Waste Audit for the Sioux Narrows and Nestor Falls Landfill Sites

Final Report

January 18, 2022

Prepared for:

Township of Sioux Narrows-Nestor Falls

Prepared by:

Stantec Consulting Ltd.

Waste Audit for the Sioux Narrows and Nestor Falls Landfill Sites

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Executive Summary

A waste audit was conducted for two waste disposal sites: the Sioux Narrow WDS and the Nestor Falls WDS, operated by the township of Sioux Narrows-Nestor Falls. The sites accept regular residential and commercial waste and have diversion programs in place for clean burnable wood, household co-mingled recycling, tires, e-waste, and paint. Non-recyclable and recyclable waste streams were audited using manual and visual methods and records were obtained for other diverted materials, where applicable. The results of the audit showed that for both sites, the large majority of waste deposited is clean wood waste (branches, trees and yard waste) and waste categorized as “other” (construction lumber, renovation waste, furniture, mixed material household items).

At the Sioux Narrows WDS, approximately 9,622.2 kg of waste was brought to the site during the three-day audit period from both the recyclable and non-recyclable waste streams and of that waste, approximately 4,372.3 kg was audited. Results were extrapolated to a one-year time frame and indicated that approximately 887.8 tonnes of waste are accepted at the Sioux Narrows WDS on an annual basis, the majority of which is non-divertible clean wood (563.2 tonnes; 63.4%) and other waste (118.7 tonnes, 13.4%). The recycling waste stream was audited, resulting in an annual estimate of 118.5 tonnes of material diverted. Of the recycling audited, the majority (81.2% of the total) was scrap metal (96,190 kg reported by Dutchak Scrap Metal (McCabe 2021, pers. comm.). Of the remaining materials audited, recyclable glass (4.5%) and tires (5.0%) made up the majority of the recycling waste stream. The results showed that the current recycling system on the site has a capture rate of 80.3%, indicating that while the current recycling system is being used, there is room for improvement, as approximately 28,788 kg of divertible waste is being landfilled each year. The diversion rate was determined to be 34.3% and is attributed to the fact that the majority of materials brought to the site are not divertible (e.g., clean wood and renovation waste).

At the Nestor Falls WDS, approximately 9,985.3 kg of waste was brought to the site during the three-day audit period and of that waste, approximately 4,488.1 kg was audited. The results indicate that approximately 631.4 tonnes of waste are accepted at the Nestor Falls WDS on an annual basis, the majority of which is other waste (e.g., construction/renovation waste, furniture; 298.7 tonnes; 47.3%) and clean wood waste (184.4 tonnes; 29.2%). Food waste was estimated to be 11.4% of the total waste disposed of at the site. The recycling waste stream was audited, resulting in an annual estimate of 40.8 tonnes. This amount is relatively low compared to the Sioux Narrows WDS, which may be attributed to several factors including: the relatively low traffic of the site (approximately 27.4% based on vehicle counts; the different site set up (recycling drop off further away from the gate, which may inconvenience people); and local habits and perceptions regarding recycling. Of the recycling audited, the majority (84.3%) was scrap metal. Of the remaining materials audited, tires (5.5%), recycled paper/cardboard (2.8%) and e-waste (2.6%) made up the majority of the recycling waste stream. The results showed that the current recycling system on the site has a capture rate of 66.3%, indicating that the current recycling system could be better utilized, as approximately 20,716.3 kg of divertible waste is being landfilled each year at the site. The diversion rate was determined to be 9.1% and is attributed to the fact that the majority of materials brought to the site are not eligible to be diverted (e.g., clean wood, renovation waste and food waste).

The contamination rate at both sites was relatively low (0.1% at Sioux Narrows WDS and 0.03% at the Nestor Falls WDS), indicating that compliance is being achieved through personal responsibility, visual inspection of recycling loads by the attendant to confirm proper segregation from the regular waste stream (with loads rejected should they observe contamination).

Based on the results of the audit, a waste reduction workplan was developed and includes the following recommended actions:

1. Implement re-use initiatives for re-usable waste such as windows, doors, clothing, construction lumber, household goods, and furniture. These items can be transported to a thrift store, a consignment store, or a Habitat for Humanity© re-store for re-purposing/re-selling. Alternatively, community free weekends, garage sales, online auctions, or giveaway pages could be implemented. A thrift shed could also be set up at each WDS, where residents place re-usable items in good condition for others to take at their leisure.
2. Improve current recycling programs by re-locating co-mingled recycling stations/compactor bins at the Nestor Falls WDS so they are strategically located at the gate entrance so that proper sorting of materials is as convenient as regular disposal for users. In addition, SNNF could provide recycling bins to residents/lodges, confirm that WDS staff are trained, post illustrative diagrams and signage at recycling stations, and/or collaborate with producer responsibility organizations to improve current programs.
3. Promote participation in waste diversion programs by notifying the users of the site as they enter the gate that co-mingled recycling is available and that they are encouraged to separate co-mingled recycling whenever possible to extend the lifespan of the site. Additional communications to improve recycling could include distribution of promotional and educational materials via website, social media, poster, or mail; increasing signage on the site to direct users to designated areas; and providing workshops to schools and other groups. A suggestion box could also be used to encourage participation and collect questions, comment, and recommendations.
4. Implement additional diversion initiatives for materials such as compact fluorescent lightbulbs, oil and oil filters, household hazardous waste, batteries, propane tanks, or other materials in collaboration with existing facilities, service providers, and producer responsibility organizations.

1.0 BACKGROUND

1.1 LOCATION AND SCHEDULE

The township of Sioux Narrows-Nestor Falls (SNNF), located in northwestern Ontario, operates two waste disposal sites (WDSs): the Sioux Narrow WDS and the Nestor Falls WDS (UTM coordinates 15 U 426920 m E 5478222 m N and 15 U 433964 m E 5430299 m N, respectively) (Appendix A; Figure 1).

The WDSs offer drop-off waste disposal services for residential residents and industrial/commercial businesses in the area and operate based on the schedule in Table 1.1. The sites are staffed during open hours of operation and the sites are closed to the public outside of these hours with a locked gate at the entrance. No curbside collection services are offered in SNNF.

Table 1.1 Waste Disposal Site Hours of Operation

Summer Hours (May 1 to September 30)	**Hours of Operation**	**Days of Operation[1]**
Sioux Narrows WDS	8:00 am to 11:30 am	Tuesday, Thursday, Friday, Saturday, Sunday
Nestor Falls WDS	1:30 pm to 5:00 pm	
Winter Hours (October 1 to April 30)	**Hours of Operation**	**Days of Operation**
Sioux Narrows WDS	9:00 am to 11:30 am	Tuesday, Thursday, Saturday
Nestor Falls WDS	1:30 pm to 4:00 pm	

NOTE:
[1] Both sites closed Mondays and Wednesdays year-round

1.2 EXISTING OPERATIONS

Both WDSs each contain a landfill area, white goods storage area, an e-waste depot, and a household recycling collection depot. Each landfill contains a Marathon TC 220 compaction unit to compact household recyclable materials. The general operations of the WDSs are as follows: residents drive into the site, the landfill attendant visually inspects the load and directs the resident to the designated drop-off location for each material. Non-divertible materials are deposited into the active landfill area and household recyclable materials, if segregated by the customer, are placed in bins next to the compaction unit, so that the landfill attendant may deposit the material into the compactor and cycle the unit. Once recyclable materials are compacted and the compactor is full, recyclables are collected by a contractor where they are transported to a distant material recovery facility located in Winnipeg, Manitoba for processing.

Materials accepted in the household recycling program include:

- Household and office paper (newspaper, cards, gift wrap, catalogues, magazines)
- Paper bags and pet food bags
- Corrugated cardboard/cardboard boxes
- Paper beverage cups
- Shredded office paper (in clear, full size plastic bags)
- Food and beverage containers, packaging, bottles, jugs, tubs, pails, and clamshells (#1-7)
- Metal, steel and aluminum cans, foil and trays
- TetraPak® and gable top cartons, juice boxes, soup boxes, milk cartons
- Glass food/beverage containers

For the household recycling program, containers must be empty and rinsed clean to reduce contamination and lids/caps of #1-7 plastic containers must be removed prior to disposal. E-waste, scrap metals, and white goods (fridges/stoves) are separated from the waste stream into designated areas and stored for collection by recycling contractors. For the e-waste program, materials accepted include:

- Computer monitors
- Desktop computers and laptops
- Printing, copying and multifunction devices
- Telephone and telephone answering machines
- Home theater systems (in box)
- Video players and projectors
- Video recorders and cameras
- Televisions

SNNF recommends that data be removed from any electronic device that contains data storage, prior to disposal.

The existing waste management program for both sites is summarized in Table 1.2.

Table 1.2 Waste Management Program Overview

Waste Stream	Disposal Method	Storage Container	Disposal Frequency
Household and commercial waste	Landfilling on-site	Not applicable	5 days/week
Burnable waste	Burning and landfilling ashes on-site	Not applicable	As needed
Household and commercial co-mingled recycling	Compacted on-site and transported by Emterra to facility in Winnipeg	Bins near compactor unit	As needed
E-waste	Stored on site in designated area and transported off-site by EPRA to facility in Manitoba	Fabric totes	As needed
White goods	Stored on site and picked up by local contractor for recycling	Designated area	As needed
Household hazardous waste and paint	Stored on site; currently looking for a contractor to collect	Designated area	to be determined
Scrap metal	Stored on site and picked up by Dutchak Scrap Metal for processing in Thunder Bay	Designated area	Once per year or as needed
Tires	Stored on site and transported off-site by local recycling contractor for processing	Designated area	As needed

1.3 OBJECTIVES

The objectives of the waste audit were to audit waste accepted at the Sioux Narrows WDS and the Nestor Falls WDS to better understand current waste disposal rates, to identify potential program efficiencies, and develop best management practices to mitigate potential environmental impacts, and to identify opportunities to increase waste diversion, ultimately resulting in improving future capacity at the sites.

2.0 AUDIT SCOPE

A waste audit involves the collection, sorting, and categorization of a sub-sample of wastes to gather information about the quantities and composition of waste generated at a particular location and the methods of disposal. This waste audit consisted of a physical audit (material separation, sorting and weighing), data analysis, and the development of waste reduction recommendations based on the findings of the audit.

Due to the presence of bears and scavengers at the WDSs, storing materials on the WDS to be audited at a later date was deemed to be a risk for the integrity of the audit and a safety concern; therefore, waste was visually inspected, stored in designated areas as it was dropped off, and manually sorted and weighed on the site on the same day as the audit.

Each site audit included waste and recycling materials accepted during regular collection activities (as described in Section 1.2). The audit for each site took place as follows:

- September 2-4, 2021: Sioux Narrows WDS (morning) and Nestor Falls WDS (afternoon)

Using these dates, data was extrapolated to represent a full week-long operation. The dates selected included two weekdays (Thursday and Friday) and a weekend day (Saturday) to capture typical weekly waste disposal activities.

Audited waste streams included garbage and co-mingled recycling. Material categories that were separated out in the audit included:

- Paper
- Plastic
- Metal
- Organics
- Glass

These materials were then separated out into the following sub-categories:

- Recyclable cardboard/paper
- Non-recyclable; compostable paper (napkins, paper towel)
- Non-recyclable, non-compostable paper
- Recyclable food and beverage glass
- Other (furniture and mixed material household items)
- Non -recyclable metal (wires, foils)
- Recyclable food and beverage metal
- Other recyclable metal (scrap metal)

- Recyclable plastics #1-7
- Other non-recyclable plastic (packaging, wrap, bags)
- E-waste
- Textiles
- Backyard compostable waste (i.e., fruit, vegetable)
- Other compostable waste (i.e., meat/dairy/oils) and pet waste
- Yard waste, trees and branches
- Household hazardous waste and batteries

Large or bulky materials, or materials generated through construction, renovation, and demolition that cannot be reasonably measured or weighed as part of the audits were inspected, and visually audited/recorded by audit staff. The visual audit included a description of the materials, an estimated size and/or weight, and photographs prior to the material being disposed of. During the audit, the most notable bulky material encountered in large trailers included branches/trees. Methods used to estimate special waste weight are described in Section 3.0 and Appendix B.

3.0 METHODOLOGY

The audit methodology that was followed by Stantec auditors is described in the following sections and is based on the CCME 1999 Recommended Waste Characterization Methodology for Direct Waste Analysis Studies in Canada. The outlined methodology also includes site-specific considerations to increase practicality and feasibility of the study.

