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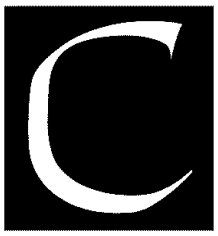

CALEDONIAN

UNIVERSITY

Waste Management Practices

at

Glasgow Caledonian University

(City Campus)

Report No: EET/EM-101/96

University Waste Paper and Cardboard Working Group
Department of Energy and Environmental Technology
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Report

By

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1. Executive Summary

A study has been undertaken into the practices and the costs of managing waste at Glasgow Caledonian University. The study was restricted to City Campus and initially concentrated on recyclable waste such as paper, cardboard and aluminium cans. It was later extended to include general solid waste management but has not included special waste.

The University does not have a waste management policy! Responsibilities for collection and disposal of waste were transferred to Central Services in August 1995 for the main University whereas the Students Union are responsible for the collection and disposal of their own waste. Most waste is collected and transferred to either an old portable compactor and container, or to open-top skips. The container is uplifted and emptied by the City Council Cleansing Department and the skips are uplifted by Shanks and McEwan Waste contractors. The City Council also uplift waste from the Students Union. No co-ordination of waste management practices is therefore evident in City Campus.

The full costs of waste management and disposal to the University are not clear. The budgeted figure (1995/96) for the University is around £11,000 per annum but more realistic costs are likely to be over £20,500. Overall spending on waste disposal including charges for uplift of SU waste and maintenance of the compactor could exceed £30,000 each year.

The introduction of the landfill tax in October, will result in an extra £7 for each Tonne of waste (excluding inert waste) being disposed to landfill. As most of the Universitys waste is disposed to landfill, the overall cost of waste management to the University will rise by several thousand pounds a year - the exact amount is dependent on the total amount of waste disposed to landfill.

In order to identify where savings could be made, a range of waste management options have been reviewed. This included waste minimisation, re-use and recycling of materials and the development and implementation of an integrated waste management plan. Significant environmental and Corporate benefits were identified including financial savings of at least £4,000 each year. Total savings for the University, possibly as high as £20,000 per annum, could be made by changing waste disposal contractor. Further savings exceeding £10,000 per annum could be achievable if a fully integrated waste management policy was developed and implemented. Even greater savings should be possible if each of the University Campuses is to be included.

The priorities required to achieve such savings were identified as changing waste disposal contractor, appointing a waste management team, increasing the environmental awareness of staff and students in the University and, developing and implementing an integrated waste management policy for the University.

2. Introduction and Background

This study initially set out to investigate the possibility of making financial and environmental savings by examining the University's waste disposal practices and diverting a significant proportion of waste from landfill. Most of this diverted waste would be composed of the recyclable element - paper, cardboard and aluminium cans. Part way through the study it became clear that significantly greater benefits could accrue from looking at the wider waste management issues. As part of the ongoing income generation development and involvement with research and consultancy in Environmental Management, the Department of Energy and Environmental Technology set up a Working Group to investigate the "Overall Integrated Waste Management" picture.

The interim report from this working group highlighted some of the significant financial and environmental benefits that would result from implementing an integrated approach to waste management. This included reviewing the University's approach to waste management from the production of waste, to minimisation, recycling and ultimately disposal.

This report now presents the findings of the broader investigation including details of the meetings with waste disposal contractors, identified in the interim report (Dec. 1995), and recommendations to improve our waste management practices.

3. Waste Management Practices in the University

3.1 Policy

The University does not currently operate a Waste Management Policy with regard to waste minimisation or recycling. Individual Departments may encourage minimisation and recycling and a small number of schemes have been initiated with varying degrees of success. Unlike some other large organisations, no University wide policy has been prepared and implemented. One University-wide paper recycling initiative that was initiated lasted only a few months and failed as a direct result of a collapse of the paper market.

3.2 Waste Generation and Arisings

Accurate information on the composition of and volumes of waste generated in the University is not available. It was therefore necessary to make estimates in order to provide a basis for the planning of future waste management operations. Estimates were obtained following discussion with key individuals in a variety of Departments (Departments considered to be major waste producers) and domestic staff. This information was supplemented by a waste composition survey undertaken by students from the BSc Environment course. This survey was restricted mostly to office-derived waste.

