

# Proposal for the Reduction and Management of Electronic Waste in Yellowknife

Prepared for  
The City of Yellowknife and Government of  
Northwest Territories



By  
Adrianna Mroz  
ENGL 301

November 26th, 2021

City Hall  
4807 - 52 Street  
P.O. Box 580  
Yellowknife, NT X1A 2N4

Drear Mayor Rebecca Alty:

In recent years the globe has experienced unprecedented environmental changes of which the north has not escaped with Yellowknife breaking a decades long heat record this pervious summer. As permafrost melt begins to destabilize the landscape northern communities need to draw focus to municipal waste management systems and ensure future environmental changes do not potentially cause issues to the health and safety of residents.

In particular, electronic waste is an often overlooked and underestimated threat to community health. Through the leaching of toxic materials from improperly stored electronic devices into substrate the potential for environmental contamination is high. According to the Arctic Institute the Northwest Territories is set to spend an additional \$51 million each year on infrastructure due to permafrost thaw, by acting now to implement small changes to waste management facilities the city may be able to recoup long term costs.

The attached report includes an overview of electronic waste, a collection of data compiled from external resources as well as a sample of residents detailing their knowledge of available resources and knowledge on electronic waste. I therefore submit the following proposal for your consideration.

Respectfully,

*Adrianna Mroz*

Adrianna Mroz

November 26th, 2021

Legislative Assembly  
4517 48 St  
Yellowknife, NT X1A 2L9

Minister Shane Thompson:

As elected member of the Legislative Assembly with the portfolio of Department of Environmental and Natural Resources you understand firsthand the changes occurring to the natural lands of the north and those who live there.

As the globe warms the Northwest Territories has not escaped without similar experiences in both extreme weather and degradation of local keystone ecological populations such as the Bluenose-East caribou. The Government of the Northwest Territories oversees the long term health of its residents who in the coming years will be increasingly vulnerable to ecological changes. By shifting a focus to the waste management of its largest city Yellowknife the GNWT is better able to safeguard the future health of the land and communities alike. Specifically, electronic waste is an often over-looked area in municipal waste management as the banality of these objects in our everyday life escapes the reality of their toxic components that left on their to degrade will contaminate soil and water.

The attached report includes an overview of electronic waste, a collection of data compiled from external resources as well as a sample of residents detailing their knowledge of available resources and knowledge on electronic waste. I therefore submit the following proposal for your consideration.

Respectfully,

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## **ABSTRACT**

The city of Yellowknife has been providing its residents with options to recycle their paper, organics, cans and aluminum since 2005, however, it is more ambiguous on its ability to adequately dispose of electronics that have met their end of life. Subsequently, the city relies heavily on the Government of the Northwest Territories (GNWT) to fill in services and implement programs. Thus, recycling is a combined effort between the City of Yellowknife and GNWT who also provides necessary subsidies from a federal reserve.

Due to the pandemic there is a higher than average amount of recycled waste in the landfill, including electronic waste, that it has not been designed to hold. In addition, a survey conducted in the community shows that residents are largely unaware how and where to dispose of electronics as well as the associated risk involved with their improper storage.

A detailed proposal is included that compares similar solutions implanted in Whitehorse, Yukon which holds a comparable population of 25,085 to Yellowknife's population of 19,569.

## INTRODUCTION

### Overview

As technology becomes increasingly integrated into daily lives with new products regularly entering the market consumers are at a greater incline to dispose of current models in favour of the latest release. This cycle of consumption had led to an enormous amount of electronics in need of disposal with globally 50 million tons of electronic waste (e-waste) created in 2018 of which approximately 20% recycled (UNEP, 2018). Subsequently, the lifespan of devices has increasingly shortened as, for example, computers have reduced from 4-6 years in 1992 to 2-3 years in 2015 (Kidde, 6).

