Report into the Construction and Demolition Waste Stream Audit 2000-2005

Sydney Metropolitan Area

Department of **Environment & Climate Change** NSW

In April 2007, the name of the Department of Environment and Conservation NSW changed to the Department of Environment and Climate Change NSW

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1 Summary

The Department of Environment and Climate Change (DECC) undertook a compositional study of Construction and Demolition (C&D) waste disposed of to landfill during the period January 2000 to June 2005. The primary purpose of the study was to accurately determine the composition of C&D waste disposed of in the Sydney Metropolitan Area (SMA). A secondary purpose of the study was to determine the relationship between C&D waste composition and:

- trends over time
- particle size fractions
- the source of C&D waste disposed to landfill
- the chemical concentrations in the waste wood and fines (material less than 4.75mm diameter) from mixed C&D waste
- the quantities of waste materials that could be potentially recoverable.

The development of an accurate methodology was critical due to the nature of the C&D waste. The large length and odd shapes of individual pieces of waste wood or metal guttering (> 5 metres) and the weight of pieces of concrete (> 100 kg per particle) posed challenges for developing appropriate methodologies for sampling, measuring and handling. A combination of hand sorting and mechanical sorting using mobile processing equipment was used to determine the composition by weight. Safety and statistical reliability of the data obtained were the two key requirements of the field audit that was conducted on landfills in Sydney.

The results of the study, as shown in Table 1, indicate that over 50% of the C&D waste that is currently disposed of within the SMA are waste materials that may be generally non-recoverable, given current collection, transport and sorting methodologies, because of contamination with asbestos and chemical contaminants. Greater segregation and removal of contaminants may reduce the proportion of non-recoverable wastes. Even if segregation of contaminants cannot reduce the non-recoverable proportion there would appear to be opportunities for recovery of up to 40% of the C&D waste that is currently lost to landfill including concrete, clay products, timber and soil.

Table 1: Estimated Quantity of C&D Waste Disposed to Landfill in Sydney Metropolitan Area in 2004-05

Major C&D Materials		Minor C&D Materials	
Material Type	tonnes	Material Type	tonnes
Asbestos (and asbestos contaminated waste)[1]	320,000	Ferrous metals	23,000
Contaminated soil	280,000	Plasterboard	17,000
Concrete products	220,000	Paper/cardboard	15,000
Soil	110,000	Plastic	13,000
Timber	95,000	Textiles	6,000
Fines	95,000	Asphalt	4,500
Clay Products	40,000	Non-ferrous metal	3,000
Natural aggregates	25,000	Glass	2,000
Garden and vegetation	25,000	Miscellaneous	16,000

1 Commonly referred to as 'asbestos containing material'.

The scheduled substantial increases in the Waste and Environment Levy will encourage greater waste avoidance and source separation by the generator and diversion of C&D waste from landfills. The levy provides an economic incentive for landfill operators to recover and reprocess mixed C&D waste into products.

In addition, the NSW Government is developing new regulations that provide greater clarity on the use of suitable waste-derived materials as fuel or for land application. This policy will complement the levy increase by encouraging and clarifying the pathways for the recovery of soil, concrete and clay products, natural aggregates and timber.

Increases in the Waste and Environment Levy and the new regulations for waste-derived materials should support greater resource recovery from the recoverable 40% of C&D waste as well as encourage further effort by industry to avoid or minimise the contamination of the remaining 60% of potentially non-recoverable C&D waste.

Markets exist for these waste-derived products when customer requirements of fit-for-purpose are satisfied and the potential risk for environmental harm is low.

2 Introduction

2.1 Background

From 1998 to 2004, approximately 1 million tonnes of C&D waste was disposed of to landfill each year in the Sydney Metropolitan Area (SMA). Large volumes of concrete, brick and tiles, asphalt and soil from construction and demolition activities were also recovered and recycled during that period.

The focus of this study is the portion of C&D waste that is disposed of to landfill, which has potential for resource recovery.

In order to assess the potential for further resource recovery within the C&D waste stream, the Department of Environment and Climate Change (DECC) undertook a compositional study of C&D waste.

2.2 Aim of Study

The aims of the project were to:

- characterise the composition of C&D waste, by material type and particle size, that is disposed of to landfill
- identify the different quantities over time of C&D wastes being disposed of to landfill from large trucks, small trucks (and skip bins) and residue materials from Material Recovery Facilities
- identify the chemical contaminants present in the timber and fines of the mixed waste component of the C&D waste stream.

The data gathered from the Study can be used to:

- help industry and DECC's Sustainability Programs Division to identify further opportunities for resource recovery of mixed C&D waste currently disposed of to landfill;
- develop strategies to avoid the contamination of C&D wastes that render the material unsuitable for recovery and recycling
- identify environmental protection compliance needs for C&D waste
- inform the revision of the *NSW Waste Avoidance and Resource Recovery Strategy, 2003*
- provide a model for similar audits of waste generators and resource recovery facilities.

Key users of the data and report are expected to be the waste and resource recovery industries, construction and demolition industry and the NSW Government.

Specific results for the individual sites audited are not published as part of this public Study report, nor are the names of the sites made public. Rather, aggregated data is published to ensure that the business of the participating landfills remains commercial-in-confidence.

2.3 Summarised methodology used on the Study

The Study was undertaken in a number of distinct and sequential stages;

Step 1 Concept Stage

- identify information outcomes and target audience
- establish data quality objectives
- seek to minimise the disruption of operating landfills
- build on existing information on C&D waste composition and flows of waste into and out of landfills in Sydney

Step 2 Research and Design Stage

- review similar international C&D waste composition studies
- develop a composite sampling and measurement technique to address the challenges of characterising C&D waste and to ensure the sampling and measurement techniques are performed safely

Step 3 Pre-field Audit Stage

- identify landfills receiving C&D waste across Sydney
- consult with the identified landfills on the sources or types of C&D waste received (11 sub-streams identified)
- develop a stratified sampling plan for the 11 sub-streams based primarily on quantity, homogeneity and particle size
- seek permission from landfills to undertake the field audit
- tender and award contract for a waste auditing contractor

Step 4 Field Audit Stage (Appendix A)

- major field audit on 5 landfills using between 10 and 20 people and four pieces of mobile plant over several weeks
- approximately 100 tonnes of C&D waste was sampled and sorted into material types or particle sizes before weighing
- practical limit for field sorting was set at approximately 25 mm diameter particles

Step 5 Geo-technical and Analytical Chemical Laboratory Stage

Step 6 Analysis of Field Audit And Laboratory Data Stage (Appendix B)

- analyse data collected from the field audit.
- provide audited landfills with individual and aggregated data as soon as practicable.
- Assess whether the data quality objectives had been achieved.

