June 2017

## PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT

# Padeswood Cement Mill 5 -Health Impact Review

## Submitted to:

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REPORT

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## **1.0 INTRODUCTION**

This health impact review and assessment has been undertaken in accordance with the scope set out in the Screening and Scoping Report prepared by Golder Associates in March 2017 (1773079.500/A.0) and issued to Flintshire County Council. The aim of this review is to summarise the potential health risks associated with the erection of a new vertical roller mill (Mill 5) at Padeswood Cement Works, capable of producing 95 tonnes of cement per hour, 650,000 tonnes per annum and to recommend relevant mitigating measures as required.

## 2.0 BACKGROUND

A comprehensive health impact assessment (HIA) of the existing Padeswood Cement Works (the Site) has been undertaken already following health concerns raised by local community representatives in 2010. Penyffordd Community Council and Buckley Town Council expressed Health concerns including rates of specific cancers, the age and geographical spread of disease, local food production issues and occupational health effects from cement production.

The HIA, led by Public Health Wales, covered baseline health status and health impacts associated with emissions from the Site of dust, noise, particulate matter, oxides of nitrogen, sulphur dioxide, carbon monoxide, metals, dioxins, odour and smoke. The investigation involved more than 80 people from seven organisations<sup>1</sup> and is documented to have taken over 13,000 hours of work at an estimated cost of £480,626<sup>2</sup>.

A summary of the comprehensive HIA is included in this review for information, with additional commentary on how the proposed development might affect the conclusions of the previous assessment and details relevant mitigation measures proposed to reduce risk to human health and the wider environment, if necessary.

## 3.0 REVIEW AND SUMMARY OF PREVIOUS HIA

In March 2010, following the concerns raised by members of Penyffordd Community Council and Buckley Town Council, the Minister for Health and Social Services, Edwina Hart, asked Public Health Wales to work with partner agencies in order to gain a better understanding of health concerns and offer expert advice. Following a period of public engagement, the health concerns were collated and agreed as a set of 87 questions<sup>3</sup> raised by members of local communities and their representatives, and a response team established to investigate and produce answers to the questions raised.

The Investigation Response Team (IRT) established comprised:

- Public Health Wales;
- Betsi Cadwaladr University Health Board;
- Flintshire County Council;
- Environment Agency Wales;
- Food Standards Agency;
- Health Protection Agency Centre for Radiation, Chemical and Environmental Hazards (Wales); and
- Health and Safety Executive.

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<sup>&</sup>lt;sup>1</sup> Hanson Cement Investigation Response Team Terms of Reference, Public Health Wales,

http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.nsf/61c1e930f9121fd080256f2a004937ed/1a5d8047ed1c7ef1802577fc005a21ef/\$FILE/FINAL%20ToR%2001.12.10.doc <sup>2</sup> Estimate of resources used during Hanson Cement investigation April 2010 – July 2012, Public Health Wales, http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.nsf/5633c1d141208e8880256f2a004937d1/a5aaf93cf7c4c0a280257a32004d66f5/\$FILE/Resources%20Used%20During%

http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.nsf/5633c1d141208e8880256f2a004937d1/a5aaf93cf7c4c0a280257a32004d66f5/\$FILE/Resouces%20Used%20During% 20Hanson%20Cement%20Investigation%20v1.pdf

<sup>&</sup>lt;sup>3</sup> Questions of concern to local communities, January 2011, Public Health Wales http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.nsf/85c50756737f79ac80256f2700534ea3/bb73d05a7affab69802577fc0057d728/\$FILE/Community%20Concerns%20v1.

The IRT held seven public meetings during the course of the investigations, each followed up with a press release. Separately, five investigation newsletters were also published. Records of all these documents are available on the Public Health Wales Investigation Library website<sup>4</sup>.

In addition, 14 technical reports were produced by relevant authorities throughout the course of the investigation, as detailed in Table 1. Web addresses for these reports are also provided in Appendix A for reference.

