



Partners in Innovation Project 04/27C

Exploiting the Value of Demolition and Construction Waste

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1. Summary & Recommendations

The Partners in Innovation Project: Exploiting the Local Value of Demolition and Construction was undertaken by UK CEED.

The project objectives were to:

- Identify waste arisings from construction and demolition (C & D) companies
- Encourage separation of material streams
- Seek to divert the material streams from landfill by identifying recycling routes
- Identify the necessary changes in practices and procedures needed to achieve such diversion
- Raise awareness locally and nationally amongst C & D companies and waste service suppliers of the scope for, and financial benefits of recycling the waste

The research focused on current practice and procedures within three key sectors: the Construction and Demolition (C & D) Industry; waste management service providers; and reprocessors. The project methodology consisted of a mixture of desk research, direct engagement with the three sectors, implementation of a pilot separation and recycling scheme and national dissemination seminars.

UK CEED's research found that:

- The concept of site waste management planning, where waste management is planned on a site by site basis, is not sufficiently understood by the construction industry
- Waste management is generally focused on timely removal of waste to enable construction to continue and to meet health and safety requirements
- Forward planning to maximise recycling and examine waste minimisation is rare, largely because C & D companies are unaware that effective waste management can deliver real savings
- The administrative structure of the organisations and arrangements at site level generally mitigate against such planning
- The lack of waste management planning means that most sites do not fully comply with waste management legislation.
- Whilst very high rates of recycling are relatively difficult to achieve, C & D companies are not aware of the quick wins that can be achieved by, for example, segregating mixed waste streams, recycling inert waste and using transfer stations to achieve recycling targets.
- It was possible to set up practical and cost effective separation of materials at site level which achieved a 70% recycling rate by diverting waste via a transfer station.

The findings of the project highlighted the need to engage in extensive awareness raising activities with C & D companies at administrative and site level. As part of the project, therefore, awareness raising components were developed and delivered that sought to:

- Facilitate and accelerate the adoption of basic on-site waste management systems to ensure that legislative requirements are met as a minimum first step towards more comprehensive planning
- Build momentum for policy and procedural changes aimed at achieving recycling and re-use.
- Broker more effective waste management arrangements between C & D companies and waste management service providers.
- Produce a 'toolkit' for easy adoption of segregation and recycling-focused waste management.

At a local level, the project made progress with promoting a demand-led approach to waste management services by stimulating several companies to review procurement processes to

ensure that their waste management contractors can recycle waste through the provision of source segregation or transfer to recycling facilities.

At a national level the seminar series demonstrated the need to assist C & D companies by providing help and guidance on initiating Site Waste Management. It also highlighted a continuing lack of awareness of basic waste management legislation, how waste management services operate and the potential to divert waste from landfill.

There are significant opportunities to join construction and demolition waste streams with other commercial streams and municipal wastes to maximise the economy and efficiency of recycling.

The project determined that construction companies, given the right level of support, are willing to become more effective at managing waste especially where it is possible to demonstrate quick wins. However, without support the companies are unlikely to adopt the necessary practices to divert waste from landfill.

Recommendations

- Greater information is required at the local level on provision of waste management services, particularly in relation to specifications of recyclate materials
- C & D companies would benefit financially from greater investigation of local waste collection and processing services
- The C & D industry require clearer information and guidance on the basic requirements of waste management legislation and forthcoming changes to the legislation
- Smaller C & D companies, which do not benefit from economies of scale, require waste management facilities and infrastructure at a local level that cater for their specific requirements, including quick and easy access without appointments and reasonable cost
- Greater transparency in the waste management service industry is required. Waste management companies need to provide to customers and policy makers accurate data on actual volumes of waste material streams and current disposal methodology, including proportion of material recycling/re-used. This could be introduced through a change in the waste transfer note systems to include a section on quantities and types of materials recovered or, at a minimum, utilising average figures from all operations.

At a legislative level the following would be effective in increasing recycling rates:

- Material specific targets for recyclables from the C & D industry
- A ban on the direct transportation of waste to landfill – rather all waste should be required to be directed through transfer stations
- Requirement for all C & D projects to introduce Site Waste Management Plans (proposed as part of the Clean Neighbourhoods Act for projects over £200,000). This will ensure that all companies, including SME's which make up 97% of the industry, consider re-use and recycling. This could be achieved through the planning system or building regulations.

Discussions with waste service providers have indicated that the following actions would assist them in diverting waste from landfill:

- Independent information/reviews on suitable technology for waste treatment, handling and storage.
- Introductions to potential inward investors – networking
- Greater investment in core business
- Support for local re-processors providing higher value activity.

2. Introduction

2.1 Background

The rationale for the project is based firmly on the policy and economic indicators at international, European Union, UK and regional levels, which are all pointing strongly and uniformly towards moving away from landfilling waste to regarding waste as a resource with exploitable value. Construction and demolition (C & D) was is major contributors to UK waste, accounting for 150m tonnes in 1998, or about 25% of all UK waste.

The following are examples of where policy and economic drivers are leading:

- The Landfill Tax Directive is being implemented in the UK, and will prohibit some wastes from landfill.
- The UK's national waste strategy supports a waste hierarchy in which landfill appears as the last option. It has established the Waste Resources Action Programme (WRAP) with £40m funding over 3 years to identify and promote recycling and markets for secondary materials.
- The PII programme itself points to the "heavy burdens on landfill" caused by waste streams from C & D.
- The Cambridgeshire and Peterborough Joint Waste Strategy 2002-2012 has been agreed, to support local authorities in achieving higher recycling rates for domestic waste. The East of England Assembly and East of England Development Agency strategies on sustainable development also support the UK's waste hierarchy approach.
- In the region and locally, there is no high profile public or private sector policy or scheme focusing on increasing the proportion of trade waste which is recycled. The proposed project attempts to do this for C & D waste in Greater Peterborough.
- The Greater Peterborough Partnership and the East of England Development Agency supports Encluster, an initiative run by the present applicant, UK CEED. Encluster aim is to support the growth of the environmental industries in the GP area, which in the past has been a pioneer of waste collection and sorting, and which now wants to develop capability in waste reprocessing.

2.2 Objectives

The objective of the project was to:

- Learn how to divert a significant tonnage of waste construction materials from landfill, for processing, remanufacturing and re-use, and implement that approach.

It was not possible to state the tonnage of waste to be diverted, since the potential within the geographical area of the project (Greater Peterborough) was unknown.

- Increase expertise in the Greater Peterborough area in the collection and recycling of construction waste.

The minimum participation in (and direct beneficiaries from) the project at any one time was considered to be:

New build: 2 companies at any one time, operating at an estimated 10 sites over the 7 month implementation period of the project (not necessarily the same companies throughout the period).

Refurbishment: 2 companies, as new build.

Demolition: 1 company, as new build.

Taking a notional average site life of 7 weeks, this would involve a minimum of 8 new build, 8 refurbishment and 4 demolition sites in the 7 month implementation period of the project.

The project will aim to maximise the number of companies and sites involved in the project, aiming for a minimum of 5 medium/large and 5 micro/small new build companies, at least 6 companies whose main business is refurbishment, at least 2 demolition companies and at least 3 waste collectors.

Disseminate the technical and operational learning points to 10 other UK sub-regions using easily assimilable methods and tools.

3.0 Waste Materials Arising in Greater Peterborough

3.1 Data Collection

The objective was to research and produce data on types, quantities (weights and/or volumes), and specification of waste arising from the refurbishment, construction and demolition industry (C & D), within Greater Peterborough and those districts whose waste management facilities effect disposal practice and procedure.

At the planning stage the main materials were considered to be aggregates/inert materials or inactive materials¹, plastics, glass, and wood, but the project also covers Insulation, metals, plaster (including plasterboard) & cement, together with miscellaneous others (which account for nearly 10% of the national construction waste stream).

The required data was sought from both 'top level' sources and companies involved in handling C & D waste.

3.2 Environment Agency (EA) Waste Returns Data

Licensed Transfer Stations and Landfill Operators are required to submit waste returns to the Environment Agency. Information is required, quarterly or yearly, on types and quantities of controlled waste handled at these facilities in the UK. Details required include a description of the waste, waste classification (as agreed by the EA local offices), and the final destination of the material stream e.g. landfill, use on site. The information is required as appropriate for materials both entering and exiting the site.

3.2.1 Environment Agency Waste Returns Data Analysis District of Peterborough

Analysis of data provided by the Environment Agency, from the waste returns, for landfill sites located in the district of Peterborough, indicates that construction and demolition waste in 2001/2 comprised 35.6% by weight of the total waste arising. In 2002/3 C & D waste accounted for 35% by weight of the total waste arising. The national average is 25%.

The above analysis is based on UK Waste Classification Codes; all code 210000 allocations (excluding domestic container glass) 220200, 220201, 220202, 220203, 220301 to 220302 (Annex 1, UK Waste Classification). The reason these codes are used instead of the European Waste

¹ * Inert Waste refers to clean soils, sands and gravel. In this report it is taken to include those materials deemed inactive and will not change in state upon disposal this includes concrete, brick/blocks, ceramics including roof and ceramic floor tiles. This is due to the industry use of the term with reference to disposal of these materials. For clarification please see waste disposal acceptance criteria for landfill.

Catalogue Codes is that all waste returns for the period have been made using the UK classification. The codes were chosen as indicative of waste arising.

These percentages translate into 108,188.49 tonnes in 2001/02 and 136,006.657 tonnes in 2002/03.

In aggregating the above data, information regards the individual project waste streams entering landfill was not available. However, if GP is similar to the national breakdown, the following data can be derived on the amount of each waste stream arising from construction and demolition activity:

Material		2001/02	2002/03
	%	Tonnes	Tonnes
Inert	7.1	7681.35	9656.47
Timber	13.8	14929.94	18768.92
Glass	UNKNOWN		
Plastics	3.2	3462.02	4352.21
Metals	4	4327.52	5440.27
Plaster & Cement	11.3	12225.24	
Packaging	25.9	28020.82	35251.71
Concrete	10.2	11035.18	15368.75
Ceramics	8.6	9304.17	11696.57
Insulation	7.5	8114.10	10200.5
Others	9.6	10386.05	13056.64

Table 1: Percentage of waste arising by type in C & D waste

3.2.2 Environment Agency Waste Returns: Project Area Analysis

To ensure that all information was gathered for waste treatment facilities in the project area, the Environment Agency was approached to provide the raw waste returns data, the data required to be submitted by waste management facilities to indicate to the EA that they are operating within the boundaries of their waste management license. Analysis was subsequently undertaken for those facilities with postcodes PE1 – 28 this included the facilities in the districts of Peterborough, East Northamptonshire, Rutland, South Kesteven, South Holland and Fenland.

Analysis of the data provided information on quantities and descriptions of waste both entering and exiting waste facilities. It was possible to determine from the raw data those materials which are separated from mixed waste streams, as volumes of mixed C & D waste enter a facility with single material streams exiting. It should be noted that from using the data provided and the UK waste codes it was possible to determine those facilities which offered a higher level of waste processing.

The analysis shows data for commonly recycled material streams, separated by a limited number of waste collection companies and skip hire companies operating licensed transfer stations and recycling facilities. Analysis conducted for all materials is included in, Annex 2 Waste Arising in Greater Peterborough. It was determined that inert waste and timber waste arisings would be used as an example to compare actual arisings against the potential in the waste stream, providing an indication of the potential to boost recycling activities. Please note that no data was available in the waste returns for flat glass, plaster/plasterboard, insulation or cement, indicating that little activity occurred or that activity to recycle this waste to place with exemptions.

To supplement the project findings additional analysis was conducted on domestic material streams. The purpose was to provide additional data to help attract inward investment to the project region. The data on waste streams separated from recycling in the Greater Peterborough area (Annex 2).

Inert Waste – (figures are based on waste returns from landfills accepting non-biodegradable wastes, co-disposal sites, transfer station and recycling facilities, UK Waste Classification 21000-210500 excluding domestic container glass)

Peterborough District for 2002/03 –

- 111,444.78 tonnes of inert waste registered (98898.78 arising from the construction sector) of which : -
 - 68,316.72 tonnes non-biodegradable sent to landfill -
 - 6671.09 tonnes of which went to co-disposal sites
- 12546 tonnes input to a concrete factory (potential raw material).
- 23910.97 tonnes diverted for reprocessing at a recycling facility of which 23327.01 tonnes was output.

District of South Kesteven for 2002/03 –

- 114,693 tonnes registered.
- 98,738 tonnes sent to landfill.

District of Rutland for 2002/03

- 113,673 tonnes registered - no evidence of output, data from two non-biodegradable landfills.

District of Fenland for 2002/03

- 735.42 tonnes registered
- 30 tonnes collected at domestic waste facility – glass
- 705.42 mixed inert waste.
- Output from facilities 759.34 tonnes.

South Holland District for 2002/03

- 4192.16 tonnes registered
- 11.16 tonnes collected at domestic waste facility
- Output from facilities 3232 tonnes

It can be seen from the above that material is shown as both entering and exiting waste facilities; this provides evidence that material is subsequently being, re-used or recycled via further process. Significantly, a large volume of material is still sent to landfill. In comparison to other districts of Peterborough and South Kesteven receive more waste. The use of inert material for quarry restoration/inert landfills and mixed waste landfills, indicates a loss of material to a lower value use and the potential for processing to add value to the higher value content of the inert waste. Assessment of table 1 against the data above indicates that a far larger quantity of inert material is arising in the Peterborough area than national figures suggested. Potentially this is due to the percentages in table 1 not providing for details of 'muck 'or site clearance/excavated inert material.

Timber Waste -

Peterborough District for 2002/03

- 1478.98 tonnes of timber waste as output from licensed recycling facilities.

- 3516.35 tonnes of timber recovered for recycling within the Project Area (excluding Wisbech) of which –
 - 3322.37 tonnes of timber separated at transfer station or collected segregated
 - 193.98 tonnes collected at Household Waste Transfer Stations or Recycling Centres, DIY source.

When the above data is compared to table 1 the theoretical scale of potential segregation/separation of wood waste is 16,280.27 tonnes of which only 3322.37 tonnes was recovered. However, it should be noted that some of this timber waste will be treated and/or painted and so negates recycling until the results of work being conducted on behalf of the Waste Recycling Action Programme is made available into the recycling of treated and painted timber.

3.3 Other 'top level data' sources

No detailed information is available on materials streams of C & D waste from other sources.

3.4 'Ground level' data

- One skip hire and recycling centre has provided data from waste returns from February 2003 to September 2003, these are included in the appendices (**Annex 3**). The data represents the material entering the site and exiting the site. It has limited value as commercial sensitivity means it is difficult to determine the market share of the company.

3.5 Other 'ground level' data

Research by APT based at Nottingham Trent University 1999-2002 has provided information on C & D waste arising in Nottinghamshire, including the waste types arising, by percentage, in a typical waste container. However, it is difficult to assess which data is more accurate and at this stage does not assist the project with the diversion of waste for reprocessing. The usefulness of the APT data will be analysed in the chapter on economic modelling.

3.6 Recommendation for further data collection

To provide accurate data on specific material types arising in Greater Peterborough it is envisaged that a monitoring system is required. Two approaches can be adopted for this monitoring:

- On-site monitoring of waste arising by type, carried out by construction or demolition company personnel and/or on a sample basis by the Project Officer.
- Monitoring and analysis of waste transfer notes, for weights, by consignment, carried out by waste collectors and/or on a sample basis by the Project Officer.

The first option faces the limitation of current software only providing data on volume not weight, with some tools using only estimated volumes. UK CEED sought to incorporate this approach into the separation schemes using BRE Smartwaste and using BRE conversion factors to calculate weights, this was cost prohibitive. UK CEED also sought to explore the potential for on-site weighing using equipment on loan to the project, and for the Project Officer carrying out sampled weighing of materials on site. This proved to difficult to implement on site due to the suitability of weight equipment, lack of space, and concern for accurate representation of the waste arising over a given period.

For the second option, UK CEED sought to involve the waste collectors taking materials from sites participating in the project in weighing separated materials at their transfer stations and recycling

sites, or in separating and weighing materials on a sample basis. It was determined that materials exiting waste transfer and recycling facilities were required to be coded in accordance to European Waste Codes and weight upon exit or subsequent transfer, this provided evidence of material recycling in the region as can be determined from the analysis of the waste returns above and so provided some ground level data on activity in the project region. The economic reality of operating a transfer station in the region meant that companies were not willing to participate in the capture and weighting of materials which had no outlet, as the investment in such an exercise had no economic benefit without material outlets. Rather, some companies would only source segregation with some separating from mixed loads if an outlet available was economically viable. This made potential capture of data on materials with limited or no outlet extremely difficult. The problem thus becomes without materials outlets source segregation/separation will not occur but without guaranteed material flows companies are not prepared to invest in facilities.

3.7 Data Analysis Conclusions

The EA waste returns only show the approximate movements of waste around the region and provided a starting point for a more accurate investigation of waste management procedures.

