

Nuclear Free Local Authorities **RADIOACTIVE WASTE POLICY**

Briefing No.42 – Dalgety Bay & the wider radium legacy

Prepared for NFLA member authorities, October 2013

The Radium Legacy and Other Contamination Problems

i. NFLA Secretariat introduction to this report

For a number of years the Nuclear Free Local Authorities (NFLA) have been involved in the myriad of issues that have come to light with radioactive contamination of land in the Dalgety Bay area of the East Fife coastline. It has been in regular discussion and provided advice to officers and councillors in Fife Council and the local and national issues relating to this issue have been raised at NFLA Scotland seminar and in reports to the NFLA Steering Committee and NFLA Scotland Forum.

Following further discussion at the most recent meeting of the NFLA Scotland Forum, and following a presentation to the NFLA Welsh Forum meeting by independent marine radioactivity consultant Tim Deere-Jones, it was decided that the NFLA Secretary commission the NFLA Scotland Policy Advisor to develop a more detailed and comprehensive report on radium contamination at Ministry of Defence and other sites. This report focuses both on the local issues relevant to the ongoing remediation of the Dalgety Bay site and the wider issues around radium contamination.

1. Introduction

The manufacture and use of radium in the early to mid-20th century within industrial, medicinal and recreational products have resulted in a number of contaminated sites across the UK. Radium, which is an alpha emitter, was frequently used, as a luminescent paint. Although radium production ended in Britain in the 1930s, radium salts continued to be imported until the 1960s. A recent UK Government report estimated that there could be as many as 150-250 contaminated sites across England and Wales, but the number could be as high as 1000. (1) These sites, represent a significant number of unregulated sources of potential radiological exposure that have not been well characterised, and it is now widely acknowledged that this radium contamination has the potential to cause significant radiological harm.

In 2007, the Radioactive Contaminated Land (RCL) Regulations came into force in the UK, providing the statutory guidance for regulators to classify and deal with RCL. The regulations gave the environment agencies the power to classify land as radioactively contaminated and a duty to implement appropriate enforcement strategies.

One UK site at Dalgety Bay in Fife, which was once a Royal Air Force airfield, was contaminated as a result of the burial of particles, clinker and artefacts that arose from past military activities on the site. Since 2011, the number of radium

contaminated finds has increased by one order of magnitude on the foreshore areas of Dalgety Bay. The increase in finds is probably mostly due to changes in monitoring practice. Although the radioactivity of the particles found at Dalgety Bay is highly variable it is quite possible that dose limits to members of the public could be breached. The possibility that some contaminated items found in the Bay may be considered to be collectable military artefacts also has to be borne in mind, unlike at other contaminated sites. (2) However, it has been emphasised locally that encountering a particle is unlikely and if residents wash their hands and don't take anything off the beach the risk is negligible.

Radioactive particles released into the sea from historic practices at Dounreay have continued to be deposited on local public beaches for a number of years and therefore continued to present a risk to members of the public using these beaches. It is hoped that the recent sea bed particle retrieval programmes will significantly reduce particle finds on public beaches, but, so far in 2013 five particles have been found on Sandside Beach, albeit particles classified as in the "minor" category. (3) Particles released from Dounreay can pose a relatively high hazard in the environment compared to normal environmental concentrations to which the public are exposed.

There has also been renewed interest since around 2007 in particulate contamination on beaches near Sellafield. The Sellafield particles have raised again a debate about whether members of the public should be warned about particles by the use of signs on beaches, or whether this would needlessly damage the tourist trade when the Health Protection Agency (now Public Health England) has declared the overall risk to beach users as very low, and related to that the level of monitoring which is appropriate. (4)

This briefing will look at what has been going on at Dalgety Bay and what the implications are for Fife Council if the area is classified by the Scottish Environment protection Agency as radioactively contaminated. It will also look at the evidence that other sites, particularly in Scotland but also in England and Wales, also need to be further investigated.

