site population factors (SPFs) and they endorsed its application in that form to new-build nuclear plant. Such an application only requires a knowledge of attenuation rate for an airborne off-site release of radioactive material and the population distribution around the site. The approach is neither risk based

nor risk informed, that would require a site specific assessment for the AWE Aldermaston site.

(h) Finally, it is suggested in Chapter 16 that some form of risk based approach to the AWE facility is appropriate to the determination of the Boundary Hall planning application. This assertion cannot be correct for the following reasons:

- (i) There is no policy support for such an approach.
- (ii) There is simply no means of conducting such a risk based assessment without a clear understanding of the specific nuclear operations on the AWE site. It is impossible to place this information in the domain of a public inquiry and the Applicant has been informed of this on a number of occasions by the Ministry of Defence. Further, the sources of potential release are not fixed, and can, and may move around the site consistent with the needs of the nuclear deterrent programme.

11. CONCLUSIONS

The proposal contravenes the well understood and settled policy that seeks to preserve the demographic characteristics of a nuclear site by developing significant new housing right up against the boundary of the AWE establishment.

The main conclusions are summarised below:

- (1) The proposed development would adversely impact upon the

maintenance of a controlled low population zone around the AWE nuclear facility, contrary to the Government policy requirement to preserve site (demographic) characteristics.

- (2) The development would introduce an additional 268 persons in a location around the AWE Aldermaston site, where the extant population already exceeds the least restrictive semi-urban limits applied to nuclear installations.
- (3) Such a situation would increase the overall risk to the public in the event of an off-site release of radioactive material following a significant plant fault by:

Exposing more people to potential harm.

- (4) 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. It is the only effective non-engineered (passive) means of restricting exposure of the local population to radiation in the event of a potential release of radioactive material into the environment following a significant plant fault.
- (5) Such an approach is consistent with the longstanding Government policy adopted in the early days of the nuclear power programme in the United Kingdom to preserve site (demographic) characteristics and that in the event of a nuclear accident:

Very few people would be exposed to extreme risks.

- (6) Two locations are highlighted by site characterisation for restrictions on residential or institutional development, they are Heath End and Boundary Hall (Tadley). Both residential locations are in close proximity to the AWE site boundary, where full exposure to the consequences of a potential release of radioactive material following a significant plant fault is greatest since there is little benefit from the effects of attenuation.

A handwritten signature in black ink, appearing to read 'J Highton', with a stylized, cursive script.

Dr John Highton, Principal Inspector Nuclear Installations

14 September 2010