3.1 PHYSICAL AUDIT

Step 1: Audit Set-Up

The waste audit set-up included a tailgate safety meeting, selection of a safe and effective work area in consultation with landfill operators, and set-up of safety measures, equipment, shelter (if required), and workstations (table, kitchen and floor scales, bins, tongs etc.).

Step 2: Estimating Total Waste

Vehicles entering the site were flagged down and drivers were notified of the waste audit. All non-hazardous solid waste, recyclable and divertible material to be dropped off at each site during the three selected days was collected from the vehicle, placed in bins (if required), weighed (if practical), noting the corresponding waste stream. Waste not selected for the audit was returned to the vehicle to be placed into the active waste area or (if recyclable) the recycling compactor bin. Waste selected for the audit sample was placed aside in a designated pile to indicate the corresponding waste stream: recyclables or garbage. Waste that was not readily placed in a bin to be weighed was placed on the scale and weighed directly, if practicable, or visually audited by estimating number of bags, measurements and/or descriptions and photographs. Pertinent details of the visual audit were recorded in the field notes. The assumptions made to estimate weights of bulky materials and photograph results of the visual audit are provided in Appendix B and Appendix C.

Step 3: Waste Sampling

Samples were then selected for sorting and weighing. Samples (vehicle loads to be audited and bags per vehicle) were selected as randomly as practical by audit personnel (approximately 1 bag per vehicle and every second vehicle); however, a true random sample was not able to be collected given the volume of vehicles entering the sites and the personnel available for the audit. Other factors affecting the randomness of the sample included resident's willingness to cooperate and stop their vehicle for the audit and accessibility of the bag/ease of removal from the vehicle. Some residents were irritated about waiting for bags to be weighed. It should be noted that some of the residents did not stop at the audit area when flagged down and some residents had their waste loose in their own re-usable bins. These loads were not selected, affecting the randomness of the sample. Based on the abovementioned guideline, a minimum sample size of 630 kg was required for each site (assuming an acceptable uncertainty range of 20%). This sample size was selected as being equivalent to approximately 20% of waste entering the facility in a day. Sub-totals of the total weight of waste entering the WDS was roughly calculated by the audit

personnel throughout the day to confirm a 20% sample would be reached by end of day. When the site had low traffic (primarily Nestor Falls WDS) and time allowed, sample size was increased to capture the additional waste and increase the representativeness of the sample.

Step 4: Sorting and Weighing

After being weighed, bags randomly selected for the sample were opened and dumped onto a workstation table, where the material was visually inspected and sorted by hand into individual bins representing the categories described in Section 2.0. Using empty bins, the scales were calibrated to zero. Once all the materials were sorted, each material category was weighed with the net weight recorded.

Step 5: Clean-Up

At the end of each day at each site, once all the waste samples are sorted and weighed, divertible materials were transferred into clear bags and dropped at the recycling area for compacting my site personnel. Non-divertible materials were placed into regular garbage bags and set aside to be pushed into the active area by the site operator(s).

Step 6: Audit Takedown

At the completion of the audit at each WDS each day, the area and any windblown litter from the audit activities was cleaned up to the extent practical, soiled equipment was cleaned and disinfected or otherwise disposed of, and the workstation (tent, tables, chairs) was taken down and packed up.

3.2 DATA ANALYSIS

3.2.1 Annualization

The data from the physical audit were used to estimate the composition of waste accepted at the sites from each waste stream on an annual basis. The extrapolation method of annualization was used to calculate the total annual mass for each material generated. This calculation was done through the following steps.

1. **Calculate the average total weekday waste entering the site (in kg)**

   This was done by adding the weight of all waste entering the site on Thursday, September 2 and Friday September 3, and dividing by two.

2. **Calculate average weekday and weekend weight for each material category (in kg)**

   This was done by adding the weight of each waste category audited on Wednesday, September 2 and Thursday September 3, 2021, and dividing by two (representing a typical weekday) and by using the total weight of each waste category audited on Saturday, September 4, 2021 (representing an average weekend day).

3. **Calculate the % of each material category in the sample**

   This was done by dividing the weight of each material category by the sample weight and multiplying by 100 to get a percentage.

4. **Calculate the total weight of each material category (in kg)**

   This was done by multiplying the total weight of the waste (for each weekday and weekend) by the percentage calculated in Step 3.

5. **Calculate the total weekly weight (in kg)**

   This was done by multiplying the weight calculated in Step 4, by three (for weekday) and by two (for weekend), corresponding to the current weekly operating schedule.

6. **Calculate the total summer (May to October) weight (in tonnes)**

   This was done by multiplying the weekly weight (from Step 5) by 26 (number of weeks from May through October the site is in operation).

7. **Calculate the total winter (November to April) weight (in tonnes)**

   This was done by dividing the weekly weight (from Step 5) by 2.5 for the Sioux Narrows WDS and 2.4 for the Nestor Falls WDS (the average decrease in traffic in winter months, as calculated by the 2020 vehicle counts provided by SNNF) (SNNF 2020); and multiplying by 26 (number of weeks from November to April, representing winter).

8. **Calculating annual totals for all waste categories (in tonnes)**

   This was done by adding the annual weekend and weekday results (calculated in Steps 6 and 7) together.

3.2.2 Diversion, Capture, and Contamination Rates

The diversion rate (D) is the proportion by mass of all divertible waste diverted from disposal to the total mass of all waste accepted at the site.

$$D = \frac{\text{(the total mass of all divertible materials diverted this year)}}{\text{the total mass of all materials accepted at the site this year}}$$

The capture rate (C) is the proportion of divertible waste which is successfully diverted from landfill.

$$C = \frac{\text{(mass of all divertible materials diverted this year)}}{\text{The total mass of all divertible materials accepted at the site this year}}$$

The contamination rate (M) is the proportion of non-divertible materials found in the divertible waste stream.

$$M = \frac{\text{(mass of all non-divertible materials in the divertible waste stream this year)}}{\text{The total mass of all materials diverted at the site this year}}$$

3.3 LIMITATIONS

The methods used in this audit are appropriate for evaluating and expanding existing waste diversion programs. The waste composition data was extrapolated from a 3-day audit period. It is assumed that the 3-day audit period represents regular day-to-day operations of the sites. It was confirmed by the Township of Sioux Narrows Nestor Falls at the time of the audit preparation that this assumption was reasonable.

Approximately 4000 seasonal residents, occupying approximately 923 seasonal households visit SNNF, many of which are from the United States (SNNF 2015). The COVID-19 pandemic caused the United States border to close, and the waste audit (originally scheduled in 2020, was substantially delayed). The waste audit was scheduled post-border re-opening, recognizing that it may close again and that the selected dates could capture activities during near-normal conditions. It should be noted that the waste disposal activities during the COVID-19 pandemic may not represent normal historical waste disposal activities; however, the scheduled dates represent a time where many public health restrictions were lifted.

Waste generated through temporary or atypical activities (i.e., special community event) was not included in the audit scope. Non-receptacle wastes (e.g., animal bedding waste, woodchips, fish carcasses etc.) were also not included in the scope of the waste audit. Large or bulky materials, or materials generated through construction, renovation, and demolition that could not be reasonably measured or weighed as part of the audits were inspected, and visually audited/recorded by audit staff. The weight of these materials was then estimated based on literature values, reasonable assumptions, and professional judgement.

4.0 RESULTS

Many indicators can be used to measure the effectiveness of a waste management program. These include the total and per capita weight of waste sent to a landfill, the composition of the waste, waste diversion rate, waste capture rate, and contamination rates within the recycling stream.

4.1 SIOUX NARROWS WDS

4.1.1 Non-Recycled Waste

A summary of the waste audit data for the non-recycled waste stream is provided in Table 4.1 below. Annual non-recycled waste accepted at the Sioux Narrows WDS was estimated at 770.2 tonnes. Of the total, 592.1 tonnes (76.9%) were estimated to be divertible and burnable waste. The results showed that the largest category of waste brought to the site is wood waste (consisting of yard waste, trees, branches and clean wood) with an estimated total of 563.3 tonnes (73.1% of the total). This waste category is managed by burning on site with the ashes used as cover material. Clean wood materials were largely brought to the site in large trailer loads and were visually audited during the audit period. The assumptions made for the materials that were visually audited are presented in Appendix B, while photographs taken of materials that were visually audited are presented in Appendix C. The results also showed that 3.7% (28,788.4 kg) of the total waste brought to the site for landfilling is waste that could have been recycled such as recyclable paper, metal and plastic.

Of the waste, a relatively large proportion (15.4%) was categorized as “other” (118.7 tonnes). This category included materials such as renovation waste (such as furniture, construction lumber, and mixed material household items such as kitchen utensils and miscellaneous decor). It should be noted that several of the residents mentioned in passing that due to the COVID-19 pandemic and border restrictions, they were not able to visit their seasonal dwellings for extended periods of time and therefore, their waste was largely related to household cleaning, renovations, yard cleanup, and discarding expired food items. These activities may have influenced the waste audit as shown by the relatively large amount of waste categorized as wood, other food (meat, dairy, oils), and other (renovation waste and mixed materials). This was slightly unexpected as border re-opening occurred on August 9, 2021, and it was anticipated that activities would have resumed to near normal by September when the audit was scheduled. The results are presented graphically in Figure 4.1. It should be noted that many food products were expired and brought to the site unopened, and due to resourcing constraints and health and safety, were not opened to audit the packaging separate from the food. It also assumed that packaging would be a very small proportion of the weight relative to the food waste.

Table 4.1 Summary of Waste Audit for Non-Recycled Waste Stream at Sioux Narrows WDS

Weekday Totals (September 2 and 3, 2021)					Weekend Totals (September 4, 2021)				Annual Totals (kg)	
									Total Waste	770,159
									Waste generation[1] (kg/person/year)	353.6
Total weight (kg)	6,486.0				Total weight (kg)	2,890.9			Non-divertible waste[2]	178,110
Total audited weight (kg)	3,051.2				Audited weight (kg)	1,264.3			Divertible waste[3]	592,049
Average audited weight (kg)	1,525.6								Potentially divertible waste[4]	31,676
% Audited	47.0%				% Audited	43.7%				
Material Categories	**Average audited weight (kg)**	**% of sample**	**Single day total (kg)**	**Annual total (kg)**	**Audited weight (kg)**	**% of sample**	**Single day total (kg)**	**Annual total (kg)**	**Combined Annual Total (kg)**	**% of total**
Recyclable cardboard/paper	26.6	1.7	56.5	6,172.8	26.8	2.1	76.7	4,460.8	10,633.6	1.4
Non-recyclable; compostable paper	8.1	0.5	17.2	1,880.8	3.6	0.3	8.6	1,187.6	3,068.4	0.4
Recyclable glass	11.3	0.7	24.0	2,615.2	14.4	1.1	34.8	4,808.2	7,423.4	1.0
Other (furniture, renovation, and household waste)	209.8	13.8	446.0	48,701.6	210.3	16.6	362.3	70,012.0	118,713.6	15.4
Non-recyclable metal	7.8	0.5	16.6	1,814.2	6.6	0.5	15.8	2,180.0	3,994.3	0.5
Recyclable metal containers	4.4	0.3	9.4	1,024.5	3.8	0.3	9.1	1,253.5	2,278.0	0.3
Metal Scrap	15.6	1.0	33.2	3,625.5	0.0	0	0	0.0	3,625.5	0.5

Table 4.1 Summary of Waste Audit for Non-Recycled Waste Stream at Sioux Narrows WDS

Material Categories	Average audited weight (kg)	% of sample	Single day total (kg)	Annual total (kg)	Audited weight (kg)	% of sample	Single day total (kg)	Annual total (kg)	Combined Annual Total (kg)	% of total
Recyclable plastic #1-7	15.6	1.0	33.2	3,620.0	3.6	0.3	8.8	1,207.9	4,827.8	0.6
Non-recyclable plastic packaging	15.1	1.0	32.2	3,512.0	7.3	0.6	17.7	2,440.1	5,952.1	0.8
E-waste	0	0	0	0.0	0	0	0	0.0	0.0	0.0
Textiles	1.5	0.1	3.1	342.4	33.2	2.6	80.1	11,060.3	11,402.7	1.5
Other food and pet waste	45.6	3.0	97.0	10,590.3	12.8	1.0	42.8	4,246.2	14,836.5	1.9
Compostable food	29.9	2.0	63.5	6,929.1	30.9	2.4	74.4	10,275.3	17,204.4	2.2
Yard waste, trees, branches, clean wood	1,121.6	73.5	2,384.2	260,358.2	909.8	72.0	2,325.7	302,901.8	563,260.1	73.1
Hazardous materials/batteries	10.7	0.7	22.7	2,480.1	0.2	0	0.4	59.3	2,539.4	0.3
Non-recyclable; non-compostable paper	0.2	0.0	0.4	37.7	1.1	0.1	2.6	361.2	399.0	0.1

