



Report to Community and Quality of Life Scrutiny Committee

Subject: Incinerator Review

Date: 21st March 2007

Author: Scrutiny Officer

1. Purpose of the Report

To update members on the progress of the scrutiny working group's review into incineration.

2. Background

This review commenced in October 2006 and a final report was drafted in March 2007.

3. Proposal

That working group members read the attached report and endorse the recommendations made by the Chair of the working group.

4. Recommendations

That this report and its recommendations be passed onto to the Portfolio Holders for Direct Services and Property and Agenda 21 Crime and Community Development- Councillors R. Nicholson and I. Gollop for their consideration for implementation.

That an article is prepared for the Council's Contacts magazine to inform the public of the outcome of this review.

That a press release is prepared outlining the outcome of this review.



Report to Community and Quality of Life Scrutiny Committee

Subject: Incinerator Review

Date: 21st March 2007

Author: Scrutiny Officer

1.0 Purpose of the Report

- 1.1 To inform members of the evidence gathered by this working group and its final recommendations.

2.0 Background

- 2.1 This working group comprises Councillors C. Preston (Chair), W. Peet, S. Prew-Smith, V. Bradley and A. Rigby. This review has also been supported by T. Lack (Scrutiny Officer) D. Parton (Head of Direct Services) and A. Callingham (Environmental Protection Manager).

3.0 The scope of the review

- 3.1 The working group was established to explore whether proposals to build and extend waste disposal incinerators close to the borders of Gedling Borough could have an impact on the quality of life of the borough's residents.

The working group sought to investigate some of the evidence available on the environmental impact of incinerators, both from available literature and also any information published about the existing Eastcroft incinerator in terms of its emissions and related health impacts. The group also chose to consider the relative health benefits of building another Energy Recovery Facility (ERF) incinerator compared to any adverse health impacts. As part of the overall health and environmental impact assessment, consideration was also given to the impact that any additional travel might incur in respect of Gedling's refuse collection freighters taking more waste to the existing incinerator and the diversion of further waste to the new ERF. In particular, the group aimed to scrutinise the costs and benefits associated with using an incinerator in the centre of Nottingham compared to other proposed means of disposal. The group's scope is attached at Appendix 1.

4.0 Information gathering

- 4.1 The working group gathered various data relating to incineration and waste disposal. This included briefing and academic papers, information from single interest (activist) groups, presentations from statutory agencies and some news media.

The group also considered the information derived from the work they commissioned from a technical consultant employed by the Association for Public Service Excellence (APSE).

- 4.2 Veolia Press release: County trims its wasteline with new contract- 28th June 2006
- 4.3 Nottingham Eastcroft Municipal Waste Incinerator Application for IPPC Permit- Waste Notts (Reclamation) March 2003
- 4.4 Nottingham Against Incineration and Landfill (N.A.I.L): People Power Planning Application - Unanimously Rejected- We fought tooth and N.A.I.L.- November 2006
- 4.5 Nottingham Evening Post: Wrangle over claim landfill 'full by 2010'- 8th November 2006
- 4.6 Mansfield Chad: Incinerator fight is taken to parliament- November 2006
- 4.7 Nottingham Evening Post: Give your view on energy ideas- November 2006 (a press release issued by the working group to encourage public comments)
- 4.8 Gedling Borough Council intranet news page: Council Committee Invites Views on Incinerator- 10th November 2006 (a more expansive press release issued by the working group to encourage public comments)
- 4.9 Nottingham Health Action Team / Nottingham City Primary Care Trust (P.C.T.): report of the Health Impact Assessment (HIA) of the Proposed expansion to the Incinerator at Eastcroft, Nottingham- Helen Ross- Public Health Development Officer- March 2006
- Nottingham Health Action Team / Nottingham City (P.C.T.): Briefing paper- Environmental Health Impact Assessment of the proposal to build a second incinerator (ERF) on the boundary of the borough- Helen Ross- Public Health Development Officer- 5th December 2006
- 4.10 Nottingham County Primary Care Trust (P.C.T.) Dr Mary Corcoran- Public Health Consultant provided the following-

Friends of the Earth Briefing papers: Pyrolysis and gasification- October 2002

Friends of the Earth Briefing paper: Anaerobic digestion- November

2004

Friends of the Earth Briefing paper: Biowaste- A guide for local campaigners- March 2005

- 4.11 A site visit to Eastcroft incinerator- off Cattle Market Road, Nottingham. Waste recycling group / Eastcroft incinerator: An introduction to the Eastcroft Energy from Waste Facility- presentation by John Green- Eastcroft Incinerator Site Manager- 18th December 2006
- 4.12 Veolia Environmental Services: Nottinghamshire - Leading the way in Waste Management- presentation by Edward Thomas- Project Director Veolia- 18th December 2006
- 4.13 Question and answer session: Malvin Trigg- Assistant Director Communities Department Nottingham County Council and Edward Thomas Project Director Veolia- 18th December 2006
- 4.14 Information / fact finding session: Martin Thurman Head of Operations and Councillor Eddie Smith Portfolio Holder for Environment- Mansfield District Council- 17th January 2007
- 4.15 Environment Agency: Regulation of Incinerators by the Environment Agency- presentation by Tanya Montgomery- Regulatory Officer- 25th January 2007
- 4.16 Information / fact finding session: Andy Stratham- Head of Housing and Environmental Services, Antony Greener- Cleansing and Recycling Manager, Councillor Nora Armstrong Portfolio Holder for Environment- Newark and Sherwood District Council- 13th February 2007
- 4.17 Newark and Sherwood District Council: Briefing Paper- Energy Recovery Incineration by Antony Greener- Cleansing and Recycling Manager- 21st November 2006

Review of Environmental and Health Effects of Waste Management: Municipal Solid Waste and Similar Wastes- Extended Summary- Enviro, The University of Birmingham, Department for Environment Food and Rural Affairs (DEFRA)- May 2004

The Health Effects of Waste Incinerators: 4th Report of the British Society for Ecological Medicine- moderators Dr Jeremy Thompson and Dr Honor Anthony- December 2005

- 4.18 APSE Best Value Consultancy: Health Impact of Incineration Gedling Borough Council- Draft February 2007

5.0 Findings

- 5.1 The working group acknowledge that the information detailed in the press release issued by Veolia on the 28th June 2006 (4.2) was useful in informing the working group's scope (Appendix 1).

- 5.2 The working group note that the Nottingham Eastcroft Municipal Waste Incinerator Integrated Pollution Prevention and Control Permit (IPPC) Application document (4.3) details the predicted impact of the proposed additional line at Eastcroft on air and land quality. It is the informational document that the Environment Agency uses who permit the process.
- 5.3 The working group acknowledge the campaign lead by the Nottingham Against Incineration and Landfill (N.A.I.L) group. This group which was established by some local environmental campaigners and launched in November 2002 states that “It aims to ‘nail’ the dirty habits of the last century of burning and burying waste”. NAIL includes members from the Greenpeace, Nottingham Friends of the Earth, Nottingham Green Party and Clean Air for Sneinton and Bakersfield (CABS) affiliations. The working group note the information items detailed on NAIL’s extensive website which suggests that there are health implications from incinerator emissions and highlights the various incidences when Eastcroft has breached the stipulated limits for emissions. The group also recognise that N.A.I.L believes that the Eastcroft expansion will result in a concomitant increase in waste refuse traffic resulting in further environmental damage. Similarly, N.A.I.L believe that the 26-year PFI waste disposal contract will undermine the promotion of a waste minimisation programme that they feel is necessary for a fall in residual waste. The working group understand that fundamentally NAIL support the Waste Management Hierarchy; Reduce → Reuse → Recycle which is widely understood to represent the most desirable waste management options.

The working group understand that N.A.I.L has recently merged with the M.A.I.N (Mansfield Against Incineration) group. The working group note that M.A.I.N has suggested that incineration is more strictly regulated in Europe compared to Great Britain and that Europe does not incinerate recyclable waste. The group note that M.A.I.N suggests that the ash waste by-product from incineration is detrimental to the environment i.e. air and soil. The working group note that this correlates with the information detailed in one of the papers also reviewed (4.17- The Health Effects of Waste Incinerators: 4th Report of the British Society for Ecological Medicine) which cites various studies that demonstrate the connection between health damage e.g. hospital admissions etc, and waste incineration. The group recognise the need for continual vigilance in the monitoring and recording of adverse health impacts to populations working at and living in close proximity to incineration plants.

- 5.4 The working group note the feature in the Nottingham Evening Post Newspaper (4.5), which reports that there is probably more capacity than originally estimated in the County’s landfill sites to take household, commercial and non-hazardous industrial waste. However, the group accept there are still finite limits regarding the amount of waste that can actually be land filled and acknowledges this information in context of other waste disposal options.
- 5.5 The working group acknowledge the feature in the Mansfield Chad Newspaper (4.6), which reports on public opposition to the proposed

ERF at Rufford by some local residents- the Rainworth Action Group (RAG). The group note RAG's lobbying of the Environment Secretary (D. Miliband) with representatives from other UK based anti-incineration groups.

- 5.6 The working group note that their press release detailed in the Nottingham Evening Post 'Give view on energy ideas' (4.7) was written to encourage public (and single issue interest group) comments and participation in this review. Unfortunately this did not yield any responses.
- 5.7 The group also understand that their information item featured on the Gedling Borough Council intranet news page: Council Committee Invites Views on Incinerator (4.8) did not elicit any views from the public either.
- 5.8 The working group acknowledge the report of the Health Impact Assessment (HIA) of the Proposed expansion to the Incinerator at Eastcroft, Nottingham. The group recognise that in summary this report concludes that 'The scientific evidence states that there would no significant negative impact on the health of the population living in the vicinity of the proposed incinerator expansion.' However, the group note that the report does make some recommendations in respect of the qualitative evidence it has gathered. This evidence suggests that the expansion (at Eastcroft) would result in a negative impact on (local) social, environmental and economic factors as people respond to perceptions which could in turn, exacerbate existing health inequalities.

The working group note the associated briefing paper- Environmental Health Impact Assessment of the proposal to build a second incinerator (ERF) on the boundary of the borough. The working group acknowledge the content of the briefing paper which details various sources of information to assist working group members with this review. The working group are aware that both the HIA report and briefing paper are considered in the APSE consultant's report (5.16. / Appendix 5).

- 5.9 The working group note all the information detailed within three Friends of the Earth (FOE) Briefing papers- Pyrolysis and gasification, Anaerobic digestion, and Biowaste- A guide for local campaigners. These outline more sustainable methods for disposing of waste which FOE suggest have less environmental and health impacts. These include methodologies using less oxygen resulting in fewer emissions, reduced travel and associated traffic pollutants and potential alternative energy sources.
- 5.10 The working group acknowledge the comprehensive presentation given by the Eastcroft Incinerator Site Manager prior to their tour of this facility. It was noted that the 'Eastcroft Energy from Waste' (EfW) Facility utilises residual waste to replace non-fossil fuels in the Eastcroft power plant to generate energy for a district heating scheme and electricity supplied to the local grid.' The Eastcroft facility has operated

since 1973 and has since been retrofitted to comply with various pieces of environmental legislation. It is currently owned by the Waste Recycling Group. The working group recognize that Eastcroft's operation is overseen and controlled by an integrated computer system and that all emissions are monitored continuously and recorded in the control room- as was observed by the group. The working group are aware that Eastcroft incinerator currently operates to meet or exceed the current Environment Agency and European regulatory limits. Whilst the group acknowledge that Eastcroft has never been prosecuted by the Environment Agency, the group are aware of the occasional breaches of these limits at the incinerator; (exceeded emission levels- 2005-8 times, 2004-6 times, 2003-3 times and 2006-3 times). The working group understand that the Environment Agency's approach to breaches is one of 'proportionality' and 'consistency' and that when breaches occur, corrections have to be made and remedial actions taken to mitigate the likely hood of similar occurrences in the future. The working group note that when minor breaches occur the Eastcroft site can be closed down within thirty minutes.

The working group are aware that whilst there is scope for expanding Eastcroft's operation- a recent planning application submitted to Nottingham City Council (for a Third Line extension) was turned down on the grounds of the effect on sustainable regeneration of the city (i.e. the Waterside Regeneration Zone), not because of identified environmental or health concerns. The group understand the Waste Recycling Group are appealing against this decision. The working group's tour of the Eastcroft facility was recognized as being instructive and helped them consider many issues and their local context.

- 5.11 The working group note the context setting presentation given by Edward Thomas- Project Director Veolia, 'Nottinghamshire- Leading the way in Waste management' which also outlined Veolia's various global and national markets. The group understand that Veolia operate 6 ERF's in the UK and 2 more are planned, of which one is proposed for the site at Rufford. The working group acknowledge the various data outlined within the presentation about the operation of ERF's including the statement that 'actual emissions are typically well below the permitted level'. The group are aware that Veolia has a contract to manage waste and recyclables with Nottingham County Council (the waste disposal authority) for another 26 years. It was noted that Veolia believes that the proposed ERF could have a positive environmental impact in terms of regeneration by encouraging new businesses to the Rufford site and surrounding area.
- 5.12 The working group note the various information derived from a question and answer session with representatives from Nottingham County Council and Veolia (Appendix 2). In particular the working group understand that Nottingham County Council anticipates that their 26-year contract with Veolia will achieve a recycling and composting rate of 52% by 2020. It is recognised that the increasing recycling levels / targets are informed by regional and national waste strategies and the group recognise that this is a positive trend. It was also reported that

the newly commissioned ERF facilities (i.e. as planned at Rufford) are safer in terms of their technology and design. Whilst the group are reassured that new ERF facilities are structurally improved they note that Veolia only gave a brief response to the question relating to the environmental impacts of incineration (question 2 Appendix 2).

- 5.13 The working group note the information / fact finding session with representatives from Mansfield District Council (Appendix 3). It is recognised that they too, are reassured by the improved technology in the new ERF's- and have been further convinced of this after visiting such a site in Hampshire. Whilst the group understand that a political (Member) perspective on incineration has not yet been agreed upon at Mansfield, their officers support incineration as an environmentally acceptable method of waste disposal (with recycling being the first choice). The working group recognize that Mansfield Council does not perceive there will be any problems with increased waste freighter traffic, more that existing freighters will be potentially re-routed to Rufford. It was acknowledged that one of the initial proposed sites for the new ERF in Nottinghamshire was to be at Crowne Farm Industrial Park at Forest Town (Mansfield) and that this was turned down due traffic concerns in certain neighbourhoods and the very close proximity of residential housing. The group also note the opposition by RAG at Rufford also as detailed in (5.5).
- 5.14 The working group acknowledge the presentation given by the Environment Agency. The group understand that part of the Environment Agency's role is to monitor air quality (emissions) to oversee health and environmental impacts. At present the Agency has issued two permits for Eastcroft- one for the main incinerator and one for a smaller incinerator on the same site which is operated by 'White Rose' for the disposal of clinical waste. The working group are aware that the permitting process involves Eastcroft incinerator operating in accordance with the 'Pollution Prevention and Control Regulations 2000' and the 'Waste Incineration Directive (UK Regulations 2000)'. The group note that the Agency regulates the Eastcroft facility by continuous monitoring, extractive sampling, quarterly reports (reflecting daily emissions), inspections and unannounced check monitoring. The group understand that the various checks on Eastcroft incinerator form a 'compliance history' and as such this reflects the three recent thirty-minute periods (in January 2006) when emissions exceeded the prescribed limits. The working group understand that any breaches (these have to be reported within 24 hours) are considered by the Agency in terms of their severity and overall compliance history. It is noted that the Agency felt these three breaches of carbon monoxide limits were not as serious as reported in the media.

