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OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

NSWMA

National Solid Wastes Management Association

March 29, 2010

Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Rulemakings and Adjudications Staff

The National Solid Wastes Management Association (NSWMA) is pleased to offer the following comments on the United States Nuclear Regulatory Commission's (NRC) petition for rulemaking from the Association of State and Territorial Solid Waste Management Officials (ASTSWMO) (75 FR 1559). NSWMA is the trade association representing private sector waste management companies that collect municipal solid waste, own and operate waste transfer stations and landfills, collect and process recyclables, and collect and compost organic waste in cities and counties throughout the United States. Our industry plays an essential part in protecting America's public health and environment.

In the petition for rulemaking, ASTSWMO requested that NRC revise its regulations for new tritium exit signs to improve recognition and thus accountability for the signs. ASTSWMO suggested that:

1. The labels required by NRC should be in several locations on the sign in larger font;

2. The expiration date should be distinctly legible to a fire or building inspector without taking down the sign; and

3. The radiation trefoil should be displayed on the front and back of advertisements.

Also, ASTSWMO recommended that a national collection effort with distinct milestones and goals be undertaken to consolidate all expired and disused tritium exit signs. ASTSWMO further requested that NRC organize a meeting with all interested stakeholders to set a new path forward on this issue.

NSWMA agrees with and supports ASTSWMO's petition for rulemaking regarding the management of tritium exit signs. NSWMA believes that NRC should exercise its full regulatory authority to prevent the disposal of tritium exit signs in municipal solid waste

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landfills because these signs directly impact landfill leachate when the tritium is released.

For example, the Pennsylvania Department of Environmental Protection (PADEP) tested landfill leachate for the presence of radioactive materials at 54 landfills. Samples were only collected once in 2004 and once in 2005. PADEP's study determined that tritium concentrations in leachate ranged from non-detectable to 182,000 pico-Curies per liter (pCi/L), with a mean concentration of 22,650 pCi/L. Also, PADEP concluded that the source of the tritium was from improperly disposed of tritium exit signs.

To further evaluate the fluctuations and trends in tritium levels in landfill leachate, the Environmental Research and Education Foundation, in cooperation with the solid waste management industry and PADEP, quarterly tested the leachate at the same 54 Pennsylvania landfills for 2 years. Interim results (report attached) from six quarters of sampling in 2007 and 2008 (the final report is not due until mid-2010) showed that tritium concentrations ranged from non-detectable to 356,774 pCi/L, with a mean concentration of 30,191 pCi/L. The results of the first 6 quarters of landfill leachate tritium sampling compared to the United States Environmental Protection Agency's (EPA) maximum contaminant level (MCL) in drinking water for tritium of 20,000 pCi/L were:

- 2nd quarter 2007 - 29 of 54 (54 percent) landfills sampled had tritium concentrations exceeding the MCL;
- 3rd quarter 2007 - 29 of 54 (54 percent) landfills sampled had tritium concentrations exceeding the MCL;
- 4th quarter 2007 - 28 of 54 (52 percent) landfills sampled had tritium concentrations exceeding MCL;
- 1st quarter of 2008 - 24 of 54 (44 percent) landfills sampled had tritium concentrations exceeding the MCL; and
- 2nd quarter of 2008 - 23 of 54 (43 percent) landfills sampled had tritium concentrations exceeding the MCL.

Because tritium is not treatable by on-site leachate treatment systems or off-site publicly owned treatment works (POTW), states have developed standards for tritium other than the EPA's MCL that are typically measured at the end of the wastewater discharge pipe. For example, PADEP is using the approximate dilution available for tritium from the leachate discharge structure to the nearest downstream drinking water intake as a standard.

A more appropriate method for controlling tritium in landfill leachate would be to prevent the tritium containing exit signs from entering landfills. Therefore, NSWMA recommends that NRC develop regulations for the proper management of tritium exit

signs that minimizes their disposal in a municipal solid waste landfill. NSWMA agrees with the ASTSWMO's petition that improving the labeling on tritium exit signs will encourage the proper disposal of the signs and significantly reduce the number of signs entering landfills. Once the source of tritium is removed or minimized from the waste stream, tritium concentrations in municipal solid waste landfill leachate will steadily decrease.

