

Update on 80/20 by 2020 Waste Diversion Goal

29 April 2015

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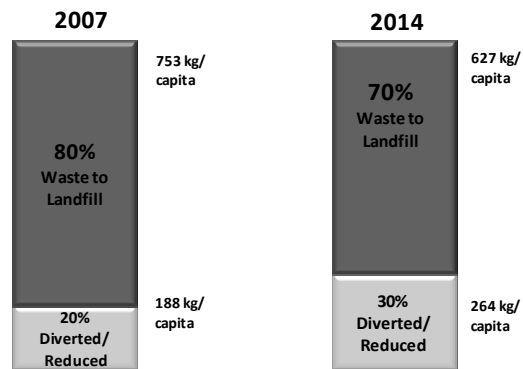
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1.0 Introduction

The 80/20 by 2020 waste diversion strategy was approved by Council (UE2007-35) in 2007 and kicked off an era of transformation for Calgarians, encouraging them to increase waste diversion and decrease waste to landfills.

As of 2014 it is estimated that Calgarians had achieved an overall waste diversion rate of 30 per cent (Figure 1). The progress is largely due to the introduction of diversion programs in the single family sector including blue cart recycling and the organics pilot program. Calgarians still send over 749,000 tonnes of waste to landfill annually that has environmental, social and financial implications.

Fig. 1 Progress towards 80/20



Based on current programs and data, it is estimated that waste diversion from all sectors will reach a minimum of 60 per cent. Although this is below the original target it does represent significant progress and would put Calgary in the top quartile for North American cities with respect to waste diversion. This 60 per cent diversion rate is based on conservative estimates (low capture rates) and does not include any diversion due to waste-to-energy technologies.

In order to continue progress towards 80/20, The City must collaborate with all four waste sectors single family (SF), multi-family (MF), Industrial, Commercial and Institutional (ICI) and Construction & Demolition (C&D) and invest significantly in facilities and programs. The original strategy identified that at maturity, the outlined diversion activities will divert 70 of the 80 per cent that is to be achieved by this strategy. The remaining 10 per cent would be addressed by emerging technologies and processes.

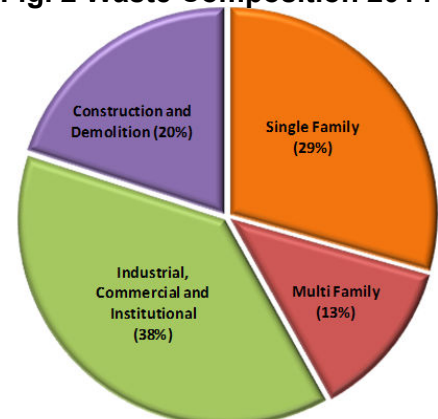
2.0 Progress 2007-2014

2.1 Waste Characterization

In Calgary, waste is managed within four sectors:

- single family residential (SF);
- multi-family residential (MF);
- industrial, commercial and institutional (ICI); and
- construction and demolition (C&D) sectors.

Fig. 2 Waste Composition 2014



Waste composition studies identify the recyclable and compostable (i.e. divertible) materials remaining in the waste stream for each sector (Figure 2). It does not include already recycled or composted materials. Waste composition from 2007 and 2014 indicated significant changes occurring in material compositions across the waste sectors.

In the single family sector, a decrease in recyclable materials in the waste stream was observed - 34 per cent to 15 per cent from 2007 to 2014. This indicates that residents are putting more recyclables in their blue carts. It represents a decrease of 40,000 tonnes of recyclable material entering the landfill.

Similarly, recyclables found in the multi-family waste stream are much lower in 2014 (24 per cent) than they were in 2007 (41 per cent), most likely due to increased awareness and access to recycling programs, through both community recycling depots and private recyclers.

The waste composition studies for the ICI and C&D sectors in 2014 have generally remained similar between 2007 and 2014. As of 2014, over 80 per cent of the materials in the ICI waste stream could be diverted from landfills.

2.2 Waste Sectors

The reduction of waste to landfill per capita, is the measure of progress in the 80/20 by 2020 goal. This measure monitors the total amount of waste disposed at The City of Calgary landfills, waste from City of Calgary residential collection as well as from private haulers, and attributes an amount (kgs) to each Calgarian. The measure is impacted by total tonnes sent to landfill as well as changes in our population size.

