Waste Audit Procedures

DALHOUSIE UNIVERSITY - OFFICE OF SUSTAINABILITY

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Dalhousie Office of Sustainability

Audit procedures were developed and refined five times over two years by Office staff: Contributors include: Gary Davidson, Waste Mgmt Projects Officer; **Kathrin Munro,** Projects Officer, **John Morrisey,** Projects Officer, **Rochelle Owen,** Director.

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WASTE AUDIT INSTRUCTIONS

Purpose

The purpose of a waste audit is to gain a detailed understanding of the types and weights of material being generated. Audit results are used to improve the economic and environmental performance of waste management efforts.

There are three major components to the waste audit:

A. Preparation
B. Sorting, recording, and cleanup
C. Analysis and reporting.

When undertaking an audit, one person should be designated as the audit coordinator. This person is responsible for preparing and leading the audit. When first beginning to conduct waste audits, it is advisable to seek assistance from regional waste education officers if they are available. The audit coordinator must ensure that all preparations are carried out before participants begin auditing and measuring waste

Preparation:

1. Identify which material streams will be audited. Use the materials stream categorization guide to help.
2. Ensure that the waste is sorted into separate piles based on waste stream, day collected, or source location if auditing specific areas or buildings.
3. Choose an adequate sample size for the audit. The % of waste audited will depend on total waste generation of the organization– larger numbers yield more accurate results.
4. Locate a suitable facility for storing the waste and conducting the audit.
5. Verify the number of participants who will be helping with the audit and obtain the required safety materials (See Appendix A for a list of personal safety equipment).
6. Choose an auditing procedure that best suits the needs of the firm (Table 1).
7. Obtain the materials required for that method (See Appendix A).
8. Conduct a training session with the audit participants. Training requirements will differ according to chosen audit type.
9. Give the people who are data recording the auditing packages and have them review the sheets and ask any questions before sorting begins.
10. Assign groups according to the chosen audit type.

Procedures:

There are significant differences between auditing methods. There is also some flexibility in how the audits are performed, and so the outlined procedures (Table 1) should be used mainly as guidelines. The audit coordinator can adjust the procedures as required to best suit the needs of the firm.

Table 1: Differences between auditing methods

	Type 1: Bulk auditing (large audits)	Type 2: Individual bag contamination rate auditing	Type 3: Individual bag & sub-categorization auditing
Personnel	• 1 audit coordinator (can also weigh the bins since frequent weighing not required) • Sorters (as many as possible)	• 1 audit coordinator • Recommended team composition of: - 1 data recorder and - 2 groups of 2 sorters • Disposal Team -OR- sorters dispose of their own waste (recommend 1 disposal team of 4-6 people per 4 teams of sorters)	• 1 audit coordinator • Recommended team composition of: - 1 data recorder and - 2 groups of 2 sorters • Disposal Team -OR- sorters dispose of their own waste (recommend 1 disposal team of 4-6 people per 4 teams of sorters)
Equipment	• Disposal bins for each category of materials being measured • 1 scale that can weigh the disposal bins • 1 auditing package per group	• 4 sorting bins per team (2 per group) • 1 scale per team • Disposal bins • 1 auditing package per group	• 6 sorting bins per team (2 per group plus an additional 2 for the sub-categorization bags) • 1 scale per team • Disposal Bins • 1 auditing package per group
Procedures	• Weigh and Open up a bags (of the audited waste stream for example garbage stream) and empty the contents into the proper disposal bins (or bags) by material • When all of the bags are gone or the disposal bin is full, weigh each bin. This will give weights of all materials found in this particular stream and % of contamination can be calculated. • Additional bins may be used for further sub-categorization of the waste streams (ie: separation of paper into fines and newsprint, or recyclables into refundable beverage containers and others) • Notes should be made of material found in what approximate quantity if further sub categories are done.	• Open up the bag of the waste stream being audited and separate contents into two bins 1) properly sorted materials and 2) contaminants • Once the bag contents have been fully separated, weigh the bins • Once the bin weights have been recorded, sort the waste into disposal bins according to local area requirements (if a disposal team is on hand, give them the bins full of waste and take 2 empty bins and continue sorting through more bags until there are no remaining bags)	• Decide how many bags will be sub-categorized (20% = 1 in 5 bags) • The data recorder will tell the groups when they must sub-categorize waste. For these bags, additional bins will be needed (one for each category of waste being measured) • Open up the bags of waste and separate contents into the bins according to properly sorted materials and contaminants (or into all waste streams if sorting through a detailed bag) • Once the bag contents have been fully separated, weigh the bins • Disposal the same as type 2
Benefits	• Detailed breakdown data for all audited waste • Less data recording required • No additional disposal step required as material is source separated.	• Will yield data on individual bags and allow for identification of outliers • Can measure percentage of bags that meet adequate contamination rates	• Same benefits as type 2 auditing • Yields information regarding the material composition of the waste streams and contamination
Drawbacks	• Individual bag data cannot be measured	• Weighing individual bags is time consuming • More susceptible to data entry errors • Requires a scale and sorting bins for each team of sorters • Waste must be disposed after each bag is audited. Will require a disposal team	• Same drawbacks as type 2 contamination auditing • Will require more sorting bins for each team • Will take more time than type 2 due to extra sorting and weighing • Detailed data is more susceptible to outliers