The data can only be used as an indication of the amount of C & D waste arising in the project area. The EA data was incomplete with data missing for some sites and unavailable for some sites and in some instances one year overdue. Further, local facilities were not listed in the returns due to exempted activity. The lack of data means that analysis will not show a complete picture of waste transactions. One requirement of waste returns is to state the destination of waste exiting from a facility, if this information was made publicly available, it would help in the accurate mapping of waste and reprocessing activity, which would provide an indication of the impact of waste transportation and provide information which would support investment decisions. The UK Waste Code and European Waste Catalogue can be 'interpretive' which had led to the use of inappropriate waste codes, making it difficult to determine waste source. Research indicated that some waste which should have been coded using construction codes was coded as industrial waste. More detailed and accurate classification by source would enable a better understanding of waste arising from construction sources. It has also been suggested by private sources during interviews conducted as part of the research that waste returns are sometimes an inaccurate account of what actually happened to material and that some material enters different parts of a facility or have been re-used in another manner than that stated on the waste return. This highlights the difficulty in monitoring the amount of material exiting and entering a facility without a more thorough approach.

3.8 Data Analysis Recommendations

- 1) The EA place more importance and emphasis on the accurate collation of Waste Returns and that more effort is made to ensure that facility inputs and outputs balance – material in:out:stored for future use, in accordance with the licensing agreement for the activity undertaken and exemptions held by the facility. Data was missing from financial year 2001/2 although the data requested and supplied end of financial year 2002/3. This includes confirming accuracy of the codes used in accordance with the European Waste Code which will supersede the UK Waste Classification Code.
- 2) Dissemination of the European Waste Catalogue (EWC) coding system in accordance with the Duty of Care. More guidance is required for the waste management and construction companies to ensure a smooth transition from the UK Waste Classification to the European Waste Catalogue and to confirm that companies are coding waste accurately in accordance to the EWC.
- 3) National data is required for the volume of waste arising from different construction types e.g. new build (housing, flats) refurbishment (commercial, domestic), demolition, schools ,

office and/or commercial buildings tonnes/M(3). Plus the percentage waste arisings by waste type against the construction types. This project sought data from BRE Smartwaste system but the cost of acquisition was prohibitive.

- 4) Audits to waste transfer facilities to ensure that material is present at waste service facilities and that waste leaving a facility arrived at the final destination.
- 5) The potential for automatic weight equipment should be investigated to provide accurate information on weight at point of transfer. Information on weights (over volume) can be used for more accurate waste management planning by construction companies and with potential large increases in landfill tax more accurate charging for waste services. A system linked to the bar coding of waste receptacles will enable the accurate tracking of waste movement in the UK thus reducing the risk of fly tipping by illegal operators and greatly assist waste management planning at strategic level.

4.0 Current practice and procedure for the treatment of C & D waste in the Greater Peterborough (GP) area:

4.1 Objectives

- 1) Identify gaps in reprocessing and remanufacturing technologies and markets for project materials streams in terms of
 - (a) Whether and where technologies and markets exist
 - (b) Quality and Specification and integration with virgin products
 - (c) Economics
 - (d) Collection and transport logistics
- 2) Identify scope for improvements in C & D waste processing
- 3) Gain an understanding of the attitudes and waste disposal behaviour of C & D Small – Medium Sized Enterprises and their waste collectors.
- 4) Obtain data on refurbishment waste
- 5) Identify the scope for increasing the level of C & D waste reprocessing to reduce the transport of waste.

4.2 Waste Collection & Management Service Provider Survey; Methodology

A two stage approach was adopted a formal questionnaire to engage companies and secondly follow up interviews to gain an in-depth knowledge of operations.

The main aim of the survey was to determine the extent of C & D waste recycling activities and to identify those companies which currently segregate/separate material for remanufacture, re-use and recycling sourced from demolition, construction and refurbishment sites, in line with the above objectives.

A further aim of the survey was to identify companies segregating waste by utilising transfer stations/recycling centres; facilities which use processes enables the, off site, separation of waste to recover the re-usable/recyclable content. In addition the survey identified companies offering forms of onsite waste segregation, or source segregation.

4.3 Waste Collection & Management Service Provider Questionnaire

A questionnaire was developed (see Annex 5) which was designed to identify current activity within the waste management industry with regard to the handling, storage and treatment of C & D waste. The questionnaire was mailed to 27 waste management service providers in the GP Area, which were considered to be registered waste carriers. The questionnaire included an SAE's and fax back form requesting information on the services provided to the C & D industry.

Eleven companies responded to the survey the results of which are shown below

Q1	Does your company provide waste collection services to the Refurbishment, Construction and Demolition sector?	10	1
Q2	Does your company provide services involving waste segregation, to facilitate re-use and/or recycling?	8	3
Q2a	If yes to Q2. Where is the waste segregated?	Source	3
		Company Premises*	5
		Transfer Station	7
		Other	0
Q3	If no to Q2, Have you researched, considered or offered segregation.	2	
Q4	If no to Q2, Would you be interested in offering segregation	2	
Q5	No' available for further comment	9	2
*a company premise refers to a site compliant with the waste management licensing regime and either operating with a license or utilising an exemption from.			

Table 2 Waste service provider survey results

Eight of the eleven companies responding to the surveyed provided services facilitating the collection of C & D waste for re-use or recycling purposes.

Of the three companies which did not facilitate waste segregation (Q2), one stated they would be willing to provide source segregation of waste, if requested to do so by a construction company. This company had also undertaken limited incidental research into source segregation. As a registered waste carrier, the company's premises were not licensed for waste transfer. The willingness to consider the option was based on the ability to transfer waste, source segregated, to local recycling facilities and/or transfer mixed waste for separation at licensed transfer stations/recycling centres. The second company stated they had conducted incidental research into segregation on-site but had no interest in offering segregation and declined further contact. A third company stated they undertook no services to the C & D industry and had no interest in doing so, declining follow-up.

Of the remaining eight companies, three offered source segregated waste collection (Q3). Follow – up on these companies, interestingly, noted that only one offered source segregation as a matter of policy to its customers by raising it as a waste management option.

The five remaining waste carriers provided for a mix of separation of waste for re-use and/or recycling at transfer facilities. These facilities were either licensed waste management facility owned/leased by the waste carrier and operate under an exemption from the waste management regime or at facilities owned by a third party.

Companies which did not operate there own facility collected mixed waste and transferred this waste to a facility that could separate it to recover the re-usable/recyclate. A transfer of waste of this nature incurs a gate fee, a charge to cover the cost of the waste separation process. This situation occurs when a company's premises is too small to facilitate separation or finds it difficult to obtain planning permission due to location and as such operates as a registered waste carrier only.

The survey clarified two methods or points at which waste was diverted from landfill one which relies on the construction companies to control source segregation and so provide a stream of pre-segregated waste to the re-use and recycling market and the second relying on waste management companies to provide infrastructure which would enable off-site separation of waste and therefore a increase in waste diverted for re-use and recycling.

4.4 Waste Collection & Management Service Provider Interviews

To build on the data collected from the waste management service provider survey, follow up interviews were conducted with service providers. This provided insight into the attitudes and behaviours of the industry and information on technology employed and data in line with further objectives including materials recovered for re-use and recycling.

It should be noted several interviews were conducted with companies which did not complete the questionnaire and outside the structure indicated below, the information recorded from these interviews is not incorporated in the official numbers but responses including qualitative data and anecdotal information is included in the discourse.

The items for discussion at the interviews included.

- Details of re-use and recycling
- Waste licensing permissions and exemptions (held by the service provider)
- Materials Handling and Storage
- Type/Size of waste receptacle utilised
- Technology employed for segregation of waste e.g. balers, shredders, granulators, sorting equipment.
- Size and capability of site
- Collection radii
- Material segregated at facility from mixed waste
- Materials source segregated
- Barriers to segregated collection of waste materials from C & D sites
- Whether opportunities had or are being researched to increase the material and/or rate of current materials recycling.
- Economic data: charging structure, basis for charging and procedures e.g. service prices, price of source separation service (onsite)
- Record keeping e.g. weighbridge

7 companies provided in depth interviews on waste handling practice and procedure which provided an insight into specific practice and procedure and general procedures applicable to all waste service providers through expansion on the above items.

4.4.1 Overview of Services provided by companies surveyed:

5 waste carriers with licensed transfer stations offering separation of waste for re-use and/or recycling using a variety of methods

1 waste carrier with licensed transfer station but no room for large scale activity

1 licensed waste carrier.

The interview highlighted a vast difference in practice across the companies interviewed from offering source segregation as a matter of policy, offering source segregation if requested but not as policy, only offering separation of waste at transfer station, having offered source segregation and stopped, to prepared to offer source segregation with proviso.

4.4.2 Barriers to recycling of Construction and Demolition Waste: Materials segregation/separation to facilitate re-use and recycling

The following barriers to re-use and recycling were quoted by waste service providers as barriers to re-use and recycling.

Barriers to re-use and recycling

- Lack of outlets for material streams from C & D sites.
- Low material prices and fluctuation in material prices.
- High capital equipment costs.
- Perceptions, recycled products are inferior to products made with virgin material
- Specifications
- Lack of resources (time) to ensure compliance with complicated legislation
- Lack of space to stockpile to achieve economies of scale.
- Price key driver not specification e.g. crushed concrete in virgin concrete manufacture
- Sale of recyclables requires Waste Merchant License, this is extra cost, easier to use in closed loop.
- Lack of competitive advantage.
- Competitive nature of gate fees (at the time of research quoted as being reduced) means that level of charging required to invest in segregation and recycling e.g. new technology, not being achieved. Some companies anticipate a much higher gate fee to enable the necessary investment in new technology and that these gate fees maintain a viable level against the tax increases. Unless this occurs bolt on operations are difficult to finance.
- Compliance with legislation makes it harder to stay competitive with less scrupulous competitors

Barriers to Re-use and Recycling of C & D waste at transfer stations

- Lack of resources to handpick materials from waste stream on premises - particularly when operating near capacity on skip hire operations.
- Distance of site from suitable transfer facility
- Availability of landfill on route between transfer station and site
- Storage hazards of segregated material e.g. risk of arson
- Planning constraints incorporating issues such as accessibility

Barriers to Re-use and Recycling of C & D waste utilising source segregation

- Contamination of loads due to lack of control/education on C & D sites, inability of C & D industry to segregate material which equals penalty in the disposal charge or prices at merchants.
- Lack of space to segregate material on C & D sites
- Storage hazards of segregated material e.g. increased fire hazard.
- Lack of detail regards classifications and levels of contamination from merchants and reprocessors.
- Lack of incentive to segregate waste for the C & D company
- Cost incurred transferring material back to facility for bulking
- Location of transfer stations/suitable material outlets in relationship to landfill.
- No guaranteed supply of recycle

Inert Material specific

- Inability to compete with cheap imported materials e.g. Dutch & Belgium processes e.g. to crush concrete to Type 1 means need to sort twice increasing cost.
- Recycled industry competing with primary industry e.g. Type 1 a by-product of quarry industry and so can be cheaper from this source.
- System of penalty rather than reward means no investment, should have Package Recovery Notes equivalent for inert waste
- Seasonality of recycling incurs storage cost main market for material in summer.
- Seasonality of performance of materials e.g. if dry summer, dry clay performs as an infill material if not incurs aggregates tax.
- Current requirements to use 10% recycled material in road works, this material due to lack of specification is used on access road, camps, haulage roads and acoustic blocks. It is then often taken up and used again on other sites.

4.4.3 Waste Management Service Provider Overview

Of the seven companies interviewed one company had a policy of segregation at source by provision of multiple skips and two would be prepared to do so upon request. All three operated medium - large scale transfer stations facilitating separation of mixed waste streams and bulking of source segregated waste. All three facilities received waste from third part waste service providers. The three companies also operated Trommels to facilitate the separation of C & D waste and skip waste from commercial and domestic sources. In comparison other smaller transfer station used handpicking, mechanical grabs and JCBs.

Of the remaining four companies two companies provided source segregation upon request and provided, at own premises separation via hand-sorting and mechanical grab. Of the remaining two companies one was a registered waste carrier and so could not offer separation of waste but would consider source segregation, the other operated a transfer station with limited space and so provided for a limited transfer of waste for bulking purposes.

The research indicates for the waste management service providers' source segregation and separation is a function of technology employed, size of company (including skip hire operation), location of facility, location of C & D sites, local available markets/outlets for re-usable/recyclables, landfill tax and market share.

Evidence of this can be seen in waste service provider case study 1. The company offered waste separation at transfer station with waste. Separation occurred when the skip hire arm was operating at a level under capacity. When the skip hire operation was at full capacity resources were diverted to enable skip exchanges to continue. This is because the income generated from skip hire was greater than the income generated from, handpicking C & D waste for re-usables/recyclates. This meant waste was often diverted to landfill. The equation was based on the cost of the time taken to handpick mixed waste, the actual quantity of good clean uncontaminated material available, distance to transport material, volume to weight ratio (material dependant), materials storage and bulking (large density to weight means it less economical to transport) and the length of time mixed waste can remain at the transfer station. This has implications for procurement of waste services. C & D companies can contract with an organisation on the basis of a recycling service provided but in reality little material is actually recovered at the facility. UK CEED produced a procurement guide to overcome this (Annex 4)

In comparison companies offering source segregation of waste as a policy and those doing so upon request operated larger facilities and employed more technology to separate waste at transfer stations as such capacity issues were not so important in the decision to recover material for recycling/re-use. To an extent offering segregated skips was a function of having developed company activity to enable the core function of the facility to shift toward recycling and not waste

disposal. The high cost of technology to separate waste and process waste to facilitate recycling was also indicated as a barrier to increasing separation of waste as the payback of capital outlay was too high for most companies to take the risk.

Of the remaining companies, one operated a licensed transfer station but did not have the room on site to transfer material or bulk up material on a large scale. This company provides transfer at their premises to avoid the high landfill tax costs of mixed, inert and active loads.

Interviews suggested De Facto recycling occurred in most companies. If loads were clean and uncontaminated either due to prior agreement with the construction company, as to the waste type, or by accident then most often the service providers stated they would divert the waste from landfill. This is due to material being easily re-routed to recycling merchants with a degree of confidence contamination had not occurred.

4.4 Material source segregation in Greater Peterborough

One line of research was to establish whether companies had researched source segregation of waste and other opportunities to facilitate an increased rate of re-use and recycling. In conjunction with the in-depth interviews this provided the opportunity to determine what prevented them from doing so as such provided qualitative information on the local barriers to increasing the re-use and recycling of waste summarised at the start of the chapter.

In general terms companies provided for the segregated and/or separation of Inert waste

- Green waste
- Timber
- Metal

Anecdotal evidence provided by interviewees suggested other waste service providers separate/segregate the same material, in the Greater Peterborough area. This is supported by the Environment Agency data analysis (Annex 2).

Outlets for other materials than those indicated above were also determined for details please see Annex 11 reprocessing capabilities in Greater Peterborough and PPS Report Annex 12.

Only one company provided as a policy multiple skips for the segregation of the above materials including source segregated and separation of waste to recover plasterboard (outside current take back schemes operating in the UK) this was used as a soil improver. This same company provided for the source segregation of plastic (film) and container glass.

Prior to the project only two companies interviewed had trialled multiple skips for inert waste, timber, metal and mixed waste. Both had stopped due to the contamination occurring on the construction sites, leading to increased costs at point of transfer. This was coupled with ongoing research to source outlets for source segregated waste particularly plastic, in general flat glass was considered to arise in too low quantities to source segregate.

Several companies had tried and tested two skip systems inert waste and active mixed waste. Customers were charged different rates for skips based on their ability to segregate waste without contamination of loads. This was due to differing rates in landfill tax for inert waste and mixed active waste. Inert Waste at £3 tax per tonne, in comparison to £18 per tonne mixed waste; offered considerable savings on disposal charges (see Section on Economic). In these instances the inert waste skip incurs a low hire charge than a mixed waste skip. The differential rate for inert landfill tax and mixed waste is a strong driving force in the provision of facilities to recover the inert fraction.

Several companies suggested they would offer and support source segregation of waste in requested and given the written guarantee the C & D companies would segregate with recourse to financial compensation. In general terms this was for the four main material type's inert, timber, metal and mixed waste.

The main reason stated was segregation provided an opportunity to

- Separate waste quickly and easily
- Bulk materials easily and quickly
- Avoid the contamination which occurs in mixed waste skips.
- Avoid landfill tax
- Sell Material

One company stated by way of example:

'if inert material or other segregate material is brought into the transfer station then, if it is inert with no contamination it can be directed straight to the trommel and powerscreen, which can be speed up.....if the material is timber only it can in some instances be bulked upon arrival or again it can go through the trommel at a faster rate using less man power to pick it'

A second;

'Contaminates are handpicked from inert waste.....clean waste increase the processing capability'

The premise is the above savings can then be passed back to the construction industry, in the form of discounts on skip hire charges.