Waste to landfill per capita has trended downward from 2007 to 2012 (753 kg/capita to 556 kg/capita). This was mainly due to the introduction of new programs for single family recycling as well as a weakened economy. The figures for 2012 to 2014 show an upward trend to 627 kg/capita that can mainly be attributed to increased economic activity, unforeseen natural events (2013 flood and 2014 snow event), and the fact that no new diversion programs were introduced during this period.

Appendix 1 has the specific information about current and future states for each sector.

3.0 Next Steps

The period of 2015-2020 will represent the biggest shift in diversion for Calgary. Maximizing diversion in existing programs and introducing new programs will ensure all sectors meet the diversion rate of a minimum 60 per cent by 2020.

The 60 per cent diversion rate is based on conservative estimates (low capture rates) for diversion and excludes waste-to-energy as a form of residual management.

Most cities focus diversion efforts in the residential (mostly single family) sector and don't have sector-wide ICI programs in place. The City of Calgary has taken on the task to engage the private sector to ensure that the other sectors also participate in the diversion effort.

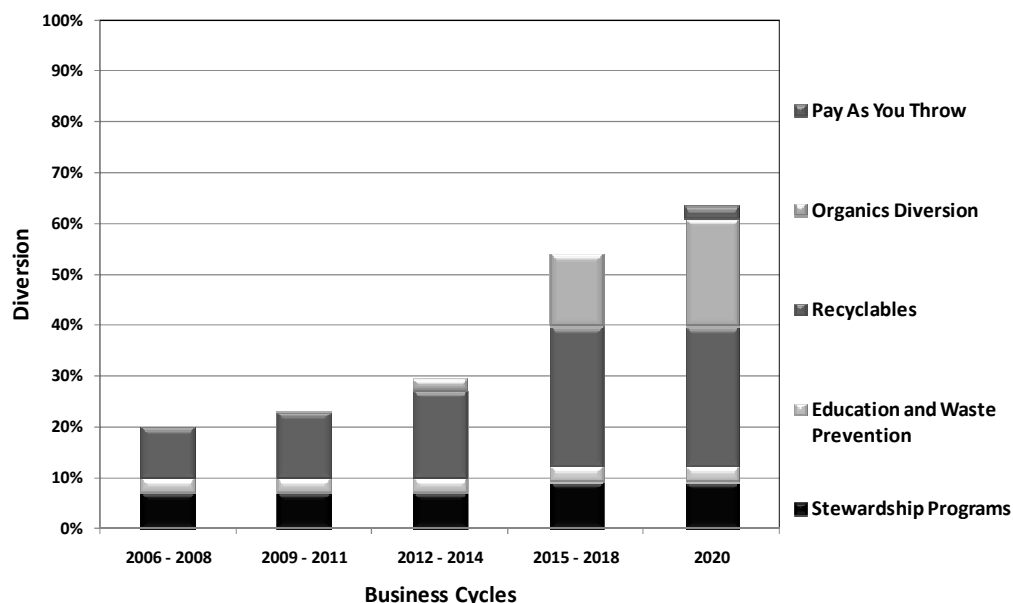
The City of Calgary has for many years focused on the single family sector, where WRS was able to manage diversion from generation to processing, specifically related to recyclables. The next step toward 80/20 will include partnerships where hauling and processing of waste and divertibles are mostly done by the private sector. This means that The City will have less of an operational role to play, but will rather focus our efforts on increased education, communication, facilitation, policy and enforcement; and to a certain extent act as a market stabilizer.

Major steps will be taken within the next few years to remove materials from the waste stream that will benefit Calgarians and the environment. These steps will focus on recyclables, organics, waste prevention, pay-as-you-throw, extended producer responsibility, residual management and collaboration.

When 80/20 was initially established, it envisioned that waste-to-energy would be needed to get The City to the 80 per cent target. Currently, a good business case does not exist to support the initiation of waste to energy. Recent unsuccessful developments in other jurisdictions support the idea that technologies are still being tested. Calgary is in an advantageous position to learn from these municipalities and provide clear cost effective direction with regard to such developments. Calgary will only fully maximize diversion programs after 2020 at which time recommendations would be made to consider alternative technologies.

Figure 3 indicates progression in all sectors and programs toward 2020. Major advances are shown in the diversion of recyclables and organics as well as the introduction of Pay-as-you-throw (PAYT).

