UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
801 WARRENVILLE ROAD
LISLE, ILLINOIS 60532-4351

March 31, 2000

Chief, Division of Low-Level
Radioactive Waste Management
Illinois Department of Nuclear Safety
Office of Environmental Safety
1035 Outer Park Drive
Springfield, IL 62704

SUBJECT: LOW-LEVEL RADIOACTIVE WASTE (LLRW) GENERATOR ANNUAL SURVEY

Dear Sir:

In accordance with your request, our office has completed your 1999 LLRW Generator's Annual Survey (Enclosure). At this time I would like to remind your office that NRC Region III is a fee exempt organization.

If you have any questions regarding the survey or related matters, please contact Gene Bonano at (630) 829-9826 or 9880.

Sincerely,

Bruce L. Jorgensen, Chief
Decommissioning Branch

Enclosure: As stated

bcc w/o encl: C. Pederson, RIII

**STATE OF ILLINOIS**
**Generators' Annual Survey**
**1999**

## PART I

FACILITY INFORMATION

1. LLRW Registration number: 1. OWT - |_|_|_|_|

2. Check the label at right for facility name, address, and contact person and make corrections below. Enter the phone number of the contact person at g.

OWT-7207
Mr. Bruce Jorgensen,
DNMS Decommissioning Branch Chief
US NRC, Region III
801 Warrenville Road
Lisle, IL 60532

|_____|

a. Name of organization: a. _____

b. Name of facility: b. _____

c. Street address: c. _____

d. City, State, Zip Code: d. _____

e. Contact person: e. _____

f. Title: f. _____

g. Phone: g. (630) 829-9615

3. County: 3. DuPage

4. Principal officer: 4. James E. Dyer

5. Title: 5. Regional Administrator

6. Name of person completing report: 6. Gene Bonand

7. Phone: 7. (630) 829-9826/9880

8. Date of report: 8. 3-28-00

## Part II (cont.)

| Type of LLRW | Stored for decay to background | Stored on-site for future disposal | Shipped directly to disposal site | Transferred to broker or processor | Combined with other waste for shipment[1] | Other[2] (describe) |
|---|---|---|---|---|---|---|
| | | | | | | |
| 35. Glassware | | | | | | |
| 36. Sealed Source or Device* | | Check SOURCES | | | SOIL, Filter PAPER | |
| 37. Paint or Plating | | | | | | |
| 38. Evaporator Bottoms/ Sludges/Concentrates | | | | | | |
| 39. Compacted Trash | | | | | | |
| 40. Uncompacted Trash | | | | | | |
| 41. Animal Carcass | | | | | | |
| 42. Biological Material | | | | | | |
| 43. Activated Material | | | | | | |
| 44. Medical Generators | | | | | | |
| 59. Other (describe) _____ _____ | | | | | | |
| | | | | | | |

*Do *not* include sealed sources returned to the manufacturer or supplier.

1. Specify the combined waste types.
2. Provide the management practices, such as incineration, disposal down a sanitary drain, return to manufacturer or supplier, ect.

## PART IV

ON-SITE WASTE MANAGEMENT

1. Did you store LLRW on-site for decay to background during 1999? (Do *not* include sealed sources stored for future return to manufacturer or supplier.)

   X NO

   ____ YES–Complete TABLE 1 (page 13) for such waste.

**NOTE:** If you **only** store waste for decay to background levels, you are only required to complete Table 1. If you **only** dispose of waste through the sanitary drain, you do not need to complete the rest of this form.

2. Did you store LLRW on-site that was in a form suitable for disposal in 1999 for future disposal? (Do not include LLRW stored for decay to background, mixed waste, or waste awaiting further on-site processing.) Do include specific waste as defined in 32 Ill. Adm. Code 340.1050

   ____ NO

   X YES–Complete a, b, and TABLE 2 (page 14).

   a) Enter the volume of LLRW placed in storage during the period of 01/01/99 through 12/31/99 **only**: 2a. 3 cu.ft.

   b) Enter the total volume (awaiting disposal) presently in storage as of 12/31/99: 2b. 18.6 cu.ft.

3. Do you plan to generated LLRW at anytime during 2000 through 2006 that will require disposal at some time in the future? (Include specific waste, such as scintillation fluids, as defined in 32 Ill. Adm. Cope 340.1050.)

   ____ NO

   X YES–Complete TABLE 3 (page 15) for such waste.

4. Will you need a Tracking System Permit Application to dispose of any LLRW at any time during 2000? (If you already have a Tracking System Permit, you do not need to re-apply.)

   ____ NO

   X YES–Complete Tracking System Permit Application form (page 12).

## PART V

MIXED WASTE

1. Are you presently storing mixed wastes (see Appendix VI for definitions)? (Do *not* include specific waste, such as scintillation fluids, as defined in 32 Ill. Adm. Code 340.1050.)

   X NO

   ____ YES–Complete TABLE 4 (page 16) and the remainder of this question.

   Enter the volume of mixed waste that was placed in storage during 1999 **only**.

   ____cu.ft. N/A

   Enter the total volume of mixed waste presently in storage as of 12/31/99.

   ____cu.ft. N/A

2. What testing methods do you use to determine that your LLRW is mixed waste?

   N/A

3. Do you plan to produce or possess mixed waste during 2000 through 2006 that will require on-site storage for future treatment or shipment for disposal at some time in the future? (Include specific waste, such as scintillation fluids, as defined in 32 Ill. Adm. Code 340.1050.)

   X NO

   ____ YES–Complete TABLE 5 (page 17) for such mixed waste.

4. Did your facility ship mixed waste for treatment, storage, and/or disposal during 1999?

   X NO

   ____ YES–Complete the remainder of this question.

   a) List the total volume of mixed waste shipped for treatment, storage, and/or disposal during 1999. (Include specific waste, such as scintillation fluids, as defined in 32 Ill. Adm. Code 340.1050.) This waste also must be included on Tables 6 & 7 (pages 18 thru 20) and/or 8 & 9 (pages 21 thru 23).

      ____cu.ft. N/A

## PART VI

OFF-SITE WASTE MANAGEMENT

1. Did you ship LLRW directly to a LLRW disposal facility during 1999?

   X NO
   ____ YES–Complete TABLES 6 (page 18) and 7 (pages 19-20) for the waste.

