

Environmental Monitoring Around Sizewell

Summary for the Sizewell SSG

September 2014

This briefing summarises the environmental monitoring programmes undertaken by the Environment Agency around the Sizewell coast. It also summarises the environmental monitoring programme that we require the operators of the Nuclear Power Stations at Sizewell to complete every year.

There are number of environmental monitoring programmes around Sizewell driven by different legal requirements, such as the Water Framework Directive and Bathing Water Directive. These are managed by the Environment Agency.

We set limits and conditions on the disposal of radioactive wastes to the environment from the power stations through our permits. We also place limits and conditions on the cooling water discharged by Sizewell B power station back into the North Sea. The power station operators are required to monitor and report compliance to us against these permit conditions.

We conduct our own monitoring of radioactivity in the environment around the power stations to check the effects of discharges from nuclear operations and inform our regulation of radioactive substances. We also require the operators of nuclear sites to conduct routine monitoring for radioactivity in the environment throughout the year. The results from these environmental monitoring programmes are reported to us every 3 months.

Sizewell B Cooling Water Discharge Monitoring

We have issued Sizewell B power station with a water quality discharge permit for the discharge of cooling water to the North Sea. The permit conditions require the operator to carry out monthly monitoring of both the sea water taken for cooling purposes and the discharge of cooling water. Within the permit we set limits based on environmental quality standards for water discharged back into the North Sea once it has been used for cooling.

The limits and conditions of the permit are summarised in the table below. Any breaches of the permit limits have to be reported to the Environment Agency immediately. We also require a report of the monitoring results to be provided to us on a quarterly basis. The Environment Agency also undertakes quarterly sampling of the influent and cooling water discharge.

Table 1: Summary of Limits and Conditions in the Sizewell B Cooling Water Discharge Permit

Sizewell B Power Station Cooling Water Limits & Conditions	
Absolute permit limits	
Maximum daily volume discharged	5,011,200 cubic metres per day
Maximum rate of discharge	58 cubic metres per second
Total residual oxidants	0.3 milligrams per litre
Temperature	45 degrees Celsius
Comparative permit limits*	
Total boron	no greater than 1 milligram per litre
Nitrite (expressed as N)	no greater than 0.2 milligram per litre
Total hydrocarbon oils	no greater than 5 milligram per litre
Ammonia (expressed as N)	no greater than 1 milligram per litre
pH	no greater than or less than 1 pH unit

* the composition of the effluent discharged shall not be changed relative to the composition of the influent water with respect to the determinands and amounts specified.

Cooling Water Permit Monitoring: What the data shows

The results of both the operator and Environment Agency monitoring show that the composition of the cooling water discharge is compliant with the permit limits.

Historical Water Quality Monitoring at Sizewell Beach

Monitoring of boron concentrations in seawater at Sizewell beach was carried out monthly from 1996 to 2012. Monitoring commenced in 1996 as at that time boron was classified as a "List 2" substance under Dangerous Substances Directive and the Environment Agency chose to monitor downstream of discharges with permitted numeric limits for List 2 Directive substances.

The Dangerous Substances Directive was replaced in 2013 by the Environmental Quality Standards Directive and boron is no longer included as a substance of interest within the new Directive. Therefore, there is no statutory requirement for the Agency to continue to monitor boron in seawater.

There is also no local reason to continue to monitor as discharges of boron from Sizewell B have been fully compliant with permitted limits (see above). The permit limit for boron in the cooling water discharge is set to ensure that the Environmental Quality Standard for boron in the receiving waters is protected. Results from environmental monitoring since 1996 show that the Environmental Quality Standard for the receiving waters has not been breached.

Boron Monitoring off Sizewell Beach: What the data shows

The results show that boron concentrations at this site were less than the environmental quality standard for Boron of 7000 µg/l, as an annual average.

Bathing Waters Directive Monitoring

There are 4 bathing beaches in the area designated under the Bathing Waters Directive: 2 at Lowestoft and 2 at Southwold. Microbiological monitoring of the seawater at these sites takes place from May to September annually. The results are compared to the microbiological standards set by the Directive and compliance assessed. The current mandatory microbiological standard is that 95% of samples must contain less than 2000 colony forming units of the bacteria *E. coli* per 100ml of seawater sample.