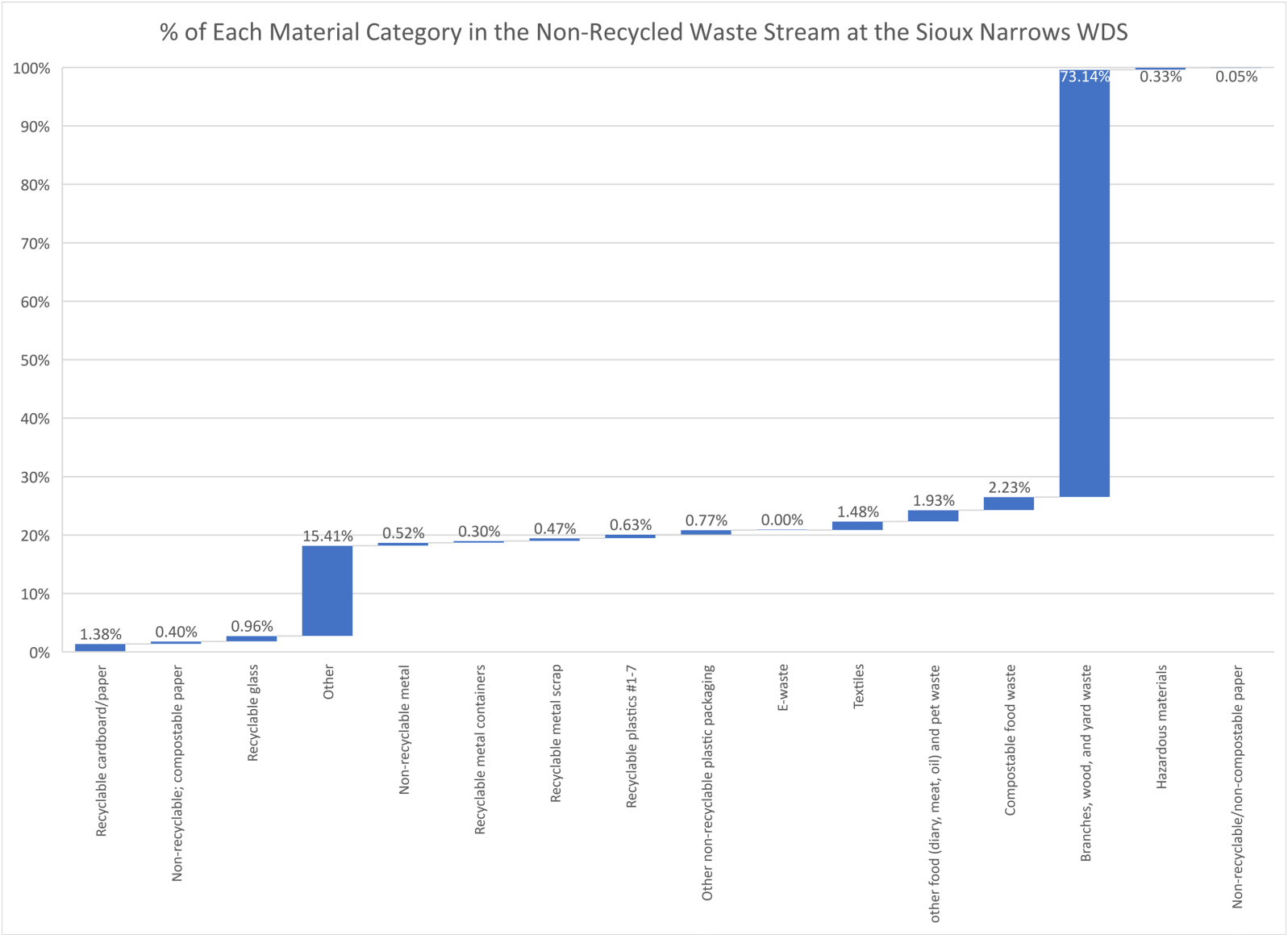
NOTES:

[1] An average population estimate of 3,000 was used (SNNF 2015) of which 2,178 people (72.6%) reside in Sioux Narrows, based on the proportion of 2021 vehicle counts for Sioux Narrows WDS

[2] Non-divertible waste represents waste categories where a diversion program is not available.

[3] Divertible waste represents waste categories where a recycling or diversion program is currently offered by SNNF (i.e., co-mingled recycling, e-waste, and scrap metal); also includes burnable waste

[4] Potentially divertible waste represents waste categories that cannot currently be diverted; however, may be able to be diverted should additional diversion programs be implemented in SNNF (e.g., composting, used clothing re-purposing)



Project Location
Sioux Narrows-Nestor Falls, Ontario

129672042

Prepared by AC on 2022-01-12
Technical Review by JT on 2022-01-12

Stantec

Client/Project
TOWNSHIP OF SIOUX NARROWS-NESTOR FALLS
Sioux Narrows-Nestor Falls Landfills Waste Audit

Figure
4-1

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4.1.2 Recycling

A summary of the waste audit data for the recycling waste stream is provided in Table 4.2 below. Annual material diverted from the Sioux Narrows WDS was estimated at 118.5 tonnes. Of the recycling audited, the majority (81.2%) was categorized as scrap metal (quantity reported by Dutchak Scrap Metals; McCabe 2021, pers. comm.). Of the remaining materials audited, recyclable glass (4.5%) and recyclable paper/cardboard (3.8%) made up the majority of the recycling waste stream. The results showed that the current system has a relatively high capture rate (80.3%), attributed largely to the annual weight of scrap metals and e-waste brought to the site relative to lighter, co-mingled recycling. Despite the relatively high capture rate, it is estimated that approximately 28.8 tonnes of waste are landfilled each year at the site, that could have been diverted, primarily through the co-mingled recycling program. Material capture rates for each category of divertible materials were calculated to determine where improvements could be made (Table 4.2). The diversion rate was estimated to be 36.1%; however, it was noted that much of the total waste brought to the site is not eligible to be diverted, such as food waste and renovation waste (Table 4.2), indicating that additional diversion programs along with communications may be required to increase the diversion rate. Wood waste was excluded in the calculation of the diversion rate, because although it is brought to the site, it does not require landfilling.

During the audit period, an incidental observance of a user disposing of a single tv in the e-waste area occurred; however, this item was not part of a selected sample. To audit e-waste, the Electronics Products Recycling Association reports for 2021 were used (McCabe 2021, pers. comm.). These reports indicated that 10 totes of electronics picked up at this site in 2021, with a weight of 1,780 kg. In addition, no tires were encountered during the audit; however annual reports from SNNF indicate that approximately 800 tires total were collected in 2021. With an estimated weight per tire of 10.2 kg, this amounts to approximately 8,160 kgs of tires (EPRA 2016). Based on the 2021 vehicle counts for each site, it is estimated that approximately 72.6% of the population is serviced by Sioux Narrows WDS (SNNF 2021); therefore, it is estimated that approximately 5,924.2 kgs of tires were collected from the site.

Finally, the audit showed that the current system has a high level of compliance, as shown by the relatively low contamination rate in the co-mingled recycling stream (0.1%). A low contamination rate is typically observed where an attendant is visually inspecting recycling loads as they arrive to confirm it has been properly segregated from the regular waste stream (with loads rejected should they observe contamination). The results are presented graphically in Figure 4.2 below.

Table 4.2 Summary of Waste Audit for Recycling Waste Stream at Sioux Narrows WDS

Weekday Totals (September 2 and 3, 2021)					Weekend Totals (September 4, 2021)				Annual Totals		
									Recycling (kg)	118,470.6	
									Waste generation[1] (kg/person/year)	54.4	
Total weight (kg)	180.3				Total weight (kg)	65.0			Diversion Rate[2] (%)	36.1	
Total audited weight (kg)	38.7								General Capture Rate[3] (%)	80.3	
Average audited weight (kg)	19.4				Audited weight (kg)	18.1			Contamination Rate[4] (%)	0.1	
% Audited	21.5%				% Audited	27.8%					
Material Categories	**Average audited weight (kg)**	**% of sample**	**Single day total (kg)**	**Annual total (kg)**	**Audited Weight (kg)**	**% of sample**	**Single day total (kg)**	**Annual total (kg)**	**Combined Annual Total (kg)**	**% of total**	**Material Capture Rate (%)**
Recyclable cardboard/paper	4.5	23	20.7	2,262.9	8.4	46.4	30.15	2,195.1	4,458.0	3.8	29.5
Non-recyclable; compostable paper	0.1	0.3	0.3	31.3	0	0	0	0	31.3	0.03	-
Recyclable glass	8.0	41.2	37.1	4,051.9	4.9	27.0	17.6	1,279.5	5,331.4	4.5	41.8
Other (furniture, renovation, and household waste)	0	0	0	0	0	0	0	0	0	0	-
Non-recyclable metal	0.4	2.0	1.8	193.4	0	0	0	0	193.4	0.2	-
Recyclable metal containers	2.6	13.6	12.3	1,339.7	2.0	10.8	7.0	511.7	1,851.4	1.6	44.8
Metal Scrap[5]	-	-	-	-	-	-	-	-	96,190	81.2	96.4

Table 4.2 Summary of Waste Audit for Recycling Waste Stream at Sioux Narrows WDS

Material Categories	Average audited weight (kg)	% of sample	Single day total (kg)	Annual total (kg)	Audited Weight (kg)	% of sample	Single day total (kg)	Annual total (kg)	Combined Annual Total (kg)	% of total	Material Capture Rate (%)
Recyclable plastic #1-7	2.7	13.7	12.4	1,353.2	2.7	14.8	9.6	700.4	2,053.6	1.7	29.8
Non-recyclable plastic packaging	1.1	5.9	5.3	580.9	0.2	1	1.0	45.2	626.1	0.5	-
E-waste[5]	0	0	0	0	0	0	0	0	1,780	1.5	100.0
Textiles	0	0	0	0	0	0	0	0	0	0	-
Other food and pet waste	0	0	0	0	0	0	0	0	0	0	-
Compostable food	0	0	0	0	0	0	0	0	0	0	-
Yard waste, trees, branches, clean wood	0	0	0	0	0	0	0	0	0	0	-
Hazardous materials/batteries	0	0	0	0	0	0	0	0	0	0	-
Non-recyclable; non-compostable paper	0.1	0.3	0.3	31.3	0	0	0	0	31.3	0.03	-
Tires[6]	-	-	-	-	-	-	-	-	5,924.2	5.0	100.0

NOTES:

1 An average population estimate of 3,000 was used (SNNF 2015) of which 2,178 people (72.6%) reside in Sioux Narrows, based on the proportion of 2021 vehicle counts for Sioux Narrows WDS

