



AUT

Mandatory Site Waste Management Plans

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List of Abbreviations

BRANZ	Building Research Association of New Zealand
C&D	Construction and Demolition
CDW	Construction and Demolition Waste
NGO	Non-Government Organisation
NZGBC	New Zealand Green Building Council
REBRI	Resource Efficiency in the Building and Related Industries
RRN	Resource Recovery Network
SWMP	Site Waste Management Plan
UN SDG	United Nations Sustainable Development Goal
WMMP	Waste Management and Minimisation Plan

1. Executive Summary

Construction and demolition waste is the largest waste stream in Auckland with approximately 3 million tonnes are disposed of to landfills and a further 700 thousand tonnes diverted back into the technosphere. Internationally, best practice indicates that over 90% of this waste can be diverted. In terms of materials arriving on site, estimates indicate that about 15% of them end up as waste. These results show that construction and demolition waste is a major cost factor in building and it produces major impacts on the environment. This has been recognised by Auckland Council which has construction and demolition waste as a priority in its latest Waste Management and Minimisation Plan.

Councils around New Zealand have been considering site waste management plans as a steppingstone to improve resource efficiency in the construction sector and a small number of them have recently introduced bylaws to provide for mandatory plans on site. The purpose of this research was to consider how these plans were implemented internationally, how did it turn out in practice and how they could be successfully implemented in Auckland to reduce construction and demolition waste. While the project was Auckland-focussed, it is hoped that the learnings could be applied to other Councils wishing to reduce the environmental burden caused by the construction industry.

A qualitative case study approach was used in this study covering an international literature review, interviewing a selection of Council officers in New Zealand and internationally from jurisdictions that had implemented mandatory site waste management plans and gaining NZ industry perspectives on implementation. The report includes the results of these investigations.

From the international literature review it was found that the drivers for mandatory site waste management plans were cost reductions generated from resource efficiency, reduction of environmental impacts, and assisting business to become good corporate citizens. A negative driver was found to be excessive administration in form-filling.

The importance of stakeholder engagement cannot be over-estimated with key stakeholders coming from the Council, construction and waste management sectors along with client representatives. Each lens provides information that can be utilised to produce a better system that is easy to implement and operate.

The role of local government was seen as being in a governance and enforcement role and setting parameters and targets that are achievable. The provision of a site waste management plan bylaw provides a basis for Council to set construction and demolition waste policy and strategy and manage performance. The information and knowledge generated through a SWMP bylaw is immensely valuable for both Council and industry.

Markets for material diverted from landfill were seen to be crucial and Councils had seen opportunities to sell goods increase as the steady flow and quantities of materials also increased. As well as construction, deconstruction at the end of life was considered an important activity to include in the scope of any bylaw.

A construction and demolition site waste management plan requires support in the form of multi-stakeholder engagement through waste estimations before construction or demolition/deconstruction. Provision of guidelines and templates was seen to be a significant factor in providing a scheme that allows efficient data collection. Education, promotion and encouragement were seen to be crucial factors to build construction sector buy-in.

Successful examples in construction and demolition waste management involved a combination of legislation, landfill levies, development of mature landfill diversion markets, an efficient platform for waste exchange and a scheme to give credit for undertaking site waste management. Interviews that were conducted with Councils backed up the need for all the measures mentioned thus far.

In Auckland there is a developing congruence in thinking between the Council, construction companies and waste management companies on the need to manage construction and demolition waste better. A site waste management plan bylaw is seen as a strategic imperative for Auckland Council as it provides a basis for Council to set future construction and demolition waste policy and strategy and manage performance. The information and knowledge generated from a bylaw will be immensely valuable for both Council and industry.

Auckland has the required collection, processing and recycling assets, infrastructure and capability to effectively implement a site waste management bylaw and achieve the desired outcomes. End user markets currently exist for the key construction and demolition waste materials (timber, plasterboard and steel) with large recycling operations located in the Auckland or upper North Island regions that can accept an increase in diverted material quantities.

Auckland Council can minimise risk by learning from the experiences of Hamilton City Council and New Plymouth District Council both of whom have implemented bylaws mandating site waste management plans within the past 2 years. In addition, the experiences of cities like San Francisco and Rotterdam, which have long-running programmes, provide invaluable learnings.

Critical success factors for Auckland have been identified. These factors include:

- A council-led programme (already achieved);
- Stakeholder consultation (in progress);
- Mandating site waste management plans through a bylaw;
- A staggered implementation starting with large projects and gradually filtering down to smaller and smaller developments;
- The Council providing tools, guides, information, assistance and a template process;
- Minimising bureaucratic requirements through an online data collection system;
- Engagement by the Council with the waste and construction industries during development to provide a system that is easy to implement and workable;
- A programme of monitoring, auditing and enforcement needs to be developed; and
- Work with other Councils to aid reproducibility and standardisation (with minor changes for localisation) across the country.

In conclusion, a programme to develop and implement mandatory site waste management plans is feasible, desirable and will work to reduce construction and demolition waste across the city. A programme will also enable the Council and the construction sector to gain valuable information on waste quantities and flow.

2. Introduction

Construction and demolition waste (CDW) is a significant waste stream. It is estimated that 35% of CDW is landfilled globally¹. The global average for CDW is 1.68 kg/capita/day², which equates to 1.05 million tonnes per year for Auckland³. This quantity represents about 35% of Auckland's current CDW production of 3 million tonnes⁴, which implies that Auckland's construction and demolition (C&D) sector is very wasteful on a worldwide scale.

At the other end of the scale, best practice from Germany and the Netherlands shows that these countries reuse or recycle around 80% of their CDW, whilst Denmark has exceeded 90%⁵. CDW management has been in place for several decades in Germany and many initiatives are in place. For instance, the "Kreislaufwirtschaft Bau" (Circular Economy in Building) initiative unifies six main market actors to enhance the circular economy in the construction sector. Their latest monitoring report from 2018 shows that building debris diversion from landfill was 93.9%, mixed construction waste was 98.7%, soil and stones was 86.2% and gypsum-based construction waste was 49.6%. Altogether 94.9% reutilisation of the building waste was achieved⁶.

By comparison, a study on UK construction sites found that about 28% of materials used on construction sites ended up as waste⁷. In NZ, BRANZ indicates that 15% of materials are wastage⁸. A recent NZ study on a residential build found that for three materials that were readily traceable: timber; plasterboard; and polystyrene, the average wastage was 29% of the material that arrived on site⁹. All these figures indicate that CDW is a major cost factor for any construction project and it produces a significant burden on the environment.

Nationwide, an estimated 7.4 million tonnes of CDW is sent to landfills annually with 51% of that represented by virgin extracted natural materials and landscaping¹⁰. The distribution of the rest of CDW across different classes of landfill is shown in Table 1.

¹ Kabirifar *et al.*, 2020

² Kaza *et al.*, 2018

³ StatsNZ, 2021

⁴ Auckland Council, 2017

⁵ Drechsler, 2006

⁶ Bundesverband Baustoffe, 2021

⁷ Price, 2010

⁸ Building Research Association of New Zealand, 2013

⁹ Gade and Seadon, 2021

¹⁰ Ministry for the Environment, 2019

Table 1: Construction & demolition waste

	Municipal landfills (Class 1)	Construction and demolition landfills (Class 2)	Controlled and managed fills (Class 3&4)	Cleanfills (Class 5)	Total	Recovery (reused, recycled)
Auckland¹¹	658,000 t	1,018,000 t		1,340,000 t	3,016,000 t	702,000 t
NZ¹²						
Rubble, concrete, timber, plasterboard, metal	661,474 t	1,765,904 t	55,185 t	1,120,374 t	3,602,937 t	1,409,808 t
Rocks, clay, soil		588,634 t	14,716 t	2,912,971 t	3,516,321 t	
Greenwaste, earthworks	133,178 t	147,159 t			280,337 t	148,543 t
NZ Total	794,652 t	2,501,697 t	68,901 t	4,033,345 t	7,399,595 t	1,558,351 t

It can be seen from Table 1 that estimations thus far completed show a low degree of accuracy. While Auckland represents 33% of the nation's population¹³ the estimate in Table 1 shows that Auckland produced 83% of CDW going to Class 1 landfills.

In addition to CDW being sent to landfill, an estimated 19% of Auckland's waste from this source is diverted from landfill through reuse or recycling. This compares to a figure of an estimated 21% nationally. These diversion rates indicate that, even without regulations or bylaws, there is a substantial secondary market for construction & demolition materials.

Moreover, the global construction industry contributes 23% of the world's greenhouse gas emissions across its entire supply chain¹⁴. Approximately 5.5% of these emissions come directly from activities on construction sites, predominantly through the combustion of fossil fuels to power machinery and equipment¹⁵. CDW contributes to global warming. Processing each tonne of CDW in a landfill site produces 90 kg of greenhouse gases¹⁶. Applying this figure to Auckland's CDW gives emissions of 371,000 tonnes of greenhouse gases annually.

Auckland Council recognises that, with the continuing expansion of C&D activities in the region, there is a need to reduce the quantities of CDW disposed to landfill. One of the mechanisms to assist CDW reduction is through the effective use of site waste management plans (SWMP). An important benefit of implementing SWMPs is carbon emissions' reduction¹⁷.

SWMPs enable waste diversion target setting, proper waste sorting, collection and auditing to improve profitability and efficiency of waste management while ensuring that waste reduction, reuse and recycling are carried out adequately¹⁸. SWMPs are best prepared during the concept design stage where the waste volumes constitute estimates, predictions

¹¹ Auckland Council, 2017

¹² Ministry for the Environment, 2019

¹³ StatsNZ, 2021

¹⁴ EIT Climate-KIC, 2020

¹⁵ EIT Climate-KIC, 2020

¹⁶ Ding *et al.*, 2016

¹⁷ Von Meding *et al.*, 2013

¹⁸ Ajayi *et al.*, 2015

and projections based on design information available at the time when the work was undertaken¹⁹.

A small number of NZ Councils have recently introduced bylaws requiring mandatory SWMPs to address construction waste, and others are considering adopting similar requirements. In addition, significant stakeholders in the construction industry like Kāinga Ora are very interested in reducing construction waste.

The questions this research seeks to address are:

- How are mandatory site waste plans implemented in construction internationally?
- How do construction site waste plans translate into practice?
- What resources are employed by Councils and builders to meet construction site waste plan requirements?
- What resources are provided by Council and industry to ensure site waste plans are successful?
- Currently, to what extent have site waste plan goals been achieved?
- How adequate are the practices of construction firms in meeting the targets set by mandatory site waste plans?
- What does site waste plan best practice compliance look like?

With a growing interest from Councils, it is timely to gather the experiences of those who have started to go down this pathway and compare these with international examples which are more mature.

¹⁹ XCO₂, 2019

3. Method

A qualitative case study approach was considered best for answering the research questions. The investigation was carried out using a five-step process.

1. Conduct an international literature review of the use of SWMPs by local government as tools to reduce construction waste;
2. Interview Council officers from three New Zealand Councils (Hamilton CC, Kapiti Coast DC and New Plymouth DC) who had started the introduction of mandatory SWMPs in their territories and gather the learnings from their journeys;
3. Interview international Council officers from two Councils (San Francisco and Rotterdam) who had introduced mandatory SWMPs and gather the learnings from their journeys;
4. Liaise with industry to gain their perspectives on SWMPs in the C&D industry; and
5. Inform Auckland Council, Kāinga Ora and the Skip the Skips project of the merit and best practice implementation of mandatory SWMPs for CDW.

The report that follows shows the results of this investigation.

4. International Case Studies

4.1. Drivers for Mandatory Site Waste Management Plans

With the increasing international focus on environmental issues, particularly climate change, pressure on the C&D industry to reduce its environmental impact is mounting. SWMPs are seen as one way to assist construction companies to fulfil several sustainable development drivers²⁰:

- **Financial:** savings available from materials resource efficiency and avoidance of waste disposal costs;
- **Environmental:** reduced resource extraction, processing and consequential CO₂ emissions from transport and manufacture, as well as depletion of landfill capacity;
- **Corporate Social Responsibility:** assists business to demonstrate their commitment to sustainable construction and good environmental management; and
- **Project specific:** adoption of good waste minimisation and management practices to meet requirements for improved performance and achievement of targets.

Three typical case studies for mandatory SWMPs are examined below, the often-quoted UK, Brazil and New Zealand. The benefits to the UK of implementing a site waste management plan have been found to be²¹:

- 15 per cent less waste on-site;
- 43 per cent less waste to landfill;
- 50 per cent savings in waste handling charges; and
- 40 per cent saving on costs compared to landfill disposal.

In addition, an effective SWMP can add value to construction projects by reducing procurement costs for additional materials and reclaiming monetary value by selling or reusing materials onsite²². The plan is also a mechanism to demonstrate to current and potential clients how waste is managed on site and how costs and risks are minimised as well as being a tool to help fulfil the requirements of environmental management systems such as ISO 14001 or Greenstar²³.

As a response to the growing CDW mountain, Defra introduced SWMP Regulations to increase diversion of CDW from landfills and prevent illegal waste activity by requiring CDW to be disposed of appropriately²⁴. A cost-benefit analysis showed that SWMPs became cost effective at \$480,000 (£250,000)²⁵. The Site Waste Management Plans Regulations (2008) placed obligations on the client (other than domestic clients) and the principal contractor for any construction project with an estimated cost of more than \$580,000 (£300,000) – the price agreed in the accepted tender. The regulations applied to all aspects of construction work, including demolition, excavation, maintenance, alteration, decoration, and engineering projects. The contents of the plan had to²⁶:

- Identify client, principal contractor and document drafter;
- Describe the location and estimated cost of the project;
- Record decisions before the SWMP was drafted on the nature of the project, its design, construction method or materials employed to minimise site waste; and
- Identify waste types, quantities and actions to divert material from landfills.

²⁰ Meadows, 2011

²¹ WRAP, 2008

²² Götttsche, 2012

²³ Götttsche, 2012

²⁴ WRAP, 2009

²⁵ DEFRA, 2008

²⁶ United Kingdom Government, 2008

However, this was overturned in late 2013 to reduce red tape, and it is no longer compulsory for sites to produce SWMPs for every project²⁷.

Approximately, 33% of on-site waste is related to poor design strategy²⁸ generating a significant source of CDW and is an area where an improvement could reduce CDW.

In Brazil, The National Council for the Environment (CONAMA) plan also aims to establish the necessary procedures for the handling and destination of materials, based on the following main objectives²⁹:

- The contractor must identify and quantify waste to be taken to specific destinations for that purpose.
- The contractor must limit the collection of waste and its transport, ensuring in all cases where possible, reuse and recycling conditions.
- Transport must comply with the corresponding regulations.
- The destination of the waste must adhere to the classification of the materials.

The Brazilian example covers very similar aspects to the UK with the accent on diversion from landfill through separation and verifying the destination.

The New Zealand Government stipulates waste reduction in its supply contracts. The procurement rules are reflected in the recently agreed Construction Sector Accord which includes construction waste reduction as one of 11 areas of focus³⁰. While the Accord does not stipulate SWMPs, these tools would provide a ready means to fulfil the requirements of rule 20 which seeks to transition to a net zero emissions economy and design waste out of the system³¹.

4.2. Stakeholder Engagement

Consulting with stakeholders and bringing them along on the journey is crucial to success. Table 2 shows key stakeholders identified by some organisations when introducing SWMPs.

Table 2: *Construction & demolition waste stakeholders*

Stakeholders	Reference
<ul style="list-style-type: none"> • architects/designers • construction and environment trade sector bodies • contractors • clients 	Defra, 2013
<ul style="list-style-type: none"> • architects • clients • energy companies • government • interior designers • suppliers of construction materials 	Moreno, 2020
<ul style="list-style-type: none"> • clients • principal contractors • SWMP drafters • waste companies 	Meadows, 2011

²⁷ WPS, 2017

²⁸ Aslam et al., 2020

²⁹ Díaz Pastrana *et al.*, 2019

³⁰ Ministry of Business, Innovation and Employment, 2021

³¹ Ministry of Business, Innovation and Employment, 2021

The common stakeholder in all three studies shown in Table 2 was the client. The importance of the client in the construction process (and decisions on practices like environmental management) in the New Zealand construction industry have been identified previously³². Additional stakeholders that would be useful to include are specifiers, quantity surveyors and engineers (structural, geotechnical and civil). The challenge has been on how to access this diverse group.

Information derived from stakeholder engagement can be extremely useful. For example, consultation in Hong Kong received feedback from some construction site workers that detailed descriptions of waste management procedures in their SWMPs significantly affected the productivity of companies with many of them lacking experience in drafting and using the plans. Unfamiliarity with filling in the documentation and the amount of detail it asked for induced a negative reaction from site workers responsible for this activity. It was also indicated that companies found difficulties in recycling construction materials on site³³. This sort of feedback provides valuable information to management and Council officials when designing improvements to SWMP systems, such as the need for the process to be simple for site personnel.