Fig. 5 Diversion Program Scenario 2020



The success of diversion in the single family sector is evident. On average cities in North America achieve between 30 per cent and 60 per cent diversion, in their single family sector. Compared to programs in other cities that take 10 – 20 years to turn the curve,

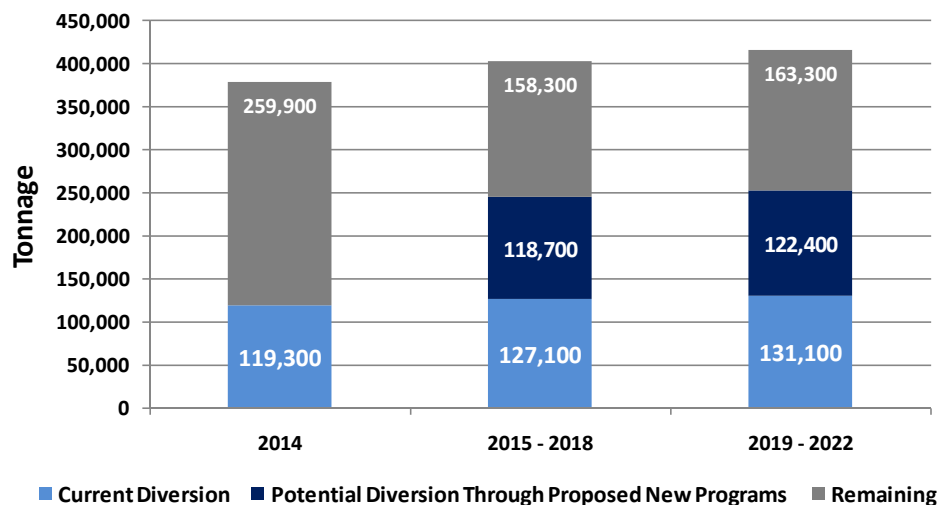
Calgary's single family sector could achieve a 60 per cent diversion rate after the implementation of Green Cart in a short seven year span.

The diversion rate is proof that dedicated programs will achieve positive outcomes even at low capture estimates. It is important to note that residents are never 100 per cent efficient in segregating their recycling or compostable material from their garbage. This is an international occurrence. Reasons for this behaviour include level of familiarity with program elements (i.e. types of materials to be recycled), education, and lack of incentives to divert (i.e. bans, tipping fees, regulation, facilities to accept divertibles, etc). Additional programs such as pay-as-you-throw and other waste prevention measures will be employed to further increase overall diversion in the single family sector to approximately 70 per cent.

3.1 Recyclables

Recycling provides one of the biggest opportunities for diversion in Calgary. Figure 4 shows the currently diverted recyclable materials and potential recyclable materials through proposed diversion programs in all sectors.

Fig. 4 Potential Recycling Opportunities



By 2018 the majority of recyclables in the single family and multi-family waste streams will be diverted. To date, approximately 119,300 tonnes of recyclables have been diverted through various programs. Depending on the success of the proposed programs, it is estimated that an additional 122,400 tonnes of recyclables will be diverted from the waste stream by 2020. Programs such as PAYT, waste prevention and education will also increase diversion of recyclables at that point.

The ICI sector will almost cut its recyclables to landfill in half over the next five years with the ban on paper and cardboard playing a significant role. Any remaining recyclables in this waste stream will be targeted with tools such as designated materials rates, other material bans, education and prevention to increase diversion.

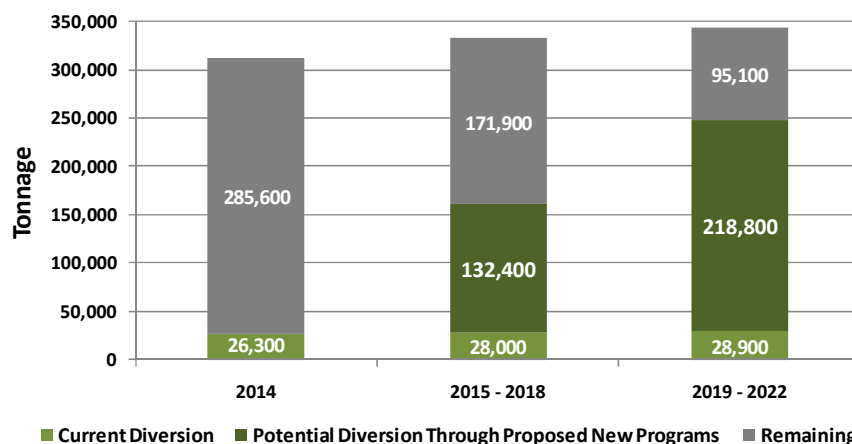
3.2 Organics

The organic waste stream across all sectors represents the next most significant element to be addressed. Figure 5 represents the current total of compostable material being diverted and potential divertible organics through proposed programs in all sectors.

