Current Status of the Waste Identification Program at AECL's Chalk River Laboratories

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ABSTRACT

The management of routine operating waste by Waste Management and Decommissioning (WM&D) at Atomic Energy of Canada Limited's (AECL) Chalk River Laboratories (CRL) is supported by the Waste Identification (WI) Program. The principal purpose of the WI Program is to minimize the cost and the effort associated with waste characterization and waste tracking, which are needed to optimize waste handling, storage and disposal.

The major steps in the WI Program are:

(1) identify and characterize the processes that generate the routine radioactive wastes accepted by WM&D,
- radioisotope production, radioisotope use, reactor operation, fuel fabrication, et cetera

(2) identify and characterize the routine blocks of waste generated by each process or activity,
- the initial characterization is based on inference (process knowledge)

(3) prepare customized, template data sheets for each routine waste block,
- templates contain information such as package type, waste material, waste type, solidifying agent, the **average** non-radiological contaminant inventory, the **average** radiological contaminant inventory, and the waste class

(4) ensure generators "use the right piece of paper with the right waste" when they transfer waste to WM&D - that is they use the correct template data sheets to transfer routine wastes, by:
- identifying and marking waste collection points in the generator's facility,
- ensuring that generators implement effective waste collection/segregation procedures,
- implementing standard procedures to transfer waste to WM&D, and
- auditing waste collection and segregation within a generator's facility.

(5) determine any additional waste block characterization requirements (is anything needed beyond the original characterization by process knowledge?)

This paper describes the WI Program, it provides an example of its implementation, and it summarizes the current status of its implementation for both CRL and non-CRL waste generators.

Note: This paper is an update of a presentation by G.W. Csullog, N.W. Edwards and M.A. terHuurne, entitled "The Waste Identification Program at Atomic Energy of Canada Limited's Chalk River Laboratories", at the Third International Seminar on Radioactive Waste Products, 23-26 June 1997, Wurzburg, Germany.

INTRODUCTION

In the early 1980's, Waste Management and Decommissioning (WM&D) at Atomic Energy of Canada Limited's (AECL) Chalk River Laboratories (CRL) initiated a program to move from the interim storage of radioactive waste to the disposal of these wastes. Atomic Energy Control Board of Canada regulatory document R104 [1] requires that the predicted radiological risk to an individual from a single waste disposal facility shall not exceed 10^{-6} fatal cancers and serious genetic effects in a year, calculated without taking advantage of long-term institutional controls as a safety feature.

The intent of the AECL disposal strategy is to conform to the regulatory requirement for disposal and to optimize both the safety and cost of disposal by classifying and disposing of waste according to its containment and isolation requirements. The strategy includes:

- categorizing, segregating, conditioning and packaging waste for emplacement in suitable disposal facilities, and
- selecting, studying and developing suitable disposal facilities.

To support its strategy, WM&D has implemented the following approach to waste management:

- determine "safe quantities" for contaminants for each conceptual disposal technology, (i.e., performance assessments or other assessments indicate that the "safe quantity" results in a risk that is below the regulatory requirement by an adequate margin)
- determine "administrative limits" for contaminants in waste packages, as follows,

$$\frac{\text{safe quantity of radionuclide X in a disposal facility}}{\text{total volume of waste in a facility}} = \text{administrative waste package specific activity to classify waste for disposal}$$

- classify wastes for disposal using the waste package administrative limits - by comparing the quantities of contaminants reported in a waste package with administrative package limits,
- store wastes until licensed disposal facilities are available,
- select wastes (based on their classification) for a given disposal concept and determine a reference inventory for the concept,
- conduct a performance assessment of a disposal concept using the reference inventory,
- obtain a disposal facility license for the selected concept, and
- emplace waste in the disposal facility within the bounds of the reference inventory.

The approach described above relies on:

- the characterization of wastes,
- the classification of wastes (compare reported contaminant quantities with administrative limits),
- the tracking of wastes up to and including disposal, and
- maintaining running inventories of contaminants as wastes are emplaced into a disposal facility.

To manage both the wastes and the large quantity of information associated with them, an administrative system had to be implemented. This paper focuses on a key component of that administrative system - the Waste Identification (WI) Program. An overview of the WI Program is presented, along with the current status of its implementation for both CRL and non-CRL waste generators.