In another example, consultation in the UK regarding repeal of mandatory SWMPs provided inciteful feedback from industry which included³⁴:

- support for repeal citing administrative burden and the bureaucratic nature of SWMPs. One respondent noted that SWMPs will remain in the industry as best practice which permits flexibility to ensure the SWMP fits to business needs and drivers;
- lack of engagement with designers and architects as the main weakness of the regulations. Several respondents noted that generally clients pass the plan onto contractors post design, thus losing the greatest savings;
- a lack of enforcement contributing to or causing the failure of the Regulations. Those opposing repeal called for better enforcement to enable better implementation;
- several respondents cited Duty of Care legislation³⁵ as causing unnecessary duplication, or conversely, easily ticked a box; and
- one of the drivers for mandatory SWMP introduction was to combat fly-tipping, however some respondents reasoned that since flytipping was often done by those working on projects of a value less than \$580,000 (£300,000), the regulations had little effect on flytipping.

4.3. Drivers for Change

Mexico City has a strategy to be a zero-waste city by 2050. As part of that strategy, in May 2019, the city introduced a Zero Waste Plan, which aims to increase the use of recycled CDW from 206 tonnes to 8000 tonnes per annum by 2024. The plan involves a suite of changes to culture, technology and legislation³⁶.

Targeting the most appropriate sites was found to be important in Mexico City which chose a threshold of 7 m³ on a site for a SWMP³⁷. The penalties for non-compliance are quite stringent with up to nine years in jail if the management of such waste does not comply with the regulation. In a New Zealand context, based on Mexico City's criterion, moderate

³² Seadon and Tookey, 2019

³³ Tam, 2008

³⁴ Defra, 2013

³⁵ The Duty of Care is legislation for business that deals with the movement of waste, ensuring it is first stored safely and securely and then transported by a licensed carrier.

³⁶ Moreno, 2020

³⁷ Moreno, 2020

refurbishment of a single dwelling would be under the requirements, but most other C & D would be included. Data on diversion from this initiative in Mexico City is not available at the time of this report.

Engagement with the key stakeholders in the sector provides an opportunity to introduce a system that operates successfully and gain buy-in from the sector by focussing on its drivers. For example, in Hong Kong, Government and building professionals recognised the need to engage to work out effective strategies for CDW reduction and management. The dominant factor for success in their case was the economic consideration³⁸.

4.4. Local Government Initiatives

The role of Council is to take the lead in defining direction and then supporting the implementation of policy which often flows down from central government. For example, local government in Argentina acted on the Ministry of Environment and Sustainable Development's National Plan of Circular Economy of Waste from the '*Formulation of a Provincial Strategic Plan for Waste Management towards Circular Economy*'³⁹. The plan required provinces to develop a tool, in cooperation with municipalities, that creates sustainable waste management strategies in their territory. The purpose of the plans was to establish a system that substantially improves the management of urban solid waste (including CDW) at the provincial level, from environmental, economic and social perspectives. These plans identify guidelines, actions and policies necessary to improve the management of solid waste leading to the closure of all landfills by 2025 and zero disposal by 2035⁴⁰.

In another approach, Chile adopted technical standards for residential housing which required every residential housing plan to specify at least 20% of pre- and post-consumer recycled material to be used for permanent elements of the construction⁴¹. However, the inclusion of these standards within a housing plan is voluntary so far and there are no regulatory instruments to incentivise the use of products with recycled content⁴². Data on the uptake of the programme has not been ascertained at the time of this report.

However, a long running CDW programme in the USA has had good buy in and results. In 2006, the City and County of San Francisco adopted an ordinance to establish a mandatory programme to maximise the recycling of mixed CDW. Under the ordinance, CDW could not be taken directly to landfill but had to go to a registered facility that can process and divert from landfill a minimum of 65% of the material generated from construction, demolition or refurbishment projects⁴³. An update in 2018 required facility recovery rates be third-party verified. The municipality's equivalent of a SWMP (Construction and Demolition Debris Management Plan) had to demonstrate how all material will be diverted from landfill. That plan must be approved by the municipality prior to commencement of the project. Discussions with Council representatives indicated that the targets were being met, and even exceeded in many cases. Refurbishment proved to be the most challenging as the waste materials could be out of current specifications, were small scale and provided more challenges for diversion.

An aspirational target for Amsterdam to become a 'circular city' by 2050 has laid the pathway for actions. Amsterdam started with the most controllable part of the construction sector, municipal buildings. An interim target requires all municipal procurement in the built environment to be circular by 2023. This means that new municipal buildings and retrofit

³⁸ Yu *et al.*, 2021

³⁹ MADS, 2019

⁴⁰ Moreno, 2020

⁴¹ MINVU, 2018

⁴² Moreno, 2020

⁴³ San Francisco Environment, 2006

projects will, for instance, progressively include used building materials and further operational adaptability in designs⁴⁴.

A common procedure before demolition is a building survey which is mandated in Singapore. Before demolition occurs, reusable and non-reusable parts of a building must be identified, then separately dismantled and removed. Reusable parts, which include piping and wiring, are placed in separate bins and sent for recycling. Concrete debris is either reused on site or recycled. CDW that contaminates concrete debris, such as ceiling boards and tiles, are discarded⁴⁵.

4.5. Supporting Site Waste Management Plans

CDW reduction and management requires a multi-stakeholder approach throughout the entire supply chain. For example, Mexico City requires manufacturers to reduce packaging and label their products to identify waste. In addition, regulations governing (and in some cases, prohibiting) single-use products have been made. Improving the infrastructure of separation plants and recycling installations is also being considered, as is the promotion of base recyclers' associations⁴⁶.

A circular economy approach to SWMPs requires multi-stakeholder engagement. The Greater London Authority's move to a circular economy requires detailed circular economy statements that include a Recycling and Waste Reporting Form with clearly defined activities and targets relating to the policy targets of⁴⁷:

- 95% reuse/recycling/recovery of CDW;
- 95% beneficial use of excavation waste; and
- 65% recycling of municipal waste by 2030.

Applicants need to provide an estimate of the total quantities of waste and/or excavation material and how much will be reused or recycled onsite, offsite and the residual to landfill. The Council engages by providing guidance and training courses that are freely available to aid the industry to achieve waste reduction, re-use and recovery, from procurement to the pre-construction and construction phases of a project⁴⁸.

Pre-demolition audits have been postulated to reduce CDW arising from demolition⁴⁹. One method used involves using audits to determine the reuse potential of construction waste⁵⁰. The audit provides a list of key demolition products that can be assessed using a reclamation valuation survey which includes markets identification for recycled and recovered material, valuations and segregation methods recommended. In the case study, audits were carried out by experienced consultants who could encourage 'best practice' to spread throughout the industry. The principal difficulty encountered in this approach was inaccurate documentation of the existing building which can make assessment of quantities and materials problematic⁵¹.

These audits are becoming more common in New Zealand and Councils are engaging at an early stage of deconstruction of their own buildings to see the potential for diversion for CDW from landfill. For example, when Tauranga City Council sought to replace its asbestos-contaminated Civic Administration Building, a survey showed that 44 types of materials (e.g. plywood panelling) and fittings (e.g. mirrors) could be diverted from landfill, with many of

⁴⁴ EIT Climate-KIC, 2020

⁴⁵ EIT Climate-KIC, 2020

⁴⁶ Moreno, 2020

⁴⁷ Greater London Authority, 2020

⁴⁸ Papargyropoulou *et al.*, 2011

⁴⁹ Hardie *et al.*, 2007

⁵⁰ McGrath, 2001

⁵¹ Hurley, 2004

them identified for reuse in a new civic building⁵². In addition, in Auckland, the Tamaki Regeneration project and Panuku require pre-demolition surveys which lead to deconstruction of buildings rather than demolition.

A more informal method is already in operation in the Auckland deconstruction and demolition market, whereby building deconstructors use outlets including TradeMe, Civilshare, Trash and Treasure Facebook pages and contacts in community organisations to recycle or reuse materials⁵³. This market-driven method has proved successful over time and has not required Council intervention through bylaws.

4.6. Learnings

One of the principal learnings is that Council C&D activities are a good place to start a roll out of SWMPs. For example, in Hong Kong it was found that the government was the most willing stakeholder to minimise waste generation; the major problem from the other parties was the high investment cost. Cost was considered the major project factor, while environment was considered the least important project factor⁵⁴. The drivers in Auckland are somewhat different, with environmental factors featuring much higher in consideration. In addition, in Hong Kong, there was a belief that minimising waste generation provided a low financial incentive but increased overheads⁵⁵. This is also a common belief amongst New Zealand contractors. However, Auckland Council's analysis demonstrated that the benefit-cost ratio for reduction and reuse was 2.83 and recycle and recovery was 2.27, hence the costs would be more than offset by the benefits⁵⁶.

Ongoing challenges with SWMPs deficiencies are in waste estimation and establishment of measures for waste management as exemplified by Spain⁵⁷. This is also evident in New Zealand. In addition, completing SWMPs and waste estimation were only seen as important by 67% of site supervisors in Spain. This resulted in poor monitoring of the waste produced which resulted in poor performance of the plans. These factors were considered to be significant limitations for waste prevention and recyclability of the waste produced⁵⁸.

Staff training on site is crucial to the success of a SWMP⁵⁹. This is a role in which Council can assist. In addition, education and training at all levels in an organisation will assist the circularity of CDW management including sub-contractors⁶⁰. Training that focussed on how to get the best out of SWMPs, rather than how to fill in a particular SWMP template was considered more useful⁶¹. Training could make use of case studies to highlight good practice. A major driver to increase a circular economy approach is for local governments to provide incentives to contractors who use responsibly sourced construction materials, including recycled CDW⁶². Motivations to increase training and education initiatives by local government can include⁶³:

- financial benefits to stakeholders;
- public policies facilitating waste sorting;
- government support for the green building industry;

⁵² Seadon, 2016

⁵³ Takar, 2018

⁵⁴ Tam, 2008

⁵⁵ Tam, 2008

⁵⁶ Rohani, Huang, Hoffman, Roberts and Ribeiro, 2019

⁵⁷ Jiménez-Rivero *et al.*, 2017

⁵⁸ Jiménez-Rivero *et al.*, 2017

⁵⁹ Papagyropoulou *et al.*, 2011

⁶⁰ Götttsche, 2012

⁶¹ WRAP, 2009

⁶² Moreno, 2020

⁶³ Yu *et al.*, 2021

- development of a mature recycling market; and
- education and research in CDW.

The lack of promotion and encouragement by the government and industry representatives were seen as critical factors that prevented contractors from using SWMPs in Malaysia. There was also a perception that appropriate solid waste management practices reduce contractors' profits⁶⁴. The Malaysian report also indicated that the effectiveness of SWMPs is limited by site constraints and overhead costs⁶⁵. The majority of sites do not have enough areas to carry out on-site sorting, which is labour intensive and is also a common problem in Auckland. The enforcement of SWMP is not common in private projects. It is necessary to provide more sorting facilities and explore the means to reduce overhead costs.

There are benefits and barriers to implementing SWMPs as shown in Table 3 and Table 4.

Table 3: *Benefits to implementing site waste management plans*

Benefits	References
Allocates resources more efficiently	Göttsche, 2012
Better waste management practices	Göttsche, 2012
Can measure the cost of waste more accurately	Göttsche, 2012
Design phase produces one-third of construction waste	Osmani <i>et al.</i> , 2008; Innes, 2004
Environmental benefits	Göttsche, 2012; Kulatunga <i>et al.</i> , 2006
Ensures waste is considered at all stages	Göttsche, 2012
Helps company with regulations	Göttsche, 2012
Improved site safety	Göttsche, 2012
Methods for reducing waste	Tam, 2008
Onsite reuse of material	Tam, 2008
Prevents potential waste problems	Göttsche, 2012
Produces cost savings	Göttsche, 2012
Reduces waste on site and prevents pollution	Göttsche, 2012

With the New Zealand industry focussed on cost, the benefits of being able to measure cost more accurately, saving on those costs and improved site safety from Table 3 could rank the highest with the New Zealand construction industry.

⁶⁴ Papagyropoulou *et al.*, 2011

⁶⁵ Yu *et al.*, 2021

Table 4: *Barriers to implementing site waste management plans*

Barriers	References
Attitudinal differences between different working groups	Alwi <i>et al.</i> , 2002; Kulatunga <i>et al.</i> , 2006
Contractor experience in construction	Begum <i>et al.</i> , 2009
Design changes	Osmani <i>et al.</i> , 2008
Few or no financial incentives	Göttsche, 2012; Moreno, 2020
Lack of awareness on site	Lu and Yuan, 2010; Oladiran, 2004
Lack of commitment from management	Formoso <i>et al.</i> , 1999; Göttsche, 2012; Jiménez-Rivero <i>et al.</i> , 2017
Lack of commitment from staff	Oladiran, 2004; Poon <i>et al.</i> , 2001
Lack of effort in practising positive waste management efforts	Kulatunga <i>et al.</i> , 2006
Lack of experience and training	Begum <i>et al.</i> , 2009; Göttsche, 2012; Kulatunga <i>et al.</i> , 2006; Lu and Luan, 2010; Osmani <i>et al.</i> , 2008;
Lack of forward planning by contractors	Osmani <i>et al.</i> , 2008
Lack of knowledge among architects and contractors	Moreno, 2020
Lack of interest from clients	Osmani <i>et al.</i> , 2008
Lack of regulations	Moreno, 2020; Poon <i>et al.</i> , 2001
Lack of space	Oladiran, 2004
Lack of understanding by site staff	Göttsche, 2012; Oladiran, 2004
Language	Oladiran, 2004
Low literacy among site operatives	Oladiran, 2004; Osmani <i>et al.</i> , 2008; Saunders and Wynn, 2004
Negative attitudes towards subordinates	Kulatunga <i>et al.</i> , 2006
Not a priority during the design process	Osmani <i>et al.</i> , 2008
Perception that waste is mainly produced by site operations	Osmani <i>et al.</i> , 2008
Poor attitude towards waste	Göttsche, 2012; Oladiran, 2004
Poor communication	Göttsche, 2012; Oladiran, 2004
Poor execution	Oladiran, 2004
Poor monitoring	Göttsche, 2012; Oladiran, 2004
Poor waste sorting	Oladiran, 2004; Poon <i>et al.</i> , 2001
Source reduction measures	Begum <i>et al.</i> , 2009
Time constraints	Göttsche, 2012; Oladiran, 2004; Poon <i>et al.</i> , 2001
Waste disposal behaviours	Begum <i>et al.</i> , 2009

Table 4 shows that there a lot of barriers to overcome for successful SWMP introduction. Quite a few of these barriers relate to learnt behaviours early in construction workers' careers (e.g, Lack of ...; and Poor...). All of these barriers are evident in the construction industry in New Zealand but seem to stem from the lack of clauses stipulated in contracts. A lot of these behaviours relate to how construction companies operate, and hence, Council's practiced approach of education and support before enforcement, will provide a useful pathway to behaviour change.

While site sorting is an effective means to reduce CDW quantities, most contractors will not do this unless it is specified in the contract. A Hong Kong study showed that 39% of contractors sorted CDW materials according to material types (e.g. soil and sand, concrete and aggregate, bricks and metal, reusable and recyclable materials) and landfill fees had little impact on sorting rates⁶⁶. It was considered that sorting was time and labour demanding and only contractual and legislative requirements would change behaviour.

The role of the designer can be considerable in determining the quantities of waste that are generated during the construction and at the demolition stage. While it has been estimated that one third of waste generated is due to the design process^{67, 68}, it influences many parts of the construction process as shown in green in Figure 1 below.

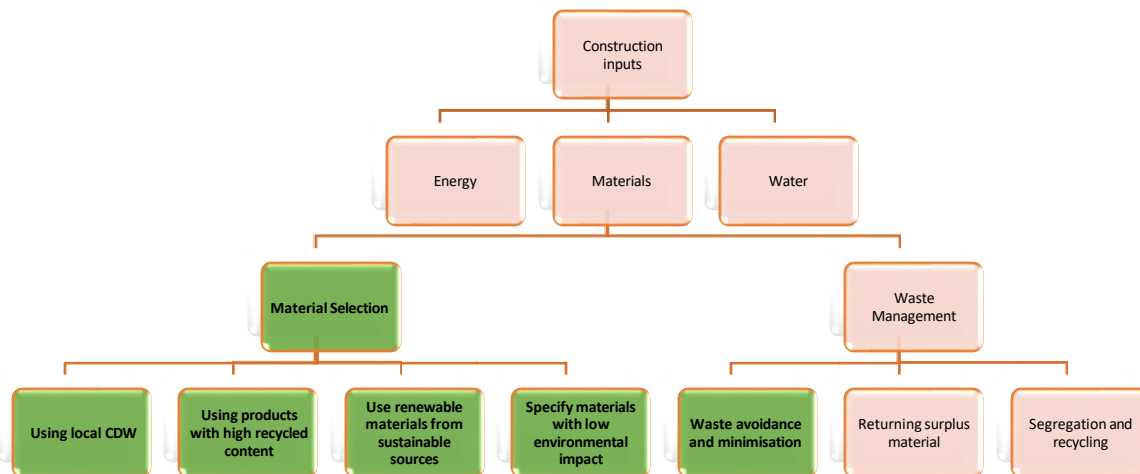


Figure 1: Points of design influence (adapted from Meadows, 2011)

4.7. Successful Implementation

Successful examples in CDW management involve a combination of⁶⁹:

- Legislation;
- high landfill levies;
- development of a mature recycling market;
- an efficient platform for waste exchange; and
- a comprehensive credit-earning building environmental assessment system.