A single family food and yard waste pilot program was developed in 2011 and implemented in four communities across the city in 2012. This pilot represents a major milestone in the next steps to achieving 80/20. The Green Cart (organic diversion) Program will be expanded to the rest of the city commencing in 2017 and should eliminate approximately 90,000 tonnes of organic material from the waste stream.

The total divertible organic material currently found in the waste stream represents over 285,000 tonnes. The organics ban, coming into effect in 2019 will divert approximately 132,400 tonnes, from the ICI and Multi-family sector; and a total of 218,800 from all sectors. Additional organic diversion in the single family sector beyond the current estimated capture of approximately 40 per cent will be investigated to align with the capacity and expansion of the City's composting facility.

Fig. 5 Potential Organics Opportunities (tonnage)



3.3 Waste Prevention

Waste prevention refers to measures taken to avoid waste from occurring in the first place. It is all the actions taken at the 'reduce' and/or 'reuse' stages of the waste hierarchy.

Food waste is one of the main targets for diversion. Food waste from Canadian restaurants, grocery stores and households cost a total of \$31 billion in 2014, up from \$27 billion in 2010. Food waste is costing the average family in Canada about \$86 per month, while between five and 11 per cent of restaurants' profits end up in landfills.

WRS is currently developing a Waste Prevention Strategy that will work toward the reduction of preventable waste across the city's waste sectors and materials streams. In addition The City has been invited to participate in the National Zero Waste Council of

Canada. As a participant, Calgary will be able to work with and collaborate with major Canadian cities (Toronto, Vancouver and Halifax), businesses and associations such as the Retail Council of Canada and Canadian Manufacturers and Exporters.

3.4 Pay-As-You-Throw

Pay-as-you-throw (PAYT) is a type of waste collection program where residents are charged for the collection/disposal of their municipal solid waste based on either the amount (weight) of waste they generate or the size of collection bin they set out for collection. PAYT can reduce disposal amounts on average by 17 per cent (and as high as 35 per cent), with significant increases in recycling. In basic terms it comes down to paying for what you use (or throw). WRS will be considering PAYT options over the course of the 2015-2018 business cycle.

3.5 Extended Producer Responsibility and Designated Materials

Extended producer responsibility (EPR) and product stewardship are two means of managing products at their end-of-life. EPR specifically makes producers responsible for end-of-life management of their products, whereas product stewardship allocates that responsibility to a provincial or municipal government.

The Province of Alberta is proposing changes to the Designated Materials Recycling Regulation (DMRR). The proposed changes are intended to reduce waste in Alberta and shift costs from taxpayers to those who produce and use products. The proposed new regulation will advance initiatives outlined in Alberta's Too Good Too Waste Strategy, better align Alberta's approach with neighbouring provinces, and support Federal programs.

WRS has been working closely with its municipal partners through organizations such as the Recycling Council of Alberta to lobby the Province with regard to EPR. Collaborative efforts included several workshops to develop formal responses to the consultation mentioned above, and specifically the proposed DMRR amendments.

3.6 Residual Management

Residual management is the disposal and treatment of the remaining material that cannot be handled by any other method.

Even if all the sector diversion programs are successfully implemented, WRS will still have to manage residual materials that are discarded as waste by residents or are unsuitable for diversion (i.e. not reusable, non-recyclable, non-compostable). Current estimates of residual materials after 2020 range between 20 and 30 per cent of total waste. Landfill disposal and treatment via alternative technologies (waste to energy) are two options to manage residuals.

WRS is currently developing a Residuals Management Strategy, centered on determining the component materials that currently make up our residuals, as well as forecasting for the future as new diversion programs are implemented. Once this composition is understood, there will be a greater understanding of the size and scope of technology and programming required to suit our needs. The residual management strategy will contain two components – a landfill strategy and waste-to-energy strategy.