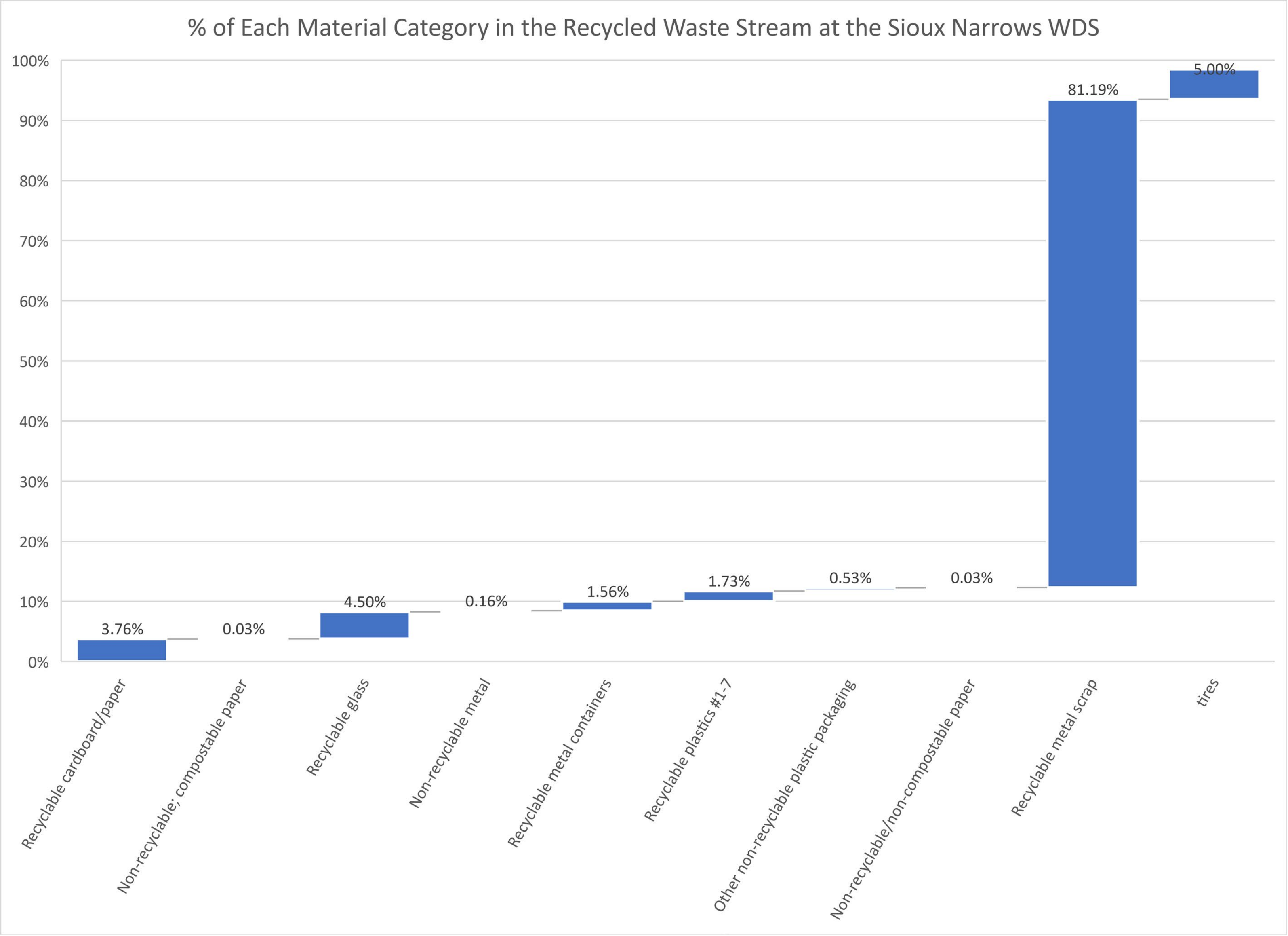
2 Annual diversion rate is calculated by dividing the total annual quantity of diverted materials by the total quantity of material accepted on the site

3 Capture rate is calculated by dividing the total annual quantity of accepted diverted materials by the total annual quantity of eligible divertible materials

4 Contamination rate is calculated by dividing the total annual quantity of ineligible materials in the recycling stream by the total annual quantity of diverted materials

5 Estimate provided by recycling service provider annual reports of materials collected in 2021

6 Unit Estimate provided by SNNF with weights determined based on reported bulk densities passenger tires (EPA 2016)



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Sioux Narrows-Nestor Falls Landfills Waste Audit

Figure
4-2

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4.2 NESTOR FALLS WDS

4.2.1 Non-Recycled Waste

A summary of the waste audit data for the non-recycled waste stream is provided in Table 4.3 below. Annual non-recycled waste at the Nestor Falls WDS was estimated at 590.6 tonnes. Of the total, 205.1 tonnes (34.7%) were estimated to be divertible and burnable waste. The results showed that most of the waste (184.3 tonnes; 31.2%) is clean wood which is burned on site with the ashes used as cover material. Clean wood materials were largely brought to the site in large trailer loads and were visually audited during the audit period. The assumptions made for the materials that were visually audited are presented in Appendix B, while photographs taken of materials that were visually audited are presented in Appendix C. The remaining waste was largely classified as “Other” (298.7 tonnes; 50.6%). This waste category included renovation waste and furniture such as drywall, construction lumber, shingles, siding, vinyl flooring, and mixed material household items such as décor and kitchen items. One user brought a load of railroad ties (chemically treated) which contributed to the relatively high proportion of “other” waste encountered. Compostable food waste (11.0%) and recyclable cardboard (2.4%) also made up a relatively large proportion of the total waste (Table 4.3).

Divertible waste in the non-recycled waste stream (excluding clean wood) represents a relatively small portion (5%) of all the landfilled waste and includes materials such as recyclable plastic, paper, glass, e-waste, and metal that was not segregated by the customer for recycling. This relatively small proportion is largely attributed to the lighter weight of co-mingled recycling relative to other material categories such as scrap metal and clean wood. The results also showed that potentially diverted materials (e.g., food waste, textiles) made up approximately 13% of the total annual waste (76.5 tonnes) and could potentially be diverted should additional diversion programs (such as composting) be implemented in SNNF.

The results of the audit are presented in Figure 4.3. As indicated in Section 4.1.1; the relatively large quantities of renovation, compostable and other food waste (expired food items), and wood waste observed during the audit period may not be representative of normal conditions as border re-openings in the summer 2021 provided users with access to their seasonal dwellings for the first time after extended border closures due to COVID-19. This result was slightly unexpected as border re-opening occurred on August 9, 2021, and it was anticipated that activities would have resumed to normal by September when the audit was scheduled.

Table 4.3 Summary of Waste Audit for Non-Recycled Waste Stream at Nestor Falls WDS

Weekday Totals (September 2 and 3, 2021)					Weekend Totals (September 4, 2021)				Annual Totals (kg)	
									Total Waste	590,579
									Waste generation[1] (kg/person/year)	718.5
Total weight (kg)	7,688.7				Total weight (kg)	2,248.8			Non-divertible waste[2]	385,500
Total audited weight (kg)	3,426.6								Divertible waste[3]	205,068
Average audited weight (kg)	3,844.4				Audited weight (kg)	1,018.0			Potentially divertible waste[4]	76,521
% Audited	44.6%				% Audited	45.3%				
Material Categories	**Average audited weight (kg)**	**% of sample**	**Single day total (kg)**	**Annual total (kg)**	**Audited weight (kg)**	**% of sample**	**Single day total (kg)**	**Annual total (kg)**	**Combined Annual Total (kg)**	**% of total**
Recyclable cardboard/paper	55.6	3.3	124.8	13,794.1	2.7	0.3	5.9	436.8	14,230.9	2.4
Non-recyclable; compostable paper	5.6	0.3	12.6	1,390.5	2.5	0.3	5.6	408.5	1,799.0	0.3
Recyclable glass	4.9	0.3	11.0	1,210.0	1.0	0.1	2.5	165.3	1,375.3	0.2
Other (furniture, renovation, and household waste)	987.8	57.7	2,216.5	244,927.3	330.7	32.5	730.5	53,813.6	298,740.9	50.6
Non-recyclable metal	1.3	0.1	2.9	322.2	0.4	0	0.8	59.7	381.9	0.1
Recyclable metal containers	2.6	0.2	5.9	653.0	1.1	0.1	2.5	182.8	835.7	0.1
Metal Scrap	13.6	0.8	30.6	3,380.5	0	0	0	0.0	3,380.5	0.6

Table 4.3 Summary of Waste Audit for Non-Recycled Waste Stream at Nestor Falls WDS

Material Categories	Average audited weight (kg)	% of sample	Single day total (kg)	Annual total (kg)	Audited weight (kg)	% of sample	Single day total (kg)	Annual total (kg)	Combined Annual Total (kg)	% of total
Recyclable plastic #1-7	3.1	0.2	6.9	767.9	0.7	0.1	1.6	115.2	883.1	0.2
Non-recyclable plastic packaging	7.5	0.4	16.8	1,856.6	3.0	0.3	6.6	489.4	2,346.0	0.4
E-waste	0	0	0.1	10.7	0	0	0	0.0	10.7	0
Textiles	2.1	0.1	4.6	511.0	56.3	5.5	124.4	9,166.2	9,677.3	1.6
Other food and pet waste	27.2	1.6	61.0	6,744.6	2.3	0.2	5.0	371.9	7,116.4	1.2
Compostable food	124.4	7.3	279.2	30,850.4	208.0	20.4	459.4	33,845.2	64,695.7	11.0
Yard waste, trees, branches, clean wood	475.1	27.7	1,066.1	117,800.1	409.0	40.2	903.6	66,562.3	184,362.4	31.22
Hazardous materials/batteries	1.3	0.1	2.8	312.9	0.2	0	0.5	36.0	348.9	0.1
Non-recyclable; non-compostable paper	1.5	0.1	3.5	382.7	0.1	0	0.2	11.6	394.3	0.1

NOTES:

[1] An average population estimate of 3,000 was used (SNNF 2015) of which 822 people (27.4%) reside in Sioux Narrows, based on the proportion of 2021 vehicle counts for Sioux Narrows WDS

[2] Non-divertible waste represents waste categories where a diversion program is not available.

[3] Divertible waste represents waste categories where a recycling or diversion program is currently offered by SNNF (i.e., co-mingled recycling, e-waste, , and scrap metal); also includes burnable waste

[4] Potentially divertible waste represents waste categories that cannot currently be diverted; however, may be able to be diverted should additional diversion programs be implemented in SNNF (e.g., composting, used clothing re-purposing)

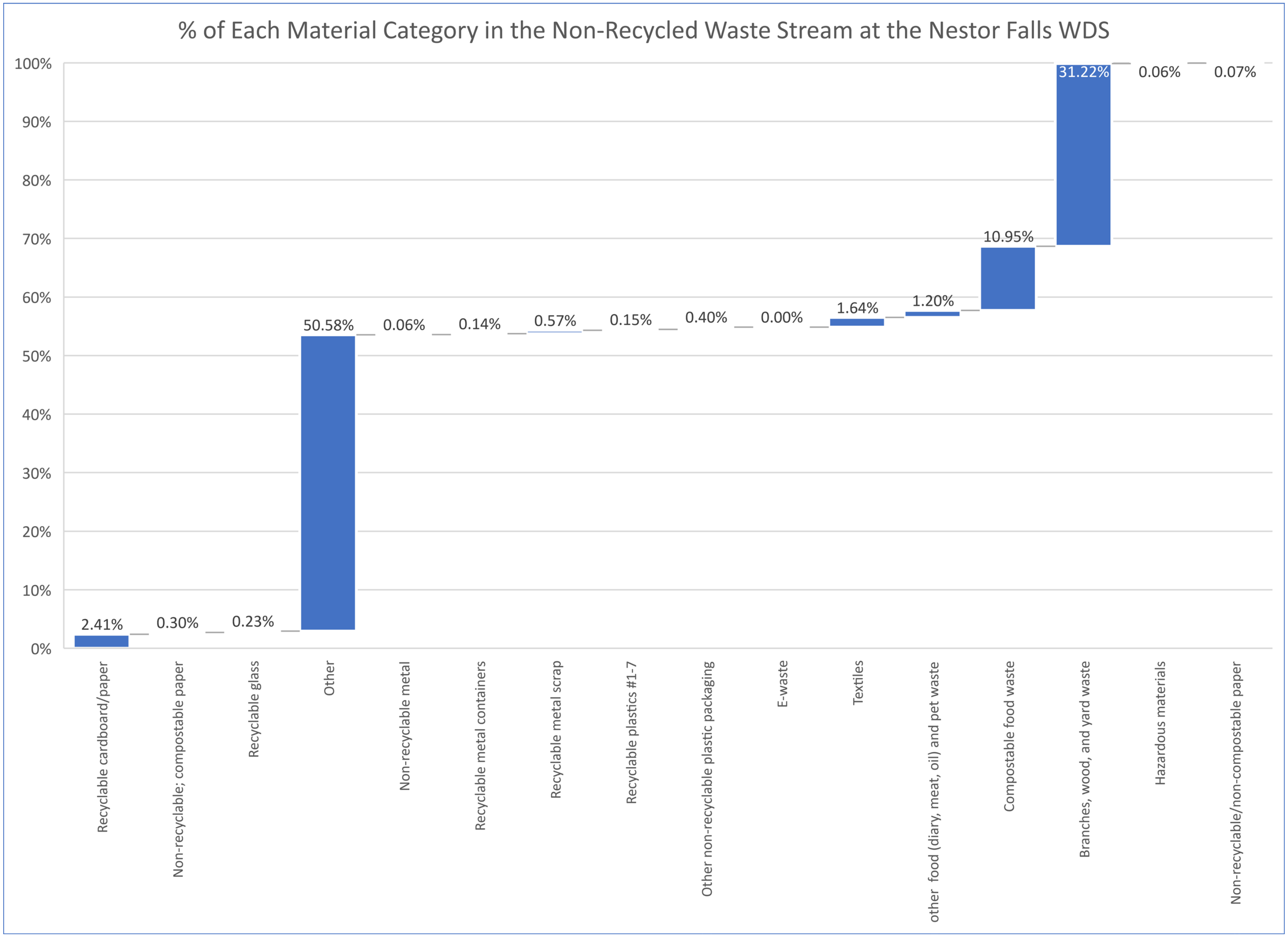

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Figure
4-3

4.2.2 Recycling

A summary of the waste audit data for the recycling waste stream at the Nestor Falls WDS is provided in Table 4.4 below. Annual recycling diverted from the Sioux Narrows WDS was estimated at 40.8 tonnes. This amount is relatively low compared to the Sioux Narrows WDS, which may be attributed to several factors including:

- the relatively low traffic of the site (approximately three times fewer vehicles than Sioux Narrows WDS in peak months; and approximately 27.4% of all vehicles counts) (SNNF 2021; 2022)
- the different site set up (recycling drop off further away from the gate, which may inconvenience people)
- local habits and perceptions regarding recycling

Of the recycling audited, the majority (84.3% of the total) was scrap metal. Of the remaining materials audited, tires (5.5%), paper/cardboard (2.8%), and e-waste (2.6%) made up the majority of the recycling waste stream. To audit e-waste, the Electronics Products Recycling Association reports for 2021 were used (McCabe 2021, pers. comm.). These reports indicated that 6 totes of electronics picked up at this site in 2021, with a weight of 1,080 kg. In addition, no tires were encountered during the audit; however annual reports from SNNF indicate that approximately 800 tires total were collected in 2021. With an estimated weight per tire of 10.2 kg, this amounts to approximately 8,160 kgs of tires (EPRA 2016). Based on the 2021 vehicle counts for each site, it is estimated that approximately 27.4% of the population is serviced by the Nestor Falls WDS (SNNF 2021); therefore, it is estimated that approximately 2,235.8 kgs of tires were collected from the site.

