Bradwell Site

Strategic Environmental Assessment Site Specific Baseline

September 2014

FOREWORD

This document has been prepared to support the NDA's Strategic Environmental Assessment of its decommissioning strategy for the 10 Magnox Sites. This document contains baseline environmental information and other relevant environmental data.

STRATEGIC ENVIRONMENTAL ASSESSMENT
Site Specific Baseline – September 2014

Bradwell Site
Bradwell-on-Sea
Southminster
Essex
CM0 7HP

Bradwell Site

Bradwell Site (hereafter referred to as the site) is a twin reactor Magnox station undergoing decommissioning, and is located close to the village of Bradwell-on-Sea in the Maldon District of Essex, South East England. It is situated on the south bank of the Blackwater Estuary, from which cooling water was abstracted during its operational phase, on the northern coast of the Dengie Peninsula. The site covers an area of approximately 30 hectares[1]. The following describes the key dates for the site:

- Construction of the site commenced in 1957, and electricity was first supplied to the grid in 1962.[1]
- The site ceased electricity generation in 2002 after 40 years of operation.[1]
- Defuelling of the reactors was completed in 2005.[2]
- The Care and Maintenance Preparations (C&MP) phase of the decommissioning process is scheduled to be completed in 2015, at which point the Site will enter the Care and Maintenance (C&M) phase.[2]
- Final Site Clearance (FSC) is scheduled to commence at the end of the C&M phase. All remaining structures on the site are estimated to be cleared by until 2092.[2]
- The Magnox Optimised Decommissioning Plan (MODP) was implemented in 2010, and Bradwell was identified as one of the two 'accelerated sites', for which several key decommissioning projects have been accelerated. Decommissioning of the Site had previously been deferred, so the accelerated dates are similar to the original projections for completion of key decommissioning milestones.[3]

[1] *Magnox Ltd (2014) Bradwell. Available at http://www.magnoxsites.co.uk/site/bradwell/*
[2] *Nuclear Decommissioning Authority (NDA) Business Plan, 2012-2015*
[3] *Magnox Ltd (2011) Bradwell Site Integrated Waste Strategy (IWS)*

Site End State Assumption

The planned end state for Bradwell Site is defined in the NDA Strategy Document 2011. This states: *'Radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land. Where the next planned use no longer requires a nuclear site licence, radioactive contamination will be reduced to meet the criteria for delicensing, with any remaining radioactive substances being subject to the relevant environmental permitting regime. The physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.'*

Current Environmental Baseline

Table 1: Baseline Data for all SEA Objectives for Bradwell Site

SEA Objective	Environmental Baseline Data	References
Air Quality & Dust	*Radioactive Discharges* • Radioactive discharges to air have reduced since the cessation of power generation. The reactor cores at Bradwell are enclosed within Steel Pressure Vessels (SPVs), which are in turn contained within concrete structures ('bioshields') designed to protect site personnel from radiation originating from within the cores. During operations, emissions to air resulted from ventilation of the bioshield voids, which released gaseous activation products when the reactors were under load. • Periodic venting of reactor coolant gas was carried out during the operational phase. This has ceased since the end of power generation. • Nuclear operations including waste retrieval which are being undertaken as part of the decommissioning works result in minor but regular aerial emissions of radioactivity in compliance with the Site's Environmental Permit. *Conventional Discharges* • Vehicles and diesel generators are used on the Site, which are sources of air contaminants including NO_x (oxides of nitrogen), SO_x (oxides of sulphur), PM_{10} and $PM_{2.5}$ (particulate with a diameter <10µm and < 2.5µm). These sources run only intermittently, and due to the rural nature of the Site, average levels of these pollutants are likely to be low. • Emission from these sources is likely to remain steady throughout the C&MP phase. • Dust is currently, and will in the future be generated from construction, demolition and excavation (CD&E) activities undertaken on the Site as part of C&MP. Appropriate mitigation measures are employed to manage dust from CD&E activities as required by planning constraints. • The location of the site is not currently designated an Air Quality Management Area (AQMA).[1]	*1. DEFRA (2014) Air Quality, http://aqma.defra.gov.uk/aqma/list.php*