The above was not relevant to all service providers as not all had bulking facilities but in general terms the opportunity for the service providers to make savings using source segregation was a consideration. This was applicable to facilities operating transfer stations utilising trommels and well as skip hire companies

Contamination is an important factor for the re-use and recycling of material. One benefit of source segregation is it avoids the contamination of material which can occur in a mixed waste skip this in turn means the quality requirements/material specification can be met more easily.

However, it was stated even using a two skips systems, the segregation of waste into inert and mixed active waste, contamination occurred. For the service provider this means incurring a penalty upon the transfer of waste, a financial penalty which in some cases is chargeable to the C & D Company, but is not always reflected of the true cost incurred particularly with regard to transport. The loss of income on such transactions or additional administrative effort experienced has led several companies revoking the offer of a two skip systems as a standard service. Recycling merchants in some instances are prepared to accept slightly contaminated material but at a lower market price, this was also evident from discussion with reprocessors. The financial penalty clause also occurs if the load type as described on the waste transfer note was an inaccurate description of the waste in the skip.

One company interviewed could not understand why construction companies, as standard, did not segregate inert waste and active mixed waste and lamented the receipt of skips containing 95% inert waste and 5% active mixed waste.

Contamination of material was also discussed in terms of separation of waste at transfer station. The presence of materials in the skip e.g. open paint cans, wash down water and mud from cleaning activities and other contaminants meant the specification of material which had a recycling value such as cardboard and paper was decreased and in some case made recycling impossible.

Location of the skip hire facility in relation to the C & D site was also a factor effected recycling. Due to the low prices recyclables from the C & D industry command then often the closest outlet dictated whether a material was re-used/recycled or landfilled. If a landfill site was located on the route a skip lorry would often take, it would be more costly to divert that lorry to a recycling facility. This was particularly relevant to inert waste the gate fee incurred for the disposal of the material at an inert landfill site being very similar to the gate fee of a recycling facility, utilising a powerscreen and crusher. Further, local project was also an influencing factor with inert waste i.e. if there was an exempted operation in close proximity. Local transfer stations make it easier to release the value of waste as it reduces transportation cost.

It is important to add some companies refused to supply information on material recycling and re-use and the conjecture from other waste management companies was this was due to the competitiveness of waste industry an unwillingness to share details on material recycling outlets and again conjecture suggests it may also be due to an unwillingness to share with the C & D industry, what they do with the C & D waste once it has been transferred to a licensed facility i.e. the value of some of waste.

4.5 Conclusion

The interviews and discussions with the C & D industry suggest source segregation could form an important methodology through which waste can be diverted from landfill and recycling rates increased for the C & D industry. Companies indicated off-site separation would yield better results if certain materials were segregated when total waste arisings warranted and these materials were kept clean and uncontaminated from other materials/liquids. To an extent this was also applicable to material separated at transfer stations.

The view within the waste management industry, with one exception, is the C & D industry is incapable of segregating waste or micro-managing waste on a site by site basis effectively to warrant the risk of source segregation said within the confines of contracts included financial penalty clauses several companies were prepared to trial multiple skips on-site.

4.6 Recommendations

- The construction industry requires more guidance and information on waste service provision at the local level – current directories need to provide more adequate detail on service provision including specifications of recycle.
- Introduction of standard waste management service contracts which prioritise re-use/recycling.
- Greater Transparency is required within the waste management service industry – to report to the C & D industry amounts and materials recycled/recovered *e.g. percentage of waste recycled – this could quickly be achieved by reporting the % recycled of a facility in a given period. This figure would not be difficult to provide as it would be the total amount of material taken into the facility against the total amount of material diverted for re-use and recycling a figure which is required as part of the waste returns, this could be calculated annually. This will enable a company to make a decision over which service provider to choose.*
- Material specifications and data is completed for all recycled material plus improved Performance Assurance Systems.

4.7 Recommendations made by the waste service providers

- Independent information/reviews on suitable technology for waste treatment, handling and storage.
- Introductions to potential inward investors – networking
- Investment in core business.
- Support for local re-processors providing higher value activity.

5.0 Economics Analysis of source segregation

As the previous chapter indicated skip hire companies are willing to provide segregation on site with provision and can transfer waste via facilities which can separate waste.

The logic is simply and is based on the differing rate of landfill tax for inert waste.

Landfill Classification	2003/4 (per tonne)	2004/5 (per tonne)
Inert Waste	£3	£3
Mixed Active (biodegradable)/Stable non reactive hazardous waste	£15	£18
Hazardous Waste	£15	£18

Table 3: Landfill Tax Rate

Segregation of inert waste and mixed waste is the most common approach adopted by waste service providers

If an inert waste skip contains no active waste i.e. is free from (all but a very small quantity) of contamination of timber, cardboard, paper or plasterboard it can be directed to a inert landfill site and so incur a lower tax rate where it also incurs a lower fee for its actual disposal – the gate fee - which the landfill operator imposes to cover operational costs.

In comparison if a mixed waste skip contains inert waste which by its nature is heavy the skip will weight more. Upon transfer of waste at landfill the skip is weighted using a weighbridge and a charge is paid in accordance with weight. The waste provider will incur a high disposal charge for the waste which is reflected in average skip hire charges. The implication for the C & D industry is in instances were large enough volumes of inert waste are arising from a project then a segregated skip is often the best solution or stock piling inert waste until the end of the project and utilising a grab hand and flat bed to transfer the waste to an inert destination.

Data on waste arisings for inert waste support this approach as inert waste can make up between 17.3% (BRE) and 58% of waste arisings on C & D sites.

In the Greater Peterborough Area an average price for inert landfill was considered £6- 7 per tonne.

In Greater Peterborough mixed waste landfill could be as high a £35 per tonne.

The interviewees with waste service providers indicated is the savings of this nature the waste service providers do an in some cases would be prepared to pass back to the C & D companies in the form of lower skip hire charges, with the proviso contamination can be controlled.

Qualitative information indicated the value of inert waste for use in activities exempted from waste management licensing meant price of the landfill tax has less of a significant impact on the disposal costs of inert waste. Rather, waste service providers base collection and disposal charges on the value of the exemption and whether the inert waste can be recovered for maintenance work at depots, on construction sites as temporary hardcore and standing, as infill, road construction or maintenance on site this is applicable to transfer station and landfill operators – indeed exemptions

as available for beneficial use of inert waste on mixed waste landfill. Anecdotal evidence also suggests as the tax level seems likely not to change in the near future landfill operators do not factor it into charging procedures.

In Greater Peterborough the structure of charging for disposal of inert waste is to an extent a reflection of the above.

To transfer inert waste a licensed waste transfer facility or recycling centre will incur a gate fee of £6-7 per tonne. The £6-7 can be waived depending on the type of inert material transferred and how clean it is e.g. up to £2-3 per tonne, 50% Concrete/Soil then £1.50, If material is clean such as broken out concrete then free. This is again a reflection of the value for the material.

Many factors influence the value of material which in turn indicates whether it is economically viable to segregate a material. Specification is one key aspect. Waste service providers indicated very few people would specify the use of recycled material in manufacture of products for the C & D industry this is due to the fact no performance criteria available on the quality of secondary materials. The above situation since the time of the research is being addressed through the work of the WRAP, Aggregain Project, the Building Research Establishment on aggregates and secondary aggregates. Examples quoted in project interviews included was the use of crushed glass in Type 1 and in the manufacture of Glasphalt and crushed concrete feed back into concrete factories on the premise the research indicates it provides better performance.

The principle was much the same for other waste material with the same factors impacted on disposal charges of the waste.

In the analysis very few materials had a good market value, metal. The decision to recycle a material was thus based on the location of the market, the value of the market and quantity of the material arising. Other key aspects include the value of the recycle and the economic benefit of avoiding the landfill tax.

The notional analysis indicated below takes into local consideration of these factors. In some instances gate fees are incurred for materials such as timber, in others a value is attributed based on a discounted, local, market value for material.

5.1 Waste Management Notional Cost Analysis

Table 1 is a cost analysis for a waste management scenario based on a notional construction site in the project region from the perspective of the waste management/skip hire company. At the core of the analysis is the principle mixed waste is taken directly to landfill and which has been termed the landfill option or the 'business as usual' option as this is the traditional disposal route for C & D Waste. The following analysis is based on the below assumptions:

- 20 tonnes of mixed waste over project
- Collected in 8 Cubic Yard (Builders) skips each with a capacity for 2 tonnes of waste - equating to the use of 10 skips over the projects life at £140 per skip
- Average distance travelled for collection is 20 miles @ .50 pence per mile – equating to £10 per (skip) lift
- Averages lift taking 1hr to complete at a manpower cost of £10 per hour – equating to £10 per lift.
- On arrival at landfill the gate fee and tax equate to £32 a tonne. This accounts for a gate fee and £15 tax.

<i>1) Landfill Option</i>	<i>Total Costs/Revenues</i>
<i>Total Revenue (from skips)</i>	£1,400
<i>Disposal Costs (landfill Only)</i>	£640
<i>Cost of Collection (of skips) - manpower</i>	£100
<i>Cost of Collection (of skips) - transport</i>	£100
Total Revenue (revenue – costs)	£560
Revenue per tonne	£28
<small>(calculations do not include overheads and for comparative purposes)</small>	

Table 3 Economic Analysis 'Business as usually' – landfill option.

The recycling option shown in table 4 maintains the same basic principles regards manpower, transportation costs, landfill and gate fees. However, the scenario has changed in that the costs and revenues are different for various materials. Research provided indicative gate fees for re-usable/recyclable material and industry sources the average price of recycle, which was then discounted to take into account the lower quality of C & D sourced material.

It was acknowledged not all material streams can currently be recycled in the project area. The notional analysis was based on the segregation of timber, metal, plasterboard, inert material, plastic, cardboard and mixed residual waste. Material is segregated into standard skips with limited reduction in skip size see Annex 6.1 for details

The percentage of each material arising from the notional 20 tonnes was taken from the APT Research conducted in Nottinghamshire using surveys of small loads (under 4 tonnes) entering transfer station and landfill sites it is from these tonnages the recycling option to be tested by UK CEED has been calculated (see Annex 6 for details).

The analysis indicates the benefit of recycling to a waste management company is a saving of £433.68 over option 1 incorporating revenue of £54.30. This equates to approx £24 per tonne. This analysis has been used to determine the potential for waste management companies providing a 10% discount of waste collection charges for source segregation of waste this is indicate in table 5.

<i>2) Recycling Option</i>	<i>Please note includes residual waste</i>
REVENUE	
<i>Revenue (all skips)</i>	£1,360
<i>Revenue (sale of recyclable material)</i>	£54.50
Total Revenue	£1,414.50
COSTS	
<i>Collection (all skips) –manpower and transport</i>	£220.00
<i>Disposal (landfill + recycling)</i>	£226.53
Total Cost	£446.53
Total Profit	£967.97
<i>Saving (landfill charges)</i>	£433.68
NET Profit	£1448.05

Please note includes residual waste

Table 4: Economic Analysis Recycling Option

2) Profit for Recycling Option	
REVENUE	
Revenue (all skips)	£1,224
Revenue (sale of recyclable material)	£54.50
Total Revenue	£1,278.50
COSTS	
Collection (all skips) - manpower and transport	220.00
Disposal (landfill+ recycling)	226.53
Total Cost	£446.53
Total Profit	£831.97
Saving (landfill Charges)	£433.68
NET Profit	£1,265.65

Please note includes residual waste

Table 5: Economic Analysis Recycling Option

5.2 Waste Management Notional Cost Analysis: Visual Representation

Chart 1: Landfill Option

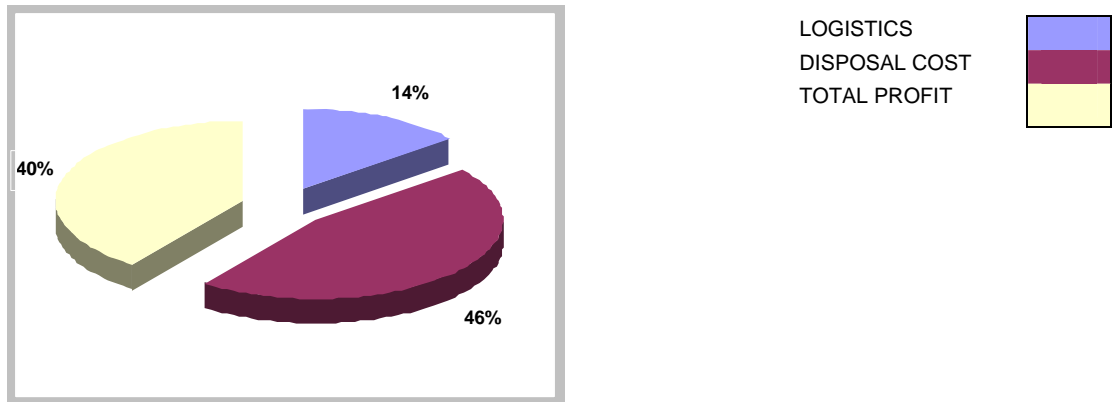


Chart 2: Recycling Option

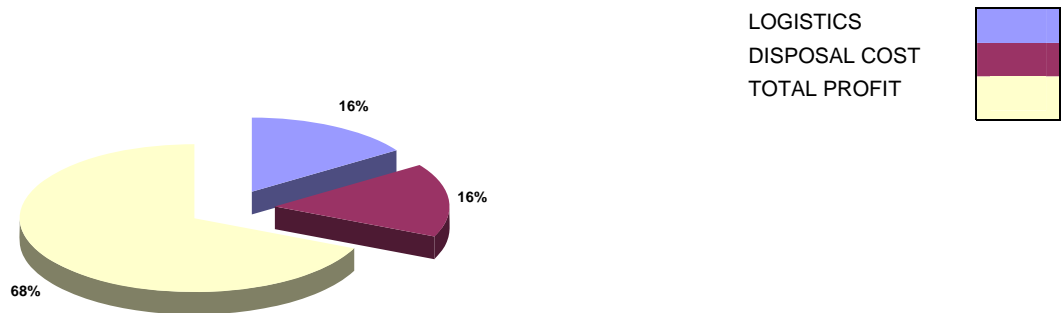


Chart 3: Recycling Option – 10%

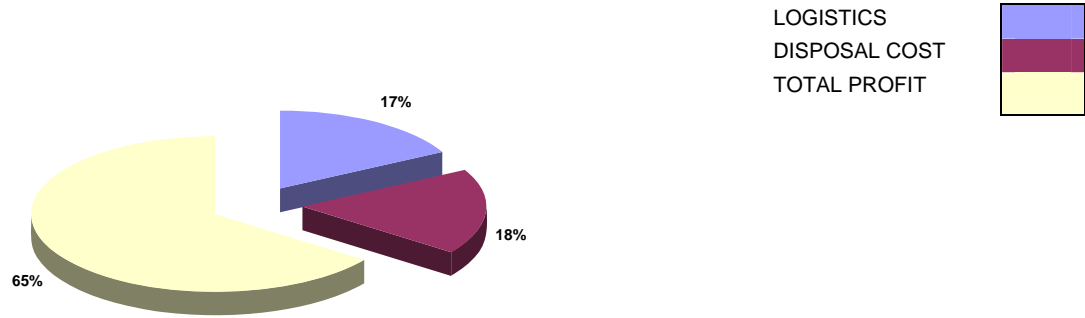


Chart 1 indicates landfill charges contribute a considerable proportion of costs for a waste management/skip hire company operating a straight to landfill option, up to 46%. The implication to maintain profit margins when landfill tax increases for mixed waste, to the ceiling of £35, waste management service providers will have to increase the level of waste disposal charges by an amount equal to the landfill tax charge. The threat to the C & D industry considerable increased waste management costs.

Chart 2 & 3 indicate sourcing of alternative increase the profit margin as disposal costs are reduced, revenue surpassing disposal costs. Further, Chart 3 indicates it is possible to maintain substantial profits with a reduction in skip hire charges by 10 percentages.

The visual representation indicates disposal costs are significant portion for the landfill option and indeed can be greater than the revenue from the skips this has been supported by anecdotal evidence from waste management companies.

5.3 Conclusion

Analysis of the current practice and procedure of the waste management industry and the economic modelling above enabled the consideration of actions that that C & D companies would have to take to increase recycling. The economic analysis provides an indication of the scenario that could be taken forward to increase recycling. An important variable with

Further, the analytical tool from which the data was taken could be modified to incorporate a more detailed analysis for a locality and its potential to divert waste from landfill by amending the variances. The spreadsheet could also be used as a planning tool for determining whether a new venture is economic for a waste management company. As such the methodology could be incorporated into toolkit for the C & D industry.

