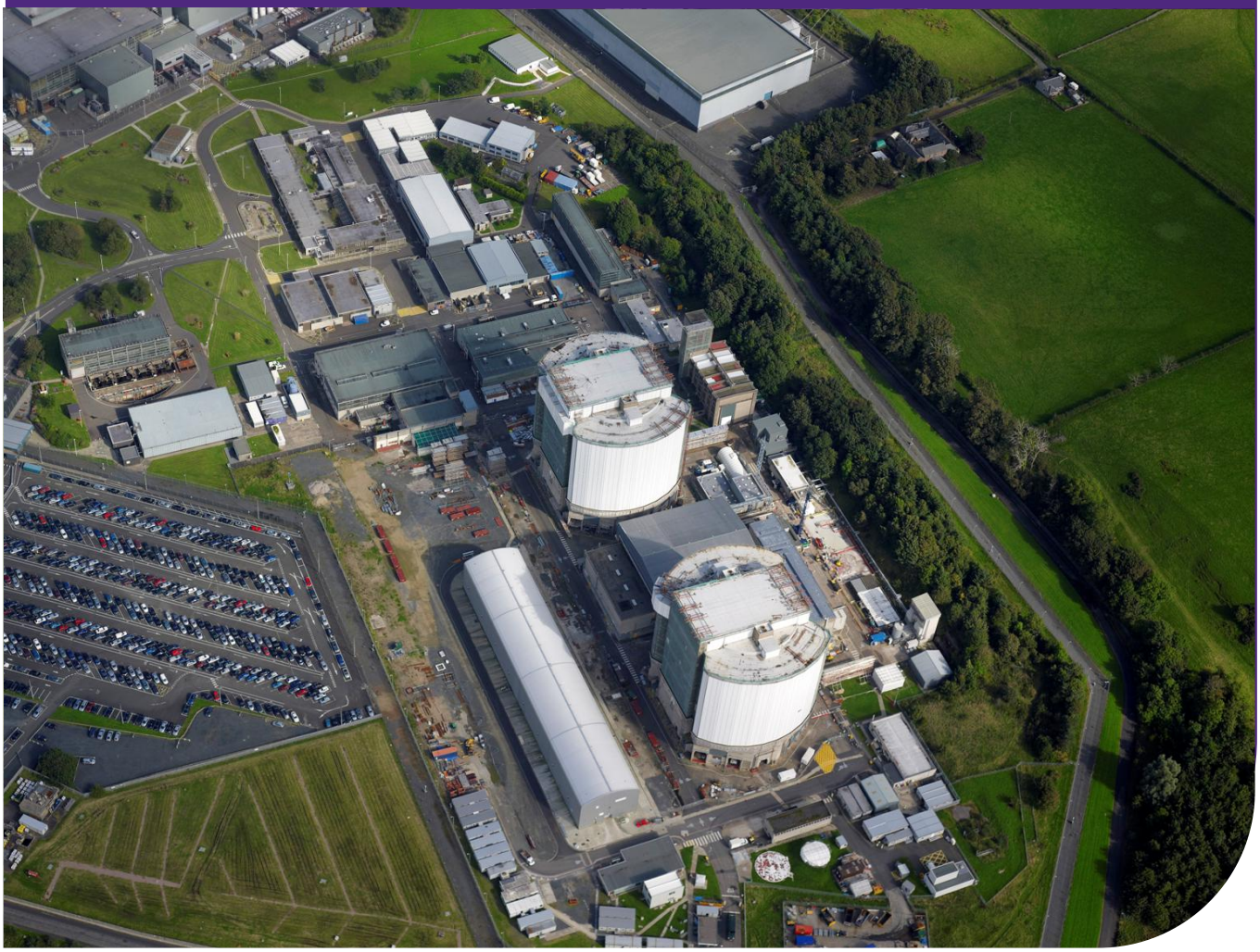
Magnox

Strategic Environmental Assessment
Site Specific Baseline

Hunterston A Site



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

Hunterston A Site
West Kilbride
Ayrshire
KA23 9RA

Hunterston A Site

Hunterston A Site is a twin Magnox station undergoing decommissioning, and is located in North Ayrshire, western Scotland. It is situated on a promontory on the coast of the Firth of Clyde, from which it drew cooling water supplies during its operational phase. EDF's Hunterston B power station is situated immediately to the north. The site covers an area of 65 hectares [1]. The following describes the key dates for Hunterston A Site:

- Construction of Hunterston A Site commenced in 1957, and electricity was first supplied to the grid in 1964 [1].
- The site ceased electricity generation in 1990 after 26 years of operation [1].
- Defuelling of the reactors was completed by 1995 [1].
- The Care and Maintenance Preparations (C&MP) phase of the decommissioning process is scheduled to be completed in 2022 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 will be cleared by 2082 [2].