Global Climate Change and Energy	• Throughout its lifetime the site has drawn power from the National Grid to satisfy domestic power needs but heavy plant items such as the gas circulators and cooling water pumps were driven by power derived directly from the station's output during generation. Now the site is decommissioning, all site supplies are powered from the grid. • Emergency backup power at the site is provided by portable diesel generators. These machines are not in constant use, but are regularly run for testing purposes. • A number of vehicles (including vans, forklift trucks, tractors) based on site and are either used within the site's footprint, or move from the Site to further afield (e.g. vehicles used in carrying out the District Survey), and have associated carbon emissions. Indirect carbon emissions originate from the use of hire vehicles by site personnel when travelling on company business in addition. • Magnox Ltd. has registered under the Carbon Reduction Commitment (CRC) and also has a company-wide energy efficiency policy. Both of these schemes are currently being implemented on a site by site basis, with the aim of minimising greenhouse gas emissions across the company. *Climate Change and Flooding* • The site is located in flood zone 1 according to the environment agency flood maps which means that there is less than a 0.1 percent (1 in 1000) chance of flooding occurring. • As with all of the coastal Magnox Sites, an ongoing issue for Bradwell during the C&M phase is the vulnerability of the site to flooding due to raised sea level and more frequent storm surges brought about by the anticipated effects of climate change in the coming decades. The site is situated on low-lying land at sea level on the coast of the Blackwater Estuary which is tidal at that location and historic instances of storm surge flooding (e.g. North Sea Flood 1953) means that the site is potentially vulnerable. • The C&M phase at the site, during which the reactors will be in Safestore, is scheduled to last until 2083[3] by which approximate time (2090-99) the Intergovernmental Panel on Climate Change has projected that the worst case scenario (emission scenario A1FI) of sea level rise is in the range 0.26 – 0.59m (relative to 1980-99 levels).[4] The site is situated at an elevation of 5.5m above Ordnance Datum, and currently has a 4.8 – 5m high sea wall and gully to provide protection from high sea levels and surges.[5] • Any further measures necessary to prevent flooding of the site during the C&M period, such as improvements to the flood defences will be identified through the periodic safety review. Furthermore, the rise in sea level during the C&M period will be gradual, allowing the advance planning of any necessary mitigation measures.	*1. DEFRA (2010) Nitrate Vulnerable Zones in England* *2. Magnox Ltd. (2011) Bradwell Site IWS* *3. Nuclear Decommissioning Authority (NDA) Business Plan, 2012-2015* *4. IPCC (2007) Projections of Future Change in Climate, http://www.ipcc.ch/publications_and_data/ar4/wg1/en/spmsspm-projections-of.html* *5. Gorman W. (2008) Bradwell Re-baseline (Post Defuelling) Safety Case – External Hazards Assessment, BRAD/DEC/REP/058*