### **Table 1: Supporting Reports**

| Document Title  | Author(s)  | Date<br>Published |
|---|--|-------------------|
| Hanson Cement Investigation: Final Report   | Public Health Wales  | 05-Jul-12         |
| Hanson Cement Investigation: community<br>engagement (Phase 2) report   | Public Health Wales  | Jul-12            |
| HSE response to occupational health concerns<br>raised regarding Hanson Cement employees  | Health and Safety Executive  | 05-Aug-11         |
| Review of Oxides of Nitrogen, Sulphur Dioxide,<br>Carbon Monoxide and Metals (Air Quality and<br>Emissions Data), Hanson Cement, Padeswood,<br>Flintshire | Health Protection Agency - Centre<br>for Radiation Chemical and<br>Environmental Hazards (Wales) | 29-Nov-11         |
| Hanson Cement Investigation Environmental<br>Health Risk Assessment Workstream - Report<br>from the Nuisance Subgroup                                     | Public Health Wales  | Nov-11            |
| Age patterns and health: Supplemental report to<br>'A descriptive analysis of health in the vicinity of<br>the Hanson Cement Plant                        | Public Health Wales  | Feb-11            |
| Hanson Cement Investigation: Draft Report   | Public Health Wales  | 06-Dec-11         |
| Review of Particulates (Air Quality and Emissions Data), Hanson Cement, Padeswood, Flintshire   | Health Protection Agency - Centre<br>for Radiation Chemical and<br>Environmental Hazards (Wales) | 16-May-11         |
| Examining cancer around Hanson Cement with regards to concerns from nearby communities  | Public Health Wales  | 12-May-11         |
| Questions of concern to local communities   | Public Health Wales  | 17-Jan-11         |
| A descriptive analysis of health in the vicinity of the Hanson Cement Plant   | Public Health Wales  | Feb-11            |
| Review of Dioxins (Emissions Data), Hanson<br>Cement, Padeswood, Flintshire   | Health Protection Agency - Centre<br>for Radiation Chemical and<br>Environmental Hazards (Wales) | 06-Jul-11         |
| An assessment of the milk, soil and vegetation<br>samples taken in the vicinity of the Hanson<br>Cement plant between 2004 and 2009                       | Food Standards Agency  | no date           |
| Hanson Cement Investigation: Environment<br>Agency response to Questions of Community<br>Concern  | Environment Agency   | no date           |



<sup>&</sup>lt;sup>4</sup> <u>http://www.wales.nhs.uk/sitesplus/888/page/49608</u>



As detailed in the final report on the investigation<sup>5</sup> the overarching question at the centre of the investigation was "Are emissions from Hanson Cement harmful to health?" The final report concluded that:

- "The Investigation Response Team found no evidence that emissions from Hanson Cement have resulted in harm to physical health."
- "Whilst the particulate and gaseous emissions from Hanson Cement may in themselves present hazards (in that they have the potential to cause harm), the level of risk that they present (i.e. the likelihood that an undesirable event ('harm') will happen) is minimal. The levels of emissions, (apart from exceptions noted below), were within safety limits and so did not pose a risk to health."
- "No evidence of any persistent increase in ill-health was found, but the health of people living near the site was generally as good, or better, than that of those living elsewhere in Wales.

Emissions considered by the investigation comprised particulates (as PM<sub>10</sub>), dioxins, oxides of sulphur, nitrogen and carbon, and metals. Other pollutants of concern were associated with nuisance and included coarse dust, noise, odour and visible smoke. The investigation noted that whilst there were occasional breaches of operational emission limits, - in particular dioxin emissions to air in 2004 and 2008 - the concentration of these emissions, even during breach periods, remained well below health based thresholds. The IRT therefore concluded that:

"The risk of these increased emissions to air to the local community was considered very low."

#### 3.1 Emissions

In terms of pollutant emissions, the investigation team considered in particular:

- Particulates (fine dusts);
- Dioxins;
- Oxides of nitrogen, sulphur and carbon;
- Metals; and
- Nuisance emissions of coarse dust, noise, odour and smoke.