2. Did you transfer LLRW to a waste processor or broker for treatment and/or disposal during at a LLRW disposal facility during 1999? (Include specific waste, such as scintillation fluids, as defined in 32 Ill. Adm. Code 340.1050.)

   X NO
   ____ YES–Complete TABLE 8 (page 21) and 9 (pages 22-23) for the waste.

3. Did you ship LLRW containing naturally-occurring or accelerator-produced radioactive material (NARM) for disposal either directly or via a broker/processor during 1999?

   X NO
   ____ YES _____ cu.ft.

4. Did you ship LLRW containing special nuclear material for disposal either directly or via a broker/processor during 1999?

   X NO
   ____ YES _____ cu.ft.

5. Did you ship LLRW containing source material for disposal either directly or via a broker/processor during 1999? (Do *not* include sealed sources.)

   X NO
   ____ YES _____ cu.ft.

6. Did you ship LLRW containing transuranic radionuclides in concentrations ≤100 nanocuries per gram either directly or via a broker/processor in 1999?

   X NO
   ____ YES _____ cu.ft.

7. Did you ship LLRW containing chelating agents in concentrations exceeding 0.1% by weight for disposal either directly or via a broker/processor during 1999?

   X NO

_____ YES _____ cu.ft.

Type of Chelating Agent–_____

Percent by weight–_____

8. Did you dispose of LLRW for any other person, company, or entity in 1999?

X NO

_____ YES–Provide the name and address below.

Name of

Person/Company/Entity:_____

Address:_____

City:_____ State:_____ Zip:_____

Telephone:(_____)_____

9. Other off-site waste management practices: (describe)

_____

_____

TABLE 2: Waste Stored On-Site During 1999 for Future Disposal

Provide the waste type, the volume in cubic feet, and the associated prominent radionuclide(s) for each type of LLRW generated in Illinois that was stored on-site for future disposal in a form suitable for final disposal at any given time during 1999. See Appendix I for waste type codes. All waste types on Table 2 also must be listed in Part II. Attach additional sheets as necessary.

| TABLE 2: Waste Stored On-Site During 1999 for Future Disposal | | | | | | | |
|---|---|---|---|---|---|---|---|
| Waste Type | Volume (cu.ft.) | Activity (mCi) | Waste Class | Treatment Code | Primary Radionuclide(s) | | |
| Soil | 10.5 | * | A | N/A | DU | Th-232<br>Th-228<br>Ra-226 | U-234<br>U-235<br>U-238 |
| Filter Paper | 0.1 | * | A | N/A | Cs-137<br>Co-60 | | |
| Check Sources Source Set (Sealed Sources) | 2.0 | * | A | N/A | Fission Products | | |
| | | | | | | | |
| | | | | | | | |
| Total Volume: | 12.6 | | | | | | |

**Instructions:**

* Pending completion of inventory...

**Waste Type** - Enter the appropriate waste type code in this column. Appendix I contains a list of codes describing various waste types.

**Volume** - Enter the volume in cubic feet for each type of waste that was in a form suitable for disposal (after treatment).

**Activity** - Enter the total activity content in millicuries for each of the waste types listed.

**Waste Class** - The State of Illinois' requirements, as reflected in 32 Ill. Adm. Code 340.1052, determine waste classification as A, B, or C. Refer to Appendix V to determine waste classification and enter the appropriate classification of the waste in this column.

**Treatment Code** - Enter the appropriate code in this column. Include only for waste stored on-site for future disposal. Appendix II contains a list of codes describing various waste treatment.

**Radionuclides** - List the radionuclides present in the waste for each type of waste stored on-site for future disposal.

TABLE 3: LLRW Generation Projections (2000-2006)

Enter the estimated volume in cubic feet and radioactivity content in millicuries of waste in each class projected to be generated in Illinois during 2000 through 2006 that will require disposal at some time in the future. Waste classification as A, B, or C is determined by the state of Illinois' requirements, as reflected in 32 Ill. Adm. Code 340.1052 (see Appendix V). Include specific waste, such as scintillation fluids, as defined in 32 Ill. Adm. Code 340.1050.

| TABLE 3: LLRW Generation Projections | | | | | | |
|---|---|---|---|---|---|---|
| Year | Class A | | Class B | | Class C | |
| | Volume (cu.ft.) | Activity (mCi) | Volume (cu.ft.) | Activity (mCi) | Volume (cu.ft.) | Activity (mCi) |
| 2000 | 2 | 0.3 | | | | |
| 2001 | 2 | 0.3 | | | | |
| 2002 | 2 | 0.3 | | | | |
| 2003 | 2 | 0.3 | | | | |
| 2004 | 2 | 0.3 | | | | |
| 2005 | 2 | 0.3 | | | | |
| 2006 | 2 | 0.3 | | | | |

**Instructions :**

**Volume** - Enter the volume of waste anticipated to be generated for disposal either directly or via a broker/processor during each year from 2000 through 2006.

**Activity** - Enter the activity content in millicuries of waste anticipated to be shipped for disposal during each year from 2000-2006.

**RETURN ENTIRE REPORT TO:**

**Chief, Division of Low-Level Radioactive Waste Management**
**Illinois Department of Nuclear Safety**
**Office of Environmental Safety**
**1035 Outer Park Drive**
**Springfield, Illinois 62704**

**COMMENTS:**

We have one 55 g. drum nearly full with soil samples, dry (filter paper) smears, check sources, and source sets for disposal this year or next.

Table 2: * Will notify you with total activity per waste type upon completion of inventory.
Page 14

# ILLINOIS DEPARTMENT OF NUCLEAR SAFETY
# TRACKING SYSTEM PERMIT APPLICATION FORM

**Facility Information :**

Facility Name: USNRC Region III
Address: 801 Warrenville Rd.
City, State, Zip: Lisle, IL. 60532
Phone Number: (630) 829-9826/9880
Contact Name: Gene Bonano
Contact Number: (630) 829-9826/9880

**License Information :**

License Number: N/A
Licensing Agency: N/A

**Final Waste Disposition :**

Is your facility licensed to receive back its own waste? Yes [X] No [ ]

Is your facility permitted to use a disposal facility? Yes [X] No [ ]

If yes: Disposal Facility: _____

Site Permit Number: _____

Other Disposition Arrangement/Facility: _____

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I hereby certify that the above information is correct and complete. Further I hereby certify that radioactive material will not be treated, stored or disposed of in Illinois in violation of any provisions of the Compact Enforcement Act. I further agree to allow the Illinois Department of Nuclear Safety to inspect shipments at times and locations determined to be convenient by the Department.