THE WASTE IDENTIFICATION PROGRAM

The WI Program was set up to:

- identify and characterize the wide variety of activities and processes that generate the radioactive wastes that WM&D receives,
- identify and characterize the wide variety of routine wastes that are generated by the various activities and processes, and
- identify how and where wastes are collected by generators to ensure that they are properly collected and segregated.

The steps of the WI Program are (refer also to Figure 1):

1. **the preparation of facility maps and process/waste flow sheets**

   Generators are asked to provide (i) maps of their facilities, (ii) descriptions of the activities carried out within those facilities and (iii) process/waste flow charts that show where and how processes/activities are carried out and where routine wastes are generated. Step 1 links the routine wastes to the activities/processes that generate them.

2. **the identification of waste "blocks" and the assignment of ID #s**

   Once the information is gathered in Step 1, the WM&D Customer Services Representative (CS-Rep), a WI Team and the waste generator's representative identify "blocks" of waste. Blocks are assumed to have similar properties with respect to handling, storage and disposal requirements.

3. **the completion of WI reports**

   The WI team works with generators to characterize both the processes that generate the wastes and the waste blocks generated.

   The WI team performs a mass balance assessment to infer the characteristics of the various waste blocks identified and it issues a report. The report (i) provides details of how waste characteristics were inferred and (ii) includes WI sheets that describe waste block characteristics, such as package type, waste material, waste type, solidifying agent, the **average** non-radiological contaminant inventory, and the **average** radiological contaminant inventory.

4. **the assignment of waste classes and the use of template data sheets**

   The WI report's data, gathered in the first three steps, are entered into the WIP-III data management system (described in a companion paper [2]).

   The quantities of contaminants entered for waste blocks are compared with contaminant limits for disposal facilities by WIP-III and WIP-III automatically assigns a disposal category. Based on other information (such as package type and external radiation levels) the CS-Rep assigns a storage category.

   The combined storage and disposal categories constitute the waste class, which is recorded in WIP-III.

WIP-III is used to print out template waste data sheets (partially completed waste data sheets based on the information entered from the WI report). To transfer wastes to WM&D, generators complete these template data sheets by entering waste package ID numbers and radiation field measurements. Templates are returned to WM&D for approval to ship (i.e., ***Q***ualified ***F***or ***S***hipment, QFS).

After wastes are received by WM&D and emplaced into storage facilities, the information on the "QFSed" templates is updated in WIP-III as follows:

(i) WM&D staff enter the template ID number into WIP-III,

(ii) WIP-III populates most fields on an electronic data sheet using information from a WIP-III electronic template that is based on the WI report's data,

(iii) WM&D staff enter the waste package ID, the radiation field information and the waste storage location onto the electronic data sheet and save the information. Using this process, 50 to 60 contaminants and other waste package information can be entered into WIP-III in a couple of minutes.

Templates reduce the paper workload for generators and they facilitate the waste acceptance process for WM&D.

5. the development and implementation of waste management plans

The AECL Environmental Protection Program Manual [3] requires AECL radioactive waste generators to develop and implement waste management plans. To date, plans have been developed by WM&D on behalf of the major generators at the CRL site and this activity is currently being extended to the minor generators at CRL and to non-CRL generators.

Waste management plans include the following major elements:

- a statement of the generator's waste management policy,
- a waste minimization plan (if applicable),
- procedures for managing wastes in the generator's facility, and
- a statement of possible changes to processes and wastes (if applicable).

Waste management plans are living documents that are also used to reference:

- waste audits that are conducted,
- compliance reports that are issued,
- radiological surveys that are performed,
- effluent monitoring reports that are issued, and
- the WI team's process/waste block characterization report(s).

6. the mapping of waste collection points and waste transfer procedures in a generator's facility

To ensure that:

- wastes are properly segregated and collected in a generator's facility, and
- generators use the "right piece of paper" to transfer wastes to WM&D,

WM&D has implemented a system to audit waste management within a CRL waste generator's facility. This system includes the:

- identification of waste collection points,
- posting of waste collection point signs (see Figure 2), and
- implementation and posting of a standard waste transfer procedure (see Figure 3).