3.2.1 Main producers of waste

The main producers of the waste in the University (over and above general office waste) have been identified as follows - students union, careers office, library, print design services, MPR and Sutcliffes caterers. Interviews were arranged with key

personnel from these sections in order to obtain information on types and volumes of waste. The main types of waste produced in these areas are now outlined :

- **Sutcliffes Caterers** A large proportion of the waste produced in the University is likely to be associated with food from the canteens and restaurant. Most of this will be unsuitable for recycling unless the food can be segregated from paper and cardboard etc. and used for animal feedstuff? Much of the cardboard packaging will be suitable for recycling if kept contaminant free. A large proportion of aluminium drinks cans are purchased and consumed in the canteens, so these would provide good locations for recycling points.
- **Students Union (SU)** The Students Union produce a significant volume of waste each week including paper, cardboard, packaging, food wastes, bottles etc. All glass wastes (approximately 8 wheelies) are uplifted, at no charge, by the City Council. A significant volume of cardboard wastes are uplifted on a twice weekly basis by the City Council. General waste (from the canteen and Bars) is collected and disposed of to the compactor or adjacent compound.
- **Print & Design Services (PDS)** PDS are the main purchaser (through the purchasing co-ordinator) and user of office paper in the University. The majority is used (in-house) for photocopying and printing requests from most of the Academic departments, but some is supplied direct to the various University departments for their own photocopying and printing needs. Wastage within their own offices has been estimated at 1%. All of this could be easily collected in appropriate containers and recycled. Ten bags of paper waste are collected each day from PDS equating to approximately 40kg per day or a Tonne every four weeks.

  In addition to the paper waste, over 260 wooden pallets are left by suppliers of paper or other consumable each year. These are currently disposed of by the University. Arrangements could be made to ensure that *all suppliers* collect their own pallets at the next delivery thereby diverting this material from our waste stream.
- **MPR** Large volumes of publicity material are produced throughout the year. Varying quantities of this are left unused and disposed to waste. This can all be collected and sold to paper/board recyclers.
- **Library** Much of this waste is paper and envelopes with some computer print out and photocopier waste.
- **Careers Office** The main item discarded from this office is approximately 100 copies of the paper journal “Current Vacancies”. This would account for approximately 10kg every 2 weeks. Every year approximately 400 prospectuses from various universities and colleges are discarded. (approx. wt 40kg).
- **Contractors** It is difficult to estimate the overall amount of contractors waste produced each year in the University. This is dependent on the type and extent of works carried out throughout the year. Spot checks between August and December 1995, indicated that much if not most of the waste contained in the Shanks & McEwan skips was contractor produced.

3.2.2 Survey of Office waste

The findings of the waste survey indicated that on average 85-90% of the waste generated in the sample from the George Moore and William Harley buildings was composed of recyclable materials such as paper and board. It has been estimated that at least 1.7 T of paper and 1.4 T of cardboard wastes are produced on City Campus each week. In addition, over 13,700 aluminium drinks cans are purchased on Campus each week. An initial recycling target for these materials would be 50%, but this could be revised up to 75% depending on the success of the scheme.

3.2.3 Special wastes

Special wastes present a greater risk to the health of those who handle or dispose of them, as well as a greater threat of polluting the environment. This report has not addressed special wastes, but this is an important area that requires closer investigation and could be covered by a University-wide policy. It is known that some departments already have policies in place for the treatment and disposal of special or hazardous waste. It is unlikely that this will cover all special waste generated in the University - e.g. fluorescent light tubes.

3.3 Waste Collection

Responsibility for collection and disposal of waste rests with Central Services. Waste generated in the University is collected by domestic staff from teaching and support Departments (and Sutcliffes caterers) and taken to either the compactor at the rear of the West Block or until relatively recently, to the open skip adjacent to the Charles Oakley Building. Waste generated by the Students Union is either collected by the City Council or taken to the compactor and skip.

