

Recycled Materials in Civil Works and Energy Efficient Street Lighting: A Review of Waikato Territorial Authorities' Procurement Practices

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Executive Summary

Background

In June 2009, Environment Waikato (EW) commissioned Waste Not Consulting to research the procurement practices of territorial authorities' (TAs) in the Waikato region, specifically in relation to council civil works. The purpose of the research was to investigate whether current TA policies and processes are stimulating, or could be used to stimulate, the use of four specific recycled materials in council civil works (i.e. crushed concrete, composts/mulches, crushed glass, recycled timber). This research followed on from a recommendation made in a strategic review of waste flows and infrastructure in the Waikato conducted by SKM in 2007¹. The project also investigated procurement policies and practices relating to the use of energy efficient street lighting technologies.

The purpose of the project was to investigate how Environment Waikato and the region's TAs can better drive waste minimisation and local economic development from within their own organisations by using recycled materials in civil works projects (e.g. roading, water services, parks and reserves and building services). An additional goal was to investigate opportunities for Waikato TAs to achieve greater energy efficiency through improving street lighting design and technology.

Methodology

A range of resources were reviewed in order to gather information on various aspects of the project, including: waste quantity data, relevant case-studies, New Zealand local government procurement and sustainability processes and policies, and general industry research relating to the use of recycled materials in physical works and energy efficient street lighting.

Information was gathered from TAs initially via face-to-face interviews with staff from 11 Waikato TAs during the last week of July 2009. A standard survey form was used to lead discussions and to obtain information and opinions on procurement policies and practices, current and potential uses of the four recycled materials in civil works and the quantity of these materials available in the district. Information was also sought on the number of street and traffic lights in each district and the use of energy-efficient technologies. Responses to the survey questions that could not be answered during interviews were obtained via follow-up phone and email conversations in subsequent weeks.

Discussions were also held with other local government staff from Christchurch City, Palmerston North District Council and two Auckland councils and industry representatives to gather general perspectives and background information. Feedback was also obtained from staff representatives from three roading and utilities contractors that operate in the Waikato regarding current and potential use of local recycled materials in council civil works. The contractors were chosen based on recommendations from council staff

Research findings

- High-level council sustainability strategies or procurement policies are not widespread in the Waikato region. Only two of the 11 TAs have existing council sustainability strategies. Five councils (including the two that have an existing sustainability strategy) referred to having an existing overarching procurement strategy

¹ Sinclair Knight Merz (2007). Waikato Regional Waste Infrastructure Stocktake and Strategic Assessment. Report prepared for Environment Waikato. Technical Report 2007/44.

or policy. Four councils noted that they are in the process of developing a procurement or sustainability strategy. ES.1 illustrates the main council policies, plans, and standards that influence council civil works procurement decisions and could be used to encourage the use of recycled materials and/or energy efficient lighting.

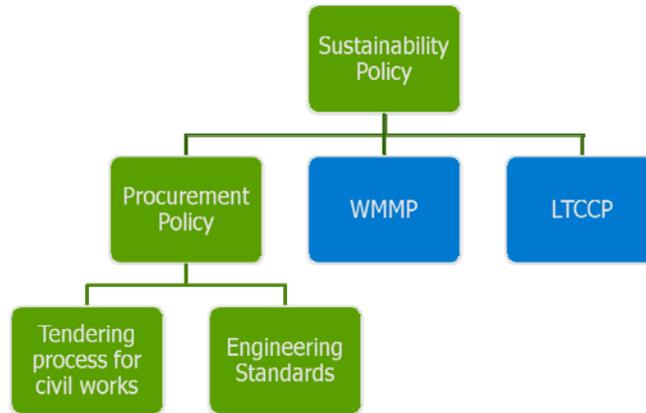


Figure E.S.1 – Influencing local government policies, plans and standards

- Waikato TA staff highlighted 21 council projects that use or have used recycled materials. The majority of these related to the use of composts/mulch and crushed concrete. No significant examples of specific large-scale projects in the Waikato were identified. Given that TA sustainability and procurement policies are not wide-spread in the Waikato region and the relatively low number of council projects identified, it is not likely that existing policies are stimulating the current use of these materials in council civil works. In addition, it was found that specific references or specifications in tender documents or council engineering standards/code of practices that allow or encourage the use of specific recycled materials are largely non-existent. It is noted, however, that policies and plans regarding waste minimisation and management have been adopted by all TAs, and these directly promote waste diversion and recycling of organic waste streams and construction wastes.
- In terms of the potential for use in council civil works projects, the four key materials assessed for this project were ranked as follows: **concrete, organics, glass, and timber**. This is based on the overall feedback provided by councils and industry representatives, together with consideration of waste quantities in the region, existing waste recovery experience, and current markets.

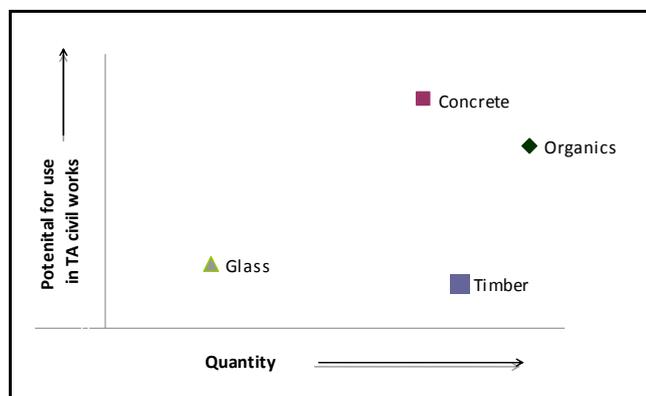


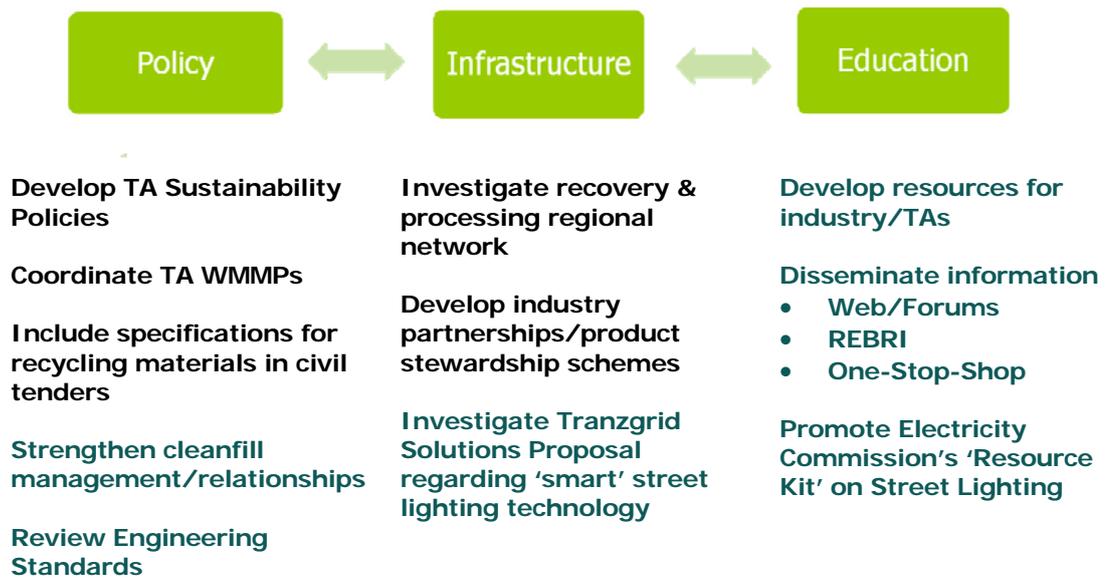
Figure E.S.2 – Key recycled materials: potential for use in Waikato civil works

- Crushed concrete is considered to have the highest potential for use in civil works contracts in the Waikato, given the relatively high quantities that are currently still being disposed of to cleanfill and landfill and the various emerging uses for this material in both the private and public construction sectors. There appears to be an emerging awareness and willingness within industry to use recycled aggregates as an alternative to hard rock and as an additive in ready-mix and other concrete products, although recovery efforts in the Waikato limit the supply and this supply limit has been identified as the key barrier to more widespread use.
- Compost and mulch products are readily available in the region; however their use in council projects is not significant (i.e. estimated to be 2000 tonnes/year based on information provided by TA staff). There are likely to be larger markets for compost products within the food-producing and agricultural sectors. Councils still have the potential to more directly specify compost/mulch products for use in a greater number of civil works contracts. This is highlighted by an example in Hamilton City Council's Development Manual, which specifies a locally produced compost product.
- The majority of glass recovered from the Waikato is, for the foreseeable future, likely to be consumed by Auckland's O-I glass recycling plant, especially given the plant's recently-increased capacity. The demand for glass aggregate in the civil sector is unlikely to compete with this existing market unless specified directly by TAs. In regards to timber, given the lack of large-scale recycling or recovery options for building timber, the potential for wide-spread use of recycled timber in council civil works in the Waikato is considered currently limited. Options to deal with this waste stream will require further research at a national level, and will likely require government, industry and community involvement.
- The availability of recycled products for use in civil works is the key barrier in the Waikato region for both councils and contractors. This is particularly important for concrete wastes but less critical for processed organic wastes which, in comparison, are readily available. The recovery of greater quantities of construction and demolition wastes from building sites, cleanfills and landfills is therefore critical in order to generate more quality product that can be used in construction and civil works. Other barriers identified by TAs related to provision of information on recycled materials and regulating cleanfills.
- The four initiatives that were raised the greatest number of times by TA staff as mechanisms to help overcome these barriers were: TAs/EW providing information to contractors on where to obtain a supply of recycled materials; changing cleanfill consenting/acceptance criteria; councils specifying the use of specific recycled materials in contract/tender documents and EW/Councils/MfE promoting specific case studies and specifications.
- In regards to energy efficient lighting, the majority of the TAs referred to having some experience with introducing more energy efficient technologies, although experience with trialing new emerging technologies (e.g. LEDs and/or new metal halide lamps) is limited to Hamilton City and South Waikato.
- None of the councils highlighted bulk-purchasing of lights as an appropriate role for EW, although Hauraki District Council's street lighting consultant considered that the purchase of regional control systems or negotiating rates with power companies at a regional level could be possible roles. The majority of councils thought EW's role should be via providing information to TAs, suppliers and contractors on the subject. This role would have a reasonable fit with promoting the soon-to-be-released

Electricity Commission’s local government ‘Resource Kit’ on street lighting and associated planned roadshow.

Recommendations

The following diagram summarises the key policy, infrastructure and educational initiatives recommended for further investigation and development. The initiatives highlighted in blue are those for which EW could take a leading role. All initiatives are discussed in more detail in Section 9.



Project background and objectives

Background

Every year, significant quantities of concrete, timber, glass, and organic materials are disposed of to landfills and cleanfills in and around the Waikato region. These materials have potential applications in civil works projects and, if recycled, could be put to beneficial use. Information on the quantity of these four specific materials currently generated in the Waikato region and sent to landfills and cleanfills is not easily attainable but it is estimated to be in the order of 150,000 to 200,000 tonnes per year².

In June 2009, Environment Waikato (EW) commissioned Waste Not Consulting to research Waikato territorial authorities' (TAs) procurement practices, especially in relation to civil works, to investigate whether current council policies and processes are stimulating, or could be used to stimulate, the use of these four recycled materials in civil works contracts. This research follows a recommendation made in a strategic review of waste flows and infrastructure in the Waikato conducted by SKM in 2007³. The project also investigates procurement policies and practices relating to energy efficient street lighting technology.

This project is based on the premise that local governments have the potential to stimulate markets for recycled materials, and the use of energy efficient lighting, by promoting their use in council-funded civil works projects.



Figure 1.1: Map showing Environment Waitako region and TAs

² Refer Table 4.1

³ Sinclair Knight Mertz (2007). Waikato Regional Waste Infrastructure Stocktake and Strategic Assessment. Report prepared for Environment Waikato. Technical Report 2007/44.

SKM's 2007 strategic review of waste flows and infrastructure report recognises the need to develop markets for recycled materials in order to encourage investment in waste recovery and processing initiatives. Gaining commitment from local governments to use recycled materials in civil works projects could be one way to develop these markets. Obtaining funding for initiatives that divert and process demolition or organic waste materials, is likely to be more easily justified if there are ongoing demands for these materials. The use of these materials in council civil works contracts is one possible market.

The Waikato region is made up of 12 territorial authorities (TAs) (refer Figure 1.1). Research for the project included surveying staff from 11 of the 12 TAs⁴, undertaking desk-top research and holding discussions with a select number of industry representatives.

Objectives

The main purpose of the project was to investigate how Environment Waikato and the region's TAs can better drive waste minimisation and local economic development from within their own organisations by using recycled materials in civil works projects. An additional goal was to investigate opportunities for Waikato TAs to achieve greater energy efficiency through improving street lighting design and technology.

The project aims to identify the barriers that impede the use of recycled materials and energy-efficient street lighting in civil works projects and the opportunities that exist. Opportunities identified through this project, may have potential to be developed as discrete initiatives that could be eligible for waste levy funding through the Waste Minimisation Act 2008. Environment Waikato could provide a facilitation role for many of these initiatives.

Terminology

There are several terms that are used frequently throughout this report. For ease of understanding, these are listed below with their respective meanings.

'TA' – refers to territorial authorities (i.e. city and district councils).

'recycled materials' refers predominantly to four key materials with potential for use in civil works projects:

- processed organic waste (e.g. compost, mulch etc for parks, reserves, land restoration etc)
- crushed concrete aggregate (for roading/footpaths etc)
- crushed glass aggregate (for roading/footpaths etc)
- recycled timber (for construction purposes etc)
- plus other specific materials identified as being a priority waste in a particular city/district.

'local recycled materials' - materials as identified above and sourced from within the Waikato region.

⁴ Franklin District Council was not included in this study given its boundaries overlap with the Auckland region and waste flows in this district are more closely influenced by Auckland's markets.

‘civil works’ or **‘physical works’** - council-funded works to construct, upgrade or maintain council infrastructure, including water services, roading, building services, parks and reserves.

‘energy efficient street lighting’ - primarily street lighting, but also traffic lights, that use energy-saving luminaires (i.e. lamp and light fittings) or control-systems.

Report structure

This report is structured in nine sections. Section 2 presents the research methodology used for this project. Section 3 provides context to the role of local government in regards to civil works and presents examples of New Zealand local government practices.

Section 4 provides background information on estimated quantities of waste materials in the Waikato region and describes each of the four materials and their associated potential for use in civil works. Section 5 provides background information regarding local government street lighting and the potential for better energy efficiencies.

Results from interviews conducted with staff from Waikato TAs are presented in Section 6 and feedback from industry representatives is summarised in Section 7. A summary of the key findings from the research is provided in Section 8. Recommendations for further actions are presented in Section 9.

Project methodology

Information gathered for this project was obtained through desk-top research, discussions with industry and local authority representatives, face-to-face meetings with key staff from each Waikato TAs, and surveys of staff from specific civil contracting companies.

Background research

A range of resources were reviewed in order to gather information on various aspects of the project, including: waste quantity data, relevant case-studies, local government procurement and sustainability processes and policies, and general industry research relating to the use of recycled materials in physical works and energy-efficient street lighting. Some of the key websites and reports that were reviewed included:

- Waikato Regional Waste Infrastructure Stocktake and Strategic Assessment (SKM, 2007)
- Local Government Magazine Street Lighting Technology Supplement 08/09 and associated September 2008 forum proceedings
- NZ Transport Agency Theme Audit of Street Lighting (NZ Transport Agency, 2007)
- Various websites including, Resource Efficiency in the Building and Related Industries (REBRI), UK's WRAP and AggRegain websites, and various NZ industry-body websites including, Aggregates & Quarry Association (AQA), Compost NZ, NZ Cement & Concrete Association, Glass Packaging Forum.

Discussions were also held with the following individuals from local government and industry to gather perspectives and background information:

- Simon Collins, Kevin Crutchley (Christchurch City Council) – sustainability practices and use of recycled materials in civil works
- Andrew Slack (Triple Bottom Line Solutions) – use of recycled materials in civil works by Palmerston North City Council
- Michelle Dawson (Waitakere City Council) – sustainability procurement processes and outcomes from a forum on street lighting held in September 2008.
- Michael Field (North Shore City Council) – sustainability practices within North Shore City Council
- Peter Fredricsen (Materials Processing Ltd) – industry perspective on supply and demand for recycled materials in the Waikato including concrete, timber and organics.
- Eric Souchon (HG Leach Ltd) – industry perspective on demand for recycled aggregates in Waikato region and local government involvement
- Campbell Robertson (Holcim (NZ) Ltd) – industry perspective on the manufacture of concrete products using recycled materials.

A request was also posted on the NZWaste email list in June 2009 asking for feedback from New Zealand council staff on the use of recycled materials in council civil works. The notice

was also included in a WasteMINZ newsletter sent out to members on June 2009 (refer Appendix B).