Biodiversity, Flora and Fauna	• The site is situated in a predominantly rural setting, and has 9 statutorily designated areas in close proximity.[1] • These designations recognise the importance of the area for its estuarine habitats in general, for specified plant communities and habitat features, and for a wide range of species dependent on these. The 9 statutory designated sites in proximity to the site are: ○ Blackwater Estuary Site of Special Scientific Interest (SSSI) ○ Blackwater Estuary National Nature Reserve (NNR) ○ Dengie Flats SSSI ○ Dengie Flats NNR ○ Colne Estuary SSSI ○ Colne Estuary NNR ○ Mid-Essex Coast Ramsar ○ Mid-Essex Coast Special Protection Area (SPA) ○ Essex Estuaries Special Area of Conservation (SAC) [1]. • These designations recognise the importance of the local estuarine habitats in general, whilst the SPA and Ramsar designations relate to the various wintering and breeding birds found locally specifically. Due to these designations the coastline adjacent to the Site is also classified as the Essex Estuaries European Marine Site. [3] [4] The site Biodiversity Action Plan considers how the Site manages its impacts on local ecosystems. This document is reviewed and updated on an annual basis. • The Environment Agency (EA) concluded that exposure to ionising radiation from authorised discharges of radioactivity from the UK's nuclear installations did not significantly impact wildlife in England and Wales.[2]	*1. Bradwell Site Environmental Impact Assessment Baseline (EIAB) Report* *2. Environment Agency (2002) Impact Assessment of Ionising Radiation on Wildlife* *3. Natural England (2011) England's European Marine Sites, available at http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx*
Landscape and Visual	• Bradwell is located on the north coast of the Dengie Peninsula, on the Blackwater Estuary.[1] • A large proportion of the land adjoining the estuary lies below 5 m above ordnance datum (mAOD).[2] • The area in which the site is situated is characterised by openness and expansive views, and apart from the site itself the area lacks any large industrial buildings.[2]	*1. Ordnance Survey (2011) 1:25,000 Sheet 175, Southend-on-Sea and Basildon* *2. Bradwell Site Environmental Impact Assessment*

[4] *Where an SPA or SAC is continuously or intermittently covered by tidal waters or includes any part of the sea adjacent to the UK, the site is referred to as a European Marine Site.*

	• Tree cover within this landscape is sporadic, and in close proximity to the Site is concentrated in hedgerows, copses and individual trees. This vegetation cover alleviates some of the Site's visual impact, especially in summer.[2] • The site is highly visible from the estuary especially at medium-long distances.[2] • There are no international or national landscape designations in the locality of the site. A special landscape area is designated locally by Essex County and Maldon District Council.[2]	*Baseline (EIAB) Report*
Archaeology & Cultural Heritage	• There are 9 Scheduled Ancient Monuments with 5km of the site, with the nearest being Pewet Island Saxon Fish Traps and the Othona Roman Fort. • There are 2 Grade I, 7 Grade II* and 149 Grade II Listed Buildings within 5 km of the site. • There are no entries in the draft Register of Landscapes, Parks and Gardens of Special Historic Interest, as listed by Natural England, near to the site. • Nearby sites of archaeological interest include Neolithic settlements and WWII coastal defences (Pill boxes). • The site is built at the periphery of a WWII era airfield (which is part of the NDA landholding), but there are no known archaeological features of importance within the site's boundary.	*Bradwell Site Environmental Impact Assessment Baseline (EIAB) Report*
Groundwater Geology and Soils	• Reworked clays, silts and sands comprise made ground that immediately underlie the site. The superficial (drift) deposits near the site are a thin layer of Marine / Estuarine Alluvium, consisting of clay and peats with sand lenses, underlain by sands and gravel. • The bedrock at the site consists of a thick layer of the tertiary age London Clay, a stiff fissured clay of marine origin. This is underlain at depth by the cretaceous chalk basement rock. • The sand and gravel deposit is considered a minor aquifer, with the alluvium classified as a non-aquifer. This results in a patchy shallow water table, with localised perched groundwater in the sand lenses in the alluvium and in the sand / gravel layer. • The London Clay is considered a non-aquifer, but the underlying chalk at depth comprises a major aquifer of regional importance. • An abstraction is made 3km from the Site at Eastlands Farm for general agricultural purposes (given the depth to and protection extended to the major aquifer, this is assumed to be a shallow borehole). • The soil in the area surrounding the Site is classified as free draining acid soils and peats, and is classified primarily as a Grade 3 agricultural quality soil, with localised areas of grade 1 and 2 soils in the site's locality.	*1. Bradwell Site Environmental Impact Assessment Baseline (EIAB) Report*