In particular, the working group note that the Eastcroft incinerator has to use 'Best Available Techniques' (BAT's) and as such emissions are significantly lower than they were in the 1970's (this is also corroborated in the APSE consultant's report- Appendix 5- 1.8). However, subject to the new ERF at Rufford going ahead- the Agency believes that some former users of Eastcroft will have to travel to the

new ERF (due to capacity issues) therefore extra traffic and road use will probably ensue (evidence to suggest this is also highlighted in the APSE consultant's report- 5.2).

- 5.15 The working group note the information / fact finding session with representatives from Newark and Sherwood (N&S) District Council (Appendix 4). The group understand that N&S District Council seemed satisfied with the safety of the newly designed ERF's after a recent visit (with Mansfield District Council) to an ERF in Hampshire. They reported that this was 'technologically well advanced' and 'tightly controlled' (regulated). The group note that whilst N&S District Council are happy with the preliminary draft of the Environmental Impact Assessment for the proposed ERF at Rufford, they will be holding a open meeting (impartially facilitated) to meet with Veolia, Friends of the Earth and P.A.I.N. (People Against Incineration). From a safety standpoint it was acknowledged that Veolia can apply for extra funds from Nottingham County Council (as part of the current contract) to retrofit additional emission abatement equipment at Rufford should more stringent legislation require this. However, it was also observed that the Rufford PFI (Public Finance Initiative) contract does tie the boroughs / districts into providing waste, and should extra transport have to be organised to enable this- then there could be increased environmental / health concerns. The group recognise that this has to be considered in respect of whether lorries can 'bulk up' (i.e. make fewer journeys but carry heavier loads) and the use of waste transfer stations.

When reviewing the three papers provided by N&S District Council (4.17), the working group note that both the N&S officers and Members are very well informed regarding the history and process of incineration, current developments and ERF facilities, emissions and the concerns relating to environmental and health impacts and alternative waste technologies.

In further scrutinising these three papers the working group acknowledge the adverse health impacts to the human food chain that result from dioxins (a waste by-product of incineration). These can include carcinogenic, reproductive and immune system changes / damage which also disproportionately affect the unborn and very young. The working group understand that whilst there is little evidence of increased cancer cases amongst those living close to incinerators; the more deprived wards in Nottingham city have a higher than (regional) average cancer rate, which includes those in proximity to Eastcroft i.e. Sneinton. The group note that this is highlighted in the Health Impact Assessment (HIA) of the Proposed expansion to the Incinerator at Eastcroft, Nottingham (4.9). The working group also understand that one of the stated benefits of ERF units is that they produce electricity. The group recognise an alternative view (ref i) which suggests that in fact ERF's are an inefficient method of producing electricity because to replace the materials burnt requires far more energy than that which is gained (generated) from burning waste and that producing electricity (with the ERF process) can add to global warming; use up recyclable resources, add to air and soil pollution and

therefore cause environment and health damage.

- 5.16 When reviewing the information detailed in the report commissioned from a specialist consultant for this review (4.18 / Appendix 5) the working group note that -

Gedling Borough Council could achieve longer term recycling targets by introducing a kitchen waste collection service (Appendix 5- ref 5.6.4). The working group note that the progression of such a scheme is problematic in that central government will not give local authorities advice on kitchen waste collection due to recent food scares i.e. foot and mouth disease.

The estimated additional vehicle and labour costs of £75,513 for Gedling Borough Council to dispose of its residual waste at the Rufford ERF (Appendix 5- ref 5.0), is they believe, contextually insignificant when wanting to avoid the use of landfill sites. Whilst the working group recognise that the Council will have to fund these potential costs, the Council will save approximately £30,000 through the reduction in vehicle maintenance cost as a result of less vehicle damage at landfill.

The salient points detailed (Appendix 5- ref 3.4.1.3) are significant in their suggestion of there being potential detrimental health impacts from incineration prior to a subsequent and critical 97% cut in dioxin emissions.

That since the 97% cut in dioxin emissions following the introduction of revised regulations in 2002 that required facilities such as Eastcroft to be significantly upgraded, that any health effects from the emissions have been largely eliminated.

The working group are not able to act upon or make any recommendations based upon certainties relating to the safety or detriment of incineration processes and can only interpret the inconclusive evidence as reflected in the consultant's report (Appendix 5- ref 3.5.7).

6.0 Summary findings

- 6.1 The first aim of this review- 'to research the environmental and health impacts of incineration and energy recovery facilities and the potential effect these can have on the health of those living or working near to such a site'.

When looking at the information gathered overall the working group felt that there was no 'absolute' evidence that persuaded them that waste incinerators posed no threat to human populations or that the arguments presented by single interest (pressure) groups were totally persuasive. Most members of the working group were reassured by the monitoring mechanisms demonstrated at Eastcroft incinerator (5.13) and those discussed in relation to modern ERF's (5.14 & 15). However, the working group note that the continuing trend to legislate

to reduce incinerator emissions maybe be indicative of there being likely health and (and more often proven) environmental impacts i.e. global warming. The group suggest that there needs to be some longitudinal research undertaken to monitor the cumulative effects of incinerator emissions overtime. Similarly the working group understand that air quality in terms of emissions (and particulates) can only be measured and judged to be 'safe' with the technology available at present. The group believe that pollution from waste freighters and the potential for road traffic accidents resulting from transporting waste to incinerators can be detrimental in terms of health and the environment. The working group consider that given all the available information, that exposure to incinerator emissions should be kept to a minimum with the proviso that ongoing (impartial) research and improvement must continue to limit and reduce incinerator emissions.

6.2 The second aim of this review- 'to examine the relative costs and other benefits of taking Gedling Borough waste to the proposed ERF compared to other alternatives'.

The group understand the financial costs of taking waste to an incinerator / ERF in terms of the maintenance of transport, road surfaces and freighter crew labour in transporting waste. More importantly, the group note the health costs as detailed in 6.1. Similarly; the working group recognise that other alternative (green) waste technologies have not been as rigorously explored as opposed to incineration which is considered the more 'popular' waste disposal option. The group feel that the 26 year waste contract with the County Council mitigates against the development and pursuance of alternative waste technologies and similarly detracts from the current wider waste disposal debate by 'taking the problem away' for many years.

When reviewing the current waste disposal options all members appreciate the limitations of landfill in terms of its current capacity and related methane gas issues. They recognise that incineration can be beneficial in that it results in an 80% reduction in the volume of waste. Similarly it is noted that the residual ash from incineration can be utilised in the refurbishment of existing roads and building materials. The group are aware that the electricity generated in incineration can be useful (not withstanding the argument presented about electricity generation and incineration discussed in 5.15). The group recognise that by using incineration for waste disposal Gedling Borough Council will meet the government's targets in reducing landfill. At a more local level the 26-year contract (with the County Council) could give the District Councils more stability in terms of planning costs and budgeting. The working group also acknowledge the potential for the planned ERF at Rufford to act as a catalyst in terms of regenerating the locality. The working group note that given the reduced choice of waste disposal schemes and localities, the choice of incineration / ERF presents currently and in the foreseeable future the most viable option. On balance, the working group are in favour of using an incinerator and the ERF for the disposal of Gedling waste with the recommendation that the Council seeks to minimise the amount of waste the Council

sends to incineration overall through waste reduction, increased recycling and by looking longer term at innovative, creative and environmentally friendly alternative ways to divert and dispose of waste. The group feel that this is important given that within the FOE Biowaste paper (4.10 & 5.9) they reviewed one study suggested that 68% of household waste is in fact biodegradable. The working group believe that incineration of this household material is unnecessary and wasteful that every effort should be made to educate the general public to recycle more of their overall waste. The group feel that this is particularly pertinent given that they had observed (on their Eastcroft tour) that waste paper had been disposed of by householders within the waste destined for incineration when this is supposed to be included in their recyclable waste.

6.3 The third aim for this review- 'to provide information that can be shared on an exchange basis with other District Councils.'

The working group consider that there is a range of information that can be shared with other district councils. From a more positive standpoint the group are convinced of the rigour involved in the various monitoring checks that incinerator operators carry out (5.10, 5.14 & 15). They recognise that incineration is a viable and cleaner alternative when compared to landfill (which is near full capacity) and that incineration can produce electricity as a by-product. Similarly, it was noted that incineration plants operate with small number of staff.

Other information that the working group identified as being important to share was the view that despite the monitoring of emissions and the improved technology associated with incinerators / ERF's, there are still widespread concerns over health and environmental impacts. In particular the group noted the information relating to the toxic effects of chemicals such as dioxins. The working group felt that the presence of 'vested' interests in the private waste disposal market in terms of public services and policy meant that incineration is often seen as the preferred and only choice of waste disposal. The group felt that other District Councils need to look at all waste disposal methods to help them plan in the longer term and they should keep in mind the environmental effects i.e. the large carbon 'footprint' is created by incineration processes

6.4 The fourth aim of this review- 'to provide information to other public organisations and local residents on the findings of the review'.

A key point that the working group felt that it wanted to convey was that Gedling Borough Council takes seriously its responsibility to collect and dispose of waste. As such the rationale for undertaking this review was so that Members could also explore other waste disposal options whilst reviewing in the main, the identified issues relating to incineration (3.1) and the possible expansion and development of incineration processes at Eastcroft and Rufford.

The working group note the many improvements that have occurred in

the incineration industry in terms of tighter regulation and improved technology and acknowledge that this is a 'step in the right direction.' They consider that incineration is not unproblematic nor is uncontroversial but given the current lack of development and investment in alternative environmentally friendly waste disposal technologies (and given the problems associated with landfill); they understand that incineration, as a method of waste disposal is the most practical and viable solution at present. However, they believe that the whole issue of waste management and disposal should be kept under constant review.

7.0 Recommendations

- 7.1 That the Chair of the incinerator working group presents the findings and recommendations from this review to Gedling Borough Council Cabinet
- 7.2 That the Portfolio Holder writes to the Environmental Portfolio Holder at Nottinghamshire County Council encouraging them to allocate more of their budget towards financing educational resources relating to waste disposal and recycling. That such resources / publicity should be aimed at the general public and schools.
- 7.3 That the Waste Management Hierarchy (5.3) should be adopted as an overarching principle for Gedling Borough Council in all its core business.
- 7.4 That where opportunities arise Gedling Borough Council encourages and invites the public to participate in forums involved in the promotion of recycling and energy conservation.
- 7.5 That when revised government guidelines for dealing with kitchen waste are published that the Portfolio Holder will write to Nottingham County Council to ask them to explore as quickly as possible the progression of kitchen waste collection and treatment.
- 7.6 That the Portfolio Holder gives consideration to methods of increasing the composting of garden waste particularly educating the public and sourcing alternatives. We note Gedling's target of 1250 tonnes (ref ii) for composting was exceeded with 1654 tonnes and this increasing trend is to be welcomed and encouraged.
- 7.7 That for the immediate and long term future Gedling Borough Council supports the use of incineration as alternative method of waste disposal to that of landfill sites.
- 7.8 That whilst the working group accept that incineration is currently the most viable method of waste disposal they endorse the need for ongoing impartial research to establish the safety of incineration processes both in the present and in the future.
- 7.9 That the whole issue of waste management and disposal should be

kept under constant review and that Gedling Borough Council should seek to reduce the need for incineration overall through increased recycling (and composting) and by looking longer term at reducing the amount of waste which is disposed of through finding environmentally friendly alternatives.

7.10 That the Portfolio Holder writes to Nottingham City Council to advise of this Council's support for the continued rejection of any expansion of Eastcroft incinerator based on negative social, environmental and economic impacts on the populations in neighbouring districts.

7.11 That a copy of this report is sent to both Nottingham City and County Councils, all district Councils and all the organisations and agencies that have assisted with the information gathering elements for this review.

8.0 Acknowledgment

8.1 The Working Group wishes to thank everyone who made themselves available to provide information and support this review.



Scope

Scrutiny committee: Community and Quality of Life
Working Group: Environmental and Health Impact
Assessment of the proposal to build a second incinerator
(ERF) on the boundary of the borough
Chair of group: Cllr C Preston
Working group members: S. Prew-Smith, W. Peet, V. Bradley,
A. Rigby
Portfolio holder/s: Councillor Ivan Gollop

(1) Scope

Why this review is being undertaken...

The disposal of waste is the responsibility of Nottinghamshire County Council (as distinct from the collection of waste which is the Borough Council responsibility). NCC has closed the Household Waste and landfill site at Burntstump, which is where Gedling used to dispose of all its domestic waste collections. Gedling waste is now disposed of at Dorket Head landfill site or the Eastcroft incinerator.

NCC has just signed a 26-year PFI agreement with Veolia Environmental Services for the disposal of waste across the County. The contract aims to increase recycling and recovery rates of waste so that the amount sent to landfill reduces from 51% to 12.5% in 6 years. To achieve this there will be investment in recycling and composting facilities, and in addition the proposal to construct an energy recovery facility (ERF) through incineration.

At the present time, some of the household waste collected is incinerated at the Eastcroft incinerator in the City of Nottingham. This incinerator has been operating for a number of years and there is currently a planning application lodged with the City for expansion of this facility. The proposal for the new incinerator arising from the PFI agreement is that it is based in the Mansfield/Ashfield area. It is also noted that Veolia have put forward proposals for an ERF at Rufford colliery within the Newark and Sherwood District.

Although incineration is a means of reducing the amount of waste that is sent to landfill sites, incinerating also has environmental impacts. However, there are also significant benefits as the energy created can be fed into the national grid to provide electricity. When taking everything in to consideration the issue remaining is whether the proposals to build and extend incinerators close to the borders of Gedling Borough could have an impact on the quality of life of the borough's residents.

The scope of this review is to investigate evidence available on the environmental

impact of incinerators, both from available literature and also any information available about the existing Eastcroft Incinerator in terms of its emissions and any related health impacts. The review will go on to consider the relative benefits of building another ERF incinerator compared to any adverse health impacts. As part of the overall health and environmental impact assessment, consideration will also need to be given to the impact of the additional travel that will be incurred by Gedling's refuse collection freighters in taking more waste to the existing incinerator and the diversion of further waste to the new ERF. In particular, the review will consider the costs and other benefits associated with using an incinerator in the centre of Nottingham compared to other proposed means of disposal.