2. Radioactive Particles and the Impact on Health

The assessment of the potential health impact of radioactivity in the environment is based on a standard methodology which assumes that radioactivity is evenly spread throughout the environment. This system has its problems (for example the failure to recognise sea to land transfer) but as far as the environment agencies are concerned it works reasonably well when contamination is released as a liquid or gaseous discharge. However, radioactive particles represent a hazard that is more difficult to quantify because the probability of encountering a particle is uncertain as are the potential effects on health if one is encountered. (5)

An assessment of the risk posed by particles requires an estimate of the probability of a person encountering a particle and then an assessment of the hazard posed by a particle should one be encountered. The problem is that particles released accidentally as opposed to via an authorised release are, at least when they are first discovered, poorly characterised in terms of their physical and radiometric properties. Such particles tend to vary wildly in size, radionuclide content, radioactivity and solubility. This means that in order to assess the hazard, information would have to be gathered on all the particles released in order to be able to assess the range of hazard presented to human health. Initially at least only

a representative sample of particles can be assessed. This presents its own problems. For example higher activity particles can be easier to find skewing the results. On the other hand smaller low activity particles might be missed even though they present the greatest hazard because they comprise alpha emitting radionuclides like radium.¹

Estimating the probability of encounter also has difficulties because it will depend on the number of particles released, which may not be known. Information on the habits of people living nearby will also be required, but should be easier to come by, although there may be a need to collect information not normally collected in habit surveys – such as the area of skin likely to be exposed. (Holiday-makers may be more at risk of skin burns from particles than fishermen, for example).

Clearly an estimate of risk under these circumstances is going to be subject to uncertainties. ***Thus we should be taking a precautionary approach which means not postponing cost effective measures until there is more certainty.*** According to the UK's Sustainable Development Strategy: “*where there is uncertainty and potentially serious risks exist precautionary action may be necessary*”

3. Dalgety Bay

Babcock Engineering Services discovered radioactive contamination at Dalgety Bay during a routine survey in 1990. The contaminant was identified as radium-226. (6) The National Radiological Protection Board undertook two surveys in 1990 and 1991 and recovered 220 and 354 sources. Subsequent surveys were undertaken by various contractors on behalf of the MoD during which sources were removed, but up until 2010 never more than 150 sources during any one survey.

In March 2007 SEPA was given a specific duty to assess sites historically contaminated with radioactivity, such as Dalgety Bay, under the Radioactive Contaminated Land Regulations.

In 2006, SEPA conducted a limited monitoring and recovery survey at Dalgety Bay to determine whether the contamination posed a realistic risk that should be quantified. This showed a possibility of significant exposures to members of the public which warranted consideration of interventions to protect the public and resulted in the erection of signs at a number of locations. In 2008, SEPA again conducted a further monitoring and recovery survey. In 2009 the Defence Estates Agency undertook a series of monitoring and recovery exercises. These confirmed SEPA's view that particles were continuing to arrive on the beach. (7)

SEPA then initiated its own survey work and between October 2011 and October 2012 over 800 sources were removed during 36 surveys. (8) The total number of radioactive sources (particles) that have been recovered since the beginning of SEPA's investigation in September 2011 is now over 1,000.

SEPA completed its risk assessment, in line with its duties required under the Radioactive Contaminated Land (Scotland) Regulations and associated Statutory Guidance, in May 2013. (9) This concluded that there is a significant possibility of

¹ An alpha emitting particle can be difficult to detect because alpha radiation doesn't travel very far, but if it becomes lodged in the body the chance of damage to the cell DNA is significantly greater than with other types of radiation.

significant harm occurring on three areas of the foreshore at Dalgety Bay in line with the criteria set out in the Statutory Guidance.²

In June 2013 SEPA published an “Appropriate Person Report”. This report was necessary to “clarify responsibilities for the contamination at Dalgety Bay and determine which parties need to address the issue”. This clearly identified the Ministry of Defence as the Appropriate Person. (10) However, it is important to remember that in terms of the legislation there can only be an Appropriate Person in respect of land which has been identified as Radioactive Contaminated Land. The term “Appropriate Person” means, in the context of this Report, someone whom SEPA considers would be an Appropriate Person if the site were to be designated as Radioactive Contaminated Land under Part IIA of the Environmental Protection Act 1990.