Step 7 C&D Waste Landfill Flow Modelling Stage (Appendix C)

- develop new database for modelling C&D waste flows.
- prepare flow models for major material flows for the report.

Step 8 Preparation of Report

3 Findings of the Study:

3.1 Overall Composition of C&D Waste Disposed of to landfills in Sydney

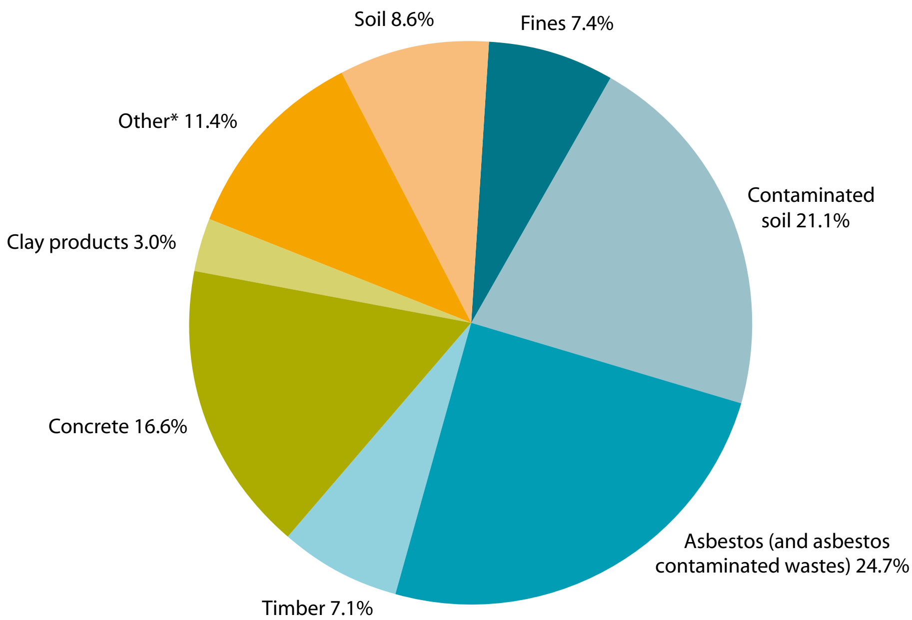
The composition of C&D waste disposed of to landfill in the SMA can be determined by combining the results of the field 'mixed' C&D waste audit with a desktop audit of the monthly reports provided by landfills to the DECC.

The main materials comprising C&D waste are asbestos (and asbestos contaminated material) at 24.7%, followed by contaminated soil (21.1%) and concrete (16.6%).

Chart 1 below shows the composition of C&D waste by individual material types that comprise more than 3% by weight. Materials comprising less than 3% by weight individually have been grouped into the Other category.

The 'Fines' consist of all material from mixed C&D waste that are less than 4.75mm in size. There was no compositional analysis of this material however samples were taken for chemical testing and the results reported in Section B-4-3. The 'Fines' were considered distinct from similar size materials such as soil and contaminated soil, and reported as a separate material type.

Chart 1: Composition of C&D Waste Disposed to Landfill by weight, 2004-05



*Other:

1.9% Natural aggregate

1.9% Garden and vegetation

1.7% Ferrous metals

1.3% Plasterboard

1.1% Paper and cardboard

1.0% Plastic

0.5% Textiles

0.4% Asphalt

0.2% Non-ferrous metals

0.1% Glass

1.2% Miscellaneous

3.2 Composition of 'mixed' C&D Waste disposed of to landfills in Sydney

The field audit estimated the composition of 'mixed' C&D waste disposed of to landfill in Sydney in 2004-2005.

'Mixed' C&D waste is a material category in reports provided by landfills to DECC each month. It is largely unsegregated loads of mixed C&D waste. These monthly reports are also used to determine the amount of waste disposal levy that is paid to DECC. Approximately 450,000 tonnes of 'mixed' C&D waste (~35%) was reported from the total of 1.3 million tonnes of C&D waste that was disposed of in 2004-5 in the Sydney region.

Changes in the composition of 'mixed' C&D waste over time may be caused by:

- the changes in the proportion of different materials used for new construction
- the presence of materials in the waste stream that are no long used
- greater source segregation during demolition and construction
- resource recovery processing that separates waste materials into material streams.

Table 2 presents the quantity of material types in 'mixed' C&D waste estimated to be disposed of during 2004-05. The expected range is an estimate of the variation in quantities by material type as well as sampling and test method errors.

Table 2: Estimated quantity of Material Types in Mixed C&D Waste disposed to Landfill in the Sydney Metropolitan Area, 2004-05

Material type	Quantity tonnes	Expected range tonnes
Concrete	103,000	70,000 – 130,000
Fines (<4.75mm)	97,000	75,000 – 115,000
Timber	90,000	60,000 – 120,000
Clay products	40,000	30,000 – 50,000
Natural aggregate	25,000	20,000 – 30,000
Ferrous metals	23,000	15,000 – 30,000
Plasterboard	17,000	10,000 – 25,000
Paper and cardboard	14,000	5,000 – 25,000
Plastic	13,000	5,000 – 20,000
Garden and vegetation	8,000	5,000 – 15,000
Textiles	6,000	1,000 – 15,000
Non-ferrous metals	3,000	1,000 – 5,000
Glass	2,000	1,000 – 5,000
Asphalt	1,500	1,000 – 2,000
Miscellaneous	8,000	5,000 – 10,000
TOTAL	**450,000**	

Note: Expected range is at a 90% confidence. For example, we are 90% confident that the true quantity of concrete in mixed C&D waste is within the range of 70,000 to 130,000 tonnes.