6.0 Divergence of waste from C & D sites in Greater Peterborough

6.1 Objective

To divert a significant tonnage of waste material from landfill for reprocessing, re-use and recycling by working with the C & D industry, monitor the quantities, quality of waste diverted from landfill and its destination.

6.2 Methodology

The approach adopted by UK CEED was to examine the company practice & procedure, the location of the site, waste arisings and quantities and determine from this the best approach to facilitating re-use and recycling on site by site basis. Divergence would be facilitated through:

- a) Source segregation
- b) Off-site separation
- c) Mixture of both approaches

System A would identify those key waste arisings and aim at divergence of those materials arising in significant quantities.

If System A operated effectively then System B would examine other materials streams and alternate methods of waste treatment onsite.

It was determined that the most effective approach would be for UK CEED to act as a broker between the C & D industry and waste service provider and change/amendment in the pre-existing/new waste management service contract to release the discounts indicated in the economic analysis i.e. UK CEED would negotiate a discounted skip hire rate.

In total 26 companies were contacted by means of an introductory letter, sent to key contacts determined by telephone enquiry, with follow up phone calls to arrange a meeting at which to discuss the project. The companies were identified using the following characteristics:

- 1) Currently operation sites in the project region
- 2) Company profile
- 3) Nature of company e.g. new build, refurbishment – housing, commercial.
- 4) Size of company
- 5) Involvement in sustainable construction initiatives

To ensure that the above approach did not exclude SME's companies, a survey was sent to thirty construction and refurbishment companies. The two objectives of the survey were to source information on current waste management practice and to ascertain whether the organisation would be interested in further involvement in the project by providing opportunities to trial segregation of waste on-site.

The project also utilised local press to make calls for which returned one respondent. Potential construction, demolition and refurbishment (C, D & R) project were also identified using public access planning applications, the long lead in times meant that these were most often unhelpful, Peterborough City Council, Planning Department included the bellow text on the letter informing companies on a successful planning applications this approach attracted no companies.

Peterborough's UK Centre for Economic & Environmental Development (UK CEED) is conducting innovative research into the recycling of waste from construction and demolition sites.

Companies in the building and waste sectors are invited to participate in the research by providing simple waste management information and/or testing new approaches to materials that can be reused and recycled.

Benefits to participating companies include identifying cost savings, ensuring compliance with future legislation, and ultimately helping UK CEED identify alternatives to landfill disposal.

Organisations already involved in the research include Peterborough City Council, Peterborough Environment City Trust, the Environment Agency, and homebuilders French Kier Anglia, Stamford Homes, and Nene Housing Society.

For more information contact Simon Chiva, UK CEED, Priestgate House, 3-7 Priestgate, Peterborough PE1 1JN, phone 01733 311814 or email s.chiva@ukceed.org.

The project as a package of waste management focussed in the benefits of sound waste management which could be achieved through participation in the project:

- *Legislative changes – facilitating the recovery of materials from industry, including recovery of material from Household DIY, Landfill tax. Increase in the landfill tax but possibility that new targets will be set for the recycling of C & D waste.*
- *Compliance with voluntary agreements such as Sitewise.*
- *Changing nature of waste management industry.*
- *Changing nature of construction industry – benefits of being seen to green, survey.*
- *Reducing the impacts of waste collection industry.*
- *Benefits of industrial image as recyclers not waste collection companies and the related public image improvements.*
- *Third party research material outlets*
- *Third Party to ensure that builders guarantee uncontaminated material – builders' co-operation. More valuable material.*
- *Competitive advantage – first organisations to start offering segregated waste collection, linked to new containers.*

6.3 Outcomes – Attracting Construction Companies

Of the twenty - six companies contacted:

- 1 company a site operating in Great Peterborough which was nearing completion after this no sites.
- 6 companies were sent letters but did not respond to several follow up call concluding that they were not interested.
- 7 companies expressed initial interest but took too long to convert, including not returning phone calls after information relayed.
- 1 company promised several new build site to undertake additional activity to facilitate re-use and recycling but did not call back even after follow up calls.
- 6 companies provided useful data on waste diverted from landfill and methodology included in case study and/or information on site waste management planning and/or site visits to witness practice and procedure but no sites to trial approaches to additional divergence of waste for re-use and recycling.

- 3 companies provided sites – two of these companies were provided with the Project Agreement.
- 2 companies not interested.

(Annex 7 SME Survey Results)

6.4 Diverting waste from landfill: Case studies

The main objective for the PII Project on was to divert waste from landfill and to monitor the quantities of waste diverted from landfill and its destination.

A secondary objective was incorporated into the project at this stage that was to enable the C & D companies to develop waste management procedures for the continued diversion of waste from landfill, once the project had been complete

The approach adopted by UK CEED was to fold the first to broker a change/amendment in the pre-existing waste management service contract to provide source segregation of waste materials. The intended outcome an increased recycling rate with a corresponding discounted skip hire rate.

6.4.1 Case Study 1 – Kier Eastern Hinchinbrooke Hospital

Company Background:

Kier Eastern is a regional construction and engineering company formally French Kier Anglia and a member of the Kier Group plc a leading UK building and civil engineering contractor also specialising in private house building, facilities management, property development and the PFI. The Group employs 7000 people worldwide and has an annual turnover in excess of £1.4bn.

Major civil engineering, building and mining projects within the UK and overseas are co-ordinated from Kier Eastern's head office in Bedfordshire while mid-range and smaller construction contracts throughout the UK are undertaken by the Group's unparalleled network of locally-managed businesses.

Kier Eastern have been pro-active in environmental management and employ an environmental manager to drive change within the company. To this effect Kier Eastern are soon to launch an Environmental Management System. Kier Eastern have fostered a target led approach to managing waste, they use Key Performance Indicator's (KPIs)² to aid improvements across all operations including waste management.

Construction Site Information

Development Name. Hinchinbrooke hospital refurbishment and car park development

Timing: October 1998 - February 1999

Owner: National Health Trust

Main Contractor: Kier Eastern

Project Coordination: Kier Eastern Environment and Quality Manager; Peter Johnson

Waste Management Analysis

A site audit concluded that the most significant wastes arisings at that point in time were

- 1) Timber
- 2) Inert Waste – Soils, Concrete, hardcore.

² www.constructingexcellence.co.uk

- 3) Plywood
- 4) Polystyrene Moulds
- 5) Mixed Waste

The approach adopted after the site audit was to focus brokerage activity on the above listed materials to instigate re-use and recycling. A secondary objective was considered separation of the mixed waste fraction at transfer station – this second activity would help identify other materials arising in significant which could be source segregated if quantities dictated.

- 1) Timber - Current onsite practice; timber off cuts – majority to skip.

UK CEED brokerage activity uncovered alternative ‘over the door’ disposal services for timber. The facility was within 5 mile of the site and charged a gate fee per tonne for waste timber/green waste for £20 a tonne.

Economic analysis conducted by the Kier Eastern Environmental Manager concluded that the option was uneconomical the decision was to made to use as much timber off-cuts as sacrificial formwork.

- a) Timber Self Haul Analysis:

Estimate maximum of one skip load per week at 6 Cubic Yards

No discount from CA for segregation.

$6\text{yd}^3 = 4.4\text{m}^3$

75% full

Timber density=0.5

Weights of timber in skip $0.5 \times 0.75 (0.375) \times 4.4 = 1.65$ tonnes

Disposal cost: -

Gate fee $1.65\text{t} \times £20/\text{t} = £33$

Skip hire £10/week

Transport £35/hr minimum of 2 hours = £70

Labour one hour a week = £ 12

Total = £125

Cost of normal skip = £110

Also the “hassle factor.” A skip can be delivered on the same day or next day. A lorry may require 2 or 3 days notice.

With reference to the calculation, it is important to note that from interview and site visits:

- *Waste Analysis could provide more accurate data on quantities arising*
- *Interviews and visits in relation to this report indicated that other sites used wooden pallets to store re-usable and ultimately recyclable wood to avoid skip hire costs – this enabled*
- *Resource Manager (on some cases non productive labour) is utilised to operate waste management activities onsite the labour costs are paid back through waste management costs savings but also savings made possible through the better transfer, handling and storage of all materials.*

All activities are different and so other factors impact on re-use and recycling decisions

- 2) Inert materials

Kier Eastern already operated a stockpile system with regard to inert waste. Waste was stockpiled for subsequent transfer using a grab hand and flatbed.

- 3) Plywood Majority will be reclaimed by the sub-contractor for re-use
- 4) Polystyrene Moulds To be retained and reused by the sub-contractor

The site audit identified expanded polystyrene used as concrete moulds, Cordek, for which the manufacturer offered a take back and recycling service that Kier Eastern was not aware of. It was subsequently been determined that the sub-contractor will re-use the moulds and thus negated the use of the take back scheme.

- 5) Mixed Waste

In the first objective changes to the pre-existing contract with a waste management company proved difficult to negotiate. Whilst it is believed that waste is transferred to a recycling facility, enquiries have failed to determine recycling rates and the waste management company are not prepared to provide discounts for source separation of waste. Subsequent brokerage to identify an alternative waste management company that would be willing to report material recovered has proved difficult because of the low cost service provided by the existing contractor and the economic impact of changing waste services on the project budget.

Best practice

The research conducted by UKCEED determined that one method by which recycling can be facilitated was through contracting waste management companies that will facilitate re-use and recycling and in doing so making the savings - indicated in previous chapters – and passing the financial benefits back to the C & D Industry in the form of discounted skip hire rates

The key to this discount is to procure companies that can facilitate recycling and have the right characteristics to explore further options available in the present and future and be prepared to report openly and honestly materials recovered for re-use and recycling.

In order to introduce this idea to the purchasing department of Kier Eastern the environmental manager utilised a procurement exercise devised by UKCEED, as a prompt for the purchasing department. The result was the Kier Environment Manager set a challenge of the purchasing department to save 10% on skip hire services. A measure of this is the annual cost of skips against annual turnover the target to achieve a reduction in the cost of skips.

The environmental manager subsequently discovered that a sister company achieved savings using a similar method and introduced an element of competition to procurement. He thus indicated that a sister company has achieving greater savings on skip procurement made possible by procuring waste services from a company that recycle waste and subsequently segregating waste onsite.

Further, the concept has been taken one stage further with the Environmental Manager and set the objective to reduce the number of companies Kier Eastern currently procure skips from 30 to a smaller number of companies which do not sent waste direct to landfill but provide segregation and separation.

KE will use the procurement exercise devised by UK CEED to reduce the number of waste service providers to then set up long term fixed agreements, removing the hap hazardous nature of waste service procurement. This will also save the money wasted ringing round for alternate services and also ensures that a constant percentage of waste is recycled.

Letter Peter Johnson (Environmental Manager for Kier Eastern) sent to purchasing team

Dear all,

Please find attached waste management note from Marriott for your comments. At the environmental managers meeting yesterday Marriott advised that since implementing this procedure they have saved £25,000 in this financial year alone!

How should we approach this issue?

Do we currently ask our skip companies if they offer discounts for segregation when placing orders?

Should we in the first instance send out a standard letter out asking what our skip companies are doing about recycling? Typical questions could include: -

- 1) What % of material do they recycle at the transfer station?
- 2) What % of material actually goes to landfill?
- 3) What materials do they recover for recycling at the transfer station?
- 4) What materials would they recover if a construction company requested recycling?
- 5) How would they achieve this?
- 6) Have they considered the provision of skips for segregating, recyclable material?
- 7) What discounts they are prepared to provide if we segregate materials on site?
- 8) What requirement or standard does the material have to be to get recycled e.g. level of contamination
- 9) What technology do they employ to sort?
- 10) Do they have any plans in the future to expand recycling operations?

(UK CEED ©)

One of the Kier Regional Kips measures the cost of skips against turnover on a monthly basis. There will soon be enough data for our performance to be monitored against the other regional companies. Targets for reducing the amount of waste we send to landfill will be set at! We need to make sure we are ready!

6.4.2 Case Study 2: Kier Eastern; New Storage Facility on an East Anglian air base

Client: Ministry of Defence

Project Type: Demolition and Construction

The project involved the demolition of two existing warehouses and the construction of a new storage facility with office accommodation and car park.

The value of the works was £5 million project

The original structures were, single storey, steel, portal frame buildings. Rather than demolish the structures and cart the material off-site as scrap/waste the decision was taken to reuse and recycle as much of the original buildings as possible. The steel frames and cladding were carefully dismantled for re-erection elsewhere.

The concrete foundations and floor slab were crushed locally and brought back to be used in the construction of the new facility. This operation produced approximately 5500m³ of type 1 material with a subsequent saving to the contract of £15,000. In addition to reducing the amount of material

going to landfill and the use of virgin aggregate the process also resulted in a significant reduction in the number of potential lorry miles and therefore a reduction in fuel use and CO2 emissions.

The fill beneath the original buildings was tested and found to be suitable for use as type 2. This was used in the construction of the new facility, mainly to build up existing levels but also in the construction of the new car park. Re-using this material avoided having to dispose of it off-site at a cost of £5/tonne and import new fill material at a rate of £11.50/tonne. Although there was some double handling, a large number of lorry movements were avoided, again resulting in significant reduction in fuel use and CO2 emissions.

6.4.3 Case Study 3: Kier Eastern Norman Church of England School, Northwold **Client: Ely Diocesan Board of Education** **Project Type: Demolition and Construction**

The project involved the demolition of an existing building, construction of a new classroom, play area, and administration area together with external works consisting of new drainage, canopies, paving, landscaping and resurfacing of the play ground.

The value of the works was £422,666.

During the demolition work the brick and concrete rubble was separated from the timber, plastic and felt. Eighty tonnes of brick and concrete were sent away for recycling. The timber, plastic and felt went away in skips to a site where some of the timber was recovered for reuse/chipping.

Disposal Costs/Savings

- Brick and Concrete £4/tonne for a 20 tonne lorry load, to dispose.
- An 8 cubic yard skip cost £96, inc. landfill tax, and holds 6-7 tonnes of material, which equates to £13.71/tonne to dispose.
- Saving per tonne £13.71-£4=£9.71
- Total saving=£9.71x80 t=£776.80

Material Diverted from landfill: 80 tonnes.

Quote from the project manager “Segregation of the waste did not take much more time than loading it all into one lorry and was more than compensated for by the savings achieved.”



6.4.4 Case Study 4: SDC Builders Ltd
Client; Axiom Housing Association
Project Type: Construction

The project involved the construction Phase 1: hostel for the homeless; a brick and block construction with recast concrete floors and stairs and Phase 2: 12 individual flats; (as above).

The waste management approach adopted by SDC was mixed waste skips in phase 1, utilising 1 skip but as phase 2 got underway 2 skips (as needed) to cover the second construction. Skip hire was budgeted at £140 per skip at the start of the project.

Phase 1 budget: £5200 = 37 skips

Phase 2 budget: £2400 = 17 skips

- To improve waste management practice the approach UK CEED adopted was to broker a waste management contract that would provide for the source segregation of waste and off-site separation of the remaining fraction.
 - UK CEED brokered a new waste management contract which prompted SDC to change waste service provider from a waste management company that did not operate a transfer station.
- 1) Original skip hire provision was at a cost of £130 per skip.
 - 2) New skip hire provision with no ground rent³
 - a) Timber Skip £110
 - b) Metal Skip £75
 - c) Inert/Inactive Skip £90
 - d) Cardboard Skip £130
 - e) Mixed Residual transferred via Recycling Centre £120

The new waste service meant that SDC could potentially save £4900 on the predicted budget

$$£5200 + £2400 - (37 + 17 \times £120) = £4900$$

The switch from a straight to landfill waste service to mixed waste separated via a transfer station which has the capacity to recycle an average of 75% of waste has provided for a diversion of waste from landfill of **106 tonnes from a total of 151.44 tonnes. A recycling rate of 70.1%.**

SDC transferred 41, 8y³ skips via the transfer station, with an average weight of 3 – 4 tonnes.

Over the course of the project SDC utilised one 6 Cubic Yard timber skip to source segregate timber.

The savings made by SDC against the original project budget of £140 a skip = $(41 \times £140) - (40 \times £120 + 1 \times £110) = £830$

In real terms by switching waste service provider SDC saved = $(41 \times £130) - (40 \times £120 + 1 \times £110) = £420$ but also achieved a 70.1% recycling rate.

Metal waste was not considered to arise in large enough quantities to warrant source segregation.

³ Ground rent is the charge for the period of time the skip is in position without collection.

Skip hire charges for cardboard was deemed to high to warrant as over and above mixed waste skip.

Inert waste was considered for segregation. Confusion over lime mortar led to a delay and unfortunately this did not go ahead. Visual inspection of a fork lift skip indicated to the Site Manager that inert waste segregation was a future possibility but required more consideration at the planning phase.



The size of the site was a limitation to source segregation. The Site Manager for SDC indicated that space was required for a mixed waste skip, close to the waste source. As such one skip serviced the Phase 1 building and the second skip for the Phase II building, the 12 individual flats. One of these skips was located on the adjacent property on which construction was being conducted by another company. As such the difficulty was not the movement of material around the site to designated skips but rather the space.