With increasing technological advances, and a lesser emphasis on a circular economy, the increasing amount of electronic waste must be processed in a more specialized fashion than regular waste. The process of recycling electronics must be done within a certified and monitored facility as the contents contain toxic materials such as lead, mercury, cadmium and chromium that are used as conductors as well as polychlorinated biphenyl ( a chemical insulator known to cause birth defects) which can be found within lithium-ion batteries. These substances are highly toxic to life as they are able to dissolve in water creating a risk of contaminating surrounding soil and water systems if left unmonitored. Leaving e-waste in landfills is therefore undesirable, however, there are also economic incentives to recycle as electronic devices contain trace amounts of valuable metals such as gold, silver and palladium. E-waste is a concern

regarding environmental contamination, however, is it also a potential source of income through the extraction of these metals.

## **Background**

Of the 725 tons of e-waste created in Canada in 2015 (representing 20.4 kg per person) roughly 20% was recycled (Kumar, 12) leaving a majority of e-waste either unprocessed or shipped to landfills. For smaller and more remote communities across Canada shipping unwanted electronics is more complicated due to infrastructure limitations and cost of shipping large installments of waste. This poses a particular challenge to northern communities that may not be accessible all season. Often the use of winter or ice roads during freezing periods and summer roads after the spring melt provide the best opportunities to access shipments to and from smaller communities. In the Northwest Territories, these roads are instrumental in providing recycling options to divert waste from landfills or incinerators. Yellowknife is the central hub of the Northwest Territories and an access point with facilities that many communities depend on such as healthcare and education as well as processing waste from communities that lack appropriate facilities.

In addition to the logistical challenges northern communities face over larger cities, on average residents of the Northwest Territories purchase more electronics per capita than the national average. Table A. displays the data from a report documented in 2012 in preparation for the Government of the Northwest Territories indicating that NWT residents purchased 1.55 kg more than the national average. This may be due to the higher annual income ( \$82,966) which is

16.7% higher than the rest of Canada (Cantin, 7)

Table A. Estimated number and weight of electronic units sold in NWT

	CANADA	NORTHWEST TERRITORIES		
		BASED ON POPULATION RATIO	BASED ON HOUSEHOLDS RATIO	BASED ON AVERAGE TOTAL EE HOUSEHOLD EXPENDITURES RATIO
EE units sold 2011	33,252,984	41,185	36,696	50,980
Weight equivalent	214,245,394 kg	265,350 kg	236,431 kg	328,459 kg
Weight per capita	6.40 kg	6.40 kg	5.70 kg	7.92 kg

Source: Cantin, pp.7

### Statement of Problem

As of 2019 the current population of the Northwest Territories is 44,826 with the majority residing within Yellowknife. Historically, the city of Yellowknife has faced unique challenges to waste storage. With the discovery of gold in 1933 a surplus of mining related waste needed disposing finding storage on a rocky forested lot outside city limits that has since become a municipal landfill. Since 2005 the city has implemented a modernized compost and recycling program with pick-up at residential homes for compost and garbage while large blue bins distributed amongst the city for recycling. There is no option to recycle more complex materials



such as e-waste at these receptacles. In order for residents to dispose of end of use electronic material they must visit a designated drop off location or landfill. Currently the city of Yellowknife does not have a webpage dedicated towards recycling electronics as users are forwarded to the GNWT services directory. Information is therefore ambiguous without a clear indication of where residents may recycle e-waste other than the municipal landfill.