This review will not consider the details of the County Council's PFI agreement, the reasons for this or the contractual discussions leading up to it's signing.

(2) Aims

The aim of the review is to:

- Research the environmental and health impacts of incineration and energy recovery facilities and the potential effect these can have on the health of those living or working near to such a site.
- To examine the relative costs and other benefits of taking Gedling Borough waste to the proposed ERF compared to other alternatives.
- To provide information that can be shared on an exchange basis with other District Councils.
- To provide information to other public organisations and local residents on the findings of the review.

(3) Timetable

The review will commence in: *October 2006*
Milestones:

Determine consultants brief	October 06
Appointment of Consultant	November 06
Visit Eastcroft	November 06
Invite Veolia representative	December 06
Receive consultant's report	Mid January 07
Invite PCT representative to discuss Consultants report	February 07
Meet representatives from neighbouring Authorities	February 07
Conclude report	Early March 07
Report to CQL Committee	21 st March 07
Other relevant groups e.g. Friends of the Earth, Greenpeace, N.A.I.L.	November 06

Information gathering and consultees

Because of the complex nature of this investigation and the requirement for technical analysis of environmental and health issues, it is proposed that the research for this report is commissioned from a specialist consultant.

The outline brief for the consultant will be:

- To research and précis any literature relating to environmental emissions and potential health implications from incinerators and ERF's
- To provide a balanced view on the potential implications of an additional incineration (ERF) facility on the boundaries of Gedling Borough
- To identify for the Council any issues which might impact on our services or those of the PCT arising from these additional facilities

Other information, which will be required:

- How will Gedling Borough Council be managing the changes in disposal arrangements from the PFI agreement?
- What additional costs in terms of mileage, vehicles etc might be incurred by GBC from these?
- What benefits are there to the costs of disposal arising from the extension of incineration facilities?
- The design and operation of the proposed incinerator and the steps, which will be taken by the operator (Veolia) to minimise any adverse implications.
- The design and operation of the possible extended incineration facilities at Eastcroft and how adverse implications will be minimised.

The working group will be inviting the following persons/organisations to one or more meetings to help with the review:

- David Parton – Head of Direct Services
- Andy Callingham- Environmental Protection Manager
- Jas Hundal/Malvin Trigg – Environment Department, Notts County Council
- Simon Bussell - Veolia
- PCT – strategic health provision
- Portfolio Holders – other neighbouring Authorities
- Environment Agency

Visits

The working group might need to consider a visit to Eastcroft Incinerator (and an Energy Recovery Facility ERF if one can be identified locally) to understand how the incinerator works, the proposals for extension and the measures in place to minimise adverse environmental impacts.

(5) How the community will be consulted, informed and involved

Consultation with the community will be the responsibility of the relevant planning authority. It would be inappropriate for this Council to consult with residents of another Council. However in establishing links with Nottinghamshire County Council, Nottingham City, Mansfield, Ashfield and Newark & Sherwood, it may be possible to have access to the results of their consultations.

Once the review is completed it will be possible for Gedling Borough Council to provide accurate information to residents about the impact of the proposed incinerator and the plans to mitigate any adverse impacts. In particular, the impacts for Gedling Borough residents.

If appropriate, the review may inform any comments this Council wishes to make on the planning application.

(6) Resources

The working group is supported by:

The Scrutiny Officer – for project management and administration
External Consultant – for professional and technical advice (scrutiny budget available)

(7) How the effectiveness of the review will be measured

The effectiveness of this review will be measured by the following:

- Informed statement about the impact on the quality of the local environment and any health related issues arising from the operation of additional incineration, ERF facilities and any other new proposals in this vicinity to deal with waste.
- Ability to give clear information to other public organisations and local residents about the impact of the proposed additional incineration facilities and ERF in the vicinity.
- Provision of information to enable bodies such as the PCT, Borough Councils and the County Council to take into consideration when planning future service requirements.

Scrutiny Incinerator Working Group meeting

Monday 18th December 4.00p.m. in the Committee Room

MINUTES

Councillors

C. Preston (Chair)
S. Prew-Smith
W. Peet
V. Bradley
A. Rigby

Officers

T. Lack (Scrutiny Officer)
D. Parton (Head of Planning)
A. Callingham (Environmental Protection Manager)
E. Thomas (Project Director – Veolia)
K. Parker (Communications Manager- Veolia)
M. Trigg (Assistant Director - Communities Dept
Nottingham County Council)

There were introductions and the Chair welcomed the outside speakers.

E.T. showed a PowerPoint presentation which outlined the Veolia business and its operation. (Please see attached).

E.T. outlined Veolia's contract with Nottingham County Council- this has two parts.

C.P. queried Veolia's role in communicating to the public and asked E.T. how he saw this. E.T. reported that he wants to work in partnership with Councils to compliment the work that they do and to furnish Council officers with up-to-date information. He highlighted some joint work that had been undertaken with Council officers on a waste strategy.

E.T. clarified that the calorific value of waste is a third of that of coal.

E.T. stated that Veolia are regulated by the Environment Agency in terms of developing facilities and subsequent emissions. He reported that this has to be in accordance with given parameters.

E.T. reported that the proposed development at Rufford would be on a UK coal owned site (an old colliery site). Veolia hopes that this may act as a catalyst to attract other businesses into the area.

1. Questions for Veolia and Nottingham County Council

1. From current incineration are there any by products like aggregates used in the construction of roadways? Are there any changes expected with the ERF?

M.T. Currently the bottom ash from the Eastcroft Energy Recovery Facility (ERF) is used on landfill sites to make roadways. With respect to the proposal for the Rufford ERF Veolia are proposing to use the bottom ash to produce building blocks or aggregate to be used in highway construction.

E.T. At the Birmingham and South East London facilities inert ash is conditioned (metals are taken out) so that it can be processed for block construction.

2. What in your opinion are the environmental impacts of incineration?

E.T. In the broad picture Veolia is taking residual waste to recover the energy- 68% of this is biogenic and this displaces fossil fuels. This is carbon neutral.

3. If Rufford is developed, what projections exist for the increased road use and associated carbon emissions?

E.T. In the broad picture- Veolia has tried to minimise the number of vehicle journeys by locating the facility near the epicentre and having relatively close transfer stations.

4. Incineration is one way of disposing of collected waste. How combustible is black bin waste? Does it require additional fuel, if so what?

M.T. Black bin waste has been delivered directly to Eastcroft since 1973 and that plant has operated without any additional fuel. The Veolia proposals will likewise be able to take black sack waste without the need for any further fuel.

5. High temperatures vaporise heavy metals. Mercury and lead from batteries is known to be a health hazard. What precautions are taken to reduce the problem?

E.T. There is a directive that covers the disposal of fridges, white goods and things with heavy metals. This can be controlled in the incinerators by 'scrubbing' acid gasses which 'grab hold' of heavy metal molecules. A European directive guides levels around concentrations.

6. In the 26-year agreement for waste disposal, we note the aim within six years, to reduce waste sent to landfill from 51% to 12.5%. What percentage of this redirected waste is planned for recycling or for incineration?

M.T. The Authority's 26-year contract will achieve a recycling and composting rate of 52% by 2020. The waste that is left over will be sent to either the Eastcroft or Rufford plants. This will mean that very little waste will be delivered directly to landfill other than the ash produced from the Eastcroft Incinerator. Although it is possible that the company that operate that plant will also wish to use that material for building blocks or highway material.

E.T. The 52% is the pure DEFRA recyclable figure, the steel etc is additional to this. Landfill will come down.

7. Can we have an update for the expected timing of the Rufford development? Prior to any new capacity coming on line, can we expect Eastcroft to pick up the increased capacity?

M.T. If all goes to plan it is expected that ERF will be operational in 2012. With respect to the Eastcroft ERF this will take residual waste from the Broxtowe, Rushcliffe and Gedling areas with inputs expected to be at current levels. The residual waste from the other District areas will go to various landfill sites.

8. How does the proposed ERF unit contrast with Eastcroft in terms of size, emissions, and potential health damage? What is the essential differences between old and new? What output of electricity is expected?

M.T. The Eastcroft facility was designed and built in the early 70s. Modern incinerators are designed to much higher architectural standards and usually the opportunity is taken to place the waste hoppers below ground level which means that the structures are much lower than the Eastcroft facility. The capacity for the Eastcroft plant is 150,000 tonnes per year compared to the proposed capacity for the Rufford plant at 180,000 tonnes per year. The Eastcroft ERF supplies steam for the use of power generation (electricity) and feeds into a local district-heating scheme. The proposals for Rufford are that it will produce electricity to be fed into the national grid. There is also the opportunity that as the Rufford Industrial establishment enlarges steam can be supplied to these premises.

M.T. Eastcroft is old- modern plants are completely different in design aesthetically.

E.T. Technology has changed slightly i.e. the 'scrubbing' principles and new facilities have to comply with the up-to-date regulations.

9. Is Eastcroft and incinerators generally spot or continuously monitored for dangerous emissions?

C.P. Computer screens reflected a continual monitoring process (as seen during the previous site visit to the Eastcroft incinerator in the control room).

E.T. Any dangerous emissions mean that permits are taken away.

10. In the regional plan for waste strategy, do we have a commitment to recycling and composting? If so what are our targets? As districts will be waste collectors, are targets uniform?

M.T. The regional strategy proposes recycling and composting levels for all waste collection authorities and waste disposal authorities of 30% by 2010 and 50% by 2015.

M.T. In addition to this Government recently consulted on a national waste strategy which set a long-term target of achieving a 50% recycling and composting rate by 2020. The national waste strategy is expected to be published in April 2007 and will confirm targets for both waste collection and waste disposal authorities.

M.T. GBC has similar targets to other districts- the governments new waste strategy will have new targets.

11. Have you considered autoclaving as an alternative to the ERF? If so why did you dismiss this option?

M.T. The procurement process undertaken by the County Council was to request waste disposal companies to offer their preferred technical solution to the County Council which were then evaluated against a number of criteria. This process resulted in the Authority identifying Veolia's proposals as the best option for Nottinghamshire.

M.T. Nottingham County Council went on an output specification which had certain parameters built into it. They asked the market for solutions to this, out of eleven responses Nottingham County Council reduced and evaluated two. PFI contracts work for the market to tell what they can provide and then the authority makes the choice/decision. Long contracts are usually what happen as a result of this. Autoclaving is mainly for medical reasons for small scale.

E.T. Veolia when bidding has to think long and hard at all options and keeps its mind open as it does not want to lose the contract. They have to look at not only the cost but the appeal to local authorities also. All technologies have underlying processes- autoclaving (heat treatment of waste) i.e. what you get out is pretty much what you put in. Also the autoclaving waste product might not be that recyclable. You have to ask can you recover the waste from the autoclaving process? You may still have to burn the waste like in an incinerator; also depending on how the waste is treated (i.e. autoclaving) the waste product may end up actually being heavier.

2. Any other business

Date and time of the next meeting-

Wednesday 17th January at 4.00p.m. in the Committee Room

Representatives from Mansfield District Council will be attending this meeting.

Scrutiny Incinerator Working Group Meeting

Wednesday 17th January 2007 4.00p.m.in the Committee Room

MINUTES

Councillors-	Officers-
C. Preston (Chair)	T. Lack (Scrutiny Officer)
S. Prew-Smith	D. Parton (Head of Direct Services)
W. Peet	A. Callingham (Environmental Protection Manager)
V. Bradley	
A. Rigby	M. Thurman (Head of Operations- Mansfield District Council)

E. Smith (Portfolio Holder for Environment- Mansfield District Council)

1. Introductions

There were group introductions.

2. Information sharing with representatives from Mansfield District Council

C.P. outlined the working group's remit and how the group were also meeting with other interested parties both statutory and single interest groups. C.P. reported that the working group had also employed a consultant to research technical information for the working group.

M.T. reported that Mansfield District Council (MDC) at an officer level supports incineration as an environmentally acceptable way to dispose of waste, however, the Council supports recycling as a first choice. M.T. highlighted how incineration deals with residual waste and how MDC Members have researched other options to incineration.

E.S. said that a political perspective had not been arrived at yet and reported that he had been to visit a modern Energy Recovery Facility (ERF) at Hampshire. E.S. said from a personal point of view he would have been in favour of an incinerator at Mansfield. He said that he had been convinced of the safety of incineration i.e. the dioxins etc and that modern incinerators have fail safe guards such as back up systems. E.S. suggested that he did not see a problem with increased traffic as MDC lorries already make journeys to landfill sites; so to go to an incineration facility at an industrial estate should be no different. E.S. reported that air quality in Mansfield is good.

It was noted that MDC has problems with the site chosen by Veolia. C.P. asked why MDC was critical of the proposed site? M.T. and E.S. reported that this was mainly because of the traffic in certain neighbourhoods and that the site proposed at Crown Farm industrial park bordered housing at Forest Town. It was reported that one MDC Councillor living near opposed the plan for the proposed incinerator and that the nearest house was approximately 100 yards away.

It was noted that that new site at Rufford is not far from the Crown Farm industrial park site down the Eakring road.

M.T. reported that new incinerators are quite different buildings in their technology and design- and the reality is that local authorities have to deal with waste. M.T. highlighted that whilst people do object to incinerators they can also object to wind farms despite their green technology and global warming concerns.

A.C. reported that any modification to Eastcroft incinerator would still require a permit from the Environment Agency regarding incinerator emissions. It was noted that the new facilities i.e. the ERF are designed to meet the new standards where as the Eastcroft incinerator has had to be retro filled to meet the new standards for incinerators.

E.S. reported that the technology has not changed much- incinerators are efficient in terms of how they 'scrubb'/process the emissions.

There was some discussion regarding the planned Materials Recycling Facility (MERF) at Mansfield and how this is likely to go ahead as Nottingham County Council has planning permission. The incinerator planned for Rufford colliery site is still out to consultation.

E.S. talked about 'bulking-up' putting more waste on lorries and freighters to reduce journeys and thus transport. It was noted that establishing and utilising local facilities can mean less transport but then there can be problems with trying to site a local facility not too near a populated area.

M.T. reported that there are regulations over 'tipping' and the amount carried. Drivers are also limited by the number of hours they work –so it can be a fine balance. The group acknowledged the pros and cons.

M.T. reported that the government could do more with supermarkets and waste as local authorities have already done a lot to recycle.

E.S. Highlighted that a lot of the population have been living near incinerator emissions in terms of crematoriums and the mercury emissions these give off from the fillings in deceased people's teeth.

D.P. remarked how Veolia are the custodians of Eastcroft incinerator and the will be for the new proposed ERF at Rufford until the end of their respective contracts.