Face-to-face interviews and surveys

Meetings with council staff from 11 Waikato TAs were held during the week beginning 27 July 2009. Information was gathered initially via face-to-face interviews. A standard survey form was used to lead discussions and to obtain information and opinions on procurement policies and practices, current and potential uses of the four recycled materials in civil works and the amounts of each available in the district. Information was also sought on the number of street and traffic lights in each district and the use of energy-efficient technologies. One or more staff members were interviewed in person and/or by phone from each council. Responses to questions that could not be answered during interviews were obtained via phone and email conversations in subsequent weeks.

Given that staff roles and responsibilities vary between councils, the staff member responsible for waste minimisation/management was contacted first to identify other council staff to interview. The survey was divided into seven sections which in some cases required staff members from different departments to complete. Refer to Appendix A for a copy of the survey form.

- Section 1: Existing Sustainability and Procurement Policies
- Section 2: Existing Use of Recycled Materials in Civil Works
- Section 3: Potential Use of Recycled Materials in Civil Works
- Section 4: Tender Process for Civil Works Contracts
- Section 5: Quantity and Cost Data for Wastes & Recycled Materials
- Section 6: Energy Efficient Street Lighting
- Section 7: Role of Environment Waikato

Staff from three roading and utilities contractors operating in the Waikato were also contacted to answer questions specific to council contract work and obtain general information regarding current and potential use of local recycled materials in civil works. The contractors were chosen based on recommendations from council staff.

Data analysis and discussion

Results from the surveys with TAs and contractors, and responses from industry representatives were summarised and analysed. Where data were collated that could be used to generate data sets this was undertaken, however given the large gaps in the availability of empirical data this meant much of the analysis had to be based on the views and opinions of TA and contractor staff and/or general estimated figures. Using this information a regional perspective was developed, along with a clearer understanding of the issues faced by councils, contractors and supporting industries. Key challenges and opportunities were analysed to identify potential initiatives for future development. Recommendations to address these challenges and opportunities were then developed.

Local government context

Using recycled materials in civil works

Many of the largest-value contracts that local authorities’ tender out to external contractors are for capital works, and upgrades and maintenance works for key infrastructure assets (i.e. water services, roading, building services and parks/reserves). These contracts account for a significant proportion of councils’ annual budgets and require tonnes of raw and processed materials.

As an example, of a list of the top 60 contracts let by an Auckland council during the 2008/2009 financial year (each with a minimum contract value of \$450,000), over 50% of these contracts were for civil works. This highlights the potential influence council contract managers, engineers, and policy staff have on promoting sustainability through civil works contracts – either by reflecting councils’ overarching sustainability objectives or by promoting specific project requirements or outcomes, such as local economic development, minimising green-house gas emissions, increasing resource efficiency and/or waste reduction etc.

By incorporating these sustainability values into council procurement and tendering processes, material and resource efficiency can be promoted to council civil contractors. Allowing or specifying the use of low-impact construction techniques or the use of recycled or low-embodied materials in civil works projects can help councils achieve desired environmental and waste minimisation outcomes. The diagram presented in Figure 3.1 illustrates the main council policies, plans, standards that can influence these types of sustainable outcomes.

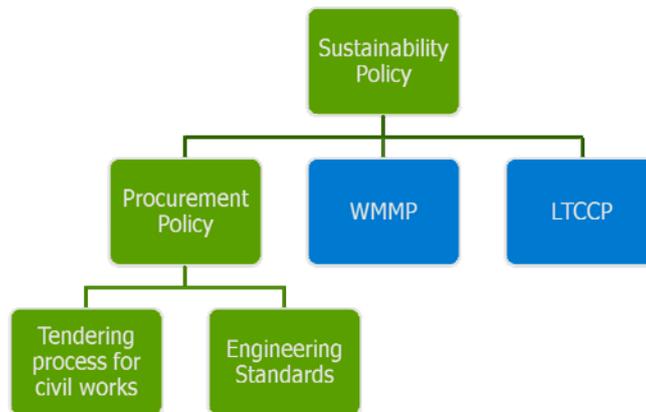


Figure 3.1: Council policies/plans/standards that have influence on sustainable procurement in civil works

Desk-top research revealed no significant New Zealand studies that have investigated the role of local government with respect to stimulating markets for recycled materials in civil works contracts, however a couple of recent references from Australia highlight it is an area with further potential. In 2008 the Western Australian Department of Environment and Conservation published a report by ACIL Tasman Pty Ltd, entitled Civil Works and Recycled Content (ACIL, 2008). The report evaluated a range of different policy options (e.g. economic incentives, regulation, educational and funding mechanisms) that could be used to increase the amount of recycled content in civil construction projects.

According to a June 2009 newsletter released by ECO-Buy Ltd (a non-profit centre of excellence in Environmental Purchasing, funded by the Department of Sustainability & Environment and Sustainability Victoria), the state of Victoria is lagging behind other parts of Australia in the use of recycled material. They report a study has recently been commissioned to identify what others are doing nationally in Australia and what the low hanging fruit may be for improvements by local government in Victoria⁵.

Council policies, strategies and plans

Various local government strategies, policies and plans influence the use of recycled materials in civil works projects, as illustrated in Figure 3.1. The types of policies and plans that a council adopt help establish a mandate for and, in many cases, funding, for specific council projects and initiatives.

Some Council plans are required by legalisation (e.g. Waste Minimisation and Management Plans (WMMP) under the Waste Minimisation Act 2008 or Long Term Council Community Plans (LTCCP) under the Local Government Act 2004) which are critical to not only communicate a council's priorities, but to also set out an action plan for achieving desired outcomes. For example, a WMMP can set a plan for implementing specific waste minimisation initiatives that council and its community commit to (e.g. increasing the recovery of C&D waste materials at council construction work sites), which align with the council's Long Term Council Community Plan.

Research by a New Zealand collaborative research consortium, Beacon Pathways Ltd, on local government's role in promoting sustainable buildings, suggests that many people would find it easier to build and renovate their homes sustainably if council policies were more supportive of sustainable design (Beacon Pathways Ltd, 2009). The same is likely to be the case for using more sustainable techniques or recycled materials in the construction of council infrastructure such as roading and water services.

Council land development standards

Many councils in New Zealand use the national standard NZS 4404:2004 "Land Development and Subdivision Engineering" as the default code for the design and construction of an array of public and private civil works including roading, water-services and general land development.

This national standard is often adopted and modified by councils, and is referred to by various names, such as a 'Code of Practice' (e.g. Thames Coromandel Code of Practice for Subdivision and Development), an 'Infrastructure Design Manual' (e.g. refer to North Shore City Council's Infrastructure Design Manual), or an 'Engineering Standard' (e.g. Rotorua District Council's Civil Engineering Industry Standard).

According to research by Beacon (Beacon Pathways Ltd, 2009), "*codes of practice have not traditionally included alternative (more sustainable) options for infrastructure, although this is beginning to change. Introducing changes to the codes is procedurally quite straightforward, through a council decision; however, any changes need to be rigorously developed and specified, to ensure the results on the ground will be robust*".

The standards used by the Waikato TAs are presented in Table 3.1. Hamilton City Council's standard is referred to as the Hamilton City Council Development Manual and is adopted by 6 other Waikato councils.

5

<http://www.ecobuy.org.au/director/publications/enewsletters.cfm?itemID=E77EFBD7EDC6E78D6DA046E41B70F971&articleID=E6D5BDEDD5F8D29BB2F42113CBD4A648>

Table 0.1 – Engineering Standard adopted by councils in the Waikato

Waikato TA	Engineering design standard
Thames-Coromandel	TCDC Code of Practice for Subdivision and Development (Engineering Standards), Version 2003 (note: is to be updated this year)
Hauraki	Adopted HCC Development Manual, Version 2009
Matamata-Piako	Adopted HCC Development Manual, Version 2009
Waikato	Adopted HCC Development Manual, Version 2009
Hamilton City	HCC Development Manual, Version 2009
Waipa	Adopted HCC Development Manual, Version 2009
Otorohanga	Adopted HCC Development Manual, Version 2009
Waitomo	Adopted HCC Development Manual, Version 2009
Taupo	Code of Practice - Development of Land 2001 (note: 2009 draft out for consultation)
South Waikato	SWDC Code of Practice for Subdivision and Development, Version 2006
Rotorua	RDC Civil Engineering Industry Standard, Version 2004

The national standard NZ4404:2004 does not include specific references to the use of recycled materials in civil construction works or the energy efficiency of street lighting; however some councils are beginning to address these limitations by developing their own standards. An example is Taupo District Council which is currently updating/replacing its Code of Practice with a new code that is more focused on objectives and performance than on strict rules and compliance. According to the council’s website, *“this will allow for more flexibility and innovation. It will allow contractors to improve on current standards by finding innovative ways to achieve results. The idea is that to comply a contractor can follow the NZ Standards, or find a more innovative approach”*⁶

Waitakere City Council’s Code of Practice — City Infrastructure and Land Development includes a useful reference in Section 3.0 of the Administration Manual stating *“Waitakere City Council encourages alternative solutions to those described in this code where this will result in better solutions. Council especially encourages developers to consider environmentally sustainable approaches and Council officers are available to discuss these. There may also be situations where the code can not be applied. When proposing solutions different to this code the following”*.

A more specific example is in North Shore City Council’s Infrastructure Design Manual, which allows for the use of crushed concrete as a bedding material in stormwater pipe construction i.e. *“When granular material is specified for bedding, this shall be hard, clean, chemically stable crushed stone or **crushed concrete**”*.

⁶ Refer to <http://www.taupo.govt.nz/PoliciesPlans/Draft-Policies-and-Plans/Code-of-Practice/>

Examples of NZ local authority procurement practices for civil works

A selection of local authorities in other regions were contacted to find out what recycled materials they were using in civil works contracts and whether any procurement or sustainability policies were being used to drive or encourage their use. The following summaries provide an outline of some of the more interesting initiatives and ideas.

Palmerston North⁷

All glass from the region is currently being crushed by Higgins Contractors and used as aggregate for roading base. Although Palmerston North City Council has a Procurement Policy encouraging the use of local materials the main driver behind this initiative was funding from the Glass Packaging Forum which was used to investigate glass options for the region.

The initiative is unlikely to continue however, as demand for glass cullet for glass recycling has increased since glass manufacturer O-I's (Owens-Illinois, Inc) decision to build a new glass furnace at its Auckland plant. As a result Council is currently considering a separate glass collection to improve the quantity, quality and price received for glass collected from the region so that it can be sent to Auckland for recycling into new glass bottles and containers.

Christchurch City Council⁸

Christchurch City Council has instigated a range of measures aimed at recovering and utilising recovered materials. Council signed off a new sustainability policy in 2008 which is expected to flow through the whole organisation and start driving procurement. Contracts for certain infrastructure projects currently require tenderers to follow REBRI guidelines, but in the future all contracts will have sustainability criteria built into them.

Another key initiative has been Christchurch's Cleanfill Bylaw which has tightened the acceptance criteria and management of the city's cleanfills. By licensing the cleanfill sites and controlling the types of materials accepted, specific materials are able to be more successfully diverted to more beneficial uses.

Council also actively encourages the private sector through its Target Sustainability programme which offers advice and consultancy services to businesses. Around 100 businesses are signed up to the programme and case studies are posted on the Target Sustainability website⁹. Businesses can also use the services of the Waste Exchange to exchange waste materials - using the exchange website or the hands-on services of two coordinators¹⁰.

Council worked in partnership with Fulton Hogan between 2003 and 2005 to construct what is often referred to as New Zealand's "First Recycled Road". For this project, crushed concrete and recycled asphalt were chosen as the most appropriate materials to use in construction of the road – both readily available and commonly used in other parts of the world. The road was completed in June 2005 and is made up of 3000m³ of concrete, including a sub-base of AP65 crushed concrete, and a base of AP40 crushed concrete. The top layer was made of recycled asphalt, using material from the millings of other job sites that was reheated and constituted into 15mm-thick asphalt.

⁷ Pers. comm. with Chris Teo-Sherill (Palmerston North City Councillor) and Andrew Slack (Triple Bottom Line Solutions, Palmerston North) June 2009

⁸ Pers. comm. with Simon Collins and Kevin Crutchley, Christchurch City Council, June 2009

⁹ www.targetsustainability.co.nz

¹⁰ www.terrano.org.nz/



Case Study 3

Golf Links Road, Christchurch
New Zealand's First Recycled Road

Internationally, recycled roading materials are widely used. Previously regarded as waste products, the new trend has demonstrated that certain recycled materials, particularly crushed concrete basecourse, are cost-effective and can outperform natural materials.



Golf Links Road, New Zealand's first recycled road in development.

In late 2003, Fulton Hogan sought the support of Christchurch City Council to help showcase the attributes of recycled materials in New Zealand. The objective was to minimise environmental impacts and encourage sustainable outcomes in the roading industry. A 300m-long stretch on Golf Links Road in Christchurch was chosen as the site for New Zealand's first "green" road, using 100% recycled materials.

Concrete³ case-study - New Zealand's first recycled road

A more recent example from Christchurch is the use of crushed concrete in the construction of the Southern Motorway, as described in the article below. The Southern Motorway extension project is New Zealand's largest crushed concrete contract and has involved stockpiling crushed concrete along the route of the motorway extension prior to construction. Council staff commented that so much of the material has been stockpiled that it is affecting price and availability in the region.

Recycled crushed concrete for new Christchurch Southern Motorway

A NZ Transport Agency decision to use recycled crushed concrete in the construction of the new Southern Motorway will have positive environmental spin offs for the Greater Christchurch area.

The Christchurch Southern Motorway project will be the most significant roading project to be carried out in the Greater Christchurch area in the next few years and will require a lot of aggregate to construct. Work on this \$180 million dollar project is scheduled to start in March 2010.

NZTA highways and operations Canterbury-West Coast regional manager Colin Knaggs says there are real pressures on construction aggregate sources within Greater Christchurch with reports suggesting there is approximately 10 years supply available.

The NZTA's decision to use recycled crushed concrete will not impact on the project cost which will be cost neutral when compared to getting the same quantity of aggregate from usual sources like quarries and riverbeds.

In 2007 the NZTA was granted consents to stockpile 60,000 cubic metres of recycled crushed concrete at locations near the site of the new Southern Motorway. Site preparation works for the storage site have been completed and material is being stockpiled as it becomes available from demolition sites around Christchurch.



IMAGE: NZ TRANSPORT AGENCY

Some of the stock piled recycled crushed concrete that will be used in the construction of the new Christchurch Southern Motorway.

Article on Christchurch Southern Motorway from Contractor Magazine, July 2009

Council have also been active in using recycled materials for several council infrastructure projects. Council's venue management company, VBase, is the owner of the new AMI sports stadium and is also part of the Target Sustainability programme. During the redevelopment of the site and the demolition of one of the stadium's stands, VBase worked in partnership with its project manager (ProDirections) and demolition contractor (Southern Demolition), to recover and recycle close to 100% of the material. This included crushing and reusing 6000 tonnes of concrete from the old stand, and using the materials in new foundations, roads and car parks at the new development. Recovered stadium seats were given to charity or fund-raising activities, or sold by the demolition contractor or via Trade Me, while plasterboard was

crushed and reused as a soil conditioner on farms. Metal was sent to local scrap metal dealers for recycling, and treated timber was prepared for resale at the ECO Recycling Park¹¹.

Other specific initiatives relating to recycled materials in Council works as highlighted by Council staff included the following:

- **Crushed Concrete:** - This is the main recycled materials being used in civil works contracts in Christchurch. Council is currently working on a project to measure the amount being used and is promoting its use in specific projects. Aggregates have been plentiful and cheap in Canterbury however constraints are beginning to impact extraction rates.
- **Timber:** - Council is encouraging the reuse of timber in building projects through education. A recent Target Sustainability project with eight house building company participants will be featured on the Council website in the near future.
- **Organics:** - Christchurch moved to a three-bin kerbside collection system in December 2008 and is composting foodwaste and greenwaste in a tunnel system. Council's Parks Department is working with the compost facility operator to use some of this material.
- **Plasterboard:** - This is the next most significant recycled material that Council believes needs to be dealt with. Currently a local operator crushes it and applies it to pasture, and Council's cleanfill by-law stipulates that no more than 2% of a load can be plasterboard. However Council acknowledges that uses have to be developed for materials before banning them outright from landfills and cleanfills.
- **Glass:** - There is little use of glass in civil works in Christchurch.

North Shore City Council and Waikare City Council¹²

North Shore City Council's Corporate Sustainability Policy drives internal responses to procurement issues and its Procurement Policy and the associated tendering process drives external responses. Tendering for specific projects involves a four-phased process with a 70% weighting on non-financial attributes and 30% on financial attributes. The four phases are as follows:

- Phase 1: Non negotiable (specific requirements which could include sustainability measures, Health and Safety etc)
- Phase 2: Sustainability assessment framework (25% of the 70% weighting)
- Phase 3: Other non financial attributes
- Phase 4: Financial attributes (30%)

A tenderer needs to gain at least 50% of the assessment points in Phase 2 to go through to the next stage of assessment. The top few tenderers that get through the first three phases go on to Phase 4 for financial evaluation. The tenderer that scores highest across all attributes is awarded the contract – which is not necessarily the one that offers the cheapest price.