SEPA’s view is that the contaminated areas on Dalgety Bay beach do meet the criteria to be designated as “radioactive contaminated land”, but the Agency says “we very much hope that we do not need to take that step and can move to a voluntary solution.” (11) SEPA’s policy is to seek, wherever possible, voluntary action to address contamination, with the backstop being designation if this does not occur. (12)

Unfortunately the MoD is disputing SEPA’s findings. The Parliamentary Under-Secretary of State for Defence, Dr Andrew Murrison, says the MoD’s technical and legal experts have problems with the adequacy and validity of both of SEPA’s recent reports - the risk assessments and the appropriate person report. Those concerns relate to the interpretation and use of fundamental scientific and legal principles. An independent review by the Centre for Radiation, Chemical and Environmental Hazards, formally part of the Health Protection Agency was not a ringing endorsement of SEPA’s approach and shows that many of the MoD’s concerns are well founded. This concluded that the likelihood of a member of the public inadvertently ingesting an object contaminated with radium that could cause them significant harm is less than one in 10 million.

Murrison goes on to say:

“A robust, evidence-based risk assessment is required that accords with accepted best practice and is scientifically rigorous. Without it, we simply cannot understand the level of risk posed to health and ensure that suitable and sufficient measures are in place to protect the public.”

The MoD also disputed the findings of SEPA’s Appropriate Person Report and questioned the “adequacy and validity” of the approach. (13)

SEPA says that for the three areas found to be contaminated current management arrangements, including erecting signs and marking out the areas, continued monitoring and removal of any particles found, are reducing the risks to the public and it is SEPA’s current view that these measures offer sufficient management

² Paragraph A.32 says:

Where:

- (a) in a single exposure event, the potential EFFECTIVE DOSE would be greater than 100 millisieverts; or
- (b) contact with contamination would result in a potential ABSORBED DOSE to the skin greater than 10 Grays in an hour;

SEPA shall regard the possibility of SIGNIFICANT HARM as significant, irrespective of the probability of radiation dose being received.

arrangements at present. The MoD says it could be argued that given the risk remains very low these measures probably preclude the need to declare any area Radioactive Contaminated Land. However it should be noted that only one of the three defined areas mentioned in SEPA's report as contaminated has been "marked out".

In the meantime, the MoD has committed to a programme of monthly monitoring and retrieval. It will determine the extent and magnitude of the contamination at Dalgety Bay, and has agreed to go ahead with the preparation of remediation options and a comprehensive clean-up plan. From those options, SEPA will determine the most appropriate remediation plan. The final plan is likely to include both engineering work and excavation. But the MoD has not agreed to fund the remediation work. So while there may be no need for a designation at present, there may be more battles ahead when the cost of the plan becomes more apparent. (14)

Former Prime Minister Gordon Brown, MP for Kirkcaldy and Cowdenbeath (in whose constituency Dalgety Bay lies), said the MoD should accept it was "*morally obliged*" to foot the bill for making the site safe. "*Having been named as the polluter, the Ministry of Defence must now agree to fund the clean-up of the area to remove the contaminated substances from the Dalgety Bay beach and the work must start immediately. I understand that the MoD is saying that it has concerns over the adequacy and validity of the exercise which has named them as the polluter. In my view, the MoD is merely delaying the inevitable.*" (15)

Mr Brown told Parliament on 9th July 2013 that in the next few months SEPA will have to designate the Dalgety Bay area as the only radiation-contaminated area in the United Kingdom if action is not taken by the MOD as soon as possible. (16)

The Committee on Medical Aspects of Radiation in the Environment (COMARE) met on 10th July 2013 to discuss Dalgety Bay. It agreed with SEPA that the continuing programme of demarcation and monitoring is not a long term viable solution, and remediation should start as quickly as possible, with monitoring and removal of radioactive sources continuing at a frequency and area determined by the Regulator, but this should be to at least current levels. The Committee also wants to see a list of all Radium-226 sites across the UK compiled. (17)

SEPA is now planning to consult local residents on clean-up options. Gordon Brown MP wants to see a deadline set so that work on excavation and engineering can proceed as quickly as possible on the basis of the plan decided – preferably before the onset of winter months when coastal erosion tends to worsen. (18)

The views of residents are fairly clear. At a meeting of Fife Council's South West Fife area committee in August it was unanimously agreed to call on the MoD to come forward with "*immediate remediation options*" for the area. The committee also expressed disappointment that the MoD was not facing up to its responsibility as the polluter. The committee also noted the continuing non-attendance of the MoD at briefings and requested that the council debate the issue to add support to calls for the MoD to take action. (19)

Fred Dawson, a former MoD Radiation Protection Specialist said after the adjournment debate called by Gordon Brown that it is clear the MOD is desperate to avoid liability:

“...the MOD is quite aware of the reputational damage the Dalgety Bay contamination issue has and continues to cause. In particular the knock-on effect in Scotland in the context of the referendum on independence and MOD nuclear programmes in Scotland.”