Whilst it is recognised that all of the emissions above have the potential to cause harm to health, investigations by the Health Protection Agency<sup>6</sup>, as summarised in the Final Investigation Report by Public Health Wales<sup>7</sup>, concluded that:

- "There were no exceedance of annual air quality objectives, and therefore no significant direct impact of airborne emissions on public health."
- "High exposures to heavy metals have the potential to impact adversely on health. However, the levels of heavy metals emissions recorded at Hanson Cement generally comply with emission limit values which are protective of health."
- <sup>5</sup> Hanson Cement Investigation: Final Report, July 2012, Public Health Wales les nhs uk:8080/Ha

.nsf/5633c1d141208e8880256f2a004937d1/4bd071b7b78ad63880257a32004d4ce5/\$FILE/Final%20Report%20of%20Han

<sup>6</sup> Review of Particulate Matter (Air Quality and Emissions Data), May 2011, Health Protection Agency - Centre for Radiation Chemical and Environmental Hazards (Wales) 20Partic http://www2.nphs.wales.nhs.uk:8080/Har ulate%20Matter%2016.05.11%20v1.pdf 930f9121fd08 56f2a004937ed/4166 5f/\$FILE/HPA sonCementDocs.nsf/61c1

<sup>&</sup>lt;sup>7</sup> Hanson Cement Investigation: Final Report, July 2012, Public Health Wales <u>http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.nsf/5633c1d141208e8880256f2a004937d1/4bd071b7b78ad63880257a32004d4ce5/\$FILE/Final%20Report%20of%20Hanson%20Cement%20Investigation%20v1.pdf</u>



Review of Dioxins (Emissions Data), July 2011, Health Protection Agency - Centre for Radiation Chemical and Environmental Hazards (Wales) http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.nsf/850 50756737f79ac80256f2700534ea3/b023c8daa64f27ef802579130062d162/\$FILE/HPA%20Review%20of%20Dioxi ns%20Sept%202011%20FINAL.docx

Review of Oxides of Nitrogen, Sulphur Dioxide, Carbon Monoxide and Metals (Air Quality and Emissions Data), November 2011, Health Protection Agency - Centre for Radiation Chemical and Environmental Hazards (Wales)

http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.nsf/85c50756737f79ac80256f2700534ea3/2c6b99b009d0d0dc8025795d00689912/\$FILE/HPA%20Report%20Nox-Sox-Co-metals%20V1.pdf



The Health Protection Agency review of particulate matter<sup>8</sup> found that PM<sub>10</sub> emissions from the Site contributed only a small proportion to regional emissions. In 2008 emissions from point sources on Site equated to only 1.6% of total recorded industrial emissions within 15 miles of the Site. The report concluded that:

- "Air quality with respect to particulate matter in the area around Hanson Cement is good and annual particulate concentrations are lower than the majority of other monitoring positions around Wales."
- "Over the period of the study [2001-2009] there has been a marked reduction in air pollution from particulate matter measured across the UK. This improvement is mirrored at the monitoring sites around Hanson Cement works, with trends showing continued improvements in air quality over the study period."
- "Across the UK this improvement is primarily attributed to better controls on both industrial emissions and those from road traffic. The tightening of emission controls is mirrored at Hanson Cement."

General air quality in the area around the Site was found to be "good, and improving". The report states that there were occasional breaches of site specific emission limit values (ELVs) for dioxins in 2004 and 2008, and oxides of nitrogen from Kilns 1 and 2 between 2002 and 2003. However, as noted, these operational permit limits are set well beneath health thresholds and as such a breach of an ELV does not correspond with a significant risk to health. Additionally, Site specific ELVs for metals were also occasionally breached, but remained compliant with general regulatory limits.

In regard to nuisance emissions of dust, noise and odour, the final report from Public Health Wales<sup>9</sup> concluded that:

"Nuisance exposures indicate that there is an impact on the community, although environmental sources other than Hanson Cement may also play a part. However, based on the data and information received, such effects are likely to be annoyance related, impacting upon broader wellbeing and quality of life, and unlikely to affect physical health."