Figure B. Recycling receptacles



## DATA

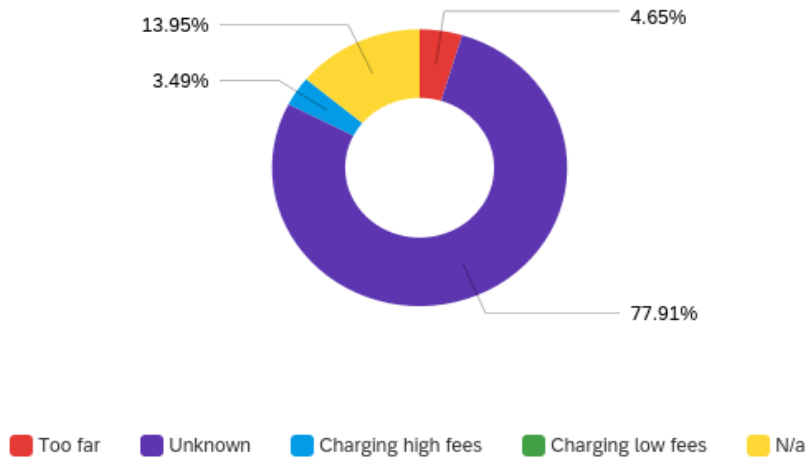
### Survey

Using the University of British Columbia's Qualtrics tool a survey was created with 10 multiple choice questions with one question including an optional type in response. The survey was exported to the community via social media and a total of 84 residents submitted information (see Appendix for detailed question and recorded responses)

## **Resident Awareness**

Following the results of the survey a large amount of residents reported they were unaware of an e-waste disposal center in the city ( Figure. C). The city's webpage lacks additional information on specific disposal sites, however, a local bottle depot does accept electronic devices as well as local stores such Staples and The Source. This knowledge is not widely displayed on either the city's or the GNWT sites providing a point of confusion among residents. Further, the survey indicates a small but general trend of e-waste disposal at the landfill with an indication that residents dispose of cellular devices the most followed by household appliances. It may be that cellphone degradation in the north is accelerated due to the quick depletion of charge in extreme cold weather. Cellular devices may make up a small percentage of waste created by residents, however, over time if devices are left open to the elements toxic material within such as lead, mercury and cobalt which may leach into soil and surrounding water table. Further, the survey indicates residential knowledge on dangerous chemicals found within e-waste is potentially low with 60% indicating they are unaware.

Figure C. High percentage of residents unsure of disposal site



## PROPOSED PLAN

### Methods

Reducing e-waste and overcoming obstacles in contamination and residential awareness may be improved by following subsequent steps:

#### Update both GNWT and Yellowknife Webpages

Both GNWT and the City of Yellowknife provide information on e-waste recycling, however, they are considerably deficient in multiple areas. The city webpage provides a brief mention of a electronic waste recycling with a hyperlink to a GNWT directory page. In order to learn more, residents must search and visit the GNWT page <https://www.enr.gov.nt.ca/en/services/waste-reduction-and-recycling>. This page provides an overview of electronics that can be recycled, lists

appropriate fees as well as provides contact information in which residents may further inquire. The site is well laid out with appropriate information, however, it does not provide residents of specific communities more information on where they may drop off electronics other than the information to inquire on yearly satellite depots. Further, the site lacks additional warning to residents of the potential health concerns with improper disposal of electronic devices lacking a greater incentive for residents to hold onto waste until a mobile pick depot arrives.

### **Use of Backhaul program and off-site recycling company**

With the onset of the pandemic many of the city's recycling features were put on hold. With the city on lock down and normal flow of manual workers from out of territory halted the city resulted to placing all residential recycle in the landfill (Williams, 2019). As the city has returned to normalcy and waste programs resumed the city may benefit from the implementation of a Backhaul program with an external recycling company. In the neighboring Whitehorse the city uses empty transport trucks that have dropped off supplies to send sensitive waste to a facility called Quantum Lifecycle in Edmonton. Currently, Yellowknife uses Alberta Recycling to handle the revenue portion of recycle refunds, such as bottle drop-offs, it may further benefit by extending the program to follow a back-haul program for e-waste.

## Update Landfill Liner

As the majority of Yellowknife consists of exposed Canadian Shield bedrock, the site of the landfill is similarly situated on a large swath of bedrock (Figure. D). In a report conducted by third party Golder Associates in 2016 on landfill management systems in the NWT, the finding detailed lack of landfill liner and leachate ( water that percolates through soil) collections systems were implemented only to new sections or cells of the landfill. As the site is host to a large swath of exposed rock there is a greater potential for water to percolate into cracks as the shield is often exposed to deep crevices. This increases the risk that material situated without a liner may contaminate precipitation such as snow fall when it begins to melt in the spring, drawing it under the surface. In addition, due to proximity of the lake as well as a creek that flows through this site is potentially at a high risk of further environmental contamination. By providing a liner for the entire landfill the area will be safe guarded from toxic leachate.