Using a custom WM&D application called CRAWL (**C**halk **R**iver **A**ctive **W**aste **L**ocator) and the CRL Landlord Geographical Information System (LGIS), WM&D can map "objects" into every room in every building at CRL. For example, WM&D can map waste collection points (radioactive, hazardous and non-hazardous), the location of posted procedures (waste transfer, radiation protection, chemical hazards, etc) and physical barriers to waste flow (radiation monitors, "rubber barriers", etc). Maps are used to conduct audits to ensure that wastes are collected and segregated where and how generators had specified when the WI team had characterized their processes and wastes.

The LGIS is tied to the CRL Space Inventory Management System (SIMS). Using SIMS, each room in each facility has an associated owner (Branch or Facility) and an associated function (washroom, hallway, Class A laboratory, hot cell, etc). Using LGIS/SIMS maps, WM&D can determine if the owner and/or purpose of a given room has changed. A change in function on an LGIS/SIMS map would signal a possible change in the wastes generated by the affected room.

7. compliance monitoring and updates to WI Program information in WIP-III

WM&D conducts and contracts out the compliance monitoring of wastes to ensure that generator estimates of the characteristics of their wastes are comparable to the results obtained from monitoring. This compliance monitoring extends to assessing the acceptability of the WI team's characterization of routine wastes by inference.

A Compliance Monitoring Specialist compares:

- the quantities of contaminants estimated to be in the waste (generator or WI team estimate),
- the quantities and variances of contaminants determined by compliance monitoring, and
- the administrative limits for contaminants for the various disposal concepts.

The Specialist determines whether or not a waste's measured characteristics, as determined by compliance monitoring, compare favourably with its estimated characteristics, taking into account the impact the waste would have on the performance of various disposal facilities. For example, if compliance monitoring results for a waste are different from the WI team or generator's estimates by a factor of 2 or more, this may be inconsequential for final disposal if, for example, the waste would contribute only a small percentage of the total contaminant inventory of a disposal concept. In other words, even if the higher (conservative) estimate of contaminant inventories were used in facility performance assessments, there would not be a significant negative impact upon the facility's predicted performance.

The review process is used to address questions such as, (i) Is the current estimate of the waste's characteristics adequate? (ii) Is additional characterization needed? or (iii) Should the waste be assigned a more restrictive disposal category? The review process links the quality of characterization data to the impact the waste will have upon the performance of various disposal facilities [4].

If compliance monitoring determines that a waste block's inferred characteristics should be adjusted:

- the waste management plan is amended to include a reference to the compliance report,
- the waste's characteristics, as entered into WIP-III, are updated,
- WIP-III immediately uses the revised data for template data sheets (even if generators submit paper copies of previous revisions of templates, WIP-III will force WM&D staff to use the latest revision of a template), and
- generators are provided with updated paper copies of templates (this step will be eliminated when the distribution of electronic copies of templates is migrated to the AECL Intranet).

8. interactions with generators

WM&D makes routine presentations to waste generators to describe its WI Program. Two main points are emphasized.

First, waste management plans and the WI team's reports are developed by WM&D specialists on behalf of generators, but the success of this activity is fully dependent on direct, one-on-one interactions with generator representatives who are the only ones with the knowledge needed to characterize the processes/activities that generate waste.

Second, while the WI Program itself is complex, the implementation in the generator's work place is quite simple. All that generators require are:

- written procedures for the segregation and collection of routine waste (if applicable),
- packages used to collect routine waste that are clearly marked with the waste block number,
- waste collection point signs and waste transfer procedures clearly posted in their facility, and
- the knowledge to use the "right piece of paper" (correct template) to transfer wastes to WM&D.

EXAMPLE APPLICATION OF THE WASTE IDENTIFICATION PROGRAM

The WI Program was applied in identifying and characterizing the various blocks of waste generated by operation of the Universal Cells (hot cells) at CRL. A total of 16 radioactive waste blocks were identified, ranging from highly radioactive cell wastes to out-of-cell trash with incidental contamination.

The data from the WI team's report were entered into WIP-III, which created template waste data sheets for each block identified. Figures 4A and 4B illustrate the front and back of one of the template data sheets created for the Universal Cells.