	Land Quality • There is radioactive and non-radioactive contamination at the site, resulting primarily from historic (during the generation phase and from the site's previous usage) events. • The radioactively contaminated soil is primarily associated with leaks from the Old Active Effluent Discharge Line, so is primarily localised around the path of the former pipeline, and is labelled as the 'North End' contamination. Part of this area has been partially remediated by excavation, with the contaminated spoil backfilled into the voids with liners in place (with access restrictions and physical barriers to the area in place). • Works are currently underway to implement a permanent remediation scheme for the North End contamination, which will isolate the volume of contaminated soil with engineered barriers for the duration of the C&M phase. • There are areas containing lesser levels of contamination outwith the excavated area for which monitoring is on-going. Some further radioactive contamination is also present within the decontamination bay sump and other localised areas within the Reactor Controlled Area. • The chemically contaminated soil is associated with leaks and spills of hydrocarbons. Kerosene contamination has been identified to the north of Reactor 1 (reflecting the Site's former use as an airfield), whilst other minor sources of hydrocarbon contamination are present in the conventional areas where significant quantities of hydrocarbons were stored and used, including the turbine hall. No active remediation has been applied to this contamination as of yet. An unauthorised asbestos burial tip is suspected in the northern portion of the site. • Remedial works are in the process of being undertaken on the site, and so far have resulted in the removal of approximately 100m^3 of contaminated spoil in the area surrounding the old active effluent discharge line. • Monitoring and investigation of these land quality issues continues to be actively undertaken as part of the MODP programme at the site. • The site shall continue to manage land quality through the production and maintenance of a land quality file, land quality characterisation plan and land quality strategy.	
Surface Water Resources and Quality	• The nearest watercourse to the site is the Blackwater Estuary. • The 'Borrow Dyke' is a continuous, shallow, intermittently wetted ditch that was excavated to provide material for the building of the sea defence bund. As this channel is situated immediately adjacent to the bund it is runs east-west just to the north of the site	*1. Ordnance Survey (2011) 1:25,000 Sheet 175, Southend-on-Sea and Basildon* *2. Environment*

	boundary fence. Water is normally only present within this channel ephemerally and in localised areas (although it can form continuous bodies of water), and does not flow into the Blackwater Estuary. No other watercourses flow into the estuary close to the site [1]. • The ecological and chemical status of the Blackwater Estuary is considered moderate in the vicinity of the site, and good downstream, under the Water Framework Directive [2]. • The tidal range in the Blackwater adjacent to the site is from 5.2m above chart datum (2.52 above AOD) at mean high water spring tide to 0.4m above chart datum (2.28 below OD) at mean low water spring tide.[3] The area of the site containing the main structures is in the EA fluvial/tidal Flood Zone 1 (so would be affected by floods less frequent than 1 in 1000 years).[3] • The site has a licence to abstract water from the Blackwater Estuary which is used to dilute and flush any discharges from the east siphon recovery chamber. The abstraction limit for the site is 94,26 m3/hour.[3] • Aqueous effluent discharges (and cooling water discharges during the operational phase) have always been made to the Blackwater Estuary. Discharges are still undertaken via the cooling water infrastructure as was the case during the operational period, although cooling water discharges have long since ceased. A new replacement discharge line is being proposed (located within the existing east outlet culvert) to ensure the continued effective dispersion of discharges during the decommissioning phases. • The dissolution of Magnox Fuel Element Debris (FED) which has been recently commissioned will necessitate the discharge of the resulting effluent to the Blackwater Estuary. The radioactivity and heavy metals in the discharge from this process will be significantly reduced, and assessment of the nitrates in the effluent has led to the conclusion that there will be no unacceptable impacts to the estuary. The site has been granted a bespoke temporary permit for the discharge of FED liquors by the Environment Agency. • A variation for Article 37 was submitted in November 2011 and an EC Opinion received in June 2012. The permit was evaluated and granted by the Environment Agency in September 2012 and became effective from October 2012.	*Agency (2002) Water for Life and Livelihoods – River Basin Management Plan Anglian River Basin District* *3. Bradwell Site Environmental Impact Assessment Baseline (EIAB) Report*
Waste	• Both operational and decommissioning activities at nuclear sites generate radioactive and conventional waste. • Low Level Waste (LLW) is generated at the site from a range of routine operational and decommissioning activities, and comprises a range of different materials. • The baseline for LLW is to package the waste and send it to the Low Level Waste Repository (LLWR) near Drigg in Cumbria for disposal,[1] other treatment options are utilised where possible, these include metal melt and incineration.	*1. Magnox Ltd (2011) Bradwell IWS* *2. DECC (2011) Implementing Geological Disposal Annual Report April 2010 – March 2011*