Name/Title: _____

Signature: _____ Date: _____

Completed Applications shall be sent to:

**Chief, Division of Low-Level Radioactive Waste Management**
**Illinois Department of Nuclear Safety**
**1035 Outer Park Drive**
**Springfield, IL 62704**

The Department of Nuclear Safety is requesting disclosure of information that is required to accomplish the statutory provisions as outlined in the Illinois Low-Level Radioactive Waste Management Act, 420 ILCS 20/9, as amended. Failure to provide this relevant information will result in the rejection of the permit application by issuing authority. Shipping waste without this required permit may subject the offender to criminal and/or civil penalties per 45 ILCS 141/30, and 32 Ill. Admin. Code 609-80.

**Do Not Write Below This Line**

Approval By: _____ Entered By: _____ Application Type: Initial [ ]

Yes No Date: _____ Date: _____ Renewal [ ]

[ ] [ ] Facility Classification: _____ Permit Number: _____

STATE OF ILLINOIS
# DEPARTMENT OF NUCLEAR SAFETY
1035 OUTER PARK DRIVE • SPRINGFIELD, ILLINOIS 62704
217-785-9900 • 217-782-6133 (TDD)

George H. Ryan
Governor

Thomas W. Ortciger
Director

January 7, 1999

Dear LLRW Generator:

The Illinois Low-Level Radioactive Waste Management Act (420 ILCS 20/4) requires all generators and brokers of low-level radioactive waste in Illinois to file an annual survey form with the Department of Nuclear Safety. These requirements have been implemented by the Department in 32 Illinois Administrative Code ch. II, Part 620.20. Enclosed with this letter is the form required for your facility to file its 1999 annual survey. This survey must be returned to the Department no later than **March 1, 2000**.

Thank you for your cooperation. If you have any questions, please call Vera Small in the Office of Environmental Safety at 217/524-6309.

Sincerely,

Michael E. Klebe, Chief
Division of Low-Level Radioactive
Waste Management

Enclosure

**STATE OF ILLINOIS**
**Generators' Annual Survey**
**1999**

## GENERAL INSTRUCTIONS

### Survey Completion

1. The survey for calendar year 1999 must be completed and submitted no later than **February 1, 2000** as required by 32 Ill. Admin. Code 620.30.

2. All quantitative data entered on the survey form must include data for the entire calendar year, unless otherwise specified.

   **Enter all volume data in cubic feet.**

   For purposes of this survey, one 55-gallon drum is equal to 7.5 cubic feet, one 30-gallon drum is equal to 4.0 cubic feet, and one 83-gallon drum is equal to 11.6 cubic feet.

   **Enter all activity data in millicuries.**

3. Complete only those questions and tables that are applicable to your facility.
   If your facility only stores LLRW for decay to background, only Parts I-IV and Table 1 need to be completed. If your facility only does in-vitro testing, then Parts I-IV must be completed.

4. Be sure to mark all YES and NO choices clearly with an "X" or check mark.

5. Complete the appropriate table(s) as directed.

6. If any response exceeds the space available for it in the survey or its tables, type or print the response on a separate sheet and attach it to the survey. Explanatory notes on attachments are welcome. The survey form or any of its pages or attachments may be reproduced.

7. Retain these instructions and a copy of your completed survey and attachments in the office of the contact person identified in Part I of the survey.

8. Return the completed survey and attachments to:

**Chief, Division of Low-Level Radioactive Waste Management**
**Illinois Department of Nuclear Safety**
**Office of Environmental Safety**
**1035 Outer Park Drive**
**Springfield, Illinois 62704**

**If you require assistance, call Vera Small at 217-524-6309.**

**Additional Information**

1. Appendix I contains a list of waste type descriptions and codes used to complete Part IV Section 4C and Tables 1, 2, 7, and 9.

2. Appendix II contains a list of treatment method descriptions and codes used to complete Part IV Section 4C and Tables 2, 7, and 9.

3. Appendix III contains a list of IDNS mixed waste type descriptions and codes, and general RCRA hazardous waste type codes used to complete Tables 4 and 5.

4. Appendix IV contains the container codes necessary to complete Table 7.

5. Appendix V contains a copy of the State of Illinois requirements, as reflected in 32 Illinois Administrative Code 340.1052, which determines waste classification as A, B, C, or greater than class C, and 340.1050 which provides information regarding the disposal of specific wastes used to complete Tables 2, 3, 4, 5, 6, 7, 8, and 9.

6. Appendix VI contains the glossary of terms.

# APPENDICES

## APPENDIX I: List of Waste Types

| CODE | WASTE TYPE |
|---|---|
| 20. | Charcoal |
| 21. | Incinerator Ash |
| 22. | Soil |
| 23. | Gas |
| 24. | Oil |
| 25. | Aqueous Liquid |
| 26. | Filter Media |
| 27 | Mechanical Filter |
| 28. | EPA or State Hazardous |
| 29. | Demolition Rubble |
| 30. | Cation Ion-exchange Media |
| 31. | Anion Ion-exchange Media |
| 32. | Mixed Bed Ion-exchange Media |
| 33. | Contaminated Equipment |
| 34. | Organic Liquid (except oil) |
| 35. | Glassware or Labware |
| 36. | Sealed Source/Device |
| 37. | Paint or Plating |
| 38. | Evaporator Bottoms/Sludges/Concentrates |
| 39. | Compacted Trash |
| 40. | Uncompacted Trash |
| 41. | Animal Carcass |
| 42. | Biological Material (except animal carcass) |
| 43. | Activated Material |
| 44. | Medical Generators |
| 59. | Other |