All these tools are present in Auckland, except for the high landfill levies, something that is gradually being addressed by central government. New Zealand legislation covers aspects including litter, product stewardship, waste disposal levies, local government roles, offences,

⁶⁶ Poon *et al.*, 2001

⁶⁷ Osmani *et al.*, 2008

⁶⁸ Innes, 2004

⁶⁹ Yu *et al.*, 2021

enforcement, reporting and auditing. Auckland has a mature recycling market with many outlets and companies involved in providing services. There is still capacity to provide for greater quantities of recycled wood (up to 160,000t), metals, plasterboard (up to 20,000t), concrete, cardboard and several types of plastics⁷⁰. A credit-earning building environmental assessment system is provided by the New Zealand Green Building Council through its various schemes that apply to everything from residential to institutional buildings.

Industry initiatives that do not rely on Council intervention can provide cost-efficient practices, beneficial environmental outcomes and positive publicity. For example, ongoing work to develop the recycling markets is happening with plasterboard. The results of the UK Gypsum Products Development Association study on recycled content of new plasterboard shows an increasing amount of recycled content as shown in Figure 2.

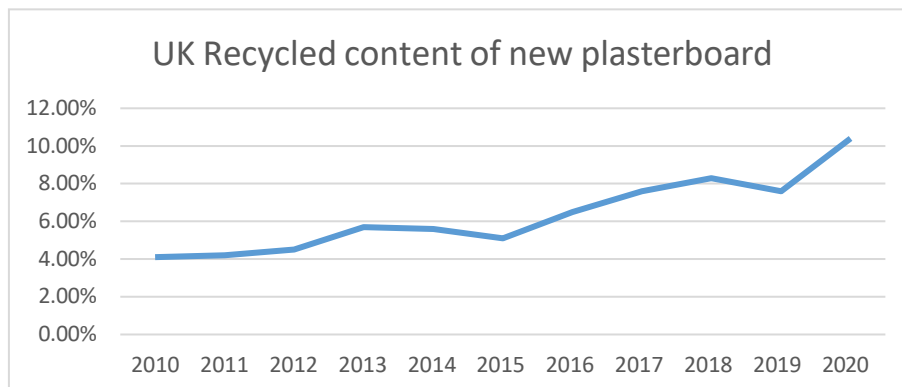


Figure 2: Recycled content of new plasterboard in the United Kingdom (Gypsum Products Development Association, 2021)

The gradual growth of the recycled content shows a commitment to move towards the circular economy in this sector in the UK. Achieving this level of recycled content for NZ manufactured plasterboard would need to divert 30,000t of plasterboard waste annually from landfill nationally (20,000t in the North Island and 10,000t in the South Island). From 2023, Winstone Wallboard’s new manufacturing plant located in Tauranga will have the capacity to recycle up to 20,000t of waste plasterboard per annum. This will more than cover the projected needs for Auckland.

Legislating for mandatory SWMPs can provide valuable support to industry. In Malaysia, the industry was supportive of this sort of approach as it would encourage them to manage CDW more appropriately. Contractors reported that the government should promote SWMPs better with financial incentives such as tax reduction as the best way to increase uptake⁷¹.

⁷⁰ Polyethylene terephthalate, high density polyethylene, low density polyethylene, polypropylene, expanded polystyrene and polyvinyl chloride pipes.

⁷¹ Papagypoulou *et al.*, 2011

5. Sector interviews

Interviews were conducted with local government people and waste industry representatives to get their perspectives on site waste management plans. A summary of the interviews follows below.

5.1. Local Government

Interviews with local government people from five jurisdictions (3 in NZ and 2 international) were conducted and a summary of the results is given in the tables that follow. These are the experiences of local government officers who are in the process of implementing, or have implemented, mandatory site waste management plans and does not necessarily reflect the situation in Auckland.

Table 5: *Initial idea to prompt mandatory site waste management plans*

Category	Responses
Council officer	<ul style="list-style-type: none"> Follow on from a demonstration project a decade earlier Hearing from other Councils Looking for good return on investment of Council funds Reading about international experiences
Plan implementation	<ul style="list-style-type: none"> Consideration of waste wider than household Guidelines for healthy and safer communities Regional Waste Management and Minimisation Plan

Table 5 demonstrates that, from a Council perspective, the idea to promote SWMPs came from Council officers looking for ways to tackle the largest waste stream disposed to landfill. The use of local networks and international examples was crucial to take the initial steps to reduce CDW. The importance of local networks cannot be over emphasised as construction and waste companies often operate across territorial authority boundaries and consistent application of bylaws and operating procedures diminishes the confusion caused by dealing with different jurisdictions. The rationale to go down this path was driven by adopted waste management and minimisation plans that sought to go beyond household waste by influencing the private sector. These ideas were supported by Council positions as shown in Table 6.

Table 6: *Council's purpose for introducing mandatory site waste management plans*

Category	Responses
Reputation	<ul style="list-style-type: none"> Waste was high on the agenda to achieve the UN SDGs. The municipality was seen as a leader and they did not want to lose that status
Driving waste reduction	<ul style="list-style-type: none"> Actions driven from question of how to achieve waste diversion targets in Waste Management and Minimisation Plan CDW diversion was not a viable option currently as it was expensive, time-consuming and the region did not have the necessary infrastructure in place Opportunities for bigger wins – source separation on waste generation showed CDW the largest proportion

Table 6 shows that maintaining the reputation of the Council and seeking to achieve significant waste reduction to work towards the United Nations Sustainable Development Goals⁷² (UN SDGs) were the main drivers to introduce SWMPs. A major driver for waste reduction is the diversion infrastructure, something which is not a significant issue in Auckland. Serious discussions are needed with stakeholders to ensure that preconceived ideas by Council are reflected in practice. Identification methods for stakeholders are shown in Table 7.

Table 7: Identification of stakeholders for building support for mandatory site waste management plans

Category	Responses
Council	<ul style="list-style-type: none"> • Economic development team • List of building previous building consent holders within the range of target group for SWMPs • Planners
Industry	<ul style="list-style-type: none"> • Attend relevant public meetings • Talk to architects • Talk to the sustainability and social return roundtable • Talk to waste contractors

Table 7 shows that a combination of internal Council investigation, and interfacing with industry events and groups provides a good proxy to identify stakeholders. Those teams that work most closely with the building sector (economic development, consents and planning) provided the best contacts. Attendance at industry meetings and individual sector representatives also provided valuable information on people and organisations that could be receptive, or were actively engaged in, construction waste diversion. The key people to target are shown in Table 8.

Table 8: Key stakeholders for implementation of mandatory site waste management plans

Category	Responses
Council	<ul style="list-style-type: none"> • Building department • City growth department • Councillors using their workshops • Planning department • Procurement manager for Council projects
Industry	<ul style="list-style-type: none"> • Construction materials' retailers • Consumers who are more environmentally focussed to assist in programme promotion • Deconstruction sector • Developers who were seeking to develop sustainably • Large construction companies (greater than \$500k commercial projects – determined Council's ability to monitor) • Local trades who were supportive • Recycling facilities operators • Waste transporters

⁷² United Nations, 2015

Council itself is a large construction procurer and therefore seeking advice from internal people can provide significant insight into which industry operators are key to progress these sustainability initiatives. As seen in Table 8, the Council departments to target are those most closely aligned to the construction sector. Attendance at relevant Council workshops to gain insight into industry thinking and additions to the list of key contacts was seen as a low energy way to develop a key stakeholder list.

One of the key stakeholder relationships is between the Waste Solutions team and the resource consents team. The resource consents team strive to pass the resource consent with as few impediments as possible and traditionally viewed a SWMP as a potential pinch point in the system as there was no mandate for these from the Resource Management Act (1991) or in district plans, thus leading to adverse reactions to SWMPs. One of the ways that this impediment can be removed is through an automatic message sent to the Waste Solutions team.

From the industry side, as shown in Table 8, materials' retailers provided a good insight on companies which were already moving down the pathway to waste reduction. Developers and consumers were other people to target. Some Councils have instituted a set dollar value (e.g. \$500k) on which projects had to submit SWMPs, which was an attempt by the Council to make it manageable for the staff time that was available to devote to monitoring the plans. Other industry participants that were targeted were those that demonstrated a willingness to reduce their environmental footprint or had access to those who were engaged in this process.

Once key stakeholders are identified there is a need to build consensus among those people. Methods to build consensus are summarised in Table 9.

Table 9: Building consensus among stakeholders for implementation of mandatory site waste management plans

Category	Responses
Council	<ul style="list-style-type: none"> • Internal consultation among affected groups • Post-implementation engagement to seek feedback • Regionally consistent waste management bylaws adopted • Support from environmentally focussed people
Industry	<ul style="list-style-type: none"> • Backlash from developers who did not consider this their problem • Breakfast launch with commercial and residential builders, architects and reuse companies • Construction companies' sustainability people met with the Council to work out the system and get buy in from the companies • Investigated with companies what would be feasible • Post-implementation engagement to seek feedback • Set up sector groups for cleanfill, waste collectors and a building subgroup. Building contractors found it useful • Talk to industry partners before and after tenders went out • Tested the draft plan and template with industry and asked for feedback • Work with NGOs which were calling for working towards the UN SDGs

Table 9 demonstrates that significant work to build consensus internally in Council can be completed informally. The most affected, and interconnected groups are the resource consent teams and the waste teams. On the wider scale, building consensus on regionally, and even

nationally, consistent waste management bylaws ensure consistency across borders.

Building consensus amongst industry for implementation of mandatory SWMPs shown in Table 9 indicates a range of initiatives to listen to industry’s needs and receive advice on how the Council could introduce a workable system. Another avenue to build consensus was to work with NGOs (for example, the New Zealand Green Building Council (NZGBC)) which have a role to assist in working towards the UN SDGs.

Support for the implementation of SWMPs required a set of drivers specific to the local level. These drivers are shown in Table 10.

Table 10: *Drivers for the supporting case for introduction of mandatory site waste management plans*

Category	Responses
Local: Council oriented	<ul style="list-style-type: none"> • A waste sorting facility was already in place • Climate action targets • Commercial Solid Waste Analysis Protocol audits on commercial waste showed 60% of waste was C&D and another 30% industrial • Include sustainability in the planning process when contemplating possible zoning changes • Job creation • Resources coming from outside the region which increased costs • Showing progress to Council zero waste targets and UN SDGs • Supporting growth that is sustainable for the city, developers and purchasers
Local: Industry oriented	<ul style="list-style-type: none"> • A way to win work • Benefits to the construction sector • Demonstrate leadership in the construction sector • Growing client expectations • Job creation • Save money on construction costs
National	<ul style="list-style-type: none"> • Climate action targets • Proposed increases in landfill levies

Council-oriented drivers shown in Table 10 cover a range of data from Solid Waste Analysis Protocol audits that demonstrated that CDW was the major waste-generating activity to the progression of facilities to manage this waste stream in the Council catchment. Activities which support climate action, like waste reduction, are also significant Council drivers.

A feature of the Council-oriented and industry-oriented drivers was job creation, a recurring theme in all waste management and minimisation activities. Central and local government respond well to job creation schemes, even in times of apparent low unemployment as this provides an opportunity to plan for times when the economy is not so buoyant.

The focus for industry in Table 10 was on the economic aspects such as saving money on materials and demonstrating leadership which contributes to winning work. There is also a growing recognition that client expectations are changing (e.g. Kāinga Ora and Tamaki Regeneration) which are significant participants in the housing development market.

Nationally, as shown in Table 10, the government has signalled increases in landfill levies that will make disposal in all types of landfills more expensive and climate action targets on

the waste sector. Thus, whichever audience is being addressed – Council, industry or national – drivers for SWMPs to reduce CDW can be expounded to provide a supporting case.

During the process of implementing SWMPs Councils identified their roles in making the process successful. The Council responsibilities identified by the Councils themselves are presented in Table 11.

Table 11: *The responsibilities of Council in implementation of mandatory site waste management plans*

Category	Responses
Tools, guidelines and information	<ul style="list-style-type: none"> • Audits • Data • Free resources • Memory jogs • Onsite assistance • Workshops
Implementation assistance	<ul style="list-style-type: none"> • Identify implementation problems from people on the ground • Identify the roles of the various waste companies in implementing the policy • Provide space for removals • Set up a green transporter system • Spot checks at sites
Consent application process	<ol style="list-style-type: none"> 1. Applications automatically trigger the waste minimisation module 2. Letter sent to construction company 3. Council notifies applicant 4. Provide a template for recording waste
Template process	<ol style="list-style-type: none"> 5. Architect, engineer or construction person sets goals 6. Record materials diversion 7. Submit within 3 months of the completed build 8. Follow up with slow responders

Councils have taken on the role of providing assistance and encouragement as can be seen in Table 11. A key aspect for success has been that applications automatically trigger a waste minimisation module and this also automatically triggers notification to the waste team. Automation in this part of the process means that construction projects within scope do not get lost in the system.

The role of Council officers in each application has been shown, in other Councils in New Zealand, to be more complex than a typical Auckland Council Waste Minimisation and Innovation Fund project. Allowing time for site visits and follow up will be important to achieve a good response from industry.

One of the more time-consuming activities has been to follow up with slow responders. On some occasions, follow up continues long after the code of compliance certificate has been issued. This situation is brought about by the consents department being adamant that provision of SWMPs do not slow down the progress of the build. This process will need to be considered in with any mandated SWMPs in Auckland.

In addition to Council’s responsibility, there are roles for industry as perceived by Council. These are shown in Table 12.

Table 12: *Industry's responsibility from Council's perspective for implementation of mandatory site waste management plans*

Category	Responses
Council provided	<ul style="list-style-type: none"> Use the suite of tools, guidelines and information provided by the Council
Industry response	<ul style="list-style-type: none"> For multi-storey buildings flexibins at each level provided adequate capacity and ability to separate Pass the savings onto clients Source separation incurs no extra fees Waste transporters fee structure based on bin size.

Council expects that industry uses the suite of information provided for it as shown in Table 12. To enable this to happen, Council needs to engage with industry early in the programme design process to ensure that what is produced adds value to industry as well as engaging onsite with contractors during C & D.

Councils have found that industry has adapted to the changes. Source separation at site has become more common where it can be achieved within the constraints of the site. Consideration of Auckland's situation shows this is not crucial. Some of the smaller collectors rely on site separation, but the larger operators site separate for large waste streams like timber, metals and plasterboard while providing separation for mixed waste at either their own or Council-run resource recovery centres. For the system to work at its optimum there has been an expectation that industry would provide the service at no extra cost and that savings would be passed onto clients. This latter expectation can be particularly difficult to implement as waste operators do not itemise the savings (and added costs) into their pricing schemes.

Implementation of a mandatory SWMP process requires both control and support from the Council as shown in Table 13.

Table 13: *Control and support for implementation of mandatory site waste management plans*

Category	Responses
Bylaw	<ul style="list-style-type: none"> Construction generating less than 22.5 tonnes of waste was not covered by mandatory SWMPs Construction materials could not go directly to landfill, but had to go to a registered facility first Third party verification for registration of recycling facilities <ul style="list-style-type: none"> A smaller accreditation firm does accreditation for smaller quantities Accreditors are independent and contractors need to demonstrate how they meet requirements Contractors need to achieve 65% material recovery or 75% recovery from municipal projects
Process	<ul style="list-style-type: none"> Enforcement and monitoring are primarily through encouragement, education and workshops No requirements on diversion levels Started on municipal projects Trigger occurs at the building consent stage

Tools for the implementation of mandatory SWMPs rests with Council as shown in Table 13. A bylaw that requires construction material to go to a resource recovery centre before any residues are sent to landfill. This has proven to be very successful with, anecdotally, greater

than 70% diversion being achieved. The same council set a threshold of 22.5t for mandatory SWMPs as their construction mainly dealt with refurbishments of buildings that were built in the middle of last century and the recovered materials were not readily diverted from landfill.

Third party verification of site waste management plans has been another method used successfully, which relieves Council of site work, thus freeing up Council officers' time to concentrate on other parts of the system. As can be seen in Table 13, a variety of accreditation providers are used and there are diversion expectations put on the providers.

The Council processes for control and support have been focussed on the support side as shown in Table 13, which is indicative that the programmes in New Zealand are in their initial stages. Internationally, in long running programmes, more control is exerted by Councils as the targets become more ambitious and industry becomes more aware of Council's direction.

Part of Council's processes for control involve data collection. The types of data collected are shown in Table 14 below.

Table 14: *Data collected by Council from mandatory site waste management plans*

Category	Responses
Waste template	<ul style="list-style-type: none"> • Action points to take to the next site • Breakdown of the waste stream • Challenges or learnings • Costs or savings to client • Endpoint of materials • Goals builders want to achieve • Goals not achieved and why • Methods being used for diversion (e.g. REBRI guidelines, donations and on selling) • Recovery by dollar value and kg/m²
Internal	<ul style="list-style-type: none"> • Number of plans within the scheme

The collected data is a mixture of numerical statistics (e.g. breakdown of the waste stream and recovery per unit) and critical thinking responses (e.g. action points to take to the next site and challenges or learnings) as can be seen in Table 14. This mixture allows for useful data collection to enable monitoring of the whole programme by Council, as well as requiring onsite people to reflect on their performance and seek improvement. This reflection allows for onsite improvements in resource efficiency and thus moves towards waste reduction.

As part of the learning process, Council officers were asked to reflect on their experiences from implementing mandatory SWMPs. The results are shown in Table 15.