A.C. reported that the domestic waste landfill site at the bottom of Spring Lane in the borough has been actively producing methane which is being monitored by GBC- he highlighted that this is also a health effect which the working group has not considered greatly.

A.C. confirmed that there is electricity generation from methane at Dorkett Head at Calverton.

C.P. thanked E.S. and M.T. for coming over from MDC to speak to the working group about their perspectives on incineration.

E.S. and M.T. requested a copy of the working group's final report when drafted. T.L. agreed to furnish them with this.

T.L. to send out the minutes to all parties who attended tonight's meeting.

3. Date and time of next meeting

Wednesday 13th February 4.00p.m. in the Reception Room- Newark and Sherwood District council

4. Any other business

C.P. asked D.P. to update him on the progress of the consultant.

C.P. gave T.L. some more documents to pass on to the consultant to review.

Scrutiny Incinerator Working Group

Tuesday 13th February 4.00p.m. in the Reception Room

MINUTES

Present

Councillors

C. Preston (Chair)

S. Prew-Smith

W. Peet

A. Rigby

Officers

T. Lack (Scrutiny Officer)

D. Parton (Head of Direct Services)

**A. Greener (Newark and Sherwood Council-
Cleansing and Recycling Manager)**

**A. Stratham (Newark and Sherwood Council-
(Head of Housing and Environment)**

**N. Armstrong (Newark and Sherwood Council-
Portfolio Holder for Environment)**

Apologies-

A. Callingham (Environmental Protection

Manager)

1. Introductions

There were group introductions.

2. Information sharing with Newark and Sherwood District Council

C.P. outlined the parameters of the Incinerator Scrutiny Review.

A.S. reported that when Rufford was announced as an ERF incinerator site Newark and Sherwood Council were surprised, as Crowne Farm Industrial Park at Forest Town Mansfield had been the first choice. It was noted that Rufford has good access links, it is a brown field site and is barren land therefore there is merit in the choice of this site. A.S. reported that British Coal are 'comfortable' with the idea for the proposed ERF. A.S. highlighted how representatives from N&S Council had visited Hampshire to see a Veolia ERF plant as it is in a similar rural location. They also went to visit the local Parish of Marchwood to talk to local people, Parish Councillors and Officers. It was noted that Veolia try to design their ERF's so that they are relevant to the location. A.S. reported that the meeting at Marchwood was very useful. The N&S party observed that the modern plant was technologically well advanced. A.S. reported that the new ERF's are tightly controlled plants and that the Environment Agency also thought the plant was well controlled. The Marchwood Liaison Group who monitors the plant and meets with Veolia are similar to the group that has been established at Rainworth near the Rufford ERF site. The group at Rainworth has some impartial facilitators (paid for by Veolia)- and this is an issue based group /forum is looking at the pro's and con's of incineration.

A.S. reported that the P.A.I.N. (People Against Incineration) protest group have refused to engage with the Rainworth group.

It was noted that Veolia's French architect has attended the Rainworth group to present his design and canvass views.

A.S. reported that N&S Council have invited representatives from Veolia, Friends of the Earth and P.A.I.N. to present their position to all N&S Members (and the public) at Kelham Hall. A third party has been invited, a professor from Sheffield University to present a balanced view on the views expressed by the invitees. GBC Members were also invited to this event and C.P. asked the details to be sent to T.L. for her distribute.

It was noted that the Environmental Impact Assessment on the proposed ERF at Rufford will be a key part of the Planning Application. N&S Council Officers have looked at the preliminary draft of this and are happy with this.

It was reported that N&S Council have asked Veolia to build an atmospheric monitoring station in Rainworth and they have agreed in principle.

N.A. reported that it was well worth GBC Members considering visiting the ERF in Hampshire as it is very interesting. It was highlighted that Rufford Colliery site is so big N&S Council envisage economic regeneration on the same site with the ERF being the catalyst.

C.P. asked that given the length of the 26 contract what is the view of N&S Council if the nature of the waste changes i.e. recycling, given the long length? A.S. replied that Veolia's answer is that if 80% of the people recycle for 80% of the time then there will be enough waste 'feedstock' for that length of time (i.e. 26 years). However, it was noted that the contract is flexible enough to take account of changes, i.e. changes in packaging of waste and the calorific value of the waste. It was acknowledged that this does not include commercial waste only municipal waste for the foreseeable future. It was reported that Veolia have 'future proofed' the contract as far as possible. D.P. reported that beyond the 26 period of the contract there will still be about the same length of life left in the ERF at Rufford.

It was noted that the new ERF will be built from recycled steel and water so it will have a low carbon footprint.

A.G. reported that in 1996 there was a major change in legislation that limited the reduction of pollutants significantly. Within the Public Finance Initiative Mechanism (PFI) there is a clause for Veolia to go back to Nottingham County Council for capital funds to retrofit to address any new legislation. PFI contracts are 'tight' on exclusivity and the boroughs are tied into this to provide waste. A.S. highlighted that there is no minimum tonnage of waste stipulated in the contract so Veolia could source other sources.

A.S. reported that North Kesteven Council lead in recycling waste –53% nationally, the other 47% however goes to landfill- next year this will be problematic in terms of fines for North Kesteven.

C.P. asked N&S Council about transport. A.G. reported that four delivery points have been identified by Nottingham County Council and that some authorities will have to use waste transfer stations though and will not directly deliver their waste. It was noted that the 'bulking up' mechanism can be used to reduce journeys. A.S. highlighted that the existing Rufford site already has lorries arriving for British Coal as the site is currently used for coal washing purposes. Therefore, there is already transport moving around this area anyway. UK Coal Operations have recently handed the Rufford site over to UK Coal Estates who have sent the development potential of the site. A transport study will however be carried out. N.A. added that there is already an established dual carriageway in the locality.

3. Way forward / Scrutiny questionnaires

T.L. handed out some questionnaires that she had designed (based on the scope) for working group members to complete. She reported that her notes to date of all the meetings reflect a lot of information gathering but not many scrutiny views. C.P. asked the working group to complete the questionnaires and return them to T.L. as soon as possible so that T.L. can get all the information summarised for the report.

4. Date for next meeting to comment on consultants report

D.P. reported that he had contacted the APSE consultant and that he anticipated that the report would arrive shortly. C.P. asked T.L. to get this report reproduced and out to the working group to review as soon as it becomes available. C.P. asked the group to read the consultants report and to bring their opinions to the next meeting.

The next meeting was arranged for Monday 26th February at 10.00a.m. in the Leaders Room.

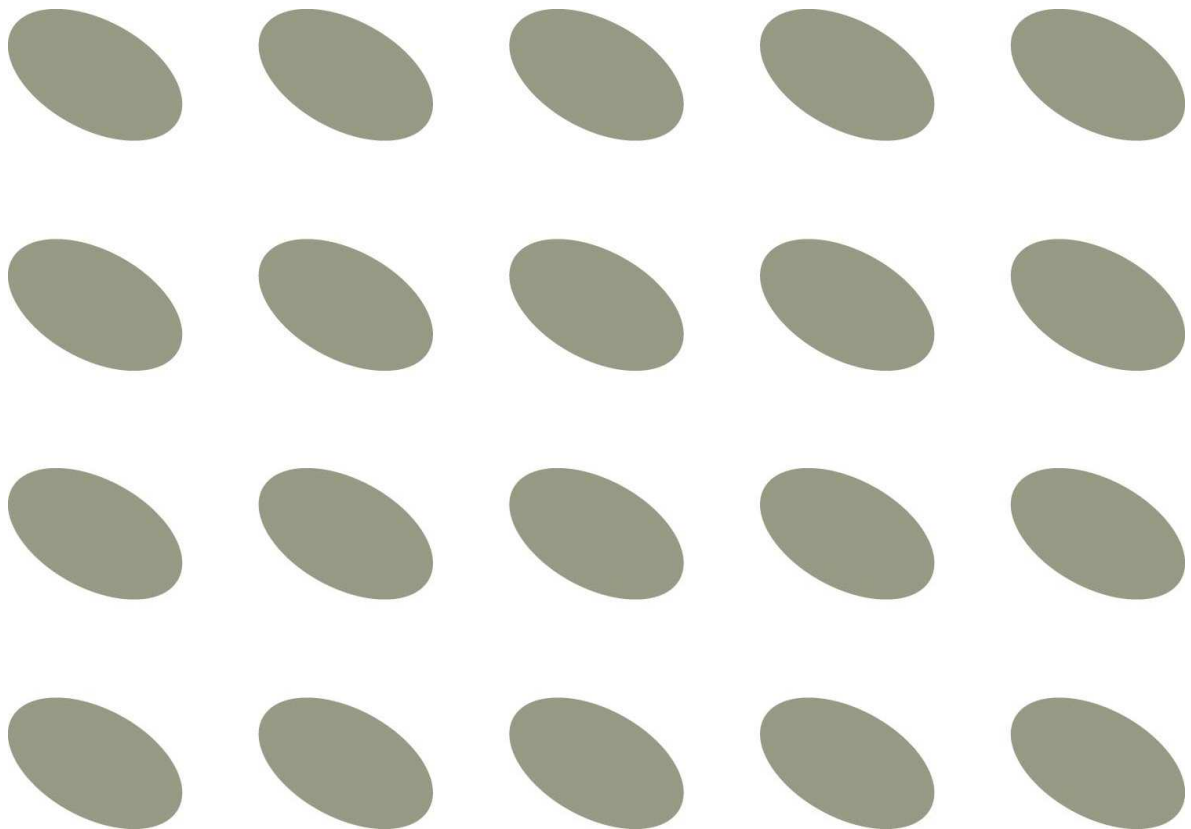
5. Any other business

C.P. reiterated the need for the group to get their questionnaires back to T.L. as soon as possible.



Gedling Borough Council

Health Impact of Incineration



February 2007

Gedling Borough Council

Health impact of Incineration

CONTENTS

1.0	Executive summary	31
2.0	Report context.....	33
2.8	Aims.....	Error! Bookmark not defined.
3.0	Incineration.....	35
3.1	Incineration in context.....	35
3.2	Main emissions from municipal solid waste	38
3.3	Eastcroft incinerator.....	40
3.4	Health Risks	45
3.4.1	Introduction	45
3.4.2	Synopsis of literature.....	46
3.5	Conclusions from literature	51
4.0	Alternatives to landfill	53
4.1	Anaerobic digestion	53
4.2	In-vessel composting	53
4.3	Gasification/ pyrolysis	54
4.4	Mechanical biological treatment (MBT).....	54
4.5	Materials recovery/ reclamation facility (MRF).....	55
4.6	Health effects from alternatives	55
5.0	Costs.....	56
5.1	Introduction.....	56
5.2	Cost and operational implications.....	57
5.3	Vehicle related costs.....	57
5.4	Additional cost calculation	58
5.5	Additional resource cost implications.....	59
5.6	Conclusions	60
Appendix 1	Gedling literature received.....	62
Appendix 2	Bibliography.....	63
Appendix 3	Health impacts (Greenpeace).....	64



Association for Public Service Excellence

2nd floor Washbrook House

Lancastrian Office Centre

Talbot Road, Old Trafford

Manchester M32 0FP

telephone: 0161 772 1810

fax: 0161 772 1811

email: enquiries@apse.org.uk

web: www.apse.org.uk

1.0 Executive summary

- 1.1 At the request of Gedling Borough Council APSE Best Value Consultancy was asked to research the environmental and health impacts of incineration and energy recovery facilities and to determine the potential effect these can have on the health of those living or working near to such a site.**
- 1.2 APSE BVC were also requested to examine the relative costs and other benefits of taking Gedling Borough waste to the proposed Rufford Energy from Waste (EfW) facility compared to other alternatives.**
- 1.3 This report determines the context of incineration as a method of waste disposal with 9% of the 25.7 million tonnes of household waste collected in England being disposed of in this way. Other European countries including Switzerland and Sweden incinerate between 5 and 7 times more per head of population than England.**
- 1.4 The main emissions from municipal waste disposal and incineration are determined and include carbon dioxide, benzene, 'dioxins', nitrogen dioxide and trace metals. The main sources of all similar emissions are transport and domestic/commercial heating.
- 1.5 The Eastcroft incinerator takes approximately 150,000 tonnes of waste per year and reduces this down to around 40,000 tonnes of ash, having saved 4 million m³ of disposal space since it became operational in 1973. The Nottingham Health Action Team, chaired by Alan Simpson MP, concluded that 'the scientific evidence states that there would be no significant negative impact on the health of the population living in the vicinity of the proposed incinerator expansion'.
- 1.6 A literature search was undertaken to identify the health effects from incineration. Four publications were reviewed taken from across a spectrum including Greenpeace, DEFRA and the Health assessment for the Eastcroft extension.
- 1.7 Only the Greenpeace study claimed any causal links to health effects, but none of the studies were able to show an absolute connection between incinerator emissions and a health impact on the local population. Other environmental factors such as industrial activity and vehicle exhausts and sociological factors such as smoking and diet have considerably more effect on human health than the very low emissions from incineration.

- 1.8 Since 1990 there has been a 99.8% reduction in emissions from incinerators, much due to heavy recent regulation. Some of the studies claim health effects from the period prior to 1990 and whilst they may have had some basis at that point the effects claimed are no longer observed. This may be down to improved measurement techniques or more likely as a result of the substantial reduction in emissions.
- 1.9 Alternatives to incineration do exist, however few are risk free. Landfill has identified health effects and increased incidents of bronchitis have been found near composting sites. On current evidence, incineration does appear to be a healthier option than landfill.
- 1.10 An alternative option was reviewed for future waste disposal at Gedling. This contrasted taking waste to Eastcroft three times per week and Dorket Head landfill site for the other two against the alternative of taking the waste to Rufford instead of Dorket Head. It is estimated that vehicle costs will increase by £40,997 and employee costs by £34,516 giving a total increase of £75,513 by disposing at Rufford. Rufford would require an additional mileage of 550 miles per week for the waste freighters.
- 1.11 The topic remains a controversial issue, although the research shows no recent evidence to substantiate any negative health effects from incineration. Notably, the Eastcroft incinerator extension was refused planning permission, not on health grounds, but on the basis of its effect on regeneration.