3.3 Composition by source vehicle of 'mixed' C&D Waste disposed of to landfills in Sydney

The field audit also identified the composition of 'mixed' C&D waste by the type of vehicle that delivered the waste to landfill. Three broad source-flows were identified after discussions with landfill operators for the audit, these were;

- vehicles from C&D Material Reprocessing Facilities (MRF)
- small vehicles (under $10m^3$, including skip bins)
- large vehicles.

The source-flow analysis provided information on the type of material that could be expected by the vehicle that delivers the waste to the landfill.

The main method for transporting 'mixed' C&D waste to landfill were small vehicles (42%), followed by MRF vehicles (30%) and large vehicles (27%).

Processing more small vehicle 'mixed' C&D waste through C&D MRFs is likely to increase the recovery of concrete.

Changes in the flow of 'mixed' waste from C&D MRFs into landfills can provide information on the level of source segregation being undertaken by the construction industry.

The material composition of 'mixed' C&D waste from the three sources varied and is presented in Table 3. Approximately 50% of the 'mixed' waste from small vehicles is potentially recoverable concrete, clay products and natural aggregates.

Table 3: Percent composition of Mixed C&D Waste Disposed to Sydney Landfills by Source Vehicle by weight, 2004-05

Material Type	MRF vehicles	Small vehicles	Large vehicles	TOTAL
Concrete products	11.2 %	33.0 %	12.3 %	**22.9 %**
Timber	27.8 %	11.6 %	32.4 %	**20.0 %**
Fines (<4.75mm)	18.5 %	26.1 %	18.0 %	**21.6 %**
Clay products	9.3 %	7.9 %	8.9 %	**8.8 %**
Natural aggregates	3.4 %	6.4 %	4.5 %	**5.6 %**
Ferrous metals	6.4 %	4.7 %	4.6 %	**5.1 %**
Paper and cardboard	5.3 %	2.0 %	2.8 %	**3.2 %**
Plasterboard	2.2 %	3.1 %	6.0 %	**3.7 %**
Plastic	4.6 %	1.9 %	2.5 %	**2.9 %**
Non-ferrous metals	0.8 %	0.5 %	0.7 %	**0.6 %**
Other C&D materials	10.5 %	2.8 %	7.3 %	**5.6 %**

3.4 Composition by particle size of 'mixed' C&D Waste disposed of to landfills in Sydney

The field audit involved separating the 'mixed' C&D Waste into 4 distinct streams based on particle size.

These four streams are based on ;

Large Particles C&D waste material that was greater than 300 mm in any one dimension, was hand picked, sorted, measured and classified. This is a common size range for timber and metal guttering and roofing products.

Medium Particles C&D waste materials with a size between ~ 30 and 300 mm in diameter. This is a common size for building material such as clay bricks and roof tiles.

Small Particles C&D waste materials with a size between 4.75 and ~ 30 mm in diameter. This is a common size for building material such as gravel (natural aggregates).

Fines Any materials less than 4.75 mm in diameter.

There was considerable variation in both the composition and quantities of C&D waste material when separated, sampled and measured by particle size. The tonnages presented in Table 4 highlight the variation in quantity.

Table 4: Estimated tonnes of Mixed C&D Waste Disposed to Landfill by size of particles by weight, 2004-05

Material Type	Large Particles (> 300 mm)	Medium Particles (~ 30 to 300 mm)	Small Particles (4.75 to ~ 30 mm)	Fines * (< 4.75 mm)
Concrete products	21,000	73,000	9,000	-
Timber	38,000	48,000	4,000	-
Fines (<4.75mm) *	-	-	-	97,000
Clay products	600	37,000	2,000	-
Natural aggregates	3,000	7,000	15,000	-
Ferrous metals	13,000	9,000	600	-
Paper and cardboard	1,300	11,000	2,000	-
Plasterboard	4,000	8,000	4,000	-
Plastic	5,000	7,000	800	-
Non-ferrous metals	1,900	850	400	-
Other C&D materials	11,200	12,100	2,200	-
Totals (~ 450,000 tonnes)	**99,000**	**213,000**	**40,000**	**97,000**

* **Note:** Fines is both a description of a type of material and a measured particle size range. Fines are simply material particles smaller than 4.75 mm in diameter. The majority of Fines is likely to be soil, however other material types and water may be present. Determining the material composition of the Fines would be expensive and was not undertaken in the study.

4 Discussion

The *Waste Avoidance and Resource Recovery Strategy, 2003* sets a recovery target for C&D waste of 76% by 2014.

Over the period 2000-01 to 2004-05 the average quantity of C&D waste disposed to landfill from the SMA has been 1 million tonnes per annum.

The *Waste Avoidance and Resource Recovery in NSW – A Progress Report 2004* estimates the quantity of C&D waste recovered or reprocessed at 3 million tonnes.

This means the current recovery rate of C&D waste from the SMA is about 75%. Recovery rates will vary as the quantity of C&D waste generated from demolition and construction activity changes due to economic cycles.

The C&D Waste Audit has identified that over 50% of C&D waste disposed to landfill has negligible opportunity for recovery. The materials that are generally non-recoverable include asbestos and asbestos-contaminated material (24.1%), contaminated soil (21.1%) and fine-size particles from mixed C&D waste (7.4%).

The remaining C&D materials disposed to landfill would appear to have the opportunity for recovery. This includes relatively large proportions of concrete (16.6%), soil (8.6%), timber (7.1%), clay products (3.0%) and ferrous metals (1.7%).

Chemical testing of timber samples indicates that 6% is contaminated to levels unacceptable for recovery purposes (4% CCA treated timber and 2% lead). A further 10% would be lost during processing. This means that of the 95,000 tonnes of timber disposed to landfill in 2004-5, there was still about 70,000 tonnes that potentially could be recovered for reprocessing into wood-based products or utilised as an environmentally appropriate alternative fuel.

In 2004-05, the quantity of mixed C&D waste disposed of to landfill was 450,000 tonnes or approximately 35% of the total quantity of C&D waste disposed of to landfills in Sydney.

The particle size analysis of mixed C&D waste showed that nearly half the material (47%) is within the medium-size particle fraction and that concrete products (16.3%) and timber (10.8%) were the main material types.

The large-size particle fraction was the next most prevalent, again with timber (8.4%) and concrete (4.6%) the main material types.