Table 15: *Learnings from implementation of mandatory site waste management plans*

Category	Responses
Markets	<ul style="list-style-type: none"> • Implementation of SWMPs resulted in appearance of secondary markets for materials
Construction Industry	<ul style="list-style-type: none"> • It is a path to jobs and economic development • Need more automation in the process – there is a lot of cut and paste • Reception by industry was positive • Where there are data gaps it is a struggle to submit the waste record
Waste sector	<ul style="list-style-type: none"> • CDW is an equity issue in relation to neighbourhoods getting traffic from transporters • Need gate fees for diversion that are cheaper than disposal • Need sufficient diverted material to make it economically viable • Sorting facility needs to feedback to the companies on a skip-by-skip basis
Council process	<ul style="list-style-type: none"> • High value builds are a good starting point then roll out to progressively lower value ones • Implementation using the internal Council team of building consenting personnel was very challenging in trying to fit into the existing system without creating user issues • Implementing mandatory SWMPs takes time • Need one template for all construction • Need to scale implementation according to the capacity of the Council to implement • Need to work inhouse with the Council infrastructure team • Private Plan applications are a bargaining process which can enable SWMPs to be embedded in the plan • There is a change from not knowing, to knowing, to doing

As seen in Table 15, the development of new secondary markets in the Council jurisdiction presents an opportunity for business and employment. This is a considerable driver given that it reinforces a strong sustainability model of economic development that enhances social development while being environmentally responsible.

The responses from industry to Councils seen in Table 15 show industry support and a call for more automation in the process. Many SWMPs viewed showed a lot of cutting and pasting (this is also probably the case for health and safety plans), which is probably appropriate given that companies are replicating buildings and developments over a short timeframe and many conditions remain the same. Purists would argue that industry should start with a blank sheet of paper and develop a SWMP for each building. This is very much akin to, for example, engineers deriving formulae from first principles before applying it to a calculation. No client wants to pay for that process and it has little benefit for the person doing the calculations (except when learning the process).

This situation is similar for SWMPs. The waste sector responses in Table 15 shows a focus on economic incentives to drive the programme forward as well as the social benefit of giving timely feedback to the producer on quantities and categories of waste.

The Council learnings in Table 15 centred around the realisation that implementing mandatory SWMPs is a time-consuming process which needs to keep in mind the effects on targeted companies.

Simplicity is the key word: simplicity in the template design; simplicity in Council processes to manage the process; and simplicity for industry users to fulfil their requirements. It should also be noted that, in Table 15, a gradual roll out across the industry, based on Council capacity to support and monitor, is the preferred mechanism. This is no different to many other waste initiatives rolled out by Auckland Council.

The final question in the survey focussed on the requirements for successful implementation of mandatory SWMPs. The results are presented in Table 16.

Table 16: Requirements for successful implementation of mandatory site waste management plans

Category	Responses
Council processes	<ul style="list-style-type: none"> • A condition in the consent • Build capacity in the construction sector through education • Council officers to attend pre-construction meetings • Development of exemplar projects • Embodied in the District Plan • Include in urban design principles • Making it mandatory • National coordination to produce a standardised plan for NZ • Need to show how the scheme participants will benefit – time and money are the drivers • Needs a committed, forward-thinking group of contractors, transporters and clients • Needs Council resources for monitoring and follow up • Needs to be adequately resourced internally to do the background work • Promotion, recognition and good news stories • Provide an updated detailed directory for local diversion • Provide incentives to completing SWMPs such as faster resource consents • The system needs to be self-driving
Data support	<ul style="list-style-type: none"> • A good waste calculator in an app • App needs to be user friendly • App to include clicking on materials, giving options for diversion and provide recommended targets • Make the process as simple as possible for the builder • Produce waste characterisation reports • Requires an online interface
Construction sector	<ul style="list-style-type: none"> • Develop a waste prevention metric • Education and awareness are important • Follow a process: <ul style="list-style-type: none"> • Write the plan • Amend • Monitor • Collect data • Complete the template and submit • Need to make prevention of waste more prominent • Separate skips for separate waste types where possible • Support from the sector for the need for SWMPs and their value • Think about waste in the pre-construction, use and demolition phases as well as construction
Waste Sector	<ul style="list-style-type: none"> • Education and awareness are important • Support from the sector for the need for SWMPs and their value • Waste transporters are a key party to provide data

Many of the responses in Table 16 have appeared in earlier parts of the survey (e.g. needing Council resources for monitoring and follow up), but some overarching principles do apply for a successful implementation. Making SWMPs mandatory requires Council to have some powers to implement while not making it too onerous on the industry. Working with stakeholders to develop an efficient system is paramount and helps to build industry support to make the programme successful. The development of exemplar projects, of which there are already quite a few in Auckland, provides the story to industry that it is achievable and gains can be made. Recognition of good practice and practitioners by Council provides assurance to the general public who use sustainability as a buying point, as well as by industry which can use it as a selling point. In summary, there needs to be support in the form of case studies, templates, tips and hints and methods for onsite waste minimisation.

Good data support is seen as an important factor by Council officers as shown in Table 16. Simplicity and ease of use are bottom lines and part of this is seen in the modern context to be a well-designed app for mobiles.

For the construction sector education is seen as an important part of the process as shown in Table 16. Education should be targeted at those industry players who are affected by implementation of SWMPs as this has been shown to be the most effective way of getting stakeholders to pay attention⁷³.

The development of a waste prevention metric (as noted in Table 16) is an interesting step forward. Waste diversion metrics are commonly produced in kg/m² or percentage of total waste. Both methods, while producing numerical results, do not have sensitivity to distinguish different types of builds at this stage. The development of a waste prevention metric is most likely to be effective at the design stage, something which has not been the focus of any industry efforts so far. Further development in this area would require designers to also think of the other waste generating stages – maintenance, refurbishment and end-of-life.

The contribution of the waste sector, beyond transport, separation and long-term storage, has been to provide waste templates and data to constructors. This had been seen as a valuable part of the overall programme to divert CDW from landfills. An area for further consideration once the scheme is in operation is to consider how to divert the smaller waste streams more effectively.

⁷³ Seadon and Giacovelli, 2019

5.2. Industry

An informal survey of a selection of construction and waste industry stakeholders took place in the latter part of 2021. The results of the survey are summarised in the tables that follow. The current situation in industry is shown in Table 17.

Table 17: *Current situation relating to site waste management plans*

Category	Responses
Leadership	<ul style="list-style-type: none"> • Waste Management • Green Gorilla • Canterbury Landscape
Organisational requirements	<ul style="list-style-type: none"> • Emerging Regional Council bylaw network • Kāinga Ora: Homes and Communities, 6 Homestar requirement • NZ Green Building Council rating tools include SWMPs
Landfill diversion opportunities	<ul style="list-style-type: none"> • Agricultural gypsum market developing • Compost market developing • Health and safety issues with plasterboard in landfills • Resource recovery network in Auckland • Some product stewardship schemes for CDW are operational

The industry responses as shown in Table 17 show that there are a growing number of major players in the waste diversion area specialising in offsite separation. At this stage Canterbury Landscape does not operate in Auckland, but it shows that the waste industry is considering CDW diversion nationally.

From industry's perspective, they recognise the emerging trend to focus on SWMPs around the country as shown in Table 17, and though it is in its nascent stage in only a few areas, the trend is clear. Major construction commissioning agencies like Kāinga Ora are stipulating SWMPs, which sends further signals to the industry.

On the market side of the equation, there is considerable support to provide for expansion including product stewardship schemes, an expanding resource recovery network developed by the Council in Auckland and diversion of major waste streams like plasterboard, organics and timber as shown in Table 17. This expansion gives confidence that CDW materials will not end up in stockpiles and cause waste issues at a later stage (compared with, for example, tyres). The growing infrastructure to reinforce SWMPs has resulted in the construction and waste industries being supportive of these plans as shown in Table 18.

Table 18: Industry support relating to site waste management plans

Category	Responses
Construction industry	<ul style="list-style-type: none"> • Builders show willingness to implement SWMPs • Business case for SWMP obvious to leading designers and builders • Customers understand the need and value • GJ Gardner investigating waste generation onsite • Haydn & Rollett conducting onsite plasterboard waste analysis • Masterspec could include SWMP provisions • NZ Green Building Council Homestar and Greenstar • Unclear on impact of non-compliance
Waste industry	<ul style="list-style-type: none"> • SWMP endorsement by industry leaders • Provide SWMPs for clients • Unclear on impact of non-compliance • Waste Management positioning to lead with a SWMP service
Public entities	<ul style="list-style-type: none"> • Kāinga Ora: Homes and Communities require 6 Homestar rating • New Plymouth District Council target projects >\$500k

As seen in Table 18, both the construction and waste industries are in favour of a larger roll out of SWMPs, with numerous examples of waste reduction measures being undertaken. However, the big question is what happens with non-compliance? This is a question that goes to the heart of the mandatory nature of the exercise and there is a feeling that enforcement by Council of bylaws is already not happening in other areas like litter and freedom camping. This will be a question addressed in the implementation part of the report.

While the compliance issue for the introduction of mandatory SWMPs provided some uncertainty, the market is showing that it has the capacity and capability to manage extra volumes of materials likely to be generated under such a scheme as shown in Table 19.

Table 19: Market developments that support mandatory site waste management plans

Category	Responses
Materials	<ul style="list-style-type: none"> • Demand for recycled timber and plasterboard currently exceeds supply • Green Gorilla has capacity to process greater waste timber volumes • Winstone Wallboards is establishing capacity to recycle 22,000 tpa of waste plasterboard • Capability and capacity to recycle steel currently exists
Infrastructure	<ul style="list-style-type: none"> • Auckland has the required resource recovery and processing infrastructure • Builders and sub-trade customers are already engaging in conversations aimed at minimising waste and diverting waste from landfill • SWMP tools are emerging to make the compliance process simple and effective • Waste Management positioning for SWMP leadership
Training providers	<ul style="list-style-type: none"> • Green Gorilla • NZ Green Building Council • Waste Management • Winstone Wallboards

From Table 19 it can be seen that significant work has gone into materials, infrastructure and training to build capacity in the system. If a staged roll out of mandatory SWMPs is adopted the market system will be able to readily adapt to the increasing demands that this initiative will bring.

There will be challenges in moving to mandatory SWMPs and industry has identified some of these in Table 20.

Table 20: Challenges in implementation of mandatory site waste management plans

Category	Responses
Constraints	<ul style="list-style-type: none"> • Ability of track and trace mechanisms to verify compliance and data provided in SWMPs • Capacity of the Council consents department • Infrastructure for resource recovery and recycling • Minimum project size for mandatory SWMP
Bottlenecks	<ul style="list-style-type: none"> • Administration of the SWMPs • Capacity of the Council consents department • Inbound and outbound logistics for materials

Many of the challenges to implement mandatory SWMPs have already been discussed earlier but are included in Table 20 for completeness. A significant challenge from industry's perspective is the capacity of the Council to manage the process. As has been seen earlier, Councils have instituted automated processes and been very selective on the size of the market they capture in the initial phases.

Verification and auditing have also been cited as a challenge to implementation. A more finely tuned track and tracing system that gives separated (rather than aggregated) composition results by waste operators seems to lay the ground to provide the needed level of detail needed.

With all of these inputs from Councils and industry, a pathway to implementing mandatory SWMPs is starting to emerge. This pathway is laid out in the next chapter.

6. Implementation of Mandatory Site Waste Management Plans

6.1. Congruence

An organic congruence is emerging in the Auckland CDW sector involving the Council, construction companies and waste management companies. Auckland Council has had an active and ongoing programme since its first Waste Management and Minimisation Plan (WMMP) in 2012 which included CDW actions to⁷⁴:

- Encourage industry and advocate with central government to develop solutions for CDW.
- Investigate, draft and adopt a bylaw prohibiting disposal of certain C&D materials in landfills and cleanfills, and regulating cleanfills.
- Develop the resource recovery network (RRN) infrastructure.
- Establish facilities for C&D recovery within the RRN
- Promote programmes such as REBRI and Green Star to the building and construction industry.
- Establish demonstration projects to encourage the use of recovered materials in construction, and to demonstrate waste reduction on construction sites.
- Acknowledge businesses that successfully reduce CDW.

The 2017 Waste Assessment showed that the progress made by the Council included⁷⁵:

- Solid Waste Bylaw 2012⁷⁶ required waste management and minimisation plans for multi-unit developments.
- Review of the Bylaw in 2016/7.
- RRN established including 5 community recycling centres and 4 community-building capacity trials, some of which have capacity for CDW.

In addition, work had been carried out on demonstration projects including deconstruction and rebuilding of the Ranui Community Centre café⁷⁷.

The 2018 WMMP included CDW actions to⁷⁸:

- Council and Council Controlled Organisations to quantify and reduce their own CDW.
- Council to pilot deconstruction projects.
- Acknowledge businesses that successfully reduce CDW.
- Work with large developers such as Kāinga Ora – Homes and Communities to minimise CDW from housing intensification projects.
- CDW behaviour change research and/or support required to achieve waste minimisation in the industry.
- CDW Waste stream composition research.
- Work with industry representatives to investigate the potential for establishing a Waste brokerage to facilitate exchange of CDW between producers and end markets.
- Promote projects that demonstrate the use of recovered materials in construction and work to find solutions to blockages that limit their use.
- Work with the C&D sector to identify issues and opportunities around developing markets for key materials (e.g. crushed concrete and treated timber).

⁷⁴ Auckland Council, 2012a

⁷⁵ Auckland Council, 2017

⁷⁶ Auckland Council, 2012b

⁷⁷ Sustainable Business Network, 2016

⁷⁸ Auckland Council, 2018

The waste sector is starting to respond to generation of large quantities of CDW that can remain in the economy. A deconstruction study conducted in Auckland showed that 42 businesses manage one or more aspects of CDW⁷⁹ and this figure is climbing. For example, in one development since the report was written, Waste Management provided a case study for the development of their new headquarters (see Appendix 1) which provided a profile for their expanded resource recovery operation.

A cost-benefit assessment conducted by the Auckland Council⁸⁰ demonstrated that when considering the environmental, social, cultural and economic factors there was a net benefit. Two options were considered for a large residential development of 7,000 houses, one that focussed on partial recovery and recycling of waste, and the other that focussed on reduction of waste generation and reuse of materials. The results showed that the benefit-cost ratio for reduction and reuse was 2.83 and recycle and recovery was 2.27, hence the costs would be more than offset by the benefits.

The building sector is being encouraged to generate less waste using SWMPs. The NZ Green Building Council has a requirement to produce a SWMP for buildings rated 6 Homestar (and above) requiring either a target in kg/m² or waste diversion percentages⁸¹. One of the largest builders, the government's public housing provider Kāinga Ora, mandates a 6 Homestar rating for houses commissioned by the organisation. In 2020/21, Kāinga Ora built 2,432 houses in 2020/21 with another 3,500 under construction or contract and 3,310 in the consenting and procurement process⁸². This mandate will have a significant influence on the construction industry and the resource recovery sector. Further encouragement to the wider industry can be provided through Council actions.

6.2. Council Initiation

The elements for initiation of mandatory SWMP process as shown in Table 5: demonstration projects; cross-council networking; looking internationally; looking beyond household waste; and WMMPs have all been present in Auckland's situation. The most important of these, a focus on waste streams other than household waste and the inevitable packaging focus, has enabled Council to embark on the most significant waste streams of C&D (and organics). This is in line with what other Councils have gone through as shown in Table 6. Thus, Auckland has set the scene for the introduction of mandatory SWMPs.

6.3. Stakeholder Consultation

Auckland Council has already established a wide network of stakeholders. This section incorporates the learnings from other Councils, both nationally and internationally. Getting support from stakeholders, both internally and externally, is vital to success for mandatory SWMPs. Since planners, the economic development team and the resource consent database provide the closest links to the C&D industry, these sources can be very fruitful to find industry support for the initiative, as shown in Table 7. Further identification of key supporters can be found through relevant public meeting attendance and talking to industry representatives from key groups like architects, sustainability roundtables and waste contractors.

From the interviews conducted, three key stakeholders in Table 8 emerge that are crucial to implementation of mandatory SWMPs. The Resource Consenting team in the Council is the first of these. There has been long running resistance (going back to the late 1990s with the

⁷⁹ Seadon, Griffin and Roberts, 2015

⁸⁰ Rohani, Huang, Hoffman, Roberts and Ribeiro, 2019

⁸¹ New Zealand Green Building Council, n.d.

⁸² Kāinga Ora, 2021

old Auckland City Council) from the team to make any changes that may be perceived as slowing down the process. Other Councils have met the same problem which has been resolved by either finding someone in the Consents team who is open to environmental improvements and work with them, or to get the team to agree to set up an automated notification system to the Waste Solutions team when a consent is lodged that fitted within the mandatory SWMPs. The Waste Solutions team would then take over the process with the understanding that site development would not be held up due to SWMPs.

The second key stakeholder is the waste operator. In Auckland there are numerous operators already diverting material from landfill from small scale to the larger ones like Green Gorilla and Waste Management which operate on similar principles.

The final key stakeholder is a developer. Many major industrial and commercial developers already have accreditation through the NZGBC Green Star programme and Kāinga Ora is a major residential developer using the NZGBC Home Star programme. Hence, there is a good pool of supporters from the development community.