Bathing Waters Directive Monitoring: What the data shows

All 4 sites have achieved the minimum bathing water quality standards for the past 5 years. For the majority of the time a more stringent, non-compulsory, higher quality, microbiological standards has been achieved.

More information on Bathing Water Directive standards can be found at this website: <http://environment.data.gov.uk/bwq/explorer/index.html>, including the most up to date results and historical compliance for individual bathing water sites.

customer service line
03708 506 506

incident hotline
0800 80 70 60

floodline
0345 988 1188
0845 988 1188

www.gov.uk/environment-agency

Water Framework Directive Monitoring

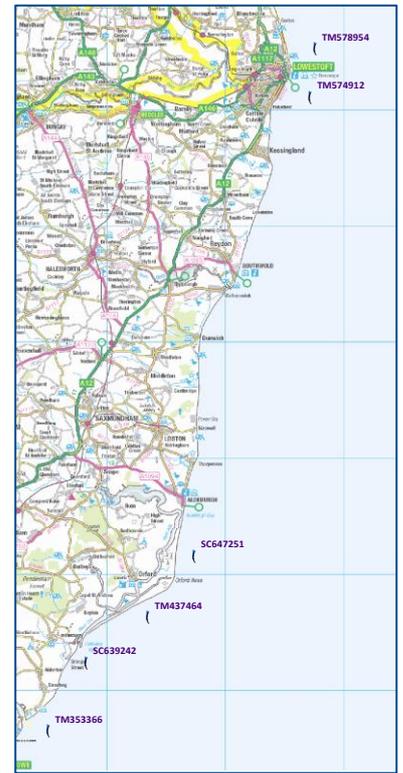
The Environment Agency is required to undertake marine water quality monitoring under the terms of the Water Framework Directive (WFD). The focus of WFD coastal monitoring is on establishing and reporting of nutrient concentrations. For the purpose of monitoring, marine waters are divided into discrete sectors. The selection of monitoring locations within a sector is done by choosing sites that can give the best representation of water body quality.

The water body that includes Sizewell extends from Lowestoft down to Felixstowe (see Map 1). There are 6 monitoring locations in this water body: 2 at the upper end and 4 at the lower end (see Map1), each location is sampled 12 times per year.

The selected monitoring locations are best placed to monitor nutrient inputs into the coastal waters from sewage treatment works (at Lowestoft, Aldeburgh, Felixstowe and Southwold) as well as inputs from the Deben, Ore/Alde and Blyth estuaries. The cooling water discharge from Sizewell B power station is not a contributor of nutrients to the water body.

Samples taken at these locations are subject to basic water chemistry analysis, i.e. dissolved oxygen, temperature, turbidity, chlorophyll and nutrient levels (nitrogen and phosphorus). This physico-chemical

information is combined with other elements, such as biological and morphological data, to give an overall Water Framework directive classification status for this area of the coast. There are five classes: High, Good, Moderate, Poor and Bad. The target class for all waterbodies is Good status.



Map 1: WFD Monitoring Locations along Suffolk Coast

Water Framework Directive: What the data shows

The most recent classification (2012) for the physico-chemical elements of water quality along the Suffolk coastline is **Good**. This means that coastal water quality is achieving the water quality targets laid down by the Water Framework Directive.

The overall classification of the coastal water around Sizewell, once other elements are taken into account (such as biological and morphological data), is also **Good** for 2012.

Environment Agency Radiation Monitoring

Together with the environmental protection agencies in Scotland, Wales and Northern Ireland and the Food Standards Agency, we undertake a programme of monitoring radioactivity in the environments around all nuclear sites in the UK. This information is published annually in the *Radiation in Food and the Environment* (RIFE) report and we have done this for over 20 years. Copies of the RIFE report can be obtained through our web site.