¹¹ Refer case-study at www.target sustainability.co.nz/CaseStudies/AMIS Stadium.pdf

¹² Meeting with Michael Field (Sustainability Manager) and Joanne Tunna (Corporate Sustainability Coordinator), July 2009.

According to discussions with Michelle Dawson (Corporate Sustainability Manager, Waitakere City Council), Waitakere City Council is currently developing a questionnaire that it proposes to include as part of its tendering process. The questionnaire seeks information on tenderers' capabilities and track-record on sustainability issues. Results from the questionnaire would form part of the sustainability assessment and non-financial weighted attributes of the tender¹³.

Other approaches highlighted by Michael Field (Sustainability Manager, NSCC) helping to lead to greater environmental or sustainable outcomes are as follows:

- **Project Design.** Design is a key point of influence with Council's Sustainability Manager sitting down with Council engineers on big projects to ensure sustainability issues are addressed.
- **Active monitoring.** This is essential for getting compliance. Fines and the risk of losing projects ensure contractors comply. Without monitoring, contracts always fall to the lowest common denominator. Council pays more for contracts than neighbouring councils because of this.
- **Job descriptions.** A condition of staff employment contracts is that staff follow all Council policies – which include procurement/sustainability policies
- **Contracts.** There is a standard environmental statement in contracts.
- **Education/training.** If Council decides to take a leadership position then it has to step up and help its contractors meet the standard through education and training.

Further examples from local governments in New Zealand

The most useful example raised by council staff in response to a request sent out via an email on the NZWaste ListServe and in a WasteMINZ newsletter came from Hastings District Council. Hastings District Council has been working on a number of trials using recovered waste material with the intention, depending on outcomes, to specify these materials in future contracts. One recent trial in early 2009 involved using crushed concrete as a sub-base for a car park site in Hastings. The purpose of the trial is to reduce construction costs while utilising a recycled material which is available locally. A second example, involves a Paintcrete trial which incorporates waste paint materials into concrete products to be used in driveway or footpath construction¹⁴.

A website search also highlighted that Whakatane District Council has recently launched a project to crush concrete waste dumped at the town's Recycling Park. The crushed concrete is to be used as base course in road construction and has reportedly saved Whakatane ratepayers nearly \$7,000 in 2008. At least 1,600 tonnes have been recovered, reducing the demand for roading construction materials. "By diverting this material into other uses, the Council is contributing to meeting goals in its Zero Waste Strategy. This waste would otherwise have found its way to the landfill", according to the Council¹⁵.

Rotorua District Council has been crushing concrete for a number of years and is a pioneer in the field. Part of the reason for Council's early involvement was that Rotorua quarries cannot produce enough high quality aggregate and it has to come from outside the district. However local crushed concrete provides a high quality, cost effective alternative and is used to fill the

¹³ Meeting with Michelle Dawson (Sustainability Manager), July 2009.

¹⁴ Pers. Comm. D. Salmon, Hastings District Council

¹⁵ <http://www.infonews.co.nz/news.cfm?l=1&t=0&id=23285>

gap. Council charges a gate fee for accepting demolition concrete and pays a contractor to process the material. It then receives a royalty for every tonne of crushed product sold making concrete recovery and processing a breakeven activity.



Concrete crushing machine at Recycling Park on Te Tahī St, Whakatane¹⁵

Recycled materials in civil works

Quantities of four key waste materials in the Waikato

This project focuses on utilising four key waste materials in civil works i.e. concrete, glass, timber and organic material. These four materials were chosen by Environment Waikato as they have potential for use in council civil works projects and because they make up a significant proportion of the national waste stream.

To determine the likely quantity, distribution and availability of these materials in the region, quantities were estimated using waste-per-capita figures obtained from consolidated waste quantity and waste composition data. Waste-per-capita figures and waste to landfill composition data are taken from a Ministry for the Environment report (MfE, 2007) and composition figures for cleanfill are taken from a paper by Slaughter (2006).

Table 0.1 - Estimated waste quantities disposed of and diverted from landfill and cleanfill, Waikato region

		Waste to landfill & cleanfill	Organics	Concrete	Glass	Timber
Per-capita estimates (T/person/yr)		1.52¹	0.190²	0.099³	0.015⁴	0.117⁵
Council	Population					
Thames-Coromandel	25,938	39,500	4,900	2,600	400	3,000
Hauraki	17,190	26,200	3,300	1,700	300	2,000
Matamata-Piako	30,480	46,400	5,800	3,000	500	3,600
Waikato	43,959	67,000	8,400	4,400	700	5,100
Hamilton City	129,249	197,000	24,600	12,800	2,000	15,100
Waipa	42,501	64,800	8,100	4,200	600	5,000
Otorohanga	9,075	13,800	1,700	900	100	1,100
Waitomo	9,441	14,400	1,800	900	100	1,100
Taupo	32,418	49,400	6,200	3,200	500	3,800
South Waikato	22,644	34,500	4,300	2,200	300	2,600
Rotorua	65,901	100,400	12,600	6,500	1,000	7,700
Total	428,796	653,000	81,700	42,400	6,500	50,100
Proportion of total waste to landfill/cleanfill (%)			13%	6%	1%	8%
Estimated quantity of four key materials (tonnes)			180,700 tonnes			
Estimated quantity diverted from landfill/cleanfill (SKM, 2007)			74,000	30,000	10,500	No data

1. Approx. 3.2million tonnes to landfill and average of 3.2million to cleanfill (based on figures from MfE, 2007). Using a 4.2million NZ population.
2. Organic wastes is based on 23% of landfill composition (MfE, 2007, predominately greenwaste and food waste) and nominal 2% of cleanfill (assumed figure). The figure excludes sewage/biosolids wastes.
3. Concrete waste is based on 3% of landfill composition (MfE, 2007, assume concrete represents a quarter of the MfE SWAP 'rubble' category, given majority of rubble category is soil) and 10% of cleanfill (based on the 15% proportion from only cleanfill composition data available from Christchurch research, Slaughter 2006, but reduced given Waikato region is less urbanised thus assume less concrete waste).
4. Glass waste is 2% of landfill composition (MfE, 2007) and 0% of cleanfill (based on only cleanfill composition data available, Slaughter (2006)).
5. Timber waste based on 7% of landfill composition (MfE, 2007, assume half of the MfE SWAP 'timber' category, given half is likely to be MDF/hardboard/furniture etc); and 8.3% of cleanfill composition (based on Slaughter, 2005 for treated and untreated timber categories).

Given the lack of detailed waste data for the Waikato region, a desk-top search of other relevant data produced no further information beyond that already held by Environment Waikato. The majority of Waikato waste data come from Solid Waste Analysis Protocol (SWAP) studies conducted by Waste Not Consulting for individual councils in the Waikato and Environment Waikato over recent years, together with a summary of waste flows conducted by SKM in the 2007 report, *Waikato Regional Waste Infrastructure Stocktake and Strategic Assessment*.

The SKM report does not present individual quantities for the four key materials disposed of to landfill/cleanfills, however the study did estimate the total quantity of Waikato waste disposed of to cleanfills and landfill was 589,000 tonnes in 2006. This figure is partly based on per-capita figures and partly based on estimated quantities from industrial and municipal waste streams. It is noted that the estimated figure in Table 4.1, as based on per-capita waste rates using MfE composition data, is approximately 60,000 tonnes higher than 2006 estimate, although both figures provide an general indication of the likely order of magnitude of total waste disposed to landfill and cleanfill.

The quantities for the four key materials are presented in Table 4.1 in order to provide a general impression of the likely order of magnitude of these materials available in the Waikato (i.e. a total of 180,700 tonnes). Further, these estimated quantities indicate the likely potential for further waste diversion. It is stressed that these figures are not validated in any way other than being calculated from the data obtained from the references stated. The quantities are estimates only and based on per-capita quantities and therefore do not take into account the range of factors that influence waste generation and disposal (e.g. economic changes, industry activity, landfill charges etc). The quantity of waste going to cleanfills fluctuates significantly given the materials disposed of at these sites are typically generated by construction and demolition activities which are heavily influenced by seasonal and economic factors. Cleanfill sites are also significantly less regulated than landfill sites and often operate over temporary periods. Very limited data is available on the number of sites located in the Waikato and the quantity and composition of wastes disposed of at these cleanfill sites. Research undertaken for the MfE in 2008 reported there are 15 consented cleanfill sites in the Waikato (SKM, 2008), however information on cleanfill composition is not available for the Waikato.

Despite this lack of hard data, it is estimated that concrete, glass, timber and organics make up about a third of the total waste going to landfill or cleanfills in and around the region. This represents a significant diversion potential, particularly for concrete, organics and timber. It is noted that biosolids are not included in the estimated quantity of organic wastes going to landfill given that MfE national composition data classifies biosolids as 'potentially hazardous', using the standard SWAP (Solid Waste Analysis Protocol) categories. If biosolids were included in the quantity of organics waste being disposed to landfill, the total tonnage would be significantly higher than the 81,700 tonnes estimated in Table 4.1.

Estimated diversion quantities for three of the four key materials are also presented in Table 4.1, based on SKM estimates. These diversion figures show already a significant quantity of glass is diverted from landfill (i.e. estimated 10,500 tonnes). The quantity of glass estimated to be currently disposed to landfill or cleanfill is 6,500 tonnes which therefore represents almost half that which is already diverted. According to one of the main concrete crushing operators in the Waikato region, the quantity of concrete diverted from landfill is likely to be closer to 45,000 tonnes¹⁶ instead of the 30,000 tonnes reported by SKM in 2007.

¹⁶ Pers. Comm. P. Freidricson, Materials Processing Ltd, July 2009.

Crushed concrete

Description and uses

Concrete is an important and common construction material consisting of coarse and fine high-quality, well-graded aggregates mixed with cement and water. To generate a reusable aggregate from waste concrete, the concrete must be crushed, washed and screened and any steel reinforcement removed. This processing must be undertaken using specialised demolition equipment and skills. Various terms are used to describe crushed concrete, including recycled waste concrete, recycled concrete aggregate (RCA), recycled crushed concrete (RCC) or reclaimed concrete material (RCM).

Crushed concrete can be reused as an aggregate in numerous applications, including: sub-base or basecourse aggregate¹⁷ in the construction of roads, footpaths, driveways etc; bedding material for pipe-work construction; general fill or drainage material; or aggregate material for use in ready-mix concrete or other masonry products.

The cement that remains in the crushed concrete aggregate is known to provide an additional beneficial binding property not present in natural aggregates. According to a 2006 report by New Zealand Transport Agency (formerly Transit NZ), entitled, *Best Practice Guidelines for the Use of Alternative Materials and Processes in Road Construction With Respect to Environmental Issues* (NZ Transport Agency, 2006), if properly processed, recycled concrete can perform extremely well in pavement base and sub-base applications. This is as a result of the high degree of angularity of the aggregate particles and a tendency for the residual cement to be re-activated. Both these factors contribute to the material achieving relatively high shear strength. The report notes that recycled concrete can also be used as bulk fill, however its premium mechanical properties are not efficiently utilized in this bulk fill application (NZ Transport Agency (Transit), 2006).

In an abstract submitted by Zhang et al. for an upcoming New Zealand concrete industry conference in 2009¹⁸, it is noted that the use of recycled concrete in road construction, while limited, is more common in New Zealand than the use of aggregate in the manufacture of concrete products. The abstract highlights results from a recent research study that indicate recycled concrete aggregate is a successful alternative to natural aggregates in the production of ready-mix concrete. This research study therefore highlights that crushed concrete, if suitably processed, has several potential beneficial uses beyond just being a hard-rock aggregate material for road and drainage works.

Demand in civil works

Recycled aggregates are not only applicable to be used in the public civil works sector but are equally reusable within New Zealand's overall building and construction sector. Current figures suggest the annual demand for aggregate in New Zealand equates to 11 tonnes per capita annually¹⁹ or approximately 45 million tonnes. Using the estimated annual quantity of waste disposed of to cleanfills and landfills in New Zealand and respective estimated composition data (as per the references stated in Table 4.1), provided all waste concrete was able to be recovered for processing and reused, the quantity would represent less than 5% of

¹⁷ **Subbase** roading materials generally consist of lower quality, coarse-graded (up to 65 mm) aggregates laid on the subgrade to make up additional pavement thickness, prevent intrusion of the subgrade into the basecourse, or to provide a working platform. The **basecourse** layer acts as the main load-bearing and strengthening component of the pavement structure and serves to reduce the stress applied to the subgrade layer and provide drainage for the pavement structure. The basecourse is usually constructed from crushed aggregates (up to 40 mm) and can, if necessary, be strengthened by stabilisation.

¹⁸ http://www.theconcreteconference.co.nz/abstracts/session_2a.aspx

¹⁹ Refer www.winstoneaggregates.co.nz.

New Zealand's annual aggregate demand. By comparison, in the UK, it is estimated that of the approximately 275 million tonnes of aggregates used each year, around 70 million tonnes (approximately 25%) are derived from recycled or secondary sources²⁰.

While the quantities of crushed concrete and other suitable waste aggregate materials are not likely to be significant in comparison to New Zealand's quarry supplies, there is recognition within the waste and aggregate industries that its potential is yet to be realised. A paper on recycled concrete use in New Zealand, presented at the 2008 Concrete and Cement Association New Zealand conference, concluded that whilst some of the overseas drivers for processing and using recycled concrete do not transfer to New Zealand there "is nonetheless a growing and significant appetite for recycled concrete aggregate" (Kirby and Gaimster, 2008).

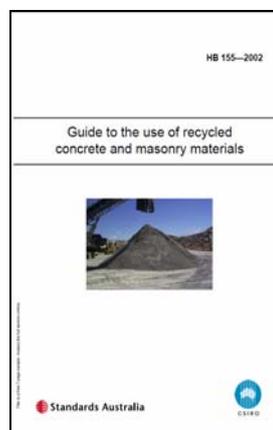
This increased interest is also reflected in the various references made to recycled aggregates included on the websites of many of New Zealand's largest concrete manufacturing and aggregate companies, including Holcim (NZ) Ltd, Atlas Concrete Ltd, Firth NZ Ltd, Stevensons Ltd and Winstone Aggregates. The establishment of an industry-wide initiative, Concrete³ (www.sustainableconcrete.org.nz), is also an indication of increased industry involvement.

Key literature and resources

In New Zealand, since 2006, recycled crushed concrete has been included as an acceptable basecourse material for use in road construction, according to Transit New Zealand's specification TNZ M/4. The New Zealand Transport Agency (formerly Transit NZ) published its "Specification for Basecourse, TNZ M/4:2006" together with the accompanying TNZ M/4 Notes. The TNZ M/4 sets out the requirements for sub-base and basecourse aggregate for use on state highways and other heavily trafficked roadways.

Although the TNZ M/4 is not directly applicable to roads with lower volumes of traffic (i.e. those roads that territorial authorities are directly responsible for), the specification nonetheless can be referred to in councils' Code of Practices for roading designs. The national specification gives further weight and justification to designers, engineers and contractors for the use of recycled concrete in roading construction. Crushed glass is also included in the TNZ M/4 specification.

In Australia, a national guidance document has existed since 2002, regarding the use of recycled concrete in a range of uses beyond just roading applications. No equivalent standard exists for New Zealand.



²⁰ Refer to www.aggregain.org.uk/sustainable_2.html

Australian standard for recycled concrete and masonry materials

In part a response to TNZ M/4, the Aggregate and Quarry Association²¹ (AQA), produced a *Best Practice Guideline for the Supply of Recycled Concrete Materials for Use in Pavements and Other Civil Works*. The guideline sets out recommendations for the supply of recycled materials for roading, fill and drainage applications, such as the source of waste materials and quality (e.g. “The Producer will ensure the materials do not contain asbestos. Recycled materials shall consist of particles crushed from concrete, brick, masonry roof tile, concrete or terracotta, ceramic tile or rock.”). The Guideline also covers recommended quality assurance procedures when manufacturing, handling and stockpiling aggregates for road surfacing work.

TNZ M/4 Notes state that recycled concrete does have the potential to produce high pH leachate and runoff if the cement fines are released from the aggregate. It recommends that recycled concrete aggregates should be washed to remove dust from the coarse particles. Transit TNZ M/4 Notes also reports issues with respect to the formation of tufa-like precipitates in some recycled concrete aggregates. The precipitate originates from the reaction of carbon dioxide with calcium oxide in the cement.

Recent research being undertaken in Canterbury is investigating the potential for carbon-dioxide to be reabsorbed when crushed²². The results from testing various New Zealand samples indicate that most of the carbon dioxide emissions from calcination of limestone during cement manufacture appear to be reabsorbed (specifically when aged concrete is crushed for recycling).