Materials in the small-size particle fraction are potentially recoverable using readily available processes for screening and sorting.

The source-flow analysis showed that small vehicles (<10m^3 including skip bins) transported the most mixed C&D waste to landfill (42%) and concrete was the most common material.

Vehicles from Materials Reprocessing Facilities (MRFs) transported 30% of mixed C&D waste to landfill and timber was the most common material.

Large vehicles transported 27% of mixed C&D waste to landfill and again timber was the most common material.

To recover more C&D waste, the readily available opportunities appear to be:

- increased recovery of concrete from mixed C&D waste transported to landfill in small vehicles
- small pieces of timber (30-300mm) transported in vehicles from MRFs
- greater segregation of asbestos waste to minimise contamination with other waste
- large pieces of timber (>300mm) within mixed C&D waste transported in large vehicles
- segregated loads of uncontaminated soil.

The challenge with reprocessing timber is to identify the small proportion of the waste that is contaminated with timber treatment chemicals such as copper, chrome and arsenic, lead-based paint or nails, which are unsuitable in recovery processes.

4.1 C&D Waste Material Characteristics

C&D waste in the SMA can be categorised into seven main individual material types:

1. Asbestos and asbestos-contaminated material
2. Contaminated soil
3. Concrete
4. Soil
5. Fines from mixed C&D waste
6. Timber
7. Clay products.

All other materials are not present in significant enough quantities for individual analysis.

4.1.1 Asbestos

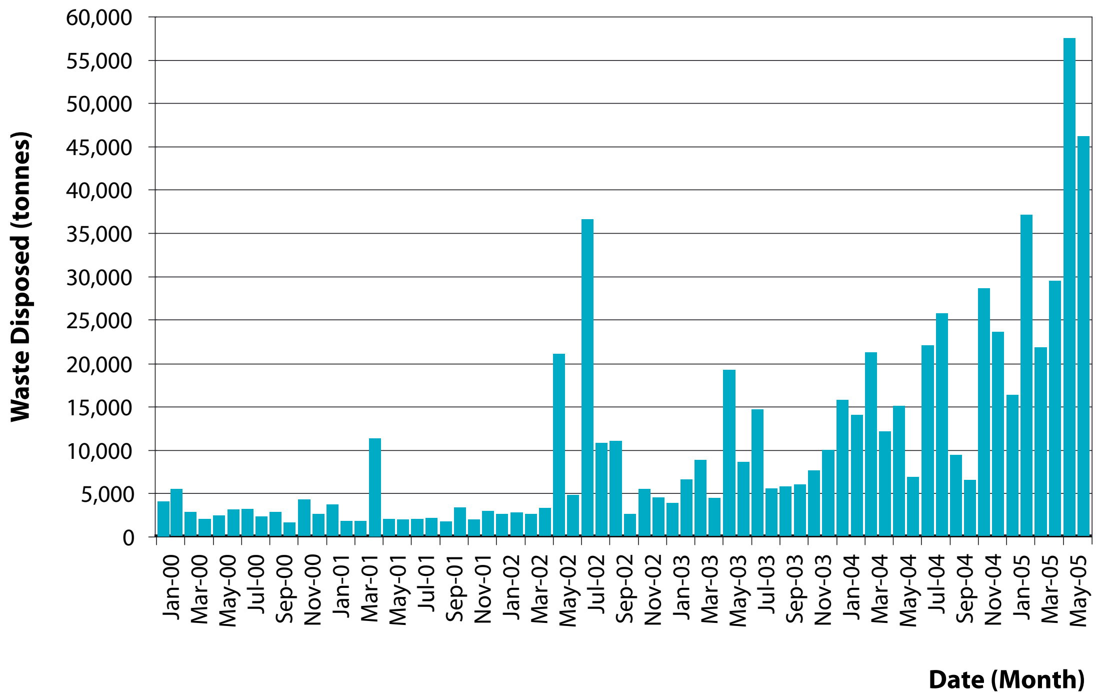
In 2004-05, asbestos and asbestos-contaminated material, (commonly referred to as 'asbestos containing material'), was the largest single material type disposed to landfill as C&D waste at 24.7% or 320,000 tonnes.

The quantity of asbestos disposed to landfill in the SMA has been increasing since January 2000 as shown in Chart 25 below. It is expected that asbestos disposal will remain at a high level while asbestos building stock continues to be demolished within the SMA.

It is most appropriate for asbestos and asbestos contaminated wastes to be disposed of to landfill. This may appear to limit real opportunities for resource recovery. However, there may be opportunities to reduce contamination of soil and other recoverable streams with asbestos if care is taken to segregate and separately remove asbestos for disposal prior to building structure reuse, deconstruction or demolition. This study has not quantified the proportion of asbestos contaminated wastes that may have been able to be kept clean and recoverable by better management and segregation.

Whilst asbestos remains a large component of C&D waste there will be a non-recoverable component affecting the resource recovery rate. Eventually, as the demolition or renovation of old asbestos-containing buildings becomes less frequent, this problematic component of the C&D waste stream will diminish.