3.6.1 Landfill

The lifespan of the three City of Calgary Waste Management Facilities are estimated at 30 years. It is imperative to ensure that landfill space continues to be utilized effectively. Increased diversion programming will support this direction and provide The City with a buffer to analyze and facilitate new technologies and techniques to manage residuals. One option is that landfills could be used as storage facilities for material that may have diversion options in the future. In addition landfills could serve as areas of biodiversity, provide opportunity for piloting innovative technologies and continue to support the region.

3.6.2 Waste-to-Energy

Current diversion rates, quantity and quality of feedstock (materials from waste stream), environmental impact, financing, siting and public acceptance are only a few factors to consider when analyzing opportunities for thermal treatment. Technologies are developing at a very high pace, but many are still unproven. Challenges such as this will require thorough analysis and consideration to make appropriate decisions for residual management in the Calgary context.

The 80/20 target envisioned that waste-to-energy would be needed to get The City to the 80 per cent target. Currently, a good business case does not exist to support the initiation of waste to energy. It is estimated that implementing a waste-to-energy solution at this time ranges between \$100 - \$500 million capital investment. In addition, recent unsuccessful developments in other jurisdictions support the idea that technologies are still being tested. Calgary is in an advantageous position to learn from these municipalities and provide clear cost effective direction with regard to such developments. While emerging and developing technologies are progressing towards commercialization, they lack the operating record in North America at the estimated scale applicable to The City to be seriously considered at this time as viable alternatives for residual management. WRS will continue to monitor emerging trends and the development and implementation of residual management solutions in other cities around the globe.

As WRS continues to prioritize actions according to the waste hierarchy (maximizing waste reduction, reuse, recycling/composting and residual management) and strives to meet the long-term goal of producing zero waste, the challenge will be to strike a balance that ensures our residual management plan, whether involving a thermal treatment technology solution or not, does not harm other efforts to divert resources to more beneficial uses.

Globally, several waste-to-energy technologies are being piloted including mechanical biological treatment such as anaerobic digestion, advanced thermal treatments such as gasification. Industry activity is centered on developing more efficient treatment options for smaller amounts of material. WRS will continue to monitor emerging trends and the development and implementation of residual management solutions in other cities around the globe.

3.7 Collaboration

Collaboration has been key in the progress of successful waste diversion programs in cities around the world. In Calgary it will become crucial over the next five years to foster the relationship between The City and private sector (sector diversion), The City and the Province (EPR) and The City and Associations (waste prevention and lobbying) to

increase diversion. The City will monitor and evaluate the progress in private sector diversion activities.

Collaboration will also increase with regional partners via the development of a Regional Waste Strategy. The plan will be developed over the next two years led by the Calgary Regional Waste Partnership.

4.0 Conclusion

By 2020, comprehensive programs that include waste reduction and reuse, recycling and composting should be in place in all sectors. Much of the programming will hinge on collaboration with the private sector, the readiness of the waste generators to comply (ICI/MF) and government direction and leadership (EPR).

WRS will develop and implement the following strategies over the next five years:

- ICI Organics Specific Strategy
- MF Organics Strategy
- C&D Strategy (update)
- Waste Prevention Strategy
- Pay-As-You-Throw
- Waste Management Facility Strategy
- Material Specific Strategy
- Waste-to-Energy Strategy
- Waste Reporting System
- Beyond 80/20 Strategy

Programs and tools guided by the strategies will include: bans, differential tipping fees, education campaigns, community partnerships etc.

Beyond 2020, estimates show that approximately 40 per cent of waste from all sectors will still be going to landfills. A four step approach will be used to manage this waste:

1. Current program diversion will be maximized. By 2020 WRS will understand existing program capacity; how to tweak these programs for maximum effect and efficiency; and how the implementation approach can be changed for example introducing variable cart sizes;
2. New programs will be introduced in sectors where additional materials could be diverted;
3. A comprehensive plan for residual management will be designed and will include:
 - a. Landfill storage of residuals that can't be diverted at this point in time, but could be useful at a later stage
 - b. Alternative technologies could include thermal treatment, anaerobic digestion, etc. It is an evolving arena that WRS is following closely to ensure the most informed recommendation is made; and
4. A new, comprehensive strategy will be in place to guide decision making and programming towards zero waste.