Note:

- the number of contaminants, over 60, reported for this waste block (Figure 4B),
- the waste block number (template number in top right corner of Figures 4A and 4B), and
- the waste class (bottom left corner of Figure 4A).
  WM&D uses a three digit waste class code, XYZ, where

X = storage category (5 is a type of tile hole in use at CRL)
Y = disposal category (3 is a geological repository disposal option)
Z = special handling/operations category.

CURRENT STATUS OF THE WASTE IDENTIFICATION PROGRAM'S IMPLEMENTATION

The WI Program was developed, tested and implementation was started on the CRL site before it was applied to non-CRL waste generators.

Figure 5 summarizes the status of the program's implementation for CRL generators as of July 1998. It shows that the WI program has been fully implemented for the following major waste generators:

- hot cell facilities (for fuel examination, pressure tube examination, isotope production, et cetera)
- fuel fabrication (recycle fuel fabrication laboratory), and
- several laboratories at CRL

Implementation is near completion for the Fuel Safety Branch Laboratories (relocated from Whiteshell Laboratories) and the new CRL facility to upgrade heavy water and to extract tritium. Because of its complexity, the NRU reactor has been divided into 16 subsystems (16 WI reports will be written). At the time of writing, four subsystems had been assessed by the WI team. In addition, work continues on expanding WI Program implementation to other CRL waste generators.

Implementation of the WI Program for non-CRL generators began with Ottawa-based radioactive waste generators. Based on successes with the Canadian Red Cross Society and the National Research Council, a general notice [5] was issued to non-CRL waste generators that routinely send waste to CRL to:

- describe the WI Program and
- notify non-CRL generators that continued acceptance of their wastes was contingent upon their participation in the WI Program (whether these wastes were accepted directly by AECL or by way of a waste broker).

At time of writing for this paper, one waste broker (Monserco Limited) had begun implementing the WI program for its customers. In addition, AECL was interacting with the University of Toronto to implement the WI program on its site and various non-CRL generators had submitted information needed for their participation in the WI program.

Figure 6 summarizes the status of WI Program implementation for the Ottawa-based generators.

While participation in the WI Program is optional, the general notice that was issued makes the following statements:

> *... Generators that do not have an on-going, routine use of radioactive materials are not required to participate in the WI program. Their wastes are considered as non-routine...*

> *... Generators that have an on-going, routine use of radioactive materials that do not intend to transfer their wastes to AECL are not required to participate in the WI program. If, at some future date, these generators decide that they want to transfer their wastes to AECL, either directly or indirectly, AECL reserves the right to not accept their wastes until such time as the generators become full participants in the WI program....*

SUMMARY

The Waste Identification Program at AECL's Chalk River Laboratories has been used to identify and characterize a wide variety of processes and activities that generate radioactive wastes and to identify and characterize the various blocks of wastes that are generated by each process or activity.

The Waste Identification Program and the associated WIP-III data management system ensure that the quality of waste characterization data is linked to disposal facility performance assessments. This link helps optimize both the safety and cost of disposal by classifying and disposing of waste according to its containment and isolation requirements.

Instead of estimating the characteristics of current radioactive wastes on a package-by-package basis, process knowledge is used to infer the average characteristics of most wastes. This approach defers, and potentially avoids, the use of expensive analytical technologies to perform additional waste characterization until reasonable certainty is gained about their ultimate disposition.

Significant progress has been made implementing the WI Program for both CRL and non-CRL waste generators.

REFERENCES

1. "**Regulatory Objectives, Requirements and Guidelines for the Disposal of Radioactive Wastes - Long Term Aspects**", Atomic Energy Control Board, Regulatory Document R-104, 1987 June 5.

2. G.W. Csullog, M.A. terHuurne, M.T. Miller, N.W. Edwards, V.R. Hulley and D. J. McCann, "**Assessing Inventories of Past Radioactive Waste Arisings at Chalk River Laboratories**", presented at the 19th Annual Conference of the Canadian Nuclear Society, 18 - 21 October 1998, Toronto, Ontario, Canada.

3. "**Management of Radioactive Waste at AECL Facilities and Sites**", Atomic Energy of Canada Limited Environmental Protection Program Manual, Element 2.5, document RC-2000-021-2.5, Rev 0, 1996 May 15.