1. Magnox Ltd (2011) Hunterston A – Facts and Figures. Available at http://www.magnoxsites.co.uk/our-sites/hunterston-a/facts-and-figures
2. Magnox Ltd. (2011) Hunterston A Site MODP Business Case

Site End State Assumption

The planned end state for Hunterston A 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 Environment Baseline

Table 1: Baseline Data for all SEA Objectives for Hunterston A Site

SEA Objective	Environmental Baseline Data	References
Air Quality	<u>Radioactive Discharges</u> • Aerial discharges of radioactivity have reduced since the cessation of generation. The reactor cores at Hunterston A 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 discharges of aerial activity 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 generation. • Nuclear operations including waste retrieval which are being undertaken as part of the decommissioning works result in minor but regular aerial discharges of radioactivity. <u>Conventional Discharges</u> • Vehicles and diesel generators are employed on Hunterston A Site, which are sources of air quality contaminants including NO_x (oxides of nitrogen), SO_x (oxides of sulphur), O_3 (ozone) and PM_{10} (particulate with a diameter <10µm). These sources run only intermittently, and due to the rural nature of the site average levels of these pollutants are likely to be low. • Discharges from these sources will likely remain steady throughout the C&MP phase. • Dust is currently, and will in future, be generated from construction and demolition activities undertaken on the site as part of C&MP. Mitigation of this dust is undertaken in all instances.	
Global Climate Change and Energy	• Throughout its lifetime Hunterston A Site has drawn power from the National Grid to satisfy domestic power needs (heavy plant items such as the gas circulators and cooling water pumps were driven by power derived directly from the station's output). The use of this energy has resulted in indirect CO_2 emissions, due to the mixed generation used in the UK • At Hunterston A Site auxiliary equipment for the provision of emergency backup power consists of 2 diesel generators. These machines are not in constant use; instead they are there for emergencies, but are regularly run for testing purposes • A number of vehicles are based at Hunterston A Site, which have associated carbon emissions. The District Survey, which uses a number of vehicles, is carried out jointly with Hunterston B Site. 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.	

Biodiversity, Flora and Fauna	• Hunterston A Site is situated in a predominantly rural setting, and has 1 designated area in close proximity.
	• This designated area is:
	  • Portencross Coast Site of Special Scientific Interest (SSSI) [1].
	  • The Kames Bay and Ballochmartin Bay SSSIs on Great Cumbrae are also located in close proximity to the site, but are separated from site by the Fairlie Roads (a deep water channel).
	• The site Biodiversity Action Plan considers how the site manages its impacts on local ecosystems. This document is reviewed and updated on a regular basis.
		1. Magnox Ltd. (2011) Hunterston A Site Environmental Impact Assessment Baseline (EIAB)