Complaints have been received by the Site relating to dust nuisance; however an assessment of dust samples collected at the time of complaints indicated that the majority of samples taken could not be attributed to the Site, with 78% of samples being made up instead of "weathered natural minerals, pollen, organic fibres, salt and 'general dust'."

With respect to noise nuisance, the investigation found only two locations where ambient night-time noise levels exceeded permitted levels. Whilst acknowledged that these occasions gave rise to anxiety and concern to local residents, the report noted that the Site has subsequently undertaken a major improvement programme to reduce noise emissions from the Site. Reference was made to the ongoing noise monitoring and management programme operated by the Site, which includes monthly boundary monitoring.

In terms of odour nuisance, it was noted that a 2008 study by Hanson Cement and the Environment Agency found that 29 of 39 complaints could not be attributed to the Site due to either wind direction at the time of the complaint, or other sources being identified as the cause. Although inconclusive, the few relevant complaints indicate that the likely source of odour emissions from the Site would be the high level chimney associated with Kiln 4.

Emissions of 'smoke' from the Site were reported to be water vapour. Weather conditions were noted as determining the visibility of the plume, with a note that location in relation to the sun would determine the visible colour of the plume; back lit plumes appearing darker, and perhaps resembling smoke.

<sup>&</sup>lt;sup>9</sup> Hanson Cement Investigation: Final Report, July 2012, Public Health Wales http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.nsf/5633c1d141208e8880256f2a004937d1/4bd071b7b78ad63880257a32004d4ce5/\$FILE/Final%20Report%20of%20Han http://www2.nphs.wales.nhs.uk:8080/HansonCer son%20Cement%20Investigation%20v1.pdf



<sup>&</sup>lt;sup>8</sup> Review of Particulate Matter (Air Quality and Emissions Data), May 2011, Health Protection Agency - Centre for Radiation Chemical and Environmental Hazards (Wales) %20Partic http://www2.nphs.wales.nhs.uk:8080/HansonCulate%20Matter%2016.05.11%20v1.pdf 30f9121fd080256f2a004



## 3.2 Community Health

In general, health in the areas near to the Site was found to be good or better than in other areas typical of Wales.

Concerns about high incidences of cancer were also allayed by a report from the Welsh Cancer Intelligence and Surveillance Unit<sup>10</sup>, which analysed cancer incidence using three methods over a diagnosis period of 18 years (1991 – 2008). The report concluded that:

- "The vast majority of analyses show that incidence (rate of new diagnoses) of cancers in the seven areas closest to the Hanson Cement plant are similar to those of Wales and Flintshire."
- "The analysis has detected no consistent pockets of cancer or cancer type over time."
- "There is no consistent information that can be found to confirm the concerns of local communities that cancer clusters of statistical significance occur in the vicinity of the cement plant."

Similarly, a study carried out by Public Health Wales Observatory found there to be no evidence of increased levels of acute respiratory disease, or other acute health problems in the communities surrounding the Site<sup>11</sup>.

## 3.3 Occupational Health

To address concerns raised regarding occupational health exposure, the Health and Safety Executive (HSE) was asked to consider its records for the Site, dating back to 1995, and to send a team of inspectors to audit operations. In their report<sup>12</sup>, HSE concluded that:

- "The evidence from HSE's inspection history indicates that the current risks from exposure to hazardous substances are generally well controlled at the Padeswood site. Occupational health provision exceeds current legislative requirements."
- "It is not possible to rule out a contribution of past exposures at the plant to subsequent development of disease in the workforce. Sometimes by carrying out an epidemiological investigation it is possible to determine whether there is an occupational cause for ill-health. In this case HSE has identified no reason for carrying out such an investigation...because of the size of the workforce, the sample size would be too small to enable robust conclusions about causation to be reached."
- "HSE has decided that further investigation of occupational health issues are not warranted based on current information."

HSE also notes in their final report that: "If the manufacturing process changes that would prompt a need for the company to re-assess any consequent risks to the health of the workforce and the need to consider different or additional controls."