## APPENDIX II: Treatment Methods

| CODE | TREATMENT METHOD |
|---|---|
| 1. | Sorption* |
| | a.) Speedi Dry |
| | b.) Celetom |
| | c.) Floor Dry/Superfine |
| | d.) Hi Dri |
| | e.) Safe T Sorab |
| | f.) Safe N Dri |
| | g.) Florco |
| | h.) Florco X |
| | I.) Solid A Sorb |
| | j.) Chemcil 30 |
| | k.) Chemcil 50 |
| | l.) Chemcil 3030 |
| | n.) Dicaperl HP200 |
| | n.) Dicaperl HP500 |
| | o.) Petroset |
| | p.) Petrocset II |
| | q.) Aquaset |
| | r.) Aquaset II |
| | s.) Other |
| 2. | Chemical Extraction |
| 3. | Dewatering |
| 4. | Evaporation |
| 5. | Filtration |
| 6. | Incineration |
| 7. | Ion-exchange |
| 8. | Solidification* |
| | t.) Cement |
| | u.) Concrete (encapsulation) |
| | v.) Bitumen |
| | w.) Vinyl Chloride |
| | x.) Vinyl Ester Styrene |
| 9. | Washing |
| 10. | Abrasive Cleaning |
| 11. | High-pressure water |
| 12. | Electropolishing |
| 13. | Supercompaction |
| 14. | Standard Compaction |
| 15. | Baling/Shredding |
| 99. | Other: (describe)_____ |

*Specify a, b, c, etc. (e.g., 8v = bitumen solidification)

## APPENDIX III: Mixed Waste Types/RCRA Hazardous Waste Codes

| IDNS CODE CODES | WASTE TYPE | RCRA |
|---|---|---|
| 1 | Lead* | |
| | a) activated lead | D008 |
| | b) contaminated lead | D008 |
| | c) lead containers (pigs) | D008 |
| 2 | Chromium * | D007 |
| | a) corrosion-inhibiting chromates | D007 |
| | b) incidental corrosion products | D007 |
| | c) Cr-51 carrier | ** |
| 3 | Metals* | |
| | a) mercury | D009 |
| | b) cadmium | D006 |
| | c) barium | D005 |
| | d) silver | D011 |
| | e) arsenic | D004 |
| | f) other | ** |
| 4 | Scintillation Fluids* | |
| | a) benzene | F005 |
| | b) dioxane | D001/U108 |
| | c) toluene | F005 |
| | d) xylene | F003 |
| | e) other | ** |
| 5 | Solvents and Other Organic Fluids* | |
| | a) freon | F002 |
| | b) other | ** |
| 6 | Alkaline liquids (pH>=12.5) | D002 |
| 7 | Acidic liquids (pH<=2) | D002 |
| 99 | Other wastes not specifically listed above which are listed by the U.S. EPA in 40 CFR 261 or which exhibit at least one of the following properties: | |
| | Ignitability | D001 |
| | Corrosivity | D002 |
| | Reactivity | D003 |
| | Toxicity | D004-43 |

*Specify a, b, c, etc. (e.g., 4c = toluene scintillation fluid)

**No waste code provided in this survey. If available, use the RCRA code.

## APPENDIX IV: Container Description Codes

| CODE | CONTAINER |
|---|---|
| 1. | Wooden Box or Crate |
| 2. | Metal Box |
| 3. | Plastic Drum or Pail |
| 4. | Metal Drum or Pail |
| 5. | Metal Tank or Liner |
| 6. | Concrete Tank or Liner |
| 7. | Polyethylene Tank or Liner |
| 8. | Fiberglass Tank or Liner |
| 9. | Demineralizer |
| 10. | Gas Cylinder |
| 11. | Bulk, Unpackaged Waste |
| 12. | Unpackaged Components |
| 13. | High Integrity Container |
| 19. | Other |

## APPENDIX V: Waste Classification (32 Ill. Adm. Code 340.1052) and Disposal of Specific Wastes (32 Ill. Adm. Code 340.1050)

Section 340.1052 Classification of Radioactive Waste for Land Disposal

a) Considerations. Determination of the classification of radioactive waste involves two considerations. First, consideration must be given to the concentration of lone-lived radionuclides (and their shorter-lived precursors) whose potential hazard will persist long after such precautions as institutional controls, improved waste form, and deeper disposal have ceased to be effective. These precautions delay the time when long-lived radionuclides could cause exposures. In addition, the magnitude of the potential dose is limited by the concentration and availability of the radionuclide at the time of exposure. Second, consideration must be given to the concentration of shorter-lived radionuclides for which requirements on institutional controls, waste form, and disposal methods are effective.

b) Classes of waste.

1) Class A waste is waste that is usually segregated from other waste classes at the disposal site. The physical form and characteristics of Class A waste must meet the minimum requirements set forth in Section 340.1055(a) If Class A waste also meets the stability requirements set forth in Section 340.1055(b), it is not necessary to segregate the waste for disposal.

2) Class B waste is waste that must meet more rigorous requirements on waste form to ensure stability (as defined in 32 Ill. Adm. Code 601.20) after disposal. The physical form and characteristics of Class B waste must meet both the minimum and stability requirements set forth in Section 340.1055.

3) Class C waste is waste that not only must meet more rigorous requirements on waste form to ensure stability but also requires additional measures as the disposal facility to protect against inadvertent intrusion. The physical form and characteristics of Class C waste must meet both the minimum and stability requirements set forth in Section 340.1055.

c) Classification determined by long-lived radionuclides. If the radioactive waste contains only radionuclides listed in Table 1, classification shall be determined as follows:

1) If the concentration does not exceed 0.1 times the value in Table 1, the waste is Class A.

2) If the concentration exceeds 0.1 times the value in Table 1, but does not exceed the value in Table l, the waste is Class C.

3) If the concentration exceeds the value in Table 1, the waste is not generally acceptable for land disposal.

4) For wastes containing mixtures of radionuclides listed in Table 1, the total concentration shall be determined by the sum of fractions rule described in subsection (g).