The results showed that the current system has a relatively low capture rate (66.3%) compared to Sioux Narrows (80.3%). This is likely attributed to the reasons listed above, similar to the rationale for the discrepancy in overall amount of recycling collected at the site. The capture rate is also indicative of the relatively large weight of scrap metal and e-waste diverted, relative to lighter co-mingled recycling, which is not well-utilized, as it is estimated that approximately 20.7 tonnes (50%) of divertible waste (e.g., cardboard, plastics, glass, metal) is not segregated and is subsequently landfilled at the site, annually. The diversion rate was estimated to be 9.1%, relatively low compared to the Sioux Narrows WDS (36.1%). This is likely due to the reasons listed above, along with the overall lower quantity of scrap metal and e-waste collected from the site. The capture rate and diversion rate did not include clean wood waste which is not truly diverted as it is burned and used on site. Non-recyclable materials including clean wood waste, other waste, and compostable waste were estimated to be a large majority of the waste accepted at the site annually (approximately 93%; Table 4.3) and therefore, the current use of the site presents limited opportunities to significantly increase diversion with the current programs.

Finally, the audit showed that the current system has a high level of compliance, as shown by the relatively low contamination rate in the co-mingled recycling stream (0.03%). A low contamination rate is typically observed where an attendant is visually inspecting recycling loads as they arrive to confirm it has been properly segregated from the regular waste stream (with loads rejected should they observe contamination). Given the relatively low total annual weight of recycling at the site, the low contamination rate may also be attributed simply to residents' good will, as it was observed that those few people who do recycle, are highly aware of the requirements and list of acceptable materials. The results are presented graphically in Figure 4.4 below.

Table 4.4 Summary of Waste Audit for Recycling Waste Stream at Nestor Falls WDS

Weekday Totals (September 2 and 3, 2021)					Weekend Totals (September 4, 2021)				Annual Totals		
									Total Recycling (kg)	40,842.0	
									Waste generation[1] (kg/person/year)	49.7	
Total weight (kg)	23.66				Total weight (kg)	24.0			Diversion Rate[2] (%)	9.1	
Total audited weight (kg)	23.65								Capture Rate[3] (%)	66.3	
Average audited weight (kg)	11.83				Audited weight (kg)	19.9			Contamination Rate[4] (%)	0.03	
% Audited	100%				% Audited	82.9%					
Material Categories	**Average audited weight (kg)**	**% of sample**	**Single day total (kg)**	**Annual total (kg)**	**Audited Weight (kg)**	**% of sample**	**Single day total (kg)**	**Annual total (kg)**	**Combined Annual Total (kg)**	**% of total**	**Material Capture Rate (%)**
Recyclable cardboard/paper	5.2	44.1	5.2	576.7	6.2	31.3	7.5	554.7	1,131.4	2.8	7.3
Non-recyclable; compostable paper	0	0	0	0	0	0	0	0	0	0	-
Recyclable glass	3.6	30.2	3.6	395.0	1.4	7.2	1.7	127.8	522.8	1.3	27.5
Other (furniture, renovation, and household waste)	0.2	1.7	0.2	22.1	0	0	0	0	22.1	0.1	-
Non-recyclable metal	0	0	0	0.7	0	0	0	0	0.7	0	-
Recyclable metal containers	0.5	4.1	0.5	53.7	3.9	19.4	4.7	343.2	397.0	1.0	32.2
Metal Scrap[5]	-	-	-	-	-	-	-	-	34,448	84.3	91.1
Recyclable plastic #1-7	1.7	14.6	1.7	190.9	8.3	41.6	10	736.3	927.2	2.3	51.2

Table 4.4 Summary of Waste Audit for Recycling Waste Stream at Nestor Falls WDS

Material Categories	Average audited weight (kg)	% of sample	Single day total (kg)	Annual total (kg)	Audited Weight (kg)	% of sample	Single day total (kg)	Annual total (kg)	Combined Annual Total (kg)	% of total	Material Capture Rate (%)
Non-recyclable plastic packaging	0.5	4.3	0.5	56.4	0.1	0.5	0.1	9.0	65.4	0.2	-
E-waste[5]	-	-	-	-	-	-	-	-	1,080	2.6	99.0
Textiles	0	0	0	0	0	0	0	0	0	0	-
Other compostable (dairy, meat, oil) and pet waste	0	0	0	0	0	0	0	0	0	0	-
Compostable food	0	0	0	0	0	0	0	0	0	0	-
Yard waste, trees, branches, clean wood	0	0	0	0	0	0	0	0	0	0	-
Hazardous materials/batteries	0.1	0.6	0.1	8.5	0	0	0	0	8.5	0.02	-
Non-recyclable; non-compostable paper	0	0.2	0	3.2	0	0	0	0	3.2	0.01	-
Tires[6]	-	-	-	-	-	-	-	-	2,235.8	5.5	100

NOTES:

1 An average population estimate of 3,000 was used (SNNF 2015)

2 Annual diversion rate is calculated by dividing the total annual quantity of diverted materials by the total quantity of material accepted on the site

3 Capture rate is calculated by dividing the total annual quantity of accepted diverted materials by the total annual quantity of eligible divertible materials

4 Contamination rate is calculated by dividing the total annual quantity of ineligible materials in the recycling stream by the total annual quantity of diverted materials

5 Estimate provided by recycling service provider annual reports of materials collected in 2021

6 Unit Estimate provided by SNNF with weights determined based on reported bulk densities for passenger tires (EPA 2016)

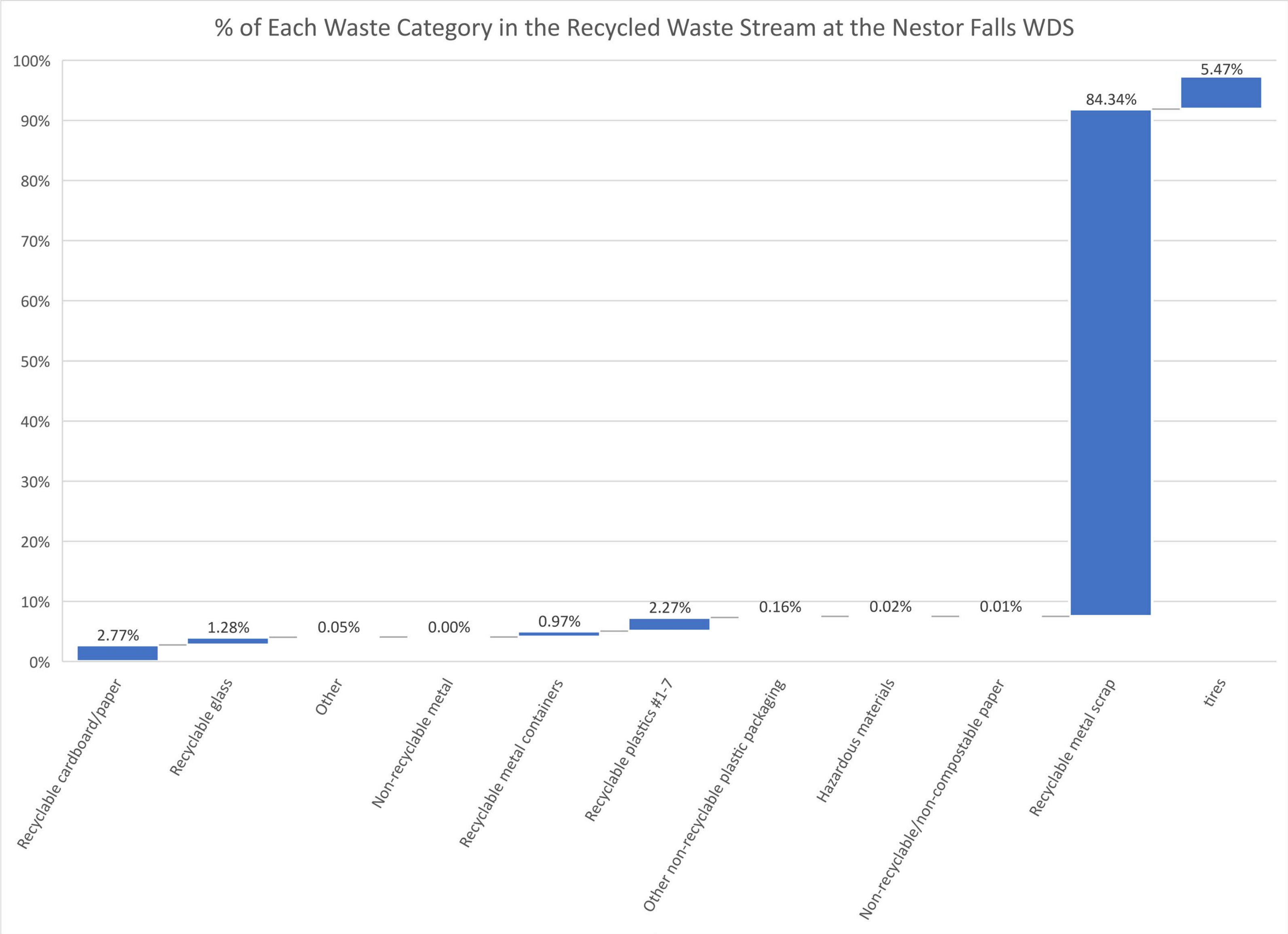

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Figure
4-4

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5.0 WASTE COMPOSITION SUMMARY

5.1 SIOUX NARROWS WDS

Approximately 9,622.2 kg of waste was brought to the site during the three-day audit period from both the recyclable and non-recyclable waste streams and of that waste, approximately 4,372.3 kg was audited. The results indicate that approximately 888.6 tonnes of waste are accepted at the Sioux Narrows WDS on an annual basis, the majority of which is non-divertible clean wood (63.4%) and other waste (13.4%) (Table 5.1). Approximately 16.5% of waste brought to the site is divertible materials such as plastics, paper, glass and metal, and e-waste and of that amount, 80.3% was sent to recycling, as described by the capture rate (Table 4.2). The total divertible materials (recyclable paper, plastic, metal and glass) that are currently being landfilled have an estimated annual weight of approximately 28,788 kg, accounting for 13.9% of waste currently being landfilled (Table 4.1). This result suggests that increased communications, incentives, and/or enforcement of recycling initiatives could also be undertaken by SNNF to improve the lifespan of the site; however, residents are primarily using the site to dispose of non-divertible waste and therefore efforts are best focused on managing these materials.

Table 5.1 Comparison of Recycling Practices at both WDS

	Sioux Narrows WDS	Nestor Falls WDS
Estimated Population	2,178	822
Total Waste Generation Rate (kg/person/year)	353.6	718.5
Total Recycling Rate (kg/person/year)	54.4	49.6
Diversion rate (%)	36.1	9.1
Recycling Capture rate (%)	80.3	66.3
Recycling contamination rate (%)	0.1	0.03

Although clean wood waste is not landfilled, it is burned on site and used as cover, therefore, it was not included in the calculation of the diversion or capture rates.