Landscape and Visual	• Hunterston A Site is located on the Ayrshire coast opposite the islands of Great and Little Cumbrae [1]. • The area in which Hunterston is situated is characterised by raised beach coast, with craggy escarpments set back from the existing coastline. Agricultural and woodland land uses dominate the surrounding area, whilst both of the Isles of Cumbrae are characterised by grazing and rough moorland. • The Hunterston sites are visible at medium-long distances from multiple locations in the area, including the coastline to the north and south and the Isles of Cumbrae and Bute.	1. Ordnance Survey (2011) 1:25,000 Sheet 341, Greenock, Millport and Largs 2. Magnox North (2009) Hunterston A Site EIAB
Cultural Heritage	• There is 2 Scheduled Ancient Monuments in close proximity to Hunterston A Site; Hunterston House and Portencross Castle. • There are 2 Listed Buildings near to the site; Hunterston House and Portencross Castle. • There are 2 entries in the draft Register of Landscapes, Parks and Gardens of Special Historic Interest; Hunterston House and Portencross Castle, as listed by Scottish Natural Heritage, near to Hunterston A Site.	1. Magnox North (2009) Hunterston A Site EIAB
Groundwater, Geology and Soils	• Made ground, consisting primarily of reworked Till and gravels, underlies much of the site itself, and in particular the Foreshore Reclaimed Area (FRA), which was formed from excavated material produced during the station's construction. The natural superficial deposits in the Hunterston A Site locality consist of Pleistocene age Raised Beach Deposits, consisting of sands with silt and peat lenses. This is underlain by Post Glacial Deposits, consisting of sands and pebbles, and the deepest superficial deposit is the Glacial Till, consisting of sandy, silty clay with pebbles and boulders [1]. • The bedrock at Hunterston A Site consists of Devonian age Upper and Lower Old Red Sandstone. The thick (400m+) Upper unit of this facies consists of consists of medium-grained sandstones containing bands of siltstone, marl and conglomerate. The underlying Lower unit consists of sandstones and conglomerates. Carboniferous to Tertiary-age igneous intrusions, consisting of dolerite dykes, felsite sills and basaltic-tuff volcanic plugs are found in the bedrock at several locations on and near the site [1]. • The sand and gravel-bearing superficial deposits and made ground at Hunterston A Site are considered a Minor aquifer, whilst the Glacial Till is a non-aquifer. The bedrock at Hunterston A Site is considered a Major aquifer [1]. • The Major aquifer is abstracted for agricultural use in the site locality [1]. • The soil in the area surrounding Hunterston A Site are classified as Peaty Podzols and Brown Forest Soils [1]. <u>Land Quality</u> • Hunterston A Site contains known areas of radioactive land contamination, and very minor non-radiological contamination issues in addition. • The most significant radioactive land contamination at Hunterston A is associated with the CP7 compound. Contaminated sediment was historically discharged to the inter-tidal foreshore via outfall pipes, which constituted	1. Magnox North (2009) Hunterston A Site EIAB 2. Golder Associates (2009) Interpretative Report on the VLLW Disposal Area, Construction Waste Disposal Area and Spoil Mound 3. Golder Associates (2001) Hydrogeology and Radioactive Contaminated Ground: Desk Study and Initial Ground Investigation Design

	unauthorised discharges. Improved maintenance and cleanout of drains and catch pits was subsequently implemented, and in 2011 it was decided that land contamination associated with CP7 would be contained using several separate methods until the FSC phase is implemented at site. • Minor radioactive contamination issues are associated with other areas including areas around the pond, resin trench, south east corner of Reactor 1, the Active Effluent Treatment Plant (AETP) / final delay tanks and the sludge tanks [3]. • There are 5 authorised, lined Very Low Level Waste (VLLW) disposal pits located in made ground within the FRA in the western part of the site, that were used for the disposal of lightly-contaminated spoil during the 1970 - 80s [2]. Surface contamination was found in the disposal area in 2005, which lead to a risk assessment and an options appraisal for remediation being carried out. Improved containment in the form of a cap over the disposal area was implemented. • Non-radiological contamination is a very minor issue at Hunterston A, with only trace amounts of hydrocarbons having been recorded in groundwater sampled at the site [1].	
Surface Water Resources and Quality	• The nearest water body to Hunterston A Site is the Firth of Clyde. Burn Gill, which drains Goldenberry Hill, flows into the Firth of Clyde in close proximity to the site, and a minor stream that drains the site and adjacent fields flows over the intertidal zone on the shoreline. • Water quality in the part of the Clyde adjacent to Hunterston A is classified as 'excellent' (Class A) under the Scottish Environmental Protection Agency's Coastal Scheme. • Aqueous effluent discharges (and cooling water discharges during the operational phase) have always been made to the Firth of Clyde. Discharges of surface water are currently made via the Hunterston B pump house, and a separate discharge pipe is used for sewage discharges from Hunterston A. • The dispersion characteristics of the Firth of Clyde are affected by factors including flow rate, sediment load, sedimentation rate, freshwater / seawater mixing rate and tidal range and atmospheric conditions. • Waterbodies containing clay mineral-rich sediments may have higher uptake potential for radionuclide anions such as Cs-137.	Magnox North (2009) Hunterston A Site EIAB
Waste	• Both operational and decommissioning activities at nuclear sites generate radioactive and conventional waste. • Low Level Waste (LLW) is generated at Hunterston A 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. • Opportunities to characterise or decontaminate to VLLW or exempt (for permitted landfill), size reduce, incinerate or metal melt, in order to reduce LLWR consignments, are actively sought. • Intermediate Level Waste (ILW) [a] is generated from both operational and decommissioning activities. It has accumulated at several locations at Hunterston A Site. The majority of which will be retrieved during C&MP given that the ILW store is 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. • The SAWB contains several waste streams that are unique to Hunterston. This is because the fuel elements	1. Magnox Ltd. (2011) Hunterston A Site IWS 2. Scottish Government (2011) Scotland's Higher Activity Waste Policy 2011 3. Walters S (2009) Fuel Element Debris Status Overview