Roles Explained:

Audit Coordinator:

This person is responsible for preparing and leading the audit. They must ensure that all preparations are carried out before participants begin auditing and measuring waste. If possible, the audit coordinator should play a role in forming or overseeing the waste management plan for the organization. It would be beneficial of this person read the waste management manual to understand the purpose of the audit and the role of waste characterization studies in waste management.

Data Recorders:

This position involves weighing the sorted contents of the audit. They will be responsible for weighing the bins and the sorted waste, recording data, and taking notes during the audit. They may also be tasked with taking pictures. Data recorders should ideally have experience in recording experimental data. It is important that the data recorder fully understands their role and the importance of good record keeping because if the audit is completed and the data is full of errors the results will be affected and may ultimately be useless. The data recorder also lets the sorting groups know when/if bags must be sub-categorized. The data recorder should review the auditing cards before the audit.

Sorters:

These people are responsible for opening the bags and sorting the waste according to the categorization chosen by the audit coordinator (see different auditing methods). In audits with no diversion team, the sorters will dispose of their own waste according to the proper materials stream in a designated diversion area.

Diversion team

These people are responsible for diverting material into proper large bins/bags after they have been sorted. This ensures the highest level of diversion is achieved at the end of the audit. Once they empty the contents of the bins, they return them to the sorting teams. If there are enough sorting bins and sorting teams, it can make the audit go much quicker with a dedicated disposal team. If there are not enough audit participants or sorting bins for this, the sorters on the sorting teams can dispose of the waste themselves.

TEAM STRUCTURE

With bulk auditing, several data recorders are not required since it is only the disposal bins being weighed rather than individual bags. For bulk auditing, audit participants can all be designated as waste sorters and data recorders and disposal teams should not be required (Figure 1). If there are enough personnel on hand, it is possible to split into independent groups which are responsible for auditing a portion of the waste or different streams. This will require extra disposal bins though.

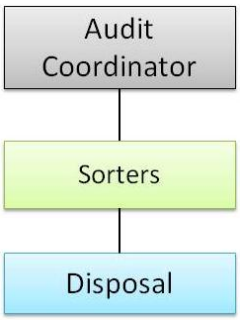

Figure 1: Recommended structure for type 1: bulk auditing.

There is some flexibility with team composition according to audit type and the resources and personnel that are available. When conducting type 2 or 3 audits, multiple diversion teams with data recorders should be formed so that data entry does not hold up the auditing process (Figure 2). If personnel are limited, the sorters can dispose of their own waste; however, a dedicated disposal team that can empty sorting bins can help the audit run more smoothly. The audit will generally go faster with more diversion teams. If the sorters are experienced, or if the bags of waste are not highly contaminated, sorters may be able to sort bags individually rather than in groups of 2. The goal is to have the sorting proceeding at a pace where the data recorder remains active. This may mean adjusting the number of teams per data recorder based on the speed of the sorters.

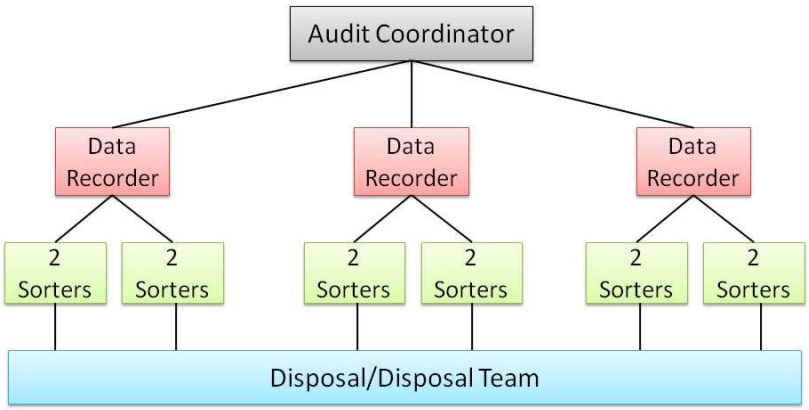

Figure 2: Recommended team structure for type 2 and 3 audits. The audit should strive to have as many diversion teams (data recorder + sorting groups) as possible.