The Site manager suggested further segregation collection could have worked using smaller skips, which could have been placed right up against the building but that this would need to be a consideration for future project. In the case of timber it was indicated that the financial benefits of £10 was not sufficient on an 8 Cubic Yard skip. For this reason a 6 Cubic Yard skip was utilised.

Best Practice

UK CEED provided SDC best practice and guidance documentation in order that SDC gain the momentum for waste management change

These documents are provided in the Annex 8 and comprised of

- 1) Waste Management, Why Bother – a tool which could be utilised to inform personnel why waste management is important (Annex 8.1)
- 2) Best Practice Guide: On-site Waste Management Handling and Storage (Annex 8.2)
- 3) Waste Management Monitoring Survey (Annex 8.3)
- 4) Waste Service Procurement Exercise (Annex 8.4)
- 5) Skip Movement Monitor (Annex 8.5)

Involvement in the project has led to SDC undertaking a review of procurement practice and site waste planning. The company utilising the Site Waste Management Planning guidance developed by UK CEED for the project are currently incorporating it into the existing Environmental Management System.

UK CEED also reviewed waste management specification clauses and recommended several amendments the objectives of which was to facilitate re-use and recycling on future projects.

In another project outcome SDC has also started a legal compliance review of 80 waste management licences and carriers registration for the waste collectors they use frequently.

The Project Officer has also provided SDC with a Waste Management Brief for another site in Greater Peterborough unfortunately the project at the time of this report had not started.

6.4.5 Case Study 5: Peterborough City Council

Client: Peterborough City Council

Project Type: Refurbishment

The project involved the £1.3 million refurbishment of a community centre. Unfortunately the long lead in time of the project a year meant that at the time of this report the project had not started.

Best Practice

UK CEED provided waste management clauses to Peterborough City Council to specify waste management procedure for the refurbishment project. The following clauses were inserted into the preliminaries A35 SPECIFIC LIMITATIONS ON METHOD/SEQUENCE/TIMING

155 DISPOSAL OF MATERIALS: Peterborough City Council have informally formed a partnership with The UK Centre for Economic and Environmental Development (UK CEED) with the aim of diverting construction waste away from landfill, for processing, remanufacture and re-use. The contractor is therefore required to:-

Submit to a method statement on the proposed methods and opportunities to be adopted to:

- Introduce a waste management scheme on the site, for use by all trades and management that provides for the collection and subsequent recycling of waste materials arising from the demolition/refurbishment/construction.
- Ensure all site operatives and staff understand the purpose and need for waste management.
- Set targets, monitor results and report.
- Temporarily store and protect recovered and segregated material.
- Recycle any existing materials discovered on site, on or off site [e.g.
 - Concrete crushed for use as aggregate in concrete;
 - Concrete or masonry as hardcore].
- Use and labelling of segregated surplus/waste containers for ease of use by site operatives.
- Segregate surplus/waste materials for reuse/recycling [e.g.

Inert materials, building rubble:

- Bricks
- Blocks
- Precast concrete
- Concrete
- Cement Mortar

Plastics

- Packaging
- Offcuts

Metals

- Electrical cable
- Pipes
- Offcut.

Paper & cardboard

- Packaging
- Site administration waste paper

Plasterboard

- Damage and offcuts

Timber and timber based boards

Protection materials
Pallets

Glass

Offcuts and damaged materials

Green waste

Trees, thinnings, cuttings, plants, roots, leaves, grass, turf

Topsoil:

Potential for remediation or reuse on or off site.

- Segregation of unusable materials and set aside from recyclable materials e.g. dust, debris, infested materials.
- Methods for disposal off site
i.e. contract with waste collector which involves segregation of mixed waste and onward transport to reprocessors. ©

The Project Officer is still engaged with the project and has attending meetings to provide guidance on how to instigate Site Waste Management Planning on the project in line with the clause above.

6.4.6 Case Study 6: S H Traditional Ltd **Client: Anonymous** **Project Type: Demolition and Re-build**

The project involved the demolition of an existing wall and rebuild of the wall.

A visual inspection of the site determined that the significant material arising from the project was brick and concrete. The site staff indicated that the process adopted was to reclaim as many of undamaged original Victorian bricks as possible in the demolition, by removing the concrete these were re-usable in the re-build of the wall.



SH Traditional required advice on the disposal for re-use and recycling of approx 24 y³ of broken brick and concrete from demolition and re-build of a brick wall.

UK CEED brokered a recycling destination for the material at £120 for the load.

A competitive rate was supplied by a third party and the waste was transferred for £100 to an unknown destiny.

* The above clause is used with permission from National Green Specification

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and placed in small containers and subsequently bulked at a site until they have a large volume to benefit from economies of scale upon subsequent transfer to transfer station or recycling facility.

SH traditional requested advice on the legality of operating a small transfer station e.g. was a waste carrier's registration required for haulage of the waste was a waste management license required or an exemption there from, are Waste Transfer Notes needed upon transfer of waste to the facility.

UK CEED acting as a broker provided this information and the requirements were deemed to prohibitive to pursue.

6.4.7 Other Best Practice Activity

UK CEED engaged several other construction companies through the C & D company survey.

The companies listed below either provided access to construction sites for visual inspection, meetings to discuss practice and procedure, waste management documentation and advice and guidance on implementing waste management changes on other sites.

With respect to these companies UK CEED was unable to monitor sites and utilise the sites directly in the project for several reasons; due to mid-construction, project having already started, the long lead in times for projects meaning construction would not start in the project timescales, site outside the region and to some extent a feeling that the companies already undertook activity to re-use and recycle. As such this meant that UK CEED did not get to broker or effect a change in waste management for these companies that can be recorded. However, the project did provide several of these companies with guidance and information on site waste management planning if it was deemed that these companies could gain benefit from the information. Annex 9 provides an indication of the company specific information provided and Annex 8 generic, some of which was considered confidential and is not included in Annex 9. The outcome of the provision of best practice guidance has been difficult to assess and outside the scope of the project as the information was required to undertake due process.

The real benefit of contact with these additional companies has been the knowledge of practice and procedure and in particularly the practical advice and tips imparted which could be utilised to provide a better standard of advice and guidance through the project.

The provision of such information also contributed to the completion of generic best practice guidance documents (Annex 8).

The author would like to acknowledge the following for the provision of detailed information on practice and procedure above that required in the survey.

- 1) Simons Construction Ltd
- 2) Interserve Projects Limited: HMP Prison Project successfully diverting waste from landfill demolition of existing buildings and 50,000ft² construction of new prison. Waste diverted to date; Limestone cladding 30m³, structural timber/joists 20m³, brick 9000m³, concrete 8000m³, mixed brick, concrete and tarmac 86,000m³, 3000 tonnes mixed metal (demolition & construction). Construction 42y³ timber, 41y³ inert material, 104y³ paper with 427y³ mixed waste.
- 3) MJ Gleeson Ltd
- 4) Jelson Ltd
- 5) Bryant Homes (A Taylor Woodrow Company)

6.5 Conclusions

A significant finding of the project has been the disconnectedness of construction companies both internally and with waste management issues. The project has encountered major difficulties in:

- identifying and contacting the right person within companies, as procuring waste services can be undertaken by any of the Environment Manager, Buyer, QS, Project Manager or Site Manager
- motivating the person responsible, particularly if not the Environment Manager
- achieving dates for meetings
- obtaining timely agreement to participate, because of the different priorities pursued by the different job functions involved.

This was compounded by a general lack of waste management knowledge through the company structure.

These difficulties have meant that the numbers of sites involved in the project was less than aimed for. They are however a genuine research finding, which has led UK CEED to identify the absence of waste management, plans for construction activities, and to develop such plans and an associated toolkit to simplify key processes for the routing of waste for recycling for other project companies.

Decisions on whether to take part in the Project was determined on the potential savings available a reflection of the anticipated volumes of waste arising from the type of construction or refurbishment, interests of the key decision makers, concern over future legislative changes and company image.

The project did produce a number of useful findings:

- By acting as a third party, the project proved successful in prompting companies to take action to mitigate their impacts on the environment, and is providing impetus to change current waste management practice in the project region.
- In starting to change practices, the best results were achieved with the medium sized construction firms that use traditional builder's skips for waste removal. Smaller firms also expressed interest in recycling and on-site segregation of waste. The limitation to achieving this was overcoming economies of scale barriers.
- Larger regional/national construction firms proved harder to engage. This was due to the difficulty obtaining the best contact and the time it takes to pass details up the command chain and/or possibly due to the perception that segregation already occurs to a sufficient level. In most instances research indicated that segregation occurs to avoid landfill tax charges and more numerous skip lift charges by compacting waste.
- Significantly, most construction companies demonstrated a lack of knowledge as to what happens to the waste after it has left the site. Very few companies contacted truly considered how much waste from their site had been recycled or whether and which materials are segregated, or tackled the unwillingness of waste service companies to provide this information. Resolution of this may be to work on the importance of an organisation-wide understanding and knowledge of environmental issues. In some instance the waste management company's under current contract did not respond to enquires to illicit details of what happened to waste after it was transferred mixed from the facility to a transfer station – and would not provide details of approx amounts of materials recycled from the facility. Negotiate between the C & D company and waste service provider on the

potential for re-use and recycling of waste material needs to be conducted at the earliest stage of a project. The C & D industry need to be more astute in their knowledge of waste (recyclate) destinations. This will also help to ensure compliance with Duty of Care.

- Most medium/large firms provide segregation of waste into types such as inert waste, mixed waste, light weight compactable. Once conducting this level of segregation a general lack of enthusiasm was found to segregate material into further waste streams, even when this was to be facilitated by an external organisation.
- Lack of knowledge of the waste management industry particularly local waste management service providers and the alternative services available.
- Barriers to re-use and recycling were often quoted one which arose was unwillingness of staff and sub-contractors to segregate waste without research or examination of the problem or how to resolve it. Concern over the number of waste receptacles on site, and the health and safety implications.
- Procurement professionals' were often responsible for the actual waste company contracted. The decision to utilise a company was based on established lists/preferred contractors, 3-4 telephone call and quotes and not a wish to maximise service potential for a locality. Research indicates that a change of culture is necessary and for the procurement professionals within companies to ask questions about waste destinations and collection practices when contracting waste services. This also had implication for the manner in which construction companies' contract with waste service providers.
- Waste management clauses did not favour recycling or re-use or the examination off.
- Legislation is often a stumbling block for the C & D industry. Duty of Care is often not met with specific regard to the utilisation of accurate European Waste Codes on waste transfer notes.
- The C & D industry in most instances has a reactionary approach to waste management. The will to recycle/not to recycle was based on immediate costs not necessarily future consideration – indicating that when landfill tax increases positive change will be had – hazard. It was determined that construction industry had a will to recycle and in most instances could see the benefits to recycling in terms of financial savings potential and the benefit to the environment but only if immediate savings were available.
- The work with SH Traditional Ltd and evidence provided in interviews with other SME's and Peterborough City Council indicated that there is a lack of transfer stations suitable for small trades this is in part due to commercial reality dictates that transfer stations operate on economies of scale and so attract larger scale activity to achieve the levels of bulking required. As such companies will continue to provide such facilities unless the risk of operating a facility aimed at small trades is overcome. Other reasons quoted include
 - a) High gate fees for amount of waste transferred
 - b) Requirement for appointments to be made prior to disposal
 - c) Unsuitability of surface for small vehicles (particularly) landfill
- Actions to recover re-usable/recyclable waste material was often based on the local knowledge of the project manager and other key site personnel. As such recycling/re-use activity was not company specific rather knowledge specific.

7.0 Recommendations

- C & D companies need to consider the local conditions and local recycle market upon procurement of waste management services and in turn require more guidance and information on waste service provision at the local level – current directories are ineffectual and need to provide more adequate detail on service provision including specifications of recycle.
- The C & D industry require clearer information and guidance on the basic requirements of waste management legislation and the changes to waste management legislation.
- Smaller C & D companies which do not benefit from economies of scale require waste management facilities and infrastructure on a local level that cater for these requirements as SME's, quick and easy access without appointments, low cost to off-set the lack of economies.
- Greater Transparency in the waste management service industry. Waste management companies need to report to customers and at a national level accurate information and data regards actual volumes of waste and its disposal methodology including the amount of material recycling/re-used. This could be introduced through a change in the waste transfer note systems to include a section on amounts and materials recovered or at a minimum utilising average figures from all operations.

Legislative control maybe the most effective means by which recycling rate can be increased this could take the form of;

- a) Material specific targets for recyclables from the C & D industry
- b) A ban on the direct transportation of waste to landfill – rather all waste should be required to be directed through transfer stations
- c) Requirement for all C & D projects to introduce Site Waste Management Plans (proposed as part of the Clean Neighbourhoods Act for projects over £200,000). This will ensure that all activities and SME's which make up 97% of the industry and a large proportion of activity consider re-use and recycling. This could be achieved through the planning system or building regulations.

Recommendations made by the waste service providers

- Independent information/reviews on suitable technology for waste treatment, handling and storage.
- Introductions to potential inward investors – networking
- Investment in core business.
- Support for local re-processors providing higher value activity.

8.0 Conclusion

- The concept of site waste management planning is not sufficiently understood by the construction industry. Whilst waste is dealt with to enable construction to continue and meet health and safety requirements, forward planning to maximise recycling is weak. The lack of waste management plans also means that most sites do not fully comply with waste management legislation.
- On reaching an understanding of good and best waste management planning, companies do not know how to implement it.
- Due to the above, the project has had to engage in a far greater element of waste awareness raising than originally anticipated. This has included:
 - achieving legislative requirements for SMEs
 - brokering more effective waste management arrangements, initiating the waste management systems on-site and ensuring the momentum for policy and procedural change generated continues with the project companies.
 - producing a 'toolkit' for easy application of recycling-oriented construction waste management.
- The design of the on-site container systems currently used poses an obstacle to efficient recycling of construction waste.
- The project has made progress with promoting a demand-led approach to waste management services by stimulating several companies to review procurement processes to ensure that their waste management contractors can recycle waste, provide source segregation or transfer to recycling facilities, and through the tender requirements and informative adopted by Peterborough City Council.
- There are significant opportunities to join construction and demolition waste streams with other commercial streams and municipal wastes to maximise the economy and efficiency of recycling.

In the first objective the diverting waste from landfill this element of the project was not successful at diverting a large volume of C & D waste from landfill. The lengthy lead in time to projects starting was one notable reason but was also hampered by inability to source the correct contact, lack of knowledge and education. It was established that the potential real benefit of the project was in the identification of the barrier to re-use and recycling and then the utilisation of the best practice knowledge regarding materials handling, storage and treatment to education of the C & D industry enabling them to generate activity that would effect a positive change in waste management practice.

The combination of these issues meant that although capability in Greater Peterborough was identified which could deal with several of the project waste streams this was not possible in the projects timescales and so the support for reprocessors, with the exception of those waste service providers that undertook basic reprocessing, was limited.

The greatest achievement of the project has been in increasing the expertise of the C & D industry in Greater Peterborough, the region and the UK in site waste management planning and the to some extent the regions waste service providers.

This information was successfully utilised in the East of England Sitewise Campaign which had 120 attendees and an event in Greater Peterborough and in the seminars that disseminated project findings Construction Resources Using Less Recycling More which across the UK had an attendance of 255 people (see Annex 10). The joint activity conducted by the partners involved in the dissemination – Constructing Excellence and National Green Specification, The Environment Agency including UK CEED has led to advances in the activity undertaken to minimise and recycle C & D waste.

The research observations concluded that main C & D companies particularly SME's lacked the waste management knowledge to manage waste effectively enough to benefit from re-use and recycling and as such are unable to unlock the potential savings that can be made from recovery of re-useable and recyclable waste. Most construction companies are not aware of the conspicuous savings available through source segregation of basic materials such as inert and mixed waste. As such the project focussed on segregating these two streams with timber and metal as secondary materials.

A majority of these problems can be resolved through vigorous site waste management planning. The recently launched Voluntary Code of Site Waste Management Plans (DTI, 2004) has gone some way toward redressing the situation.

Coupled with a provision of adequate information on benefits provided through case studies and the C & D industry does show a willingness to change practice and procedure. In turn this will create the stability the waste management industry require to invest in limited activity to support re-use and recycling, even in the simplest form this is offering source segregation as a policy and passing the financial savings which can be released from the process.

Simon's Construction are perhaps the best example of where a demand led initiative has been successful a Lincolnshire company, outside the Greater Peterborough boundary, successfully lobbied the waste management industry in their locality to provide bespoke recycling solutions that have become standard practice in the locality. This coupled with long term contracts has meant that the recycling rates that have been achieved are award winning.