3.4 Current University Waste Disposal Arrangements

The University has two main mechanisms for disposal of refuse. The main system in use at present is skips supplied by Shanks and McEwan (S&M) waste disposal firm and the other is by means of a compactor and attached skip (owned and maintained by the University) which is emptied by the City Council. Due to the poor reliability of the compactor (break-downs are frequent) most waste is put into the skips supplied by S&M. Waste generated by the Students Union is stored in eight 1100L “Euro-bins” and uplifted three times a week by the City Council. Glass from the SU is set aside for recycling, and also uplifted by the City Council.

3.4.1 Open skips

Open skips are rented from Shanks and McEwan and used for a variety of different types of waste. They are unlocked and therefore also receive waste generated outwith the University, and generated by building contractors in the University. They are an expensive means of storage and transport of waste as often much of their space is taken by air and not refuse. The fact they are accessible, encourages non-permitted users to deposit waste. Major users of the skips were found to be builders contractors. As the Duty of Care for waste relates to producers, handlers and disposers of waste, contractors should be responsible for any waste they produce during their business and therefore should pay for its disposal. It is understood that now contractors pay for their own skip hire.

3.4.2 Compactor

Compaction of waste is important as it increases the amount of waste that can be transported by a container of set volume. Repairs to the compactor are costly in time and money - down-time results in the compactor being out of use with a consequent increased reliance on the open skips. Recent repair bills have been around £500. Due to the compactors age and condition, its compaction efficiency is likely to be reduced.

More important is the fact that the compactor does not meet current safety standards as a result of recently introduced legislation (a guard or cage is require to safeguard the operator when loading waste).

3.4.3 Euro-bins

The bins used by the Students Union (SU) may be convenient for the storage of their wastes but when full, waste is taken to either of the receptacles mentioned above.

3.5 Waste Disposal Costs

Although the budgeted figure for the University (excluding the SU) is around £11,000 the actual costs for uplift of the skips and wheeled bins is likely to be approximately £21,500 per year. (Apparently we were not being charged for the uplift of compacted waste, but this has now to be included at a cost of £74 per uplift.). This cost was calculated using information on the number of skips used each week (averaged over a three month period). This cost also excludes the costs associated with the maintenance of the compactor. Collection costs within the University are also not included.

Costs for disposal of waste from the SU increased from £309 per month to approximately £450 per month at the end of 1995. Annual costs are therefore approximately £4200.

Landfill tax will, from October 1996, be applied to waste on a tonnage basis and will result in an additional cost of £7/Tonne of waste (plus vat). It is possible that this cost will be passed directly on to the waste producer. If our waste is assumed to weigh 10T per skip (possibly an under estimate given the variety and volume of contractors waste) and the tax is applied to our waste then the additional cost could be approximately £17,000 (excluding City Council uplift) each year. Landfill tax applied to City Council uplift could push the additional cost to the University to over £20,000 each year. Recent indications are that the full £7/T will not be applied to waste producers. Nevertheless, the cost of waste disposal to the University will be at least an additional several thousand pounds a year from October.

4. Waste Management Options

Normally the most cost-effective and preferred hierarchy of waste management options is waste minimisation followed by reuse or recycling and ultimately followed by disposal. Co-ordinated control of these options can only be achieved through development of an integrated waste management policy which is implemented University wide.

4.1 Waste minimisation

The best way to reduce costs of waste management is to ensure that only the smallest amount of waste is produced in the first place. A range of methods can be introduced to encourage reduction in the amount of waste generated at source. Integral to this will be to increase the environmental awareness of employees and students at the University and inform them of the importance of following good waste management practices. Only then will we begin to see a significant change in the overall generation and handling of wastes.

Detailed information on waste arisings is necessary if we are to identify **all** the key areas of waste production in the University and therefore be able to measure the success of waste minimisation initiatives. Waste audits of Departments can provide this information as well as indicating initiatives for minimisation and recycling that are appropriate to their needs.

4.2 Reuse and recycling

Many types of waste are suited to reuse and recycling. Perhaps the most important for the University, in volumetric terms, is paper and cardboard.

Paper and cardboard recycling should form an integral part of the Universities waste management strategy. Not only this will divert a significant proportion of waste from landfill, thereby benefiting the environment (and our environmental image) it makes savings in transport and direct landfill charges. Furthermore it can be utilised as a resource as many recycling organisations are willing to pay for it thereby providing a small income.