Cleanup

1. All waste should be disposed of properly according to local area sorting requirements. For audits with sub-categorization, this will need to be done on an ongoing basis throughout the audit since the sorting bins will need to be emptied and reused. For bulk auditing no additional sorting step is required for disposal.
2. Any waste residues or spills should be cleaned up immediately.
3. Team leaders should give data to the audit coordinator and explain any unclear data on the sheets.
4. The audit coordinator should briefly look over the data to ask any questions they may have about recorded data while data recorders are on hand.
5. Materials and equipment should be returned to the audit coordinator

Analysis and Reporting.

1. Enter the data values into the excel spreadsheet auditing tool.
2. The tool will only allow manipulation of cells which require data entry and these cells are highlighted in yellow. If you wish to alter the tool, you must first unprotect the sheet
3. Once all the data is entered, enter the % of waste audited and the % of waste that has been sub-categorized
4. The detailed sub-categorization data will automatically be added to the larger data set for contamination. It will also be represented graphically
5. Summary tables will be automatically produced showing the projected annual waste production values and contamination rates based on the contamination data set and the sub-categorization data.

APPENDICES

Appendix A: List of materials required for all audits (materials may vary depending on the volume and type of waste being audited)

Appendix B: Sample auditing sheets for the paper stream

Appendix C: Sample auditing sheets for the organics stream

Appendix D: Sample auditing sheets for the recyclables stream

Appendix E: Sample auditing sheets for the garbage stream

Appendix F: Sample blank auditing sheets for any stream

APPENDIX A

Table 1 contains a list of materials that is required for each specific type of audit. In addition to these, there are also materials that are required for all audits and they are listed below.

List of materials required for all audits:

Waste:

- collected from chosen locations
- sorted by stream (and building if looking for more specific data).

Personal protective equipment:

- gloves
- coveralls or protective clothing
- safety glasses

Common auditing equipment:

- Camera
- Bins or bags for proper disposal of audited waste. The number required will vary according to the amount of waste being audited.
- Cleaning equipment
    - Broom
    - Mop
    - Rags
- A bucket or sink for emptying liquids from beverage containers
- Scissors or another cutting tool
- Disposal bins and bags

Audit package consisting of:

- Auditing Instructions
- A sorting chart
- Data sheets for recording weights
- Clip boards with pens
- Extra paper for notes

PAPER (DETAILED SORTING SHEET)

Data Recorder Name: _____ **Date:** _____

Email: _____ **Phone #:** _____

Paper (g)	1	2	3	4	5	6	7	8	9	10
Office Paper										
Miscellaneous Paper										
*Corrugated Cardboard										
Other:										
Notes:										
Contamination (g)	**Record data in grams and indicate any discrepancies in the notes**									
Recyclables										
Organics										
Garbage										
Other:										
Other:										
Notes:										

*Corrugated cardboard is part of the paper stream, but it must be kept separate

Additional Notes: _____

_____

_____

% of waste being sub-categorized: _____

Subcategorization % in bag numbers:

5% = 1 in 20 bags	50% = 1 in 2 bags
10% = 1 in 10 bags	75% =3 of 4 bags
20% = 1 in 5 bags	100% = All bags

PAPER (CONTAMINATION SHEET)

Data Recorder Name: _____ **Date:** _____

Email: _____ **Phone #:** _____

Sample:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Paper (g)															
Contamination (g)															
Notes															

Sample:	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Paper (g)															
Contamination (g)															
Notes															

Sample:	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Paper (g)															
Contamination (g)															
Notes															

Additional Notes: _____

_____

_____

% of waste being sub-categorized: _____

Subcategorization % in bag numbers:

5% = 1 in 20 bags
10% = 1 in 10 bags
20% = 1 in 5 bags
50% = 1 in 2 bags
75% =3 of 4 bags
100% = All bags

ORGANICS (DETAILED SORTING SHEET)

Data Recorder Name: _____ **Date:** _____

Email: _____ **Phone #:** _____

Organics (g)	1	2	3	4	5	6	7	8	9	10
Food										
Boxboard & Soiled Paper										
Other:										
Notes:										
Contamination (g)	**Record data in grams and indicate any discrepancies in the notes**									
Paper & Cardboard										
Recyclables										
Garbage										
Other:										
Other:										
Notes:										