TABLE 1

| Radionuclide | Concentration curies/cubic meter |
|---|---|
| C-14 | 20,008.00 |
| C-14 in activated metal | 80.00 |
| Ni-59 in activated metal | 220.00 |
| Nb-94 in activated metal | 0.20 |
| Tc-99 | 3.00 |
| I-129 | 0.08 |
| Alpha emitting transuranic radionuclides with half-life greater than five years | 100.00* |
| Pu-241 | 3,500.00* |
| Cm-242 | 20,000.00* |
| Ra-226 | 100.00* |

*AGENCY NOTE: Units are nanocuries per gram.

d) Classification determined by short-lived radionuclides. If the waste does not contain any of the radionuclides listed in Table 1, classification shall be determined based on the concentrations shown in Table 2. However, as specified in subsection (f), if radioactive waste does not contain any nuclides listed in either Table 1 or 21, it is Class A.

1) If the concentration does not exceed the value in Column 1, the waste is Class A.

2) If the concentration exceeds the value in Column 1 but does not exceed the value in Column 2, the waste is Class B.

3) If the concentration exceeds the value in Column 2 but does not exceed the value in Column 3, the waste is Class C.

4) If the concentration exceeds the value in Column 3, the waste is not generally acceptable for near-surface disposal.

5) For wastes containing mixtures of the radionuclides listed in Table 2, the total concentration shall be determined by the sum of fractions rule described in subsection (g).

TABLE 2

| Radionuclide | Concentration curies/cubic meter | | |
|---|---|---|---|
| | Column 1 | Column 2 | Column 3 |
| Total of all radionuclides with less than 5-year half-life | 70.00 | * | * |
| H-3 | 40.00 | * | * |
| Co-60 | 700.00 | * | * |
| Ni-63 | 3.50 | 70.00 | 700.00 |
| Ni-63 in activated metal | 35.00 | 700.00 | 7000.00 |
| Sr-90 | 0.04 | 150.00 | 7000.00 |
| Cs-137 | 1.00 | 44.00 | 4600.00 |

*AGENCY NOTE: There are no limits established for these radionuclides in Class B or C wastes. Practical considerations such as the effects of external radiation and internal heat generation on transportation, handling, and disposal will limit the concentrations for these wastes. These wastes shall be Class B unless the concentrations of other radionuclides in Table 2 determine the waste to be Class C independent of these radionuclides.

e) Classification determined by both long- and short-lived radionuclides. If the radioactive waste contains a mixture of radionuclides, some of which are listed in Table 1 and some of which are listed in Table 2, classification shall be determined as follows:

1) If the concentration of a radionuclide listed in Table 1 is less than 0.1 times the value listed i in Table 1, the class shall be that determined by the concentration of radionuclides listed in Table 2.

2) If the concentration of a radionuclide listed in Table 1 exceeds 0.1 times the value listed in Table 1, but does not exceed the value in Table 1, the waste shall be Class C, provided the concentration of radionuclides listed in Table 2 does not exceed the value shown in Column 3 of Table 2.

f) Classification of wastes with radionuclides other than those listed in Tables 1 and 2. If the waste does not contain any radionuclides listed in either Table 1 or 2, it is Class A.

g) The sum of the fractions rule for mixtures of radionuclides. For determining classification for waste that contains a mixture of radionuclides, it is necessary to determine the sum of fractions by dividing each radionuclide's concentration by the appropriate limit and adding the resulting values. The appropriate limits must all be taken from the same column of the same table. The sum of the fractions for the column must be less than 1.0 if the waste class is to be determined by that column. Example: A waste contains SR-90 in a concentration of 50 curies/cubic meter and CS-137 in a concentration of 22 curies/cubic meter. Since the concentrations both exceed the values in Column 1. Table 2, they must be compared to Column 2 values. For Sr-90 fraction, 50/150 equals 0.33: for Cs-137 fraction, 22/44 equals 0.5; the sum of the fractions equals 0.83. Since the sum is less than 1.0, the waste is Class B.

h) Determination of concentrations in wastes. The concentration of a radionuclide may be determined by indirect methods such as use of scaling factors which relate the inferred concentration of one radionuclide to another that is measured, or radionuclide material accountability, if there is reasonable assurance that the indirect methods can be correlated with actual measurements. The concentration of a radionuclide may be averaged over the volume of the waste, or weight of the waste if the units are expressed as nanocuries per gram.

Section 340.1050 Disposal of Specific Wastes

a) A licensee may dispose of the following licensed material as if it were not radioactive:

1) 1.85 kBq (0.05 uCi), or less, of hydrogen-3, carbon-14, or iodine-125 per gram of medium used for scintillation counting; and

2) 1.85 kBq (0.05 uCi), or less, of hydrogen-3, carbon-14, or iodine-125 per gram of animal tissue, averaged over the weight of the entire animal.

b) A licensee shall not dispose of tissue pursuant to subsection (a)(2) above in a manner that would permit its use either as food for humans or as animal feed.

c) The licensee shall maintain records in accordance with Section 340.1180.

## APPENDIX VI: Glossary of Terms

**Abrasive cleaning:** The use of abrasive substances to remove contamination from the surface of an object. Such abrasives may include sand or grit used in scouring and sand used in sandblasting.

**Absorption:** Any process in which a liquid is held in the interstices of an absorbent material, such as water being held in a sponge.

**Absorbent materials:** Absorbent materials such as diatomaceous earth or vermiculite are currently added to several institutional waste streams to minimize potential transportation impacts. These streams include liquid scintillation vial(LSV) waste, absorbed liquid waste, and biowaste. Existing commercial disposal facility operators require that these wastes be packaged with specified proportions of waste to absorbent material before they are accepted for disposal. For example, LSV waste is required to be packaged using sufficient absorbent material to absorb twice the total volume of the liquid in the package. Lime is frequently added to the biowaste stream. Double packaging of these waste streams is also used for additional safety. For the liquid scintillation vial and the absorbed liquid waste streams, a volume increase factor of 3.0 assumed. NOTE: Absorbents such as vermiculite and diatomaceous earth are not considered to be solidification agents since they do not chemically or physically bind the wastes.

**Accelerator-produced material:** Any material made radioactive by a particle accelerator.

**Activated hardware:** Tools, instruments, equipment, and lead or lead shielding made radioactive by irradiation. Activated metals and instruments come from equipment directly associated with the reactor and spent fuel pool.

