Sub No 52

ENVIRONMENTAL PROTECTION AGENCY
13 SEP 2011

Nevitt
Lusk
Co. Dublin
11 Sept 2011

Dear Mr. Meeney,

REF WO129-03, MEHL

We would like to draw your attention to the enclosed report dated 17 Jan. 2011. The report refers to eco-toxicology of Bottom ash. You may note Ex-minister John Gormley also referred this issue to the EPA during his time of office. It appears from the enclosed document that bottom ash must be regarded in some circumstances as hazardous waste. The report also makes reference to the health dangers of living beside ash landfills. The report also makes reference to arsenic [one of the many hazardous substances in the ash] in drinking water. May we also remind you that Fingal county Council put in a submission about possible contamination of the nearby public water supply.

Kind Regards
The secretary
Nevitt Lusk Action Group

ENVIRONMENTAL PROTECTION AGENCY
13 SEP 2011

17th JAN 2011

Please confirm that the DEA Waste Classification and Management System: Updated Regulations and Standards will be applied as a criteria to classifying this waste stream and following on from this determining the appropriate waste disposal criteria.

As a second step we would like to draw your attention to the following global debate on the eco-toxicology of incinerator ash which we consider meets the criteria as a hazardous waste. There is currently a very live debate (particularly in the UK and Eurozone) about regulating incinerator bottom ash as hazardous waste and the regulatory authorities are currently trying to finalise their regulations. These centre on some major and legitimate concerns about the use of bottom ash in unbound uses as a replacement for aggregate and this summary touches upon some of the arguments.

1. There is increasingly little doubt that the 'fly ash' has many hazardous waste properties and will need to be treated and disposed of at specialist facilities. Recent research indicates that there are potentially serious health and environmental impacts arising from the landfill disposal of fly ash even in modern containment landfill sites (Macleod, Duarte-Davidson et al. 2006; Macleod, Duarte-Davidson et al. 2007). This shows that the modelled exposure to children around the Wingmoor farm landfill site, one of the major fly ash disposal facilities in the UK, can exceed acceptable intakes of dioxin from the contamination in the fly ash.

2. Whilst the bottom ash is often described as being 'inert' this is incorrect – bottom ash is never classed as 'inert' in the UK. The bottom ash is currently taxed as ***"inactive"*** waste for landfill tax purposes although this may be about to change as the default position in the recent Customs and Excise consultation is that the bottom ash should be taxed at the standard rate of landfill tax.

3. In practice the designation of bottom ash is either as non-hazardous or hazardous

waste. At the end of 2006 the Environment Agency indicated that they had tested some bottom ash samples and: *"Levels of lead and zinc in a number of isolated compliance monitoring samples have exceeded the hazardous waste threshold for H14."*

4. H14 is the hazardous waste criteria for ecotoxicity. Veolia, one of the major incinerator operators, has indicates (Veolia Environmental Services 2007) that when they had tested for metals and then used the recent Environment Agency WM2.2 assessment methodology to determine the whether the wastes were hazardous wastes about 40% of the samples from UK incinerators were found to be hazardous waste under the H14 criteria.

5. This follows increasing concern about the environmental impact of combustion residues in disposal and utilisation, especially for the release of toxic substances such as heavy metals (such as arsenic, cadmium, chromium, copper, mercury, molybdenum, nickel and, particularly in relation to ecotoxicity, lead and zinc) together with soluble salts from the residues (Stegemann, Schneider et al. 1995; Hartenstein and Horvay 1996; Hunsicker, Crockett et al. 1996; Abbas, Moghaddam et al. 2003).

6. The content of toxic metals present in the bottom ash from municipal waste incinerators is usually 10-100 times larger than in natural soils (Theis and Gardner 1990).

7. As a result of the toxicity associated with the heavy metals and other contaminants several researchers have concluded that bottom ash should be classified as a hazardous waste because of the ecotoxic properties it exhibits.

8. Ferrari et al (Ferrari, Radetski et al. 1999) subjected municipal waste incineration bottom ash to a range of ecotoxicity tests in both the leachate and solid phase.

9. Their results clearly demonstrated *"a significant increase in all antioxidant stress enzyme activity levels across all plant tests even at the lowest test concentrations (solid phase and leachate)"*. This was demonstrated to be a good indicator of solid or leachate phase toxicity.

10. As with many other test regimes it is clear from this work that the bottom ash may not prove hazardous in all tests. This indicates that care must be taken with the test regimes and that selective testing could deliver apparently reassuring, and hence misleading, results. For ash to be demonstrated to be hazardous, however, a single failure of an appropriate test is sufficient.

11. Ibáñez et al. (Ibáñez, Andrés et al. 2000) found that all four samples of MSW bottom ash from two incinerators (one in an industrial and the other in a rural area) contained chemicals at or above the hazardous waste range. It should be noted that this study was published even before zinc oxide and chloride had to be considered when assessing the

hazardous classification of ash.