# 4.0 SUMMARY OF POTENTIAL HEALTH IMPACTS FROM THE PROPOSED DEVELOPMENT

The proposed development comprises the demolition of existing cement storage and loading facilities and the erection of a new vertical roller mill (Mill 5) capable of producing 95 tonnes of cement per hour or 650,000 tonnes per annum. The new Mill 5 is being installed in response to increasing national demand. The Padeswood Site is currently utilising all of its milling capacity, with excess clinker being transported by road to

<sup>12</sup> HSE HSE occupational health 2011, response to concerns raised regarding Hanson Cement employees, August http://www2.nphs.wales.nhs.uk.8880/HansonCementDocs.nst/85c5075673179ac80256f2700534eadq98025795d006862d4/\$FILEHSE\$%20Report%20Final%20De c%202011.pdf



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<sup>&</sup>lt;sup>10</sup> Examining cancer around Hanson Cement with regards to concerns from nearby communities, May 2011, Public Health Wales http://www.wcisu.wales.nhs.uk/sitesplus/documents/1111/WCISUCancerAnalysisHansonCement.pdf

<sup>&</sup>lt;sup>11</sup> A descriptive analysis of health in the vicinity of the Hanson Cement Plant, February 2011, Public Health Wales Observatory http://www2.nphs.wales.nhs.uk:8080/PubHObservatoryProjDocs.nsf/0/ac6ceb5269a46ab480257829003f269c/\$FILE/20100831



other cement works for grinding and onward sale. By installing Mill 5, the milling capacity of the Site will be increased such that the need to transport clinker is eliminated.

On completion of the proposed development, existing Mills 1, 2 and 4, which utilise older technologies for the manufacture of packed cement will be mothballed. The Site will then operate the proposed Mill 5, with existing Mill 3 – the most modern and efficient of the existing four mills – providing back up and/or spare capacity in the event of future upturns in market demand. The proposed maximum capacity for Mill 5 on completion of the proposed development project is 650,000 tonnes per annum.

Additional infrastructure associated with the proposed development includes a rail loading facility and modification to and extension of existing railway line, together with other ancillary development including three steel cement storage silos, belt conveyors and pneumatic pipelines.

The proposed development does not introduce any new processes and as such is not anticipated to have any significant adverse impact on health or the environment. Instead, vertical roller milling is known to have a number of advantages over the existing grinding technologies employed at the Site, including:

- 30-50% less energy use;
- Reduced vibration, with associated lower levels of wear;
- Reduced water use (less needed for water injection and pre-hydration);
- Improved particle size distribution in final product; and
- Higher powder flowability of the finished cement, resulting in improved de-loading of silos and trucks (i.e. less residues in vessels).

The new rail loading facility will enable between 4,000 and 5,000 tonnes of cement to be transported from Site by rail each week and will result in the use of best available techniques to minimise the potential for dust emissions during the loading of train tankers and an energy efficient loading system. The removal by rail of finished product is anticipated to remove 31 heavy vehicle movements from the surrounding local roads per day.

The proposed development represents a like for like change to the milling process, albeit with the proposed new Mill 5 being a more efficient and modern technology than the Mills (1, 2 and 4) it is replacing. There is no proposed change to the kiln processes on Site, which are the most relevant processes in terms of many of the emissions and impacts covered by the HIA.

### 4.1 Emissions

The previous HIA concluded that there have been no exceedances of annual air quality objectives, and therefore no significant direct impact of airborne emissions from the Site on public health.

The Site is operated in line with Environmental Permit (EP) EPR/BL1096IB which requires monitoring of all significant emissions, comprising:

- Kiln stacks:
  - Continuous monitoring for total particulate matter, carbon monoxide, sulphur dioxide, hydrogen chloride, oxygen, moisture, nitrogen oxides (as NO<sub>2</sub>), ammonia, and volatile organic compounds (as TOC); and
  - Spot sampling twice per year for metals (cadmium, thallium, mercury, antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium), dioxins and hydrogen fluoride.
- Cement mills and clinker cooler:
  - Continuous monitoring for total particulate matter.