Dawson’s view is that if this issue ends up in Court the MoD will be forced to accept liability, and this could set a legal precedent with MOD liable for the pollution it caused by historic activities involving Radium at hundreds of sites. (20) Dawson says:

“SEPA has shown extreme patience with the MOD I believe the time has now come for SEPA to take legal action against the MOD to resolve the issue without further delay.”

4. Other Sites

A dozen sites across Scotland suspected of being contaminated by radioactive waste from past military or industrial activities were named by SEPA last year. One is the Ministry of Defence firing range at Dundrennan on the Solway Firth, where depleted uranium tanks shells have been tested. Others are former air force, army and naval bases around the country where radium was used to make dials glow in the dark. There are also former radium factories in Wishaw and Balloch. (21)

5. Sites suspected of radioactive contamination

The full list of sites in Scotland suspected of radioactive contamination includes:

- Ministry of Defence firing range, Dundrennan, Kirkcudbright, Dumfries and Galloway
- Former Defence Aviation Repair Agency, Almondbank, Perth and Kinross
- Royal Artillery Range, RAF Benbecula, Western Isles
- Former air base, RAF Edzell, Angus
- Former air base, RAF Kinloss, Forres, Morayshire
- Former air base, RAF Machrihanish, Mull of Kintyre
- Royal Marines base, RM Condor, Arbroath, Angus
- Former army luminising depot, Forthside, Stirling
- Former radium plant, Gowkthrapple, Wishaw, North Lanarkshire
- Boatyard on site of an old radium works, Balloch, Dunbartonshire
- Former military aircraft base, Dalgety Bay, Fife
- Beaches near the Dounreay nuclear complex, Caithness

Apart from Dalgety Bay RAF Kinloss has received the most attention. Environmental reports, known as Land Quality Assessments, prepared for the Ministry of Defence (MoD) highlights that the authorities have been aware of *"potential human health and environmental risks"* since at least 2004. The documents also suggest that radiological contamination could extend to land which was sold and is no longer part of the base. It is believed that more than 1,000 aircraft were dismantled at Kinloss after the end of WWII. Instruments coated with "glow in the dark" paint containing radium were burned and buried at the site. (22) Radiation monitoring was carried out on sand dunes near to the former RAF base earlier this year. Moray Council said monitoring would be carried out at Findhorn in August. (23)

Another coastal site which didn’t appear on the list but may be contaminated with radium is the former seaplane base at Wig Bay Loch Ryan, near Stranraer. (24)

6. England

A number of MoD sites in England have also been reported as containing radium contamination. Confirmed sites include:

- RAF Pelham in Norfolk – radium contamination confirmed by local authority. (25)
- Chatham Dockyard, Kent – MoD confirmed that 0.95GBq of Carbon-14 had been buried. (26) This waste was buried with the agreement of the regulator on the assumption that it contained only short-lived Cobalt-60 (27)
- Eskmeals, Cumbria – Depleted Uranium Weapons Firing Test Centre (28)
- Hilsea, Portsmouth, Hampshire – disposal of radium residues. (29)

A full list of sites contaminated by radium was released by the MoD to the Guardian in December 2011. (30) The list included:

- Former SAS HQ at Stirling Lines, Hereford
- MS Daedalus, near Portsmouth: former naval air base
- Defence Aviation Repair Agency Gosport, Hampshire: former aircraft repair depot
- RAF Henlow, Bedfordshire: air base
- RAF Newton, Nottingham: former air base
- RAF Little Rissington, Gloucestershire: air base and former home to Red Arrows
- Stirling Lines, Hereford: former SAS headquarters
- RAF Shawbury, Shrewsbury, Shropshire: air training centre
- RNAS Anthon, Cumbria: former naval air base
- RAF Carlisle, Cumbria: a former military equipment depot.