Figure D. Yellowknife Landfill highlighted with yellow circle



Source: Google Maps, 2021

Figure E. Water systems proximity with landfill circled in orange



Source: Google Maps, 2021

### **Program for Residential Recycling**

Residents are accustomed to driving to designated receptacles to recycle items such as cardboard, glass and aluminum. By providing a small receptacle at these sites for e-waste, such as computer components and cellphones, residents may be able to drop off devices at their own convenience and likewise the city may implement a bi-monthly schedule for pick-ups. Comparably, in the neighboring city of Whitehorse, with approximately the same population size as Yellowknife, the city has implemented a buy-back program for its end of life electronics that it is then able to refurbish and sell. By collecting these electronic the city may also find a means of creating new jobs as well as generating income.

## CONCLUSION

Confusion surrounding e-waste disposal sites as well as a lack of information on the municipal website, in conjunction with GNWT's provided site, is an area in which the city may consider creating new content in order to better inform the public of both disposal locations as well as associated risks. The landfill is another area that may be improved by providing an adequate barrier to the entire site in order to better protect the adjacent bodies of water, especially with the consideration that Great Slave Lake ( directly across from the landfill site) is used to provide residents with potable drinking water. Overall, these changes may be implemented to the success of creating a greater degree of transparency and information to residents, safe guarding the land from possible contamination.

# APPENDIX

## Survey Questions and Results

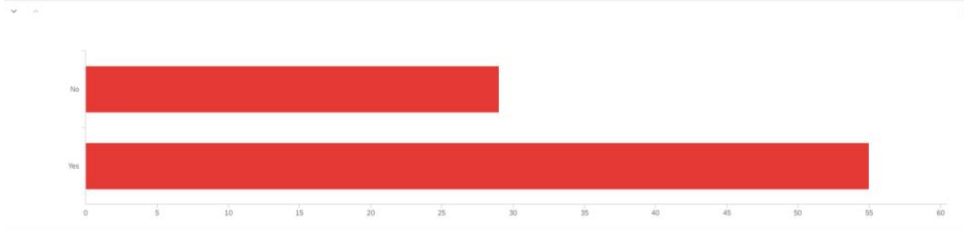


Since 1990 the city of Yellowknife has offered residential receptacles for recycling items such as plastic and cardboard, however, the option for recycling more complex materials could be improved. Among the most hazardous and costly to safely dispose of are electronic devices that have met their end of life (e-waste). Improper disposal of e-waste is of particular concern due to the use of combustion retardants and electrical conductors known to pose a serious threat to the health of both wildlife and humans. The purpose of this survey is to provide recommendations to the City of Yellowknife by gathering residential knowledge on e-waste disposal as well as to identify potential obstacles to residents. There are 10 multiple choice questions with the option to select more than one for some and one optional type in question. Your responses are voluntary and anonymous.

Thank you for your time and participation in the survey.



21 - Do you currently have electronics that have met their end of use? Page Options ▾

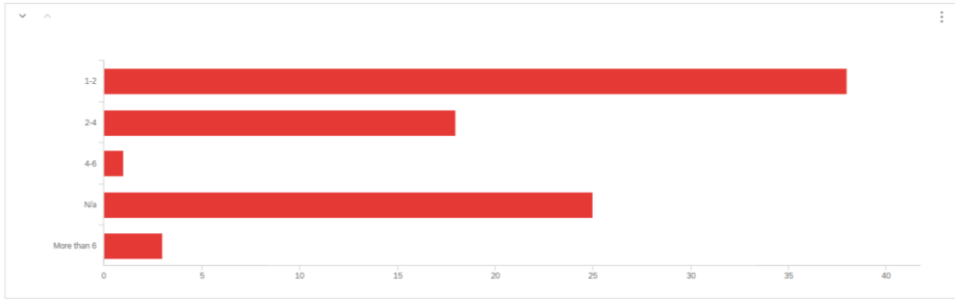


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Do you currently have electronics that have met their end of use?	1.00	2.00	1.65	0.48	0.23	84



Q2 - If answered yes, approximately how many units?