In terms of Auckland, there is support from both waste infrastructure providers and on-site experience for expansion of SWMPs to provide better environmental outcomes. This substantial platform of support provides a good basis to build consensus among stakeholders in the Council by internal consultation and gaining support from environmentally focussed people and working with industry to ascertain what is feasible for them as shown in Table 9.

As well as establishing relationships to build support, Councils found that the selling points could be focussed in three areas: Council; industry; and the national scene as shown in Table 10. From the Council perspective, as well as having the infrastructure in place and profiling CDW as the largest waste stream, there was a strong emphasis on job creation, sustainable growth and progressing towards zero waste targets.

Industry also highlighted job creation but also a lot centred on gaining and retaining new clients. The environment, and particularly associated climate change issues, are in clients' radar and future-focussed ones are prepared to pay more for a more resilient product. SWMPs contribute to this overall thinking.

At the national level, climate action targets and landfill levy increases provide further incentives to think differently. However, the effects of landfill levy increases should not be overestimated. A study carried out by the Council showed that waste quantities produced from construction were similar on Waiheke Island and the Auckland Isthmus, even though the cost of disposal on the island were \$100 per tonne more. The proposed national increases do not get anywhere close to this figure, so it is not expected that mere implementation of the levy increases will be a significant driver for waste minimisation. One of the tools available to Councils is a waste bylaw.

6.4. Waste Bylaw

At the very least, a waste bylaw signals to the community that the type of wastes being referred to are important in the eyes of the Council. In the areas in New Zealand that have passed waste bylaws for CDW, industry is waiting for the next steps. A quick transition from the passing of the bylaw seeing action on the ground is needed to keep industry support. In addition, consistency between Councils in their requirements, particularly around information to be supplied by the C&D industry, lessens the chances of loss of support by large stakeholders.

Hamilton City Council was the first mover in New Zealand to regulate for mandatory SWMPs. A copy of their full waste bylaw can be found in Appendix 2. The commentary here only refers to sections 5.48-5.52 (Provision of site waste plans for building work), section 7.7

(Waste management and minimisation plans) and section 9 (Fees and charges). Taking these sections one by one enables closer inspection of the clauses and their intent.

5.48 Any person applying for a building consent must also submit a Site Waste Management Plan to the Council for approval.

Concurrent submission of the SWMP with the resource consent provides for ease of administration. One of the key steps in this process is that an automatic notice is sent to the Waste Solutions team as noted in Table 11. This enables efficient processing by the waste team and no effort on the part of the resource consents team.

5.49 A Site Waste Plan must comply with the Council guidelines which may include:

- a. the name of the client, principal contractor, and the person who prepared the Site Waste Plan; and*
- b. the location of the site;*
- c. the estimated building cost of the building work;*
- d. a description of each type of waste expected to be produced;*
- e. an estimate of the quantity of each type of waste; and*
- f. the proposed method of waste management for each type of waste (e.g. recovery, recycling, disposal).*

Up till date, the Council guidelines have not been finalised. Much of the information required by the Council has been derived from the REBRI Guidelines⁸³ and hence it forms a template for anyone who is currently using them. New Plymouth District Council have produced a booklet that has useful information⁸⁴. Section 5.49(e) could prove problematic to estimate since, in a recent residential case study⁸⁵, only three waste streams produced more than 10% of the total waste each (timber, plasterboard and metal-roofing), while another nine lay between 0.25% and 3%. A more useful metric might be overall waste per unit area, which would allow the principal contractor to estimate or input into a formula like the ones developed for residential construction projects in New Zealand⁸⁶. While this is a very low accuracy model, it does provide a starting point. It should be noted that there is no penalty attached to getting a 'wrong' result. The point of the exercise is to get contractors to think about waste generated onsite.

5.50 While the building work is being carried out, the principal contractor must:

- a. ensure that*
 - i. reasonable steps are taken to prevent waste escaping from any waste container;*
 - ii. waste from the site has no more than a minimal adverse effect on neighbouring occupiers;*
 - iii. any waste container is regularly emptied when it is full;*
- b. review the Site Waste Plan as necessary;*
- c. record quantities and types of waste produced; and*
- d. record the types and quantities of waste that have been:*
 - i. reused (on or offsite)*
 - ii. recycled (on or offsite)*
 - iii. sent off to other forms of recovery (on or offsite)*
 - iv. sent to landfill*
 - v. otherwise disposed of.*

⁸³ Building Research Association of New Zealand, 2022

⁸⁴ New Plymouth District Council, n.d.1

⁸⁵ Gade and Seadon, 2021

⁸⁶ Domingo and Batty, 2021

Section 5.50(a) focuses on the litter aspects of site waste, something which is becoming more evident around Auckland. The rest of the section aims to get a recording of how well (or otherwise) the SWMP worked. Once again, there is no penalty for getting figures that do not match the original estimates.

5.51 Within 90 days of completion of the building work the principal contractor must provide an updated Site Waste Plan to the Council that includes:

- a. confirmation of the plan has been monitored and updated;*
- b. a comparison of estimated quantities of each type of waste generated against the actual quantities of each waste type; and*
- c. an explanation of any deviation from the plan*

Section 5.51 is the one that has caused the greatest difficulty. Once the project has finished the contractor wants to move onto the next one and there is no impetus like withholding the Code Compliance Certificate due to non-filing of the updated SWMP. In some Councils, chasing contractors to file their documentation occupies a lot of Council officers' time, which means this should be factored in to any work allocations.

5.52 The principal contractor must ensure that a copy of the plan is kept on site, and that every contractor knows where it can be found. It must be available to any contractor carrying out any work described in the plan.

Section 5.52 follows typical site requirements for other documentation such as building plans and the health and safety documentation. This is a small, but useful requirement that elevates the importance of C&D waste minimisation to the level of other aspects of construction.

7.7 Where a person does not comply with any Waste Plan required under this Bylaw for a ... Building Work, the Council may:

- a. revoke the applicable Waste Plan and require a new Waste Plan to be submitted for approval, which may require a new application fee to be paid; and*
- b. impose a higher fee for Waste Plan applications following revocation, in accordance with the Local Government Act 2002; and*
- c. enforce any offence that may have been committed under the Litter Act 1979; and*
- d. enforce breach of this Bylaw, as provided for in the Local Government Act 2002 or other legislation.*

Section 7.7 provides for enforcement procedures. There is a growing recognition around Auckland that the City's bylaws are not being enforced (e.g. illegal beach camping⁸⁷ and begging⁸⁸). While the provisions in many bylaws allow for enforcement, the more usual approaches have been to engage with the culprits and try to encourage behaviour change. While socially this may have a more long-lasting effect (voluntary is better than mandatory), this is a time intensive activity that requires multiple interventions to achieve behaviour change.

9.1 The Council may charge fees for licences or Waste Plans, including fees to process an application or carry out inspections as part of any waste collection or facility operator licence; or Waste Plan.

9.2 The Council may require waste collection and facility operators to provide bond pursuant to s56(3) of the Waste Minimisation Act 2008.

⁸⁷ Morton, 2022

⁸⁸ Slade, 2016

9.3 *The Council may recover costs associated with enforcement of this Bylaw in accordance with the Local Government Act 2002 or other legislation.*

Section 9 covers fees and charges. These are in line with other Council activities and Council is well versed in implementing these provisions. Continuation of these costs will provide for a seamless transition to a fees and charges scheme.

A different approach, that has significant success over the 15 years it has been in operation, has been that taken by the City and County of San Francisco. The bylaw (Ordinance) requires that mixed CDW must be transported off-site by a registered transporter and taken to a registered facility to process and divert from landfill a minimum of 65% of the CDW (see Appendix 3). There are exceptions for small quantities and DIYers which are a very diverse group producing small amounts of waste. The best way of reaching this group is probably to have information available on the Council website. Auckland has the infrastructure to be able to implement such a scheme, with potentially just licensing and monitoring processes needed to make it operational. With two large waste companies already in operation (Waste Management Ltd and Green Gorilla) and many smaller ones, there is already significant capacity to form a base for this diversion process.

6.5. Implementation needs of Site Waste Management Plans

It would be unreasonable to assume that, following a waste bylaw being passed, it would immediately apply to all construction in the region. This would be an unmanageable situation. Instead, a phased approach should be signalled so that all C&D work is eventually covered. This signal is an important part of the process as it gives guidance to industry that they will need to upskill. The alternative (no progressive timeline) has been shown to be unsuccessful (e.g. the Waste Minimisation Act (2008) had provisions to increase the waste levy, everyone expected that this would happen, but once it became clear that the government was not going to do this, everyone went back to business as usual. It then took 13 years before any increases were made, with waste volumes ballooning during this time).

Large construction companies like Fletcher Construction and Naylor Love already have processes in place to be able to manage SWMPs and the same applies in the residential area for those companies that contract to Kāinga Ora. Hence the first targets should be large residential, commercial and industrial developments that are significant waste generators, followed by tranches that progressively encompass smaller and smaller scale C&D projects.

The role of Council in the implementation process is quite substantial and covers provision of:

- tools, guides and information;
- assistance;
- setting up a consent application process; and
- a template process.

A list of the needs or processes for each of these parts is shown in Table 11. In addition, Councils have concluded that industry's role is more to support the implementation and hopefully show some benefits to the customers as shown in Table 12 (though anecdotally, this has not happened in practice).

In addition to the support role, the Council needs to exercise some degree of control for meaningful implementation to make SWMPs an effective mandatory requirement. While a bylaw that includes diversion of CDW can be a good tool to aid waste diversion, good practice also needs to be rewarded. Third party verification for registration of recycling facilities (as shown in Table 13) can provide the control to ensure that diversion facilities are complying with the bylaw. It should be noted that, in the case quoted in Table 13, a higher level of diversion was expected from municipal projects, compared to private sector projects.

In the example in Table 13, a lot of the C&D work consisted of refurbishments of old buildings, from which it was harder to divert materials due to their age and condition.

A reward system can go further than just the recycling facilities. Third party verification of companies within the C&D sector, with acknowledgement on the Council website, can provide an incentive for the industry to engage in better practice. An example of such a system is the NZGBC Homestar and Greenstar programmes where accreditation has waste management plan elements which could be leveraged to form the basis of an Auckland scheme. Construction companies or developers who comply throughout their business could qualify for inclusion on a Council best practice website which could be a page that automatically links to the accreditor's site. Likewise, companies that sponsor product stewardship schemes could also receive that recognition. The need to update such a website on an ongoing basis would also need to be built into the programme.

6.6. Data Collection

An important part of mandatory SWMPs is the collection of data, both quantitative and qualitative. A SWMP policy requires transparent waste data that is easily accessible. As Councils progress toward implementation of SWMP's, they encounter a persistent challenge, access to reliable waste data. In order to estimate projected waste and to measure progress against construction project targets, as required by SWMP's, builders and Councils need access to data that identifies waste as it is being produced throughout the construction process.

Current practice has waste information provided by the waste service provider on the issue of an invoice, and often only monthly or at completion of the project. There is no standardised method for reporting data across waste service providers, and there are often data gaps and issues with quality. In many cases builders cannot easily access their own historical waste data, and where it is available it is often inconsistent due to the lack of a standardised reporting process. Enabling access to historical and real time waste data would allow builders to set waste diversion goals and empower subcontractors and suppliers to contribute to waste minimisation.

Council policy should require transparent disclosure of waste data, put in place systems to address standardisation and quality, and ensure data is easily accessible. As such, SWMP's can provide a valuable source of C&D waste data to Councils for the future development of waste strategy, policy, and bylaw requirements.

Current SWMPs collect a lot of data, but the transition from the manual form to a useable data analysis platform is a very time-consuming and cumbersome process. The consensus among the interviewees was that the process of data collection needs to be as simple and automated as possible. This indicates that collection should be done electronically with the use of a mobile app providing a useful pathway. Council officers from around the country have noted this could be a useful tool for everyone. Anecdotally, some people have expressed hesitation of using a cookie-cutter mentality which may result in a reluctance to change from practices once established. The counter to this is that no one goes back to first principles in an industry setting and professionals commonly replicate what has been done previously.

Inclusion of a waste estimation algorithm, like that from Domingo and Batty⁸⁹ which takes into account the number of storeys, floor area and cladding, could provide a useful estimation tool for residential builds. In an aggregated form, Councils and the industry could find the data useful as they seek to improve practice. As well as the breakdown of the waste stream and destinations, Council officers suggested several categories that require the contractor to reflect on their practice, as shown in Table 14. These reflection points include

⁸⁹ Domingo and Batty, 2021

challenges or learnings, goals not achieved and why, and action points to take to the next site. There could be provision for the action points to be automatically loaded for the next project.

6.7. Pathway to implementation of plans.

Auckland Council is already well down the path to achieve the conditions necessary for the next steps towards a successful implementation of SWMPs as shown in Sections 6.1 and 6.2. As the literature review and interviews have demonstrated, there are several issues to be addressed during the implementation process:

- Keeping it simple by minimising bureaucratic requirements.
- Development of an online system for recording waste data including types, quantities and actions to divert material from landfills that provides for cut-and-paste options.
- Timely feedback from waste companies on individual bin quantities and composition.
- Waste and construction industry engagement before and during roll out.
- Coordination between construction and waste providers, including online stakeholders like TradeMe and Civilshare to achieve site separation where possible.
- Waste bylaw amendments.
- Staged introduction.
- Establishing monitoring, auditing and enforcement functions.
- Third party verification of recovery rates.
- Online directory for local diversion of waste including resource recovery centres.
- Support for product stewardship schemes in the construction sector.
- Promotion, recognition and good news stories
- Reproducible across Council boundaries.

These issues will be expanded on in the following subsections.

6.7.1 Online

A key to success in SWMP implementation is to keep the requirements simple by allowing as much as possible to be done online. Factors under this category include:

- Lodgement of the resource consent generating an automatic notification to the Waste Solutions Team
- SWMP templates to be available online for input with an app that will work on PCs, tablets and mobile phones. These templates should allow for either customisation of data or replication from previously developed templates (by the developer or others) that allow for standardisation of waste types and/or destination of materials. An example that goes part way to an online system is found in the New Plymouth District Council Waste Reduction Plan⁹⁰. An interface with the waste company should allow for direct input for quantities, destinations and verification data.
- Waste estimations can be done either by construction personnel or by using an estimation generated from already available data such as that from the study completed for Auckland Council⁹¹. As data is further added from differing types of construction, it may be possible to provide feedback to the constructors comparing them to others doing the same type of construction.
- The templates can be based on the REBRI Waste Management Plan⁹² and the REBRI Waste Transfer Form⁹³. It is envisaged that the templates themselves would not be reproduced on the app, but the app would cover the material in those templates in a user-friendly format for electronic input. It is suggested that the

⁹⁰ New Plymouth District Council, n.d.2

⁹¹ Domingo and Batty, 2021

⁹² Building Research Association of New Zealand, 2014

⁹³ Building Research Association of New Zealand, 2014

following amendments to the forms are considered to make the data more relevant to an online platform:

- REBRI Waste Management Plan
 - Materials rearranged according to likely quantities: timber; plasterboard; concrete/masonry; metals; plastics; soil; and miscellaneous.
 - Include an estimation of quantities in kg/m²
- REBRI Waste Transfer Form
 - Waste types rearranged according to likely quantities: timber; plasterboard; concrete/masonry; metals; plastics; soil; and miscellaneous.

6.7.2 Engagement

The waste and construction industries need to be engaged in the discussions, both before and during the rollout of the mandatory SWMP programme. This will enable stakeholders to assist in developing a system that is easy to implement and workable.

One of the areas requiring significant stakeholder engagement is the development of an app and the user interface will be an important aspect to keeping the process simple. This will require waste and construction industries to engage in the development phase. It may also be useful to engage with online stakeholders like TradeMe and Civilshare to see how their programmes can be part of the market solutions.

The provision of an app will enable the waste companies to provide timely feedback (typically bin by bin immediately post measurement) via an online system that can interface with the app. Once again, this works in favour of a simple system, which also enables the construction sector to receive timely information that can be passed on to the subcontractors at their regular toolbox meetings. Providing this timely information is another way of elevating the environmental impacts to a level that bring equivalence to health and safety issues.

6.7.3 Waste Bylaw

The waste bylaw amendments involve consideration of two aspects, making SWMPs mandatory and diversion of all construction waste to a sorting facility or site separation as discussed in Section 6.4. Both aspects can work in harmony, but it is recommended that both the construction and waste industries be involved in the planning phase to ensure a smooth introduction and roll out.

6.7.4 Scaling

It is anticipated that the roll out of mandatory SWMPs will be progressive over time so that all stakeholders can get used to the new operating environment. Data on speed of roll out is not easy to come by, but one Council estimates that one person can manage twenty sites a year. This includes visitations to assess progress during the construction phase and follow ups for submission of the documentation after the project is complete. This task could be easily conducted by the accreditation agency as part of their accreditation process.

Internationally, large sites were targeted first and then the programme targeted smaller and smaller sites until all anticipated sites were covered. Examination of international examples shows that not every construction site needs to be included in the scheme. A hobbyist making a few changes to their dwelling does not present a profile that is high enough to consider capturing in the effort needed for a SWMP. Likewise, professionals doing small jobs are not likely to produce enough waste to make a SWMP worthwhile. It is suggested that all new house builds and all demolition is covered by mandatory SWMPs.