2.0 Report context

- 2.1 At the request of Gedling Borough Council, a review was undertaken of the potential impact of using incineration as the preferred method of disposal.
- 2.2 The disposal of waste is the responsibility of Nottinghamshire County Council (as distinct from the collection of waste which is the Borough Council responsibility). NCC has closed the household waste and landfill site at Burntstump, which is where Gedling used to dispose of all its domestic waste collections. Gedling waste is now disposed of at Dorket Head landfill site or the Eastcroft incinerator.
- 2.3 NCC has just signed a 26 year PFI agreement with Veolia Environmental Services for the disposal of waste across the County. The contract aims to increase recycling and recovery rates of waste so that the amount sent to landfill reduces from 51% to 12.5% in 6 years. To achieve this there will be investment in recycling and composting facilities, and in addition the proposal to construct an energy recovery facility (ERF) through incineration.
- 2.4 At the present time, some of the household waste collected is incinerated at the Eastcroft incinerator in the City of Nottingham. This incinerator has been operating for a number of years and there is currently a planning application lodged with the City for expansion of this facility. The proposal for the new incinerator arising from the PFI agreement is that it is based in the Mansfield/Ashfield area. It is also noted that Veolia have put forward proposals for an ERF at Rufford colliery within the Newark and Sherwood District.
- 2.5 Although incineration is a means of reducing the amount of waste that is sent to landfill sites, incinerating also has environmental impacts. However, there are also significant benefits as the energy created can be fed into the national grid to provide electricity. When taking everything in to consideration the issue remaining is whether the proposals to build and extend incinerators close to the borders of Gedling Borough could have an impact on the quality of life of the borough's residents.
- 2.6 The scope of this review is to investigate evidence available on the environmental impact of incinerators, both from available literature and also any information available about the existing Eastcroft incinerator in terms of its emissions and any related health impacts. The review will go on to consider the relative benefits of building another ERF

incinerator compared to any adverse health impacts. As part of the overall health and environmental impact assessment, consideration is also given to the impact of the additional travel that will be incurred by Gedling's refuse collection freighters in taking more waste to the existing incinerator and the diversion of further waste to the new ERF. In particular, the review will consider the costs and other benefits associated with using an incinerator in the centre of Nottingham compared to other proposed means of disposal.

2.7 This review does not consider the details of the County Council's PFI agreement, the reasons for this or the contractual discussions leading up to its signing.

2.8 Aims

This document aims to:

- **Research the environmental and health impacts of incineration and energy recovery facilities and the potential effect these can have on the health of those living or working near to such a site.**
- **To examine the relative costs and other benefits of taking Gedling Borough waste to the proposed ERF compared to other alternatives.**
- **To provide information that can be shared with other District Councils.**
- **To provide information to other public organisations and local residents on the findings of the review.**

3.0 Incineration

3.1 Incineration in context

3.1.1 In 2004 the UK produced about 335 million tonnes of waste. (Defra 2006, 'The Environment in your pocket'(9)) This includes nearly 100 million tonnes of minerals waste from mining and quarrying, which is not currently subject to control under the EU Waste Framework Directive and around 220 million tonnes of controlled wastes from households, commerce and industry (including construction and demolition wastes). Household wastes represent about 9 per cent of total arisings.

3.1.2 25.7 million tonnes of household waste was collected in England in 2004/5 and 22 per cent of this waste was recycled or composted. This has increased from 7 per cent in 1996/7. In 2005, 72% of the total was disposed of via landfill, 9% by incineration and 19% recycled.

3.1.3 The Landfill Directive requires a continuing reduction in biodegradable landfill reducing to 75% of the 1995 quantity by 2010 and 35% by 2020.

3.1.4 Energy from waste (EfW) is one of a range of options for disposal and involves the controlled incineration of waste to reduce its volume, reduce chemical contaminants and in the process generate heat that can be used for electricity generation.

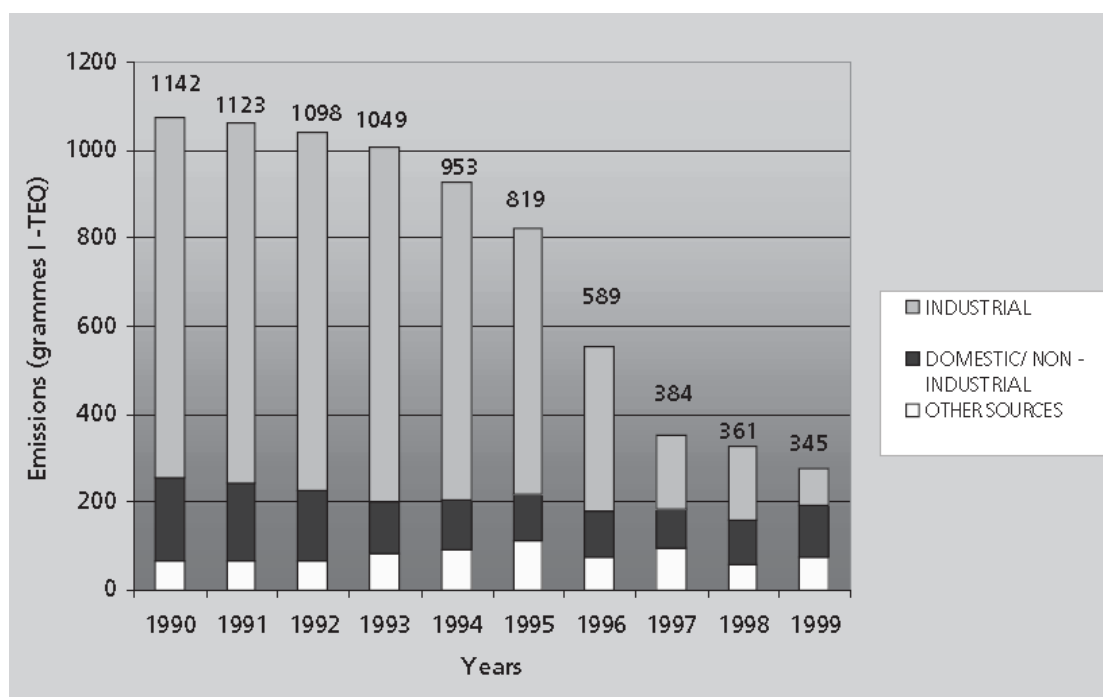


Fig 2. Trends in dioxins emissions to air in UK (grammes I-TEQ per year). From NAEI data for 1990 to 1999.

- 3.1.5 EfW results in emissions to air of carbon dioxide and water along with low levels of other substances. The volume of waste is reduced by 90% and the weight by 75%. Much of the resulting ash is made into breeze blocks and the remainder along with residues from the air pollution control system is sent to landfill
- 3.1.6 Data from Eurostat (fig. 3) shows that Denmark, Sweden, Switzerland and Luxembourg are the main users of incineration for municipal waste with up to 350 kg per person. This compares to nearer 50 kg per person in the UK.
- 3.1.7 Since 2005 all EfW facilities have required a permit to operate. The incinerators operate under strict regulation under the Waste Incineration (England and Wales) Regulations 2002. These tightened standards have seen a 99% cut in lead emissions and 97% cut in dioxins since the early 1990's. Emissions of dioxins from industrial sources have dropped substantially as can be seen from figure 2.

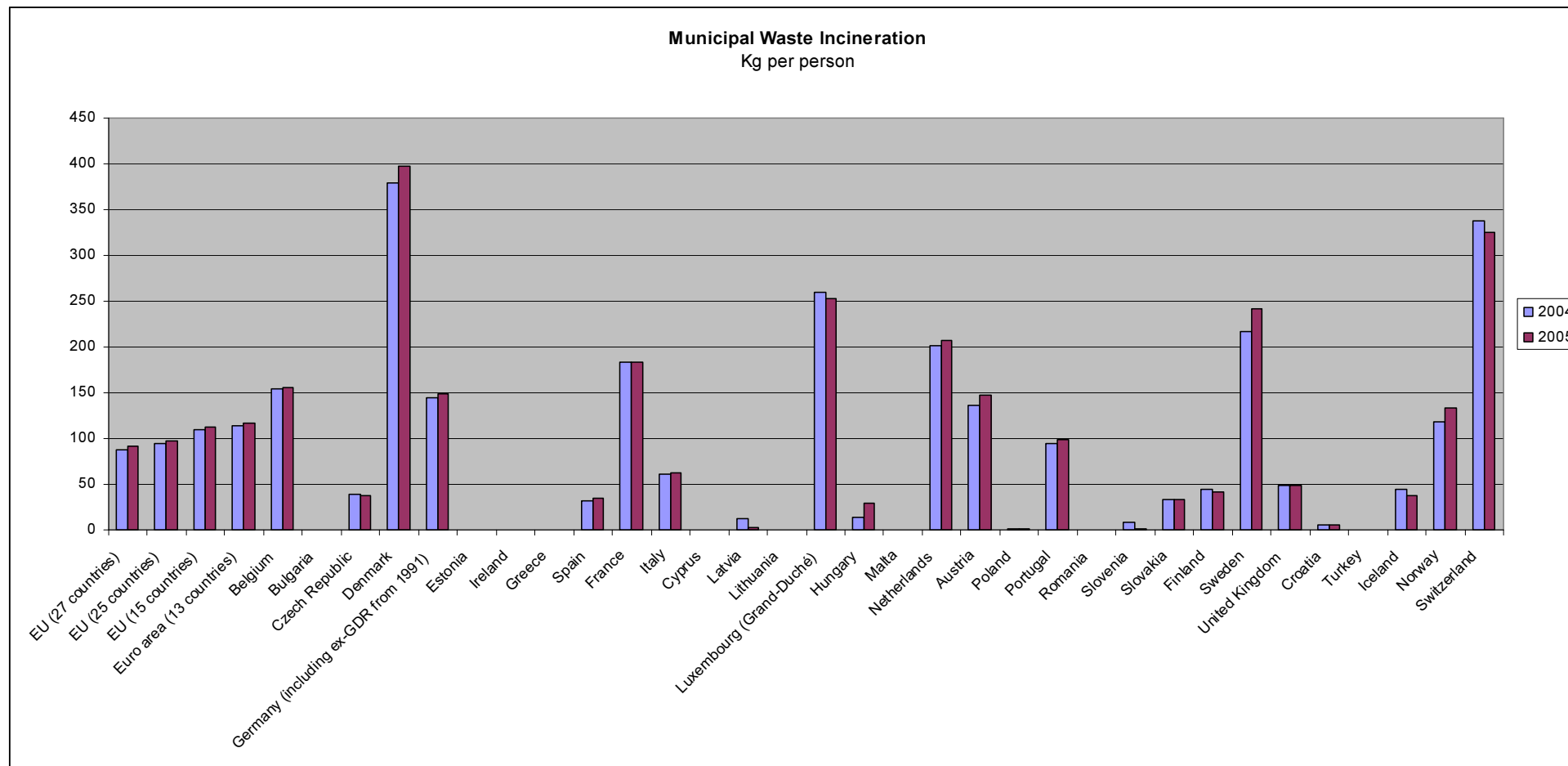


Fig 3 –Eurostat municipal waste –kg per person

3.2 Main emissions from municipal solid waste

3.2.1 The *Review of Environmental and Health Effects of Waste Management: Defra May 2004 (1)* summarised the main emissions from waste management operations with most information available on emissions to air. Rather less information exists on emissions to land, water or other waste management facilities highlighting a potential need for further research in that area.

3.2.2 The main emissions compose:

- **Methane and carbon dioxide** which are the two emitted substances which may significantly influence global warming. In the UK nearly 150 million tonnes (MT) of CO₂ is released every year. Management of municipal solid waste accounted for 3.6 MT (2.4% of the national total). Other important contributors are electricity generation (42 MT; 28.5% of the national total); and transport (21% of the national total). Methane has a global warming effect which is over 20 times more powerful than carbon dioxide. In the UK about 2.4 MT of methane is released every year. Emissions from municipal solid waste in landfill sites account for 0.7 MT (27% of the national total). Another important contributor is agriculture, which accounts for an estimated 1.0 MT (about 40% of the UK total).
- **Benzene** is a substance of concern because it can cause cancer. Less than 0.02% of UK emissions are due to municipal solid waste operations. Transport is the main source of benzene, accounting for 47% of UK emissions.
- **Dioxins and furans** (often referred to as just “dioxins”). The developing reproductive system of male offspring seems to be particularly sensitive to exposure to dioxins before birth. Dioxins are associated with other developmental and reproductive effects, and the immune system is also potentially sensitive. UK expert committees regard dioxins as a probable human carcinogen (that is, it can probably cause cancer in humans). Dealing with municipal solid waste accounts for only about 1% of UK emissions of dioxins, shared approximately equally between incineration and emissions from burning landfill gas. Domestic sources such as cooking and burning coal for heating are the UK’s single largest source of dioxins, accounting for about 18% of emissions. Transport accounts for about 3% and electricity generation about 4% of the UK total. A number of other sources contribute to emissions of dioxins to a similar or greater extent: accidental vehicle fires; fireworks and bonfires; small-scale waste burning (for example on building sites); incineration of other wastes; and the iron and steel industry.

- **Nitrogen dioxide** is a substance of concern, particularly for air quality in urban areas. Emissions of oxides of nitrogen also contribute to acid rain, and excessive levels of nitrogen which can be harmful to some sensitive habitats. Dealing with municipal solid waste results in emissions of about 10,000 tonnes per year of oxides of nitrogen (which form nitrogen dioxide in the atmosphere). This is less than 1% of the UK total – the main contributors are electricity generation (24%) and road traffic (42%). Emissions of oxides of nitrogen and other substances from incineration of municipal solid waste are the most tightly controlled of all waste management processes.

- **Metals** emitted to the air have a range of possible health effects. Dealing with municipal solid waste accounts for about one tenth of UK emissions of cadmium (a substance associated with cancer of the lungs, throat and prostate, reproductive effects and kidney disease). Almost all of the cadmium emitted from facilities dealing with MSW comes from landfill sites. Municipal solid waste accounts for lower proportions of UK emissions of other substances. The iron and steel industry is the main source of emissions of most heavy metals (for example mercury, arsenic, lead, cadmium).

- Other important sources include:
 - **lead emissions** from non-ferrous metals processing;
 - burning coal to produce electricity and heat in industrial facilities, which is an important source of **arsenic** emissions;
 - road traffic, which is an important source of **mercury**. The manufacture of chlorine from mercury cells, non-ferrous metal production and coal combustion are also important sources.

- There is less information available on emissions to groundwater and surface water. **Nitrogen** can promote the growth of unwanted algae **organo-tin** compounds can affect fish and shellfish, others include **phosphates, pentachlorophenol, copper, tin and lead**. The rough estimates of emissions of substances which might be of concern are all a very small proportion of the national total. Releases to groundwater and surface water, unlike releases to the air, do not necessarily result in human exposure because mains water is treated before supply. Mains water has to comply with strict safety standards. Some facilities (anaerobic digestion, pyrolysis/gasification, incineration and landfill) result in the generation of electricity. This means that we would avoid the need to generate electricity in other ways – for example, from burning coal, gas or oil, or from nuclear energy.