[a] In HAW '11, anything which is not classified as LLW (which includes ILW) is referred to as 'Higher Activity Waste (HAW)'. The term ILW is generally used in Magnox company documents for Scottish sites however, in order to achieve consistency across the company and is also used in this document. The terms ILW and HAW should be treated as analogous in this document.

	employed at the site incorporated a graphite sleeve. This resulted in a quantity of graphite Fuel Element Debris (FED) waste being produced after the elements were discharged from the reactors and the graphite was separated, which was transferred to the Bunkers 2-5 in the SAWB [1]. • In addition to the graphite, several other waste items (including Fuel Support Members), employed as part of the unique bottom-loading design of the Hunterston A reactors, consist of highly activated metals, were discharged to Bunkers 1-5 in addition. • Magnox FED was transferred to Bunker 1 [1]. <u>Site Waste Strategy Baseline</u> • The Scottish Government published its Higher Activity Radioactive Waste Policy in 2011 (HAW '11), which states that it's intention is '*to support long-term near surface, near site storage facilities so that the Waste is monitorable and retrievable and the need for transporting it over long distances is minimal*' • Waste strategy at the Hunterston A will conform with this policy instrument. • 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 is being pursued by Magnox Ltd. However, the use of these containers will not be implemented at Hunterston A Site, because Radioactive Waste Management Directorate (RWMD) boxes and cementitious encapsulant already comprise the baseline for the immobilisation of both wet and solid ILW waste streams. • Once encapsulation of the solid and wet ILW commences at Hunterston, the packages will be emplaced in the fully shielded ILW Store that is available on site, pending a decision on continued storage or final disposal that is in accordance with HAW '11. • The Graphite Pathfinder Project, which was initiated in 2010 following a site strategic ILW review, was a speculative project undertaken to investigate the feasibility of the permanent disposal of ILW from the SAWB into a near-surface engineered cell within the stable bedrock at a location on the NDA landholding. This was to be as an alternative to using the ILW Store, and was in line with the requirements of HAW '11. • Bunker 1 at Hunterston A contains 565m^3 of Magnox FED [3]. There is a Best Practicable Environmental Option (BPEO) study that has identified dissolution as the preferred management option for this waste stream.	
Traffic and Transport	• The site access road connects to the A78 trunk road. This road links to the national motorway network at Jct. 29 M8 via the A760 and A737 to the north, or via Jct. 8 M77 via the A71 and A77 to the south. • The nearest railhead to Hunterston A Site is located adjacent to the Hunterston Ore Terminal, on the Ayrshire Coast Line. This is a fully operational line that operates regular passenger and freight services. The nearest passenger rail stations are located at either West Kilbride or Fairlie.	1. Ordnance Survey (2011) 1:25,000 Sheet 341, Greenock, Millport and Largs
Land Use and Material Assets	• Hunterston A Site occupies an area of 65 hectares • Hunterston A Site consists of two reactor buildings, an ILW store, SAWB, charge machine servicing building, various ancillary buildings, access roads, grassy areas, and areas of hardstanding. • The surrounding area is rural and semi-rural in nature and is used for agricultural, recreational and industrial purposes. • Notable uses in proximity to Hunterston A Site include the Hunterston Estate (incorporating Hunterston Castle), and the privately owned Little Cumbrae island across the Fairlie Roads. There are no official Public Rights of Way near the site [1]. (partly due to the Scottish Right to Roam laws), but public access to the coastline in the Portencross SSSI is gained	1. Ordnance Survey (2011) 1:25,000 Sheet 341, Greenock, Millport and Largs 2. Magnox Ltd. (2011) Hunterston A IWS

	via the site access road.
	• Hunterston A 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 or has been made available for recycling during the C&MP phase, such as from general building dismantling.
	  • The majority of the remaining recyclable metal on site is incorporated into the boilers, the primary circuit, the bioshield and the SPVs, and 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 be managed in accordance with HAW '11), but the remainder will be LLW or exempt, and as such 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 monitoring data gathering is undertaken at Hunterston House and Campbelton Farm, (1km to the northeast and 1.1km to the southeast of site, respectively). • 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. • Noise and vibration originate from a number of sources at Hunterston A Site. • Since the cessation of generation the profile of noise and vibration from the site has changed, and there are now no significant noise sources on site and no nuisance noise.	Magnox North (2009) Hunterston A Site EIAB