Billboard advertising Concrete³ website and CO₂ absorption properties

The United Kingdom’s government-funded Waste & Resources Action Programme (WRAP)²³ manages a comprehensive “Aggregates Programme”. Funding for the programme is supplied by Defra (Department for Environment, Food and Rural Affairs), the Aggregates Levy Sustainability Fund and the Scottish Executive. By providing free information and support, the Aggregates Programme raises awareness of the opportunities that exist for recycled and secondary aggregates and addresses barriers to their use. The programme “*aims to reduce the demand for primary aggregates by promoting greater use of recycled and secondary aggregates*”.

There are multiple resources and tools that are likely to be useful to New Zealand’s recycled aggregate emerging sector. The programme’s website, www.aggregain.org.uk, provides comprehensive information and tools, including supplier directories, quality standards, life-

²¹ Which “endorse the recycling of concrete and aggregates as environmentally and financially responsible use of NZ’s resources” <http://www.aqa.org.nz/Environment.asp>

²² http://www.holcim.ch/NZ/EN/id/1610655915/mod/5_6/page/editorial.html

²³ www.wrap.org.uk and www.aggregain.co.uk

cycle analysis tools, CO₂-emission calculations, and interactive diagrams to display the various uses for recycled aggregates.



WRAP's AggRegain website

Processed organic wastes

Description and uses

For the purpose of this report, processed organic wastes include food wastes, garden wastes, biosolids (or sewage sludge), and other carbon-nitrogen rich materials suitable for use as feedstock in composting (or equivalent) processes.

Organic materials can be processed aerobically to form different products – notably compost and mulch. Compost is a fully processed, stable product that can be used to improve the structure and fertility of soils and/or as a mulch to suppress weeds and retain moisture. Mulch is a partially processed product (for example it may be just shredded green waste) that has not been fully decomposed and is suitable mainly for weed suppression and moisture retention. Mulch can be produced as simply as cutting down vegetation, shredding it and leaving it in situ (possibly with the addition of nitrogen to reduce nitrogen loss). By contrast composting requires organic material to be taken off site for processing which may take a period of weeks or months. There are many different composting technologies ranging from simple windrow systems to fully enclosed mechanised systems.

Organic materials can also be processed anaerobically (in the absence of oxygen) to form methane and carbon dioxide rich biogas suitable for energy recovery, plus a digestate which can be used as a fertiliser/soil amendment. Anaerobic systems tend to be capital intensive and suited more to urban settings and/or specific organic waste streams. A number of councils in New Zealand are considering city-wide food and green waste collections which will result in the production of much larger quantities of compost than are currently available.

Demand in civil works

There is scant data available on the demand for compost-type products in New Zealand in civil works sector. The largest market is likely to be in the agricultural/horticultural sector which to date has not used large quantities in comparison to conventional fertilizers and soil amendments. This is in part because New Zealand has relatively young soils with high organic

matter content. In countries with older soils, like Australia, greater efforts have been going into finding ways to use compost in the agricultural/horticultural sector. With increasing pressure to conserve water and reduce inorganic fertiliser applications in New Zealand however, the demand from this sector is likely to increase over time. Impeccable quality control is a prerequisite for all food producing industries and the introduction of the New Zealand Compost Standard NZS 4454:2005 is a step in the right direction towards increasing demand from the sector.

In 2004, consultants URS investigated end-use markets for compost products in the Auckland, Bay of Plenty and Waikato regions, and listed approximately 20 existing and potential end markets. Three of these 20 markets related to applications in local government civil works: topsoil/soil amendment/mulch for road and construction work; topsoil/top dressing for turf/soil amendment for establishing turf and landscape plantings in parks/reserves and cemeteries; and ground covering to retain moisture, reduce erosion and filter stormwater in civil construction works.

The research concluded that the domestic (i.e. retail bag) market is an existing but mature market with limited, if any, potential for further development. Horticultural, organic farming and bio-agricultural farming are markets that, although existing, are currently small and offer potential for further growth. Further, the study reported that the “*greatest potential for market development is for bio-agricultural farming, forage and field crop growers, and public works departments.*” These markets were considered undeveloped and potentially requiring high volumes (URS, 2004).

Increasing the demand for compost-type products via civil works contracts is therefore expected to be able to soak up some of the existing and future supply but the capacity of local government civil works to use more product is not yet well understood in the Waikato region. According to one Auckland council staff member, council civil works contracts would use less than 1% of the compost produced from the districts organic wastes. One-off projects like major roading and building infrastructure developments will have the potential to use large quantities but intermittent demand is a problem when the supply of raw materials is ongoing and cannot be increased or decreased to suit.

New housing and business developments have the potential to use large quantities of compost products as long as there is growth in the construction industry. Council specifications for subdivision design and associated landscaping requirements may be one way of increasing demand for a locally produced product.

Crushed glass

Description and uses

Glass is typically recovered for recycling via council-funded kerbside collections and drop-off centres, commercial recycling collections, and transfer stations or recovery centres. The only glass that can be collected via household collections in New Zealand is in the form of bottles and jars. These materials are recovered and onsold to various markets for further processing, but the majority of the recovered glass is manufactured into new glass bottles and containers. Window glass can be used as raw material for insulation products (e.g. Pink Batts) but is sourced from glass window factories and not from post-consumer sources.

Alternative recycling options include, being crushed and used as a sandblasting or pool filtration material, a mulch for vineyards (reflecting light and suppressing weeds), or as a construction aggregate. Terranova in Christchurch has developed several uses for crushed

glass in an effort to develop solutions for the stockpiles of recovered glass in the South Island²⁴.

Where economic and environmental factors favour the reprocessing of recovered glass into new glass products, this use should be considered a priority given that it can deal with high volumes of recovered material and produces a high-value product. Using glass aggregate for roading and other construction purposes, although viable under certain circumstances, does result in downgrading the value of the material.

Demand in civil works

The largest market in New Zealand for recovered glass is as a raw material for manufacturing into new glass bottles and containers. There is only one manufacturing facility operating in New Zealand which is located in Penrose, Auckland and owned by the OI (Owens Illinois, USA). According to Envision (2005), the amount of glass recycled in New Zealand increased significantly from 30,000 tonnes in 1994 to 90,000 tonnes in 2004. Over this period, the increase generated an oversupply of recovered glass in New Zealand which had to be stockpiled or landfilled because the OI plant had insufficient capacity at the time to process the material.

In August 2009, it was reported in Auckland City Council's *City Scene* newsletter that OI and Visy (NZ) Ltd have invested in a significant piece of new sorting-technology that will aim to improve the quality of glass recovered at Visy's new Materials Recovery Facility in Auckland. The OI plant has also installed a third furnace. Together these capacity improvements will subsequently increase O-I's ability to process greater quantities of recovered glass.

Given that the primary use for recovered glass in New Zealand is for reprocessing into new glass bottles, secondary uses such as in civil works construction, only become viable when this primary market shifts, or in parts of the country where it is not economically viable to transport glass to Auckland. Given the Waikato's proximity to Auckland and the quality of glass recovered in the region, OI's demand for Waikato glass is likely to remain strong. However if the market changes, alternative options may need to be reconsidered taking transport, environmental and economic factors into account.

Although the economics for glass recycling have improved in recent years and some glass from the South Island is being transported to Auckland, alternative uses are still needed in parts of the South Island. Research by Envision (2005) identified the following 'high-volume, low value' uses for crushed glass which have applications in council civil works projects²⁵. Further examples are described in Envision's 2005 report and on the New Zealand Glass Packaging Forum website (www.glassforum.org.nz).

- **Backfill** - used as fill material overseas for pipe bedding, site grading, under concrete slabs, behind retaining walls etc.
- **Roading aggregate** - Glass is used as a replacement aggregate for roading in the UK and USA and there is extensive research supporting this application. In New Zealand a number of local trials were undertaken using crushed glass aggregate mixed with natural aggregate for roading and it is now used extensively in places like Palmerston North. In mid 2009, Auckland City Council reported that glass sorted and stockpiled at the new Auckland Visy Materials Recovery Facility in Onehunga was to be used as a substitute aggregate for Auckland's footpath construction. Opting for this alternative market was caused in part by the poor quality of glass following the sorting

²⁴ www.rmf.org.nz/terranova/Glass/

²⁵ Glass Mountains: Options for Glass Recycling in Otago. Envision New Zealand 2005

process used for Auckland's new commingled kerbside collections. The sorted glass was unsuitable for use by OI.

- **Concrete aggregate (Glasscrete)** - Recycled glass aggregate can also be used in concrete (glasscrete). Potential exists for deleterious chemical reactions to occur however, which affect concrete strength. These include alkali-silica reaction – which can be avoided and sugar contamination from the contents of used containers. A recent example is the use of glass aggregate in concrete products for the construction of the new Lion Nathan brewery in South Auckland, called Project Century²⁶.
- **Asphalt (Glassphalt)** - Glassphalt is basically the same as conventional hot-mix asphalt, except that 5% to 40% of the rock and/or sand aggregate are replaced by crushed glass. It was used extensively in 2004 in Invercargill, but was discontinued for economic reasons. In the UK there has been a rapid increase in the use of recycled glass aggregate over the last few years and this is predicted to continue. A tax (around 15%) on virgin material has played a big part in this.

According to New Zealand Transport Agency's TNZM/4 Specification for Basecourse, up to 5% glass cullet can be used in basecourse and subbase applications on roads. The cullet must achieve a defined particle size distribution and must have less than 5% contamination (typically paper, metal, plastic and cork) by mass. Although the TNZM/4 recognises that higher proportions (e.g. 15–30%, depending on application) have been successfully used overseas, the low percentage means that the quantity of cullet is not significant and therefore environmental risk is kept to a minimum.

Glass quality and transportation costs are therefore significant factors affecting the glass remanufacturing market. Well sorted, uncontaminated glass from the Waikato should find a ready market in Auckland but the market is highly dependent on the requirements of a single buyer.

Recycled timber

Most recycled timber comes from construction and demolition sites and is either recovered on site during construction or demolition or diverted from landfill at resource recovery facilities or transfer stations. The recovery of construction timber is limited however due to the lack of resource recovery facilities, a general lack of storage space at these facilities, and a lack of markets for recovered materials.

Given these current limitations, of the four materials investigated for this project, timber is likely to have the least potential for use in council civil works. There is also very little literature available in New Zealand on the use of timber in civil works projects.

There may be more potential in the private building sector, particularly in home building DIY situations where timber can be used for home renovations etc. The difficulty with recycled timber in commercial building programmes is lack of specifications to meet building code regulations. Recycled timber is most likely to be used for secondary purposes like boxing for footpaths, driveways or for temporary structures such as fencing and posts.

Much of the work that has been done on developing uses for recovered timber for building projects has occurred in the community sector. Community enterprises like Xtreme Waste in Raglan (Waikato District) have developed facilities and processes to recover, process (e.g. de-

²⁶ Project Century refer www.mainzeal.co.nz/projects/project-century.aspx

nail) sort and sell timber for construction purposes. It is a labour intensive activity that suits organisations like Xtreme Waste which have job creation as one of their prime objectives.



Building timber recovery at Xtreme Waste site in Raglan, Waikato District

There are more reuse and recycling options for untreated timber than treated timber. Untreated timber can be burned as hog fuel for energy recovery or chipped and used as mulch – as well as being used for construction purposes (the main focus of this project). The options for treated timber however are limited to construction uses. Distinguishing between treated and untreated timber is difficult however and this adds another complicating factor to recovery and reuse/recycling efforts.

The difficulty in both sourcing and using recycled timber makes it generally unsuitable for council civil works projects. Apart from the minor uses listed above (boxing, fencing etc) there do not appear to be any immediate construction uses that would divert anything more than a fraction of a percent from landfill. The best diversion potential seems to be in using timber as hog fuel for furnaces for energy generation.

Energy-efficient street lighting

Introduction

With over 330,000 street lights in New Zealand, running for over 4000 hours each per year, street lighting consumes a significant amount of electricity. At around \$18 million per year this represents a significant cost to ratepayers (Electricity Commission, 2009). Loveless and Peng (2006) state that street lighting can account for approximately 50% of a typical New Zealand council's electricity usage.

Energy efficient street lighting installations have multiple benefits for councils and communities beyond the obvious energy, maintenance and cost savings. These include appropriate lighting levels and visibility (which can lessen residents' need for additional security lighting), greater safety (through improved visibility) and reductions in crime (Electricity Commission, 2009).

Background information

The principal types of lamp in use in New Zealand are high pressure sodium (76 per cent of total stocks). Older technologies such as mercury vapour (15 per cent) and fluorescent (5 per cent) are the other significant types, according to results from an audit undertaken in 2007 by the New Zealand Transport Agency (NZTA, 2007). Various new lamp technologies (and associated components) have been emerging in recent years, including new generation metal halide lamps and light-emitting-diodes (LEDs). In addition to advancing lamp technologies, other 'smart' technologies have been developing that allow remote controlling of street lighting systems (i.e. dimming lights, turning on and off, and adjusting according to the amount of 'planetary' light available in the night sky).

In late 2008, a forum on "Advancing New Zealand's Street Lighting Technologies" was held in Waitakere City, hosted by Waitakere City Council. Over 100 people attended the forum which was initially expecting to receive interest from around 30 local government and industry representatives. The Electricity Commission noted in a recent publication that the *"attendance and industry participation at the Waitakere City Council's September 2008 street lighting forum highlighted the growing interest in efficient street lighting. This, combined with the LED and metal halide trials currently underway in some districts highlights the momentum that is beginning to gather, and the growing opportunities to work together and share knowledge and experiences on a national basis"*.

A key piece of research undertaken by the New Zealand Transport Agency in 2007, entitled Theme Audit of Street Lighting initiated much of the current interest in the area of street lighting. The audit reviewed 20 'approved organisations' (AO) in New Zealand, largely territorial authorities. The key barrier highlighted in relation to energy efficiency of street lighting was the following:

- "Paying for energy supply under an annual lump sum payment system. This offers no incentive to either party to improve efficiencies of systems" (NZTA, 2007).

In an article in Local Government Magazine Supplement on Street Lighting, Shearer (2009) reports that almost all street lights in New Zealand are fed from un-metered supplies and the electricity usage is charged on an estimated load basis. The inability to measure actual loads and establish load profiles and then measure and validate savings from the introduction of new

technologies or control approaches is a major barrier to the implementation of improvements. Regulatory barriers to the acceptance of advanced streetlight dimming control systems and software-based energy metering systems (which are available in Europe) have not yet been solved.

The Theme Audit highlighted the following initiatives that AOs have been utilising to attempt to achieve greater effectiveness of installations and for better energy efficiency:

- Replacement of obsolete lamp types;
- Use of more efficient lamps;
- Light performance and energy efficiency audits;
- Council having a comprehensive energy management plan;
- Use of LED luminaires;
- Use of dimmer controls;
- Use of electronic ballasts; and
- Varying switching times according to prevailing conditions.



Local Government Magazine Supplement 2008/2009

The success of the forum held in Waitakere City in 2008 and associated interest, led to a dedicated technology supplement being published in the Local Government Magazine in 2009. This supplement provides numerous articles regarding many of the topics discussed at the forum, including:

- Technologies for street lighting luminaires, fittings and bulbs (e.g. solar powered lighting, LED lighting, metal halide etc)
- Technologies for controlling street lighting (i.e. dimming, turning on and off)
- Results and recommendations from a Theme Audit undertaken by NZTA in 2007
- Metering street lighting and the role of the Electricity Commission.

Role of the Electricity Commission

With a key role to promote and facilitate electricity efficiency, and a brief to fund programmes that provide incentives for cost effective electricity efficiency, the potential savings from efficient street lighting is of interest to the Electricity Commission. The Electricity Commission is a crown entity that has been operating since 2003 under the Electricity Act 1992.

One of the key initiatives that the Electricity Commission has been involved with in recent months in regards to street lighting is the 'Efficient Street Lighting Project'. The purpose of the project is to develop a 'Resource Kit' that will provide resources to local authorities on energy efficient street lighting, such as tools to compare new technologies and assess the benefits, develop street lighting policies that incorporate relevant electricity efficiency considerations, and present robust business cases for network upgrades. This is likely to be released in September/October 2009 and will be accompanied by a road show around the country.

In a document providing background information on the project, the Commission states that *"from an investment perspective, the Commission has an obligation to achieve electricity savings at the least cost, which means potential street lighting initiatives must be ranked against other investment options such as compact fluorescent lamps and more efficient halogen lamps. The extent to which the Commission can commit funding is at a level at which the resulting energy savings make the investment economical (i.e. where the cost of achieving the savings is less than the cost of building new electricity generation plant)".* (Electricity Commission, April 2009).

Energy Efficient Street Lighting Project – Electricity Commission

The Commission recognises that although there is significant scope for local authorities to improve street lighting efficiency and save money, a number of barriers limit the ability to tap into these saving opportunities. **The majority of information presented in this section is based on publications released by the Electricity Commission in April 2009 in relation to the Energy Efficient Street Lighting Project.**

In 2008, the Commission formed a street lighting working group including representatives from the New Zealand Lighting Council, NZTA, LGNZ, the Energy Efficiency and Conservation Authority, and several councils. This collaborative approach (which drew from the outcomes and recommendations of the NZTA Theme Audit) was instrumental in further defining the operational challenges and issues facing councils and key barriers to the uptake of efficient street lighting, and identifying initiatives to address those barriers.