Chart 2: Monthly Quantity of Asbestos Disposed to Landfill from the SMA



4.1.2 Contaminated Soil

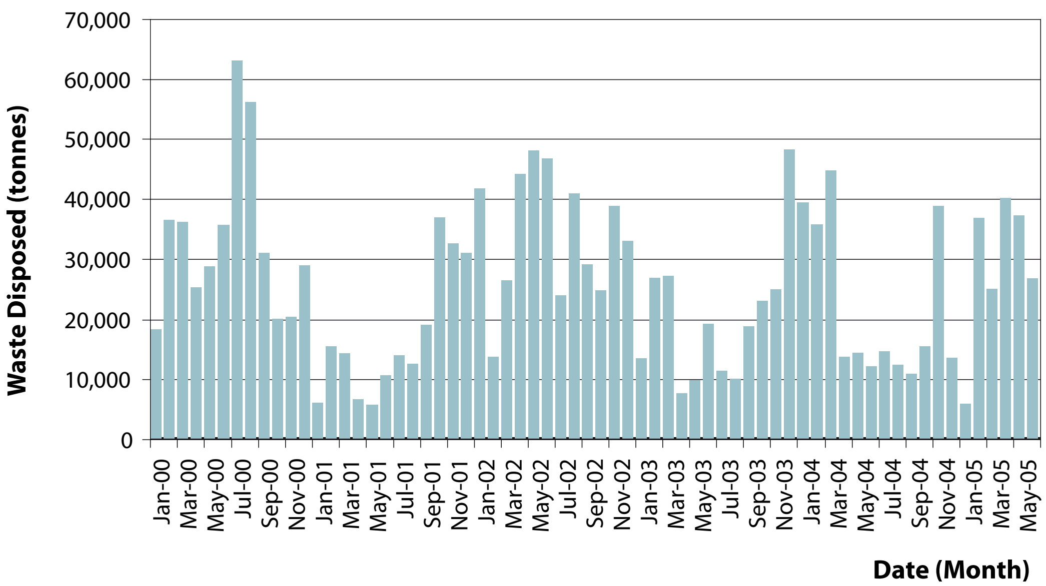
Contaminated soil disposed to landfill is soil with contaminants at typical levels considered to be either 'solid' or 'industrial' waste according to the NSW Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes (2004), as well as soil that has not been properly characterised.

In 2004-05, contaminated soil was the second largest material type disposed to landfill as C&D waste at 21.1% or 280,000 tonnes.

The monthly flow of contaminated soil to landfill is dependent upon building and construction activity within the SMA. The redevelopment of old industrial sites can generate peak flows.

The opportunity for environmentally appropriate resource recovery of contaminated soil is limited by technical, market and economic barriers.

Chart 3: Monthly Quantity of Contaminated Soil Disposed to Landfill from the SMA



4.1.3 Concrete products

In 2004-05, concrete products comprised 16.6% or 220,000 tonnes of the C&D waste disposed to landfill.

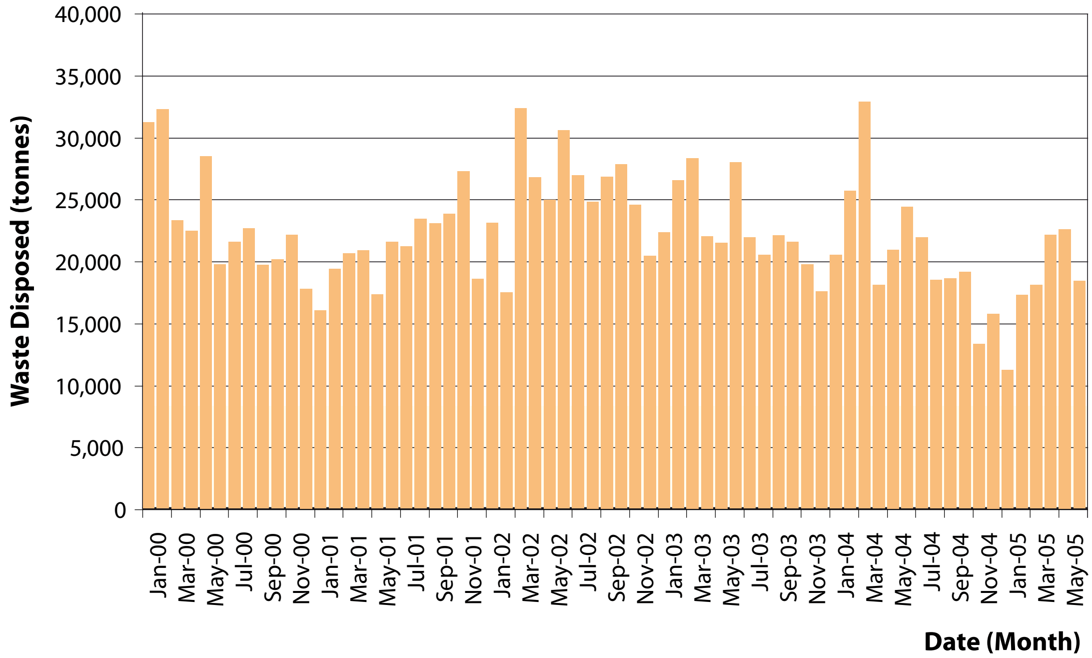
The monthly flow of concrete products disposed to Sydney landfills is currently relatively constant at between 18,000 to 22,000 tonnes per month. The quantity of concrete disposed in mixed C&D waste is just under half the total disposed to landfill from the SMA. The remaining quantity is received at landfill as segregated loads of concrete that is mostly used on landfills for operational purpose such as cover and roads.

From particle-size and waste-flow source analysis, concrete products could be broadly characterised as appearing in the medium-size fraction and being transported to landfill for disposal in small vehicles (less than 10m^3). However, concrete is a prevalent material type in all particle-size fractions and all three source-flow streams.

C&D MRFs and sites that utilise larger vehicle loads appear to be more effective in either recovering or source-segregating concrete, so it does not require disposal. Industry sources suggest that source separation of concrete at generator sites has increased since 2000 as the concrete has been diverted to 'off-site' recyclers and converted into road building products.

Concrete products would appear to have the potential for additional recovery dependent upon the ability to sort mixed C&D waste as well as the level of construction and demolition activity.