Table 2: Environmental Discharge Data for Baseline Years 2008 – 10 for Hunterston A Site

In addition to the baseline information, which describes the permanent, semi-permanent and inherent features and impacts of Hunterston A Site and its surrounding area, the following table outlines discharge data for the site for particular years, 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	• The following describes the composition of radionuclides comprising the total radioactivity released by Hunterston A Site to atmosphere in 2008:
	  • 0.0013 TBq of H-3 (6.5 % of annual limits)
	  • 1.28 x 10^{-4} TBq of C-14 (6.4 % of annual limits)
	  • 4.26 x 10^{-7} TBq of beta (<1 % of annual limits) [1].
	• These discharges were assessed to result in doses to the critical group of 3.4 µSv (from consumption of milk and vegetables, with infants as the most exposed group; 0.34 % of the public dose limit) [2].
		• Discharges of radioactivity to the atmosphere decreased significantly upon the cessation of generation.
		• As decommissioning progresses through the C&MP phase the trend will be for discharges to continue to remain steady or decrease.
		• However, certain decommissioning activities such as the as the retrieval, treatment and passivation of wastes and draining of the pond may result in short term spikes in aerial discharges of radioactivity.
		• 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 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 site for disposal (in accordance with HAW '11) will result in traffic movements to the site. This retrieval will likely be
			1. FSA (2009) Radioactivity in Food and the Environment 14
			2. Magnox North and South (2008) Monitoring Our Environment

		phased over an extended period of time, so the impact from this is likely to be limited.	
Global Climate Change and Energy	• In 2010 4563 MWh of energy was used at Hunterston A Site • This energy consumption resulted in the indirect emission of 2400 tonnes of CO_2 • No direct emissions of CO_2, or indirect emissions from sources other than those associated with energy consumption, were associated with the site in 2010.	• 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 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.	Magnox Ltd. (2011) EHSSQ Company Statistics
Surface Water Resources and Quality	• The following describes the composition of radionuclides comprising the total radioactivity released by Hunterston A Site to the marine environment in 2008: • 6.1×10^{-4} TBq of H-3 (<1 % of annual limits) • 0.0386 TBq of beta (6.4 % of annual limits) • 1.35×10^{-4} TBq of alpha (<1 % of annual limits) [1]. • These discharges were assessed to result in doses to the critical group of 16 µSv (from external exposure and consumption of seafood; 1.6 % of the public dose limit) [2].	• Discharges of aqueous radioactivity decreased significantly upon the cessation of generation and 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. • However, certain decommissioning activities such as the as the retrieval, treatment and passivation of wastes, and decontamination and dewatering of the pond 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]. • It is possible that during the decades-long C&M phase percolating ground- and rainwater may entrain and mobilise activity from contaminated structures such as	1. FSA (2009) Radioactivity in Food and the Environment 14 2. Magnox North and South (2008) Monitoring Our Environment 3. Hunt C. (2011) BPM for Water Management during C&M, Bradwell Site, BRAD/BPM/017 [b]

[b] This document pertains specifically to Bradwell Site, but the assertions made in this report regarding water management and discharges during the C&M phase are applicable to the whole Magnox fleet.

		areas of the Safestore buildings [3]. Routine monitoring and inspection will identify if this is occurring, and intervention will be undertaken in line with the requirements of the C&M Safety Case to ensure that any activity does not migrate off site. • 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 due to this have not been made, however.	