4.3 Disposal

The landfill tax will be applied to all solid waste produced by the University and landfilled. The smaller the amount of waste that is produced and collected for disposal, the smaller the collection and disposal charges. It is of major importance therefore that as much waste as possible is diverted from landfill.

4.4 Integrated Waste Management Policy

As was highlighted in the interim report, the University would benefit, significantly, from developing and implementing an integrated waste management policy. This would require effective co-ordination of resources and should be backed at UMG level so that all producers of waste (i.e. every member of staff) will become involved in responsibly managing waste. It is not a task that can be achieved, effectively, by one person working on it part-time. It is a task that should be undertaken by a Working Group and will probably take at least six months to a year to complete. EET already have the expertise available to undertake such a project would be the logical choice as Consultants/Managers.

The more effective the source reduction/waste minimisation and reuse/recycling initiatives, the more waste that can be diverted from landfill and the greater the savings for the University (and environment).

5. Comparison of Costings from Waste Contractors

The interim report highlighted the importance of looking at all aspects of the University's waste management operations. In addition to the recycling organisations who had initially contacted the University to collect and recycle our white paper, several general waste contractors were contacted and invited to submit details of recycling and waste disposal. The organisations that were initially considered and invited to fact-finding interviews are shown in Table 1.

Table 1 Waste management/recycling organisations

Organisation	Activity
Weir Recycling, Alloa	General paper recycling
Hannay Recycling, East Kilbride	General recycling
Shanks and McEwan, Coatbridge	Waste disposal
UK Waste, Giffnock	Waste disposal and recycling
Kelvin Salvage, Kirkintilloch	Waste disposal and recycling
Rebox Recycling, Paisley	Paper recycling
Glasgow City Council	Waste disposal and recycling

Details of their submissions are included in Appendix 1 and summarised in Table 3. Originals of the submissions are filed in Dr Gilmours office.

5.1 Initial considerations

A number of important factors influencing the choice of organisation and waste management options are outlined below.

5.1.1 Organisations offering recycling and disposal options

Co-ordinated recycling, collection and uplift and the associated reduced transport and disruption on site (as well as the possibility of reduced cost) is the preferable service offered by waste contractors. As not all of the organisations could offer this "one stop shop" service some decided to combine services offered by other companies. Thus Hannay and Kelvin Salvage (individually) chose to use the waste disposal service offered by S&M.

Weir recycling Ltd and **Rebox recycling** were not considered in the final analysis costings because they were unable to provide a full recycling and disposal service. The **City Council** were also not invited to provide a costing because they would not be able to offer income from the recycling operations.

5.1.2 Type of compactor

The use of the existing compactor is uneconomic, unreliable and in breach of recently introduced legislation. As such it should be replaced and a new static compactor purchased or leased. Static compactors are less liable to breakdown due to the fact that they are not lifted and dropped twice a week. Prices for purchase and rental have been obtained from several companies and these prices are summarised in Table 2.

Table 2 Costs of rental and purchase of compactors

Contractor	*Compactor*	*Rental/yr.*	*Purchase*
Hannay	MGB Randalls 1200 static	£3,285	£10,108
Hannay[1]	MGB Randalls 1200 static with hoist	£4,380	£14,262
Shanks & McEwan[2]	NS	£2,774	£8,652
UK Waste[3]	NS	-	-
Kelvin Salvage	MGB Randalls	£2,920	Man

Notes
1 hoist suitable for taking euro bins
2 no details on compactor type or manufacturer
3 promised details but none submitted - have chosen to go with existing compactor
Man- direct from manufacturer

S & M offered the lowest rental and purchase price for the compactor. No information was provided regarding the manufacturer or model of compactor. Kelvin salvage offered the next lowest rental price, but no purchase price.

Regardless of which waste contractor was awarded our waste management contract, the University could choose to go direct to the manufacturer of the compactors. At present MGB Randalls are the market leaders and details of their machines are contained in Appendix 2.

5.2 Waste Contractors Costings

As not all of the organisations were offering identical services, it was difficult to compare, directly, the value of each of the services offered but companies were compared on as equal a basis as possible. Differences between services offered are highlighted in the notes. Estimated running costs for each of the organisations are compared in Table 3 for the first two years.