Around Sizewell we sample sediments from coastal locations (orange dots on Map 2), seawater adjacent to the power stations (green dot) and freshwater from rivers and streams in the local area (blue dots), as shown in Map 2. Samples are taken twice per year. Seawater samples are analysed for gross alpha/beta activity, tritium (H-3), caesium-137 (Cs-137) and americium-241 (Am-241). Sediment samples are analysed for Cs-137 and Am-241 content. Freshwater samples are analysed for gross alpha/beta activity, H-3, sulphur-35 (S-35) and Cs-137. We also undertake radiation (gamma) monitoring twice per year at 5 intertidal locations in the area ("X"s on the map): Sizewell Beach, Dunwich, Rifle Range, Aldeburgh and Southwold Harbour.

customer service line
03708 506 506

incident hotline
0800 80 70 60

floodline
0345 988 1188
0845 988 1188

www.gov.uk/environment-agency

Seawater samples from 2012 all returned values of less than the limit of detection for the radionuclides listed above, apart from the result for gross beta radiation where a result of 15 Bq per litre was obtained. This result is about average for seawater globally. Most radioactivity in seawater comes from the presence of a naturally occurring isotope of potassium, K-40¹.

The Food Standards Agency takes a number of terrestrial and marine food samples every year.

We use the monitoring data, together with information gathered about the habits of local populations - such as, who lives where, how much local produce is eaten, what activities people do in the local area - to calculate the radiation doses that people in the area could receive.

EA Radiation Monitoring: What the data shows

In the most recent RIFE report, compiling data collected in 2012, the total radiation dose from all pathways and sources was 0.021 mSv, or approximately 2% of the annual radiation dose limit to a member of the public. In comparison, a 4-hour international flight could give a dose of 0.02 mSv from increased cosmic radiation at high altitudes². The main contribution of total dose was from direct radiation from Sizewell B power station, which would most affect adults living in the vicinity of the site. Total doses have declined since the Sizewell A Magnox reactor stopped generating power in 2006.



Map 2: Sampling and Radiation Monitoring Locations around Sizewell

Operator Monitoring of Radiation in the Environment

We permit the operators of nuclear sites to discharge radioactive waste in to the environment. Our permits set limits on the amount of radioactivity that can be discharged and conditions on the operator of a nuclear site. One of the conditions we impose through our permit is that an operator of a nuclear site must have an environmental monitoring programme in place that meets our expectations³.

At Sizewell, a combined programme for both power stations is in place. The results from the monitoring programme are reported to us every 3 months. The current programme has a wide range of monitoring and sampling locations:

- 15 radiation monitoring locations in the local area (Map 7)
- 8 passive shade monitoring locations (Map 8)
- 3 different milk samples
- Sampling of up to 10 species of fish, molluscs and crustacea during the year
- Biannual radiation monitoring of the strandline close to the power stations
- Annual radiation monitoring of local fishing equipment
- 5 locations where grass and soil samples are taken (Map 5)

¹ Woods Hole Oceanographic Institute, Centre for Marine and Environmental Radiation, retrieved 23 September 2014.

² Source: Living with Radiation (5th Edition) published by the National Radiation Protection Board (now part of Public Health England) in 1998.

³ We have set out guidance on environmental monitoring in our publication, *Radiological Monitoring Technical Guidance Note 2: Environmental Monitoring*, published in 2010.

- 11 coastal and estuarine locations where radiation monitoring takes place quarterly and a further 6 locations where annual spot checks take place (Map 4)
- 5 coastal locations where sand and sediment samples are taken (Map 6) and analysed for a wide range of radionuclides, predominantly common fission products and activation products, that can be detected in the environment and, if found in high concentrations, would indicate an unauthorised release or abnormal operating conditions at the power stations. Samples are specifically analysed for:
 - Cerium-144 (Ce-144)
 - Cobalt-60 (Co-60)
 - Caesium-137 (Cs-137)
 - Europium-155 (Eu-155)
 - Niobium-95 (Nb-95)
 - Antimony-125 (Sb-125)
 - Zirconium-95 (Zr-95)
 - Cobalt-58 (Co-58)
 - Caesium-134 (Cs-134)
 - Europium-154 (Eu-154)
 - Potassium-40 (K-40)
 - Ruthenium-106 (Ru-106)
 - Strontium-90 (Sr-90)
 - Gross beta activity

Operator Environmental Radiation Monitoring: What the data shows

Environmental monitoring data supplied by the operators of the Sizewell nuclear power stations has shown over the years that radiation levels in the environment around Sizewell are not significantly different than background radiation levels distant from the power stations. There are no unusual trends in the data that would indicate unauthorised emissions or leaks. Environmental receptors are not being adversely affected by discharges of radioactivity from the power stations.