	• Opportunities to characterise or decontaminate to Very Low Level Waste (VLLW, for controlled burial) or exempt (for permitted landfill), size reduce, incinerate or metal melt, in order to reduce LLWR consignments, are actively sought [1]. • Intermediate Level Waste (ILW) is generated from both operational and decommissioning activities. The majority of this waste will be retrieved from storage locations, such as the active waste vaults during C&MP when an ILW store becomes available on site. The exception to this are some Miscellaneous Activated Components (MAC) stored in vaults in the concrete bioshield which will be retrieved during FSC.[1] *Site Waste Strategy Baseline* • The use of self-shielding Ductile Cast Iron Containers (DCICs) for interim storage and eventual final disposal of solid and wet (which is dried within the container) ILW has been developed by Magnox Ltd., and is planned to be implemented at the site. This is supported by generic and site-specific options studies, but will also be subject to regulatory approval. • The waste packages will be emplaced in the site ILW store for interim storage pending eventual phased transfer to the UK national Geological Disposal Facility (GDF) circa 2040 (but possibly as early as 2029).[2]	
Traffic and Transport	• The main vehicular access to the site is described as follows: '*from the national highway network is by way of the A12 London – Ipswich trunk road and the A414 to the west of Maldon. The most appropriate route for HGVs is via the B1018 to Latchingdon, followed by the unclassified C111 through the settlements of Mayland and Steeple, and then the B1021 to Bradwell site avoiding Bradwell-on-Sea village'.* [1] • The nearest railhead to the site is on the Crouch Valley Line that runs to Southminster. This fully operational line runs regular passenger services. The nearest passenger rail station is Southminster. • The Average Annual Daily Traffic (AADT) stated in the 2002 baseline for the site was in the range 900-13750 vehicles on the main route to the site, of which between 50 and 700 of these vehicles were Heavy Goods Vehicles.[2]	*1. Bradwell Site Environmental Impact Assessment Baseline (EIAB) Report* *2. BNFL plc (2002) Bradwell Nuclear Station Environmental Statement*
Land Use and Material Assets	• The site occupies an area of 20 hectares,[1] and consists of two reactor buildings, an ILW vaults complex, the turbine hall basement void, the Interim Storage Facility (under construction) various ancillary and support buildings, access roads, grassy areas and areas of hard standing. • The surrounding area is rural in nature and is used primarily for agricultural and recreational purposes.	*1. Magnox South (2012) Bradwell Site – Land Required for Operational Purposes* *2. Magnox Ltd. (2011) Bradwell Site IWS*