The C & D industry require access to information on waste management at the earliest opportunity to avoid the reactionary approach to waste management that the increases in landfill tax will produce. Simplified guidance is required on the implementation of Site Waste Management Plans (which utilises a system of examination waste on a site by site basis) and significantly how lessons learnt across several sites can be utilised to change generic company behaviour.

With respect to the changes within the C & D industry the project should have provided itself a greater period of time to influence change and monitor the results. The project has however been successful as aforementioned leveraging activity and participants in the project notably Green Specification and Constructing Excellence are undertaking further activity to keep the momentum going that the project started. UK CEED has several projects in the pipeline and is working with Envirowise on their Construction Programme.

The project also gave too much credit for construction companies for managing their waste in an effective manner. In the initial stages of the project it was taken for granted that construction companies would manage their waste effectively and that the purpose of the PII Project would be to introduce companies to the principle of recycling and increase the diversion of waste from landfill and time permitting indicate methodology and resources that would reduce the production of waste. In reality waste management was often viewed by a large portion as a necessity and not as a valid means by which savings could be achieved.

This was conspicuous in from site to site operated. The extent to which this effected waste management was often down to individual employee interests and experiences and relationships with waste management companies. In some cases local knowledge of waste management companies and a tradition of using one waste management company was detrimental to recycling and re-use as the contractor in question had not investigated alternative options. The level of recycling on-site was often a direct result of local knowledge and interest not company policy.

The work with construction companies has also shown up the inadequacies of the design of waste container and collection systems currently used. This is described in more detail in Annex 11 and reflected the extent of UK CEED research. Several companies were prepared to look in to the design of waste receptacles but none were willing to finance the costs required. Singh UK Ltd is currently trialling split skip or skips divided into two compartments but these modifications have been made in-house. One suggestion for construction sites by a skip fabricator was to take advantage of vertical storage in much the same manner as household waste recycling bins.

APPENDICES

1.0 UK Waste Classification Codes

Waste Class	Description
210000	Inert - UNSPECIFIED
210100	Inert - NATURAL ROCKS & SUB-SOILS
210101	Inert - Rock and stone
210102	Inert - Sub-soils
210200	Inert - CERAMIC AND/OR CEMENTED MATERIALS
210201	Inert - Glass
210202	Inert - Ceramics
210203	Inert - Concrete and/or mortar
210300	Inert - PROCESSED MINERAL MATERIALS
210301	Inert - Moulding sands and/or clays
210302	Inert - Clay absorbants
210303	Inert - Other mineral absorbants
210304	Inert - Man-made mineral fibres (MMMMF)
210305	Inert - Silica
210306	Inert - Mica
210307	Inert - Abrasives
210400	Inert - MIXED CATEGORY 21 WASTES
210500	Inert - WATER WITH CATEGORY 21 MATERIALS
220200	General and Biodegradable - CONSTRUCTION/DEMOLITION WASTE
220201	General and Biodegradable - Mixed construct'n/demolit'n waste
220202	General and Biodegradable - Asphalt/bitumen/coated roadstone
220203	General and Biodegradable - Streetworks waste

2.0 Waste Arising in Greater Peterborough

Data analysis of Environment Agency Waste Returns

Waste Description	Waste Classification Codes	Weight 2002/03 (tonnes)	Weight 2001/2 (tonnes)	Total tonnes
Mixed Construction and Demolition Waste	21000 - 22000	98,898.78	Unknown incomplete records	
Mixed Inert Waste	Category 21 waste's	111,444.78	117,269.00	228740.78
Container Glass	210201	862.00	32	894.00
Paper and Card	220401	15858.87	18749.17	346080.04
Plastics and Polymers	220402	619.00	842.12	1461.12
Mixed Textiles	220406	110.70	85.46	195.16
General Material separated for recycling	25000	34174.9	7725.4	41900.3
Metal – ferrous/non-ferrous	Category 23 wastes	27187.4	36234.79	63422.19

3.0 Data Waste In/Out Local Transfer Station

<i>Material</i>	<i>Period</i>	<i>Weights In (tonnes)</i>	<i>Weights Out (tonnes)</i>	<i>Period</i>	<i>Weights In (tonnes)</i>	<i>Weights Out (tonnes)</i>
WOOD	1st June - 30th Sept 03	0	0	1st Feb- 30th May 03	26.94	26.94
NON FERROUS METAL		40	40		35.92	35.92
HARDCORE		800	600		800	800
PAPER/CARDBOARD		15	15		20.71	20.71
ACTIVE WASTE. Municipal (LANDFILL)		450	450		300	300
RESIDUAL Mixed						

4.0 Waste Management Procurement Exercise

Guidance

Local Reuse and Recycling: An exercise of this nature first requires that you research the local opportunities available for the materials, fixtures and fittings as indicated above.

What you will be left with is a list of local opportunities these can be translated into one database if required.

It is then possible to formulate an idea of whether these opportunities are viable and cost effective e.g. if timber can be collected for free by a local company then this is better than paying a skip charges. These opportunities need to be considered in relation to the below procurement of waste services.

Skip Hire/Waste Management: Recycling of waste material via waste management companies can be achieved in two ways.

1. ON-SITE SEGREGATION OF WASTE into material types e.g. timber, metal, inert, plastics etc
2. ON-SITE SEGREGATION OF WASTE to facilitate the off site separation into material types e.g. packaging, mixed waste, light weight compactable, inert at transfer station or recycling centre

Ask questions or ask the waste management company to submit a proposal for providing waste management service. Ensure that the waste management/skip hire company have the characteristics that are required to help with a waste management route and importantly if they do recover materials for recycling; the discount they would be prepared to apply over standard charges. Ensure that your purchaser rings several local companies or requests several proposals. Ensure that they keep trying if they are unsuccessful at sourcing a company with the right characteristics. Characteristic that you are looking for is a company that will facilitate the recycle as

much of your waste as possible for the largest discount. It is important that the person who is undertaking the procurement process is aware of the types of materials in question.

Questions that require consideration in relation to points 1 & 2 above are: -

- 1) Does the waste management company/skip hire company recover waste material for recycling?
- 2) Do they provide for the segregated collection of waste materials from site through the provision of separate containers? E.g. inert (separate container for concrete, , timber, metal, plastic & cardboard
- 3)
 - a. Do they provide for the segregated collection of waste types from site to facilitate the off-site separation of material types? E.g. mixed inert or inactive, mixed active waste, lightweight compactable?
 - b. Is this material recovered at transfer stations/recycling centres?
 - i. Which materials recovered are recovered
 - ii. What percentages recovered (from 8yd³ Builders Skip)
- 4) What containers are used for material type/waste type?
- 5) What requirement or standard does the material have to be to get recycled e.g. level of contamination? or what standard to go to landfill
- 6) What is the standard skip hire cost per skip, what discounts are they prepared to provide per skip for
 - (a) Segregation on-site into material type
 - (b) Segregation on-site into waste types for sort at off-site at transfer station/recycling centres?
- 7) What provisions do they make for hazardous and liquid waste

5.0 Waste Management Service Provider Questionnaire

Please note that all answers will be treated in strict confidence and will not be made available to third parties.

COMPANY NAME.....

CONTACT NAME.....

CONTACT NUMBER.....

		Please tick as appropriate	
1	Does your company provide waste collection services to the Refurbishment, Construction and Demolition sector?	Yes	No
2	Does your company provide services involving waste segregation, to facilitate re-use and/or recycling?	Yes	No
3	If yes to Q2. Where is the waste segregated?	Source Company Premises Transfer Station Other	
4	If no to Q2. Have you researched, considered or offered segregation in the past?	Yes	No
5	If no to Q2, Would you be interested in offering segregation?	Yes	No
6	Would you or a company representative be available to clarify answers to this questionnaire, for further research?	Yes	No

**PLEASE FAX BACK TO UKCEED ON 01733 312782 or SEND
USING THE ENCLOSED PRE-PAID ENVELOPE
THANK YOU FOR YOUR HELP**

6.0 Material Arising Analysis

	Percentage of waste in typical (APT)	Kilograms	Tonnes	20Tonnes
Inert	58%	580Kg	0.58	11.6
Timber	12.44%	124.44 Kg	0.124.44	2.49
Cardboard	1.41%	14.1kg	0.0141	0.28
Plastic	1.26%	12.4kg	0.0124	0.25
Metal	5.57%	55.7kg	0.0557	1.11
Plasterboard	1.80%	18.1kg	0.0181	0.362
Mixed residual	1.87%	187.7kg	0.187	3.74
Insulation (fibreglass)	0.27%	2.7 kg	0.0027	0.054
Glass	0.53%	5.3kg	0.0053	0.106
	Source			19.992
	www.apr.co.uk			
	Percentage of waste in typical (APT)	Kilograms	Tonnes	20Tonnes
Inert	58%	580Kg	0.58	11.6
Timber	12.44%	124.44 Kg	0.124.44	2.49
Cardboard	1.41%	14.1kg	0.0141	0.28
Plastic	1.26%	12.4kg	0.0124	0.25
Metal	5.57%	55.7kg	0.0557	1.11
Plasterboard	1.80%	18.1kg	0.0181	0.362
Mixed residual	1.87%	187.7kg	0.187	3.74
Insulation (fibreglass)	0.27%	2.7 kg	0.0027	0.054
Glass	0.53%	5.3kg	0.0053	0.106
	Source			19.992
	www.apr.co.uk			

6.1 Recycling Option - Cost Analysis

Inert Waste - 5 (8Cy) Skips x 2.32 tonnes. Total Weight of Inert Waste 11.60tonnes

Revenue (Skip)	£140.00	£700.00
Landfill @£7	£7.00	£81.20
Manpower 1hr	£10.00	£50.00
Transport 20m's	£10.00	£50.00
Profit		£518.80
Net Saving (landfill)	(11.60t X £32) - (11.60 x £7)	£290.00
Net Profit		£808.80

Cardboard & Plastic - 1 (4Cy) skip x 0.53tonnes

	£80.00	£80.00
Revenue (material sales) @£15(t)	£40.00	£21.20
Manpower 1hr	£10.00	£10.00
Transport 20m's	£10.00	£10.00
Profit		£81.20
Net Saving (landfill)	(0.53t X £32)	£16.96
Net Profit		£98.16

Plasterboard - 1 (4Cy) skip x 0.36t

Revenue (Skip)	£80.00	£80.00
Recycling Charge@£9.0	£9.00	£3.24
Manpower 1hr	£10.00	£10.00
Transport 20m's	£10.00	£10.00
Profit		£56.76
Net Saving (landfill)	(0.36t X £32)	£11.52
Net Profit		£68.28

Timber - 1 (8Cy) skip x 2.49tonnes

Revenue (Skip)	£140	£140
Recycling Charge@£9.0	£9.00	£22.41
Manpower 1hr	£10	£10
Transport 20m's	£10	£10
Profit		£97.59
Net Saving(landfill)	(2.49t X £32)	£79.68
Net Profit		£195.18

Metal - 1 (4Cy) skip x 1.11tonnes

Revenue (Skip)	£80	£80
Revenue (material sales)@£30 (t)	£30	£33.30
Manpower 1hr	£10	£10
Transport 20m's	£10	£10
Profit		£93.30
Net Saving (landfill)	(1.11t X £32)	£35.52
Net Profit		£128.82

Mixed Residual - 2 (8Cy) Skip x 1.87tonnes

Revenue (Skip)	£140	£280
Landfill@£32	£32	£119.68
Manpower 1hr	£10	£20
Transport 20m's	£10	£20
Profit		£120.32

7.0 Small to Medium Sized Enterprise Survey

	1	2	3	4	5	6	7	8	9	10
1.No of employees	11	-	15	2	1-2	20	15	2	5-11	1
2.Area of activity	*Con Housing	Ref/Con Com	Con Com	Con Housing	Con Housing	Ref/Con Com/Housing	Con Housing	Ref Housing	Ref/Con -	Ref/Con Housing
3.Main Type										
4.a.Conducting segregation of C & D waste	No	No	Yes	Yes	No	Yes	Yes	No	Yes	No
5.Material Segregated on site	-	-	Rubble Timber	Soil Hardcore	-	Hardcore Timber Card/Paper	Rubble Timber	-	Soil, Hardcore Timber	-
6.Method of segregation	-	-	Skip	Trailer	-	Skip Dumpy Bag	Shovel	-	Skip Skip Bag	-
7.Waste Management Co (WMC) Recycles	Unknown	Unknown	Unknown	Unknown	No	Yes	-	No	Unknown	No
8.Materials WMC Recycle	-	-	-	-	-	Unknown	-	-	-	-
9.Recycling considered when contracting WMC	No	No	Yes	Yes	-	Yes – balanced with cost	No	No	No	No
10.Supplier Take Back	No	No	No	No	No	No	No	No	No	No
11.Considered / researched segregation/ greater segregation	No	No	No	No	No	No	No	No	No	No
12.Would consider provision of (further) onsite segregation	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes if cost Effective

* Con-struction, Ref-urbishment, Com-mercial.

8.0 Best Practice Guidance – SDC Builders Ltd

8.1 WASTE MANAGEMENT, WHY BOTHER?

The reasons:

1. Protecting the Environment
2. Financial
3. Compliance with legislation (avoiding prosecution)
 - a. Health and safety
 - b. Dust and Noise
 - c. Duty of care
 - d. Ban on co-disposal (European waste codes, waste acceptance criteria)
 - e. Future Legislative Requirements
4. Business & Public relations: enhanced reputation for sound environmental and waste management.

The requirement to manage waste is an increasingly important facet of day-to-day life. At the domestic level, households have been provided with green boxes for the recycling of waste material. This change in provision has been brought about by the introduction of waste reduction and recycling targets for local authorities. Targets achieved through the introduction of penalties for local councils and financial incentives and disincentives for households recycling, such as increased or decreased rates. As such it is a natural progression to consider, that once domestic waste going to landfill has been reduced, that attention will be directed at other major sources of waste such as the construction and demolition industry, which accounts for 1/3 of all waste production.

PROTECTING THE ENVIRONMENT

A staggering 72.5 million tonnes of waste arises annually from construction and demolition sites – a substantial proportion of the 400 million tonnes of waste which the industry as a whole produces annually. The environmental pressures that waste creates in terms of landfill allocation, carbon dioxide emissions, the green house effect and ozone depleting substances, are significant. The final material delivered to site is just one aspect of the impacts; the final product represents the use of natural resources, raw materials sourcing activity such as mining and quarrying, the transportation and related emissions and manufacturing. Preventing waste and recycling reduces the dependence on natural resources, creates less pollution by reducing manufacturing and transportation related emissions, uses less energy and water, since recycling many materials requires less energy and water compared to products made from virgin materials, reduces greenhouse gases and ozone depleting substances by using less energy for manufacturing and transportation.

FINANCIAL IMPLICATIONS OF WASTE

- 1) The (increasing) cost of disposal - landfill tax (see below)
- 2) Cost of non-compliance with legislation – the cost of prosecution
- 3) The real cost of inefficiency; the purchase cost of materials, cost of storage and the cost of handling.

Compliance with legislation

The most significant piece of legislation for the construction industry is the Landfill Tax and the ban on co-disposal of waste at landfill sites. Both sets of legislation impose financial implications for the C & D industry.

Health and safety

Managing environmental and waste issues have an important role to play in the avoidance of accidents and incidents. A tidy site reduces hazards

Rates of landfill tax

The standard rate of landfill tax, which applies to active waste disposed of to landfill, will increase to £15 per tonne from 1 April 2004, as announced in The Budget in 1999. The Chancellor Gordon Brown in 2003 announced that the rate would increase to £18 per tonne in 2005-06 and by at least £3 per tonne in the years thereafter on the way to a medium-to-long-term rate of £35 per tonne.

Budget 2004 announced that the lower rate, which applies to inactive waste, disposed of to landfill, remains at £2 per tonne.

The higher rate of tax is already being passed on to the industry by waste management companies that are increasing the costs of waste collection. As the rate increases by £3 next financial year the increase in the cost of waste disposal will rise more steeply unless waste can be minimised and diverted from landfill.

Further, European Waste Strategy consultation includes proposals to harmonise the cost of landfill across Europe. The UK currently has one of the lowest landfill charges and rates; harmonisation will increase the rate of landfill charges in line with already high Continental charges.

Ban on Co-Disposal

The ban on co-disposal in April 2004 has introduced three classes of landfill site; inert, non-hazardous (active, putrescible, biodegradable) and hazardous. Now, 'non-hazardous' sites can accept only non-hazardous waste, with few 'hazardous' sites this increases the cost of hazardous waste disposal per tonne, it is important that hazardous waste not be mixed with non-hazardous waste to keep the cost per tonne down.

The directive will also ban liquids and certain materials from landfill and tighten site monitoring and engineering standards. It will be supplemented by the new European Waste Catalogue which has extended the range of materials classified as 'hazardous', and the Waste Acceptance Criteria, which will introduce stringent pre-treatment requirements. The requirement for pre-treatment means that some hazardous waste can be treated and rendered non-hazardous – and as such can be disposed in a non-hazardous landfill site. Inert waste can also be accepted in a non-hazardous landfill.