Some of the key barriers the working group identified included:

- knowledge of and information on street lighting technologies;
- organisational structures;
- split incentives between developers and councils;
- procurement/regulatory policies;
- stockpiles of low-efficiency mercury vapour lamps (encouraged by the retention of 'like for like' replacement policies);

- tariff structures;
- un-metered street lighting; existing infrastructure; funding/access to capital, and
- a focus on up-front capital cost.

While it is possible to address some of these barriers (such as information) through targeted initiatives, others, (such as tariffs) are structural in nature and would require a carefully co-ordinated approach and significant investment of time and resources to resolve.

Based on the outputs of the street lighting working group, the Commission ran a closed tender for the development of a comprehensive street lighting Resource Kit and a universal street lighting Infrastructure Design Standard (IDS) which are to be rolled out to all councils in the second half of 2009 by way of a structured promotion, education and training programme. This programme (known as the Efficient Street Lighting Project) will target the information barrier as a priority, as well as barriers relating to split incentives, procurement/regulatory policies and the focus on up-front capital cost.

The Resource Kit is intended to provide councils with resources on available street lighting technologies, as well as tools to compare new technologies and assess the benefits, develop street lighting policies that incorporate relevant electricity efficiency considerations, and present robust business cases for network upgrades. The IDS, which will set universal, standard specifications for new installations, will help ensure new installations deliver high quality light output while minimising electricity consumption.

While this will support councils to achieve their energy efficiency targets, other barriers, such as mercury vapour lamps, tariff structures, and un-metered street lighting may limit the savings that can be achieved.

More work is required to determine the extent of mercury vapour lamps within street lighting networks and in council stockpiles, better understand tariff structure constraints across councils, and investigate metering & billing opportunities to allow councils to receive the electricity savings and financial benefits that modern street lighting control systems can provide. The outcome of further work in these areas will help inform potential future programmes.

Survey results

Introduction

Meetings were held with staff from 11 TAs during the last week of July 2009. A survey form (refer Appendix A) was used during the meetings to elicit information about various topics including: current tendering and procurement policies and practices, examples of civil works that use recycled materials, data on waste quantities and opinions on what the key barriers and opportunities are. Staff were also asked about the type of role Environment Waikato should have in relation to promoting the use of recycled materials in civil works and energy-efficient street lighting. Discussions with various staff were held in order to obtain this range of information.

Results from the survey are presented in the following sections. First-order statistical analyses are presented together with general feedback offered by council staff.

Procurement and sustainability policies

The purpose of Section 1 of the survey was to gain a general impression of Waikato councils' overarching sustainability and procurement policies or strategies. Staff were asked what (if any) sustainability policy or procurement policy do the council use. Results are presented in Figure 6.1.

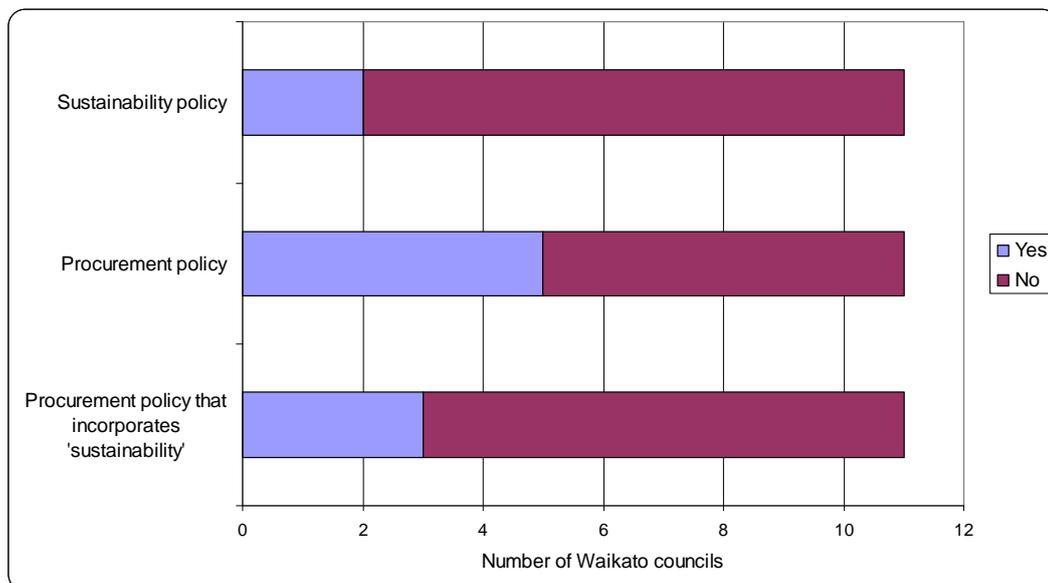


Figure 0.1 –Council responses to sustainability and procurement policy questions

Two councils out of the 11 referred to having a council sustainability policy: Rotorua District Council and Hamilton City Council. Rotorua District Council has a new Corporate Sustainability Policy and Action Plan developed in 2008²⁷.

Hamilton City Council has an Environmental Sustainability Strategy, which was released in 2008 as part of a wider strategic framework for the city. The Environmental Sustainability

²⁷ <http://www.rdc.govt.nz/YourCouncil/Sustainability/SustainabilityPolicy.aspx>.

Strategy is one of a set of eight city strategies. Each strategy reflects the priorities of the various organisations involved and their outcomes that charter a way forward for the city. The city has also had an ‘Environmental Policy’ in place since 1998, although this is soon to be rewritten and will include a greater focus on procurement.

Five of the 11 councils (including Hamilton City and Rotorua District) referred to having some form of existing procurement policy or strategy. Four other councils highlighted that the current procurement policy or process is to be updated or developed further. Several councils made reference to the recent NZ Transport Agency’s Procurement Manual²⁸, which is driving councils to update their procurement processes in order to align with the Agency’s manual.

Three councils identified that their existing procurement strategies incorporate environmental or sustainability considerations or criteria to some degree. Matamata-Piako District Council has recently developed a council procurement strategy which requires purchases of goods and services to consider the Four Well-beings (i.e. social, economic, environmental and cultural). Hamilton City Council’s existing procurement policy, which was referenced in a 2004 Ministry for the Environment report²⁹ as a good example of local government procurement practice, is currently under review and will include further improvements relating to sustainability and involve all parts of council.

Existing uses for recycled materials in civil works

Section 2 of the survey was designed to gather information on existing examples of recycled materials being used in civil works by councils. Figure 6.2 presents the various examples of projects that were raised by Council staff according to the type of waste material.

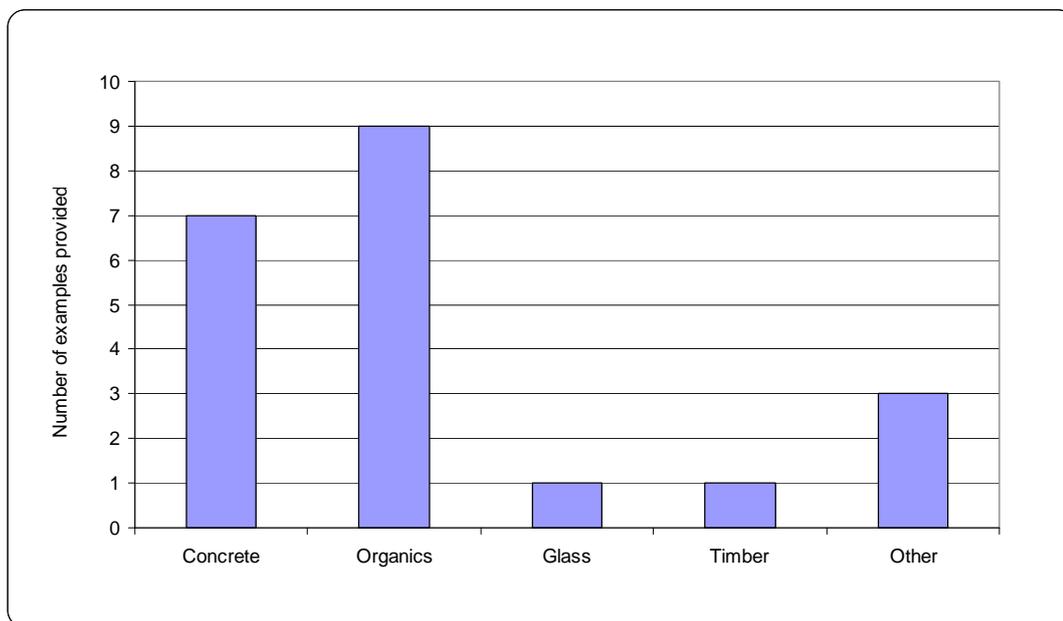


Figure 0.2 – Council examples of civil works that use or have used recycled materials

Council staff provided 21 examples or references to civil works that use or have used recycled materials. The majority of these project examples related to processed organic wastes as compost/mulch products for parks or reserves work (e.g. greenwaste mulched and used in-situ

²⁸ Refer to NZTA’s Procurement Manual: <http://www.landtransport.govt.nz/funding/procurement/procurement-manual.html>

²⁹ Refer to MfE report, Excellence in Local Government, 2004. <http://www.mfe.govt.nz/publications/sus-dev/local-govt-procurement-nov04/html/approaches/hamilton-cc.html>

at parks/reserves, biosolids compost currently being trialled in TCDC to be used on parks/reserves), followed by seven references to the use of crushed concrete as aggregate (e.g. basecourse for drainage, footpath or roading projects)

Only one reference was made regarding the use of glass and timber in civil projects. Rotorua District Council highlighted glass has been used in water services and footpath projects and in Waitomo waste timber is chipped and used for daily cover at the council's landfill. Other products that were referred to were tyres (e.g. Waitomo DC uses these as drainage materials at the landfill site), steel slag (i.e. Waikato DC trialled this material in roading sites approximately six years ago) and recycled bitumen (e.g. Waikato referred to this being recycled for roading projects in their district).

Several of the council's roading engineers (Waikato, Thames Coromandel, Waipa) noted that in-situ road recycling and road stabilisation techniques are common practice for contractors when upgrading or maintaining low-trafficked roads. This approach means that minimal aggregates are required to be transported to the construction site, as the roading pavement is dug up and reused as basecourse materials before resealing. Given this, the use of crushed concrete or other recycled aggregate brought from off-site is not often necessary.

Council staff were asked if they were aware of any specific council mechanisms that were helping to stimulate the use of local recycled materials in civil works. None of the council staff interviewed considered there were any specific tendering processes, specifications or procurement policies that were having a direct impact on the use of recycled materials in civil works. Comments provided by staff on this question included the following:

Nothing formal yet. Tenderers are judged on how well they propose to utilise materials on site. Council try to steer them in the right direction but it is on a project by project basis.

Nothing in water services. In roading there is a reference to using old road aggregate in the 'lower level' - contractors are required to use salvaged materials in the contract. They also are required to mill the top of the road (asphalt) and this is used traditionally for the foundation of new footpaths.

No. Contracts allow it but do nothing to encourage using recycled materials. Contractors use crushed concrete because it is nice to use (still has some cementing properties so places well) and cheap.

No - although in roading Council/contractors push now for onsite roading construction - following a change in technology/equipment. Open to alternative approaches - but no specific requests/specifications in tenders made.

No but Transit NZ does have specs for concrete and asphalt though so indirectly these are in place. Code of practice doesn't specify recycled materials except compost.

No. However at the design stage the 'reuse if at all possible' philosophy is followed.

Potential for future use of recycled materials in civil works

Staff opinions regarding future potential uses, drivers, barriers and opportunities were gathered as part of Section 3 of the survey.

Nine of the councils (82%) responded 'Yes' when asked whether there was potential to increase the use of recycled materials in council's civil works. Several councils qualified this

response however by noting the significant issue of material availability being a key barrier. For those that responded, 'No', the lack of suitable recycled material was also raised.

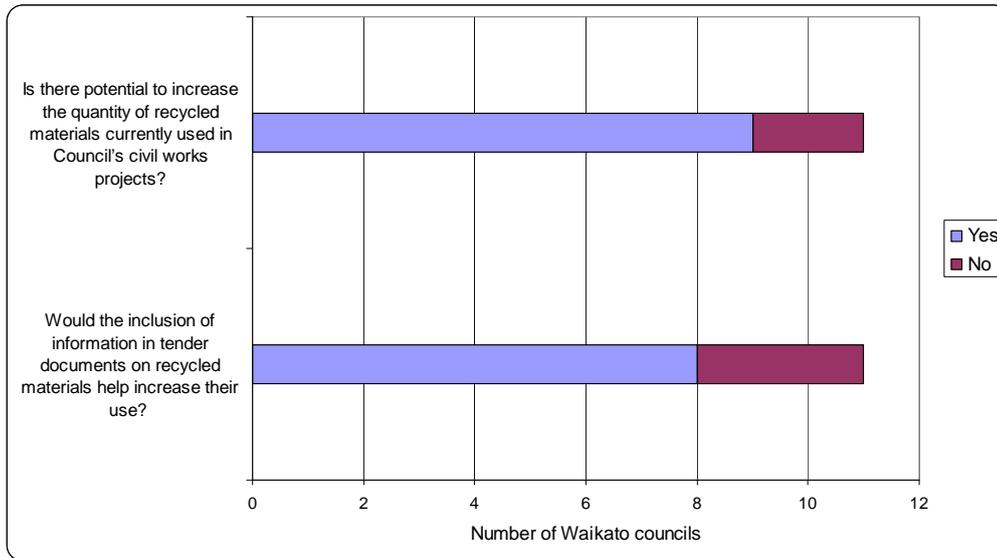


Figure 0.3 – Council responses to questions regarding potential uses

Further, while it was recognised by TA staff that there are materials that could be diverted for more beneficial uses in the construction sector, currently it is not necessarily cost-effective to divert these materials from landfills given the multiple costs associated with the recovery and processing of the materials; transport costs; and establishing alternative sites for stockpiling/processing etc. Investigations are currently being undertaken however by three adjoining councils in the east Waikato region (Hauraki, Thames-Coromandel, and Matamata-Piako) to develop a shared recovery facility for construction and demolition (C&D) waste. The potential to establish another jointly owned facility in the Waikato region was also raised by other council staff. Otorohanga was identified as one possible location, given its proximity to multiple other districts. It was also discussed with Waikato District Council staff that the Meremere Power Station in Huntly (north Waikato) has recently been converted into a demolition recovery facility by private firm, Nikau Contractors Ltd³⁰. The impact this will have on material flows and availability of construction materials in the Waikato is not yet well understood. Further, it is understood that another private operator, Materials Processing Ltd, is currently in the planning stages of developing a C&D recovery site in Tokoroa, Waikato.

Eight of the 11 councils answered positively to the question “*Would the inclusion of information on recycled materials (e.g. specifications, availability, suppliers etc) in tender documents help increase the use of these materials by contractors*”. Additional comments that provided qualifications to the overall positive response, were the following:

*With limitations - specifications would come once greater quantities are available.
Availability/cost limitation.*

There is potential for council to carry risk for using recycled material.

Like Council staff, contractors just haven't been thinking of it - it hasn't been top of mind. So putting info in would help raise awareness.

Councils have to consider ratepayers so would have to be cost competitive.

³⁰ <http://www.stuff.co.nz/waikato-times/news/766>

Of the four key recycled materials (organics, concrete, glass and timber), processed organic wastes (e.g. composts, mulches) and crushed concrete were considered to have the most potential for use in civil works, although staff noted the potential was still limited. The majority of councils ranked glass and timber materials as being either third or fourth in the hierarchy. Otorohanga District Council however ranked glass as being second behind concrete and Rotorua ranked glass second behind organics.

Council staff were also asked to identify other significant waste materials that may have uses in civil works. Roothing asphalt was mentioned by staff from Hamilton City Council and Waikato District Council as a key waste with the potential to be reused in roading. Used tyres were highlighted by Waikato District Council and Waitomo District as a significant waste stream but for which there are limited applications in civil works currently. Silage wrap was also raised by Matamata Piako District Council, however applications in civil works for this waste stream are also limited. Silage wrap would require significant processing into specific construction products that have applications in civil works.

Drivers, barriers and future initiatives

Council staff were asked to identify some of the key **drivers** for the use of recycled materials in civil works. Staff were then asked to identify the key **barriers** that limit the use of recycled materials in civil works. To assist with this process, six possible drivers and seven possible barriers were presented to staff (Table 6.1). Staff were asked to rank these possible drivers and barriers as having a high, medium or low significance.

Table 0.1 – Possible drivers and barriers

Drivers	Barriers
<ul style="list-style-type: none"> • Meeting Council policy • Diverting material from landfill • Reducing environmental impacts • Local economic development • Meeting national waste policy • Cost savings 	<ul style="list-style-type: none"> • Cost • Availability • Quality assurance issues • Lack of specifications • Lack of information • Lack of experience using material • Cleanfills

As the graphs in Figures 6.4 and 6.5 illustrate, the most common drivers highlighted by staff were ‘Cost Savings’, ‘Diverting material from landfill’ and ‘Reducing environmental impacts’. ‘National waste policy’ was the only driver that was not given a high ranking by any of the TA staff. It is interesting to note that although nine TAs considered ‘Council policy’ to be a driver, the majority of them considered this as having low significance.