	• Notable uses in proximity to the site include a coastal footpath that runs immediately adjacent to the site. • The site incorporates a significant quantity of material that is potentially eligible for direct reuse or recycling: • This includes a substantial quantity of recyclable metal in the boilers, the gas ducts, the SPVs, and as rebar incorporated into large concrete structures such as the bioshield.[2] • A proportion of this recyclable metal will be made available for recycling during the C&MP phase, such as the turbine hall deplanting, boiler house de-plant and other general building dismantling. • The boilers, the primary circuit, the bioshield and the SPVs will be dismantled at FSC, so the majority of the recyclable metal on site will be produced at this time. A proportion of this material will be classified as ILW (activated reactor components in particular) so will likely not be suitable for recycling (and will likely be packaged and consigned to the GDF), but the remainder will be LLW or exempt, and as such may be eligible for recycling and reuse within or outwith the nuclear industry.[2] • A large volume of inert concrete and masonry rubble will be produced through demolition activities during C&MP and FSC, and will likely be reused on- or off-site as infill material, or similar.[2]	

Noise and Vibration	• Noise and vibration originate from a number of sources at the site.
	• The Baseline Noise Survey Data (LAeq, dB(A) (Daytime)) as measured from the site directly in 2003 is as follows:
	  ○ Downhall Beach Estate – 51.4
	  ○ Down Hall / Trusses Road – 55.6
	  ○ Coastal Footpath – 53.2
	  ○ Bradwell Waterside – 53.4.[1]
	• The criteria for the significance of noise are the proximity of noise sources to the receptors, and the presence of any screening / nature of the ground between the source and the receptor.
	• Since the cessation of generation the profile of noise and vibration from the site has changed, but remains significant due to the nature of decommissioning works.
		1. Bradwell Site Environmental Impact Assessment Baseline (EIAB) Report

Table 2: Environmental Discharge Data for Baseline Years 2012/13 for Bradwell Site

In addition to the baseline information, which describes the permanent, semi-permanent and inherent features and impacts of Bradwell Site and its surrounding area, the following table outlines discharge data for the site for the site in 2012/13[5], and how these quantities will likely change in future. This is intended to provide a quantitative 'snapshot' of the features of the site and impact that it has (and is anticipated to have in future), in order to supplement the baseline information.

SEA Objective	Environmental Discharge Data	Future Changes in Environmental Discharges	References
Air Quality & Dust	• Total Alpha discharged to air in 2012 and 2013 was below the reporting threshold. • Total Beta and Gamma (excluding Tritium) to air in 2012 was 4.21E-04 TBq and 4.63E-07 TBq in 2013. • Total Tritium to air in 2012 was 2.63E-02 TBq and 9.51E-03 TBq in 2013.[1] The *total dose* from all pathways and sources of radiation was less than 0.005 mSv in 2012 which was less than 0.5 per cent of the dose limit for members of the public of 1 mSv, and a decrease from 0.048 mSv in 2011. The lower value in 2012 was due to a decrease in the estimate of direct radiation from the site.[2]	• As decommissioning progresses through the C&MP phase the trend will be for discharges to remain steady or continue to decrease. • Certain decommissioning activities such as the as the retrieval, treatment and passivation of wastes may result in short term spikes in aerial discharges of radioactivity. • Civil works during C&MP such as the construction of the ILW store will generate dust. • Once the major hazard reduction projects have been completed and the site enters the extended, quiescent C&M phase, aerial discharges of radioactivity will be extremely low. • The degassing of desiccant material in storage, bioshield concrete and core graphite may result in very minor discharges of tritium. • Dust from demolition and traffic movement may affect the local area during all 3 decommissioning phases. Civil works will be a source of dust. • FSC will result in a temporary increase in aerial discharges of	*1. Magnox 2012 and 2013 Nuclear Industry Sector Plan (NISP) Submissions* *2. CEFAS (Centre for Environment, Fisheries and Aquaculture Science) (2012) Radioactivity in Food and the Environment 18*