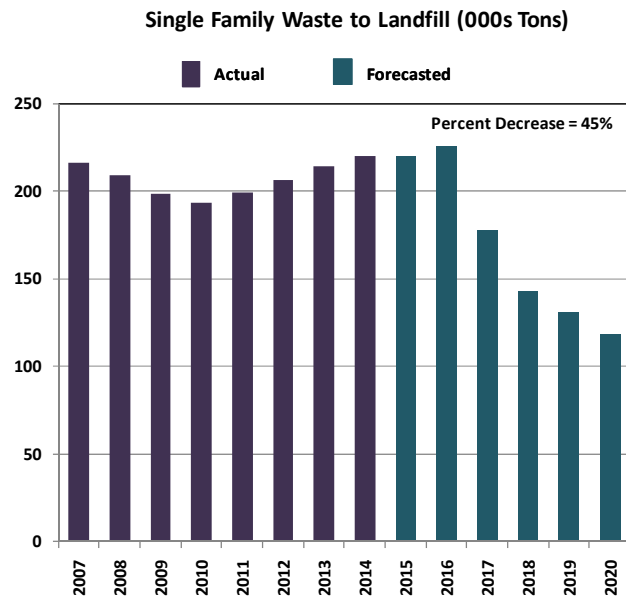
Achieving 60 per cent diversion across all sectors by 2020 will signal a significant accomplishment for the waste sector in Calgary. Reaching this goal within the framework of collaboration, efficiency and environmental protection ensures that citizens' expectations and needs are met, not only today, but also for future generations.

Appendix 1 – Single Family Residential Sector Progress

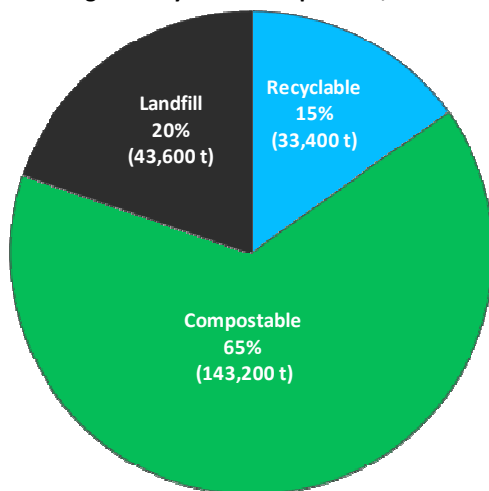
The single family residential sector in Calgary is made up of 316,000 residences (up to and including fourplexes) and is serviced by The City of Calgary's Black Cart (garbage) and Blue Cart (recycling) programs.

Current State

- Sent a total of 220,100 tonnes of waste to landfill in 2014, which equals 240kgs of waste per capita and 29 per cent of The City's total waste.
- Diverted 34 per cent of waste in 2014, or 102,600 tonnes (2007 diversion rate was 19 per cent).
- Most of the single family diversion is currently facilitated by the Blue Cart Program and several provincial stewardship programs.
- The Green Cart pilot launched in four neighbourhoods in 2012 is also contributing to the sector's diversion, keeping 2,084 tonnes of organic material out of the landfill in 2014.



Single Family Waste Composition, 2014



Future State

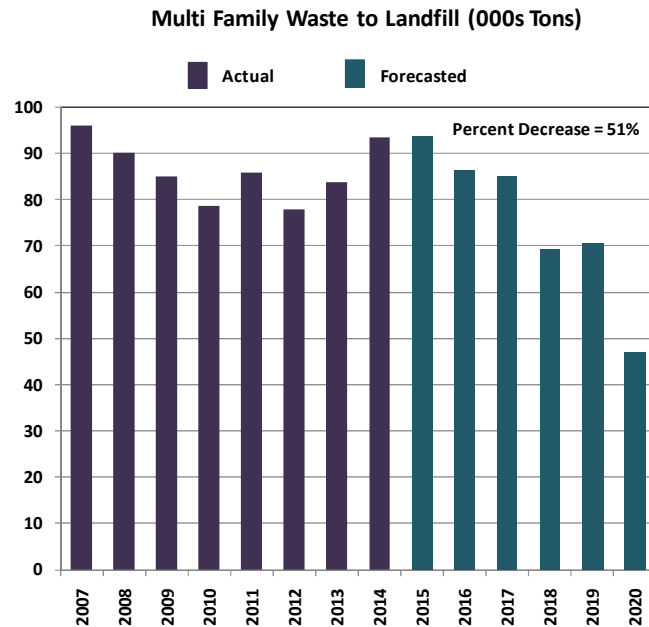
- Approximately 15 per cent, or 33,400 tonnes of recyclable materials still remain in the single family waste stream. These materials will be targeted for diversion through the Waste Prevention Strategy and pay-as-you-throw.
- The largest remaining component of the waste stream is food and yard waste, making up 65 per cent of the waste stream, or 143,000 tonnes. This material will be diverted in larger numbers as the Green Cart Program goes city-wide in 2017.
- It is estimated that the Green Cart Program will divert almost 40 per cent of the single family waste stream or 90,000 tonnes of waste from landfills yearly.