Although a non-hazardous site can accept inert waste, it is very important to recognise that the Landfill Tax for an inert site is pitched at £2/tonne while it is charged at £15/tonne at a non-hazardous site. This provides an incentive to segregate material to ensure that you are charged the lower rate of Landfill Tax. Segregating inert tax in this manner will also help to ensure that the material can be very easily recycled using segregation of inert waste. Recycling is facilitated even further if inert waste is segregated into inert waste materials.

The ban on co-disposal will increase the cost of waste disposal for hazardous waste, as hazardous waste will potentially be required to be transported greater distances to licensed facilities. It also impacts on site waste management as more materials are classified as hazardous.

The landfill tax and ban on co-disposal have implications for site waste management. Steps need to be introduced to ensure that waste is minimised and diverted from landfill to avoid the increasing cost of waste management. This can only be achieved through sound Planning.

Future Legislative Requirements

Constructing Excellence is currently working with the construction and demolition industry-led DTI Construction Task Force on issues of sustainability. Part of the focus is to determine how waste can be minimised and diverted from landfill in practice. Constructing Excellence and the task force have determined that the construction industry should be implementing Site Waste Management Planning and providing each site with its own Site Waste Management Plan, the latter for use by site staff.

The taskforce has recommended that the requirement for site waste management plans be introduced as legislation via the Clean Neighbourhood Bill, with a trial period as a voluntary code of conduct. In this case, the client would be responsible for ensuring that the contractor produces a site waste management plan for its site. The outline system for the plan - in effect a waste management method statement - will be a requirement at the tender stage.

ENHANCED PUBLIC IMAGE

The general public, through the media, are increasingly aware of social and environmental issues which are attributed to consumption. An understanding of sustainability and related issues attributed to this has meant that more consumers are voting with their wallets and avoiding companies that do not take action to mitigate the impact of activities. This means that companies, which can demonstrate sustainability credentials will fare better in more aware society. Similarly the change in consumer awareness and driving legislative means companies are becoming more concerned with green credentials and are introducing ethical procurement strategies the effect of which is to green their supply chains.

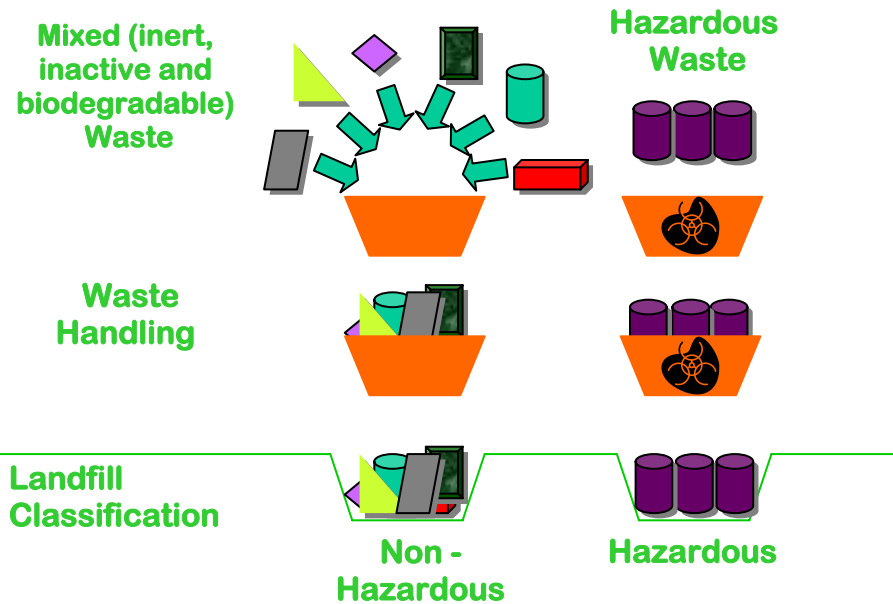
8.2 Best Practice Guide: On-site Waste Management handling and storage

The following on-site practice was observed as part of the UK CEED research subsequent discussion held as part of the environment Agency Sitewise Campaign for the Eastern Region helped to categorise the following behaviour.

Standard Practice –

- Minimum site waste management requirements (from April 2004). Non-hazardous waste (active and in-active) is collected mixed in one container and hazardous based on the ban on co-disposal.

4



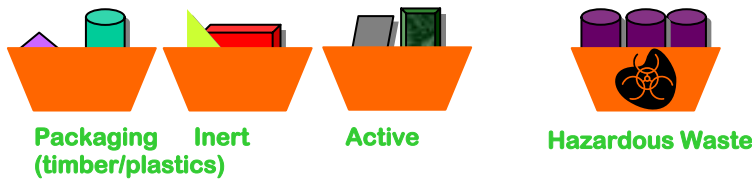
Legal Minimum -

- Producer Duty of Care
 - Waste Transfer Notes
 - European Waste Catalogue
 - Special Waste Consignment Notes for wastes classified as hazardous (see EWC)
- Waste Carriage
- Waste Management Licenses
- Pollution Prevention
 - Watercourses
 - Noise
 - Nuisances

⁴ Diagrams Courtesy of National Green Specification

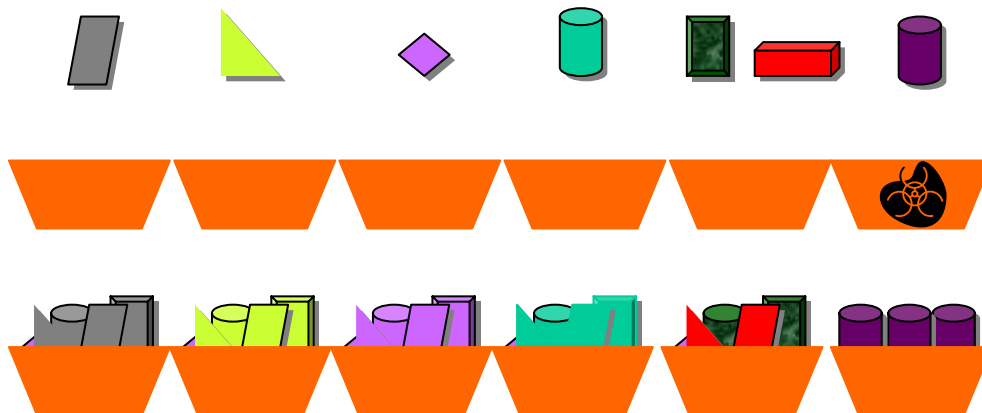
Good Practice – based on landfill tax rate increases and the ban on co-disposal.

- Legal minimum
- Site Waste Management Requirement
 - Recommended Site Actions: Waste segregation into waste types, using designated containers for recovery or reprocessing
 - In-active waste (inert), active mixed waste and inert waste segregation for recovery or reprocessing or some companies light weight material (compactable), active (non-compactable) and hazardous waste.



Better Practice –

- Legal Minimum + Good Practice -
- Segregation of waste into waste materials & types for re-use and recycling.
- Understanding and following of waste hierarchy – reduce, re-use, and recycle.
- Materials Storage & Handling e.g. Materials Protection, Care, Good workmanship
- Prefabrication/Preassembly where appropriate and other waste minimisation techniques
- Site Waste Management Plans - waste planning, monitoring and reviewing.



8.3 Project/Waste Monitoring Survey:

Document control Checklist

1. Skip movement monitor complete.
 - a. Issues reported?
2. Waste Transfer Notes accurate? (random sample)

Waste Management Survey

1. Confirm with site personnel (foreman/manager) in general terms how segregation is progressing
 - a. Time
 - b. Barriers
 - c. Contamination
 - d. Storage
 - e. Transport
 - f. Other issues
2. Has there been any contamination incident? How resolved if resolved?
3. Site Personnel Survey
 - a. Are they aware of the initiative onsite?
 - b. Are they are aware of the purpose of the initiative?
 - c. How did they find out about the initiative?
 - d. How well do they perceive its working?
 - e. Are they signed up to the initiative?
 - f. Do they perceive that there is anything else that could be done to improve waste management? E.g. waste minimisation, re-use and recycling.

8.4 Procurement Exercise

This questionnaire is designed for use by the department/individual to investigate skip hire/waste management service provision in a local area. The objective of the document is to provide a prompt for the information required to procure local lower cost waste services, (to a development site or area of operation) waste services that will assist in the objective of achieving best practice waste management by a) Providing a local delivery point for re-usable, recyclable material b) Provide collection services for re-usable, recyclable materials that can be facilitated by segregation on site c) Provide off-site separation of general waste to recover re-usable/recyclable waste. Evidence suggests that up to 10% can be saved by segregating waste.

Details should be translated to a spreadsheet for future reference.

Company Details	
Company Activity, Classification e.g. waste management, reclaim and re-use, disposal?	
Waste Material(s) recovered for recycling/ re-use? Of waste materials accepted for recycling/re-use?	
Methods of recovery offered? (i) Do they provide for source separation by providing containers for collection? (ii) Do they collect co-mingled for	

<p>segregation off-site? If yes, would they be prepared to provide containers for source separation (on the construction site)</p> <p>(iii) Do they accept materials for drop off (over the door delivery)?</p>	
<p>Cost of service</p> <p>(i) What are the charges for pick up services including container (skip) rental, haulage and tipping fees? (list costs of collection by material type and container)</p> <p>(ii) If drop off (over the door) what are the tipping fees?</p>	
<p>What is the percentage of each material recovered for recycling/reuse?</p> <p>(i) Source separated material?</p> <p>(ii) From co-mingled collection?</p> <p>(iii) Or what is the general recycling rate for the facility?</p>	
<p>Are receipts available for tracking the types and quantities of recyclables? or other method e.g. reports/graphs?</p>	
<p>Would they be prepared to collect other recyclable materials, if requested to do so by a construction company?</p>	
<p>What are the specific guidelines for each material? (e.g. specification of material (minimum quantity and quality, do they accept plywood in timber skip?)</p>	
<p>What technology do they employee to sort/process material? E.g hand picking, grab hand, trammel.</p>	
<p>End use of material segregated/separated for re-use/recycling?</p>	
<p>What are collection options; call for pick up, scheduled collection, access? What are the delivery requirements?</p>	
<p>Other collection requirements? E.g. access</p>	
<p>Potential Revenue gained from sale of material?</p>	
<p>Check that company comply with waste licensing requirements</p>	
<p>Will they help set up a program for recycling?</p>	

9.0 Best Practice Guidance

9.1 Gleeson Site Waste Management Recommendations

Onsite Waste Management System Operational Issues

Planning for Waste Management - production of site waste management plans

Need to introduce into pre-project meetings waste management planning and the subsequent production of site waste management plans. (See agenda items in previous guidance). These meetings need to include Environmental Manager, Architect, Project Manager and major sub-contractors etc. At the meeting a decision is required on the manner in which resources will be treated on-site depending on the local options available for its treatment, in accordance with the waste hierarchy. Further, issues of materials storage and handling can be discussed as well as general environmental issues.

The discussion at the planning meeting forms the basis of the individual Site Waste Management Plan (or environmental plan), which are the instructions for site staff and sub-contractors on how each waste and each resource (material etc) will be managed on-site.

This is then communicated to Gleeson personnel and sub-contractors at induction and by posters around the site. In the case of Gleeson this would be shown below the Environmental Policy documents, so that you have a goal and subsequent instructions (see sample Site Waste Management Plan) on how to achieve.

The compliance with the plan is then the responsibility of the Site Environmental Coordinator and ultimately Project Manager.

Ensuring sub-contractors take responsible for waste management

Clear instructions are required to be communicated to sub-contractor.

The emphasis should be on 1) the sub-contractor seeking the information required to manage their waste 2) Gleeson providing accurate and timely information to the sub-contractor.

1) Contractual obligation is one method by which to ensure that the sub-contractors comply with waste management systems and policy.

Preliminaries and contractual documentation need to include guidance to the effect that Gleeson have distinct waste management and environmental targets that it requires all contractors to help achieve through compliance with Site Waste Management guidance documentation. These documents could make reference to the policy by inclusion in the appendix against a general requirement in the documentation or can make specific reference to requirements against each objective. The below can be abbreviated into a small amount of key information in a separate booklet for use on site.

Examples: Waste Disposal

Gleeson have set a target to reduce the amount of waste going to landfill by 10%.

Gleeson aims to achieve this by implementing Site Waste Management Planning.

Containers will be provided for the disposal

The sub-contractor is required to.....

- 1) Appoint a person responsible for compliance with environmental objectives to liaise with Gleeson Site Environmental Coordinator
- 2) Follow the instructions included in the induction and provided in the (Environmental) Site Waste Management Plan for the individual site

Financial penalty can help to ensure compliance.

The document also needs to include the inclusion of sub-contractors in monthly project meetings – in which waste management and the environment is on the agenda.

Other Recommendations

1. Environmental Audits – needs to check for compliance with waste segregation objectives. E.g. a) check skip for segregation of waste and contamination b) check accuracy of waste transfer note.
2. Environmental supervisors provided with bonuses if segregation etc successful and/or for completing Smartwaste.

9.1 Interserve Projects Ltd Site Waste Management Recommendations Sub-contractors documentation

The below guidance is designed to improve sub-contractor knowledge of waste management for the purpose of re-use and recycling and can be inserted into guidance documentation and/or tender documentation.

Item 1

Where Sub-contractors are required to use the waste collection and disposal provisions arranged by main contractors, on a site that provides for source separation of waste for recycling purposes.

Guidance documents

Containers are supply for the segregation of waste for the purpose of re-use and recycling, please ensure that recyclable waste is placed in the designated container as per (the system in force on the site/site environmental guidance).

Tender documents:

Interserve operates an Environmental Policy the objective for waste management is e.g. the diversion of waste from landfill for processing, remanufacture and re-use.

Ensure that the waste is placed in the correct receptacle. Ensure that segregation of waste, for re-use and recycling, is conducted in accordance with onsite guidance.

It is also possible to insert clauses stipulating financial penalty for non-compliance. This would work in a similar manner as occurs with the financial penalty for a sub-contractor not clearing waste produced by them into the correct receptacle, the financial penalty is the cost incurred by the main contractor that subsequently cleared the waste. Regards, the non segregation of waste the cost would be the higher disposal cost incurred by the contamination of skip full of recycle with a foreign material e.g. the sub-contractor, placing plasterboard in a skip full of inert waste. This is similar to the allowable percentage schemes for brickies etc.

Item 2

Where sub-contractors will be managing own waste.

The most effective methodology would be to place the requirement for provision of re-use and recycling in the tender document. This would require a submission by the potential sub-contractor on site waste management planning.

Submit a method statement on the proposed methods and opportunities to be adopted to See Report Page 35



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10 Construction Resources: Using Less and Recycling More Seminar Evaluation Report

Executive Summary

Between September and November 2005 UK CEED organised and ran a series of ten regional seminars on the subject of reducing and recycling construction waste, in response to an in-depth research study undertaken through Partners In Innovation funding by Encluster, a UK CEED Initiative and work undertaken by the two main project partners; National Green Specification and Constructing Excellence. The aim of each seminar was to disseminate waste management best practice providing a practical base on which construction companies can develop Site Waste Management Plans.

The events were a great success with more than 300 delegates booked to attend (target 250). Some events were so oversubscribed that efforts have begun to organise more in those areas e.g. Yorkshire and Manchester.

For details of each event including speakers and venues please see end of report.

Seminar Experience

The majority of respondents felt that the overall pre-event communication was of a high standard and that the presentations and speakers at the seminars were of good quality, interesting and informative. The limited number of people at some of the events was not considered by delegates as a hindrance, rather it enabled a more focussed approach to local waste arrangements and company interest. The events on the basis of delegate feedback both anecdotally and through the forms was extremely positive and can only lead to the conclusion that the events were a success regards the delivery of information to the audience.

The venues scored well, however some delegates thought a few them were too small for the number of attendees. This was, partially, due to the decision to source low cost or non cost venues. The timing of the seminars was also commented on as some felt that more time was needed for Q&A sessions and networking with an earlier start. The consensus of the speakers was that the event could have been extended to a full day to do the subject justice.

A questionnaire was given to attendees at the seminars asking them for comments and suggestions, below is evidence and samples taken from this survey.

There were no negative comments regarding the seminars themselves, below is a breakdown of questions asked and answers given.

Table 1: Evaluation Form Responses

Question	Yes	No	Comment
How did you learn about this event	Email:36 Word of mouth: 25 Website: 15	n/a	
Did the information provide you with all you needed to know about the event	86	2	More details on venue location.
What other information might have been helpful	n/a	n/a	Copies of presentations in folders
Are you glad you attended the workshop	86	2	
Was the information specific to your interest	75	4	
Did this event provide an opportunity to network	75	4	
Would you attend this kind of event again	75	2	
What other types of topics would be of interest to you	See below		
Any other comments	See below		
Location	79		
Time	79	3	
Date	79		
Length	79	3	
Workshop Programme	79	2	
Refreshments	81	1	

* Not all questions on all sheets answered.