3.3 *Eastcroft incinerator*

- 3.3.1 The Eastcroft incinerator currently takes waste from Gedling and other Nottinghamshire authorities. Planning permission was requested in July 2005 05/01520/PMFUL3 for an extension to the existing facility although the initial application was refused. An appeal was lodged in November 2006 by Waste Recycling Group, the incinerator owners, who seek a public enquiry. The extension was turned down primarily for the effect on regeneration and not health concerns.
- 3.3.2 The current incinerator takes approximately 150,000 tonnes of waste per annum from around Nottingham and reduces it to 37,500 tonnes of ash and 2,600 tonnes of recovered ferrous metals. The incinerator is linked to an energy recovery scheme. The Incinerator has saved over 4 million m³ of disposal space since it became operative in 1973 and at current rates will save a further 5 million cubic metres over the next 20 years
- 3.3.3 Nottingham also has three clinical incinerators located at Eastcroft, the Nottingham City Hospital, and the Sutton Bonington School of Agriculture. The aim of incinerating this category of waste is to remove the pollution and health risks, rather than to reduce volume.



Fig 4 Nottingham Incinerator (c) Environment Agency

- 3.3.4 The emissions are monitored and the data collated by the National Atmospheric Emissions Inventory (NAEI). The tables following detail the emissions from all the main identified sources within a 5km radius of Eastcroft.
- 3.3.5 By way of contrast fig 6 shows the estimated emissions within the same 5km area. It can be seen that by far the biggest sources of emissions are those from transport and commercial and residential heating. Emissions due to industrial combustion are minimal by comparison. E.g. for CO₂ transport is 67% total, heating 26% and industrial combustion <5%.
- 3.3.6 Trace compounds are released by a variety of other commercial and industrial companies and the Wilford crematorium.
- 3.3.7 The Nottingham Health Action Team assessed the health impact of the proposed Eastcroft extension in March 2006. (8) .Those wards surrounding the incinerator all had life expectancies below the regional average, with those of the Dales ward at 77.7 for females and 70.6 for males. However it was noted that most Nottingham City wards have a similar lower life expectancy due to high levels of deprivation. The report notes the concerns of the community but concludes 'The scientific evidence states that there would be no significant negative impact on the health of the population living in the vicinity of the proposed incinerator expansion'.

3.3.8 Rufford

Similar emissions data has been retrieved for the proposed incinerator site at Rufford. The emissions data indicates that the existing brick works produces a similar amount of CO₂ and considerably more particulate emissions than a modern incinerator.

- 3.3.9 Again transport is shown as making by far the largest contribution to emissions across the wide range of pollutants.

Fig 5. Emissions from Major Point Sources within 5 km of the centre of Postcode NG2 3AH (Eastcroft) for 2003

The table below shows emissions from large point sources, usually emitted at higher levels through a chimney or elevated vent. These emissions are selected from a 5 km radius of the centre of the postcode NG2 3AH. Emission values are annual tonnes

Operator	Site Name	1,3 Butadiene	Benzene	Benzo[a]pyrene	CO	CO2	NOX	SO2	PM10	Pb	VOC	Authorisation
A R Wilson Packaging Ltd	Nottingham	-	-	-	-	-	-	-	0.0043	-	2.5	-
Asda Stores Ltd	Hyson Green	0.0014	0.017	-	-	-	-	-	-	-	9.8	-
Asda Stores Ltd	West Bridgford	0.0014	0.017	-	-	-	-	-	-	-	9.8	-
Boots Co Plc	Nottingham	-	-	-	-	17169	9.9	-	-	-	-	AA3450
Enviroenergy Ltd	Nottingham	-	-	-	-	1376	5.9	-	-	-	-	AA4715
J McIntyre (Aluminium) Ltd	Nottingham	-	-	-	-	-	-	-	0.12	0	-	AK2866
J Sainsburys Supermarkets Ltd	Beeston	0.0022	0.025	-	-	-	-	-	-	-	15	-
J Sainsburys Supermarkets Ltd	Nottingham - Castle Boulevard	0.0022	0.025	-	-	-	-	-	-	-	15	-
Notice Ltd	Nottingham	-	-	-	-	4045	-	-	-	-	-	-
Powergen Cogeneration Ltd	Nottingham	-	-	-	-	7462	-	-	-	-	-	-
PZ Cussons (UK) Ltd	New Basford	-	-	-	-	2261	-	-	-	-	-	-
Safeway Stores Ltd	Gamston	0.0022	0.026	-	-	-	-	-	-	-	15	-
Total Oil Ltd	Colwick	0.0013	0.015	-	-	-	-	-	-	-	9	-
Wastenotts (Reclamation) Ltd	Eastcroft	-	0.51	0.00011	5	12094	242	5	0.0095	0.01	0.5	AH0653
Wilford Hill Crematorium	Nottingham	-	-	-	0.4	0	0.8	0.1	6.5E-05	-	0.03	-
Wm Morrison Supermarkets Plc	Netherfield	0.0019	0.022	-	-	-	-	-	-	-	13	-

(Source NAEI)

Fig 6. Average of Area Sources for Postcode NG2 3AH (Eastcroft) for 2003

The table below shows the average emission around your postcode in tonnes per annum per km² from sources likely to influence the local air quality

Pollutant	Sector											Total Emission
	1	2	3	4	5	6	7	8	9	10	11	
1,3-butadiene	-	-	-	-	0.001	-	0.41	0.083	-	-	-	0.49
Benzo[a]pyrene	-	0.01	-	0.0002	-	-	0.05	0.004	6.9E-05	-	0.005	0.064
Benzene	-	0.13	0.024	-	0.028	-	1.1	0.36	0.013	-	-	1.7
Carbon Monoxide	-	7.2	2.1	-	-	-	481	93	0.65	-	0.19	584
Carbon Dioxide as C	0.88	8525	694	-	-	-	3237	222	2.1	-	-	12681
Lead	-	0.05	-	-	-	-	0.2	0.057	0.0041	-	-	0.31
Nitrogen Oxides as NO2	-	37	10	-	-	-	81	9.6	0.017	-	0.006	138
PM10 (Particulate Matter < 10um)	-	0.59	0.14	0.53	-	2	4.5	0.94	0.0091	-	0.032	8.7
Sulphur Dioxide	-	0.37	-	-	-	-	0.29	0.67	0.1	-	-	1.4
Non Methane VOC	-	1.5	0.22	1.2	11	45	40	6.3	0.039	-	0.031	105

Code	Sector		
1	Combustion in energy production and transfer	6	Solvent use
2	Combustion in commercial, institutions, residential and agricultural sectors	7	Road transport
3	Combustion in industry	8	Other transport and machinery
4	Production processes	9	Waste treatment and disposal
5	Extraction and distribution of fossil fuels	10	Agriculture
		11	Nature, land use change and other

Fig 7. Average of Area Sources for Postcode NG22 9DD (Rufford)for 2003

The table below shows the average emission around your postcode in tonnes per annum per km² from sources likely to influence the local air quality

Pollutant	Sector											Total Emission
	1	2	3	4	5	6	7	8	9	10	11	
1,3-butadiene	-	-	-	-	-	-	0.015	0.000098	-	-	-	0.015
Benzo[a]pyrene	-	0.005	-	3.1E-06	-	-	0.003	5.3E-06	0.007	-	0.0004	0.014
Benzene	-	0.013	-	-	0.0002	-	0.028	0.00039	0.008	-	-	0.05
Carbon Monoxide	-	0.52	-	-	-	-	12	0.027	0.078	0.042	0.18	13
Carbon Dioxide as C	-	17	-	-	-	-	172	0.53	-	2.8	32	224
Lead	-	0.018	-	-	-	-	0.01	0.000086	-	-	-	0.028
Nitrogen Oxides as NO2	-	0.094	-	-	-	-	3.9	0.019	0.003	0.001	0.0064	4
PM10 (Particulate Matter < 10um)	-	0.04	-	0.00025	-	-	0.13	0.0018	0.016	0.024	0.015	0.23
Sulphur Dioxide	-	0.14	-	-	-	-	0.017	0.0012	0.002	-	-	0.16
Non Methane VOC	-	0.059	-	0.05	0.015	0.09	1.2	0.0075	0.032	-	0.73	2.2

Fig 8. Emissions from Major Point Sources within 5 km of the centre of Postcode NG22 9DD (Rufford) for 2003

The table below shows emissions from large point sources, usually emitted at higher levels through a chimney or elevated vent. These emissions are selected from a 5 km radius of the centre of the postcode NG22 9DD.

Operator	Site Name	1,3 Butadiene	Benzen e	Benzo[a]pyren e	C O	CO2	NO X	SO 2	PM1 0	P b	VO C	Authorisatio n
Hanson Brick Ltd	Kirton	-	-	-	-	11227	-	-	28	-	-	-
Renewable Power Generation C/o Hyder Industrial Ltd	Bilthorpe Power Generation Scheme	-	0.00094	-	6.7	-	2.1	-	0.91	-	0.2	-
Tesco Stores Ltd	New Ollerton	0.0024	0.027	-	-	-	-	-	-	-	16	-
UK Coal Plc	Clipstone Colliery	-	-	-	-	-	-	-	8.5	-	-	-
UK Coal Plc	Thoresby Colliery	-	-	-	-	-	-	-	8.5	-	-	-

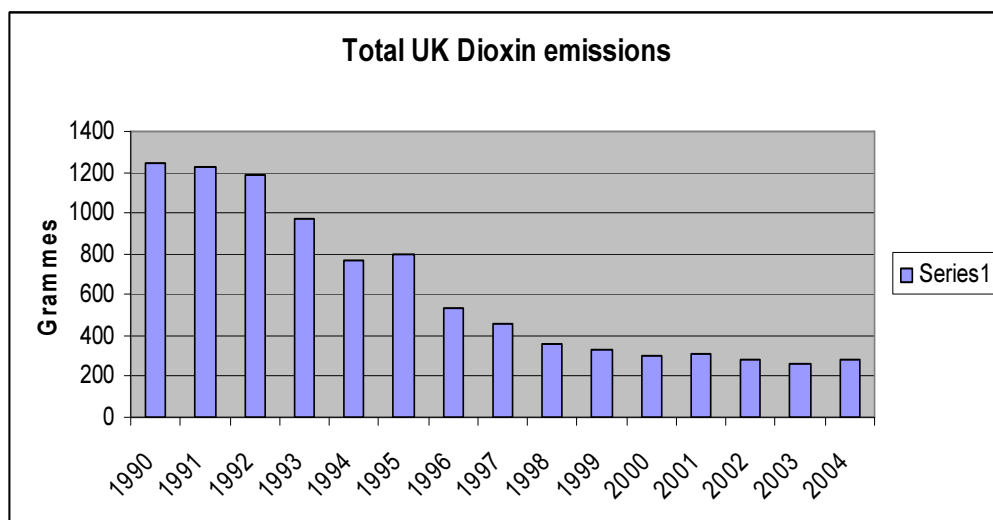
3.4 Health Risks

3.4.1 Introduction

3.4.1.1 Incineration has been used as a method of waste disposal for a considerable number of years. Together with many other industrial processes, environmental legislation was been a relatively recent introduction. Clean Air Acts in 1956, 1968 and 1993 tightened the regulatory environment and further recent legislation has ensured that acceptable emission limits have been reduced dramatically.

3.4.1.2 Much of the available research on the health effects of incineration relies on data from the period when regulation was less exacting and there were undoubted cases of releases of toxic substances from chimneys. Examples continue to emerge from the new members of the European Community where heavily polluted towns struggle to come to terms with European requirements for emissions from older industrial processes. (Copsa Mica – Romania has soil contained lead levels 92 times above the permitted level and vegetation had a lead content 22 times above the permitted level.).

3.4.1.3 Many of the studies into the health effects of incineration draw on a period of history before the 1980s and the health effects found undoubtedly had some basis. Since that time, the emissions due to incineration have reduced massively and the technology improved substantially. Since 1996 the emissions from incineration have seen a 99% cut in lead emissions and a 97% cut in dioxin emissions.



(source NEAI)

3.4.14 Emissions from incinerators are now insignificant compared to other forms of emissions from vehicles, power stations and central heating systems. The Nordic countries and Switzerland with longer environmental histories than the UK have chosen incineration as their desired method of disposal.(fig3).

3.4.15 We searched a variety of sources and on-line academic references. In total over 90 papers exist on incineration/disposal and health and several authors have previously reviewed the literature to ascertain what links there are between incineration and health. To avoid bias for any particular publication we took four publications from across the spectrum to allow triangulation of the results:

1. *Incineration and human health: State of knowledge of the impacts of waste incinerators. Greenpeace Research Laboratories May 2001.*
2. *Review of environmental and health effects of waste management. DEFRA 2004*
3. *The human health impact of waste management practices. A review of the literature and an evaluation of the evidence – Management of Environmental Quality: An International Journal volume 14, number 2, 2003*
4. *Health impact assessment for the proposed third line extension of the Eastcroft energy from waste plant. Professor James Bridges 2006*

3.4.2 Synopsis of literature

1. *Incineration and human health: State of knowledge of the impacts of waste incinerators. Greenpeace Research Laboratories May 2001 (5)*

The document recognises the growing problem of waste throughout the world, the increase regulation on landfill and stricter regulation of incinerators. The paper then suggests that there are alternatives portraying incinerators as a 'quick fix' option.

Incinerators are noted for being controversial in terms of their impact on the environment and human health as well as economic considerations. They are known to emit numerous toxic chemicals into the atmosphere and produce ashes and residues'. It notes that the Philippines have banned the incineration of

municipal medical and hazardous waste under the Philippine Clean Air Act 1999. It advocates recycling and other non-burn technologies.

A broad range of health effects are associated with living near an incinerator as well as working at the installations. These include 'cancer, adverse impacts on respiratory systems heart disease, immune system defects, increased allergies and congenital abnormalities' Whilst cancer has been associated with older incinerators, modern incinerators also have health effects.

Acknowledging reduction in some chemicals from stack emissions, modern incinerators still emit toxic substances as well as residues within the fly and bottom ash. Reduction in dioxins and other chemicals in stack gases commonly leads to increased releases of other chemicals.

The paper admits that 'in most cases, health effects which have been associated with incinerators cannot be tied down to a particular pollutant' and it is therefore impossible to predict health effects for new or updated incinerators. This forms the basis for a call for the complete phasing out of incineration and the implementation of 'sound waste management policies'.

It is claimed that incinerators are typically fed mixed waste streams and these contain hazardous substances including heavy metals. These same heavy metals are emitted as tiny particles from the stack and also remain in the ash. PVC once burned forms highly toxic dioxins which re-enter the environment.

Research on environmental contamination and human exposure is limited and focuses on dioxins and heavy metals. More modern incinerators can contribute to contamination of local soils. In several European countries, cows milk from the vicinity of the incinerator has elevated levels of dioxins.

Populations residing near incinerators have been found with increased levels of dioxins in the UK, Spain and Japan, but not in Germany and the Netherlands. At one incinerator in Finland mercury was found in increased amounts in local residents hair. Children in Spain were found with elevated levels of urinary thioethers which signify toxic exposure. Some studies of incinerator workers have shown similar increased levels of chlorinated phenols, lead, mercury and arsenic in body tissues.