**Air filter:** Any device used to filter particles or chemicals from the air. May include ventilation exhaust filters, HEPA (high-efficiency particulate air) filters, and charcoal filters, or the media used in air filters. Such air filter media may include charcoal or cellulosic fibers.

**Aqueous liquid waste:** Waste that is dissolved in water. Water-soluble liquid scintillation fluids are included in this waste type.

**Ash:** The product of incinerating low-level radioactive waste (LLRW).

**Background radiation:** The radiation in the natural environment, including cosmic rays and radiation from naturally-occurring radioactive elements both outside and inside living organisms. Also called naturally-occurring radiation.

**Biological wastes:** The waste consists of animal carcasses, tissues, animal bedding, and excreta, as well as vegetation and culture media.

**Broker:** Any person who takes possession of LLRW for the purposes of consolidation and shipment.

**Byproduct material:** 1) Any radioactive material, except special nuclear material, yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material; 2) the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content, including discrete surface wastes resulting from underground solution extraction processes, but not including underground ore bodies depleted by such solution extraction processes. Please note that for the purposes of this survey, the second definition (2) is not considered to be LLRW.

**Cartridge filters:** Cartridge filters contain one or more disposable filter elements. These elements may be typically constructed of woven fabric, wound fabric, or pleated paper supported internally by a stainless steel basket.

**Chelating agent:** Amine polycarboxylic acids (e.g. EDTA, DTPA), hydroxy-carboxylic acids, and polycarboxylic acids (e.g., citric acid, carbolic acid, and glucinic acid) used for purposes of bonding, i.e., to stabilize radioactive materials.

**Class A waste:** Waste with the lowest concentrations of radionuclides. The physical form and characteristics of Class A waste must meet the minimum requirements set forth in 32 Ill. Adm. Code, ch. II, 340.3080(a). If Class A waste also meets the stability requirements set forth in 32 Ill. Adm. Code, ch. II 340.3080(b), it is not necessary to segregate the waste for disposal.

**Class B waste:** Waste with higher concentrations of radionuclides than Class A, Class B waste must meet more rigorous requirements on waste form to ensure stability (as defined in 32 Ill. Adm. Code, ch II, 601.20) after disposal. The physical form and characteristics of Class B waste must meet both the minimum and stability requirements set forth in 32 Ill. Adm. Code, ch. II 340.3080.

**Class C waste:** The highest concentrations of waste that is permitted for disposal as low-level radioactive waste, Class C waste not only must meet more rigorous requirements on waste form to ensure stability but also requires additional measures at the disposal facility to protect against inadvertent intrusion. The physical form and characteristics of Class C waste must meet both the minimum and stability requirements set forth in 32 Ill. Adm. Code, ch. II 340.3080.

**Compaction:** Compaction is an often-used treatment method--particularly at nuclear fuel-cycle facilities--for reducing the volume of waste streams containing compressible material such as paper, plastic, glass, wood, and light-gauge metal. Most of the volume reduction is attained by compressing the waste to reduce its void volume. The term compactor is usually applied to hydraulic or mechanical rams that compress wastes into boxes or 55-gallon steel drums. The boxes and drums are then used as disposal containers. Typical hydraulic rams generate 20,000 to 30,000 pounds of force, and are fitted with shrouds and simple air filtration systems to minimize release of airborne radioactivity.

**Concentration:** The amount of a specified substance in a unit amount of another substance. The classification system for low-level radioactive waste is based on the concentrations of long- and/or short-lived radionuclides, measured in curies per cubic meter or nanocuries per gram.

**Contaminated hardware:** Tools, instruments, equipment, and lead or lead shielding having radioactive contamination on their surfaces.

**Contaminated oils:** Lubricating or machine oil which becomes contaminated with radioactive materials.

**Contaminated Rubble, Sand, Soil:** Concrete, gravel, sand and soil, or other building rubble contaminated with radioactive materials.

**Contamination:** The introduction of radioactive material any place where it is not desired.

**Decay:** The spontaneous transformation of one nuclide into a different nuclide or into a different energy state of the same nuclide. During decay, the unstable radioactive nucleus releases energy or particles. The process results in a decrease, with time, in the number of original radioactive atoms in the sample. Also referred to as radioactive disintegration.

**Decontamination:** The removal of radioactive contaminants from surfaces or equipment, using processes such as washing, electropolishing, abrasive cleaning, or cleaning with high-pressure water.

**Depleted uranium:** The source material uranium in which the isotope uranium-235 is less than 0.711 weight percent of the total uranium present. Depleted uranium does not include special nuclear material.

**Dewatering:** The process of removing water from wet low-level radioactive wastes.

**Disposal facility:** A parcel of land or site, together with structures, equipment, and improvements on or appurtenant to the land or site, which is used or is being developed for the disposal of LLRW. "Facility" does not include lands, sites, structures, or equipment used by a generator in the generation of LLRW.

**Drums:** Commonly used to ship and dispose of low-level radioactive waste, drums are usually made of steel, and are cylindrical in shape with either sealed or removable heads.

**Dry active waste (DAW):** Waste that commonly consists of paper, cloth, plastic, rubber, tape, non-metal filter, and scrap wood. May also include scrap metal, glass, smoke detectors, electrical conduit and cable, and insulation material. DAW may be both compactible and combustible, compactible and non-combustible, non-compactible and combustible, or non-compactible and non-combustible. Also see reactor trash and institutional trash.

**Electropolishing:** Any electrochemical process in which radioactive contamination is removed from the surface of the metal.

**Evaporation:** Treating liquid wastes by heating them to vaporize the volatile components. The vaporized liquid generally contains greatly reduced quantities of dissolved fluids, suspended solids, and radioactivity relative to those found in the input waste stream. In the nuclear industry, the vaporized waste is normally condensed and collected, and then either discharges or recycled after testing to determine whether the condensate requires additional treatment. The concentrated solution (bottoms) left in the evaporator retains virtually all of the solids and radioactivity and is solidified and shipped to a disposal facility.

**Evaporator concentrates:** Concentrated liquid waste may be produced by the evaporation of a wide variety of liquid waste streams. The waste consists of liquids with elevated suspended and dissolved solids content, and also consists of sludge resulting from supersaturation during evaporation.