7. Wales

None of the MoD's 15 sites released in December 2011 were in Wales. However, given that DECC has estimated there could be anywhere between 150 and 1000 contaminated sites across England and Wales (not just MoD), Tim Deere-Jones has speculated that some of the 14 former WW2 airfields in Pembrokeshire or the naval bases at Milford Haven Waterway could be contaminated. His presentation to the NFLA Welsh Forum is available from the NFLA Secretariat.

8. Conclusions

Dalgety Bay does appear to meet the criteria for designation as Radioactive Contaminated Land. Relying on signs alone is not a long-term solution. When the MoD publishes its clean-up plan, if the Ministry of Defence still refuses to foot the clean-up bill, it may be necessary to designate the area Radioactive Contaminated Land and force the MoD to pay. However, the MoD could well decide to take the issue to the Courts since it claims to disagree with SEPA's findings. Although the balance of opinion appears to be that the MoD would lose such a case, all monitoring and remediation work might be halted while court proceedings are undertaken, and such a case would not be good for Fife's public and touristic image, so it would be best for all concerned if this can be avoided.

On the other hand, the MoD needs to accept liability for its past actions at Dalgety Bay and other sites around the UK. Remediation work at Dalgety Bay is long overdue and an urgent programme of monitoring needs to be undertaken at all other potential contaminated sites around the UK.

9. Recommendations

This report will be sent to all NFLA member authorities and as many non-member Councils as possible. It will also be sent to SEPA, MoD, the wider UK Government (Department of Energy and Climate Change and Department of the Environment Food and Rural Affairs), Public Health England, Public Health Wales, the Scottish and Welsh Governments, local MPs, MSPs and AMs, the Scottish Councils Committee on Radioactive Substances and the LGA Nuclear Legacy Advisory Forum for comment and a request for appropriate meetings.

NFLA member authority councillor contacts should discuss the matters raised in this report with appropriate waste management officers, contaminated land officers and public health officers in the Council. If there are MOD sites in their area they should consider liaising with them on the content of this report.

10. References

- (1) Radioactive Contaminated Land Statutory Guidance, DECC April 2012
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48325/4472-draft-statutory-guidance-covering-radioactive-cont.pdf
This report refers to a 2005 study <http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/scho0805bjme-e-e.pdf>
- (2) Tyler, A.N. Dale, P. Copplestone, D. Bradley, S. Ewen, H. McGuire, C. Scott, E.M. The radium legacy: Contaminated land and the committed effective dose from the ingestion of radium contaminated materials, Environment International, Vol. 58, September 2013 pp449-455. <http://www.sciencedirect.com/science/article/pii/S0160412013001347>
- (3) Particle Clean-Up, Dounreay Site Restoration Ltd. website accessed 25th September 2013
<http://www.dounreay.com/particle-cleanup>
- (4) Radioactive Particles on West Cumbrian Beaches – the case for the provision of signs to advise the public CORE August 2013 http://www.no2nuclearpower.org.uk/wp/wp-content/uploads/2013/08/CORE_Review_Radioactive_Particles_and_the_case_for_Beach_Signs_August_2013.pdf
- (5) Dale, P. Robertson, I. and Toner, M. Radioactive Particles in Dose Assessments, Journal of Environmental Radioactivity Vol. 99 (2008) 1590-1595.
<http://www.sciencedirect.com/science/article/pii/S0265931X0800101X>
- (6) Dalgety Bay Monitoring Report Babcock Engineering Services 2005
http://www.sepa.org.uk/radioactive_substances/publications/idoc.ashx?docid=91b1b9d8-78c3-41eb-9b55-d750e8e7648c&version=-1
- (7) Dalgety Bay Radium Contamination, SEPA, September 2011
http://www.sepa.org.uk/radioactive_substances/idoc.ashx?docid=716d7c47-bd36-41cf-aeb8-6b95a247e05d&version=-1
- (8) Dale, P. Robertson, I. and Toner, M. Radioactive Particles in Dose Assessments, Journal of Environmental Radioactivity Vol. 99 (2008) 1590-1595.
<http://www.sciencedirect.com/science/article/pii/S0265931X0800101X>
- (9) Dalgety Bay: Radioactive Contaminated Land Risk Assessment. SEPA, May 2013
http://www.sepa.org.uk/radioactive_substances/publications/idoc.ashx?docid=97cad49d-deb0-4603-92a3-6d9e182bb2fd&version=-1
- (10) Dalgety Bay: Appropriate Person Report, SEPA, June 2013
http://www.sepa.org.uk/radioactive_substances/publications/idoc.ashx?docid=26ba077d-27f7-4bfd-b00c-f55757b6cc49&version=-1
- (11) Dunfermline Press 10th June 2013
<http://www.dunfermlinepress.com/news/roundup/articles/2013/06/10/460416-bay-beach-meets-radioactive-contaminated-land>
- (12) Pers Com with Paul Dale at SEPA 26th September 2013
- (13) Hansard 9th July 2013 : Column 331
- (14) SEPA website accessed 25th September 2013
http://www.sepa.org.uk/radioactive_substances/dalgety_bay.aspx
- (15) Hansard 9th July 2013 : Column 331