In regards to the barriers raised with TA staff, ‘availability’, was the barrier that all 11 TAs highlighted, and the majority of which (64%) considered to have a high significance. Ten TAs identified ‘Lack of specifications’ and ‘Lack of information’ as being barriers, however the majority (80%) ranked these barriers as having medium or low significance. ‘Cleanfills’ (i.e. the presence of cleanfills and/or the lack of regulations) was raised by nine of the TAs and was the barrier with the third highest significance ranking following ‘Cost’.

Interestingly, while ‘Cost savings’ was raised as a significant driver for many of the councils to use recycled materials, ‘Cost’ was also identified by TAs as being a significant barrier. While this sounds paradoxical, it is likely that the cost of recycled materials is a driver provided the materials are easily available, as they are likely to be cost competitive with the conventional material. ‘Cost’ is likely to become a barrier however when the waste or recycled material is

not available. Given the lack of availability of certain waste materials, the cost to divert and process these wastes soon becomes less competitive than conventional materials.

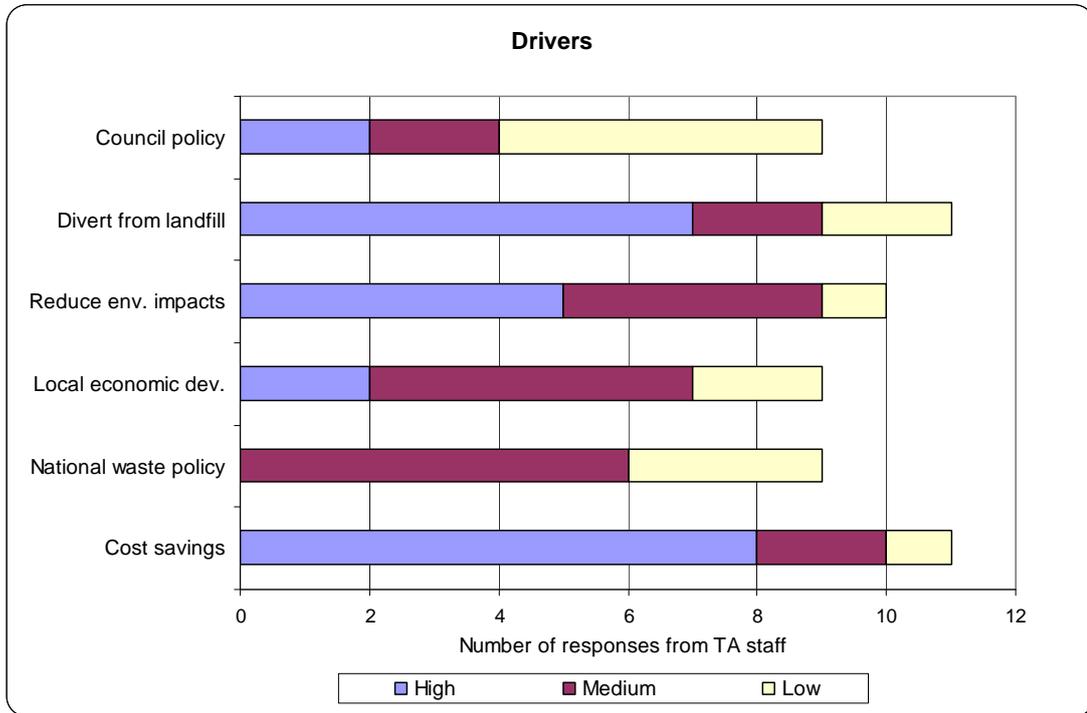


Figure 0.4 – Drivers for TAs to use recycled materials and significance ranking

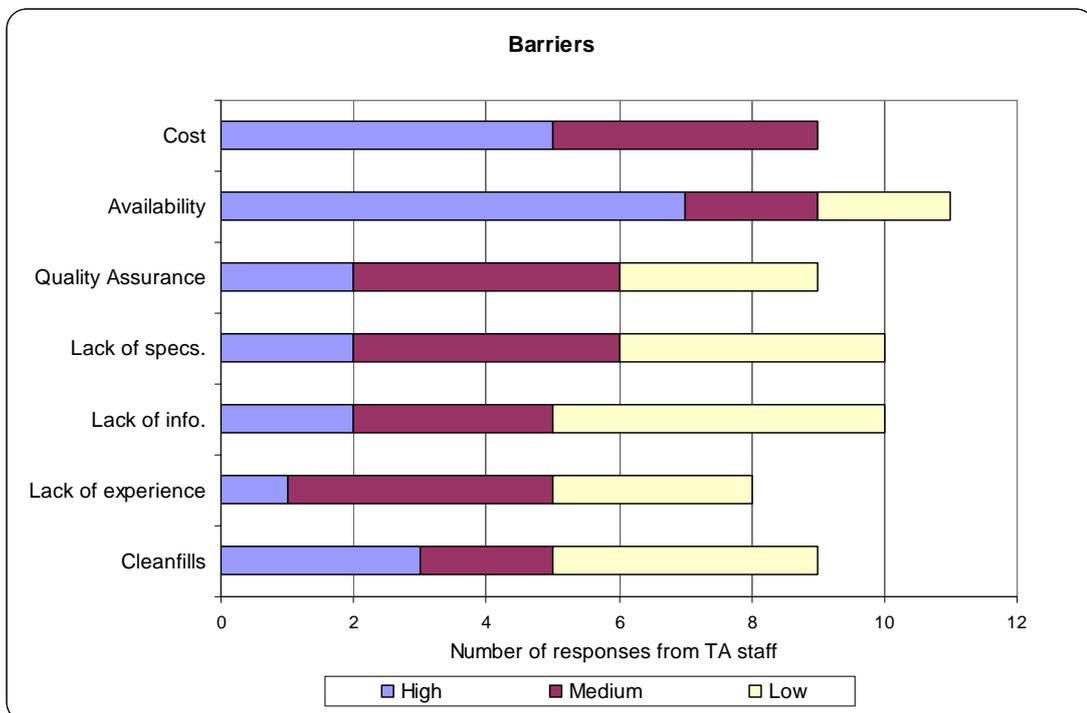


Figure 0.5 – Barriers to TAs to use recycled materials and significance ranking

The last question in Section 3 asked council staff to rank seven suggested initiatives that councils or Environment Waikato could be involved with to help promote greater recovery of key waste materials and their use as materials in civil works. The seven initiatives are

presented in Table 6.1. These are ranked in order according to the number of TAs that considered the initiative to be of value.

Table 0.2 – Initiatives that may help stimulate the use of recycled materials in civil works

Proposed initiatives for councils and EW to stimulate use of recycled materials in civil works	Number of responses	Overall ranking
Councils/EW providing information to contractors on where to obtain a supply of recycled materials	7	1
Changing cleanfill consenting/acceptance criteria	6	2=
Council specifying the use of specific recycled materials in contract/tender documents	6	2=
EW/Councils/MfE promoting specific case studies and specifications	6	2=
EW providing a coordination role between suppliers of recycled materials in the region, TAs and civil contractors	4	3
Council promoting the use of recycled materials in private sector construction through resource/building consenting processes and/or educating private sector	3	4
Coordinated bulk-purchasing of specific recycled materials in the region	2	5
Other (i.e. streamline consenting for processing/stockpiling sites)	1	6

The feedback from this question highlights what initiatives TAs consider will bring the most benefit. The four initiatives raised the highest number of times by council staff each offer ways to overcome the key barriers identified by the TAs – i.e. availability, information and regulating cleanfills. These initiatives should be seen as priority areas for further investigation.

It is noted that only two of the 11 TAs considered bulk-purchasing of products for the region as a beneficial initiative. Several council staff commented that the purchase of materials is predominately the responsibility of council’s civil contractors. The contractors often have arrangements to obtain a supply of materials at specific rates and therefore bulk-supply of recycled materials across the region by council(s) may not necessarily add any further cost savings compared to the rates that contractors themselves can receive.

Tender processes and standard specifications

Council staff were asked whether there were any specific tendering processes or specifications that are used to promote the use of recycled materials in civil works. None of the councils could provide direct examples of specifications that have been used in tenders and/or contracts to dictate the use of recycled materials in civil works. The one exception was mentioned by Hamilton City Council staff referring to a specification for compost products in their Development Manual. A brief review of the Manual, found the following reference to the use of compost for landscaping - “3 parts by volume of approved compost, e.g. that produced from the Hamilton Organic Recycling Centre” (refer Hamilton City Development Manual, Part 7 – Landscape Works, Version August 2008).

Seven out of the 11 Waikato councils (Hamilton, Waikato, Waipa, Matamata-Piako, Otorohanga, Waitomo and Hauraki) use the Hamilton City Council's Development Manual (or Code of Practice) which sets out the technical specifications by which all local infrastructure projects are to be designed and constructed. Therefore opportunities are likely to be created by modifying the HCC's Development Manual, given that such changes will also dictate the construction practices used by contractors in more than half of the region (by population and land area). It is noted, that Hamilton City Council has a standard process for considering amendments to the Manual as per a standard online 'Opportunity for Improvement Form (OFI)'³¹. Such changes would be considered for the 2010 manual update.

Quantity and cost data

Section 5 aimed to identify what information is currently available from councils in regards to district-wide waste quantities and/or the quantities of materials used in civil works. It was not expected that the TAs would have access to extensive data to provide answers for this section. Precise figures were not requested, rather general order of magnitude information.

Waste and recycling quantity data

In terms of quantities of waste generated in the district, data were typically limited to those waste streams that councils control (and therefore measure), such as the domestic refuse collected by councils kerbside collections, waste handled at council-run transfer stations or council-owned landfills etc. More often than not Council staff were able to provide the total waste quantity from these types of waste streams but not for the specific waste materials (i.e. timber, glass, organics and concrete). Composition data was not readily available, although references were made to SWAP analyses that have been undertaken by Waste Not Consulting for council collections and of waste entering disposal facilities in the region in recent years.

Diversion quantities for organics (greenwaste predominately) and recyclable glass were able to be provided by TA staff more often than concrete or timber materials. This was expected given that glass is a common recyclable commodity typically collected via kerbside recycling collections or drop-off recycling stations and therefore councils have records of these quantities. Likewise, greenwaste is recovered by councils at transfer stations, recovery facilities or landfill sites and quantity data are often available.

Overall, the annual waste generated within the districts, based on the indicative information provided by the majority of councils, was in the order of 200,000 tonnes. This figure represents the council controlled waste streams. No data regarding total waste generated within the districts could be provided, given that these data rely on commercial waste data and/or source information from landfill and cleanfill operations, which is non-existent or not publicly available. The 200,000 tonne estimate therefore represents only a proportion of the total waste generated in the region.

The estimated annual quantity of materials diverted from landfill, based on estimates from council staff, was in the order of 80,000 to 100,000 tonnes, which represents predominately glass and greenwaste quantities. No data could be provided by any of the councils for quantities of recovered timber. The material that had the most data was glass (8 out of the 11 councils provided an estimate for recovered glass) followed by organic wastes. The estimate quantity of diverted materials is somewhat comparable to the SKM estimate presented in Table 4.1 (i.e. approximately 140,000 tonnes, excluding timber products, which is of the same order of magnitude).

³¹ <http://hamilton.co.nz/page/pageid/2145835108>

Quantity data for compost and aggregate use

Basic estimates were able to be supplied by the majority of councils for the annual quantity of compost-type products and aggregates used in civil works projects. Using these data, in total around 550,000 tonnes of aggregate was estimated to be used by 9 of the 11 councils. Note that where quantities were provided in cubic metres, a basic density factor of 2 was used to convert to tonnes.

Although this figure is not based on any validated accurate measures, it helps to indicate that, as would be expected, the demand for aggregate in civil works far outweighs the estimated supply of crushed concrete/glass materials that could be recovered from the waste stream (less than say 50,000 tonnes, refer Table 4.1).

Data or estimates for the quantity of mulch/compost products used by councils were less readily available or known by the TA staff interviewed. Of the seven councils who were able to provide general estimates for the total quantity of mulch/compost products used in civil works (e.g. predominately parks and reserves), a total annual requirement of approximately 2000 tonnes was estimated. Where quantity data was provided in cubic metres, a basic density factor of 0.5 was used to convert to tonnes. Contrary to the demand for aggregate products, based on these figures, the quantity of organic wastes available throughout the district therefore far outweighs the amount that can be used in council civil works projects.

All councils noted that the current materials used in civil works are sourced from the Waikato region (i.e. compost products from local suppliers and aggregates from quarries within the region).

Cost data

Cost information, for both processed organics and recycled aggregates, is highly variable depending on the processing technology used, onsite management systems, the quality of the waste materials processed and the quality of the finished product produced. Costs also fluctuate significantly depending on transportation requirements.

Regardless of these multiple factors, cost information was provided by some councils for mulch/compost products and typical aggregate products used in council civil works projects. These costs ranged from \$12 to \$50/m³ for processed organic products and \$24 to \$65/m³ for aggregates.

The Rawlinsons Handbook 2008 provides comprehensive quantity surveying cost information for New Zealand and lists the cost for the supply of three aggregate products GAP20, GAP40 to GAP65. The prices range significantly from \$12/m³ to \$47/m³, depending on the location within the country, however are comparable to the range of costs given by TA staff. Four locations are specified in Rawlinsons - Auckland, Wellington, Christchurch and Dunedin. The highest costs were for GAP products obtained from Auckland and the lowest costs were from Christchurch. Rawlinsons notes that the prices “vary widely depending the source and distance to be carried”.

When asked whether “Council would be willing to pay a premium for use of local recycled materials?” the majority of the Councils (9 of the 11 councils) responded ‘No’. Those councils that indicated a higher price could be paid for locally sourced recycled materials, commented that the price difference would need to be minor and that the higher cost would need to be weighed against other considerations.

Street lighting

Questions in Section 6 of the TA survey related to council street lighting. TAs provided a range of general information on: the extent of the street lighting load in each council; the annual cost of electricity for street lighting; experience with using alternatives, more energy-efficient technologies; and future plans for street lighting upgrades. Council staff were also asked what role EW should have in regards to promoting more energy efficient lighting. Results from the survey questions are summarised as follows:

Current load

- The street lighting load ranged from 570 street lights in Otorohanga to approximately 16,000 in Hamilton. The budget spent on electricity (from the 9 councils that provided cost data) ranged from \$72,000 (Waitomo) to \$1.2 million (Hamilton City Council), with a total of approximately \$2.7 million. Just under half of this total cost is spent by Hamilton City Council. All councils' systems are un-metered.
- Only Hamilton City operates more than a few traffic lights. The annual electricity load for Hamilton's traffic lights costs approximately \$70,000 and a quarter of the lights are LEDs.

Council experience

- Seven of the councils stated they have experience with installing more energy-efficient lighting. The types of technologies councils referred to included the following:
 - ❖ Waikato District Council and Thames Coromandel District Council both referred to using AEC Kaos fittings. These are lamp fittings rather than the street lamps but are considered to offer energy benefits as they are more durable, protect the lamp, dispel light effectively and therefore bulbs do not need to be replaced as often.
 - ❖ Hamilton City Council has trialled LED lamps on two streets. This trial started in November 2008 and is still continuing. Cosmopolis new metal halide lamps were also installed on another couple of streets (50 or 60 lamps in total) and a car park has had LEDs installed (around 70). Hamilton City Council is currently investigating options for control systems with the lines company.
 - ❖ Several councils (e.g. Waikato District Council, Hauraki DC, Rotorua DC) highlighted that as part of renewal programmes, street lights are being replaced with lower wattage lamps or more efficient luminaires e.g. replacing 80 W lights with new 70W SON type or 35W metal halide lamps.
 - ❖ South Waikato District Council conducted a small trial on Bridge St, Tokoroa, in 2009 using a mixture of lower wattage SON lamps, 160W metal halide lamps and Cosmopolis lamps. Council's consultant, Odyssey Energy Ltd, reported that, the higher ingress protection (IP) rating of these lights (i.e. ingress protection rating IP66 compared to IP54) has the benefit of allowing maintenance periods to be increased from 3 years to 4 years, with an associated decrease in maintenance visits over the 25 year operational life of the luminaire. In terms of LED lights Odyssey Ltd states, "*we have carried out some paper research on these lights and there is little to be gained in the way of energy savings with these lights, and their higher capital cost*

offsets the reduced maintenance. However, we would be keen to trial some of these lights to get a stakeholder perspective on their actual light quality”³².

Future upgrades and specifications

- Five out of 10 councils that responded to the survey questions have planned street lighting upgrades. The plans range from annual plans to a 12-year plan in Hauraki District Council.
- Street lighting is controlled by council Code of Practices and AS/NZS 1158 0.2005. Some council’s Code of Practices are being updated (TCDC and Taupo), which could allow for new recommendations from the Electricity Commission to be incorporated.