**Filter sludge:** Filter sludge is waste produced by precoat filters and consists of filter aid and waste solids retained by the filter aid. Diatomaceous earth, powdered mixtures of cation and anion exchange resins, and high purity cellulose fibers are common filter aids. These materials are slurried and deposited (precoated) as a tin cake on the initial filter medium (wire mesh, cloth, etc.). The filter cake removes suspended solids from liquid streams.

**Filtration:** A process of removing radioactive particles from liquid waste by filtering. Filtration media may include cellulosic fiber, diatomaceous earth, and activated carbon. In some cases, the filtered liquid can be recycled. Filtration may also be applied to the removal of contamination from air by using high-efficiency particulate air (HEPA) filters or other kinds of filters.

**Final disposal volume:** The volume of waste shipped for disposal including the container in which it was disposed.

**Gaseous waste:** Radioactive waste in a gaseous state.

**Generator:** Any person who produces or possesses LLRW in the course of or incident to manufacturing, power generation, processing, medical diagnosis and treatment, research, education, or other activity.

**Greater than Class C waste:** Waste with a concentration of radioactivity exceeding those established for Class C low-level radioactive waste, as defined in 32 Ill. Adm. Code ch. II, Part 340.3070.

**Half-life; radioactive:** For a single radioactive decay process, the time required for the activity to decrease by half its value by that process. Glossary of Nuclear Science Terms.

**Hazardous waste:** A waste or combination of wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed, and which has been identified, by characteristics or listing, as hazardous pursuant to Section 3001 of the Resource Conservation and Recovery Act of 1976, P.L. 94-580 or pursuant to regulations of the Pollution Control Board.

**High-integrity container (HIC):** A type of container that is intended to provide structural stability and containment of low-level radioactive waste for a long period of time. The design, and physical and chemical properties of the materials from which such containers are fabricated contribute to this stability. They are used for both the transportation and disposal of waste.

**High-level radioactive waste:** 1) The highly radioactive material resulting from the reprocessing of spent nuclear fuel including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and 2) the highly radioactive material that the Nuclear Regulatory Commission has determined, on the effective date of this Amendatory Act of 1988 (Illinois Low-Level Radioactive Waste Management Act, Section 3(j)), to be high-level radioactive waste requiring permanent isolation.

**High-pressure water cleaning:** A process for cleaning radioactive contamination from the surfaces of objects by spraying with a jet of water. Also see "Decontamination."

**Incineration:** Treatment of combustible waste materials by thermal oxidation. Combustion or incineration involves complete oxidation of wastes by burning in an excess of oxygen (air). Most frequently used for organic liquids, animal carcasses, and most solid institutional wastes.

**Institutional trash (DAW):** Consists almost entirely of materials that are both compactible and combustible. It generally consists of paper, rubber or plastic gloves, disposable and broken labware, and disposable syringes.

**Ion exchange:** A process for selectively removing ionic constituents from liquid waste by reversibly transferring ions between resins and the waste.

**Ion exchange media:** Ion exchange media usually consist of organic resins, which can be cation or anion resins, or a mixture of both. Inorganic zeolite ion exchange media have also been used in some cases.

**Ionizing radiation:** Includes gamma rays and x-rays, alpha and beta particles, high speed electrons, neutrons, protons, and other nuclear particles or electromagnetic radiations capable of producing ions directly or indirectly in their passage through matter; but does not include sound or radio waves, or visible, infrared or ultraviolet light.

**Isotope:** One of two or more atoms with the same atomic number (the same chemical element), but with different atomic weights. Carbon-12, carbon-13, and carbon-14 are isotopes of the element carbon, the numbers denoting the approximate atomic weights. Isotopes may be stable or radioactive.

**Limitation of articles in contaminated areas:** Unnecessary contamination of tools and other articles can be avoided by restricting the number of articles allowed to enter contaminated areas.

**Limitation of contaminated areas:** Similar to "limitation of articles in contaminated areas," a limitation on the number of areas within a facility in which radioactive materials can be used will also minimize unnecessary contamination of materials.

**Liquid filter cartridges:** Disposable or cleanable filters that are replaceable as a cartridge unit.

**Liquid filter media:** A sludge consisting of diatomaceous earth, cellulosic fiber, powdered ion exchange resin, charcoal, or activated powdered carbon.

**Liquid scintillation fluids:** Flammable organic solvents (e.g. toluene, benzene, xylene) comprise the major constituents of scintillation fluids.

**Liner:** An inner package into which LLRW is packed that is loaded into an outer shielded packaging for shipping. The liner is subsequently unloaded for burial at the waste disposal site while the outer container is cleaned and reused.

**Long-lived radionuclide:** An atom whose nucleus decays at a slow rate so that a quantity of such radionuclides will exist for an extended time.

**Low-level radioactive waste or "waste":** Radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel or byproduct material as defined in Section 11e(2) of the Atomic Energy Act of 1954, 42 U.S.C. 2014. Except when otherwise indicated in the rules, LLRW includes "mixed waste."

**Medical generators:** Separation columns that are both "hazardous waste" and "low-level radioactive waste" as defined in the Illinois Low-Level Radioactive Waste Management Act. Also see hazardous waste and low-level radioactive waste.

**Mixed waste:** Waste that contains a combination of low-level radioactive waste and hazardous materials. Hazardous components are those listed by the Environmental Protection Agency in Subpart D of 40 CFR 261, or those that exhibit any of the following four hazardous characteristics: ignitability, corrosivity, reactivity, or extraction procedure (EP) toxicity. Both radiological and chemical toxicity must be considered in its management and disposal.

**NARM:** See "Naturally-occurring or Accelerator-produced Radioactive Material."

**Natural uranium:** An element with the atomic number 92 having 14 known isotopes ranging from uranium-227 to uranium-240, the most abundant being uranium-238. Natural uranium is found in several minerals from which uranium is extracted and processed for use in research, nuclear fuels, and nuclear weapons.