The paper concludes that there are great concerns about possible health impacts although there is little evidence especially to rigorous scientific standards. This

however is strongly indicative that incinerators are potentially very damaging to human health.

A list of potential health effects identified in the report is listed in Appendix 3

2. Review of environmental and health effects of waste management. DEFRA 2004 (1)

The major report covers 420 pages and assesses all the main methods of dealing with municipal solid waste which includes recycling and composting, incineration and landfill.

Information on health effects is then listed under those where there exists concern and those where no health effects were identified. Interestingly landfill showed a concern with a slight increase in birth defects for those mothers living within 2km of a landfill site and materials recycling facilities and showed higher levels of flu-like diseases amongst workers. Composting sites showed increased levels of eye irritation and bronchitis like effects for those living close by. In total the report evaluated the results of 23 epidemiological studies around incineration and found no definitive links to health effects.

Emissions of dioxins and furans per tonne of waste from incineration are higher than from other options. It notes however that emissions from incineration in the UK have changed dramatically with a 99.8% reduction in emissions since 1990. Methane emissions with most effect on global warming are highest from landfill.

In regard of incineration there have been no identified health effects:

‘Many studies have investigated how many cancers occur close to incinerators. There is no consistent evidence of a link between exposure to emissions from incinerators and an increased rate of cancer. Where apparently significant effects have been observed, these are often in relation to incinerators close to other sources of potentially hazardous emissions, which makes it much harder to pin down the source of any effect. The Government’s independent expert advisory Committee on the Carcinogenicity of Chemicals in Food, Consumer Products and the Environment concluded that *“any potential risk of cancer due to residency (for periods in excess of ten years) near to municipal solid waste incinerators was exceedingly low and probably not measurable by the most modern techniques”*

Similarly there is little evidence that emissions from incinerators make respiratory problems worse. In most cases the incinerator contributes only a small proportion to the local level of pollutants.

The report notes that many substances have a 'threshold' level below which the body can accommodate the substance without any ill effects. This threshold differs from person to person.

On a national scale emissions from all forms of waste management are estimated to result in 5 hospital admissions and one death brought forward by air emissions per year. For cancer the estimate is one additional incidence of cancer every 500 years.

3. The human health impact of waste management practices. A review of the literature and an evaluation of the evidence – Management of Environmental Quality: An International Journal volume 14, number 2, 2003 (6)

This report was later to form the basis for a report to the South West Public Health Observatory of the NHS and performs a literature review of incineration, landfill and other disposal techniques.

A judgment was then made on the evidence using defined criteria with possible judgements of 'convincing, probable, possible and insufficient. It was found that there was insufficient evidence to demonstrate a causal link between incineration and adverse health effects.

The literature search yielded 50 primary studies and three reviews. The majority were studies of communities with 14 for occupational health. Most health outcomes were investigated including cancer, biomarkers, developmental effects on children and mortality.

The study screened the results of the various studies to ensure that other factors had been taken in to effect and then asked whether the studies consistently showed a strong or moderate risk to health. The result was inconsistent with half finding health effects and half not with a conclusion that evidence was insufficient.

By way of contrast the paper measured risk, 1 implies no effect, >1 implies increased risk, <1 implies health benefit

Cause	Effect	Relative risk
Cigarette smoking 25 cigs/day	Bladder cancer	5.0
Heavy alcohol consumption	Oesophageal cancer	18.5
Cigarette smoking - >25 cigs/day	Liver cancer	30.0
Hepatitis B virus infection	Liver cancer	>100
Heavy alcohol consumption +smoking	Oesophageal cancer	101.5
Occupational exposure to asbestos	Methothelioma	>200

No recent studies for waste sites found more than a 1.86 link to congenital effects, with most around 1.08. i.e. minimal risk.

The paper concludes that either incineration does not cause adverse health effects or that health effects are not detectable using existing epidemiological methods and the available data.

4 Health impact assessment for the proposed third line extension of the Eastcroft energy from waste plant. Professor James Bridges, Emeritus Professor of Toxicology and Environmental Health, University of Surrey, Guildford, Surrey (7)

The report was prepared to accompany the planning application for the extension to the Eastcroft incinerator in Nottingham. The report contains detailed information on the methodology for determining health effects and potential chemical emissions.

The chemicals emitted from the stack are subdivided into those that could have *acute* effects which are likely to occur within a short period of exposure and those where the effects are *chronic* which are likely to show effects over prolonged exposure

The report then outlines the different types of data available to assess the health effects from an incinerator through epidemiology studies, toxicology studies and exposure information.

In regard to Eastcroft, two approaches were used:

- 'air dispersal modelling of the ground levels of each chemical of interest emitted from the stack of the plant. This modelling approach errs on the side of caution. These conservative estimated

ground level concentrations of each chemical/chemical class can be compared against the appropriate health based standards.

- Examination of published findings on the health impacts of incinerators both in the UK and elsewhere in the world. In addition the possibility that locally grown food could become contaminated as a result of the operation of the Eastcroft Energy from Waste Plant has also been examined (based on modelled data)'.

The report identifies that the published literature indicates that a number of incinerators operating in the middle of the last century caused significant environmental pollution to the local environment. There is however very limited evidence that adverse health effects occurred to members of the local community. The emission levels for these incinerators were around 1000 times higher than those for a modern facility.

Each chemical group is examined including carbon monoxide, hydrogen chloride and hydrogen fluoride, nitrogen dioxide, particulate matter (PM10), sulphur dioxide, metals, dioxins, polycyclic aromatic hydrocarbons, volatile organic compounds. The health effects of each are detailed and compared to probable emission levels. In each case the levels attributable to an incinerator are so low as to be insignificant and thus have no health effect.

It is also evident that many chemicals emitted from an incinerator, also exist from other sources and that the contribution from a stack cannot often not be differentiated from them. Where the proportion emitted from the stack is very small, effects on health are unlikely to be significant and the mere presence of a chemical is insufficient to conclude toxicity.

The estimated levels of contamination to local food are so low that there would be no health risk and similar combinations of chemicals are unlikely to have any effects on the local population.

The report concludes that 'the airborne emissions from the proposed expansion of the Eastcroft Plant will not cause any significant risk to the health of the local population'.

3.5 Conclusions from literature

3.5.1 Only the Greenpeace study claimed any causal links to health effects, however none of the studies were able to show an absolute connection

between incinerator emissions and a health impact on the local population.

Other environmental factors such as industrial activity and vehicle exhausts and sociological factors such as smoking and diet have considerably more effect on human health than the very low emissions from incineration.

- 3.5.2 A few statistical studies showed a slight increase in certain health effects within a few km of an incinerator, however these effects were not repeated at other incinerator sites and could be the result of other pollutants or other naturally occurring chemicals.
- 3.5.3 Studies of incinerator workers did identify a few cases of possible health effects, however these studies are not conclusive and are based on periods in history when emissions from a variety of sources were substantially higher than today.
- 3.5.4 Theoretical modelling of dispersal from an incinerator stack has been attempted and shows minimal contamination of the surrounding area. Even if the local population grew and ate the majority of their food within 2 km of the incinerator, the exposure to pollutants (especially dioxins) would be minimal.
- 3.5.5 Whilst all agree on the likely emissions from incinerators, the effects are slight. Interestingly the more recent studies find far fewer effects than those based on pre 1980 information. This could be as a result of more stringent and advanced testing methodology but must also be a reflection of the massive reduction in emissions from incineration – 99.8% reduction since 1990.
- 3.5.6 Some studies try to suggest that evidence is lacking because modern techniques may not be sensitive enough to measure health effects. This appears to be another way of saying there is no evidence.
- 3.5.7 Whilst it is impossible to provide 100% proof, there does appear to be no significant risk to the health of the local population from modern incinerators. It therefore appears that much of the unease about incineration is not based in fact.

4.0 Alternatives to landfill

4.0.1 There are alternatives to landfill. Some of the technologies are 'tried and tested' and have a long established track record in the treatment of residual waste in the UK. Other technologies have been used widely in Europe, but only recently introduced in the UK or have been used to treat different types of waste. There are also new and emerging technologies, which are currently unproven.

4.0.2 The following table provides a summary of the main alternatives to landfill and their development status in the UK. Energy from Waste has been examined previously under incineration, the other options are expanded below.

Technology	Facilities operating in the UK
Energy from Waste	5 operating in the Midlands region
In-vessel composting	Yes - full scale
Anaerobic digestion	Yes - mainly for processing sewage sludge
Mechanical Biological Treatment	One operational - several under development
Gasification/ pyrolysis	Pilot plant under development. No full-scale commercial plants

(Warwickshire Country Council)

4.1 *Anaerobic digestion*

4.1.1 Biodegradable material is processed in an enclosed vessel under controlled conditions. The material breaks down in the absence of air and produces a gas, liquid fraction and digestate (compost-like material).

4.1.2 The gas produced can be used to generate electricity, which can then be sold to the national grid at a higher tariff than conventionally generated electricity. Whether markets can be found for the digestate will depend on the quality of the material produced., however it may be necessary to landfill this material if a viable market cannot be found. Rejects from the process will also need to be landfilled.

4.2 *In-vessel composting*

4.2.1 Biodegradable material is processed in an enclosed vessel under controlled conditions. The material breaks down in the presence of air and produces compost.

4.2.2 Depending on the quality of the compost produced, markets may be found in agriculture or amenity horticulture, however, quality is critical. If source separated waste is processed the quality of the final product will be better than if mixed waste is processed. It may be necessary to landfill the material if a viable market cannot be found. Rejects from the process will need to be landfilled.

4.3 *Gasification/ pyrolysis*

4.3.1 Gasification and pyrolysis are referred to as advanced thermal treatment processes. They are separate processes but are often combined to improve combustion efficiency. They are not suitable for processing mixed, black bag waste, which will require sorting or pre-treatment (shredding) before processing. The facilities are typically smaller than conventional thermal treatment facilities such as Energy from Waste.

4.3.2 Gasification and pyrolysis combust waste with a limited supply of air (gasification) or in the absence of air (pyrolysis) to produce a variety of products. Both processes produce a gas, which can be used to generate electricity, and sold to the National Grid for an enhanced tariff. In addition to electricity, a carbon-rich material, char and oil (from pyrolysis) are also produced. There is the potential to use these products if a viable market can be found, otherwise they will need to be disposed of. As with Energy from Waste, the processes also produce fly ash, which will need to be disposed of at a specialist hazardous waste landfill site.

4.4 *Mechanical biological treatment (MBT)*

4.4.1 MBT is a generic term for a number of processes, which are combined to process waste. It can be used to process mixed, black-bag waste or source separated waste. MBT processes typically include a series of screens and conveyors to separate different fractions of waste (the same as a materials recycling facility MRF). The biodegradable fraction is then processed using anaerobic digestion or in-vessel composting technologies.

4.4.2 The products produced will be dependent on the configuration of the technologies used but can include; refuse derived fuel (paper, plastics, etc.) separated recyclables (metal, glass) compost-like material and if

anaerobic digestion is used then electricity can be produced, which can be sold to the National grid for an enhanced tariff.

4.4.3 Whether viable markets can be found will be dependent on the quality of the products produced. If not viable markets cannot be found then the products will have to be landfilled.

4.5 *Materials recovery/ reclamation facility (MRF)*

4.5.1 Source separated or mixed waste (dirty MRF) is separated mechanically and in some instances by hand into different recyclable fractions e.g. glass, paper, plastic and metals. Depending on the quality of the separated materials it is likely that a viable market would be found for the products.

Technology	Process mixed 'black bag' waste	Process source-separated waste	Waste requires pre-treating before processing	Product still classified as biodegradable
Anaerobic digestion	N	Y	Y	Y
In-vessel composting	N	Y	Y	Y
Energy from Waste	Y	Y	N	N
Gasification/ Pyrolysis	N	Y	Y	N
MBT	Y	Y	N	Y

4.6 *Health effects from alternatives*

4.6.1 There is virtually no data on the health effects of the technologies listed in section 4. It is probable they will produce a similar range of potential emissions to incineration but in lower quantities.

4.6.2 Whilst this document focuses on incineration, it should not be taken that other forms of waste disposal are 'risk free'. Open windrow composting raises concerns about emissions, if the waste is not handled properly and landfills can give rise to emissions to water, land or air unless properly managed.

4.6.3 Most municipal solid waste facilities, where studies have taken place, have found that health effects in people living near waste management

facilities were either generally not apparent, or the evidence was not consistent or convincing.

4.6.4 A few aspects of waste management however have been linked to health effects in local people.

- A detailed study of landfill sites has identified a possible link between living close to a landfill site, the occurrence of some birth defects and the occurrence of unusually low birth weight. The study however was not able to demonstrate a definite link are causal and the results could be the result of other factors.
- A recent study undertaken at residential areas in close proximity to a commercial composting plant looked at the incidence of bronchitis and minor ailments in people living in this area. The study showed that there might be a link between emissions from the facility and these health effects in residents living nearby. Similar studies into cancer and asthma have found no increase in health effects

5.0 Costs

5.1 Introduction

5.1.1 Gedling Borough Council currently disposes of its domestic residual waste at the following locations.

- Dorket Head landfill site located on the outskirts of Arnold
- Eastcroft Incinerator located in the Cattle Market in Nottingham

5.1.2 Nottinghamshire County Council have entered a 26 year P.F.I. agreement with Veolia Environmental Services for the disposal of waste across the County, and Veolia are proposing to build an E.R.F. facility at the ex-Rufford Colliery site in north Nottinghamshire. Subject to this facility being made available, an agreement will be established with Gedling Borough Council (B.C.) and Nottinghamshire County Council (C.C.), which will require Gedling B.C. to dispose of its domestic residual waste at the E.R.F. at Rufford on Monday and Tuesday of each week and at the Eastcroft Incinerator Plant on Wednesday, Thursday and Friday.

5.1.3 The purpose of this section of the report is to establish the operational implications to Gedling B.C. in utilizing the proposed E.R.F. at Rufford and a continuation of the current waste disposal arrangement.

5.1.4 The two options being reviewed therefore are:

- Disposal of residual waste at an E.R.F. at Rufford for two days per week, and at Eastcroft Incinerator for three days per week or
- Disposal of domestic residual waste at the Dorket Head Landfill Site, Arnold for two days per week and at the Eastcroft Incinerator in Nottingham for three days per week

5.1.5 To assist in the operational cost assessment of the two options, all the proposed sites were visited to establish realistic mileage and tip turn round times.

5.2 Cost and operational implications

5.2.1 Due to its location, the proposed E.R.F. facility at Rufford will have the following operational and cost implications to the provision of the domestic residual waste collection service.