The proposed development reflects a change only to the cement mills – as such the majority of emissions monitoring, and indeed the emissions, will remain unchanged.

Total particulate matter emission concentrations from the proposed Mill 5 are predicted to be less than emission sources recorded from the existing mills 1, 2 and 4.

The haulage of product by train, rather than by road transport, will also act to reduce emissions from road transport, removing 31 heavy vehicle movements from the surrounding local roads per day.

## 4.2 **Community health**

It is not anticipated that community health will be in any way adversely affected by the proposed development. There is likely to be a positive impact on local communities as a result of the project because:

- Predicted particulate concentrations with the new cement mill are less than existing emission sources; and
- The new rail loading facility will remove 31 heavy vehicle movements from the surrounding local roads per day.

Additionally, there is unlikely to be discernible changes in noise levels at nearby receptors when Mill 5 is operational than the existing situation.

### 4.3 Occupational health

UK Construction & Health and Safety standards will be applied to the existing designs as part of the engineering process for use in the UK.

In line with the recommendations from HSE in their August 2011 report<sup>13</sup> Hanson will re-assess any risks to the health of the workforce as a result of the installation of Mill 5 and consider the need for different or additional control measures in line with their occupational health and safety management system, accredited to OHSAS 18001.

### 5.0 MITIGATION MEASURES

The Site is and will continue to be operated in line with EP reference EPR/BL1096IB (as amended). A permit variation application will be submitted to Natural Resources Wales setting out in detail the proposed changes in operations and associated changes to emissions from the Site. Existing ELVs for the Site will be reviewed by Natural Resources Wales and appropriate changes made to the EP conditions with which the Site has to maintain compliance.

As part of the EP variation application, existing management plans for noise and odour emissions from the Site will be updated.

http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.nsf/85c50756737f79ac80256f2700534ea3/010a6020282adef98025795d006862d4/\$FILE/HSE%20Report%20Final%20De c%202011.pdf



<sup>&</sup>lt;sup>13</sup> HSE response to occupational health concerns raised regarding Hanson Cement employees, August 2011, HSE



## **Report Signature Page**

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# **APPENDIX A**

References





### APPENDIX A References

| Document Title  | Author(s)   | Date Published |   |
|---|---|----------------|---|
| Hanson Cement Investigation: Final Report   | Public Health Wales   | 05-Jul-12      | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/5633c1d141208e8880256f2a004937d1/4bd071b7b78a<br>d63880257a32004d4ce5/\$FILE/Final%20Report%20of%20<br>Hanson%20Cement%20Investigation%20v1.pdf |
| Hanson Cement Investigation: community engagement (Phase 2) report  | Public Health Wales   | Jul-12         | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/5633c1d141208e8880256f2a004937d1/5529220146a0<br>4e4f80257a32004d2278/\$FILE/Community%20Engageme<br>nt%20Phase%202%20Report%20V1.pdf           |
| HSE response to occupational health concerns raised regarding Hanson Cement employees   | Health and Safety Executive   | 05-Aug-11      | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/85c50756737f79ac80256f2700534ea3/010a6020282ad<br>ef98025795d006862d4/\$FILE/HSE%20Report%20Final%2<br>0Dec%202011.pdf                          |
| Review of Oxides of Nitrogen, Sulphur Dioxide,<br>Carbon Monoxide and Metals (Air Quality and<br>Emissions Data), Hanson Cement,<br>Padeswood, Flintshire | Health Protection Agency -<br>Centre for Radiation Chemical<br>and Environmental Hazards<br>(Wales) | 29-Nov-11      | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/85c50756737f79ac80256f2700534ea3/2c6b99b009d0d<br>0dc8025795d00689912/\$FILE/HPA%20Report%20Nox-<br>Sox-Co-metals%20V1.pdf                      |
| Hanson Cement Investigation Environmental<br>Health Risk Assessment Workstream - Report<br>from the Nuisance Subgroup                                     | Public Health Wales   | Nov-11         | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/85c50756737f79ac80256f2700534ea3/0ae92e73aee1c<br>1e98025795d00680c19/\$FILE/Report%20from%20Nuisanc<br>e%20Sub%20Group%20November%202011.pdf   |
| Age patterns and health: Supplemental report<br>to 'A descriptive analysis of health in the<br>vicinity of the Hanson Cement Plant                        | Public Health Wales   | Feb-11         | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/85c50756737f79ac80256f2700534ea3/ddd495f2a36f7c<br>e88025795e00345a5c/\$FILE/Additional%20health%20ana<br>nlysis%20document%20FINAL.pdf         |