It is suspected that the activities occurring during the waste audit were affected by COVID-19 border re-openings, despite the borders opening a month prior to the audit. It was noted that many residents indicated that they were doing maintenance and clean-up of their seasonal dwellings, including emptying expired food items, which may have influenced the audit results by inflating the quantity of wood waste, food waste, and renovation waste than under normal conditions.

5.2 NESTOR FALLS WDS

Approximately 9,985.3 kg of waste was brought to the site during the three-day audit period and of that waste, approximately 4,488.1 kg was audited. The results indicate that approximately 631.4 tonnes of waste are accepted at the Nestor Falls WDS on an annual basis, of which approximately 9.7% is divertible, 29.2% is burnable, and the remaining 61.1% is non-divertible (Table 5.1). Approximately 40,742.1 kg (9.1%) of the total waste accepted at the facility is sent to recycling, as represented by the diversion rate; however, the large majority of non-divertible waste accepted at the site suggests that the diversion rate would not likely be substantially increased through increased compliance or communications with the current recycling program (Table 4.4). In addition, although household recyclables are not a large portion of the waste brought to the site, the co-mingled household recycling system is not well utilized, as indicated by the capture rate (66.3%) which is largely representative of the materials collected through the scrap metal and tire recycling programs.

As described above, most of the waste (47.3%) deposited on the site was categorized as “Other” (e.g., furniture, renovation waste, construction lumber, mixed material household items) and 29.2% was categorized as burnable (e.g., clean wood). Finally, compostable food waste accounted for approximately 10.3%.

The results indicate that the Nestor Falls WDS is largely used by residents and businesses to dispose of non-divertible waste; therefore, to increase capacity at the site, efforts are best focused on managing these materials. It is noted; however, that the total divertible materials (recyclable paper, plastic, metal and glass) that are currently being landfilled have an estimated annual weight of approximately 20,716.3 kg (Table 4.3), making up 5% of all landfilled waste, indicating that increased communications, incentives, and/or enforcement of recycling initiatives could be undertaken by SNNF to provide some incremental increase in landfill capacity.

5.3 WASTE DIVERSION COMPARISON

Reports of household recyclables collected in 2020 were obtained from the recycling contractor, for comparison to the audit estimates. The 2020 report indicated a total of 15,090 kgs of household recycling across both sites in 2020 (Emterra 2020). The 2021 estimate based on the audit results was 16,672 kgs (13,694.5 kgs at Sioux Narrows WDS and 2,978 kgs at Nestor Falls WDS). The comparison of audited annual amount to the 2020 reported amount indicates that the audit estimate is likely providing a representative estimate of the actual conditions.

The total amount of recycling accepted at the Nestor Falls site, along with the diversion rate and capture rate are relatively low compared to the Sioux Narrows WDS (Table 5.2). Based on 2021 vehicle counts, the estimate for the total diverted recycling rate assumes 27.4% of the population (822) resides in Nestor Falls and the remaining population (2,178) resides in Sioux Narrows.

Table 5.2 Summary of Annual Waste Estimates for the Sioux Narrows WDS and Nestor Falls WDS

Material Categories	Sioux Narrows WDS		Nestor Falls WDS	
	Annual quantity (kg)	% of annual total	Annual quantity (kg)	% of annual total
Recyclable cardboard/paper	15,091.7	1.7	15,362.3	2.4
Non-recyclable; compostable paper	3,099.7	0.4	1,799.0	0.3
Recyclable glass	12,754.8	1.4	1,898.1	0.3
Other (furniture, renovation, and household waste)	118,713.6	13.4	298,763.0	47.3
Non-recyclable metal	4,187.6	0.5	382.7	0.1
Recyclable metal containers	4,129.3	0.5	1,232.7	0.2
Metal Scrap	99,815.5	11.2	37,828.5	6.0
Recyclable plastic #1-7	6,881.4	0.8	1,810.3	0.3
Non-recyclable plastic packaging	6,578.2	0.7	2,411.4	0.4
E-waste	1,780.0	0.2	1,090.7	0.2
Textiles	11,402.7	1.3	9,677.3	1.5
Other food (dairy, meat, oil) and pet waste	14,836.5	1.7	7,116.4	1.1
Compostable food waste	17,204.4	1.9	64,695.7	10.3
Yard waste, trees, branches, clean wood	563,260.1	63.4	184,362.4	29.2
Hazardous materials/batteries	2,539.4	0.3	357.3	0.1
Non-recyclable; non-compostable paper	430.2	0.1	397.4	0.1
Tires	5924.2	0.7	2,235.8	0.4
Total Waste (Waste and Recycling stream)	888,629.3	100	631,421.0	100
Divertible waste	146,377.0	16.5	61,458.4	9.7
Non-divertible waste	178,992.3	20.1	385,600.1	61.1
Burnable waste	563,260.1	63.4	184,362.4	29.2

There are several factors that may be contributing to the current diversion rate at the Nestor Falls WDS. Currently, the site is set up with the gate at the entrance, and the active area at the back of the site. The designated divertible waste areas are not well marked and there are no signs directing users to those areas. Given that there is only one site attendant stationed at the gate, it is unclear if users are compliant in bringing their divertible waste to designated areas once they are past the attendant. No designated materials were encountered during the audit period, other than household recycling. The recyclables compactor is also more than 20 m away from the gate, and not directly on route to the active waste area

which may be causing increased waste generation rates by inconveniencing people to drive off route and stop a second time to drop off those materials. Whereas at Nestor Fall WDS, the recycling compactor is directly at the gate, where the attendant is stationed. In addition, the results indicated that the community of Nestor Falls produces approximately two times the amount of waste per person, than Sioux Narrows, indicating that efforts directed at material re-use, particularly for construction or furniture waste, could increase site capacity moving forward.

At the Sioux Narrows WDS, recycling set up could also be improved. During the audit period, mixed recycling and wood/branches appeared to be the main materials segregated, although there were materials such as e-waste and scrap metals in the designated areas, indicating that these areas are being used. It was also noted that designated areas on the site are also not clearly marked with signs or fencing, this can lead to confusion to users who ultimately, may dispose of these divertible wastes in the active area out of frustration or convenience. In addition, because the designated areas for e-waste, appliances etc. are over 50 m away from the gate/attendant, there is an opportunity for users to disregard the directions of the attendant and dispose of divertible materials in the active area.

6.0 ENVIRONMENTAL REVIEW

An environmental review was conducted for each waste site to determine if current operating practices follow regulatory requirements, best practices, standards and/or guidelines. For the environmental review, the following regulations, standards, and guidelines were reviewed (Manitoba standards were incorporated in the absence of equivalent standards for Ontario):

- *Ontario Landfill standards: A guideline on the regulatory and approval requirements for new or expanding landfilling sites (2012)*
- *Ontario Guideline for the Production of Compost in Ontario (2012)*
- *Environmental Protection Act R.S.O. 1990, c. E.19 O. Reg. 232/98: Landfilling Sites*
- *Environmental Protection Act R.S.O. 1990, c. E.19 O. Reg. 347: General-Waste Management*
- *Environmental Protection Act R.S.O. 1990, c. E.19 O. R 101/94: Recycling and Composting of Municipal Waste*
- *Professional Engineers of Ontario: Solid Waste Management Guideline (2017)*
- *Standards for Landfills in Manitoba (2016)*

Based on the conditions observed during the waste audit, both sites appeared to be largely operating within the regulatory requirements as described in the Regulation 232/98: Landfilling Sites of the *Environmental Protection Act* (Table 6.1); however, at both sites, scavenging by residents was observed in the active landfilling area during the audit period. Scavenging is prohibited in O. Reg 232/98: Landfilling Sites because of the safety concerns associated with residents walking on the active waste area, and heavy equipment moving on the site. Scavenging activity by site users was noted during the audit period at each site despite signage posted at the entrance to both sites indicating that scavenging is prohibited. It is therefore recommended that the landfill operator/manager inform the residents of the safety concerns associated with scavenging, inform them that scavenging is against the regulation, and discourage residents from scavenging to the best of their abilities.

Best practices for landfill operations were also reviewed. Based on this review, areas of improvement were identified (Table 6.1). Based on the conditions observed at the sites, the following actions are recommended:

- Increase the frequency of compaction and covering of the active waste area to reduce occurrences of fires, scavenging by animals and humans and to reduce windblown litter.
- Improve containment of windblown litter through the placement of temporary fencing and/or creating berms around the active waste area.
- Improve delineation of waste storage areas (e.g., e-waste, metals, paint, tires) more clearly using additional signage, fencing and/or berms to better direct residents, contain the waste so it does not become mixed with other waste piles, and increase waste diversion.
- Improve fire protection by obtaining a water source to the site (e.g., water truck), if feasible. As the site currently does not have electricity to operate a water pump and obtaining a water truck may not

be feasible, it is recommended to develop an emergency response plan in case of a fire including implementing regular waste compaction and covering.

- Improve the safety of the site by storing diverted materials in an organized way, such as appliances in upright position and tires in rows to facilitate transport off-site.

Table 6.1 Summary of Environmental Review

Regulatory Requirement	Sioux Narrows WDS In compliance? (Y/N)	Nestor Falls WDS In compliance? (Y/N)
100 m buffer around the site	Y	Y
Ownership of the site fee simple	Y	Y
Groundwater monitoring network	Y	Y
No burning of municipal waste	Y	Y
No scavenging at the site	N- scavenging occurs	N- scavenging occurs
Implement a surface water monitoring program	Not applicable	Not applicable
Implement a groundwater monitoring program	Y	Y
Implement a leachate monitoring program	Not applicable	Not applicable
Waste covered at the end of each working day with daily cover	Not in compliance	Not in compliance
Best Practice	**Followed? (Y/N)**	**Followed? (Y/N)**
Site supervised by an operator at all times when the facility is open to the public	Y	Y
Gate locked or barricaded when the site is closed to the public	Y	Y
Operator checks loads for prohibited wastes and directs traffic to appropriate disposal area	Y	Y
Operator conducts routine inspections and maintenance	Y	Y
Site is serviced by an all-weather road	Y	Y
Landfill has signage to bring attention to: hazards, prohibiting scavenging, name of the facility, operating hours, types of materials accepted, and 24-hour emergency contact #	Y	Y
No smoking policy in place and enforced	Y	Y
Source of water available in case of a fire	Y-Fire pond	Y- Fire pond
Active waste contained with a berm and/ or fencing to contain windblown litter	N-no containment	N- no containment
Segregated materials should be kept in a clean, organized area, clearly marked or otherwise delineated	N-areas not clearly marked	N-areas not clearly marked
White goods stored in upright position with ODS removed by a certified technician	N-not upright	N-not upright
Segregated waste is stored no longer than 1 year	Y	Y

Table 6.1 Summary of Environmental Review

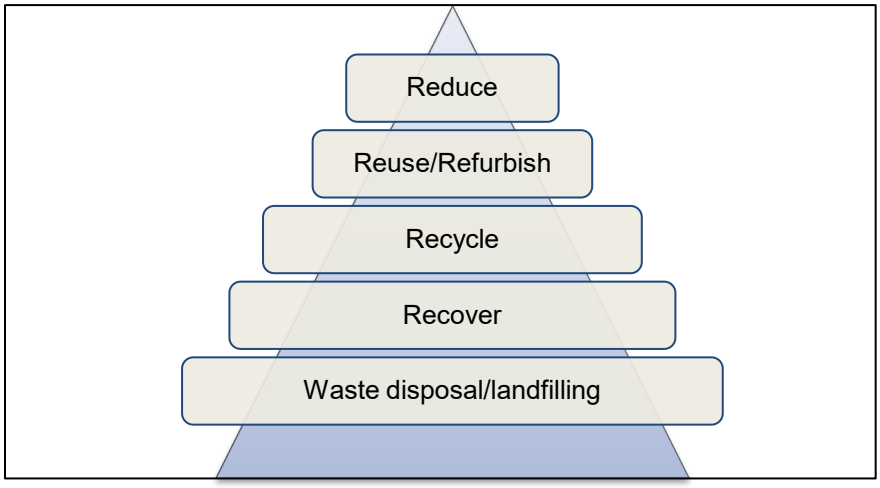
Best Practice	Followed? (Y/N)	Followed? (Y/N)
Tires stored in rows with rims removed, according to size for easy loading	N-tires piled	N-tires piled
Tire storage area minimum of 50 m away from any burn area	Y	Y
Regular litter clean up, compaction, and covering is conducted to reduce pests	N- greater frequency recommended	N- greater frequency recommended
E-waste stored in totes/gaylord containers	Y	Y

7.0 WASTE REDUCTION WORK PLAN

A sound waste reduction work plan is based on the 4Rs hierarchy: Reduce, Reuse, Recycle, and Recover, with priority assigned in that order. Reducing the volume of landfilled waste through the implementation of the 4R principles also increases the lifespan of the WDS facilities by optimizing their capacity, reducing the costs associated with site expansion or waste hauling. The current estimated capacity remaining in the Sioux Narrows WDS is 20,336 m^3 (Stantec 2020a) and 22,250 m^3 at the Nestor Falls WDS. The purpose of the principle of reduction is to decrease the overall volume of waste generated by residents, and subsequently the amount of waste that is disposed of, optimizing the site capacity to the extent practical. The purpose of the principle of reuse is to, wherever practicable, re-purpose materials that have reached the end of life; thereby, reducing the consumption and disposal of new materials, subsequently generating cost efficiencies. The purpose of the principle of recycling is to segregate, store, and transport materials (where practical) to be processed into new materials of equal, greater, or lesser value, prolonging the life of a material and delaying its final disposal. Revenues are also potentially generated for the material supplier and material processor if the material can be recycled into products of greater value. Socio-economic opportunities such as jobs and contracts may also be created as recycling requires resources such as labor and equipment. The purpose of the principle of recovering is to process the waste in a way that captures the raw components of the material, such as energy, which can then be converted to electricity or heat, and can be used in other processes or site operations.