4. G.W. Csullog, "**The Link Between Performance Assessment and Quality of Data**", Atomic Energy of Canada Limited document AECL-10182, 1990 November (presented at the 2nd International Seminar on Radioactive Waste Products, 28 May - 01 June 1990, Julich, Federal Republic of Germany).

5. "**Notice of Changes to AECL's Radioactive Waste Management Services**", WM&D memo SDTB-NWE-98-001, 1998.01.22 (available in French as "**Avis de modifications des Services de gestion des déchets radioactifs d'EACL**").

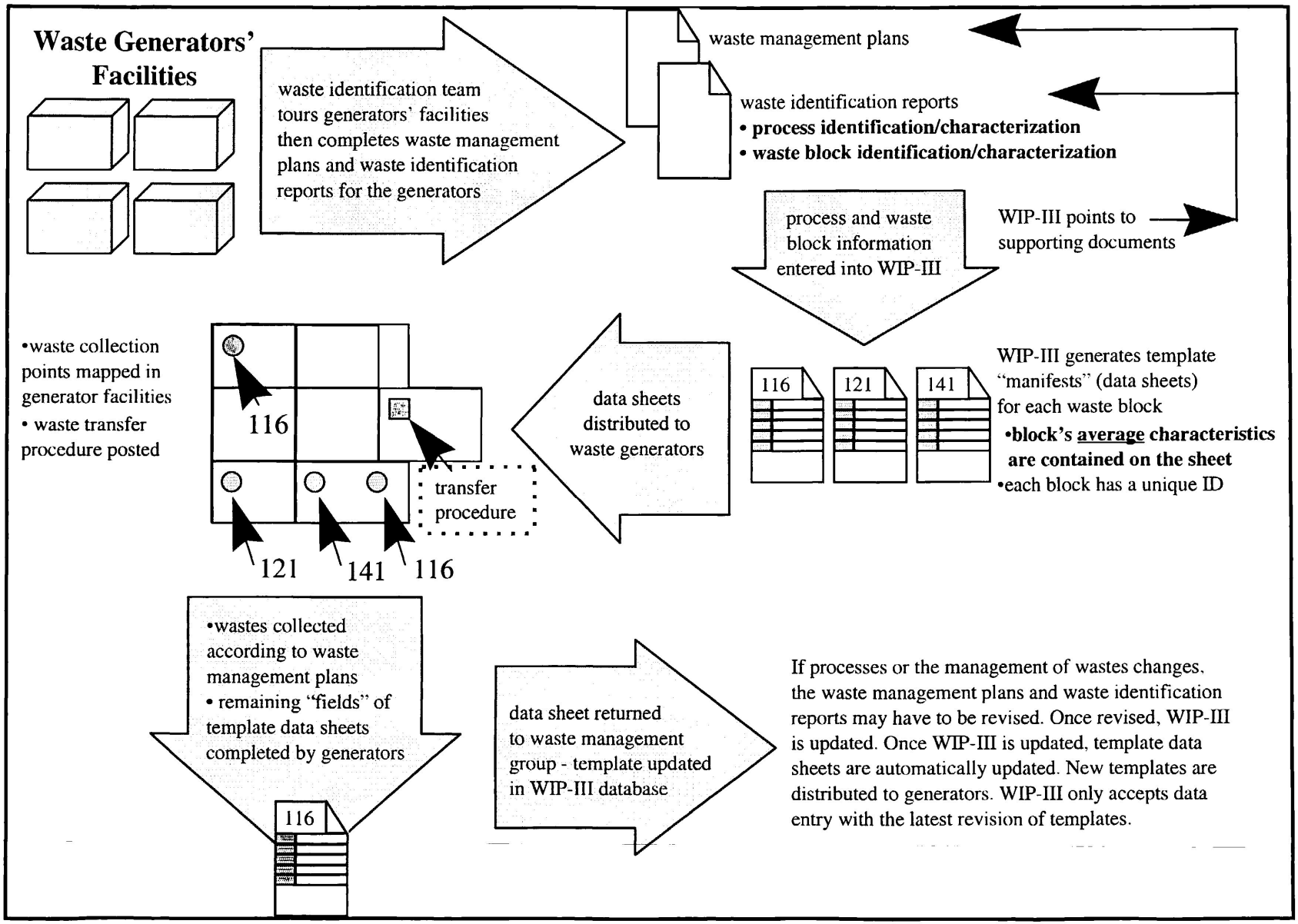

Figure 1: Schematic Overview of the AECL-CRL Waste Identification Program

WASTE BLOCK 209 COLLECTION POINT

Only the following items are to be placed into waste block 209

fuel & fine reactor component debris from cells 1, 2 and 3 (from cutting and destructive exam), fuel and reactor component samples from cells 4-7, fine and coarse filters from the active drain system, sludge from the active drain system

Note: the above list shall conform to the waste management plan that applies to this waste block

CAUTION

Do not place any of the following items into waste block 209

coarse reactor component debris "free" of fuel (Note that the fine reactor component debris listed for block 209 is finely divided from cutting operations and is mixed with fuel debris. Coarse reactor component debris is covered by waste block 201)

Note: the above list shall conform to the waste management plan that applies to this waste block

Figure 2: Sample Waste Block Collection Point Sign

Procedures for Transferring Radioactive Wastes from Production Services' Facilities in Buildings 225, 225A and 229 to the CRL Waste Receiver

Background Information

Both routine and non-routine wastes may be accepted by the group responsible for waste management at CRL. Routine wastes are those identified by the following Production Services waste management plans:

- WM&D-WMO-90430-WPN-BC225-1 (current revision)
- WM&D-WMO-90430-WPN-BC225A-1 (current revision)
- WM&D-WMO-90430-WPN-BC229-1 (current revision)

Routine wastes are:

- identified as "blocks" by the waste receiver,