The maps below give an indication of the spread where some of these samples are taken within the local area around Sizewell:



Map 3: Quarterly Coastal Radiation Monitoring Locations



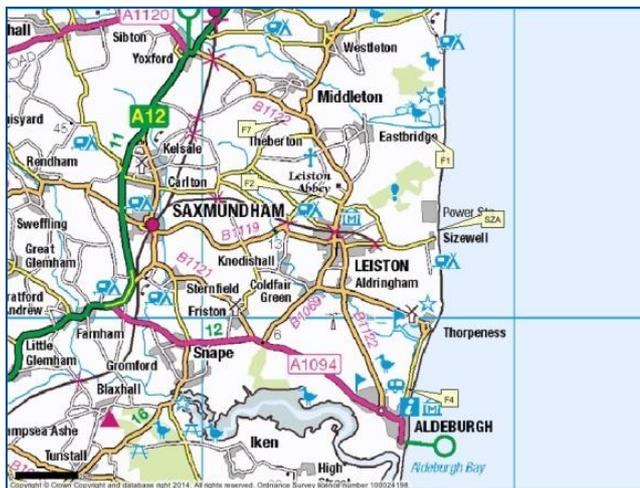
Map 4: Annual Coastal Radiation Monitoring Locations

customer service line
03708 506 506

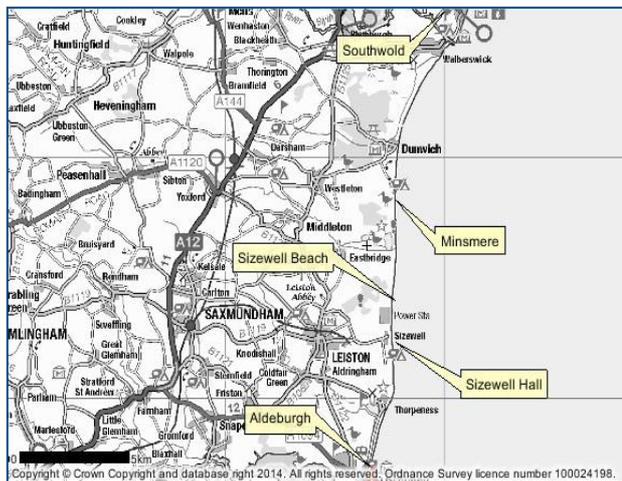
incident hotline
0800 80 70 60

floodline
0345 988 1188
0845 988 1188

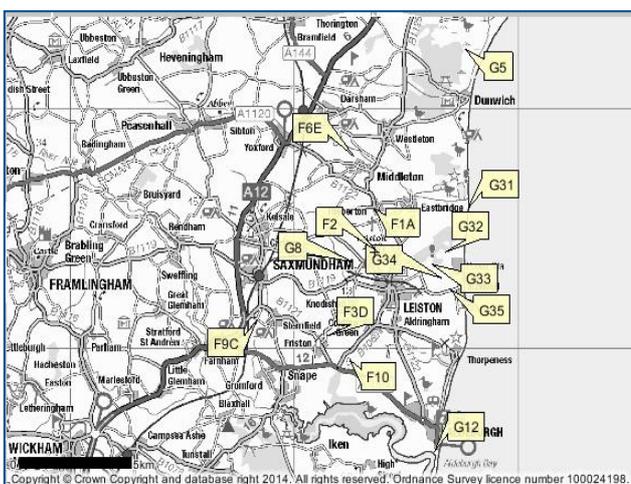
www.gov.uk/environment-agency



Map 5: Grass sampling locations



Map 6: Sand and Silt Monitoring Locations



Map 7: Radiation Monitoring Locations



Map 8: Passive Shade Monitoring Locations

Conclusion

A variety of environmental monitoring takes place around the Sizewell nuclear power stations. Monitoring shows that marine water quality is good and concentrations of radioactivity measured from environmental samples taken from around Sizewell are no different to background radiation levels measured away from nuclear sites.