When asked about suggestions on how the experience could be improved, here is a sample of some of the replies:

- “Marginal opportunity to network”
- “Not long enough, would have been better as a full day”
- “Not long enough some presentations were rushed”
- “Too basic”
- “Didn’t learn anything new”
- “More depth into topics would have been better”
- “Needed confirmation of attendance earlier”

When asked if there were other suggestions for other subject matters that could be covered in future events, here are some responses –

“Waste legislation”
“Procurement, handling and disposal of hazardous waste”
“Legal issues and requirements”
“Sustainability in construction”
“Environmental management systems”
“Soil recycling”
“Design issues”
“Refurbishment of social housing”

Below is a sample of replies from ‘Any Other Comments’

“I will definitely recommend this to my colleagues”
“Definitely gave a chance to network”
“Good interchange of ideas”
“Well presented and relevant”
“Very enjoyable and reassuring to hear of the progress being made in this field”
“Very useful and informative and I learnt allot”
“Clearly presented, good opportunity for discussion”
“Very informative and practical guidance”
“Very good and informative”

Event Details

- **Format** – The events comprised of 1 EA speaker, 3 core speakers (UK CEED, National Green Specification and Constructing Excellence) and 2 local speakers. The local speakers comprised one case study on construction waste management and one case study from the waste industry or interested party. It became apparent that the second speaker was not effective as waste management companies were reluctant to talk to smaller groups and further there is a lack of local impartial expertise on the subject of waste management for the construction industry. Further, it was felt that details of good local practice was more effectively elicited from delegates with the core speakers providing advice and guidance on how to source added value waste services
- **Timescales** – For the 2004 seminar tour the entire process was undertaken in just over 4 months (late July – late November). The tight deadline meant that UK CEED was required to market and promote the seminars through existing marketing routes and established networks. To assist in meeting the deadline UK CEED worked with Constructing Excellence’s Best Practice Clubs and Regional Managers to market the events on a regional basis with a national focus through the partners’ respective websites. Time was allocated for each event with the first four prioritised for delivery followed by a programme to deliver the next six. The initial task was to source low cost/no cost venue through partner organisations, with dates that research indicated did not clash with similar events that would attract our target delegates. The task was allocated into arranging venue, date and time and the logistics of the event and secondly sourcing local experts, ensuring that the two was coordinated. Lessons learnt included that, due to the events being free to attend better techniques and more time could have been employed to ensure that booked delegates attended the event. More time, for example, was needed to chase

each booked delegate to ensure attendance at the seminar. However, all events met the minimum target for delegates prior to the event.

- **Promotion** – For the seminars, a promotional flyer and a booking form was produced to market the event, the main objective was to use this flyer as an attachment to the mailing and distribution lists of partner organisation. Further details of the event including a press release, flier and booking forms were also send out to organisations with the request that they include on ‘events’ websites and partners main websites. The information was also available on UK CEED’s website. The seminars clearly illustrated that the most effective way of attracting delegates was through the use of partner websites and their distribution networks but that individual delegate follow up is required to ensure delegates attend events, when this technique was used for the Cardiff event (cancelled) it proved effective to establish planned attendance.

Press releases were sent to trade press but unfortunately experience has concluded that only a small percentage of these articles are run. The PR and Marketing of the event given more time could have been better co-ordinated but the results of the event and the numbers of delegate booked onto the events and the feedback (some examples indicated below) reflects the success and for future events a weekly plan should be established and implemented.

CIWM included the events in their online newsletter which was received by more than 5000 people. Constructing Excellence’s East of England distribution list comprises of 1000 people. Envirowise disseminated the information to their regional networks. The event was remarked upon in the MRW but unfortunately did not include details. Green Register, Chamber of Commerce East of England, PECT BEMS and NEBEM all disseminated information on their email distribution lists. In addition local authorities in the appropriate areas were targeted using web research to establish named recipients.

- **Booking Process**—the booking process was a very simple and straightforward process, however booking forms were initially received by the project manager and then passed on to the events manager, as it was felt that the a full time member of staff was required to be the main contact.. This meant that there was a lag time between initial receipt of entries and then input into the database; this caused limited problems with delegates that booked on at the last minute. Although not seen to be an issue in the long run, in the one instance where delegates had to be placed on a reserve list or directed to other events due to the fire regulations on the venue, a period of time elapsed before they were informed.

It was also apparent further clarification was required that delegates would not receive confirmation of their place until the maps and final information were sent a week before the event. This is something to be noted for future events. In hindsight all delegates should have been contacted prior to the event by telephone to ensure attendance. This too will be noted for the future events.

- **Partnerships**– UK CEED, Constructing Excellence, Envirowise, CIWM, National Green Specification and NEBEM (for the north east event). Partner organisations were asked to disseminate the information through both national and local distribution networks. In some areas however this was not as successful as in others due to many factors including lack of communication and uncertainty of obligation. Unfortunately this led to one of the seminars being cancelled.

It has been noted that too much reliance was placed on partners delivering verbally agreed outputs to a designated timeframe, without enough follow up to ascertain whether targets had been met .e.g. assistance in identifying and approaching local speakers. On the whole partners' roles were implemented well. For future events a Memorandum of Understanding will be drafted. In addition, when distributing information about the event on one occasion the wrong email address was given on a newsletter meaning that potential delegates were not able to register their interest, without investigation.

It should also be noted that on occasion the established speaker was not able to attend the event and did not give any notice of this. This meant a hasty re-write of the programme and drafting in of another speaker at very short notice.

- **Cancelled seminars**—UKCEED had to cancel two of the seminars. The East Midlands seminar was due to low attendee numbers a week before the event. Emergency discussion with Rob Crowder, Sustainability Officer at Nottingham City Council determined that the location was one which delegates have been reluctant to attend in the past due to its distance from the centre of Nottingham. The venue, Boughton Pumping station, was booked on the basis of its environmental credentials and the value UK CEED though this would bring to the event. Furthermore, the event had coincided with a concrete event held in Nottingham the day before. Unfortunately it is not always possible to research all sources for clashing events. Interest in the event did subsequently pick up for the event later in the week and a total of 14 people wished to book on to the event, unfortunately the decision had already been made and the venue cancelled and these delegates were directed to Doncaster Earth Centre as such the Midlands are interested in operating another event in Leeds or Nottingham. The South Wales seminar was cancelled, again, due to low bookings. This was due, in part, to a reliance on Constructing Excellence's dissemination of the marketing material which they failed to do despite repeated requests both by email and telephone. As a result some potential delegates belonging to CE distribution lists did not receive the information. For future events an MOU should iron out these issues.

Indeed the chair for the Wales event, and local coordinator, went on holiday and passed the chair to a colleague who was only aware of his role two days before. It was in discussion with Don Snow, on the management board of CE Wales, which determined that the best way forward was to cancel the event. He apologised for the lack of co-ordination from CE Wales on behalf of the CE Regional Manager and suggested that he would like an event to be held in Wales in the future and should this be a possibility to contact him directly. This event would need to be held in North & South Wales and he was positive that such an event would attract great interest.

Small - Medium Sized Enterprise attendance

It was estimated that 30% delegates were from SME's

Please see table below for breakdown of SME status for each event including delegate booking figures and non-attendance.

Table 2: Breakdown of each seminar

Event	booked	attended		SME	
Yorkshire and Humberside	63	32	55%	30	52%
East of England	28	14	50%	9	32%
West Midlands	29	20	31%	6	26%
London	30	12	40%	7	23%
South West	27	19	70%	5	18%
North West	28*	20	71%	6	26%
North East	43	35	81%	6	14%
Scotland	27	22	81%	unknown	

Core Speakers

Simon Chiva—UK CEED
 Brian Murphy—National Green Specification
 Sue Innes—Constructing Excellence
 Ralph Crouch—Environment Agency

Details of each event including speakers and venues

Region	Yorkshire and Humberside	East of England	West Midlands	London	South West	North West	North East	Scotland
Venue	Doncaster Earth Centre	East of England Showground	CERT, Birmingham	CE Head Office	CREATE Centre	Centre for Construction Innovation, Manchester	University of Durham	University of Edinburgh
Local speaker 1	Simons Construction Ltd, Barry Smith	MJ Gleeson, Rob Mair	Interserve Projects Ltd, Charles Scott			Simon Chiva on behalf of Simons Ltd	James Burrell Ltd, Eric Knightly	Laing O'Rourke, Dr Stephen Thompson
Local Speaker 2		Simon Chiva	Simon Chiva		Future Foundations, Lesley Seymour			

11 Re-processing Capability in Greater Peterborough high and low level processing

Aggregates/Inert: -

Inert material recycling is undertaken by the construction industry, and is supported by survey analysis indicating that construction companies recycle soil and hardcore and 'muck'. Evidence indicates that small builders, 1-5 employees, also facilitate the recycling of inert material. In most instances material is bulked via transfer stations, before delivery to its final destination, or processed at local MRF's using crushing and screening technology. In some instances material is transported between construction sites for varying use depending on the type of material and level of processing e.g. as temporary standing for office and road sub base.

The report conducted by PPS Recovery (Annex 12) indicates that an active inert re-use industry is in operation that is to a certain extent transient in nature due to re-processing using mobile plant. Attempts to map this transient element were outside the scope of this project, the mapping of fixed plant reprocessing plant was possible, data for which was available from Environment Agency waste returns. Demand for the material also changes with the location of development projects, including road construction, and quarries/landfill which require restoration. As such these changes can affect the amount of material that goes to landfill in one location and influence recycling levels.

What can be determined within the project region from the EA data is that large amounts of aggregate material are still going to landfill and as such an expansion of reprocessing is required. Further, data also masks the large volume of inert material that is landfilled as mixed waste.

The small differential between gate fees at most landfills and over the door fees at MRF or transfer stations in the project area means that inert material continues to be landfilled due to the lack of incentive in some instances. Indeed it has been indicated by waste management a companies/skip hire company that at present landfill tax is not a motivation that influences recycling, rather it is the location of landfill and the geographical location of alternative outlets for material. A number of geographically dispersed sites are therefore preferential to the recycling of inert material, as it reduces transportation costs.

Current exemptions operating at most landfill sites means that inert material is used for repair work and on road construction, which changes with the seasons. This can reduce the cost of disposal on a seasonal basis and creates seasonal fluxes.

The transient and seasonal nature of the inert material market means that skip hire companies become adept at sourcing new outlets for materials if this new option is an alternative to transportation of material. The use of local knowledge is invaluable in the quest for low cost outlets and can provide bonuses for drivers.

To facilitate the use of inert material it is recommended that more work be conducted into the specification of recycled inert material in construction products creating higher value outlets. This will lead to an inevitable increase in the extent to which material is segregated on site, at a minimum into two skips inert and mixed.

It is recommended that builders be instructed in the benefits of two skips systems for waste segregation for the duration of the construction period. The inert skip is then subjected to a lower landfill tax charge. Local skip companies have indicated that they will be prepared to pass on the savings, if the material is uncontaminated on delivery to transfer stations and MRF and landfill,

some companies within the project area are already taking advantage of lower skip hire charges. In the interim period it takes to increase recycling capacity in the UK recovery of larger quantities of inert material can be encouraged by indicating the potential cost saving that is available, to the construction industry, if they segregate inert materials as the first barrier to recycling. It is therefore recommended that at a minimum the construction industry be made aware of the cost savings that can be made through the basic segregation of inert and mixed waste on construction sites and that avoiding contamination will ensure higher disposal costs will not be passed back to the construction companies. Cost/Revenue analysis indicates that considerable net savings can be made avoiding the higher rate of landfill tax.

Disposal charges at MRF's and transfer stations in the project area for material is based on the type of inert material collected e.g. clean concrete will be charged at a lower cost. However, it has proved extremely difficult to provide more accurate information on charging as companies deem that it is too commercial sensitive to provide to third parties, this indicates that disposal charges are made on a load-by-load basis.

Information on MRF gate fees was hard to obtain but indication is that charges vary from free for broken out concrete up to £2-3 per tonne if the material is clean, 50% Concrete/Soil then £1.50. £1.60 a tonne for hardcore. At inert landfill this can be as low as £3 a tonne up to £7 a tonne. At mixed sites if a landfill operator is trying to discourage the tipping of inert material then this charge could be considerably higher.

It has been determined that within the project area one landfill operator has the capacity to recycle most of the material in the project region, however, unless higher values are found then this will not always of set the cost of delivery.

Wood:

Outlets for timber in the local area include landscaping, furniture manufacture and CHP. It is anticipated that timber recycling does account for greater tonnage than indicated by the above data and that further some activity is not recorded.

It is anticipated that outlets for timber will not pose a difficulty within the project area.

Problem materials appear to be wooden pallets, few companies possess the chippers/shredders required to turn this pallets into a resource for animal bedding, mulch and the chipboard industry.

Glass:

One waste management company operates a flat glass collection scheme in the Project area.

It is anticipated that volumes of glass waste will be extremely low from construction and would only result as breakage; construction companies are therefore reluctant to recycle glass as they deem it to costly in terms of man power and collection costs. Windows are often delivered prefabricated, with glass pre-fitted to avoid breakage.

Collection of 9Cy skips of MIXED GLASS incur a £30 collection charge, this is to offset the cost of delivery to the re-processor in St Helens. Over the door delivery is free but incurs transportation costs. CLEAR GLASS collection of a 9Cy skip is free. Contamination is charged at £30 a tonne.

BRE research has indicated that recovery of glass from refurbishment and demolition is time consuming and concluded that is uneconomical to recycle from these sources. For the purpose of this project these will be considered on a case-by-case basis, facilitating the collection of glass with those companies that possess a strong link to glaziers and PVC window fabricators.

Plastics

No local outlet exists for the recycling of plastic waste from the C & D industry.

It has been indicated by RECOUP that at the time of publication, no re-processors in the Project area have the capability of recycling plastic waste arising from the construction industry. RECOUP have indicated that in the first trial stages of the Project plastic packaging should be the focus due to the large quantities of this type of plastic waste arising, construction companies have also requested that we focus on packaging including cardboard and plastics.

To facilitate the recovery of packaging plastics from the construction industry a trial segregation period is required. This is due to the lack of information on the types of plastic packaging that is being used within the material supply industry. Trial segregation would indicate quantities of material arising, the best method of collection and economic viability. Coupled with the uncertainty of polymer types is contamination issues, as such it is anticipated that purchase of this material will be on an 'as seen' basis.

Plastic packaging requires bulking and delivery to re-processors, if these are located a distance away then determining the theoretical prices that can be gained from the material is of importance to the economic transportation of material.

The nearest location for rigid PVC recycling is in Leicestershire, with little recycling of post consumer PVC. Due to this consideration and the difficulty in sourcing outlets for plastic packaging waste PVC in the initial stages of the project were not considered.

based in Europe posses the technology to recover glass fibre from industrial scrap but there is little data and indication that material is recovered from the construction and demolition industry. Recycled glass is used as a major feedstock for glass fibre manufacture with flat glass as a preference.

A typical cullet specification is:
Particle size < 10mm
ferrous metals < 50g/tonne
non-ferrous metals < 20g/tonne
ceramics < 30g/tonne
organics < 120g/tonne

Three major insulation fibre glass manufacturers in the UK, Owens Corning Alcopor, British-Gypsum Isover, Superglass. Mineral wool association (www.eurisol.co.uk).

Mineral Wool - Associations in Europe indicate that mineral wool is recovered from the demolition and construction industry and used in the manufacture of new products. Owing to improving technology, most of the waste products are recycled back into the production process, as well as using waste from building sites or demolition works as a feedstock to replace raw materials. www.eurima.org.

Metal

Several metal recycling operations exist in the Project area. Trial segregation will indicate volume and types of material arising.

Plaster/Plasterboard

The region has only one post consumer plasterboard recycling facility. At this facility silver backed plasterboard is recycled and used as a soil improver. It was anticipated that material could be diverted to this location, and/or attraction of another opportunity for plasterboard. This company

charge a £20 a tonne gate fee for delivery, however, the volume of material required to warrant transportation could not be achieved with the limited number of sites.

The soil association has indicated that the use of gypsum as a soil improver is allowed under the current exemption however, the gypsum needs to be separated from other material and substances in plasterboard. Separation from the silver foil liner or cardboard liner, and reprocessing to remove the binding substances under a waste management license. The resultant gypsum can then be spread onto the land as a soil improver.

British Gypsum provide a recycling service for post consumer scrap off-cuts but this service has a minimum requirement for the amount of plasterboard waste created and a requirement to order 20 containers for the collection of the scrap material. There is some scope for round robin collection all within a limited geographical area. Further, the collection system is only in operation for British Gypsum products. As yet in the UK no technology exist which can re-process all post-consumer, wet/dry plaster & board, a demolition waste plaster, in the US this technology is in use.