Page Options

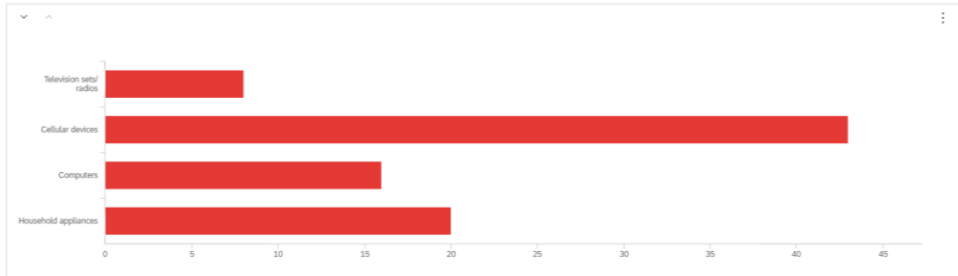


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	If answered yes, approximately how many units?	1.00	5.00	2.26	1.37	1.89	85

1 back to top

Q3 - Of those waste electronics the most are:

Page Options



Q3.5 - Other

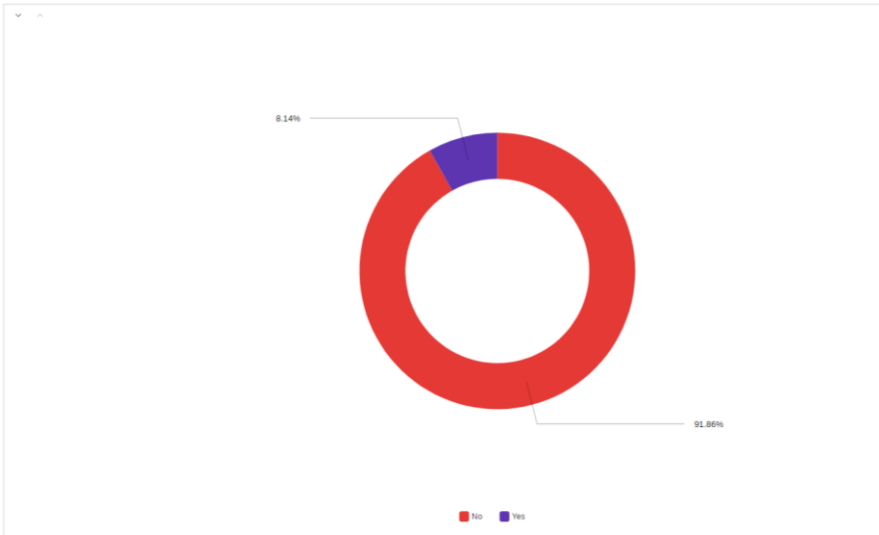
Page Options

Other

- Electric snow machine parts
- small batteries
- ipad
- old car parts
- batteries

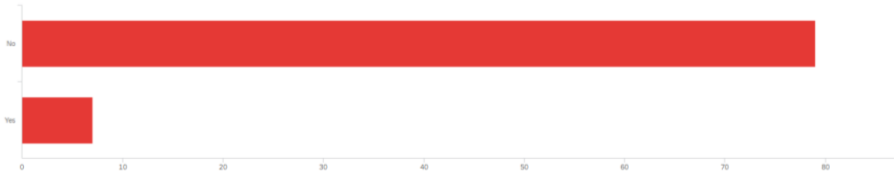
Page: 1 Of 3

Q4 - Are you aware of any electronic disposal centers within the city?



Q5 - Have you ever visited a center to dispose of electronics?