Table 3 Estimated running costs of waste recycling and disposal

Contractor	Equipment rental[4]	Uplift costs	Recycling costs	Total £	
	£	£	£	yr. 1	yr. 2
UK Waste	NA[1]	7415.2	2415	9830.2	8980.2
Shanks & McEwan	3175.5	11388	NA[2]	14563.5	14563.5
Kelvin Salvage	3650	4940[3]	0	8590	8590
Hannay	4007	7280	1200	12487	12487

Notes
1 UK waste propose to use the portable compactor currently owned and used by the University.
2 S&M are not proposing a recycling scheme (except a limited scheme for cardboard which has not been considered)
3 Uplift costs do not include for the euro bins although waste from here could be transported to the compactor
4 Equipment includes compactors & skips where specified

The lowest total running and disposal costs were offered by Kelvin Salvage. The main savings were to be found in very low uplift costs (although it is assumed that the euro-bins are no longer used and waste is taken to the new static compactor) and no charges for recycling.

There is not much difference between the two lowest quotes i.e. from Kelvin Salvage and UK waste respectively in the second year. The principal difference between the two quotes is that UK waste quote is based on using our existing compactor. As this compactor breaches new safety standards, this option is not recommended.

5.2.1 Confidential paper waste

Most organisations make a charge for the uplift and guaranteed secure disposal of confidential papers. Kelvin Salvage have stated that there would be no charge for this service. It is understood that different departments make their own arrangements for the disposal of confidential paper waste. It is unknown what the University currently pays for the disposal of confidential waste, but it is likely to run into hundreds if not into thousands of pounds. Included in this category could be old exam scripts which previously were taken to an incinerator (which has now closed) for disposal at a cost. The provision of a free service for the disposal of confidential waste is therefore likely to be of significant financial benefit to the University.

5.3 Returns from Sale of Recyclable Materials

The amount that each of the Contractors was willing to pay for recyclable items in our waste stream are included in Table 4.

Table 4 Financial returns from sale of recyclable materials

Contractor	*Paper £/T*	*Segregated pamphlets £/T*	*Cardboard £/T*	*Aluminium cans £/kg*
UK Waste	NS	NS	NS	NS
Shanks & McEwan	NS	NS	20	NA
Kelvin Salvage	20	30	10	Alcan rate
Hannay	12	12	12	Alcan rate

Notes
NS - not specified in written quote
NA - not available

5.3.1 Paper and cardboard etc.

The amount that contractors are able to pay for recyclable materials is dependent on market conditions. This has been one of the major deterrents for organisations becoming involved with recycling companies as several organisations have set up recycling schemes only to see them falter as a direct result of the paper market collapsing, thereby having to pay for the uplift of this material. Integral to this issue is whether the contractors are part of an organisation that has its own paper mill - e.g. UK waste and Kelvin Salvage or whether they are paper merchants e.g. Hannay.

Although UK Waste did not specify the amount they were willing to pay for recyclables in their quote, verbal prices stated were comparable to, if not slightly better, than Kelvin Salvage.

The overall remuneration to the University from selling recyclable materials is likely to be small in comparison to the savings from reduced disposal charges (from landfill tax etc.). Of greater importance here is the guarantee that the company will continue to uplift our segregated waste for recycling even if the market should collapse. Such a guarantee is more likely to come from companies with paper mills and would be written into contract documentation.

5.3.2 Aluminium Cans

Alcan UK have a monopoly on the recycling of aluminium drinks cans and therefore all contractors would either collect and sell the cans to Alcan or involve Alcan directly. It should be noted that some recycling of aluminium cans is already in place in the University although it is not monitored by any official group. Initially it was set up by the SU but now only one ex-student is involved. The collection of cans is very limited with only a few recycling stations and it is understood that the takings for this venture are donated to some Charity.

6. Benefits and Savings

Many large organisations have been implementing waste management policies and reaping significant benefits, commercial gains and financial savings. Benefits can be anything from improved environmental performance to gaining commercial advantage.

6.1 Financial Savings

In the present climate for funding Higher Education, any saving can be considered important. Potential financial savings have been estimated above and are now examined with respect to existing and likely costs.