This Waste Reduction Work Plan implements the 4R principles through a hierarchical approach, where each waste stream is assessed for opportunities to reduce or avoid the waste as a primary goal, followed by opportunities to re-use, recycle or recover the waste and finally followed by disposal. This hierarchy is presented in Figure 7.1 below.

Figure 7.1 Waste Management Hierarchy



7.1 RECOMMENDATION #1: IMPLEMENT REDUCTION AND REUSE INITIATIVES

Reduction and reuse initiatives present an opportunity to reduce waste requiring disposal and are environmentally and financially beneficial, given that there is low or no processing requirements/inputs, handling, or storage requirements for SNNF. Although reduce and reuse initiatives are environmentally and financially beneficial, they can be more difficult to implement than waste diversion programs since they challenge the public's perceptions surrounding material consumption and may present a burden to residents to transport their wastes elsewhere to be re-purposed.

7.1.1 Renovation, Furniture, Textiles

Waste such as windows, doors, clothing, construction lumber, household goods, and furniture can be transported to a thrift store, a consignment store, or a Habitat for Humanity© re-store for re-purposing/re-selling. Alternatively, a community wide "free weekend" could be implemented where residents are encouraged to place unwanted re-useable items at the curb for free. Other ways to re-purpose include online community Facebook buy and sell pages or online auction sites or "Buy Nothing" pages where items that can be re-used are listed for bidding. A community-wide garage sale weekend could also be promoted or the collaboration with Diabetes Canada or similar charities to implement a regular collection of gently used clothing and accessories. Finally, the WDS could set up a thrift shed, where residents place re-usable items in good condition for others to take at their leisure. It should be noted that this option may produce safety concerns and require additional resources such as staffing as the shed may require cleaning and organizing and may present an opportunity for people to socialize at the WDS, presenting a safety concern and a COVID-19 concern.

7.1.1.1 Estimated Lifespan Effects

With a 30% increase in the diversion of materials such as used clothing (textiles); it is estimated that this could increase capacity at the Sioux Narrows WDS by 3.4 tonnes per year (26 m^3 per year) and at the Nestor Falls WDS by 2.9 tonnes per year (22 m^3 per year) (assuming a density of 133.4 kg/m^3; EPA 2016b). With a 10% increase in the diversion of materials such as wood furniture (other); it is estimated this could increase capacity at the Sioux Narrows WDS by 11.9 tonnes per year (118.7 m^3/year) and at the Nestor Falls WDS by 2.9 tonnes per year (298 m^3/year) assuming a density of 100 kg/m^3, EPA 2016b).

The Sioux Narrows WDS has an estimated lifespan of 7.2 years; therefore, the resulting diversion would increase the site's lifespan by approximately 0.3 years (assuming an average fill rate of 2,832 m^3/year); Stantec 2020a). The Nestor Falls WDS has an estimated lifespan of 22 years; therefore, the resulting diversion recommendations couple potentially increases the lifespan by 7 years (assuming an average fill rate of 1,000 m^3/year; Stantec 2020b).

7.2 RECOMMENDATION #2: INCREASE USE OF EXISTING DIVERSION PROGRAMS

Based on the findings of the waste audit, the following recommendations have been developed to assist in increasing the use of current waste diversion programs, which would result in potential increase in WDS capacity.

Materials that offer the greatest potential for improvement based on quantities produced that are not currently being recycled are recyclable paper, plastic, glass and metal (Table 4.3 and Table 4.4). It is recommended that SNNF consider improving the current recycling programs using the following methods:

- Re-locate co-mingled recycling stations/compactor bins at the Nestor Falls WDS so they are strategically located at the gate entrance so that proper sorting of materials is as convenient as regular disposal for users.
- Provide co-mingled recycling bins to residents/resorts at cost or free of charge to encourage recycling.
- Confirm that WDS staff are trained and well-versed in the current list of acceptable materials.
- Post illustrated diagrams and/or signage on the recycling stations to clarify acceptable materials.
- Collaborate with an organization such as Recycle Everywhere/Canadian Beverage Container Recycling Association to implement a beverage container recycling program for municipal spaces such as offices, parks and gathering areas.
- Work with local businesses such as resorts, restaurants, and golf courses to increase the use of the co-mingled recycling program.

7.2.1 Estimated Lifespan Effects

The results of the waste audit indicated that 28.7 tonnes per year (383 m^3) and 20.7 tonnes per year (276 m^3) of eligible recyclables are landfilled at the Sioux Narrows WDS and Nestor Falls WDS, respectively (assuming a density of 75 kg/m^3 for co-mingled recycling; EPA 2016). With a remaining lifespan of 7 years for the Sioux Narrows WDS and a landfilling rate of 2,832 m^3/year (Stantec 2020a), it is estimated that the diversion of these materials could result in an additional one-year capacity. Furthermore, with a remaining lifespan of 22 years for the Nestor Falls WDS and a landfilling rate of 1,000 m^3/year (Stantec 2020b), it is estimated that the diversion of these materials could result in an additional six years' capacity.

7.3 RECOMMENDATION #3: COMMUNICATIONS PROGRAM

Communication is a key component of any successful waste management program. For that reason, it is important that SNNF develop a communications program that can be used by the landfill operators and other municipal staff to educate residents and tourists, and foster buy-in into the existing recycling programs.

The implementation of a well-planned communications program will help to:

- Motivate residents and tourists to participate in the program and stress its importance;
- Increase capture rates of recyclable material (increase diversion rate);
- Verify that satisfaction is achieved following the success of waste reduction initiatives;
- Maintain residents' interest and confidence in the program; and
- Ultimately increase the lifespan of the existing facilities, saving taxpayer money for the siting and design of a new facility

Specifically, it is suggested that SNNF promote participation in waste diversion programs by implementing the following activities:

- Notify the users of the site as they enter the gate that co-mingled recycling is available and that they are encouraged to separate co-mingled recycling whenever possible to extend the lifespan of the site.
- Distribute and promote (via website, social media, e-mail, newsletter) an electronic version or paper version of the recycling guidelines, acceptable materials list for the co-mingled recycling program, guidelines for electronic waste recycling and scrap metal recycling, and/or information regarding community waste events.
- Increase signage on the site to clearly direct users to the associated divertible waste storage areas (e.g., e-waste, tires, clean wood) and clearly discourage users from putting divertible materials in landfill area.
- Provide communication through website, social media and in-school workshops promoting the benefits of backyard composting and utilizing of the co-mingled recycling program.

It is also suggested that SNNF implement the following communication initiatives on an ongoing basis:

- Use a suggestion box to encourage participation in waste reduction initiatives and to collect comments, questions, and recommendations.
- Implement educational posters and/or e-mail messages to provide positive feedback about the results of initiatives or about the waste reduction program as a whole.

7.4 RECOMMENDATION #4: IMPLEMENT ADDITIONAL DIVERSION INITIATIVES

Although the results of the waste audit identified that the majority of divertible waste was clean wood diverted through burning, or "other" waste primarily related to renovations (Table 4.1 and Table 4.3), there may be additional small increases in site capacity achieved through the implementation of additional diversion initiatives. Other waste diversion initiatives available to SNNF include the following materials (Table 7.1). Additional materials may also be potentially diverted through local contractor services available in the region.

Table 7.1 Summary of Additional Diversion Programs Available to SNNF

Product	Authority	Recycling Cost/unit	Proposed Drop-Off Location[1]	Storage Requirement
Mattresses and box springs	Mother Earth Recycling	$15	Mother Earth Recycling, Winnipeg, MB	Clean and dry (e.g., shipping container)
Household hazardous waste: paint, solvents, pesticide containers, car batteries	Resource Productivity and Recovery Authority (RPRA) in partnership with Product Care Ontario	No charge	On-site; Management by ProductCare recycling	Sheltered, well-ventilated area on pallets, clearly labelled and carefully packed with lids secure
Household batteries	RPRA in partnership with Call2Recycle	No charge (Pre-paid shipping)	Drop box at municipal facilities	Minimum terminal protection guidelines met
Propane tanks	RPRA in partnership with Product Care Ontario	$2-$5	On-site; Management by ProductCare recycling	Upright and stacked
Sharps and un-used medications	Health Products Stewardship Associations	No charge	Various pharmacies in Kenora ON	Sealed bag
Fluorescent bulbs	Resource Productivity and Recovery Authority (RPRA) in partnership with Product Care Ontario	No charge (up to 4 ft lengths)	Kenora transfer station	In cardboard packaging

NOTE:
[1] Acceptance of the material to be confirmed with the service provider

7.4.1 Compostable Materials

Waste that is compostable such as food waste (e.g., fruit and vegetable waste, eggshells, coffee grounds, tea) can be composted and used for garden beds and landscaping. Encouraging residents to implement backyard composting may present an opportunity to reduce waste requiring landfilling; however, composting may attract wildlife scavengers such as racoons and bears, and therefore, compost bins would likely need to be lockable or bear proof containers and be closely monitored. Methods for SNNF to encourage backyard composting may include:

- Providing information to residents around the benefits of composting.
- Providing compost bins for sale at the municipal office.
- Partnering with a non-profit organization to conduct workshops or presentations on composting.

A composting area at the WDS could also be established to encourage users to drop off separated, compostable leaf and yard waste to be composted using turned windrow composting. The composting area would need to meet the requirements outlined in the *Environmental Protection Act R.S.O. 1990, c. E.19* Ontario Regulation 101/94: Recycling and Composting of Municipal Waste, including but not limited to meeting an internal temperature, turnover, and chemical composition requirements (e.g., compost needs to reach a minimum of 55°C after five turnovers and subsequently cured for 6 months). It should be noted that the composting requirements do not apply if the material is used solely for landfill cover.

Finally, establishing a composting area for food waste at the WDS is not recommended, as this would require an Environmental Compliance Approval for a Waste Disposal Site (Processing) under section 27 (1) (b) of the *Environmental Protection Act S.O. 1990, c. E.19.*

7.4.1.1 Estimated Lifespan Effects

The results of the waste audit indicated that 17.2 tonnes per year (62.6 m^3) and 64.7 tonnes per year (235.3 m^3) of compostable organic waste is landfilled at the Sioux Narrows WDS and Nestor Falls WDS, respectively (assuming a density of 275 kg/m^3 for food waste; EPA 2016). Should the promotion of backyard composting result in an additional 10% of compostable waste diverted, this could divert 6.3 m^3 and 23.5 m^3 annually. With an estimated remaining lifespan of 7 years at the Sioux Narrows WDS and a landfilling rate of 2,832 m^3/year (Stantec 2020a), it is estimated that the diversion of these materials would not result in a measurable increase in lifespan; however, with a remaining lifespan of 22 years for the Nestor Falls WDS and a landfilling rate of 1,000 m^3/year (Stantec 2020b), the diversion of these materials could result in an additional six months' capacity.