- An increase in vehicle related costs
- An increase in the productive hours required to undertake the service incurring additional employee costs

5.3 Vehicle related costs

5.3.1 Regarding vehicle related costs, the following factors have been taken into account.

- Average number of trips to the E.R.F. has been based upon 2.5 per round per day which is the optimum number having regard to the capacity of the refuse collection vehicles engaged on the service
- Fuel consumption is based upon average fuel usage for the types of vehicle used and the topography of the District
- Measured distances to the waste disposal sites and “tip turn round” have been taken from the Councils depot at Jubilee House to the waste disposal locations
- Fuel costs are based upon the Councils costs for the purchase of DERV.
- Employees rates are based upon the Councils current terms and conditions

- Vehicle costs based upon the current fleet of 9 – 26 tonne R.C.V.'s and 1 – 22 tonne R.C.V., all with bin lifts
- Disposal arrangements including two days per week for disposing of either the E.R.F. at Rufford or the Dorket Head Landfill Site, and three days disposal at Eastcroft Incinerator.

5.4 Additional cost calculation

Average return mileage to Rufford	-	30 miles
Average return mileage to Dorket Head Landfill Site	-	8 miles
Additional mileage incurred	-	<u>22 miles</u>

Total number of journeys to the waste disposal site in two days:

26 tonne unit	-	$9 \times 2.5 \times 2$	=	45
22 tonne unit	-	$1 \times 2.5 \times 2$	=	5

Total additional mileage per week

(alternative weekly collection of residual waste)

26 tonne unit	-	$\frac{45 \times 22}{2}$	=	495
22 tonne unit	-	$\frac{5 \times 22}{2}$	=	55

Average fuel consumption m.p.g.

26 tonne unit	=	3.7
22 tonne unit	=	4.0

Fuel Cost

Average Fuel Cost	-	0.7654p per litre, i.e. £3.48 / gallon
-------------------	---	--

Additional cost for fuel

26 tonne unit	$\frac{495}{3.7} \times 52 \times 3.48$	=	£24,209
---------------	---	---	---------

22 tonne unit	$\frac{-55 \times 52 \times 3.48}{4}$	=	£ 2,488
---------------	---------------------------------------	---	---------

Total		=	£26,697
-------	--	---	---------

Maintenance Cost

Average maintenance cost including tyres		=	50p / mile
--	--	---	------------

Additional maintenance cost / annum		=	0.50 (495 + 55) x 52 = £14,300
-------------------------------------	--	---	--------------------------------

TOTAL ADDITIONAL VEHICLE COST CHARGES		=	£40,997 per annum
--	--	---	--------------------------

5.5 Additional resource cost implications

5.5.1 This is based upon the worst case scenario whereby there is no spare capacity in the current domestic waste collection operation to absorb the increase in journey time for waste disposal at Rufford.

5.5.2 The cost implications are therefore based upon additional overtime working.

Average return time taken to Rufford			54 minutes
Average return time taken to Dorket Head Landfill	-		18 minutes
Additional time per return journey	-		<u>36 minutes</u>

NB. It is assumed that the time spent at the two waste disposal facilities will be broadly similar.

Total additional resource time per round per day.

Drivers	-	1 x 36 x 2.5	=	90 minutes or 1.5 hours
Loaders	-	2 x 36 x 2.5	=	180 minutes or 3 hours

Total additional resource time for ten turn rounds for two days

Drivers	-	10 x 1.5 x 2	=	30 hours
Loaders	-	10 x 3 x 2	=	60 hours

Employees basic rates of pay for overtime working

Wages

Drivers	=	8.20 x 1.5	=	£12.30 per hour
Loaders	=	6.02 x 1.5	=	£ 9.03 per hour

Additional employee costs per annum

(alternate weekly collection of residual waste)

Wages

Drivers	=	12.30 x 30 x 26	=	£ 9,594
Loaders	=	9.03 x 60 x 26	=	£14,087
		Total	=	<u>£23,681</u>

Holiday and sickness Cover (18.5%)

$$= 23681 \times 0.185 = £4,381$$

N.I. / superannuation (23%)

$$= 28062 \times 0.23 = £6,454$$

TOTAL ADDITIONAL EMPLOYEE COSTS = £34,516 per annum

**TOTAL ESTIMATED ADDITIONAL COST = £75,513
ASSOCIATED WITH DISPOSAL OF
RESIDUAL WASTE AT RUFFORD**

5.6 Conclusions

- 5.6.1 The current estimated additional costs incurred through the disposal of domestic residual waste for two days per week at an E.R.F. at the ex-Rufford site, as opposed to the Dorket Head Landfill Site are based upon current costs. Because it is uncertain if and when the proposed E.R.F. at Rufford will be operational, it is not possible to accurately forecast what the additional operational cost will be.
- 5.6.2 It should also be noted that the costing exercise has focused upon the disposal arrangements of household residual waste. There may be similar cost

implications in respect to other collection services provided by the Council, e.g. collection of bulky household items and the disposal of detritus and litter collected from the Council's street cleansing service.

- 5.6.3 There are other alternative proposals the Council may wish to consider the one relevant to the proposed disposal arrangements.
- 5.6.4 In order to achieve its longer term recycling targets, i.e. 50% by 2010, the Council may be required to introduce a kitchen waste collection service. Other councils which have introduced kitchen waste collection initiatives, are recording an average recycling performance of 5% for those properties participating in the scheme.
- 5.6.5 The operational implications with regard to the Councils residual waste collection service should Gedling introduce a Borough wide kitchen waste collection service, would be to reduce the number of daily trips to the tip per round from 2.5 to 2.0. This would ensure that collections of domestic residual waste by the ten rounds could be completed in the standard working day, and also there would be very little additional vehicle mileage to that currently being registered.
- 5.6.6 Another factor that should also be taken into account, is the growth in the number of domestic properties due to take place within the Borough over the next few years, which will almost certainly require the introduction of an additional domestic refuse collection round.
- 5.6.7 It is possible that there will be sufficient spare capacity within this extra round to absorb the additional travelling time incurred through disposing of domestic residual waste at the E.R.F. at Rufford.

Appendix 1 Gedling literature received

Articles supplied by Gedling BC as part of the review

NAIL Mail	e-mail	Nail News
Only Solutions LLP	briefing	briefing
NAIL	Newsletter	
MAIN	e-mail	
Friends of the Earth	webpages	East Mids Campaign news
NAIL	briefing	
MAIN	briefing	
Jerome Baddley	Nottenergy.com	FOE briefings
Helen Ross	Briefing	Public Health
Barry Robinson	e-mail	incineration
Waste Management	Magazine article	
Notts Health Action Team	Report	Health Impact Assessment

Appendix 2 Bibliography

1. Review of environmental and health effects of waste management: Municipal Solid Waste and Similar Wastes. Enviro Consulting Ltd and University of Birmingham with Risk and Policy Analysts Ltd, Open University and Maggie Thurgood .DEFRA 2004
2. Eurostat Municipal Incineration statistics 2004/2005
3. Emissions of dioxins and dioxin-like polychlorinated biphenyls from domestic sources – Enviro Consulting for Defra May 2006
4. A zero waste UK - Institute for public policy research and green alliance, October 2006
5. Incineration and human health: State of knowledge of the impacts of waste incinerators. Greenpeace Research Laboratories May 2001
6. The human health impact of waste management practices. A review of the literature and an evaluation of the evidence – Management of Environmental Quality: An International Journal volume 14, number 2, 2003
7. Health impact assessment for the proposed third line extension of the Eastcroft energy from waste plant. Professor James Bridges 2006
8. Report of the Health Impact Assessment (HIA) of the proposed expansion to the incinerator at Eastcroft, Nottingham. Nottingham Health Action Team – March 2006
9. The environment in your pocket 2006 10th edition –DEFRA & Office for National Statistics

Web site references:

Eurostat	epp.eurostat.ec.europa.eu
National Atmospheric Emissions Inventory	www.naei.org.uk
Department for Environment, Food and Rural Affairs	www.defra.gov.uk

Appendix 3 Health impacts (Greenpeace)

HEALTH IMPACT	COMMENTS
Biomarkers of Exposure	
Elevated mutagens in urine	Incinerator ashes and stack emissions are mutagenic (have the ability to damage DNA). Workers are therefore exposed to mutagenic compounds. Elevated mutagens in urine indicate exposure to mutagenic compounds. (Study dates 1990 & 1992).
Elevated levels of hydroxyrene in urine	Hydroxyrene is an indicator of internal exposure to PAHs. The result suggests elevated exposure to PAHs. (Study date 1992).
Increased quantity of thioethers in urine	Thioethers in urine are an indicator of exposure to electrophilic compounds such as PAHs. The results suggest exposure to electrophilic compounds. (Study date 1981).
Cancer	
3.5-fold increased probability of mortality from lung cancer	Workers who were employed at a MSW incinerator in Sweden at sometime between 1920 and 1985. (Study date 1989).
1.5-fold increased likelihood of mortality from oesophageal cancer	Workers who were employed at a MSW incinerator in Sweden at sometime between 1920 and 1985. In conjunction with evidence from other research, the result implies an increased health threat to workers. (Study date 1989).
2.79-fold increase in mortality from gastric cancer	Workers employed at an MSW incinerator in Italy at sometime between 1962 and 1992. Some of the increase may have been due to other confounding factors. (Study date 1997).
Other Impacts	
Increased mortality from ischemic heart disease	Workers who were employed at a Swedish MSW incinerator in Sweden at sometime between 1920 and 1985. The result was statistically significant in workers with greater than 40 years employment. (Study date 1989).
Excess hyperlipidemia. A significant association between blood dioxin levels and natural killer cell activity (immune system effect). Altered sex ratio among offspring. Decreased liver function. Increased allergy.	Workers employed at an incinerator in Japan, that operated between 1988 and 1997. Excess of hyperlipidemia was significant. Change in immune system cells. Altered sex ratio was not statistically significant. Correlation between allergy and dioxin exposure must be confirmed. (Study date 2000).
Excess of proteinuria (urine abnormality) and hypertension. Possible increased incidence of small airway obstruction (unconfirmed diagnosis). Abnormal blood chemistry.	Workers at a MSW incinerator in the US. An excess of workers with significant proteinuria. (Study date 1992).
Chloracne (a skin condition due to dioxin-exposure)	Chloracne found in one worker from an old incinerator in Japan, who had high blood levels of dioxin. (Study date 1999)
Biomarkers of Exposure	
Increased quantity of thioethers in urine	Thioethers in urine are an indicator of exposure to

	electrophilic compounds such as PAHs. The results suggest exposure to electrophilic compounds. (Study date 1981).
No abnormal chromosomal damage	No excess chromosomal damage among children living near two Belgian incinerators. (Study date 1998)
Cancer	
37% excess mortality due to liver cancer	A study on 14 million people living within 7.5 km of 72 MSW incinerators in the UK. Further research to eliminate possible confounders found the increased probability of liver cancer to lie between 20 and 30%. Social deprivation could not be totally ruled out as a confounder. (Study dates 1996 and 2000).
44% increase in soft tissue sarcoma and 27% increase in non-Hodgkin's lymphoma.	Significant clusters of these cancers in residents living close to an incinerator in France. Possibly due to exposure to dioxin from the incinerator, but more research is needed to confirm if this is the case. (Study date 2000).
6.7-fold increase in likelihood of mortality from lung cancer	Significantly increased occurrence in residents living close to a MSW incinerator in an urban area of Italy. (Study date 1996).
Increased incidence of cancer of the larynx	Found around one UK hazardous incinerator of waste solvents (1990), but not nine others. In Italy, excess mortality from this cancer was found in residents living near to an incinerator, a waste disposal site and an oil refinery.
2-fold increased probability of cancer mortality in children	A study conducted on 70 MSW incinerators in the UK (1974-87) and 307 hospital waste incinerators (1953-1980). These results are consistent with another study in which an increased probability of childhood cancer was observed for hospital incinerators and large-scale, high-temperature combustion industries (Study dates 1998 and 2000).
Respiratory Impacts	
Increased purchase of medicine for respiratory problems	A study at a village in France that had a MSW incinerator. Results suggest increased use of medicine for respiratory illness but a cause-effect relationship cannot be concluded (Study date 1984).
Increased respiratory symptoms, including 9-times increase in reporting of wheezing or cough	A study in the US on residents living near to a hazardous waste incinerator. The results are of limited utility because of methodological concerns about the study. (Study date 1993).
Adverse impacts on lung function of children	A study on children living near to a wire reclamation incinerator in Taiwan. Results indicate that higher air pollution, but not the incinerator itself, is linked to altered lung function in children. (Study date 1992).
Increased respiratory systems including lung disease, wheezing, persistent cough and bronchitis	A study on 58 individuals living near to cement kilns burning hazardous waste in the US. Significant increase in respiratory symptoms. (Study date 1998).
No adverse effect on the prevalence or severity of asthma in children.	A study on children living near to sewage sludge incinerators in Australia. (Study date 1994).

No increase in respiratory effects or decrease in lung function	A study on 3 communities (6963 individuals) living near to a municipal, hazardous and hospital waste incinerator in the US. The lack of association between exposure to particulate air pollution and respiratory health in this study should be interpreted cautiously due to limitations in data on individual exposures.
Sex Ratio	
Increase in female births	A study on populations living near to 2 incinerators in Scotland, UK. The effect was found in the area potentially most exposed to incinerator releases. Other studies have found an increase in female births where fathers were accidentally exposed to high levels of dioxins. (Study dates 1995 and 1999).
Congenital Abnormalities	
Increased incidence in orofacial clefts Other midline defects including spina bifida and hypospadias (genital defect)	The significant increase in orofacial clefts was observed for births in an area located near to an incinerator site where open burning of chemicals took place 1960-69. A link between the conditions and living near the incinerator is likely but not confirmed.
1.26-fold increased probability of congenital malformations among new born infants	A study conducted on a population living near to 2 MSW incinerators in Wilrijk, Belgium. (Study date 1998).
Increased congenital eye malformations (anecdotal report)	Reported at an area near two chemical waste incinerators in Scotland, UK. Further research in the UK found no link, although the study was hampered by lack of data on the condition. (Study date 1989).
Multiple Pregnancy	
Possible increase in rate of twinning/multiple pregnancy.	An increase in twinning was significant in 1980 in a population living near to an incinerator in Scotland, UK. A 2.6-fold probability of multiple pregnancy found near incinerator in Belgium (Study date 2000). No impact on multiple pregnancy found on a survey of an incinerator in Sweden. Data from different studies is conflicting and inconclusive.
Other Impacts	
Lower thyroid hormone levels in children	Children living near a German incinerator had significantly lower blood levels of certain thyroid hormones. (Study date 1998)
Increased allergies, increased incidence of common cold, increased complaints about health in general, increased use of medication in school children	A study conducted on school children living near to two MSW incinerators in Wilrijk, Belgium. (Study date 1998).