- (16) Scotsman 28th June 2013 <http://www.scotsman.com/news/environment/gordon-brown-mod-must-fund-dalgety-bay-clean-up-1-2982336>
- (17) SEPA Press Release 10th July 2013
http://www.sepa.org.uk/about_us/news/2013/sepa_statement_regarding_dalge.aspx
- (18) Dunfermline Press 10th September 2013
<http://www.dunfermlinepress.com/news/dalgetybay/articles/2013/09/10/471101-bay-residents-to-be-consulted-on-radiation-cleanup/>
- (19) Dunfermline Press 28th August 2013
<http://www.dunfermlinepress.com/news/dalgetybay/articles/2013/08/28/469594-mod-squirming-like-worms-on-hooks-over-dalgety-bay-radiation/>
- (20) Milcon Research and Consulting 18th July 2013
<http://milconrandc.blogspot.co.uk/2013/07/dalgety-bay-adjournment-debate.html>
- (21) Sunday Herald 29th July 2012 <http://www.robedwards.com/2012/07/agency-names-12-scottish-sites-suspected-of-radioactive-contamination.html>
- (22) BBC 18th May 2012 <http://www.bbc.co.uk/news/uk-scotland-north-east-orkney-shetland-18122594>
- (23) BBC 1st Aug 2013 <http://www.bbc.co.uk/news/uk-scotland-north-east-orkney-shetland-23531873> & Herald 2nd Aug 2013
<http://www.heraldscotland.com/news/environment/radiation-tests-at-ex-raf-air-base.21763256>
- (24) Milcon Research and Consulting 1st July 2013
<http://milconrandc.blogspot.co.uk/2013/07/wigtown-bay-another-dalgety-bay.html>
- (25) Norwich Evening News 14th August 2013
http://www.eveningnews24.co.uk/news/luminous_paint_found_at_norfolk_airfield_during_radioactivity_survey_1_1481523 & Milcon Research and Consulting 15th August 2013
<http://milconrandc.blogspot.co.uk/2012/08/radium-contamination-confirmed-at-pulham.html>
- (26) Milcon Research and Consulting 17th September 2013
<http://milconrandc.blogspot.co.uk/2013/09/latest-update-on-carbon-14-at-chatham.html> & 16th August 2013 <http://milconrandc.blogspot.co.uk/2013/08/unregulated-disposal-of-radioactive.html>
- (27) Milcon Research and Consulting 27th April 2012
<http://milconrandc.blogspot.co.uk/2012/04/chatham-urban-nuclear-waste-dump-and.html>
- (28) Milcon Research and Consulting 19th October 2012
<http://milconrandc.blogspot.co.uk/2012/10/du-firing-programme-at-eskmeals-as-low.html>
- (29) Milcon Research and Consulting 9th March 2012
<http://milconrandc.blogspot.co.uk/2012/03/disposal-of-radium-by-burial-portsmouth.html>
- (30) Guardian 20th December 2011 <http://www.theguardian.com/environment/2011/dec/20/mod-radioactive-world-war-two>