- assigned a block number by the waste receiver, and
- assigned a customized waste data sheet (template), which contains the block number.

Any waste not identified by the waste management plans listed above is considered a non-routine waste.

Procedures

1. Routine Waste Blocks

1.1 Marking Routine Wastes with the Block Numbers from Their Assigned Templates

1.1.1 **Prior to collecting** a routine waste block in the package that is specified on its assigned template, the package shall be labelled with the waste block number that is specified on its assigned template, except as specified in paragraphs 1.1.1.2 and 1.1.1.3, below.

1.1.1.1 For example, if waste block 101 is collected in the Mo cell in a 5 gallon can, the 5 gallon can shall be labelled "block 101" prior to placing it into the cell.

1.1.1.2 For cases where a package is not used to collect the waste, for example HEPA filters, the item that will become the waste shall be labelled with the block number that is specified on its assigned template.

1.1.1.3 For cases where a routine waste block is collected in trash cans lined with plastic bags, BOTH the plastic bag that lines the can and the trash can shall be labelled with the block number that is on the waste block's assigned template.

Figure 3: Sample Waste Transfer Procedure (posted in generator's facility)

AECL - On-Site Data Sheet

Waste Generator Information

Building Number	234
Branch Number	0500
Work Order	
Representative Name and Phone	Ed Plaice 4323

Special Instructions

For 15gal. change pkg type, vol (0.1 m3) & waste class (630)

Waste includes rags, mops, wipes from Co process, fuel unloading, bundle disassembly, LWR fuel cutting, PT machining & hydriding, equip from hydriding, IX disposal (all cells)

Singles	Ranges *	
		to
		to
		to
		to

Attach separate page listing Package IDs if more packages with same characteristics | Total no. of packages

General Information NOTE: enter Activity, Volume and Weight for a single package or the average activity, Volume and Weight for multiple packages. Do NOT enter the totals for multiple packages.