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| Hanson Cement Investigation: Draft Report   | Public Health Wales   | 06-Dec-11      | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/85c50756737f79ac80256f2700534ea3/e905a3ecf49c17<br>fb8025795e003e6ab8/\$FILE/Draft%20Hanson%20Cement<br>%20Investigation%20Report%20v1%2006.12.2011.docx |
| Review of Particulates (Air Quality and<br>Emissions Data), Hanson Cement,<br>Padeswood, Flintshire | Health Protection Agency -<br>Centre for Radiation Chemical<br>and Environmental Hazards<br>(Wales) | 16-May-11      | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/61c1e930f9121fd080256f2a004937ed/4166cae77788d<br>96f80257893004db55f/\$FILE/HPA%20Review%20of%20P<br>articulate%20Matter%2016.05.11%20v1.pdf            |
| Examining cancer around Hanson Cement<br>with regards to concerns from nearby<br>communities        | Public Health Wales   | 12-May-11      | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/61c1e930f9121fd080256f2a004937ed/aa35445e09f7ae<br>5f80257893004de388/\$FILE/WCISU%20Cancer%20Analy<br>sis%20Report%2012.05.11%20v1.doc                  |
| Questions of concern to local communities   | Public Health Wales   | 17-Jan-11      | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/85c50756737f79ac80256f2700534ea3/bb73d05a7affab<br>69802577fc0057d728/\$FILE/Community%20Concerns%20<br>v1.pdf   |
| A descriptive analysis of health in the vicinity of the Hanson Cement Plant                         | Public Health Wales   | Feb-11         | http://www2.nphs.wales.nhs.uk:8080/PubHObservatoryProj<br>Docs.nsf/0/ac6ceb5269a46ab480257829003f269c/\$FILE/2<br>0100831_HansonDescriptiveAnalysis_Full_Document_v1d.<br>pdf  |
| Review of Dioxins (Emissions Data), Hanson<br>Cement, Padeswood, Flintshire                         | Health Protection Agency -<br>Centre for Radiation Chemical<br>and Environmental Hazards<br>(Wales) | 06-Jul-11      | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/85c50756737f79ac80256f2700534ea3/b023c8daa64f2<br>7ef802579130062d162/\$FILE/HPA%20Review%20of%20D<br>ioxins%20Sept%202011%20FINAL.docx                  |





### APPENDIX A References

| Document Title  | Author(s)             | Date Published |   |
|---|-----------------------|----------------|---|
| An assessment of the milk, soil and vegetation<br>samples taken in the vicinity of the Hanson<br>Cement plant between 2004 and 2009 | Food Standards Agency | no date        | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/85c50756737f79ac80256f2700534ea3/dbe62ef30351b<br>7f0802579130062f7df/\$FILE/FSA%20Food%20Chain%20<br>Dioxins%20Report%20Final%20Sept%202011%20ENGLIS<br>H%20.doc |
| Hanson Cement Investigation: Environment<br>Agency response to Questions of Community<br>Concern                                    | Environment Agency    | no date        | http://www2.nphs.wales.nhs.uk:8080/HansonCementDocs.<br>nsf/85c50756737f79ac80256f2700534ea3/82962509655dc<br>e3a802579130061735d/\$FILE/EAW%20Response%20to%<br>20Questions%20of%20Community%20Concern.pdf                   |



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