Chart 4: Monthly Quantity of Concrete Disposed to Landfill from the SMA



4.1.4 Soil

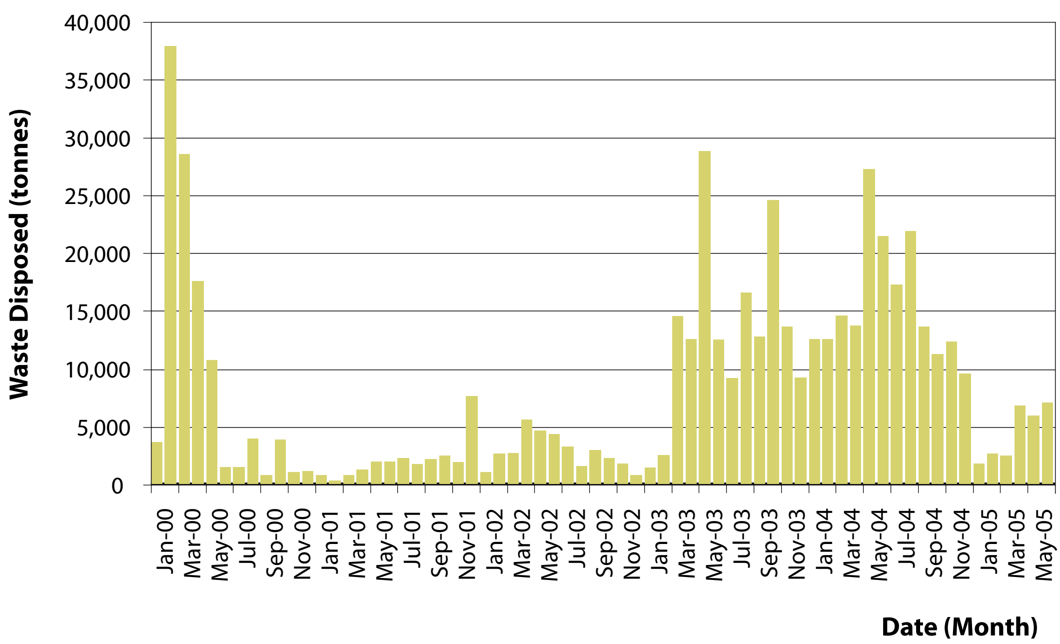
In 2004-05, soil comprised 8.6% or 110,000 tonnes of C&D waste disposed to landfill. The monthly flow of soil to landfill is dependent upon the mass balance and cost of transportation of soil within the SMA. Generally soil is reused onsite during 'cut and fill' but when there is more 'cut' than 'fill' then the soil may be sent to landfill. Clean soils are more likely to be sent to and used at other construction sites than disposed of to landfill.

From Chart 28 below it can be seen that the flow of soil to landfill is sporadic.

Of the 110,000 tonnes of soil disposed to landfill in 2004-05 more than 27% (30,000 tonnes) was utilised for operational purposes within landfills such as cover and roads.

There is potential for the recovery of soil from landfill but also recognition that landfills require soil for operational purposes. As the waste levy increases, the diversion of soil from landfill disposal is likely to increase substantially.

Chart 5: Monthly Quantity of Soil Disposed to Landfill from the SMA



4.1.5 Fines from Mixed C&D Waste

Fines are defined as the material from mixed C&D waste that are less than 4.75mm in size. It was originally thought that fine-size particle fraction could be considered for recovery purposes in the same context as soil, however subsequent chemical analysis suggests it should be treated as a separate and distinctly different material.

In 2004-05, the quantity of fines from mixed C&D waste comprised 7.4% or 95,000 tonnes of C&D waste disposed to landfill.

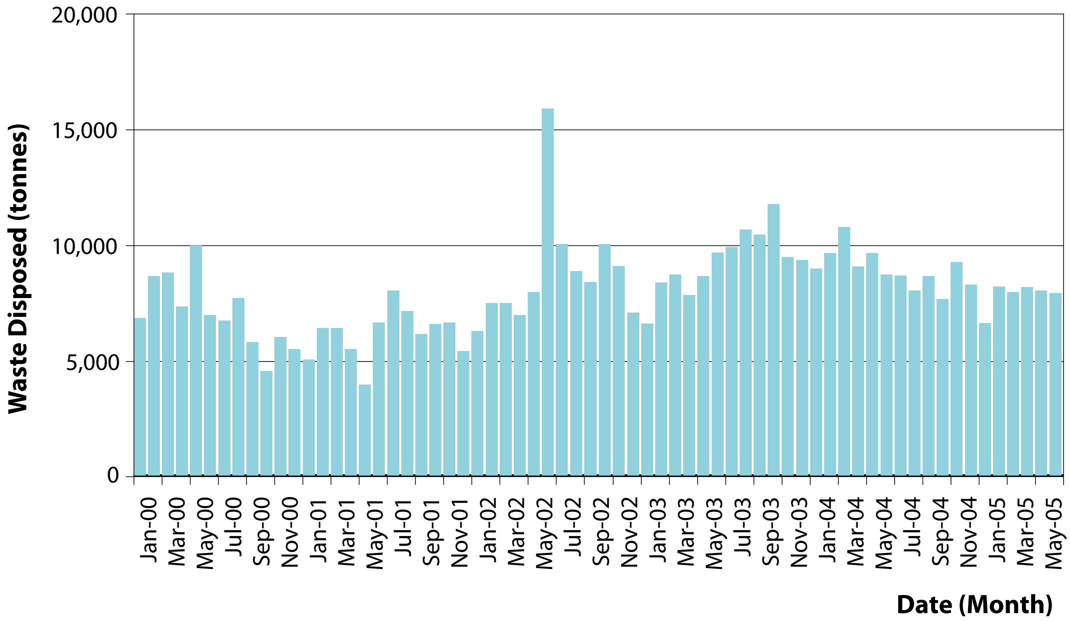
The monthly flow of fines to landfill is consistent with the monthly flow of mixed C&D waste to landfill under the assumption that the composition of mixed C&D waste does not vary significantly over time.

The main barriers to recovery are:

- the need to screen mixed C&D waste a number of times to separate the fines
- minimising contamination in the fines
- developing and implementing appropriate technologies to reduce or remove contaminants
- identifying environmentally appropriate markets.

Recyclers would need to manage potentially high levels of lead and other contaminants, including asbestos, by minimising potential contaminated sources. Waste generators could minimise the amount of fines disposed of, or reduce the potential for contaminants by improving demolition practices.

Chart 6: Monthly Quantity of Fines from Mixed C&D Waste Disposed to Landfill from the SMA



4.1.6 Timber

In 2004-05, the quantity of timber comprised 7.1% or 95,000 tonnes of C&D waste disposed to landfill. Timber disposed in the mixed C&D waste stream makes up 95% of all timber disposed to landfill from the SMA.