Package Type	CAN	5 GALLON	Overpack ID
Waste Material	CELL WASTE	SECONDARY	
Solidifying Agent	NONE	Reg 347 Hazard	NOT ASSESSED
Volume(m**3)	0.037	Weight(kg)	7.2
Waste Type	HOT CELL		
Package Radiation	Contact: _____ mR/hr	@1m: _____ mR/hr	
	Date: _____	Surveyor Signature: _____	
Additional Remarks			
Gain/Loss or Transfer Number			

WMO use only:

QFS Stamp	Waste Class Location	Waste Class Billing	Suggested or Actual Location						
			Area	Facility Type	Facility Unit	Facility Sub-Unit	X	Y	Z
	530	530							

Package(s) received? ☐ yes ☐ no Date received

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Figure 4A: Example of a Template Data Sheet (front of page)

AECL - On-Site Data Sheet

Template ID: 112 | Revision: 1

Listing of Contaminants

Contaminants identified in Waste Identification Program:

Type	Contaminant	Average Qty	Type	Contaminant	Average Qty
Long Lived Nuclide	AG-108M	Suspect	*Long Lived Nuclide*	AM-241	1.17E+07 Bq
Long Lived Nuclide	AM-242M	Suspect	*Long Lived Nuclide*	AM-243	Suspe
Long Lived Nuclide	AR-39	Suspect	*Long Lived Nuclide*	C-14	7.86E+07 Bq
Long Lived Nuclide	CA-41	Suspect	*Long Lived Nuclide*	CD-109	6.19E+03 Bq
Long Lived Nuclide	CD-113M	Suspect	*Long Lived Nuclide*	CL-36	4.47E+03 Bq
Long Lived Nuclide	CM-243	6.68E+05 Bq	*Long Lived Nuclide*	CM-244	6.32E+06 Bq
Long Lived Nuclide	CM-245	Suspect	*Long Lived Nuclide*	CM-246	Suspe
Long Lived Nuclide	CO-60	1.40E+12 Bq	*Long Lived Nuclide*	CS-134	4.37E-09 Bq
Long Lived Nuclide	CS-135	1.35E+01 Bq	*Long Lived Nuclide*	CS-137	3.99E+09 Bq
Long Lived Nuclide	EU-152	Suspect	*Long Lived Nuclide*	EU-154	3.77E+08 Bq
Long Lived Nuclide	EU-155	2.20E+08 Bq	*Long Lived Nuclide*	FE-55	8.07E+08 Bq
Long Lived Nuclide	H-3	1.33E+08 Bq	*Long Lived Nuclide*	HO-166M	Suspe
Long Lived Nuclide	I-129	1.24E+03 Bq	*Long Lived Nuclide*	KR-85	3.47E-08 Bq
Long Lived Nuclide	MO-93	2.21E+03 Bq	*Long Lived Nuclide*	NB-93M	2.09E+04 Bq
Long Lived Nuclide	NB-94	5.47E+08 Bq	*Long Lived Nuclide*	NI-59	5.85E+06 Bq
Long Lived Nuclide	NI-63	1.32E+09 Bq	*Long Lived Nuclide*	NP-237	1.22E+04 Bq
Long Lived Nuclide	PD-107	4.77E+03 Bq	*Long Lived Nuclide*	PM-147	Suspe
Long Lived Nuclide	PU-236	Suspect	*Long Lived Nuclide*	PU-238	9.20E+06 Bq
Long Lived Nuclide	PU-239	1.23E+07 Bq	*Long Lived Nuclide*	PU-240	2.06E+07 Bq
Long Lived Nuclide	PU-241	4.70E+09 Bq	*Long Lived Nuclide*	PU-242	6.88E+04 Bq
Long Lived Nuclide	RU-106	1.15E+10 Bq	*Long Lived Nuclide*	SB-125	6.48E+08 Bq
Long Lived Nuclide	SE-79	1.60E+04 Bq	*Long Lived Nuclide*	SM-151	1.40E+07 Bq
Long Lived Nuclide	SN-121M	Suspect	*Long Lived Nuclide*	SN-126	3.04E+04 Bq
Long Lived Nuclide	SR-90	2.80E+09 Bq	*Long Lived Nuclide*	TB-157	Suspe
Long Lived Nuclide	TC-99	5.20E+05 Bq	*Long Lived Nuclide*	TH-228	Suspe
Long Lived Nuclide	TH-230	1.30E+00 Bq	*Long Lived Nuclide*	U-232	Suspe
Long Lived Nuclide	U-234	4.42E+04 Bq	*Long Lived Nuclide*	U-235	6.74E+02 Bq
Long Lived Nuclide	U-236	1.00E+04 Bq	*Long Lived Nuclide*	U-238	1.24E+04 Bq
Long Lived Nuclide	ZR-93	2.16E+05 Bq	*Short Lived Nuclide*	CM-242	Suspe
Toxic Substance	ALUMINUM	5.94E-03 grams	*Toxic Substance*	CHROMIUM	8.82E-03 gra
Toxic Substance	COBALT	8.17E-04 grams	*Toxic Substance*	NICKEL	3.63E-03 gra

Contaminants in the table above are reported in concentration units. Bq/m3 for nuclides, kPa for pressurized gases, and g/kg for other contaminants. Total quantities (Bq or g) will be calculated based on the volume and mass of waste.