6.1.1 Savings from change of waste contractor

In financial terms, Kelvin Salvage (KS) has been identified as offering the most attractive Integrated waste management package. Savings of <u>at least</u> £3,000 per annum are likely just by changing from S&Ms skips (assuming the budgeted figure of £11,000) to the service offered by KS. This saving excludes the potential saving from disposing of the SU waste in the new compactor, and excludes annual maintenance charges for the old compactor. If these costs were to be included, the savings are likely to be <u>at least</u> £7,000 per year based on current prices. If the overall current costs for disposal of waste is as high as £30,000 each year, the potential saving by changing to KS could be up to £20,000 each year.

6.1.2 Landfill tax and waste minimisation savings.

Given the types of waste (paper, cardboard and cans) it is likely that <u>minimum</u> savings from landfill tax would be £1,000 per year. Greater savings (over £10,000 annually) should be realised by minimising waste production, restricting access to skips and therefore reducing the frequency of collection of skips.

6.1.3 Income from recycling

A small income (£1,500 - £2,000 annually) may be generated by the sale of paper, cardboard and cans. It is suggested that such revenue be used for environmental research projects administered by EET.

6.2 Environmental Image

The University is an organisation which over the last few years has set up the Department of Energy and Environmental Technology and the Centre for the Environment. It has a developing expertise in environmental research and runs several courses covering aspects of environmental and waste management.. Developing and implementing our own waste policy is an important starting point in demonstrating our environmental credibility to our present and potential clients. The benefits from this may be difficult to gauge, but they may manifest themselves in attracting additional consultancy or research funding from other organisations or, by highlighting our environmental profile, may attract more students. It is therefore important that we are seen to "practice what we preach".

EET has the expertise to advise on the development and implementation of environmental and waste policies. The management fee for such a service could be set at 35% of the savings generated and would contribute to the Departmental Income Generation Target.

7. Priorities and Implementation

This may appear to be the most difficult part of such a project as it relies on the support and co-operation of everyone who uses University premises. Some small start up costs may be incurred from the time taken by people to change their waste management practices. This should be small in relation to the savings that are likely to result in the longer term. Both UK Waste and Kelvin Salvage offer education and training in implementation of recycling systems.

- **Appointment of Waste Management Team**
  A waste management team is required to oversee and co-ordinate the various stages in development and implementation of an integrated waste management plan. It should be given support from the University Executive and report directly to one of the Senior Vice-Principals.
- **Increasing Environmental Awareness**
  This is fundamental to helping secure the support of staff, students, and visitors to the University. The Waste Contractor may be able to help in the education and training of staff and students.
- **Development of Integrated Waste Management Policy**
  This should be developed by the Waste Management Team over the next few months. This will include examining all waste arisings throughout the University (including Park and Southbrae), identifying and testing initiatives for minimising, re-using and recycling waste, and co-ordinating the implementation of these initiatives University wide.

- **Changeover of waste contractor**
  This will be relatively straightforward and will help reduce waste disposal costs immediately. Of all the contractors examined, Kelvin Salvage offered the most cost-effective recycling and waste disposal service. It is envisaged that full scale segregation and recycling of paper, cardboard and aluminium cans would be phased in over a period of time, say 6 months.

8. Conclusions and Recommendations

8.1 Conclusions

1. Detailed information on waste management practices and the full cost of waste disposal is not available for the University.
2. The operation of two separate waste collection and disposal services within City Campus is not cost-effective.
3. The University can make significant financial (and environmental) savings by changing waste disposal contractor and improving the efficiency of waste management operations.

8.2 Recommendations

1. EET should be appointed as Consultants to advise on setting up the waste management team and on the development and implementation of a waste management policy for the University.
2. Waste minimisation and reuse/recycling should become an active part of all University employees responsibilities.
3. Kelvin Salvage offered the most attractive package from the waste contractors interviewed and should be considered for award of the University waste disposal contract.

Acknowledgements

The University Waste Paper and Cardboard Working Group are grateful to the many people who gave time and effort in providing the information contained in this report.

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Appendix 1

Quotations from Waste Contractors

Appendix 2

Information on compactors