Additional Notes: _____

_____

_____

% of waste being sub-categorized: _____

Subcategorization % in bag numbers:

5% = 1 in 20 bags	50% = 1 in 2 bags
10% = 1 in 10 bags	75% =3 of 4 bags
20% = 1 in 5 bags	100% = All bags

ORGANICS (CONTAMINATION SHEET)

Data Recorder Name: _____ **Date:** _____

Email: _____ **Phone #:** _____

Sample:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Organics (g)															
Contamination (g)															
Notes															

Sample:	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Organics (g)															
Contamination (g)															
Notes															

Sample:	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Organics (g)															
Contamination (g)															
Notes															

Additional Notes: _____

_____

_____

% of waste being sub-categorized: _____

Subcategorization % in bag numbers:

5% = 1 in 20 bags
10% = 1 in 10 bags
20% = 1 in 5 bags
50% = 1 in 2 bags
75% =3 of 4 bags
100% = All bags

RECYCLABLES (DETAILED SORTING SHEET)

Data Recorder Name: _____ **Date:** _____

Email: _____ **Phone #:** _____

Recyclables (g)	1	2	3	4	5	6	7	8	9	10
Glass Bottles/Jars										
Plastic Bottles & Containers (#1,2)										
Plastic Films and bags (#4)										
Metal Containers										
Other Beverage Containers										
Other:										
Notes:										
Contamination (g)	**Record data in grams and indicate any discrepancies in the notes**									
Paper & Cardboard										
Organics										
Plastics (#3,5,6,7)										
Garbage										
Other:										
Other:										
Notes:										

Additional Notes: _____

_____

_____

% of waste being sub-categorized: _____

Subcategorization % in bag numbers:

5% = 1 in 20 bags
10% = 1 in 10 bags
20% = 1 in 5 bags
50% = 1 in 2 bags
75% =3 of 4 bags
100% = All bags

RECYCLABLES (CONTAMINATION SHEET)

Data Recorder Name: _____ **Date:** _____

Email: _____ **Phone #:** _____

Sample:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Recyclables (g)															
Contamination (g)															
Notes															

Sample:	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Recyclables (g)															
Contamination (g)															
Notes															

Sample:	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Recyclables (g)															
Contamination (g)															
Notes															

Additional Notes: _____

_____

_____

% of waste being sub-categorized: _____

Subcategorization % in bag numbers:

5% = 1 in 20 bags
10% = 1 in 10 bags
20% = 1 in 5 bags
50% = 1 in 2 bags
75% =3 of 4 bags
100% = All bags

GARBAGE (DETAILED SORTING SHEET)

Data Recorder Name: _____ **Date:** _____

Email: _____ **Phone #:** _____

Garbage (g)	1	2	3	4	5	6	7	8	9	10
Waste plastic										
Waste metal										
Waste glass										
Other/composite										
Other:										
Notes:										
Contamination (g)	**Record data in grams and indicate any discrepancies in the notes**									
Recyclables										
Organics										
Paper										
Cardboard										
Other:										
Other:										
Notes:										

Additional Notes: _____

_____

_____

% of waste being sub-categorized: _____

Subcategorization % in bag numbers:

5% = 1 in 20 bags
10% = 1 in 10 bags
20% = 1 in 5 bags
50% = 1 in 2 bags
75% =3 of 4 bags
100% = All bags

GARBAGE (CONTAMINATION SHEET)

Data Recorder Name: _____ **Date:** _____

Email: _____ **Phone #:** _____

Sample:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Garbage (g)															
Contamination (g)															
Notes															

Sample:	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Garbage (g)															
Contamination (g)															
Notes															

Sample:	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Garbage (g)															
Contamination (g)															
Notes															

Additional Notes: _____

_____

_____

% of waste being sub-categorized: _____

Subcategorization % in bag numbers:

5% = 1 in 20 bags
10% = 1 in 10 bags
20% = 1 in 5 bags
50% = 1 in 2 bags
75% =3 of 4 bags
100% = All bags

APPENDIX G

Data Recorder Name: _____ **Date: _____**

Email: _____ **Phone #: _____**

	1	2	3	4	5	6	7	8	9	10
Notes:										
Contamination (g)	**Record data in grams and indicate any discrepancies in the notes**									
Notes:										

Additional Notes: _____

_____

_____

***% of waste being sub-categorized:* _____**

Subcategorization % in bag numbers: **5% = 1 in 20 bags** **50% = 1 in 2 bags**
10% = 1 in 10 bags **75% =3 of 4 bags**
20% = 1 in 5 bags **100% = All bags**