Other Contaminants:

Note that all long-lived nuclides, short-lived nuclides, chelating agents, toxic substances, and pressurized gases MUST be reported if contained in the waste package.

Type	Contaminant	Actual Quantity	Measure Unit	Suspect
				OR ☐
				OR ☐
				OR ☐
				OR ☐
				OR ☐

Contaminants in the table above are reported as the amount contained per package (Bq, grams, or kPa).

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Figure 4B: Example of a Template Data Sheet (back of page)

Generator	Task 1	2	3	4	5	6	7	8
B375 (FM Hot Cells)	☺	☺	☺	☺	☺	☺	☺	☺
B375 (M&M Hot Cell)	☺	☺	☺	☺	☺	☺	☺	☺
B375 (RFFL)	☺	☺	☺	☺	☺	☺	☺	☺
B225/225A/229 (Mo/Xe/FISST)	☺	☺	☺	☺	☺	☺	☺	☺
B234 (UC Hot Cells)	☺	☺	☺	☺	☺	☺	☺	☺
NRU	☒	☒	☒	☒	☒	☒	☒	☒
B524 (Biological Research Facility)	☺	☺	☺	☺	☺	☺	☺	☺
B107 (Plutonium Chemistry Lab)	☺	☺	☺	☺	☺	☺	☺	☺
B145 (M&M Labs)	☺	☺	☺	☺	☺	☺	☺	☺
B320&B330 (Fuel Safety Branch Labs)	☺	❖	☒	☒	☒	☺	☒	☒
B215 (CECEUD)	☺	☺	❖	☒	☒	❖	☒	☒

Task No.	Task Description
1	receive input information from waste generator's representative
2	complete waste identification (WI) report using input information
3	create template waste data sheets for waste blocks identified / characterized by WI report
4	create standard procedure to transfer waste from generator to AECL receiver
5	create waste collection point signs for each waste block identified
6	complete waste management plan
7	make WI program presentation to generator's staff
8	post waste collection point signs and collect waste per waste management plan and WI report

☺ = completed

❖ = near completion or significant progress made

☒ = not started or minimal progress made

Figure 5: Current Status of WI Program Implementation for CRL Radwaste Generators (July 1998)

Generator	Task 1	2	3	4	5	6	7	8
NRC - Institute for Biol. Science	☺	☺	☺	☺	☺	☺	☺	☺
Red Cross - Alta Vista Road	☺	☺	☺	☺	☺	☺	☺	☺
Red Cross - Plymouth Road	☺	☺	☺	☺	☺	☺	☺	☺
Canadian Food Inspection Agency	☺	❖	❖	❖	❖	❖	☒	☒
Carleton University (NOREMTECH)	☺	☺	☺	☺	☺	☺	☒	☒
MDS Nordion (Mo-99 purification)	☺	❖	☒	☒	☒	☒	☒	☒
Health Canada (DFF)	☒	☒	☒	☒	☒	☒	☒	☒
Agriculture Canada	☒	☒	☒	☒	☒	☒	☒	☒

Task No.	Task Description
1	receive input information from waste generator's representative
2	complete waste identification (WI) report using input information
3	create template waste data sheets for waste blocks identified / characterized by WI report
4	create standard procedure to transfer waste from generator to AECL receiver
5	create waste collection point signs for each waste block identified
6	complete waste management plan
7	make WI program presentation to generator's staff
8	post waste collection point signs and collect waste per waste management plan and WI report

☺ = completed

❖ = near completion or significant progress made

☒ = not started or minimal progress made

Figure 6: Current Status of WI Program Implementation for Ottawa Radwaste Generators (July 1998)