However, to ensure that tritium exit signs are managed properly, additional regulatory elements may need to be adopted or existing regulations may need to be enforced. Therefore, NSWMA agrees with the petitioner that NRC should organize a meeting with all interested stakeholders to set a new path forward on this issue prior to amending the existing regulation. NSWMA and its members are ready to assist NRC as it moves forward with this matter. Thank you.

Sincerely,

Edward W. Repa

Edward W. Repa, Ph.D.
Director, Environmental Programs

Radiological Investigation Results for Pennsylvania Landfill Leachate -- 2007/2008 Tritium Update

Prepared for:

Environmental Research and Education Foundation
and
Pennsylvania Department of Environmental Protection
Bureau of Radiation Protection
and
Bureau of Waste Management
Harrisburg, Pennsylvania

Project No. 130651
November 13, 2008

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Executive Summary

During the fall of 2004, the Pennsylvania Department of Environmental Protection (PADEP) implemented a sampling and analysis plan (SAP) to investigate radioactive material potentially present in untreated landfill leachate. The investigation included all active and permitted landfills in the Commonwealth of Pennsylvania having a leachate collection system (i.e., half of the 108 solid waste landfills in the Commonwealth met this selection criterion) and a report [1]of this investigation was published in October 2005. The fall 2004 SAP results showed that tritium was the most prevalent radionuclide present in leachate (identified in 57 of the 59 samples analyzed or 97%). Results ranged from 6.86 to 94,400 pico-Curies per liter (pCi/L), with a mean concentration of 25,200 pCi/L. Prompted by these tritium results, PADEP planned to conduct a subsequent round of sampling and analysis for tritium in leachate (fall 2005 SAP) at the landfills included in the fall 2004 SAP. The fall 2005 SAP results showed that tritium was again present in nearly all of the samples (i.e., identified in 55 of the 59 samples analyzed or 93%). The tritium concentrations ranged from -62 to 181,700 pCi/L, with a mean concentration of 20,900 pCi/L. By comparison, the range of results for the fall 2004 SAP were significantly narrower (7 to 93,500 pCi/L), but with an almost identical mean concentration of 24,400 pCi/L. There were 16 (27%) samples with results above 20,000 pCi/L in the fall 2005 SAP, about half that seen in 2004 (31 samples or 53%).

The United States Environmental Protection Agency (USEPA) has set a maximum contaminant level (MCL) of 20,000 pCi/L for tritium under its drinking water standards. In order to ensure that the MCL for tritium in drinking water is not exceeded, PADEP Bureau of Radiation Protection (BRP) considers 20,000 pCi/L as an applicable or relevant and appropriate requirement (ARAR) for leachate and any point of water intake to a drinking water supply. However, none of the fall 2004 or 2005 SAP tritium results exceeded the ARAR level at the point of intake to current drinking water supplies because the treatment and discharge processes for leachate is subject to dilution factors associated with possible human exposure scenarios.

Nonetheless, the fall 2005 SAP results confirmed the existence of measurable concentrations of tritium in landfill leachate effluents and prompted PADEP to recommend further monitoring of landfill leachates for possible impact on drinking water supplies. While the exact source(s) of the observed tritium in

[1] *Radiological Investigation Results for Pennsylvania Landfill Leachate*. Pennsylvania Department of Environmental Protection, Bureau of Radiation Protection and Bureau of Waste Management, Harrisburg, Pennsylvania. October 3, 2005. This report is accessible via the world wide web at http://www.depweb.state.pa.us/dep/site/default.asp - keyword "Radiation Protection," or by request from BRP Radiation Control Division at 717-787-3720.

leachate was not feasible or practical to confirm, PADEP believed that gaseous tritium light source (GTLS) 'EXIT' signs have been, and continue to be, disposed of in landfills. These GTLS devices contain significant quantities of tritium gas that, once ruptured in a landfill, are readily oxidized into tritiated water that is eventually captured as leachate.