Appendix 2 – Multi-Family Residential Sector Progress

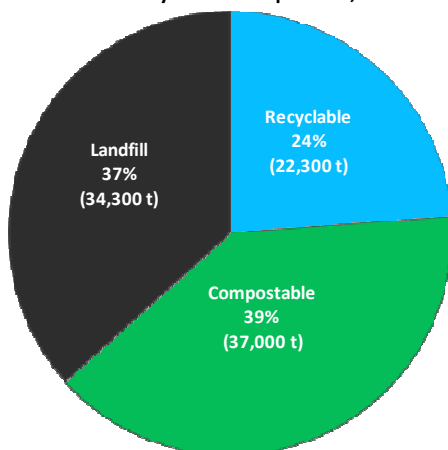
The multi-family residential sector is made up of 163,000 residences and is primarily serviced by the private sector for waste and recycling collection, or by a combination of private waste collection and community recycling depot (CRD) use.

Current State

- Sent a total of 93,600 tonnes of waste to our landfills in 2014.
- The City's smallest waste contributing sector at 13 per cent of total waste.
- Diverted approximately 20,000 tonnes of materials from our landfills in 2014, mostly through CRDs and provincial stewardship programs – private sector diversion is unknown.
- Approximately 35 per cent of multi-family buildings currently receive some form of recycling service from the private sector.
- Building owners and tenants are currently preparing for mandatory recycling in 2016.



Multi-Family Waste Composition, 2014



Future State

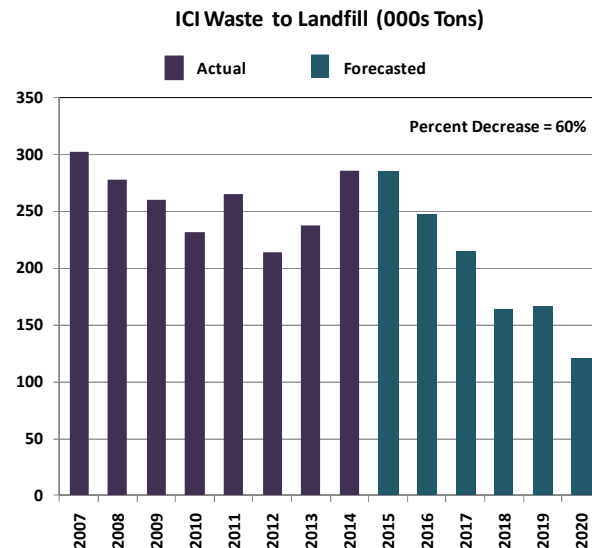
- In 2014, City Council (UCS2014-0026) approved the Multi-family Recycling Strategy that will facilitate the diversion of up to 70 per cent of recyclables from landfills. The strategy requires multi-family residents to have a recycling service hired by February 2016.
- Multi-family building owners and residents will have the flexibility to tailor service levels and related costs as part of the 2016 Bylaw.
- Developing a Multi-family Organics Strategy to provide residents organics with diversion options by 2019.

Appendix 3 – Industrial, Commercial and Institutional Sector Progress

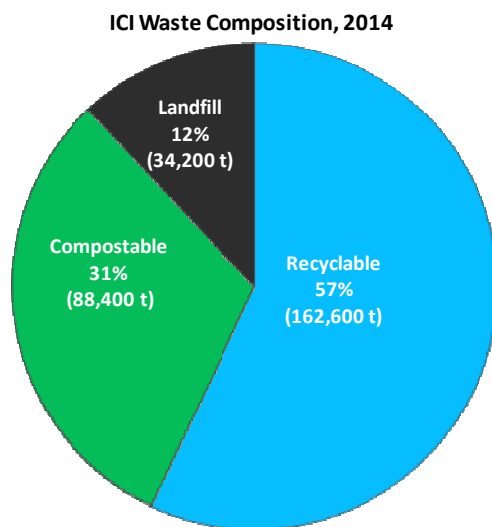
The Industrial, Commercial and Institutional (ICI) sector in Calgary is made up of 160,000 businesses, institutions and industries representing 780,000 workers.