Refurbishments can vary in scale from a bit of a touch up to virtually reconstructing the building. Guidance on where to draw the line for a SWMP could be the Mexico City example (Section 4.3) which uses 7m³ as the cut-off point.

6.7.5 Verification

A programme of monitoring, auditing and enforcement need to be established as part of the verification process. One of the aspects that assisted in managing the work internationally was the establishment of third-part verification schemes where several providers were contracted for different scales of construction. This could also apply to the situation in Auckland.

Auckland is already well on the way to establishing verification processes with organisations like the NZGBC's Homestar and Greenstar programmes. This should not preclude other providers from establishing verification processes to complement these programmes.

It is a relatively simple process which is more of an accounting exercise to ensure that waste quantities from waste companies correlate with claimed quantities on the app. The process also involves checking on a few details like actions and learnings from each building. The time-consuming part appears to be getting the outputs from the builders filed in a timely fashion. Timely filing could be assisted by online means whereby pushing a submit button at the end would make filing easier.

6.7.6 Promotion

One of the crucial functions of Council to make the programme a success is keeping information current through Council outlets. A previous initiative set up in the early 2000s quickly became unused as it was not widely advertised to industry and was not updated. To make this programme a success, Council needs to provide regularly updated information online.

Provision of reliable information is paramount to the success of the programme. To assist this process, a directory on the Council site showing local diversion opportunities for waste including resource recovery centres and links to specific sites within Civilshare and TradeMe (not just the home page). The directory be searchable by material (drop down box) or suburb (for non Civilshare and TradeMe opportunities). It is suggested that the suburb classification include surrounding suburbs until there is at least one diversion opportunity identified. This will save time on site where a site manager is looking at how to divert material responsibly and wants to do it quickly. The site could also show waste companies that are prepared to pick up small quantities of materials. It would also be useful to show support for product stewardship programmes in the construction sector by highlighting them in the directory.

To ensure currency and buy-in from stakeholders, promotion of the programme should be undertaken through recognition of participants and good news stories. The promotion could include a list of compliant construction companies and waste providers which allows people to see who provides best practice. A concept similar to the food grade system used by Auckland Council⁹⁴ might provide a good starting point for such a database. The grading system could be built around the idea of a:

- 'C' for a company just starting off in the programme and having a few compliant builds.
- 'B' for a larger number of compliant builds.
- 'A' for a larger number of builds and the data is provided on time without a lot of follow up needed.

The grading could be provided by the verification providers.

In addition, generating a regular series of good news stories on the site would provide further recognition and impetus for the programme. This provides a two-way effect, with the

⁹⁴ <https://www.aucklandcouncil.govt.nz/licences-regulations/business-licences/food-businesses-quality-grading/Pages/find-food-grade-restaurant-cafe.aspx>

company gaining a reputational advantage and the Council being seen to demonstrate that this programme is important.

6.7.7 Reproducibility

New Zealand is a very small country and both waste providers and construction companies work across Council boundaries. Prior to the formation of the 'supercity' each component council had their own set of rules which resulted in significant frustration to anyone working across borders, of which construction and waste industries were significant providers.

The work that has been done so far by various Councils has used the Hamilton City Council as a template and made minor modifications. Suggestions have been made by Council officers interviewed that a system that is reproducible countrywide would allow for more Councils to start to manage their CDW. There is some hope by the officers that with Auckland's capacity and capability, it would be able to provide the lead, particularly with the online recording systems. Minor changes for local conditions (e.g. local suppliers) should be easy to incorporate.

7. Conclusions

CDW, as the largest waste stream, has been targeted in an ad hoc way for many years. During this time, the construction industry, Council and waste providers have initiated small-scale programmes to reduce waste on construction sites. There has been a growing awareness that a more formalised approach needs to emerge that tackles this waste stream. With the alignment of practices in the construction industry and the waste industry, along with efforts by Council over several years to improve practice, it was time to see how a more formalised system could be introduced in Auckland.

Auckland Council assisted in making connections through the C40 network so that international best practice could be examined by those who were intimately involved in implementing it. Internationally, there were examples that had been running for many years and interviews were conducted with key people to gain insight into what was successful and what should be avoided.

Locally, there were a few Councils that were on a path to introduce mandatory SWMPs, but none were fully implemented at the time the interviews were undertaken. However, valuable information was gained from how those Councils went about aligning the construction industry, waste providers and the Council.

The major conclusion from this study is that the introduction of mandatory SWMPs is a feasible outcome for the Auckland Council, but it requires a systemic approach for it to bear fruit successfully. Merely passing a bylaw and expecting compliance will not make the impact on CDW to landfill that the Council is aiming for.

While the bylaw is at the heart of the programme, the following components are essential to ensure that implementation is successful:

- Significant online development of resources;
- Engagement by the Council with the construction industry and waste providers prior to implementation and throughout the programme;
- Scaling up over time so that the Council is not overwhelmed in the initial introductory phases;
- A verification scheme to ensure that what the construction industry and waste providers say is actually happening;
- Working with other Councils so that there is one system across New Zealand with minor changes (e.g. using local suppliers).

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Appendix 1: Waste Management Case Study – Separation at source

CASE STUDY | SEPARATION AT SOURCE



Case Study: Separation at Source The Sustainable Building & Construction Solution

Location: Auckland, New Zealand

Dates: 2019

Background

When Waste Management embarked on a journey to build a new sustainable home for their Auckland team in 2019, they knew they wanted a fit for purpose, world-class development and a building process that followed the sustainable ethos of the circular economy which the business embraces.

The commercial and industrial facility comprises a truck depot, bin storage, offices, car parking and extensive landscaping, enclosed workshops for maintenance, and includes New Zealand's first electric truck conversion workshop.

Sustainability was fundamental from the outset of the project. With more than twelve waste streams being produced from the demolition through to build phase, the team wanted to achieve the highest levels of waste minimisation as possible. As such, a "separation from source" solution was implemented, that included having separate bins onsite throughout to collect the different waste streams for repurposing / recycling. The result was an accurately measured diversion rate of 76% during the build phase and a total of 97% from demolition to build.





Separation at Source

The Sustainable B&C Solution vs Default single bin Recycling Solution

Committing to diverting as much building and construction waste as possible from landfill via a sustainable *"separation at source solution"* provides many benefits over a default *"single bin"* solution:

- You are taking ownership of your own waste
- Supports the highest levels of sustainability
- Maximises recovery
- Supports the Circular Economy
- Ensures accurate reporting
- Reduces double handling and sorting of waste
- Reduces waste contamination, leading to higher levels of waste diversion
- Helps identify problematic waste
- Goes towards achieving points (Home/GreenStar)
- Informs decisions for improvement

Working in Partnership

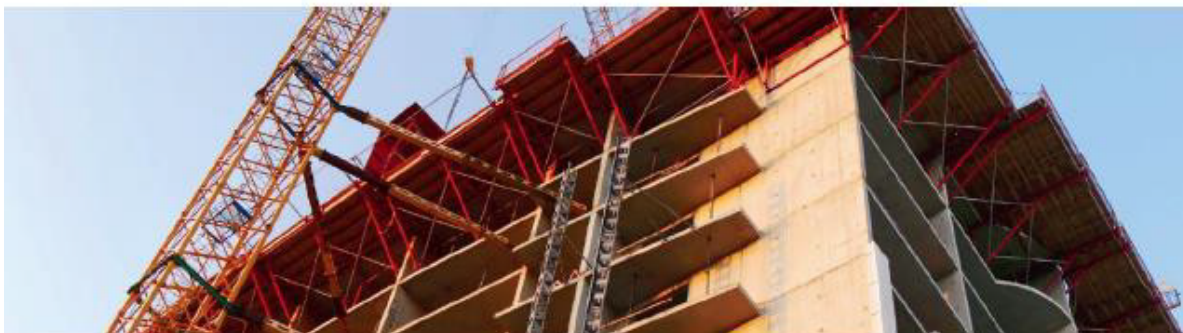
The highest levels of building and construction waste diversion targets are best achieved by working in partnership with your waste service provider. Waste Management supports many construction companies throughout New Zealand with achieving waste diversion targets and supporting projects Waste Minimisation Plans.

We have several solutions available for achieving diversion, including:

- Separation at source solution
- Waste education for your team
- Digital solutions for simplicity

Standardisation and consistency is a major factor for gaining smooth and effective waste disposal from the time that the waste is created through to the collection for recycling or disposal. Within the workplace, team effort has been proven as the recipe for success when it comes to waste awareness, waste responsibility, and the reduction of waste to landfill, focusing on the diversion of recyclable material.

Contact your Account Manager or phone 0800 101010 to discuss the *"separation at source solution"* for your next building project.



Appendix 2: Hamilton City Waste Management and Minimisation Bylaw 2019

Approved By: Council	Date Adopted : 28 November 2019
Date In Force: 29 November 2019	Review Date: November 2029

HAMILTON CITY WASTE MANAGEMENT AND MINIMISATION BYLAW 2019

This Bylaw is made by the Hamilton City Council under the powers given to it by the Waste Minimisation Act 2008, Local Government Act 2002, Heath Act 1956, and the Litter Act 1979.

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Hamilton City Council BYLAWS

1. PURPOSE

- 1.1. The purpose of this Bylaw is to support the management and minimisation of waste by:
- a) promoting and delivering effective and efficient waste management and minimisation in Hamilton City as required under the Waste Minimisation Act 2008;
 - b) supporting the implementation of the Council's Waste Management and Minimisation Plan;
 - c) upholding the purpose of the Waste Minimisation Act and the goals in the New Zealand Waste Strategy;
 - d) regulating the deposit, removal, collection, transport, and processing of waste;
 - e) enabling fees and charges for use of waste management and minimisation services and facilities provided, owned, or operated by the territorial authority;
 - f) protecting the health and safety of waste collectors, waste operators and the public; and
 - g) enabling the management of litter and nuisance in public places.

2. APPLICATION

- 2.1. This Bylaw applies to the City of the Hamilton Council.

3. DEFINITIONS

- 3.1. The following definitions apply to this Bylaw, except where inconsistent with the context:

Term -	means:
Approved	Written authorisation from the Council
Approved container	Any container (including bags) that has been approved by the Council for the collection of any type of waste, with approval based on the following criteria: the prevention of nuisance, the protection of the health and safety of waste collectors and the public, and the achievement of effective waste management and minimisation.
Authorised Council officer	A person appointed by Hamilton City Council for the purposes of ensuring compliance with the Bylaw, as defined as an Enforcement Officer in the Waste Minimisation Act 2008 section 76, Local Government Act 2002 section 177 and as defined as Litter control officers under the Litter Act 1979 section 5.
Building work	means work— (a) for, or in connection with, the construction, alteration, demolition, or removal of a building; and (b) on an allotment that is likely to affect the extent to which an existing building on that allotment complies with the building code; and (c) includes sitework.
Bylaw	This Solid Waste Bylaw

Hamilton City Council BYLAWS

Class 1-5 landfills	Class	Common Name	Accepted Waste Material	Material Source
	1	Municipal Solid Waste Landfill	Non-hazardous waste. Typically, mixed waste from multiple sources and containing a high content of organic material; may include waste cited for classes 2, 3, 4 and 5. May be developed for specific industrial wastes (for example, monofills or residual waste sites)	Households, industry, institutions, construction sites, contaminated sites
	2	C&D Landfill	Unsorted/uncontrolled construction and demolition material. May be developed for specific industrial wastes (for example, monofills or residual waste sites)	Construction sites, demolition material, soil from areas with significantly different chemical properties
	3	Managed Fill	Inert material (e.g. selected inert construction or demolition material) or soils with specified maximum contaminant concentrations greater than applicable local background concentrations.	Selected materials from construction and demolition sites, earthworks and site remediation
	4	Controlled Fill	Inert material (e.g. selected inert construction or demolition material) or soils with trace element concentrations greater than applicable regional background concentrations	Selected materials from construction sites and demolition sites and earthworks
	5	Clean Fill	Virgin excavated natural materials (VENM) such as clay, soil and rock that are free of: <ul style="list-style-type: none"> • combustible, putrescible, degradable or leachable components; • hazardous substances or materials (such as municipal solid waste) likely to create leachate by means of biological breakdown; • products or materials derived from hazardous waste treatment, stabilisation or disposal practices; • materials such as medical and veterinary waste, asbestos, or radioactive substances that may present a risk to human health if excavated; • contaminated soil and other contaminated materials; and • liquid waste. <p>When discharged to the environment, clean fill material will not have a detectable effect relative to the background.</p>	Slips/road clearance, construction site clearance, earthworks surplus
Council	The Hamilton City Council or any person delegated or authorised to act on its behalf			
Council collection points	Places or containers approved by Council where approved containers may be left for collection or waste may be deposited if collection from a public place is unfeasible or impractical			
Cover material	Means material specified by the Council under clause 4.1.f as suitable for use as cover material at a class 1-4 landfill site			

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Deposit	To cast, place, throw, drop or allow to escape any waste or diverted material <i>depositing, in relation to litter, includes—</i> (a) casting, placing, throwing, or dropping litter; and (b) allowing litter to be cast, thrown, dropped, or to escape, from any motor vehicle or trailer
Disposal	As defined in the Waste Minimisation Act 2008
Donation collection point	A place approved by Council where reusable or recyclable types of waste may be deposited for the purposes of raising funds from the waste items
Event	An activity that is irregular or infrequent and does not require the construction of a permanent building, the installation of permanent infrastructure or services, or works such as vegetation clearing or other operational work. Events involve large groups of people either as participants or spectators and include carnivals, parades, concerts, markets, craft or trade fairs, field days, open days, displays and the like. This definition applies only where the activity is not covered by another definition/activity in the District Plan
Home composting	The activity of creating decaying organic matter from domestic green waste and/or food waste into compost
Illegal Dumping	Means the same as Litter
Licence	A licence, consent, permit or approval to do something under this Bylaw and includes any conditions to which the licence is subject
Litter	Any refuse, rubbish, animal remains, glass, metal, garbage, debris, dirt, filth, rubble, ballast, stones, earth or waste matter or any other thing of a like nature deposited in a public place
Litter receptacle	A receptacle provided for the collection of litter
Manager	A person who controls or manages any premises, activity, or event, regardless of whether that person has a proprietary interest in those premises or that activity or event. Includes a Body Corporate
Multi - Unit Development	A property comprising three or more separately occupied residential units or business units, whether in the same building or in separate buildings, and held either in common ownership or in separate ownership
MUD	Multi - Unit Development
Nuisance	A nuisance in terms of the Health Act 1956
Occupier	The inhabitant occupier of any property; and in relation to any land (including any premises and any coastal marine area), includes any agent, employee, or other person acting or apparently acting in the general management or control of the land, or any plant or machinery on that land
Packaging	Materials used to wrap or protect goods

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Person	An individual, a corporation sole, a body corporate, and an unincorporated body
Premises	A building or buildings and the land belonging to it or them
Public place	<p>As defined in the Litter Act 1979</p> <p>Includes—</p> <p>(a) every motorway, road, street, private street, footpath, access way, service lane, court, mall, and thoroughfare;</p> <p>(b) any public reserve within the meaning of section 2 of the Reserves Act 1977 to which the public generally has access, whether with or without payment of any fee, and any reserve under that Act classified as a nature reserve or a scientific reserve;</p> <p>(c) any park, garden, or other place of public recreation to which the public has access, whether with or without payment of any fee;</p> <p>(d) any beach or foreshore, or the bank of any river or stream, or the margin of any lake, to which the public traditionally has access, whether with or without payment of any fee;</p> <p>(e) any waters to which the public traditionally has access, whether with or without payment of any fee, for bathing or other recreational purposes;</p> <p>(f) every wharf, pier, or jetty (whether under the control of a harbour board or not) to which the public has access;</p> <p>(g) any conservation area within the meaning of the Conservation Act 1987;</p> <p>(h) any airport within the meaning of section 2 of the Airport Authorities Act 1966;</p> <p>(i) any cemetery within the meaning of section 2 of the Burial and Cremation Act 1964;</p> <p>(j) any land vested in or controlled by any local authority (within the meaning of section 5(1) of the Local Government Act 2002) or the Crown, being land that is not occupied pursuant to any lease, licence, or other authority by any private person;</p> <p>(k) any national park constituted under the National Parks Act 1980;</p> <p>(l) any other place whether public or private in the open air, including any walkway within the meaning of section 4 of the Walking Access Act 2008, to which the public has access, whether with or without payment of any fee,— but does not include any site for the disposal of litter, or any receptacle installed in any such public place pursuant to this Act or any other Act</p>
Public Notice	<p>To:</p> <p>(a) publish on an Internet site to which the public has free access a notice that—</p> <p>(i) includes all the information that is required to be publicly notified; and</p> <p>(ii) is in the prescribed form (if any); and</p> <p>(b) publish a short summary of the notice, along with details of the Internet site where the notice can be accessed, in 1 or more newspapers circulating in the entire area likely to be affected by the matter to which the notice relates.</p> <p>The notice and the short summary of the notice must be worded in a way that is clear and concise</p>
Recovery	The extraction of materials or energy from waste or diverted material for further use or processing; and includes making waste or diverted material into compost
Retail	The use of land or buildings where goods and services are offered or exposed to the general public for sale, hire or use, but excludes restaurants, licenced premises, offices or drive-through services
Solid Waste Storage Area	An on-site storage area for refuse, recyclable material and organic matter that is accessible for waste collection services
Treatment	Means subjecting waste to any physical, biological, or chemical process to change its volume or character so that it may be disposed of with no or reduced adverse effect on the environment; but does not include dilution of waste