PADEP was planning to add tritium to the list of monitoring parameters for leachate at landfills; however, they decided to further study the problem in cooperation with the solid waste industry. To this end, the Environmental Research and Education Foundation (EREF) in November of 2006 let a request for proposal titled "Evaluation of Tritium Concentrations in Municipal Solid Waste Landfill Leachate in Pennsylvania Landfills" to continue quarterly tritium monitoring at active Pennsylvania landfills. The work was initially won by Civil and Environmental Consultants, Inc. (CEC), specifically the health physics practice. When the health physics practice joined Safety and Ecology Corporation (SEC) in September of 2007, the EREF contract was transferred to SEC. SEC has received monitoring results for the last three quarters of 2007 as well as the first two quarters of 2008 and compiled the data. The five additional data points for each of the 54 active landfills provide enough data to trend the leachate tritium activity concentration at each of the landfills. The details of the sampling and an analysis of the results are presented in this report.

1.0 Introduction

1.1 Scope

The sampling and analysis plan (SAP) for the tritium research project was implemented at active (permitted) municipal solid waste landfills (LFs) in the Commonwealth of Pennsylvania. Quarterly tritium sampling began the second quarter of 2007 and will continue through the first quarter of 2009. The sampling and analysis activities were conducted at the direction of the Environmental Research and Education Foundation (EREF) and the Pennsylvania Department of Environmental Protection (PADEP) Bureau of Radiation Protection (BRP) to obtain additional tritium concentration data for untreated LF leachate. This report documents the additional data through the second quarter of 2008 and how it was obtained.

1.2 Background

There are a total of 108 solid waste LFs in Pennsylvania designated for receipt of municipal waste (MW), residual waste (RW), sanitary waste, and construction/demolition (C/D) debris. Of this total, 54 LFs are permitted and active with the remaining 54 inactive or designated by PADEP not to be included in this sampling event. Most of the active LFs (Table 1) feature a leachate collection system to capture liquids percolating through the LF for wastewater treatment facility processing. Active LF operators are required by PADEP regulations to periodically sample and characterize their leachate for a suite of nonradioactive constituents of concern (i.e., COCs). Radioactive COCs are not presently required.

1.3 Data Needs

The primary data need fulfilled by the SAP was tritium radioactivity concentration. There were not secondary data needs anticipated based on a review of the primary data.

1.4 Project Organization and Responsibility

Specific individuals of the radiological SAP LF leachate team were assigned the following project positions during performance of the monitoring activities:

- Representing the PADEP Bureau of Radiation Protection Sponsor – David J. Allard
- Representing the PADEP Bureau of Waste Management Point of Contact (POC) - Steve Socash
- Sampling Surveillance/Laboratory Shipments – PADEP Regional Offices
    - Region I (Southeast) POC – Ronald Furlan
    - Region II (Northeast) POC – William Tomayko

- Region III (South Central) POC – John Krueger
- Region IV (North Central) POC – James Miller
- Region V (Southwest) POC – David Eberle
- Region VI (Northwest) POC – Todd Carlson

1.4.1 SAP Operations and Data Management

Safety and Ecology Corporation POC – Anita Mucha

1.4.2 Laboratory Operations

PADEP Bureau of Laboratories POC - Michael L. Webb

2.0 Field Sampling Plan and Laboratory Analyses

2.1 Sampling Locations, Frequency, and Media

Sampling and sample packaging for shipment were performed by properly trained and qualified LF site representatives and/or authorized PADEP representatives. Representative samples of untreated leachate from each leachate management system were collected using sampling kit instructions provided to each LF. The LF facility and media to be sampled was determined by PADEP and specified on the DEP Sample Submission Sheet record (see Attachment A) accompanying each sampling kit. Additional details of each of these sampling methods are presented in the following subsections.