Current State

- Largest contributing sector of waste to Calgary landfills.
- Sent over 285,300 tonnes of ICI material to landfill in 2014, an increase of nearly 50,000 tonnes from 2013.
- Extensive stakeholder engagement was completed from 2012-2014 to assist in developing a strategy for ICI waste reduction.
- Very little data exists for the ICI sector. Collaboration with industry shows potential for data sharing from haulers and processors.
- Conversations with ICI organic processors suggests over 10,000 tonnes of organics is currently being diverted from landfill and composted in nearby processing facilities.



Future State



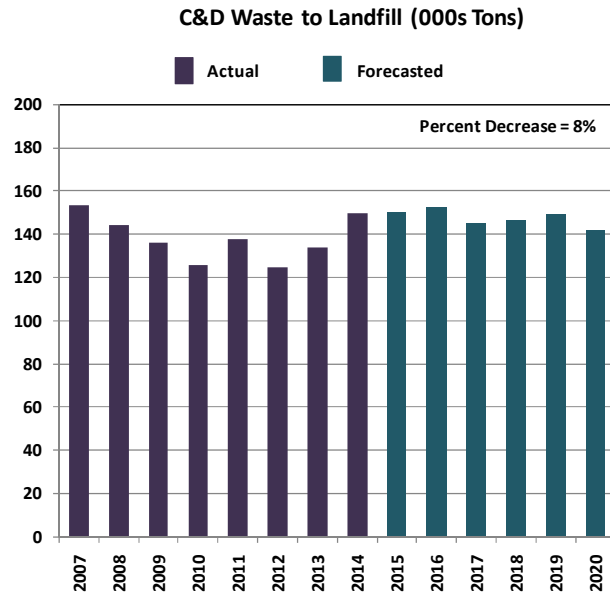
- The ICI Diversion Strategy is set to tackle the large portions of divertible material in the waste stream through the following programs:
 - Increasing landfill fees for certain materials such as paper and cardboard (2016) and organics (2017).
 - Bylaw requiring all recycling (2016) and organics (2019) to be separated on-site for diversion.
 - Banning paper and cardboard (2018) and organics (2019) from City of Calgary landfills.
- Estimations show that bans on paper and cardboard and organics could divert as much as 160,000 tonnes of ICI material from landfill by 2020.

Appendix 4 – Construction and Demolition Sector Progress

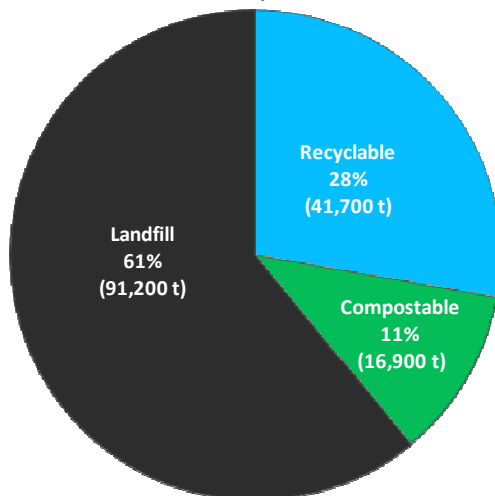
The Construction and Demolition (C&D) sector includes all of the renovation, construction and demolition activities in Calgary.

Current State

- Sent over 149,800 tonnes of material to landfill in 2014
- Expanded the Spyhill collection pilot to full C&D recyclable collection programs at Spyhill, East Calgary and Shepard landfills. Collected and diverted 11,000 tonnes of material in 2014
- Recyclable wood and drywall were added to the Designated Materials List. Previously listed materials: concrete, brick and masonry block, asphalt and scrap metals (\$165/tonne)
- Private industry continues to be highly active in the C&D diversion industry



C&D Waste Composition, 2014



Future State

- Paper and cardboard has been added to the Designated Materials List and will become effective 2016 February 1.
- Updated C&D strategy including innovative solutions such as deconstruction incentives
- Further programming decisions to be made upon the completion of a consultant report on "The Current State of C&D Material Diversion in Calgary"