Proposed roles for Environment Waikato

In Section 7 of the survey, Council staff were asked to consider the role(s) that EW should have in regards to the use of recycled materials in civil works and energy-efficient street lighting. Three options were proposed for both recycled materials and street lighting, in addition to a ‘None’ and an ‘Other’ category. The options are listed in Table 6.2 together with council responses. Results are also presented graphically in Figure 6.3.

Table 0.3 – Proposed roles for Environment Waikato

Proposed role for EW regarding recycled materials in civil works	Number of responses	Proposed role for EW regarding energy-efficient street lighting	Number of responses
Option 1: Coordinate information on quantities and availability of recycled materials in the region	5	Option 1: Coordinate bulk-purchase of luminaires and/or control systems	1
Option 2: Provide advice, guidance and/or support to TAs on the use of recycled materials (e.g. case-studies, specifications etc)	8	Option 2: Coordinate bulk-purchase of energy-efficient traffic-signal lights	0
Option 3: Provide advice, guidance and/or support to industry (i.e. suppliers, contractors) regarding material availability, specifications etc.	8	Option 3: Provide information to suppliers, contractors, councils	8
Option 4: None	2	Option 4: None	1
Option 5: Other	7	Option 5: Other	4

The majority of council staff considered EW as having one or several roles to play in regards to the use of recycled materials in civil works and promoting energy-efficient street lighting. For both topics, providing advice and information to both TAs and industry was highlighted as the option with the highest number of responses from councils. Staff interviewed from Rotorua District Council considered EW has no direct role to play in either the use of recycled materials in TA civil works or street lighting. Otorohanga DC staff also considered there is no

³² Letter to Gordon Naido, South Waikato District Council, from Odyssey Energy Ltd, June 2009.

specific role for EW in regards to the use of recycled materials, with the exception of potentially subsidising mobile crushing machinery for waste concrete or glass.

In regards to recycled materials in civil works, other roles suggested for EW by council staff were as follows:

- Streamline consenting for sites proposed to stockpile or process waste materials as consenting process for these sites can be drawn out and costly.
- Provide greater regulation on cleanfills. If there was stronger regulation to stop material going to landfill/cleanfill then more could be recovered.
- Provide funding for capital improvements and C&D processing - Otorohanga was suggested as a good place for a facility given it is centrally located.
- Determine what the needs are and fill the gaps
- Fund and/or support more pilot studies
- Enhance the regional waste exchange

With regards to street lighting, none of the councils considered bulk-purchasing of lights as an appropriate role for EW, although Hauraki District Council's street lighting consultant (Ray Wells, Power Solutions Ltd) highlighted that the purchasing of control-systems at a regional level may be a role for EW. In regards to bulk-purchasing his comment was reflective of several other councils, *"Not sure how EW will fit into the big picture but bulk purchasing will be difficult to achieve when all TLA's in the EW region have differing requirements for street-lighting using different technologies to achieve design outcomes to AS/NZS1158 and I would be cautious of installing a technology on your network because someone in Hamilton or Cambridge thought it was a good idea. Contractors already have bulk purchasing arrangements with product suppliers so do not think EW will have any influence here"*³³.

Several council staff offered other roles for EW as summarised below:

- Investigate a current proposal to be presented to EECA by a company called Tranzgrid - regards establishing a centralised control system for street lighting using wireless remote technologies (further information provided in Appendix C).
- Fund some pilot trials in the Waikato to give TAs confidence in a new product. It is noted that a change in current metering/power usage system is also required.
- EW could help coordinate a group of partners - TAs, EECA, Sustainable Business Network etc to set up a one-stop-shop on a main street for use by the public and businesses. The shop would provide independent information and advice on energy efficiency and other business sustainability and resource efficiency issues. Bob Brown from Hamilton City Council considered this option to have value in Hamilton City given that currently information is fragmented and commercially-biased.
- Investigate whether EW could play a role in negotiating with electricity network providers/retailers on behalf of numerous TAs.

³³ Pers. Comm.. Ray Wells, Power Solutions Ltd. Consultant to Hauraki District Council.

Feedback from civil contractors and suppliers

In order to gain a general impression from industry as to some of the barriers, drivers and future initiatives that exist within the civil contracting sector with respect to the use of key recycled materials, staff from two large contracting firms were contacted (Downer EDI and Fulton Hogan) as well as a smaller utilities contractor (Allens United Ltd) as suggested by council staff at Hamilton City Council. In addition, general discussions were held with representatives from the concrete manufacturing industry, aggregate suppliers and a waste processor in the Waikato region. Organic waste processors in the region were not contacted given a study on organic waste processing opportunities was being undertaken by EW concurrent to this project.

Contractors

Representatives from the Waikato region at Fulton Hogan, Downer EDI Works and Allens United Ltd were contacted. General comments from each contractor highlighted that even though various waste materials are produced by civil works, it is often in contractor's best interest to reduce waste as much as possible and therefore 'onsite' recycling of demolition wastes and materials tends to be common practice in civil projects wherever possible (i.e. cut used as fill, reusing roading materials as fill and basecourse onsite).

No significant examples of council projects in the Waikato region that use recycled materials (specifically brought to site from external suppliers) were able to be highlighted by the contractors, apart from general examples of reusing recycled bitumen for roading projects or the general use of mulch or compost products. One contractor mentioned that kerb-and-channel is often taken off-site to be crushed and then later reused as basecourse material for other projects however.

Downer EDI representatives raised one of their recent projects that involved the demolition of an old timber mill site where the concrete flooring was crushed and stockpiled onsite for potential further use during construction stages. Although this project was not an example of a local government project, it highlights that the concrete material was considered by the client/contractor to have sufficient value to be recovered and processed instead of being taken to cleanfill or landfill. The cost savings from avoiding disposal costs and/or bringing in additional aggregate material would have helped provide some incentive to offset the cost of bringing in a mobile concrete crushing contractor.

The two larger contractors ranked concrete as having the highest potential to be used in works, followed by organics or glass and then timber. All the contractors noted that composts or mulch products are already fairly commonly used in civil works projects, given that these products are available, they meet suitable quality standards, and have suitable properties and uses in civil works. Allens United ranked organic wastes as having the highest potential to be used, followed by timber, concrete and then glass. Given Allens United typically work on small to medium-sized contracts within the Hamilton area, it is possible that they have ready access to used timber products and therefore consider these to have greater potential in civil works, in comparison to the larger contractors that may not have a ready supply.

Asphalt (or bitumen) millings were highlighted by both the large contractors as a waste material with further potential to be reused in roading projects. It was noted by one contractor that this recycling option still requires further research and greater acceptance by local authorities. Fulton Hogan has recently begun using plant machinery in New Zealand that can recycle bitumen/asphalt onsite. This technique is called 'Foamed Bitumen Pavement

Recycling' and requires the operation of one of two large machines that operate around the country (Wirtgen WR 25000 SK). The use of this plant in the Waikato is not yet wide-spread.

Contractors highlighted the two main drivers for using recycled materials in civil works relate to 'cost savings' and 'company policy', in most cases more so than 'meeting council specifications or contract requirements' or the 'availability of the recycled materials'. The overarching reason for the lack of recycled materials being used in civil works currently is in regards to obtaining a supply of recycled materials (i.e. availability). This barrier is less relevant for processed organic waste products but more applicable to recycled aggregates and timber.

Regardless of the lack of available recycled products, there appears to be a willingness by contractors to use recycled materials if specified by councils, especially where a suitable, quality product can be sourced at a cost acceptable to council budgets. If councils set requirements for the use of recycled materials, then it would appear from contractors' feedback that the contracting sector are able and willing to respond. Interest was expressed by the large contractors for further information about the potential uses for recycled concrete and glass aggregate. As stated by one representative, *"We try to ensure we have knowledge of [recycled materials], but always keen to hear of anything else or even work with councils on potential materials (e.g. trial sites). We do this in other parts of NZ."*

Concrete and aggregate manufacturers and suppliers

Holcim (NZ) Ltd operates numerous concrete manufacturing plants around the country including a site at Pokeno in the Franklin District (north Waikato). According to a discussion with Campbell Robertson from the Pokeno site (Technical Services Manager), staff have been developing and testing a range of products that contain recycled waste products, including crushed glass, crushed concrete and fly ash. The development of these products is, in part, driven by client demand.

One example highlighted was the recent construction of a new brewery for Lion Nathan Ltd in South Auckland. The client requested that used glass bottles be incorporated into concrete pre-cast slabs as an aggregate (refer Section 3.3). Most recently, the University of Auckland has specified to its building contractor, that as part of obtaining a 'Green-Star' building rating for their new building, concrete materials must contain a certain proportion of recycled aggregates and/or fly-ash from the Huntly Power Station. Holcim (NZ) Ltd has been working on developing and testing these products.

Another product that is being developed and used is a ready-mix concrete that incorporates crushed concrete. This product was provided by Holcim for the construction of the Hukanui Eco-School in the Waikato (www.ecoclassroomnz.com). While this is not a local government funded civil works project it reflects the direct use of crushed concrete in the construction sector.

Obtaining a good quality supply of recycled material is critical for efficient production and product quality assurance. Lack of storage space to stockpile supplies of recycled materials at the Holcim Pokeno site was highlighted as a potential limitation. Regardless of these operational and quality issues, it would appear that there is definitely further potential to build on the interest within the private building sector and the capabilities of the concrete manufacturing plants in the Waikato and beyond to develop a greater market for concrete products that incorporate crushed concrete. This option would create a closed loop solution for concrete wastes.

Key points obtained from a discussion with staff from **Stevenson Ltd** included the following:

- Stevenson is currently involved with recovering some 'waste' materials at its Drury site to produce certain construction products (e.g. concrete masonry waste, concrete washings, windscreen glass, and recycled asphalt), as part of the company's commitment to sustainability and recycling. They are working with researchers (via Pavespec) to test various products/mixes for strength and performance properties etc, so that this information can inform designers/consultants for project specifications.
- Whole of life costs need to be used when assessing projects, so that the benefits when using a premium and/or recycled product (e.g. a crushed concrete basecourse that has added stabilising properties from the cement content) can be taken into account over the course of the infrastructure's life.
- Products made from recycled materials are not currently commercial viable given the costs of cartage and processing, especially when the conventional aggregate products can be sold for equivalent or less cost. However if concrete could be processed to a higher-grade product (e.g. aggregate for concrete making rather than just GAP40) then it may become a higher premium product and compete better on cost basis with conventional products.
- The existing state of New Zealand's waste/demolition/construction industry is not well integrated and there is a lack of incentives (e.g. aggregate tax in UK or quantities in Australia that make things more viable there) to make recovery and processing of waste materials commercially viable. Another major issue is locating sorting/recovery/processing plants close to construction sites. Ideally council projects would involve both demolition and construction simultaneously. This provides a secure demand for a recovered/processed product.

Peter Fredricsen, Director of **Materials Processing Ltd** has had extensive experience in the resource recovery sector and has operations in the Waikato region, including an office based in Hamilton. MPL operate resource recovery operations, where greenwaste, woodwaste and concrete wastes can be processed. They also provide mobile crushing and shredding services.

MPL helped pioneer concrete crushing in the Waikato in partnership with Rotorua District Council. The majority of this product is onsold to private contractors rather than being used in council civil works however. Based on the research by Dr. Greg Arnold (Pavespec), Peter Fredricsen promotes crushed concrete products as a premium aggregate product compared to conventional aggregate.

MPL is currently offering a recovery service for building sites, where the building site is provided with a skip bin and returned to MPL's Northland site for sorting and recovery. Peter suggests that in order to recover and divert greater quantities of construction and demolition wastes, councils could circulate a letter to all builders reminding them of the implications of the Waste Minimisation Act 2008 and their obligations with regards to the REBRI programme. He also recognises that cleanfill sites need greater controls and enforcement measures, in order to enhance the recovery of concrete materials.

Eric Souchon from **HG Leach Ltd** which operates quarries and a landfill site in the Waikato region considered that the main issue is that "there is little or no recycled concrete available to crush in rural areas of the Waikato region. The amount available is negligible", although he does note the work that Materials Processing Ltd has been involved with throughout the region. He also highlighted that because local government are not specifying recycled materials in any of their projects this acts as a hindrance to industry acceptance.

Summary and conclusions

In summary, the following key points regarding the use of recycled materials in council's civil works are highlighted:

- High-level council sustainability strategies or procurement policies are not widespread in the Waikato region. Only two of the 11 TAs have existing council sustainability strategies. Five councils (including the two that have an existing sustainability strategy) referred to having an existing overarching procurement strategy or policy. Four councils noted that they are in the process of developing a procurement or sustainability strategy.
- Council staff provided twenty-one references to council projects that use recycled materials (or have used) in the Waikato. No significant examples of specific large-scale projects were identified. Given that TA sustainability and procurement policies are not wide-spread in the Waikato region and the relatively low number of projects that use recycled materials, it is not likely that existing policies are stimulating the current use of these materials in council civil works. In addition, it was found that specific references or specifications in tender documents or council Codes of Practices that allow for the use of specific recycled materials are largely non-existent. It is noted however that policies and plans regarding waste minimisation and management are held by all TAs, and these directly promote waste diversion and recycling of organic waste streams and construction wastes.
- In terms of their potential for use in council civil works projects, the four key materials assessed for this project are ranked as follows: **concrete, organics, glass, and timber**, as illustrated in the diagram below. This is based on the overall feedback provided by councils and industry representatives, together with consideration of waste quantities in the region, existing waste recovery experience, and current markets.

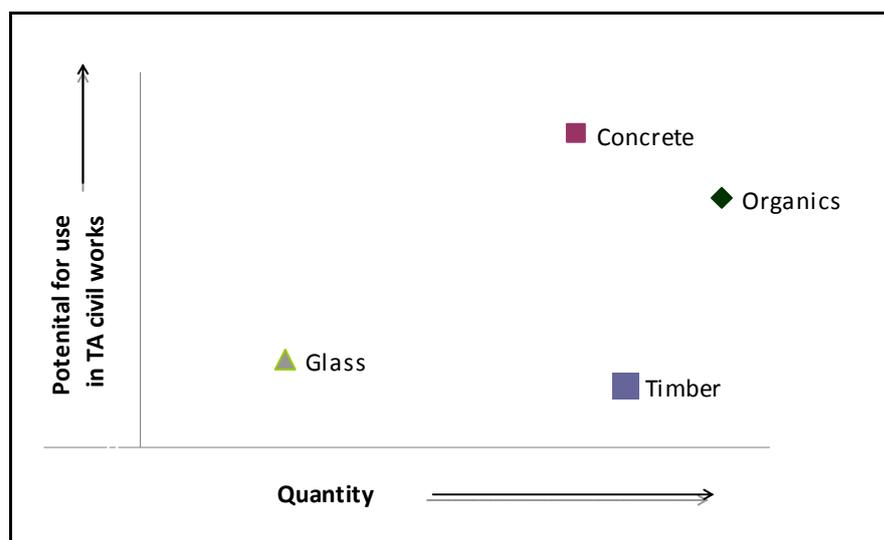


Figure 0.1 – Key recycled materials potential for use in Waikato civil works

- Crushed concrete is considered to have the highest potential for use in civil works contracts in the Waikato, given the relatively high quantities that are currently still being disposed of to cleanfill and landfill and the various emerging uses for this

material in both the private and public construction sectors. There appears to be an emerging awareness and willingness within industry to use recycled aggregates as an alternative to hard rock and as an additive in concrete products, however current recovery efforts in the Waikato limits the supply and is the key barrier.

- Compost and mulch products are readily available in the region, however their use in council projects is not currently significant (i.e. estimated from data provided by TA staff to be total 2,000 tonnes/year). It is likely that there are larger markets for compost products within the food-producing and agricultural private sectors. Councils still have the potential to more directly specify compost/mulch products for use in a greater number of civil works contracts – as highlighted by the example technical specification included in Hamilton’s Development Manual.
- The majority of glass recovered from the Waikato is likely to continue to be consumed by Auckland’s O-I glass recycling plant, especially given the plant’s recent increased capacity. The demand for glass aggregate in the civil sector is unlikely to compete with this existing market unless specified directly by TAs. In regards to timber, given the lack of large-scale recycling or recovery options for timber products (specifically treated building timber), the wide-spread use of recycled timber materials in council civil works is considered currently limited in the Waikato. Options to deal with this waste stream will require further research at a national level, and will likely require government, industry and community initiatives and involvement.
- The availability of recycled products for use in civil works is the key barrier in the Waikato region for both councils and contractors. This is particularly important for concrete wastes but less critical for processed organic wastes which, in comparison, are readily available. The recovery of greater quantities of construction and demolition wastes from building sites, cleanfills and landfills is therefore critical in order to generate more quality product that can be used in construction and civil works. Other barriers identified by TAs related to provision of information on recycled materials and regulating cleanfills.
- The four initiatives that were raised the greatest number of times by council staff as mechanisms to help overcome these barriers were: TAs/EW providing information to contractors on where to obtain a supply of recycled materials; Changing cleanfill consenting/acceptance criteria; Council specifying the use of specific recycled materials in contract/tender documents and EW/Councils/MfE promoting specific case studies and specifications.
- In regards to energy efficient lighting, the majority of the TAs referred to having some experience with introducing more energy efficient technologies, although experience with trialling new emerging technologies (i.e. LEDs and new metal halide lights) is limited to Hamilton City and South Waikato.
- None of the councils highlighted bulk-purchasing of lights as an appropriate role for EW, although Hauraki District Council’s street lighting consultant raised that the purchase of regional control-systems or negotiating rates with power companies at a regional level could be possible roles. The majority of councils thought EW’s role should be via providing information to TAs, suppliers and contractors on the subject. This role would have a reasonable fit with promoting the soon-to-be-released Electricity Commission’s local government ‘Resource Kit’ on street lighting and associated planned roadshow.