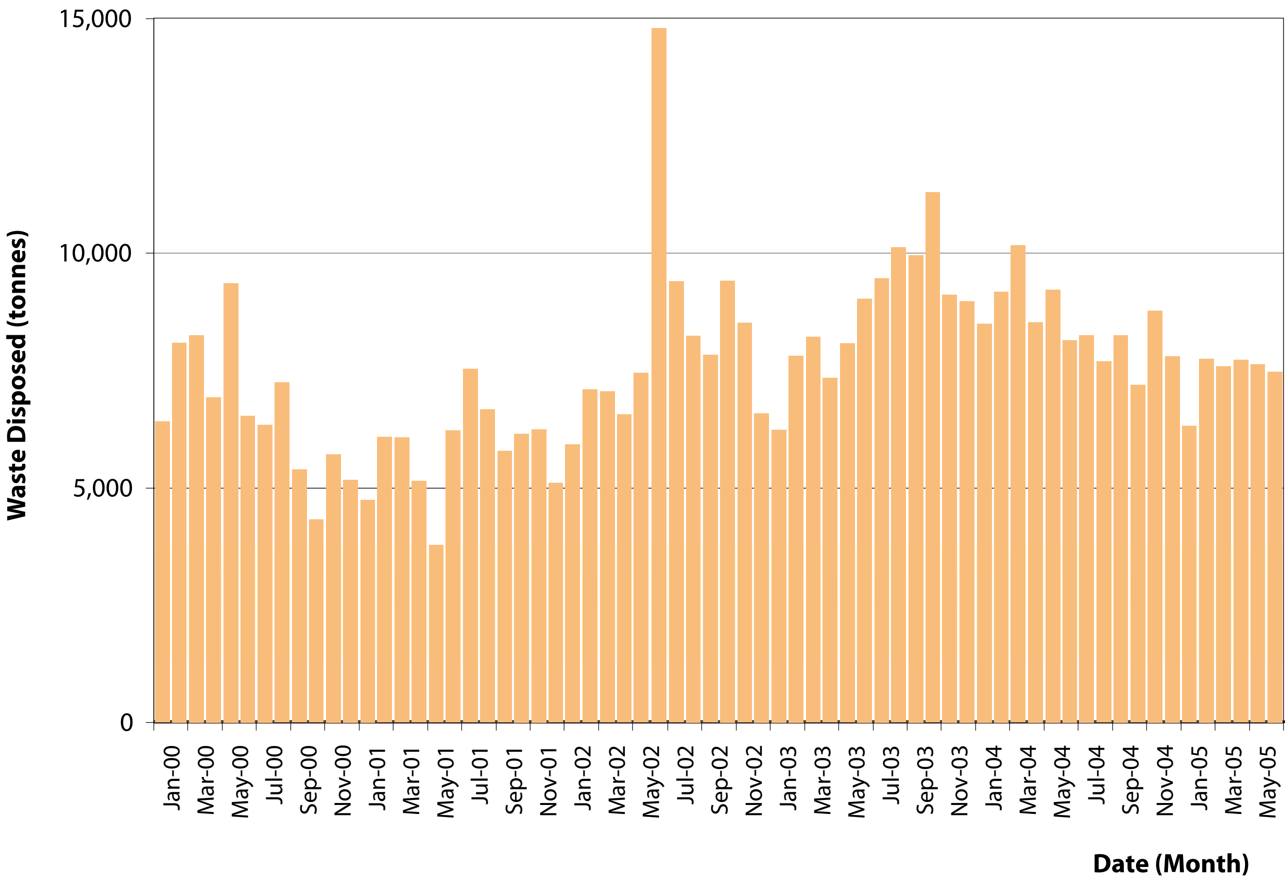
From the particle-size and source-flow analysis, timber could be broadly characterised into two categories:

1. large size (>300mm) pieces of timber transported in large vehicles
2. medium size (30-300mm) pieces of timber transported in vehicles from MRFs.

Timber greater than 300mm was categorised as 14.4% hardwoods, 14.4% softwoods and 9.1% other timber such as plywood, medium-density fibreboard and particleboard.

Timber has the potential for increased recovery from landfill disposal but potential barriers would be the physical handling of the large pieces of timber, sorting the small proportion of timber contaminated with copper, chromium and arsenic (CCA), lead-based paint and nails.

Chart 7: Monthly Quantity of Timber Disposed to Landfill from the SMA



4.1.7 Clay products

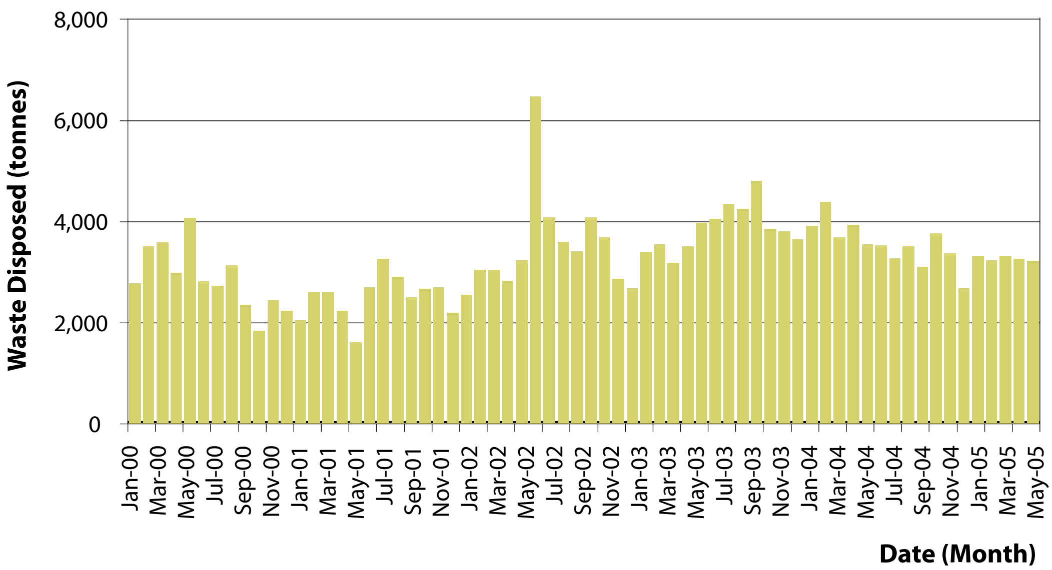
In 2004-05, clay products comprised 3.0% or 40,000 tonnes of mixed C&D waste disposed to landfill. The monthly flow of clay products disposed to landfill as mixed C&D waste is relatively constant at about 3,000 tonnes per month.