7.4.2 Wood Waste

Although wood waste is currently segregated and burned, reducing the volume of waste entering the landfilling area, an additional option to divert and re-use this material is to chip the wood for use in hog fuel. This material may then be used to power boilers and dryers at industrial facilities and may have a cost-recovery benefit to SNNF. Clean wood waste could also be used for heating at camps and construction sites, or for campfires at nearby lodges. The clean wood would need to be segregated, split into smaller pieces and stored for drying, which may not be feasible at the current site. It is recommended that SNNF explore these options as clean wood waste was found to be a large portion of the waste accepted at the site.

8.0 CLOSURE

This report has been prepared for the sole benefit of SNNF. Any use of this report by a third party, or any reliance on decisions made based on it, is the responsibility of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made, or actions taken, based on this report.

9.0 REFERENCES

9.1 LITERATURE CITED

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SNNF 2021. Annual vehicle gate counts for Sioux Narrows WDS and Nestor Falls WDS. Township of Sioux Narrows Nestor Falls.

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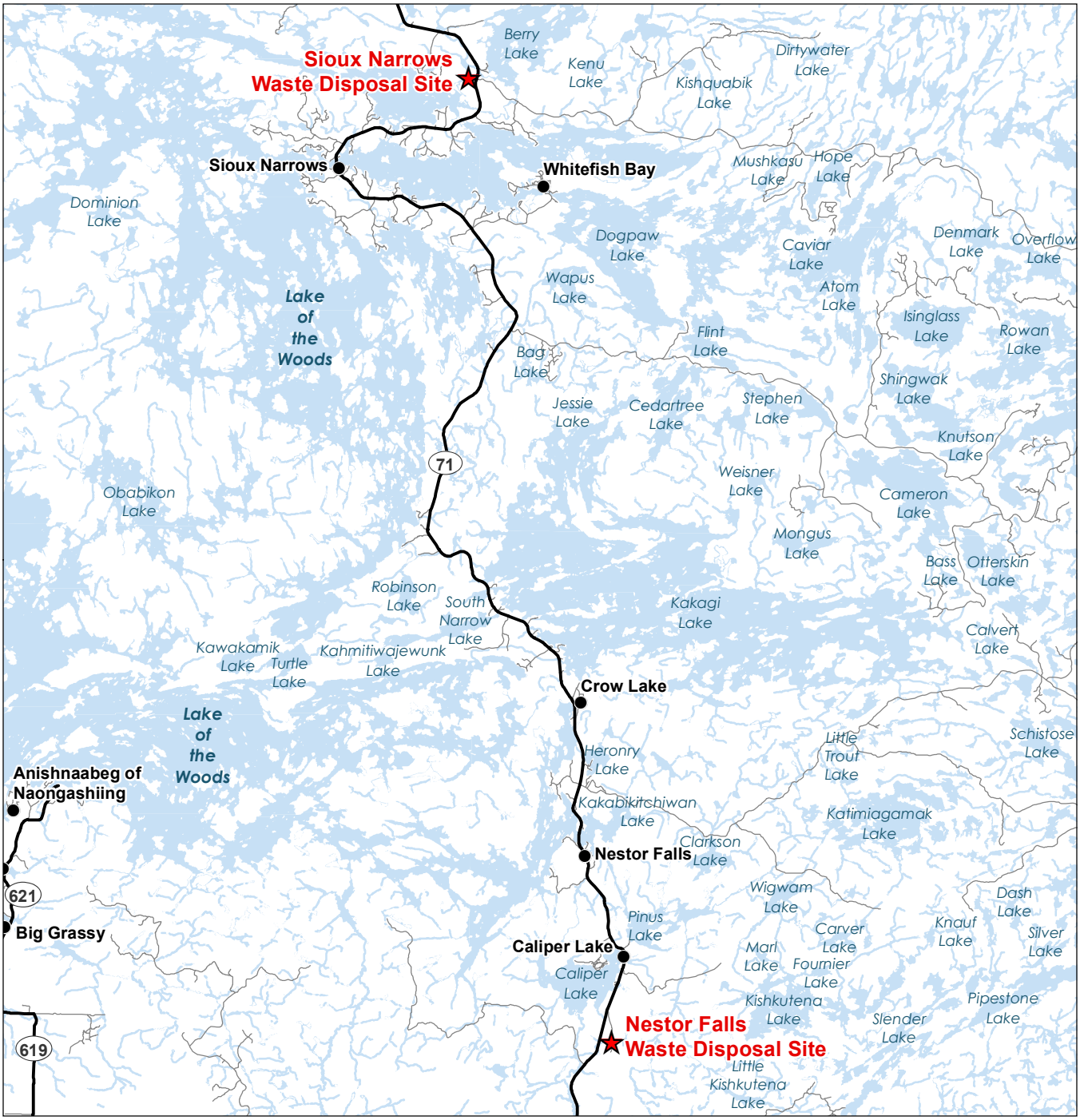
Stantec Consulting (Stantec). 2020b. 2019 Water Quality Assessment. Nestor Falls Waste Disposal Site. Winnipeg, MB.

9.2 PERSONAL COMMUNICATIONS

McCabe. 2021. E-mail communications with Stantec Consulting. November 30, 2021, and December 7, 2021.

APPENDICES

Appendix A FIGURE



Legend

- Site Locations
- Major Road
- Minor Road
- Watercourse
- Waterbody

0 2 4 Kilometres

(At original document size of 8.5x11)
1:300,000

N

Stantec

Project Location
Sioux Narrows and
Nestor Falls, ON

Prepared by ACampigotto on 2021-11-01
Reviewed by JTheroux on 2021-11-01

Client/Project 129672042
TOWNSHIP OF
SIOUX NARROWS NESTOR FALLS
Waste Audit for Sioux Narrows Nestor Falls Landfills

Figure No.
1

Title
Site Locations

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Base Data Sources: Government of Canada

G:_GIS_Project_Folder\129672042_SiouxNarrowsNestorFallsVArcMaps\Figure1_SiteLocations_20211101.mxd Revised: 2021-11-01 By: acampigotto

Appendix B VISUAL AUDIT ASSUMPTIONS

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VISUAL AUDIT METHODOLOGY

The visual audit for large/bulky items was undertaken using the following steps:

1. The resident was asked the length of their trailer
    a. For half ton truck boxes, an assumed size of 4 ft x 6 ft was used
    b. A trailer width of 6 ft was used
    c. For the trunk of a vehicle, the size was roughly measured using a measuring tape
2. The resident was asked the type of waste (any notable comments such as an estimated weight of the waste, were recorded)
    a. It the load contained multiple bags, a single bag was weighed and was multiplied by the estimated number of total bags which were visually counted
3. Photographs of various loads were taken to identify waste categories in the load and to accompany the field notes.
4. Online sources were used to roughly estimate the weight of the waste, which was multiplied by the estimated volume of the load (see table below). Online sources were converted to kg as required.

Waste item	Assumed size	Assumed weight/unit	Reference
Lumber 2x4	8 foot lengths	0.77 kg/ft	Engineering Toolbox (2013)
Lumber 2x6	6 foot lengths	0.9 kg/ft	Engineering Toolbox (2013)
Dresser	1 unit; 3 drawer	34 kg	EW TAZ (2019)
Mattress	1 unit; twin	24.9 kg	US EPA (2016b)
Chair-rocker	1 unit	9 kg	EW TAZ (2019)
Barbecue	1 unit	30 kg	Canadian Tire (2021)
Railroad tie	8 ft length	72.6 kg	Home Depot (2021)
Large battery	1 unit	16.3 kg	US EPA (2016a)
Scrap metal	See Note 1 &2	11.6 kg/ft^3	US EPA (2016b)
Renovation and Residential waste	See Note 1, 2 and 3	4.2 kg/ft^3	US EPA (2016a)
Branches/trees	See Note 1 &2	2.13 kg/ft^3	US EPA (2016a)
Shingles	See Note 2	7 kg/ft^3	US EPA (2016b)
Food waste	4 gal crate	8.7 kg	US EPA (2016a)
Cardboard	See Note 1	1.68 kg/ft^3	US EPA (2016b)

Notes:

1. Assumed truck box dimensions of 4 ft x 6 ft
2. Assumed resident estimated trailer length x 6 ft width and average of 2 ft height
3. Assumed waste was equivalent to mixed, uncompacted municipal solid waste

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Appendix C VISUAL AUDIT PHOTOGRAPHS

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 1

Photo Location:
Sioux Narrows WDS

Direction:
Facing south

Survey Date:
9/2/2021

Comments:
Showing load of lumber and wicker furniture

Photograph ID: 2

Photo Location:
Sioux Narrows WDS

Direction:
Facing south

Survey Date:
9/2/2021

Comments:
Showing load of lumber and wood furniture

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 3	
Photo Location: Sioux Narrows WDS	
Direction: Facing south	
Survey Date: 9/2/2021	
Comments: Showing boat trailer of tree branches	

Photograph ID: 4	
Photo Location: Sioux Narrows WDS	
Direction: Facing south	
Survey Date: 9/2/2021	
Comments: Showing half tonne truck load of miscellaneous waste	

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 5 **Photo Location:** Sioux Narrows WDS **Direction:** Facing east **Survey Date:** 9/2/2021 **Comments:** Showing half tonne truck load of miscellaneous metal waste	

Photograph ID: 6 **Photo Location:** Nestor Falls WDS **Direction:** Facing south **Survey Date:** 9/2/2021 **Comments:** Showing half tonne truck load of renovation waste	

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 7

Photo Location:
Sioux Narrows WDS

Direction:
Facing south

Survey Date:
9/3/2021

Comments:
Showing trailer of clean wood

Photograph ID: 8

Photo Location:
Sioux Narrows WDS

Direction:
Facing south

Survey Date:
9/3/2021

Comments:
Showing trailer of clean wood

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 9

Photo Location:
Nestor Falls WDS

Direction:
Facing south

Survey Date:
9/2/2021

Comments:
Showing trailer of clean wood

Photograph ID: 10

Photo Location:
Nestor Falls WDS

Direction:
Facing south

Survey Date:
9/3/2021

Comments:
Showing half tonne truck box of misellaneous waste

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 11 **Photo Location:** Sioux Narrows WDS **Direction:** Facing south **Survey Date:** 9/3/2021 **Comments:** Showing trailer of metals and textile waste	

Photograph ID: 12 **Photo Location:** Sioux Narrows WDS **Direction:** Facing south **Survey Date:** 9/3/2021 **Comments:** Showing trailer of wood waste	

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 13 **Photo Location:** Nestor Falls WDS **Direction:** n/a **Survey Date:** 9/3/2021 **Comments:** Showing trailer of renovation waste	
Photograph ID: 14 **Photo Location:** Sioux Narrows WDS **Direction:** Facing south **Survey Date:** 9/3/2021 **Comments:** Showing trailer of wood waste	

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 15 **Photo Location:** Sioux Narrows WDS **Direction:** Facing south **Survey Date:** 9/4/2021 **Comments:** Showing trailer of wood waste	
Photograph ID: 16 **Photo Location:** Sioux Narrows WDS **Direction:** Facing west **Survey Date:** 9/4/2021 **Comments:** Showing textile waste and furniture	

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 17

Photo Location:
Sioux Narrows WDS

Direction:
Facing east

Survey Date:
9/4/2021

Comments:
Showing lumber and household items

Photograph ID: 18

Photo Location:
Nestor Falls WDS

Direction:
Facing south

Survey Date:
9/3/2021

Comments:
Showing trailer of wood waste

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 19

Photo Location:
Nestor Falls WDS

Direction:
Facing north

Survey Date:
9/4/2021

Comments:
Showing trailer of wood waste

Photograph ID: 20

Photo Location:
Nestor Falls WDS

Direction:
n/a

Survey Date:
9/3/2021

Comments:
Showing expired food items

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 21 **Photo Location:** Nestor Falls WDS **Direction:** Facing east **Survey Date:** 9/4/2021 **Comments:** Showing trailer of household items	
Photograph ID: 22 **Photo Location:** Sioux Narrows WDS **Direction:** Facing east **Survey Date:** 9/4/2021 **Comments:** Showing half tonne of cardboard and metal waste	

Client:	**Township of Sioux Narrows Nestor Falls**	**Project:**	**129672042**
Site Name:	**Sioux Narrows and Nestor Falls WDS**	**Site Location:**	**15 U 434012E, 5430307 N and 426907 E, 5478217 N**

Photograph ID: 23 **Photo Location:** Sioux Narrows WDS **Direction:** n/a **Survey Date:** 9/3/2021 **Comments:** Showing furniture waste	
Photograph ID: 24 **Photo Location:** Nestor Falls WDS **Direction:** n/a **Survey Date:** 9/3/2021 **Comments:** Showing furniture and metal waste