Recommendations

Environment Waikato can take numerous actions either independently or in conjunction with Waikato TAs, and through engagement with industry and community stakeholders, to further develop markets for recycled materials and increase energy efficiency in street lighting.

The actions presented in Section 9.1 below are suggested as ways to help promote the recovery of key waste materials and/or increase the uptake of recycled materials in council civil works. Recommendations are grouped according to **'Policy Initiatives'**, **'Education Initiatives'** and **'Infrastructure Initiatives'**. It is noted that the initiatives are not presented in any specific priority order. Further evaluation will be required for each proposed initiative.

There is potential for many of the recommended actions to be incorporated into projects that could be eligible for waste levy funding under the Waste Minimisation Act 2008. Half of the waste levy fund will be given direct to individual TAs based on the district's population and the other half of the fund will be contestable. The criteria for the contestable fund are yet to be decided by the Ministry for the Environment (MfE). Separate actions are presented in relation to energy efficient street lighting in Section 9.2.

Recycled materials in civil works

POLICY INITIATIVES

- **Develop overarching council sustainability and/or procurement policies**

That EW facilitate workshops with TAs to assist in the development of overarching council procurement and sustainability policies, practices and initiatives.

That EW and TAs investigate ways to incorporate the New Zealand Transport Agency's new procurement manual into council procurement practices.

Several council staff interviewed for this project raised the concern that without a higher-level council policy it is difficult for officers to have any mandate to promote the use of particular materials or consider alternatives to standard practices. It is essential for local authorities to provide a top-down mandate for action and send clear signals to contractors regarding environmental and procurement policy priorities. The real benefits, however, are achieved when sustainability objectives at policy level are clearly linked to practical delivery mechanisms – such as contract specifications, award criteria and performance indicators³⁴.

The upcoming EW-facilitated workshop in mid-September 2009 with TAs from the Waikato and Bay of Plenty regions is a good example of action being taken to address the issue of developing council policies on procurement and sustainability. Sustainability

³⁴ According to a manual produced for local authorities on sustainable building practices, by Beacon Pathway Ltd, "policies are an important signal of a council's priorities and intentions. Policies that "promote", "support", or "encourage" can be viewed as soft and generally inconsequential however. The challenge for councils lies in specifying and delivering effective methods to achieve those policies. Effective council initiatives are those where policies intentions have been actively implemented through an array of regulatory, economic, and educational methods. Policies are tied to action through the LTCCP process, and – perhaps more importantly – through the efforts of officers across council units".

strategies/policies developed by Hamilton City and Rotorua District could be highlighted as relevant examples for other Waikato TAs.

- **Incorporate specific initiatives into TAs Waste Minimisation and Management Plans (WMMPs)**

That EW work with TAs to develop and promote the incorporation of specific initiatives (that can help achieve desired outcomes with respect to recovering waste materials and reusing wastes in civil works) into TAs' WMMPs

Under the Waste Minimisation Act 2008, all councils are required to adopt a revised Waste Minimisation and Management Plan by 2012. This presents an opportunity to incorporate specific initiatives into Waikato TAs plans that may help to stimulate the recovery of key waste materials from landfill and cleanfill and to promote their use in civil works. It is important to note that the pro-rated funding that each council receives from the national waste levy must be spent in accordance with councils' WMMPs.

These are numerous initiatives that councils could include in their WMMPs that do not require significant capital investment, but rather changes to council policies or administrative practices. EW could assist TAs by generating a list of suggested initiatives that councils can consider including in their WMMPs, such as the following:

- ❖ Include a requirement in all contracts for council-funded civil works projects (or those over a certain value) that civil works contractors submit a Site Waste Management Plan as part of project planning. This would help contractors and council staff to identify key waste streams and help to generate appropriate reuse or recovery options.
- ❖ Undertake a review of council's code of practice to identify whether there are opportunities to include specific references to the use of approved recycled materials e.g. composts for parks and reserves, crushed concrete or glass as a bedding or basecourse material etc.
- ❖ Promote more resource recovery at private building and construction sites through the building consenting process or via educational programmes such as REBRI.
- ❖ Set explicit targets for the amount of C&D waste recovered within the district (or disposed of within the district), depending on best available data sources. TAs could consider setting targets and measuring the quantity of materials recovered through council-owned sites (e.g. at resource recovery parks or community enterprises). The targets should be realistic and annual performance against the target should be documented.

- **Enforce regional rules on cleanfills**

That EW adopt the soon-to-be-released MfE Guidance document on the Management of Cleanfills, which provides tools for regional councils to achieve better control over cleanfill operations and sites via regional plan rules.

It is understood that currently large quantities of C&D wastes are disposed of in legal or illegal cleanfills sites rather than being diverted into alternative markets or landfill. This issue is recognised by the MfE and a guidance document outlining how regional councils can better govern and enforce cleanfill acceptance guidance was produced in 2009. Environment

Waikato has a regulatory role in controlling the operation of cleanfill sites under its regional plan. Provided sites require consent (i.e. are not classified as permitted activities under the regional plan), EW can recover costs for their ongoing enforcement and monitoring roles. TAs can also assist with this process by developing relationships with local cleanfill operators and report to EW illegal activities.

- **Incorporate specifications into TA engineering standards**

That EW/TAs undertake a review of existing Engineering Standards to investigate opportunities to incorporate specific references to recycled materials for use in specific works.

By specifying recycled materials in Code of Practices/Engineering Standards, greater awareness can be generated within the contracting sector for the types of applications that recycled materials can be used for and those that council allow. Given that seven TAs currently use the existing HCC's Development Manual as their engineering standard, introducing changes to this manual will also dictate the construction practices used by civil contractors in over half of the region. Through such changes and monitoring the effectiveness of these inclusions, local authorities can demonstrate delivery against sustainability policies, procurement good practice, and diversion of priority wastes. Example specifications could be elicited from a review of other New Zealand council's engineering standards, the TM4 specification for roading basecourse and other tools available from UK's WRAP website³⁵.

- **Incorporate specific requests in tender documents for the use of recycled materials, when and where materials are available**

That TAs waste officers work together with contract managers and civil works engineering staff to identify opportunities to include specific clauses in tender documents for the use of certain waste materials when and where they become available or set minimum recycled content requirements for particular projects.

There are likely to be some easy gains to be made if, for example, composted organic wastes from council-owned facilities are directly specified in parks and reserve contracts, or that a stockpile of crushed concrete is specified for use in particular civil works contracts. It would help therefore to have these particular materials included in the council code of practice/engineering standard.

To aid local authorities in implementing this, WRAP has published a 'Recycled Roads' guide, which provides step by step advice for local authority procurement. The guide presents a model approach that ensures recycling and reuse of road materials is embedded in all roading contracts and schemes³⁶.

³⁵ Multiple resources are available at - <http://www.wrap.org.uk>

³⁶

www.publicservice.co.uk/article.asp?publication=Local%20Government%20and%20the%20Regions&id=233&content_name=Environment&article=6782

EDUCATIONAL INITIATIVES

- **Facilitate discussions with civil contractors and key suppliers of recycled materials**

That EW/TAs engage with civil contractors to investigate ways to increase contractors' knowledge of waste materials available in the district/region and progress existing contractor-council initiatives (e.g. site waste management plans, use of recycled bitumen).

That TAs/EW engage with local waste and recovery/demolition waste operators to promote their services and facilities to builders and council contractors.

Feedback from the contractors contacted for this study, indicated that although the use of recycled materials in civil works is limited, the main drivers for their use is 'company policy' more so than 'council requirements'. There is therefore likely to be opportunities for TAs to engage with council contractors to encourage contractors' current waste minimisation initiatives (e.g. using site waste management plans, recycled bitumen etc) and to provide information and identify ways to increase the use of recycled materials. Information about the services available within the district/region (e.g. mobile concrete crushing, compost supplies etc) would also be of use to contractors.

- **Develop dedicated educational resources for contractors, suppliers, TAs and disseminate**

That EW/TAs promote the REBRI and other web-based tools and educational information to contractors, building industry and suppliers and develop specific information relating to the Waikato (e.g. case-studies, research, suppliers, quantities etc).

Investigate establishing a permanent one-stop-shop in Hamilton to disseminate information to industry/business on resource and energy efficiency/sustainability

Council staff recognised that a key role for EW relates to the provision of information and guidance to TAs and industry. The above initiatives would help to fulfil this role by developing specific information that could be disseminated via a range of communication channels, such as EW website/REBRI website, forum meetings, email newsletters, waste-exchange etc. Another suggestion, raised by Hamilton City Council staff, relates to the establishment of a one-stop-shop that could be like a permanent expo that provides advice and information to industry/businesses regarding resource and energy efficiency/sustainability.

INFRASTRUCTURE INITIATIVES

- **Investigate options for developing resource recovery facilities as part of a regional network for the Waikato region for the processing and storage of construction and demolition wastes**

That EW facilitates discussions with TAs and industry to investigate potential sites and/or current proposals for construction and demolition waste recovery centres that can serve multiple districts (e.g. current proposal from TCDC/Hauraki/Matamata-Piako).

A key barrier identified by both councils and contractors in regards to using recycled aggregates related to availability and supply of suitable materials. Developing sites for recovery, processing, and storage of construction and demolition wastes is critical to help address this key barrier. By increasing recovery rates, TAs will be better placed to promote and specify the use of C&D wastes and help to generate cost-competitive recycled materials. The concept of a regional recovery network is one that has been researched in depth for the Auckland region.

- **Develop industry partnerships and product stewardship schemes**

That EW considers working with or facilitating discussions with key industry players to develop specific initiatives and/or a product stewardship scheme for particular products - specifically concrete.

Depending on EW's capacity to become involved with wider national product stewardship schemes, this recommendation would involve engaging with Waikato-based industry representatives to initiate local or national product stewardship schemes. The Waste Minimisation Act 2008 sets up obligations for industry to establish product stewardship schemes that address the impacts of waste generated by a product's generation/use. The findings from this report suggest that a product stewardship scheme for concrete products could potentially be developed given the existing involvement and interest from key industry players in finding uses for crushed concrete (e.g. Holcim NZ Ltd, NZ Cement and Concrete Association). Schemes for other materials such as treated timber, bitumen, and tyres require further research and industry involvement.

Energy efficient street lighting

It is recommended that Environment Waikato support the outcomes of the Electricity Commission's current project on street lighting and promote the 'Resource Kit' which is to be rolled out in late 2009. EW may have a role in hosting and/or promoting the planned roadshow events within the region.

It is recommended that Environment Waikato investigate possible involvement in the current proposal being put forward to Waikato TAs by Tranzgrid Solutions Ltd.

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Appendix A – TA Survey

Appendix B – NZWaste and WasteMINZ notices

From: nzwaste@yahoogroups.com [mailto:nzwaste@yahoogroups.com] **On Behalf Of** Waste Not
Sent: Thursday, 25 June 2009 10:04 a.m.
To: nzwaste@yahoogroups.com
Subject: [nzwaste] recycled materials in civil works

Hi All

I'm interested to find out if there are local authorities out there who are specifying the use of particular recycled materials in tender documents for civil works contracts e.g. organic mulch/compost for parks and reserves, crushed concrete, crushed glass or recycled timber for use in roading, building or other civil works etc?

Any comments or examples of successes/issues/barriers etc, please do get in touch.

This information will assist with research being undertaken on behalf of Environment Waikato.

Kind regards

Nadine

Nadine Wakim
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RECENT ACTIVITY

New Members 1
[Visit Your Group](#)

Find helpful tips
 for Moderators
 on the Yahoo!
 Groups team blog.

Yahoo! Groups
 Everyday Wellness
 Zone
 Check out featured
 healthy living groups.

Weight Loss Group
 on Yahoo! Groups
 Get support and
 make friends online.

Welcome to WasteMINZ's Weekly e-newsletter 26 June 2009

In this week's edition

1. Final Call for Papers for the WasteMINZ Conference
2. Local Authorities comments needed
3. WasteMINZ Board – Call for Nominations
4. Advertising in Waste Awareness
5. WasteMINZ Editor Update

1. Final Call for Papers

The abstract submission form for the technical paper you have been planning on presenting at the WasteMINZ conference is attached. Don't delay in completing it and returning it to ensure that you have the opportunity to present your research or case studies to the movers and shakers of the waste world.

2. Local authorities – can you help?

Local authorities are being asked if they specify the use of particular recycled materials in their tender documents for civil works contracts. e.g. organic mulch/compost for parks and reserves, crushed concrete, crushed glass or recycled timber for use in roading, building or other civil works etc. Research is currently being undertaken on behalf of Environment Waikato. If you can comment or provide examples of successes/issues/barriers Nadine Wakim would like to hear from you. Her email is nadine@wastenot.co.nz

3. WasteMINZ Board

Elected members of the WasteMINZ Board serve a two- year term with three positions available for nomination each year. Any current financial member can nominate any other current financial member to be elected to the Board. Nominations must be received by the Chief Executive Officer on or before 2 September, which is 42 days prior to the WasteMINZ Annual General Meeting. The AGM is being held on Wednesday 14 October 2009 and the election will be conducted by postal ballot. You can email Lyn for a nomination form at lyn@wasteminz.org.nz

4. Advertising in WasteAwareness

Satisfied advertisers have told us that the focused audience that WasteAwareness provides has been great for sales of services or products. You're invited to ring or email Carole to obtain the reasonable costs for members to advertise in WasteAwareness. There are opportunities for ¼, and ½ page advertisements or why don't you consider placing your business card. Grab this opportunity and advertise in the August/September edition. Carole's email is carole@wasteminz.org.nz

5. WasteMINZ Editor Update

WasteMINZ says farewell to Sarah MacDonald, who's been the editor of Waste Awareness for some 6 years. She's busy with George her little son and her growing internet business.

Another Sarah – Sarah Knowles has taken on this challenging and enjoyable role and her first taste of WasteAwareness will be preparing the August/September edition. WasteMINZ also welcomes Yvette Stokman who has come on board for four months and is contracted to assist with the organisation of the Conference with a major focus on the Expo

Marion Short
 Chief Executive Officer
 WasteMINZ

Appendix C – Street lighting proposal

Information provided by Tranzgrid Solutions

New technologies in Smart Street Light control & monitoring are about to come to life in NZ. **TranzGrid Solutions**, a Hamilton based Power Consulting business has formed an alliance with European companies who have developed the smart technology for Street Light and Agriculture systems. The Smart system provides wireless control & monitoring solutions between a central management bureau and multiple council street Light networks.

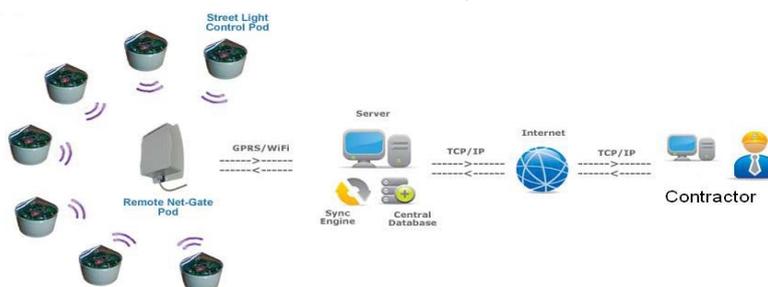
The major benefits to councils are:

- Reduced Energy consumption up to 50%
- Reduced Maintenance Costs up to 50%
- Accurate fault finding and reporting
- No need for a separate street light control relays or cables , so ideal for new subdivisions and upgrades.
- Fully auditable system
- ROI of approx 4 to 6 years

The smart System can provide the following control and information:

- *Remotely configure and commission the assets on the network*
- *Switch on and off the lamp remotely or turnoff every 2 or 3 light etc*
- *Dim the lamp to any level that is supported by the lamp*
- *Automatically identify failures & send reports to maintenance contractors*
- *Get detailed data (voltage, lamp feedback, ...) to troubleshoot any failure*
- *Get the number of running hours as calculated by the electronic dimmable ballast to anticipate lamp change before they fail*
- *Get the energy consumption from the electronic ballast to calculate and display the aggregated energy consumption for a whole geographic zone or a city.*

Below is a basic overview of the Smart system



Tranzgrid Solutions provide full concept to Installation solutions for power companies and councils.

For Further Information, please contact

Peter Stockley – Tranzgrid Solutions

peter@tranzgrid.co.nz 07 829 5829