[5] *Data from 2012 and 2013 are presented to provide an indication of variances*

		radioactivity. This is because the radioactive reactor cores and associated equipment and infrastructure will be dismantled at this point. Detailed estimates for the discharges from this process have not been made, but will likely comprise particulate as major remaining structures are demolished. • Retrieval of waste packages from the site for transfer to the GDF when it becomes available during the C&M phase will result in traffic movements to the site. This retrieval will likely be phased over an extended period of time, so the impact from this is likely to be limited.	
Global Climate Change and Energy	• In 2012, 4495 MWh of energy was used at the site, increasing to 5581 MWh in 2013. • Direct CO_2 and other greenhouse gas emissions generated in 2012 were 2.6E-04 megatonnes, and 1.60E-04 megatonnes in 2013. • Indirect CO_2 and other greenhouse gas emissions generated (including energy consumption and site diesel usage) was 2.9E-03 in 2012 and 3.0E-03 in 2013.[1]	• The Site will draw power from the grid and operate plant and vehicles for decommissioning works such as ILW processing and for general domestic needs until the completion of C&MP. • During C&M the Site's power usage will be very low, but periodic inspections and maintenance will result in very small spikes in energy usage. • The retrieval of waste packages from the site ILW store during C&M will result in intermittent vehicle movements to and from the Site. Energy use and the operation of numerous vehicles will resume on a significant scale during FSC. • However, the types of the vehicles in use and the nature of energy mix in use in the UK at these dates cannot be predicted, thus the associated CO_2 emissions relative to the present are unknown.	*1. Magnox 2012 and 2013 Nuclear Industry Sector Plan (NISP) Submissions*

Surface Water Resources and Quality	• Total Alpha liquid discharges were 3.34E-05 TBq in 2012 decreasing to 2.21E-05 TBq in 2013. • Total Beta Gamma (excluding Tritium) liquid discharges were 7.75E-03 TBq in 2012 and 1.85E-02 TBq in 2013. • Total Tritium liquid discharges were 1.45E-02 TBq in 2012 and 8.30E-03 TBq in 2013.[1] Liquid wastes are discharged into the River Blackwater estuary. Low concentrations of artificial radionuclides were detected in aquatic materials as a result of discharges from the station, discharges from Sellafield and weapons testing. Due to the low concentrations detected, it is generally difficult to attribute the results to a particular source; however concentrations were generally similar to those for 2011.There is an overall decline in caesium-137 concentrations in sediments. The technetium-99 detected in seaweeds at Bradwell was likely to be due to the long distance transfer of Sellafield derived activity. Gamma dose rates on beaches were difficult to distinguish from natural background.	• Discharges of aqueous radioactivity decreased significantly upon the cessation of power generation and the dispatch of all the spent fuel to Sellafield. • As decommissioning progresses through the C&MP phase the trend will be for discharges to continue to decrease. • Certain decommissioning activities such as the retrieval, treatment and passivation of wastes may result in short term spikes in aqueous discharges of radioactivity. • Once the major hazard reduction projects have been completed and the Site enters the extended, quiescent C&M phase, aqueous discharges of radioactivity will be very low, but not zero [3]. • FSC will result in temporary discharges of aqueous radioactivity, primarily from waste treatment as the radioactive reactor cores and associated equipment / infrastructure are dismantled. Detailed estimates for the discharges during this have not been made.	*1. Magnox 2012 and 2013 Nuclear Industry Sector Plan (NISP) Submissions* *2. CEFAS (Centre for Environment, Fisheries and Aquaculture Science) (2012) Radioactivity in Food and the Environment 18*
Waste	• The following waste metrics are for 2012 and 2013: • In 2012, the site produced 345.3m^3 of LLW from decommissioning activities which was reused, recycled or disposed of.[1] From this total, 181.7m^3 of LLW metal was recycled, 144.1m^3 of this LLW was treated and 19.5m^3 of all LLW was disposed to LLWR.[1]	• As decommissioning progresses through the C&MP phase the trends for waste generation will likely remain at current levels or increase. When the site enters C&M in 2015 these levels will fall significantly.	*1. Magnox 2012 and 2013 Nuclear Industry Sector Plan (NISP) Submissions*