Waste	• The following waste metrics are for the Financial Year 2010 / 11:
	• Hunterston A Site produced:
	  • 47580 kg of general waste
	  • 4600 kg of hazardous waste (excluding asbestos)
	  • 12000 kg of asbestos
	  • 76672 kg of inert waste
	  • 29864 kg of metals
	  • 0 kg of WEEE
	• Disposal routes:
	  • 45610 kg was consigned to conventional landfill
	  • 756114 kg was reused / recycled
	• ISO Container Shipments:
	  • 1 FHISO
	  • 3 HHISO
	  • 2 HHISO
	• Radioactive Waste Volumes and LLWR Consignments:
	  • 0 m^3 of solid ILW
	  • 197 m^3 of compactable LLW
	  • 672 m^3 of non-compactable LLW
	  • 0 m^3 was consigned to LLWR (434 m^3 awaiting dispatch)
	• Both Reactors 1 and 2 are fully defueled [2].
		• The anticipated future arisings of radioactive and conventional waste are outlined in Table 4.	Magnox Ltd. (2011) Hunterston A Waste Management Metrics - Period 12 FY2010/2011
			2. Magnox Ltd. (2011) Hunterston A Site IWS

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

Table 3: Additional Data for baseline Year 2008 – 10 for Hunterston A Site

SEA Objective	Additional Data	Changes in Additional Parameters	References
Surface Water Resources and Quality	• In 2010 the site consumed 10128 m^3 of mains water	• Water consumption at the site is likely to continue for the duration of the C&MP period at a similar level.	Magnox Ltd. (2011) EHSSQ Company Statistics
Economy, Society and Skills	• Hunterston Site is located in a semi-rural area of North Ayrshire [1]. • The major settlements within 10km of Hunterston A Site are West Kilbride and Ardrossan to the southwest, Fairlie and Largs to the north, Dalry to the east, and Millport (Isle of Cumbrae) to the northwest, as well as a number of smaller settlements [1]. • The population of North Ayrshire was 135200 during 2010 [2]. • North Ayrshire had a working population of 63500 during 2010 [2]. • The dominant working sectors in North Ayrshire during 2008 were and Public Admin, Education and Health (11900, 30 %) and Distribution, Hotels and Restaurants (11000, 27%) • In December 2010, 159 staff, 24 project staff and contractors* were directly employed by Hunterston A Site [3]. • Employment in the Electricity, Gas and Water Supply industry in North Ayrshire was not listed, but the effect of employment at Hunterston A Site is likely to be low against the total working population of this district. • In 2010 (24100, 28 %) of the population were employed to NVQ4 level or above. • North Ayrshire is not subject to Convergence Funding from the EU, or other external assistance (the Isle of Arran [North Ayrshire], when considered as part of the Highlands and Islands EU Region, is classified as a Phasing-Out Region of Convergence Funding) [4]. • The number of personnel employed on site will decrease	• 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 341, Greenock, Millport and Largs 2. Office for National Statistics (2011) Official Labour Market Statistics, available at http://www.nomisweb.co.uk/ 3. Magnox Ltd (2011) Industrial Safety Stats @ December 2010 4. EU (2011) Cohesion Policy 2007 – 13, available at http://ec.europa.eu/regional_policy/atlas2007/index_en.htm

	significantly after the completion of C&MP. * Contractor numbers are variable, depending on the work being undertaken at the site.		
Traffic and Transport	• The Annual Average Daily Traffic (AADT) from all traffic movements on the A78, approximately 1km to the south of the junction with the site access road, from recent measurements was 8926, of which 428 were Heavy Goods Vehicle (HGV) movements. • On the A78 to the north of the site, close to the junction with the A760, the traffic movements from recent measurements was 9571, of which 538 were HGV movements. • The proportion of these total movements that are directly attributable to Hunterston A 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 Hunterston A Site. • Movement of materials for potential future major construction or other projects e.g. cladding of the reactor buildings for C&M 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.	Department for Transport (2011) AADF Home, available at: http://www.dft.gov.uk/matrix/search.aspx
Health and Safety	• Hunterston A Site had 0 reportable Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) incidents during 2010 • The Occupational Safety and Health Administration Total Recordable Incident Rate (OSHA TRIR) for Hunterston A Site in 2010 was 0.25	• The current Health and Safety regime will likely continue to be enforced for the remainder of the C&MP phase. • Comparable Health and Safety standards to the current ones will likely be enforced during the periods of the C&M phase when personnel are on site for waste package retrieval activities, inspections etc. • Comparable Health and Safety standards will likely be enforced during the FSC phase.	Magnox Ltd (2011) Industrial Safety Stats @ December 2010

Table 4: Future Radioactive and Conventional Waste Arisings for Hunterston A Site [c]

Category of Waste	Time of Arising	Unpackaged Volume (m3)
LLW	C&MP	1598.5
	C&M	100
	FSC	40998.9
ILW	C&MP	2686.6
	C&M	0
	FSC	3753.8
Inert, hazardous and non-hazardous conventional	C&MP	77647.4
	C&M	0
	FSC	32316.2

(Hunterston A Site IWS, 2011)

[c] Packaged volume is between 20 – 50% greater than the unpackaged volume, depending on the type of container and encapsulant applied (UK Radioactive Waste Inventory, 2007).