Table 1

	SAP ID	Facility Name	City	County
Southeast RI	1	Bethlehem Steel Corp RWLF	Coatesville	Chester
	3	GROWS MWLF	Morrisville	Bucks
	4	Pottstown MWLF	Pottstown	Montgomery
	5	SECCRA MWLF	West Grove Kennett	Chester
	6	Tullytown resource Recovery MWLF	Tullytown	Bucks
Northeast RI	11	Alliance Sanitary LF/MWLF	Taylor	Lackawanna
	12	Chrin Brothers Inc. MWLF	Easton	Northampton
	13	Commonwealth Environmental Systems MWLF	Foster Township Hegins	Schuykill
	15	Grand Central Sanitary LF/MWLF	Pen Argyl	Northampton
	16	IESI Bethlehem LF/MWLF	Bethlehem	Northampton
	17	Keystone Sanitary LF/MWLF	Dunmore	Lackawanna
	18	Pine Grove LF/MWLF	Pine Grove	Schuykill
Southcentral RII	38	Cumberland County MWLF	Shippensburg / Newburg	Cumberland
	39	Conestoga MWLF	Morgantown	Berks
	40	Greater Lebanon Refuse Authority MWLF	Lebanon	Lebanon
	41	IESI Blue Bridge MWLF	Scotland	Franklin
	42	Lancaster County Solid Waste (Frey Farm) Resource Recovery	Bainbridge / Conestoga	Lancaster
	43	Lanchester MWLF	Narvon	Lancaster
	44	Mifflin County SWA MWLF	Lewistown	Mifflin

	SAP ID	Facility Name	City	County
Southcentral RIII	45	Milton Grove C/DLF	Mt. Joy Township	Lancaster
	46	Modern MWLF	York	York
	47	Mountain View MWLF	Greencastle	Franklin
	48	Pioneer Crossing MWLF	Birdsboro / Harleysville	Berks
	49	Rolling Hills MWLF	Boyertown	Berks
	50	Sandy Run MWLF	Hopewell	Bedford
	51	Western Berks RA MWLF	Birdsboro	Berks
Northcentral RIV	54	Allenwood MWLF	Brady Township	Lycoming
	56	Northern Tier MWLF #2	West Burlington Township	Bradford
	59	Wayne Township MWLF	Wayne Township	Clinton
	60	White Pines MWLF	Pine Township	Columbia
Southwest RV	64	Arden Inc. MWLF	Washington	Washington
	65	BFI Imperial MWLF	Imperial	Allegheny
	66	Brunner MWLF	Zelienople	Beaver
	67	Deep Valley C/DLF	North Fayette Township	Allegheny
	68	Evergreen MWLF	Coral	Indiana
	69	Greenridge Reclamation MWLF	Scottdale	Westmoreland
	70	J & J MWLF - CBF Inc.(Onyx Chestnut)	McClellandtown	Fayette
	71	Kelly Run Sanitation MWLF	Elizabeth	Allegheny
	72	Laurel Highland MWLF	Johnstown	Cambria
	73	MAX Environmental Tech (Noncaptive RW Disposal Impoundment)	South Huntington	Westmoreland
	74	Monroeville (Chambers Development) MWLF	Monroeville	Allegheny
	75	Mostoller MWLF	Somerset	Somerset
	76	Paris Flyash Noncaptive RWLF	Hanover Township	Beaver
	77	Westmoreland (Rostraver) MWLF	Belle Vernon	Westmoreland
	78	Shade MWLF	Caimbrook	Somerset
	79	South Hills MWLF	South Park / Library	Allegheny
	80	Southern Alleghenies MWLF	Davidsville	Somerset
	81	Valley MWLF	Irwin	Westmoreland

	SAP ID	Facility Name	City	County
Northwest RVI	90	Clarion County MWLF	Leeper	Clarion
	91	McKean Kness MWLF	Kane	McKean
	92	Lake View MWLF	Erie	Erie
	94	Northwest Sanitary MWLF	West Sunbury	Butler
	95	Seneca MWLF	Evans City / Mars	Butler
	96	Superior Greentree MWLF	Kersey	Elk