12. More recently the work by Lapa et al (Lapa, Barbosa et al. 2002) on the EC Valomat project concluded: *"all bottom ashes [including sample B1] should be classified as ecotoxic materials."*

13. Radetski et al (Radetski, Ferrari et al. 2004) then investigated the genotoxic, mutagenic and oxidant stress potentials of municipal solid waste incinerator bottom ash leachates and reported: *"The MSWIBA leachates were found to be genotoxic with the Vicia root tip micronucleus assay.*

14. These findings were confirmed by Feng et al. (Feng, Wang et al. 2007):

In this study, our results clearly demonstrated that MSWIBA leachates had genotoxicity on Vicia faba root cells as other researches did (Radetski, Ferrari et al. 2004). Bekaert et al. (1999[1] <#_ftn1>) demonstrated that the aqueous leachates from a landfill of MSWI ash had a significant genotoxicity on the amphibian erythrocytes.

15. UNEP (UNEP and Calrecovery Inc 2005) warned in 2005 that whilst ash from incinerators has been reused in civil engineering works: *"in industrialised countries, the most prevalent method of management is disposal of the ash in lined landfills to control the risk of underground pollution by soluble toxic chemicals leached out of the ash.*

16. UNEP continued: *"Both fly ash and bottom ash contain chemical constituents that pose potential serious risks to operating personnel and the public. The chemical constituents of concern include heavy metals, dioxins, and furans".*

17. Feng expressed surprise about countries that do not include bottom ash on their hazardous waste lists: *However, in many countries and territories (such as USA, some OECD countries, China), Bottom ash is not included in the List of Hazardous Wastes, being dumped into landfills directly or after maturation (Gau and Jeng, 1998; (Ibáñez, Andrés et al. 2000);(Lapa, Barbosa et al. 2002)). Therefore, we suggested that the comprehensive evaluation of the environmental impacts of BA is necessary before decisions can be made on the utilization, treatment or disposal of bottom ash.*

18. Ore et al (Ore, Todorovic et al. 2007) examined the leachate from bottom ash that had been stored outside for six months for weathering (in a similar way to the proposals by Suez) and then used for road construction.

19. They carried out several ecotoxicity tests and found a high initial release of salts and Cu in line with relatively high concentrations in laboratory generated MSWI bottom ash leachates presented in the literature (Meima and Comans 1999; Lapa, Barbosa et al. 2002)

20. A mung bean assay using *Phaseolus aureus* revealed the toxicity of bottom ash leachate - which continued to the final tests three years later, albeit due to different compounds leaching.

21. Leachates with significantly higher concentrations of Al, Cl, Cr, Cu, K, Na, NO2–N, NH4–N, total N, TOC and SO4 were generated in the road-section built on bottom ash when compared to the road-section built with conventional gravel. Compared to the leachate from gravel, the concentrations of Cl, Cu and NH4–N were three orders of magnitude higher, while those of K, Na and TOC were one order of magnitude higher. After 3 years of observations, while the concentrations of most components had decreased to the level in gravel leachate, the concentrations of Al, Cr and NO2–N in bottom ash leachates were still two orders of magnitude higher.

22. The authors concluded that high concentrations of chloride emitted from the road can lead to increased toxicity to the recipient, e.g. for plants, and the bottom ash reused in a road construction could thus have a toxicological impact on the surroundings.

23. A series of ring tests for ecotoxicity methods have been carried out in Europe (Becker, Donnevert et al. 2007; Moser 2008). These included sampling and testing of incinerator bottom ash from a Dutch incinerator (Cu 6,800 mg/kg; Zn 2,639 mg/kg; Pb 1,623 mg/kg) a high pH (about 10.5). The bottom ash was found to be ecotoxic in these tests even after it had been aged for several months (Römbke, Moser et al.).

24. Very recently the UK Highways Agency (Highways Agency 2009) has banned the use of incinerator bottom ash in foaming cement because of a series of explosions on sites caused by hydrogen when the ash has been used (Mann 2009).

25. The Environment Agency has admitted it does not "*have 100% confidence*" in its classification of incinerator bottom ash (IBA) as non-hazardous waste (ENDS 2009).

26. It cannot therefore be assumed that the bottom ash would be suitable for re-use – and, properly assessed much of the bottom ash would almost certainly be hazardous waste.

27. Finally it is noted that even when incinerator bottom ash is 'recycled' only part of the ash can be used. In Hampshire, for example, where particular efforts have been made to increase the acceptability of incineration only about 33% of the ash can be utilised according to Project Integra reports[2] <#_ftn2> . The landfill demand is therefore likely to be higher than suggested by operators.

28. On the basis of the evidence available it is reasonable to conclude that bottom ash should be treated as hazardous waste and that future disposal options represent a potentially high risk and expensive addition to the costs of incineration.

US EPA developments

Similarly in the USA the EPA identified 431 containment units for coal slurry at 162 sites around the country and has labeled 49 of them "high hazard"—meaning they pose a risk to human health and the environment. In October 2009, the agency issued a proposed rule that would have designated the ash as hazardous waste that needed special handling and would be regulated at the federal level.

Additionally there are two potential new rules for public comment: The first (and more stringent) option would categorize coal as a "special waste" and require extra care in the disposal of the waste and tough federal oversight.

The original draft rule states that labeling ash as nonhazardous "would not be protective of human health and the environment."

An assessment [10] prepared for the EPA noted that the cancer risk from drinking water contaminated with arsenic—just one of the many hazardous substances in the ash—is 1,800 times EPA's regulatory limit. The Environmental Integrity Project has been looking extensively at data on contamination, identifying 137 sites where toxic materials have leached into the groundwater. At some sites, they found arsenic and other heavy metals at up to 145 times what is permissible under federal guidelines.

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