	• In 2013, the site produced 885 m^3 of LLW from decommissioning activities, from this 173 m^3 of metal was recycled, 569 m^3 was treated and 143 m^3 was disposed of (84 m^3 to landfill as out of scope and 59 m^3 to LLWR). • In 2012 2353.1 tonnes of inert waste was produced by the site from decommissioning activities. 100% of this total was recycled.[1] • 6400.5 tonnes of non-hazardous waste was produced from decommissioning activities in 2012. 97% of this total was recycled.[1] • In 2013 3186.8 tonnes of inert waste was produced by the site from decommissioning activities. 100% of this total was recycled.[1] • 4607.8 tonnes of non-hazardous waste was produced from decommissioning activities in 2013. 100% of this total was recycled.[1]		

The following table illustrates further parameters that are significant for the site.

Table 3: Additional Data for baseline Years 2012 and 2013 and predicted changes for Bradwell Site

SEA Objective	Additional Data	Changes in Additional Parameters	References
Surface Water Resources and Quality	• In 2012 the site used 15690 m^3 of mains water, and 27815 m^3 in 2013.[1]	• Water consumption at the Site is likely to continue for the duration of the C&MP period at a similar level.	*1. Magnox 2012 and 2013 Nuclear Industry Sector Plan (NISP) Submissions*
Economy, Society and Skills	• The site is located in a rural area of the Maldon District in the county of Essex.[1] • The major settlements within 10km of the site are Bradwell-on-Sea to the northwest, Tillingham to the south and Southminster and Burnham-on-Crouch to the southwest, and a number of other small villages and settlements in addition.[1] • The population of Maldon District was 62200 during 2013.[2] • Maldon District had a working population of 33400 during 2013.[2] • The dominant working sectors in Maldon District during 2013 were Services (15000, 76.9 %) and Public Administration, Education and Health (4900, 25.2 %). • Employment in the Electricity, Gas and Water Supply industry in Maldon District was not listed, but the effect of employment at the site is likely to be low against the total	• The number of personnel employed on site will decrease significantly after the completion of C&MP. • Personnel numbers at the Site will increase again for the duration of FSC.	*1. Ordnance Survey (2011) 1:25,000 Sheet 175, Southend-on-Sea and Basildon* *2. Office for National Statistics (2014) Official Labour Market Statistics, available at http://www.nomisweb.co.uk/* *3. EU (2011) Cohesion Policy 2007 – 13, available at http://ec.europa.eu/regional_policy/atlas2007/index_en.htm*

	working population of this district. • In 2013, 9400 (23.4%) of the population were employed to NVQ4 level or above. • Maldon District is not subject to Convergence Funding from the European Union, or other external assistance.[3]		
Traffic and Transport	• The AADT from all traffic movements on the A414 (a route connecting the site to the A12 from the north, via Maldon) from recent measurements was 14999, of which 733 were Heavy Goods Vehicles (HGV) movements. • On the A132 (a separate possible route to Bradwell to the south, via South Woodham Ferrers) the AADT from all traffic movements was 26604, of which 853 were HGV movements.[1] • These were the most local count points that were available. • The proportion of these total movements that are directly attributable to the site is very low, and will continue to be so even during periods of increased work at the site.	• It is anticipated that general traffic and HGV movements will remain steady or increase during the remainder of the C&MP phase at the Site. • Higher numbers of personnel will be on site due to the requirements of MODP, meaning that the daily commuting movements will likely be maintained. • Movement of materials for potential future major construction or other projects e.g. delivery of DCICs to site, construction of the site ILW store will generate extra traffic movements, as will movement of demolition waste and other inert material for reuse or conventional disposal. • A similar increase in traffic flows on local roads can be expected for the duration of the FSC phase.	*1. Department for Transport (2014) AADF Home, available at: http://www.dft.gov.uk/matrix/search.aspx*

Figure 1: Statutorily Designated Areas in the Vicinity of Bradwell Site