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Waste	<p>(a) means any thing disposed of or discarded; and (b) includes a type of waste that is defined by its composition or source (for example, organic waste, electronic waste, or construction and demolition waste); and (c) to avoid doubt, includes any component or element of diverted material, if the component or element is disposed of or discarded</p> <p><u>Waste categories:</u></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Related to the source of the waste</th> <th style="text-align: left;">Related to the composition of waste</th> <th style="text-align: left;">Related to restrictions applied to waste</th> </tr> </thead> <tbody> <tr> <td>Domestic Waste Commercial Waste Construction and Demolition Waste</td> <td>Food Waste Green Waste Hazardous Waste Inorganic Material Recyclable Material Refuse Reusable Material Special Waste</td> <td>Diverted Material Prohibited Waste</td> </tr> </tbody> </table>			Related to the source of the waste	Related to the composition of waste	Related to restrictions applied to waste	Domestic Waste Commercial Waste Construction and Demolition Waste	Food Waste Green Waste Hazardous Waste Inorganic Material Recyclable Material Refuse Reusable Material Special Waste	Diverted Material Prohibited Waste
Related to the source of the waste	Related to the composition of waste	Related to restrictions applied to waste							
Domestic Waste Commercial Waste Construction and Demolition Waste	Food Waste Green Waste Hazardous Waste Inorganic Material Recyclable Material Refuse Reusable Material Special Waste	Diverted Material Prohibited Waste							
	Category	Definition							
	Commercial waste	Waste that results from a commercial enterprise and includes waste generated by the carrying on of any business, manufacture, process, trade, market, or other undertaking							
	Construction and demolition waste	Waste generated from any building construction or demolition works; and includes any concrete, plasterboard, wood, steel, brick, cardboard, metals, plastic or glass							
	Diverted material	Any thing that is no longer required for its original purpose and, but for commercial or other waste minimisation activities, would be disposed of or discarded							
	Domestic waste	Waste consisting of refuse, recyclable material or organic matter (food waste and/or green waste) originating from any household or from the cafeteria, lunchroom or canteen of any commercial enterprise, but does not include commercial waste nor prohibited waste.							
	Food waste	Waste that is derived from any item of food and is organic in origin and includes fruit and vegetable scraps, meat, fish and bone discards, and any other similar food waste							
	Green waste	Compostable plant material							
	Hazardous waste	Waste that is reasonably likely to be or contain a substance that meets 1 or more of the classification criteria for substances with explosive, flammable, oxidising, toxic, corrosive or ecotoxic properties under the Hazardous Substances (Classification) Notice 2017							
	Inorganic material	Waste consisting of household equipment, furniture, appliances and material of a similar type that due to its nature or size cannot be collected as domestic waste in an approved container, and that is specified by the Council as suitable for: <ul style="list-style-type: none"> a) collection from a public place by the Council; b) collection from any premises by the Council; or c) delivery to a resource recovery facility 							

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	Litter	Any refuse, rubbish, animal remains, glass, metal, garbage, debris, dirt, filth, rubble, ballast, stones, earth or waste matter or any other thing of a like nature deposited in a public place. For clarity, litter includes illegal dumping.
	Organic matter	Food waste and/or green waste that is specified by the Council under clause 5.15a4.1 a as organic matter
	Prohibited waste	<p>Waste containing-</p> <ul style="list-style-type: none"> • any material capable of causing injury to any person or animal unless the material is sufficiently contained to prevent injury; • any material capable of causing damage to the approved container or likely to shatter in the course of collection material unless the material is sufficiently contained to prevent damage to the approved container or to prevent injury; • any material that may endanger any person, animal or vehicle which may come in to contact with it prior to, during or following collection, transportation or disposal; • any radioactive wastes, but excluding domestic smoke detectors; • any used oil and lead-acid batteries; • any hazardous waste; • medical waste; • any other material publicly notified as prohibited by the Council under clause 5.15h
	Recyclable material	Waste specified by the Council under clause 5.15a as suitable for recycling
	Recycling	The reprocessing of waste or diverted material to produce new materials
	Refuse	<p>Waste which</p> <p>(a) subject to (b), is not organic matter, recyclable material, prohibited waste, construction and demolition waste or inorganic material;</p> <p>(b) may include organic matter and/or recyclable material that does not exceed the maximum allowable limits specified by the Council under clause 5.15 of this Bylaw</p>
	Reusable material	<p>Waste or diverted material that is further used in its existing form for the original purpose of the materials or products that constitute the waste or diverted material, or for a similar purpose</p> <p><i>reuse</i> means the further use of waste or diverted material in its existing form for the original purpose of the materials or products that constitute the waste or diverted material, or for a similar purpose</p>
	Special Waste	Any waste whether from a commercial premise or any other source which is hazardous, toxic or by its nature requires special disposal because of environmental considerations or landfill operational requirements. Examples of such are: asbestos, inflammable, explosive or corrosive substances and radioactive substances
Waste collector	A person who collects or transports waste and includes commercial and non-commercial collectors and transporters of waste (for example, community groups and not-for-profit organisations); but does not include individuals who collect and transport waste for personal reasons (for example, a person taking household garden waste to a landfill)	
Waste management facility	A facility which primarily provides waste management and disposal services or waste remediation and materials recovery services, in relation to solid waste	

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Waste management facility operator	A person who owns or manages a waste management facility
Waste management and minimisation plan	A waste management and minimisation plan adopted by a territorial authority under section 43 of the Waste Minimisation Act 2008
Waste Plan	A plan, required by the Council under this Bylaw, that sets out how waste is managed at a Multi – unit Development, Event or Site where building works are carried out
Waste operator	A person who is a waste collector or operates a waste management facility
Waste remediation and materials recovery services	The remediation and clean-up of contaminated buildings and mine sites, mine reclamation activities, removal of hazardous material and abatement of asbestos, lead paint and other toxic material. This also includes recovery, sorting, and/or storage services in relation to waste
Waste treatment and disposal services	The treatment or disposal of waste (including hazardous waste), including the operation of landfills, combustors, incinerators, compost dumps and other treatment facilities (except sewage treatment facilities), and waste transfer stations

4. CONTROLS

- 4.1. Any control specified by the Council under s 151(2) of the Local Government Act 2002 to support the implementation of this Bylaw:
- a. must be made by a resolution and public notice; and
 - b. may:
 - i. prohibit, restrict, or control any matter or thing generally, for any specific category or case, or in a particular case;
 - ii. apply to all waste or to any specified category of waste; and
 - iii. apply to the City or to a specified part of the City; and
 - iv. apply at all times or at any specified time or period of time

5. COLLECTION, TRANSPORTATION, PROCESSING, AND DISPOSAL OF WASTE

GENERAL RESPONSIBILITIES

- 5.1. The occupier and the manager of a premises must ensure that the domestic waste from the premises is separated into waste types as determined by the Council, and deposited for collection in the correct approved container.
- 5.2. No person may deposit in a container material that is not approved for that type of container.
- 5.3. The owner and/or the manager of any premises must ensure that approved containers are provided to tenants.
- 5.4. The owner, occupier and the manager of any premises must ensure that:

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- a. reasonable steps are taken to prevent the waste escaping from any waste container;
 - b. waste from the premises has no more than a minimal adverse effect on neighbouring occupiers;
 - c. any waste container is regularly emptied when it is full;
 - d. the contents of any waste container, excluding containers for green waste, are protected from rain or ingress or egress of flies and animals;
 - e. all dwellings contain a practical means and route of safe access and egress to any solid waste storage area for both residents and waste operators (where applicable); and
 - f. steps are taken to ensure that no waste is deposited in or about any building or its surrounding area (including kerbside) except in accordance with this Bylaw;
- 5.5. The occupier and the manager of any premises who is in control of an approved container must ensure that:
- a. the container is kept in a safe location, hygienic, in good repair, and without any modifications or alterations to its appearance;
 - b. if required, waste is deposited in the container in a manner that allows the whole of the contents to fall out easily and cleanly when the container is emptied;
 - c. the container is placed for collection in an upright position off the road, in front of the premises from which the waste originated and as close to the kerbside as possible;
 - d. reasonable steps are taken to prevent the container disrupting or obstructing pedestrian and vehicular traffic and to preserve access to the premises.
- 5.6. No person may:
- a. put waste into an approved container which has been provided to any other person, without that other person's consent;
 - b. remove waste from, or interfere with any waste deposited in an approved container, except the Council, a licenced waste collector or the person who deposited the waste;
 - c. remove or interfere with any mode of identification of any approved container, including electronic devices attached to the container;
 - d. remove a container provided by the Council from the premises to which it has been allocated, except with the prior written approval of the Council.
- 5.7. The occupier and the manager of any premises is responsible for any waste generated on the premises until it has been collected.

LICENSING OF WASTE COLLECTION AND WASTE MANAGEMENT FACILITY OPERATORS

- 5.8. The following waste operators must have a waste operator licence issued by the Council and must not collect waste if they do not hold such a licence:
- a. Any waste collector who collects and/or transports waste from land in the City:
 - i. in a quantity of at least 40 tonnes of waste in any twelve-month period; and / or
 - ii. at least 40 times in any twelve-month period
 - b. Waste management facility operators with a facility in the City which handles more than 40 tonnes of waste in any twelve-month period.

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- 5.9. An application for a waste operator licence must be made on the application form which is available from the Council, and must be accompanied by any application fee and the information required by the Council to process the application.
- 5.10. The holder of an existing licence may apply to the Council for a renewal of that licence.
- 5.11. A licence is personal to the holder and is not transferable.
- 5.12. A licence may be granted or refused at the discretion of the Council, and if granted may be on such terms and conditions as the Council deems appropriate.
- 5.13. When considering a licence application, the Council may take into account the following non-exhaustive list of factors:
- a. The extent to which the licenced activities will promote public health and safety;
 - b. The extent to which the licenced activities support achievement of the Council's waste management and minimisation plan, including goals and initiatives within that plan;
 - c. The quantity and type of waste to be handled;
 - d. The methods employed for the handling of the waste;
 - e. The frequency and location of the waste collection, removal and transportation services;
 - f. The specifications of the vehicles, equipment, and containers to be used for the handling of waste;
 - g. The applicant's experience, reputation, and track record in the waste and diverted material industry; and
 - h. The terms and conditions under which any disposal of waste is permitted and the existence of, or need for, any statutory approvals, authorisations, or consents required to be held or complied with in respect of such disposal.
- 5.14. A licenced waste operator must comply with all terms and conditions of the licence. These conditions may include, but are not limited to, the following matters:
- a. Term – a licence may be granted for a term of up to 5 years;
 - b. Licence fee – the licensee must pay an annual licence fee in an amount determined by the Council's annual fee and charges;
 - c. Bond – the Council may, on a case by case basis, require a licence holder to post a bank-guaranteed bond;
 - d. Compliance with standards – the licence holder must comply with any standards or policies the Council has set for waste handling such as:
 - i. Provision of waste collection services within reasonable times specified by the Council;
 - ii. The collection of any litter within a specified distance of an approved container awaiting collection and any litter spillage from the licence holder's vehicle during the collection, transportation or disposal process; and
 - e. Kerbside collections – restrictions on the timing and/or location of collections; and
 - f. Provision of information – the licence holder must provide data relating to waste they have handled to the Council during the term of their licence, in the form and at the times determined by the Council, which may include:

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- i. the quantities of various waste categories that have been handled by the waste operator during a period of time;
- ii. waste log books for each vehicle operated in accordance with the licence recording the quantity, composition and destination of each waste type and the point in time when such data was recorded during the waste collection, transportation or disposal process;
- iii. weighbridge receipts;
- iv. gate records of waste tonnage.

GENERAL CONTROLS ON THE COLLECTION, TRANSPORTATION AND DISPOSAL OF WASTE

- 5.15. The Council may specify controls for the following matters in relation to the collection, transportation or disposal of waste from any property:
- a. types of domestic waste that may be treated for all purposes (including deposit, collection, transportation, and disposal) as recyclable material, organic matter or refuse;
 - b. maximum allowable limits of a specified waste type that may be collected or transported from a public place in an approved container for refuse and that subsequently may be disposed of;
 - c. maximum allowable limits of a waste type that may be placed in a container approved for another waste type;
 - d. the maximum number of hours prior to or following the collection period that a container may be placed in a public place; and
 - e. the maximum weight of waste put in individual containers; and
 - f. types of waste that may be handled at any class 1 – 4 landfill and material that may be used as cover material at any such site;
 - g. materials that may be used as natural or other hardfill material at a Class 5 landfill;
 - h. types of waste that are prohibited; and
 - i. the locations where collections from a public place may occur;
 - j. the types of waste that may be collected from a public place.
- 5.16. General controls on the collection, transportation and disposal of waste must be accordance with clause 4.
- 5.17. Any waste operator who collects or transports waste must:
- a. make available to the owner, occupier or manager of a premises one or more approved containers to enable separate collection of each of the waste types required to be separately collected from the premises; and
 - b. not collect for disposal any domestic waste which has not been separated into refuse, recyclable material and organic matter and exceeds the maximum allowable limits specified by the Council under clause 5.15c; and
 - c. not dispose to a class 1 – 4 landfills any waste type that could be reused or recycled.

COLLECTIONS FROM A PUBLIC PLACE

- 5.18. Any person providing or using a waste collection service in or from a public place must comply with this Bylaw.

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- 5.19. Waste may not be placed on a public place for collection unless it is:
- domestic waste;
 - green waste;
 - any other type of waste determined by the Council in clause 5.15 as able to be placed on a public place for collection.
- 5.20. Prohibited waste, diverted material, construction and demolition waste or commercial waste may not be placed in a public place for collection unless authorised by the Council under this Bylaw.
- 5.21. Any waste operator who collects or transports waste from a public place must ensure waste containers provided clearly differentiate the waste operators' containers from the containers of other operators.
- 5.22. The Council may specify controls for the following matters in relation to the collection or transportation of waste from a public place:
- the area to which the control applies;
 - the type, size, colour, and construction of containers that may be used for the storage and collection of waste;
 - the types of waste that may be collected in various types of container;
 - the categories of waste that may be deposited at or collected from a public place;
 - the conditions applicable to any collection service from a public place;
 - the placement and retrieval of approved containers for collection, collection days and times, and restrictions on the number and weight of approved containers;
 - requirements to ensure the correct separation of categories of wastes into approved containers;
 - the locations, access times and conditions of use of Council collection points;
 - any other operational matter required for the safe and efficient operation of a collection service from a public place.
- 5.23. No person may deposit waste at a Council or donation collection point other than in accordance with clauses 5.25 to 5.27.
- 5.24. Controls in relation to the collection or transportation of waste from a public place must be accordance with clause 4.

COUNCIL COLLECTION POINTS

- 5.25. The Council may specify:
- any place, or receptacle in a public place, as a Council collection point for the collection of domestic waste; and
 - controls relating to the deposit of waste at the Council collection point.
- 5.26. Controls in relation to Council collection points must be accordance with clause 4.

DONATION COLLECTION POINTS

- 5.27. Anyone intending to provide a donation collection point must obtain Council approval in advance and must operate the donation collection point in compliance with any requirements the Council specifies including, but not limited to:

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- a. the location;
- b. vehicle access;
- c. the type of waste which may be deposited;
- d. the use of approved containers;
- e. the removal of deposited waste from the collection point; and
- f. a requirement to clean up or remove any litter or graffiti.

INORGANIC MATERIAL

- 5.28. The Council may specify controls for the following matters in relation to the collection of inorganic material from a public place:
- a. the weight, size and nature of inorganic material that may be deposited for collection;
 - b. the categories of inorganic material that may be deposited for collection;
 - c. the times, locations and conditions applicable to the collection of inorganic material;
 - d. the methods by which the inorganic material may be collected;
 - e. any other operational matters required for the safe and efficient collection of inorganic material from a public place.
- 5.29. Any person who deposits inorganic material for collection on, or collects or transport inorganic material from, a public place must comply with the controls made by the Council.
- 5.30. Controls in relation to the collection of inorganic material from a public place must be accordance with clause 4.

NUISANCE AND LITTER

- 5.31. No person may:
- a. allow any accumulation of waste or diverted material on or around any premises they own, occupy or manage to become offensive, a nuisance or likely to be injurious to health;
 - b. use an approved container in a manner that creates a nuisance, is offensive or is likely to be injurious to health.
- 5.32. Except as provided for under any Council Bylaw, no person may:
- a. burn or allow to be burnt on any property they own, occupy or manage any waste except organic matter;
 - b. bury or allow to be buried on any property they own, occupy or manage any waste except:
 - i. organic material;
 - ii. dead companion animals and nuisance pests; or
 - iii. for the purposes of home composting.
 - c. dispose of any waste on any premises except at:
 - i. a class 1-4 landfill, or
 - ii. any premises they own, occupy or manage, for the purposes of home composting.