From particle-size and source-flow analysis, more than 90% of clay products could be characterised as belonging to the medium-size particle fraction (30-300mm) and being equally evident in all three source-flows to landfill.

Most clay-based bricks and tiles are manufactured to be 30-300mm to facilitate handling on construction sites. Clay-based materials are fairly strong so there is minimal breakage when in the waste stream or during processes such as screening and sorting.

Clay products appear to have the potential for further recovery dependent upon the ability to sort and segregate mixed C&D waste. Strong markets exist for recovered clay and concrete products in the road-making industry.

Chart 8: Monthly Quantity of Clay Products Disposed to Landfill from the SMA



5 Conclusions

The approach used to determine the typical composition of C&D waste being disposed of in the SMA over the period 2000 to 2005 was successful and should be utilised in future studies.

The method used was able to;

- accurately determine the composition and the variations in flow of mixed C&D waste to landfill
- determine the typical composition of three major source flows for mixed C&D waste received at landfills - large and small vehicles as well as vehicles transporting residues from Material Recovery Facilities (MRFs)
- identify C&D composition by particle size, so an assessment could be made of the quantity of materials that could be potentially recovered using existing technology
- identify the presence of environmental contaminants that are likely to limit the potential recovery of the fine-size particle fraction and waste wood
- provide information that can be used to model the compositional trends and flows of C&D waste to landfills in Sydney and NSW over the next 5 years.

The results of the C&D composition study are summarised in Table 5, which has been divided broadly into:

Disposal: the composition of C&D waste that is disposed to landfill in the SMA including the composition of mixed C&D waste.

Potentially Recoverable: the quantities of materials that could be recovered and utilised that are landfilled, including material from mixed C&D waste, source segregated material and materials used within landfills for operational purpose.

Potentially Non-recoverable: the quantity of materials that are generally not able to be appropriately used or recycled due to environmental or human health impacts or materials that may be lost during processing.

Table 5 can be used to identify opportunities to increase the recovery of C&D waste and to evaluate changes in the composition and flow over time. Strategies currently used by industry to minimise C&D disposal and environmental harm can also be monitored using Table 5. These strategies include:

- avoiding the generation of waste (i.e. less waste sent to landfills for disposal)
- high levels of recovery and disposal of materials that can harm the environment or human health (i.e. asbestos waste)
- increased source separation at C&D sites for recycling at off-site recycling or landfill recycling facilities (less waste received at landfills that do not operate recycling facilities and higher levels of recycling at landfills)
- increased recovery and recycling of mixed C&D waste at off-site recycling and landfill recycling facilities (more residues received for disposal from MRFs or further processing and greater recovery of waste materials sourced from small and large vehicles by landfills)
- screening of mixed C&D waste at generation sites and MRFs to separate fine-size particle fraction from other potentially recoverable materials (increased flows of fine-size particle fraction received at landfills for disposal)
- size reduction of larger particles of mixed C&D waste at generation sites, MRF and recycling facilities to enable greater separation of timber, concrete and ferrous metals (reduced flows of large-size particle fraction waste received at landfills for disposal).

In addition, the NSW Government is developing new regulations that would recognise suitable waste-derived materials as fuel that might be used as a fuel or applied to land. This approach will encourage the recovery of about 400,000 tonnes pa of uncontaminated soil, concrete & clay products, natural aggregates and timber. Commercial markets exist for these products because they have similar fit-for-purpose specifications as raw materials.

Table 5: Summary of C&D Waste Flows and Composition at Landfills in the SMA, 2004-05

	Current Disposal			Potentially Recoverable				Potentially Non-Recoverable		
Material Type	Disposed of in Mixed C&D Waste (M)	Disposed of from segregated loads (S)	Total Disposal = A+B+O+C+D	Recovery from Mixed C&D waste (A)	Recovery of segregated loads currently disposed of at landfill (B)	Operational Purpose within a landfill (O)	Total Potentially recoverable = A + B + O	Problematic contaminants (C)	Not suitable for processing or processes losses (D)	Total Non-recoverable = C + D
	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes
Asbestos	0	320,000	320,000	0	0	0	0	320,000	0	320,000
Contaminated soil	0	280,000	280,000	0	0	30,000	30,000	250,000	0	250,000
Concrete[2]	100,000	80,000	180,000	80,000	30,000	50,000	160,000	0	20,000	20,000
Soil	0	110,000	110,000	0	80,000	30,000	110,000	0	0	0
Timber	92,000	3,000	95,000	72,000	0	3,000	75,000	5,000	15,000	20,000
Fines	95,000	0	95,000	0	0	0	0	95,000	0	95,000
Clay Products1	40,000	35,000	75,000	32,000	10,000	25,000	67,000	0	8,000	8,000
Natural Aggregates	25,000	0	25,000	22,500	0	0	22,500	0	2,500	2,500
Garden and vegetation	8,000	17,000	25,000	4,000	17,000	0	21,000	0	4,000	4,000
Ferrous metals	23,000	0	23,000	13,000	0	0	13,000	0	10,000	10,000
Plasterboard	17,000	1,000	18,000	0	0	1,000	1,000	0	17,000	17,000
Paper/Cardboard	14,000	1,000	15,000	7,000	1,000	0	8,000	0	7,000	7,000
Plastic	13,000	0	13,000	6,500	0	0	6,500	0	6,500	6,500
Textiles	6,000	0	6,000	0	0	0	0	0	6,000	6,000
Asphalt	1,500	3,000	4,500	0	3,000	0	3,000	0	1,500	1,500
Non-ferrous metal	3,000	0	3,000	1,500	0	0	1,500	0	1,500	1,500
Glass	2,000	0	2,000	0	0	0	0	0	2,000	2,000
Miscellaneous	8,000	8,000	16,000	0	0	0	0	0	16,000	16,000
Mixed C&D	NA	450,000	NA	-	-	-	0	-	-	-
TOTAL	~ 450,000	~ 1,300,000	~ 1,300,000	~ 240,000	~ 140,000	~ 140,000	~ 520,000	~ 670,000	~ 110,000	~ 780,000

2 Section 88 WCMR data does not distinguish between concrete and clay products. The quantities have been estimated using ratios from the C&D Audit.