Page Options

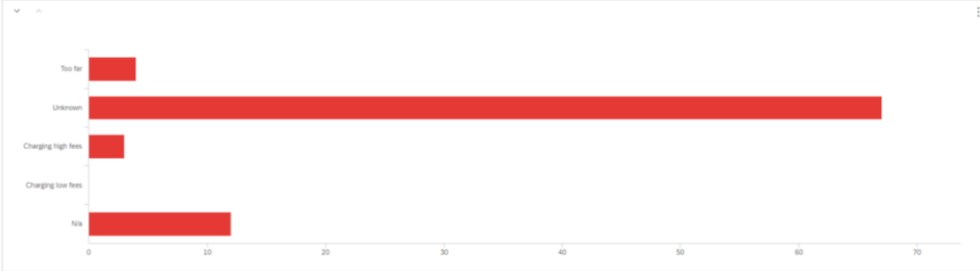


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Have you ever visited a center to dispose of electronics?	1.00	2.00	1.08	0.27	0.07	86

Navigation icons: back, forward, search, and refresh.

Q6 - If answered no, the e-waste disposal center is:

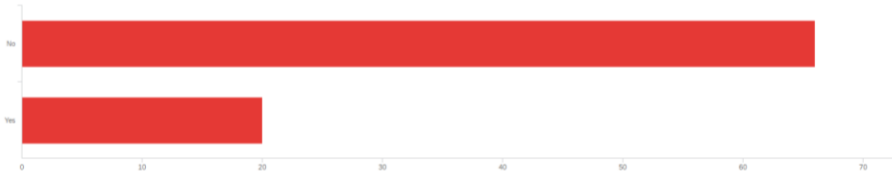
Page Options



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	If answered no, the e-waste disposal center is:	1.00	5.00	2.41	1.08	1.17	86

Q7 - Have you disposed of old electronics at the municipal landfill?

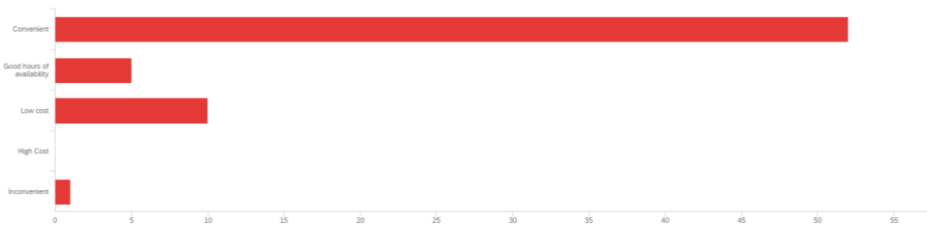
Page Options



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Have you disposed of old electronics at the municipal landfill?	1.00	2.00	1.23	0.42	0.18	86

Q8 - If answered yes, the landfill is:

Page Options



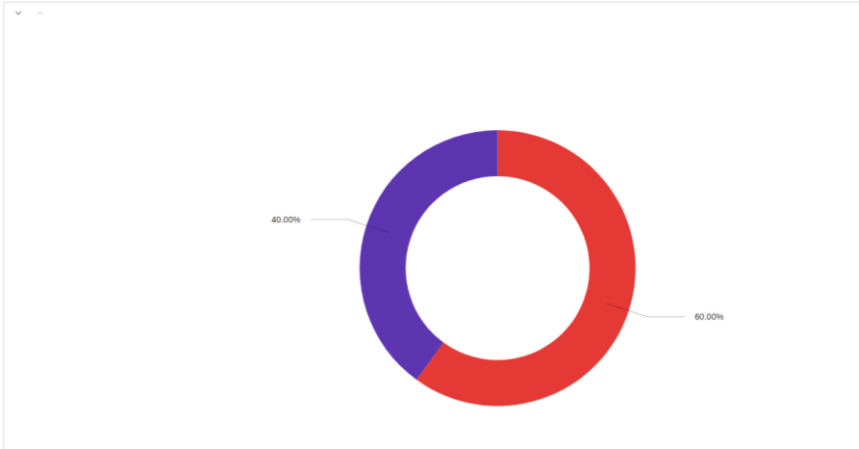
Q9 - Are you aware of any current recycling fees for electronics?

Page Options



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Are you aware of any current recycling fees for electronics?	1.00	2.00	1.12	0.32	0.10	86

Q10 - Are you aware of any potentially dangerous chemicals within electronic devices?



Word count 2,488

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