Main Environmental Issue for Hunterston A Site

Land Quality

- There is radioactive land contamination at Hunterston A Site, resulting primarily from historical (during the generation phase) events. The site is considered to have only very minor non-radiological land quality issues.
  - Radiological contamination is associated with a number of sources at Hunterston A Site, but the main land quality issue is in the CP7 Compound and associated drainage. This has been the source of unauthorised discharges of sediment contaminated with Cs-137 on to the inter-tidal foreshore via outfall pipes from the land drains that serve the main site access road adjoining the CP7 Compound. By 2010, an enhanced regime of maintenance and clean-out of catch pits on the existing drainage system had been instigated to minimise the risk of further discharges to the foreshore. Following an extensive options appraisal, a decision was taken in November 2011 to contain the land contamination in situ for the foreseeable future (until FSC). The in-situ containment is to use a combination of drainage diversion, a slurry wall and impermeable cap.
  - Minor contamination has been detected at several other locations including (but not limited to) between Reactor 2 and the pond, roadway north of AETP (resin trench), south of Sludge Drying Beds, Siphon Seal Land Shaft area, south east corner of Reactor 1, temporary overland active effluent discharge line and the pond and its downstream infrastructure such as the AETP and effluent line [2].
  - The VLLW Disposal Area consists of a series of 5 discrete, sealed pits constructed within the made ground of the FRA, into which solid VLLW was disposed under an authorisation in the 1970s / 80s. A 2005 survey identified surface contamination in the disposal area. A quantitative risk assessment to human health was carried out for dose rates relating to this surface contamination, and the contents of the VLLW pits, which were found to be sufficiently low to demonstrate risk parity with respect to the delicensing criteria [3]. Due to stakeholder concerns an options appraisal study was carried out subsequent to the risk assessment in order to select a remediation strategy. Improved containment in the form of a cap was selected and implemented, and the need to excavate and transfer the contents either during C&MP or FSC was therefore eliminated.
- There are no major issues with non-radiological contamination at the site, and only trace amounts of hydrocarbons have been found in groundwater, and very minor hydrocarbon staining is evident on some areas of hardstanding [1].
- Extensive investigation and characterisation works at the site have been undertaken in recent years, and monitoring of land quality issues is ongoing.

FED Dissolution

- Following a BPEO study dissolution has been identified as the optimal treatment method for the Magnox FED waste currently in storage in Bunker 1 on site. The technology to be used in order to implement this has not yet been determined. The decision on which technology (mainly which acid is used for the processing) will be made based upon the most suitable method used at other Magnox Sites.
    - If this process is implemented, the resultant effluent will be discharged to the Firth of Clyde as per all other aqueous discharges from the site. The radiological and conventional environmental impacts of these discharges will be duly managed through abatement measures and considered through an Environmental Risk Assessment supported by modelling and dispersion studies as required.

Climate Change and Flooding

- As with all of the coastal Magnox Sites an ongoing issue for Hunterston A 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. This is due to the low lying coastal nature of the site.
    - The C&M phase at the site, during which the reactors will be in Safestore, is scheduled to last until 2070, a couple of decades prior to the 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 1990-99 levels) [4]. As such, the site will likely be cleared before the full effects of a worst case scenario are projected to be realised, but sea levels nonetheless could potentially be rising significantly during the site's C&M and FSC phases. The site is situated at an average elevation of approximately 4.5 m above Ordnance Datum (mAOD), and is protected from coastal erosion by engineered rock and crushed concrete bunds that were built during the construction phase [3].
    - 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. Magnox North (2009) Hunterston A EIAB
2. Golder Associates (2001) Hydrogeology and Radioactive Contaminated Ground: Desk Study and Initial Ground Investigation Design
3. Golder Associates (2009) Interpretative Report on the VLLW Disposal Area, Construction Waste Disposal Area and Spoil Mound
4. IPCC (2007) Projections of Future Change in Climate, http://www.ipcc.ch/publications_and_data/ar4/wg1/en/spmsspm-projections-of.html

Figure 1: Statutorily Designated Areas in the Vicinity of Hunterston A Site