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- 5.33. No person may:
- a. deposit any waste arising from that person's household or that person's business activities in any litter receptacle provided by the Council in any public place;
 - b. remove any waste from any litter receptacle provided by the Council in any public place, where this results in any waste being deposited outside the receptacle, unless authorised by the Council to do so;
 - c. deposit or attempt to deposit any waste in any receptacle provided by the Council in any public place if:
 - i. the receptacle is full; or
 - ii. the waste is likely to escape.
 - d. affix any item to any litter receptacle provided by the Council in any public place; or
 - e. damage any litter receptacle provided by the Council in any public place.
- 5.34. The owner, occupier or manager of any premises on which any item is affixed or displayed that is likely to become litter, must take all steps to the satisfaction of the Council to prevent it becoming litter, and to promptly remove it in the event that it does become litter.
- 5.35. The occupier of a retail premises must provide appropriate facilities so that customers can choose to remove packaging associated with products that they have purchased and leave that packaging at the retail premises at the point of purchase. For the purposes of this Bylaw, such packaging is the responsibility of the occupier of the retail premises unless and until it is removed from the premises by a purchaser.

PROVISION OF MULTI-UNIT DEVELOPMENT WASTE PLANS

- 5.36. Any person who owns, occupies or manages a MUD must comply with any approved MUD Waste Plan required under this Bylaw.
- 5.37. From the date of adoption of this Bylaw, any person intending to construct a MUD must submit a MUD Waste Plan at the same time as the resource consent application for that MUD.
- 5.38. Any MUD Waste Plan must comply with 5.39 and 5.40 of this Bylaw and be approved by the Council.
- 5.39. A MUD Waste Plan must include, but is not limited to, the following:
- a. identification of an adequate area on the premises for the storage of containers that is readily accessible to the occupiers of units and to a licenced waste operator (where applicable) to enable separate collection and transportation of refuse, recyclable material and/or organic matter;
 - b. the methods to be used to minimise noise and odour and to keep the area hygienic, free from vermin or other infestations and protected from theft and vandalism;
 - c. identification of the practical means and route of safe access and egress to the solid waste storage area for both residents and waste operators (where applicable);
 - d. an estimate of the volumes of refuse, recyclable material and organic matter that will be generated;
 - e. how waste generated by the MUD is to be minimised;
 - f. how the collection and use of recyclables and reusable material will be maximised;

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- g. a statement that:
 - i. the MUD is able to be serviced via the notified standard Council-provided waste service; or
 - ii. the MUD requires a waste service which cannot be serviced via the notified standard Council-provided waste service. This statement must also include detail of the non-standard service requirements and whether the occupier will be expected to pay any servicing costs.
 - h. the steps which will be taken to ensure that no waste is deposited in or about the MUD or its precincts (including kerbside) in breach of this Bylaw; and
 - i. any other matter required by the Council to ensure MUD waste is managed in accordance with the Council Waste Management and Minimisation Plan.
- 5.40. The Council may specify controls for the following matters in relation to the collection or transportation of waste from MUD:
- a. the categories of recyclable material, organic matter and refuse that may be deposited at or collected from a Multi-unit Development;
 - b. the times, locations and conditions applicable to any collection service from a MUD, including the placement and retrieval of containers for collection, collection times and restrictions on the number and weight of approved containers;
 - c. requirements to ensure the correct separation of refuse, organic matter and recyclable materials into approved containers;
 - d. any other operational matter required for the safe and efficient operation of a collection service from a MUD.
- 5.41. Any person who manages a MUD or owns or occupies a unit in a MUD must comply with any controls for the deposit, collection, transportation and management of waste in the MUD made by the Council.
- 5.42. Controls on the collection or transportation of waste from MUDs must be accordance with clause 4.
- 5.43. The Council may, on application, grant a written exemption from compliance with all or any the requirements of this clause if:
- a. in the opinion of the Council, the costs of full compliance would be disproportionate to any resulting waste management and minimisation benefits; or
 - b. the manager or owner demonstrates to the satisfaction of the Council that refuse, recyclable material and organic matter are collected separately; and regularly.

PROVISION OF EVENTS WASTE PLANS

- 5.44. Any organiser of any event must obtain prior approval from the Council for an Event Waste Plan for the event.
- 5.45. The Council may require an Event Waste Plan to meet requirements set out by the Council Event guidelines which may include:
- a. an estimate of the types and volumes of waste to be generated by the event;
 - b. how waste generated by the event is to be minimised;

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- c. the steps to be taken to maximise the collection and re-use of recyclable material and reusable material;
 - d. the equipment to be provided for the storage, collection and transportation of waste and diverted material;
 - e. the method of and person responsible for the collection and disposal of waste generated by the event;
 - f. the provision of litter minimisation, collection, and removal from within the event site and its immediate surrounds; and
 - g. any other matters relating to event waste management and minimisation that may be specified by the Council.
- 5.46. The organiser of an event must comply with the approved Event Waste Plan.
- 5.47. On completion of the event, the organiser must provide the Council with a report on the implementation of the Event Waste Plan, including:
- a. a waste analysis which sets out the predicted and actual types and amounts of waste generated by the event; and
 - b. the waste management facilities used to recover, recycle, treat or dispose of waste generated by the event.

PROVISION OF SITE WASTE PLANS FOR BUILDING WORK

- 5.48. Any person applying for a building consent must also submit a Site Waste Plan to the Council for approval.
- 5.49. A Site Waste Plan must comply with the Council guidelines which may include:
- a. the name of the client, principal contractor, and person who prepared the Site Waste Plan; and
 - b. the location of the site;
 - c. the estimated total cost of the building work;
 - d. a description of each type of waste expected to be produced;
 - e. an estimate of the quantity of each type of waste; and
 - f. the proposed method of waste management for each type of waste (e.g. recovery, recycling, disposal).
- 5.50. While the building work is being carried out, the principal contractor must:
- a. ensure that
 - i. reasonable steps are taken to prevent waste escaping from any waste container;
 - ii. waste from the site has no more than a minimal adverse effect on neighbouring occupiers;
 - iii. any waste container is regularly emptied when it is full;
 - b. review the Site Waste Plan as necessary;
 - c. record quantities and types of waste produced; and
 - d. record the types and quantities of waste that have been:

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- i. reused (on or off site)
 - ii. recycled (on or off site)
 - iii. sent to other forms of recovery (on or off site)
 - iv. sent to landfill
 - v. otherwise disposed of.
- 5.51. Within 90 days of completion of the building work the principal contractor must provide an updated Site Waste Plan to the Council that includes:
 - a. confirmation that the plan has been monitored and updated;
 - b. a comparison of estimated quantities of each type of waste generated against the actual quantities of each waste type; and
 - c. an explanation of any deviation from the plan
- 5.52. The principal contractor must ensure that a copy of the plan is kept on site, and that every contractor knows where it can be found. It must be available to any contractor carrying out any work described in the plan.

6. GENERAL PENALTIES AND POWERS

- 6.1. Any person who acts in breach of this Bylaw commits an offence and is liable upon summary conviction to a fine, as provided for under the Local Government Act 2002 (which specifies a fine not exceeding \$20,000), and may also be liable to penalties under other legislation.

7. OTHER ENFORCEMENT POWERS

GENERAL RESPONSIBILITIES

- 7.1. Where an owner, occupier or manager of a premises does not comply with any of clauses 5.1 to 5.7, the Council may:
 - a. Notify the occupier, owner or manager that they have failed to comply with the Bylaw; and
 - b. Provide details of the failure to comply and information on how to comply; and
 - c. Inform the occupier, owner or manager:
 - i. that the breach shall be recorded against their property; and
 - ii. if the property receives three recorded breaches within a three-month period their waste service may be withdrawn; and
 - iii. specify the steps which the owner or manager will need to follow in order to appeal the decision or reinstate the service.
- 7.2. Any final notice of withdrawal of service shall also be sent to the postal address of the ratepayer for the property and shall specify:
 - a. the date of service withdrawal; and
 - b. the steps which the owner or manager will need to follow in order to appeal the decision or reinstate the service.

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LICENCED WASTE OPERATORS

- 7.3. Where a licence holder does not comply with the terms and conditions of a waste operator licence, the Council may:
- a. issue a written warning to the licence holder, which may be treated as evidence of a prior breach of a licence condition during any subsequent review of the licence;
 - b. review the licence, which may result in:
 - i. amendment of the licence; or
 - ii. suspension of the licence; or
 - iii. withdrawal of the licence.
 - c. have recourse to any bond where the Council has incurred any cost as a result of the breach of the licence condition. This includes where the Council has itself performed or arranged for the performance of any licenced activity on the default of the licence holder;
 - d. review the amount and nature of the bond, which may result in an increase of the amount of the bond;
 - e. enforce any offence that may have been committed under the Litter Act 1979; and
 - f. enforce any breach of this Bylaw, as provided for in the Local Government Act 2002 or other legislation.

COLLECTIONS FROM A PUBLIC PLACE OR COLLECTION POINT

- 7.4. The Council may:
- a. remove the contents of any approved container left out for collection from a public place, where the contents or placement of the container do not comply with any aspect of clause 5.18 to 5.24;
 - b. suspend the use of any Council collection point service, where any aspect of clauses 5.25 or 5.27 have not been complied with;
 - c. withdraw approval for provision of a donation collection point, where any aspect of clause 5.27 has not been complied with;
 - d. enforce any offence that may have been committed under the Litter Act 1979;
 - e. enforce breach of this Bylaw, as provided for in the Local Government Act 2002 or other legislation.

INORGANIC MATERIAL

- 7.5. Where a person does not comply with a control made by the Council under clauses 5.28 and 5.29, the Council (or a licenced waste operator where applicable) may:
- a. reject (i.e. not collect) the inorganic material, if the inorganic material or placement if any aspect of clauses 5.28 and 5.29, have not been complied with;
 - b. remove the inorganic material, where the inorganic material or placement if any aspect of clauses 5.28 and 5.29, have not been complied with;
 - c. enforce any offence that may have been committed under the Litter Act 1979; and
 - d. enforce breach of this Bylaw, as provided for in the Local Government Act 2002 or other legislation.

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NUISANCE AND LITTER

- 7.6. Where a person does not comply with a control made by the Council under clause 5.31 to 5.35, the Council may:
- a. issue a notice requiring corrective action within a specified time period;
 - b. recover costs as set out in 9.3;
 - c. enforce any offence that may have been committed under the Litter Act 1979; and
 - d. enforce breach of this Bylaw, as provided for in the Local Government Act 2002 or other legislation

WASTE MANAGEMENT AND MINIMISATION PLANS

- 7.7. Where a person does not comply with any Waste Plan required under this Bylaw for a MUD, Event or Building Work, the Council may:
- a. revoke the applicable Waste Plan and require a new Waste Plan to be submitted for approval, which may require a new application fee to be paid; and
 - b. impose a higher fee for Waste Plan applications following revocation, in accordance with the Local Government Act 2002; and
 - c. enforce any offence that may have been committed under the Litter Act 1979; and
 - d. enforce breach of this Bylaw, as provided for in the Local Government Act 2002 or other legislation.

WASTE PLANS FOR MULTI-UNIT DEVELOPMENTS

- 7.8. Where a person does not comply with any of clauses 5.36 to 5.41, the Council may:
- a. issue a notice requiring corrective action within a specified time period; and
 - b. recover costs as set out in 9.3.
- 7.9. Where an owner, occupier or manager of a MUD does not comply with any of clauses 5.36 to 5.41, the Council may:
- a. notify the occupier, owner or manager that they have failed to comply with the Bylaw;
 - b. provide details of the failure to comply and information on how to comply; and
 - c. inform the occupier, owner or manager
 - i. that the breach shall be recorded against their property; and
 - ii. if the property receives three recorded breaches within a three-month period their waste service may be withdrawn; and
 - iii. specify the steps which the owner or manager will need to follow in order to appeal the decision or reinstate the service.
- 7.10. Any final notice of withdrawal of service shall also be sent to the postal address of the ratepayer for the address and shall specify:
- a. the date of service withdrawal; and
 - b. the steps which the owner or manager will need to follow in order to appeal the decision or reinstate the service.

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WASTE PLANS FOR EVENTS

- 7.11. Where an applicant does not comply with any of clauses 5.44 to 5.47, the Council may:
- a. withhold or revoke consent for any event;
 - b. issue a notice requiring corrective action within a specified time period; and
 - c. recover costs as set out in 9.3.

WASTE PLANS FOR BUILDING WORK

- 7.12. Where a person does not comply with any of clauses 5.48 to 5.52, the Council may:
- a. issue a notice requiring corrective action within a specified time period; and
 - b. recover costs as set out in 9.3.

8. EXCEPTIONS AND SAVING PROVISIONS

- 8.1. A person is not in breach of this Bylaw if that person proves that the act or omission was in compliance with the directions of an authorised Council officer.

9. FEES AND CHARGES

- 9.1. The Council may charge fees for licences or Waste Plans, including fees to process an application or carry out inspections as part of any waste collection or facility operator licence; or Waste Plan.
- 9.2. The Council may require waste collection and facility operators to provide a bond pursuant to s56(3) of the Local Government Act 2002.
- 9.3. The Council may recover costs associated with enforcement of this Bylaw in accordance with the Local Government Act 2002 or other legislation.

The COMMON SEAL of the HAMILTON CITY COUNCIL
was hereunto affixed in the presence of:

Councillor: _____

Councillor: _____

Chief Executive: _____

EXPLANATORY NOTE

This note is for information purposes and does not form part of this Bylaw [Insert if required].

Appendix 3: San Francisco Construction and Demolition

City and County of San Francisco Construction and Demolition Debris Recovery Program

Ordinance No. 27- 06

Introduction

The City and County of San Francisco adopted an ordinance (No. 27-06) effective on July 1, 2006, that creates a mandatory program to maximize the recycling of mixed construction and demolition (C&D) debris.

The Ordinance requires that mixed C&D debris must be transported off-site by a **Registered Transporter** and taken to a **Registered Facility** that can process and divert from landfill a minimum of 65% of the material generated from construction, demolition or remodeling projects. *(Please see below for definitions of Registered Transporter, Registered Facility and Construction and Demolition Debris.)*

Affected Projects

The ordinance applies to **all** construction in San Francisco, such as:

- New Construction
- Remodels
- Tenant Improvements
- Teardowns/Demolition
- Additions
- Repairs
- Full Demolition (Please see “Full Demolition Requirements” below)

Requirements

Except as provided below, only Registered Transporters can remove mixed C&D material from a construction site, and they must take this material to a Registered Facility. Anyone who removes mixed C&D debris from a construction site, and is not exempt (*see below*), must be a Registered Transporter. Any facility that accepts mixed C&D material must be a Registered Facility. *(See below for application information.)*

Registration Exceptions

The following are exempt from registration requirements:

- **Transporters** who
 - haul less than one (1) cubic yard of material, or
 - use vehicles with no more than two axles and no more than two tires per axle (such as small pick-up trucks), or
 - remove materials that are source-separated on site and kept clean for recycling or reuse (such as separated clean wood, metal, dirt, concrete or fixtures).
- **Property owners** who remove mixed C&D material with their own vehicles.
- **Facilities** that **only** process clean material that is source separated at the construction site and is kept separate for reuse or recycling.

Full Demolition Requirements

Any person applying for a permit for full demolition of an existing structure must submit a Demolition Debris Recovery Plan (DDRP) to the San Francisco Department of the Environment (SFE) that provides for a minimum of 65% diversion from landfill of C&D debris, including materials source separated for reuse or recycling. The DDRP must be submitted to and approved by SFE **before** the Department of Building Inspection will issue a Full Demolition Permit.

Application information

Anyone applying to be a Registered Transporter, Registered Facility or for a Demolition Debris Recovery Plan must complete and submit the appropriate application to the Department of the Environment.

To request applications, submit completed forms or receive additional information, please contact:

Department of the Environment, 11 Grove Street, San Francisco, CA 94102
Attn: C&D Phone: 415.355.3700 Email: Environment@sfgov.org
Website: SFEnvironment.org

Forms available:

- Registered Transporter
- Application Registered Facility
- Application Demolition Debris Recovery Plan

To review the Ordinance and Regulations or to download forms, go to www.sfenvironment.org

Definitions

Registered Transporter – Anyone who is hired to remove waste material from a construction and/or demolition site who uses a vehicle with more than two axles or two tires per axle (such as a large pickup truck with four tires on the rear axle or three-axle dump trucks) and is hauling at least one (1) cubic yard of mixed C&D material, must be a Registered Transporter. The Registered Transporter must have applied for and received a registration from the San Francisco Department of the Environment. The Registered Transporter is obligated to take this material only to a Registered Facility or to a facility that accepts source separated material for recycling (such as all metal, wood or dirt).

Registered Facility – Any facility that accepts mixed construction and demolition debris for processing and recycling must be registered and must demonstrate an overall minimum recycling rate of 65%.

Facilities that accept only clean, source-separated materials for recycling (such as wood, dirt, metal and cardboard) are not required to register with the City. A Registered Facility must have applied for and received a registration from the San Francisco Department of the Environment.

Construction and Demolition Debris – Building materials and solid waste generated from construction and demolition activities, including, but not limited to, fully cured asphalt, concrete, brick, rock, soil, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, fixtures, plastic pipe, metals, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction, deconstruction, demolition or land developments. This term does not include refuse regulated under the 1932 Refuse Collection and Disposal Initiative Ordinance or sections of the Municipal Code that implement the provisions of that ordinance; materials from the public right-of-way; or, unless specified in Chapter 14 of the Environment Code, materials source separated for reuse and recycling. Hazardous waste, as defined in California Health and Safety Code section 25100, et seq., as amended, is not Construction and Demolition Debris.

10.10.06