**Naturally-occurring or Accelerator-produced Radioactive Material (NARM):** Radioactive NARM waste includes discrete material (small volume, high activity accelerator-produced materials, radium needles used in medicine, and drinking water filters from radium-contaminated areas) as well as diffuse material (generally lower activity radium-contaminated soil at locations where radium was used for manufacturing luminous dials and paint or where natural deposits of radium exist, or material in which radium or other naturally-occurring materials have been concentrated).

**Naturally-occurring Radioactive Material (NORM):** Radioactive material that has a natural source. See Naturally-occurring or Accelerator-produced Radioactive Material.

**Nuclide:** A species of atoms characterized by its mass number, atomic number, and nuclear energy state provided that the lifetime in that state is long enough to be observable. Nuclides may be stable or radioactive.

**Oils (contaminated):** Lubricating or machine oil contaminated with radioactive materials.

**Organic liquid:** Carbon-based compounds such as alcohols, aldehydes, ketones, and organic acids. Includes liquid scintillation media containing chemicals such as benzene, xylene, or toluene, and degreasing solvents such as carbon tetrachloride, freon, or vanadous formate. For purposes of this report, this waste type does not include oils.

**Processing:** The preparation, manipulation, or conversion of radioactive material.

**Processor:** Any person or company taking possession of LLRW for treatment.

**Radiation:** See ionizing radiation.

**Radioactive material:** Any material, solid, liquid, or gas which emits radiation spontaneously.

**Radioactivity:** The spontaneous emission of radiation, generally alpha, or beta particles and often accompanied by gamma rays, from the nucleus of an unstable nuclide. Measured in curies.

**Radioisotope:** A radioactive isotope. An unstable atom of an element that decays or disintegrates spontaneously, emitting radiation. More than natural and artificial radioisotopes have been identified.

**Radionuclide:** A radioactive species of atom having a specific mass, atomic number, and nuclear energy state.

**Radium contaminated waste:** Radium is a naturally occurring radioactive element which has been used in medical and industrial applications since the turn of the century. While there are several known isotopes of radium, the one that has the greatest utilization is radium-226, an isotope forming part of the uranium-228 decay scheme. Since it is an alkaline metal that reacts with nitrogen, in commercial use it is principally in the form of a salt.

**Reactor trash (DAW):** Trash is the most varied waste stream generated by Light Water Reactors and can contain everything from paper towels to irradiated reactor internals.

**Recycling:** The process of reusing items or materials. Recycling may include some form of treatment before the item or material can be reused for its intended purpose.

**Rubble, sand, soil (contaminated):** Concrete, gravel, sand and soil, or other building rubble contaminated with radioactive materials.

**Sealed source:** Any device containing radioactive material to be used primarily as a source of radiation which has been constructed in such a manner as to prevent the escape, under normal conditions, of any radioactive material.

**Sludge:** Wet wastes resulting from sewage or water treatment processes.

**Solidification:** Cement and synthetic polymer solidification systems are currently used by some light water reactors. Bitumen (another agent) is being actively marketed and some bitumen solidification systems (which are widely used in Europe) have been sold in this country. Polyester (another synthetic polymer) has been evaluated in laboratory and pilot plant studies using simulated light water reactor liquid wastes and may be routinely used in the future.

**Sorting of waste by radionuclide, half-life, or activity:** Keeping track of the radionuclide, curie content and the half-life of each type of waste enables generators to segregate materials according to the manner in which they must be handled and disposed.

**Source material:** Uranium or thorium, or any combination thereof, in any physical or chemical form; or ores which contain by weight one-twentieth of one percent (0.05 percent) or more of uranium; thorium; or any combination thereof. Source material does not include special nuclear material.

**Source reduction:** Those administrative practices that reduce the radionuclide levels of LLRW or that prevent the generation of additional LLRW.

**Special nuclear material in quantities not sufficient to form a critical mass:** Uranium enriched in the isotope U-235 in quantities not exceeding 350 grams of contained U-235; U-233 in quantities not exceeding 200 grams; or any combination of them, except source material.

**Specific waste:** Refers to two specific waste types that may be disposed of without regard to their radioactive component: 1) liquid scintillation fluids containing no more than 0.05 microcuries per gram of carbon-14 or hydrogen-3 (tritium); and 2) animal carcasses containing no more than 0.05 microcuries per gram of tissue of carbon-14 or tritium. These materials must still be handled in accordance with other applicable regulatory requirements.

**Stabilization:** Any process by which radioactive waste is made stable to physical, chemical, or biological degradation. Processes such as solidification, or certain packaging procedures may result in stabilization.

**Standard compaction:** Compacting material using a compactor capable of generating up to 15 tons of compressive force can produce volume reduction ratios of three or four to one when used to treat compactible waste streams. Waste streams compactible with a standard compactor include dry active waste, filter cartridges, and liquid scintillation vials.

**Storage:** Temporary holding of waste for treatment or disposal for a period determined by Department regulations.

**Storage for decay to background:** Practice of holding waste in storage for decay to background. Once at a background radiation level, as measured with an appropriate instrument, this waste could

then be deemed no longer radioactive and routine trash disposal is permitted by most regulatory agencies.

**Strippable coating:** Any removable coating layered on a surface to prevent an item or area from becoming contaminated.

**Supercompaction:** Compacting material using a compactor that can apply compressive forces approaching 100 times those achievable by standard compactors. Volume reduction ratios can approach eight to one for selected applications.

**Transferred disposal volume:** The waste-only volume of low-level radioactive waste transferred to a broker or processor for storage, treatment, or disposal.

**Transuranic:** An element with an atomic number greater than 92.

**Transuranic waste:** Waste contaminated with alpha-emitting radionuclides with atomic numbers greater than 92 and half-lives greater than 20 years in concentrations greater than 100 nanocuries per gram.

**Treatment:** Any method, technique, or process, including storage for radioactive decay, designed to change the physical, chemical, or biological characteristics or composition of any waste in order to render the waste safer for transport or management, amenable to recovery, convertible to another usable material or reduced in volume.

**Volume reduction:** Those methods including, but not limited to, biological, chemical, mechanical, and thermal methods used to reduce the amount of space that waste materials occupy and to put them into a form suitable for storage or disposal.

**Washing:** Any procedure in which tools, glassware, and other contaminated articles are washed in order to partially or completely remove radioactive contamination. Washing may involve the use of detergents or chelating agents.