2.1.1 Sample Collections and Analyses

Each LF facility received up to two sample containers: 1 glass bottle for the unfiltered sample, and as necessary, 1 QC duplicate glass bottle. Each glass bottle was appropriately marked or labeled with the sample identification code and the analysis required. The sample containers were not pre-preserved with a small volume of nitric acid since tritium adsorption onto container walls is negligible and the 5-day holding time limit is therefore not applicable. Samples were not filtered because the laboratory analysis procedure utilizes evaporation during sample preparation.

Each sample collected was analyzed by the laboratory for tritium concentration using EPA Method 906.0 with a *Packard* TriCarb 2900TR liquid scintillation counter. The TriCarb counter is an ultra low background analyzer offering automatic window optimization to provide a high efficiency-to-background ratio. Internal quench correction is also provided to determine sample-specific detection efficiencies.

2.1.2 Sample Identification

Systematic 11-character sample identification (ID) codes were used to uniquely identify all samples. The ID code format was "AAbbCCCCdEf" meaning:

- AA – a two-digit LF identification number: 01 to 97 (see Table 1, column "SAP ID")
- bb – a two-letter sample matrix designator: LE (Untreated Leachate)
- CCCC – a four-digit project sequential sample number beginning 0194.
- d – a single letter sample analysis designator: C (^3H).
- E – a single-digit sample type designator: 1 (original), 2 (field QC duplicate).
- f – a single letter designating analysis turn around time: N (normal 15 day TAT), Z (archive without analysis).

An LF SAP Excel® Workbook was used to record and maintain all pertinent information associated with each sample ID code marked/labeled on sample bottles and COC records issued to field personnel.

2.2 Quality Control Samples

Quality assurance objectives were specified so that the data produced are of a known and sufficient quality for determining whether a risk to human health or the environment exists. Because this investigation was an update to a previous preliminary effort, all data was considered noncritical; accordingly, an extensive effort to validate the precision and accuracy of field sampling adversely affecting results produced in the laboratory setting was not warranted or justifiable. By design, the SAP assured representative sampling because all sample aliquots were taken from a single composite sample. In the field, precision was affected by sample collection procedures and by the natural heterogeneity encountered in the environment. Overall, both field and laboratory precision was evaluated by examining the results of field duplicate samples and laboratory quality control (QC) samples. Laboratory precision was based on the use of laboratory-generated duplicate samples or matrix spike/matrix spike duplicate samples. The field QC duplicate sample load used for this investigation was 10% of the total samples collected (i.e., five duplicate sample sets). Each duplicate sample was analyzed for the same radiological parameters as the original paired sample.

Trip blanks were unnecessary since no volatile organic compound analyses were included in the SAP. Since sampling equipment was not reused, equipment rinsate samples were not obtained and analyzed to identify instances of sample cross-contamination.

The analytical laboratory chosen for this investigation has extensive experience analyzing tritium and sample matrices required by this investigation. Further, the laboratory maintains and implements an approved quality assurance program (QAP) to provide objective evidence that all measurements satisfy specific quality assurance objectives. Accordingly, performance evaluation samples (e.g., samples spiked with known concentrations of radionuclides in levels similar to those expected in the actual samples or blanks) were not to be prepared beyond those included in the laboratory's QAP to further document the accuracy and precision of their measurements process.

2.3 Chain of Custody Record

The chain-of-custody record serves as a written record of sample handling from the field through laboratory receipt. When a completed sample changes custody, those relinquishing and receiving the sample signed the chain-of-custody record. Each change of possession was documented, from the sampler

to sample courier, and finally from the courier to the laboratory. The completed chain-of-custody records are included with the laboratory analytical reports (Attachment D).

2.4 Handling and Disposition of Investigation-Derived Waste

All waste dispositions were coordinated with the appropriate LF site representative to ensure compliance with applicable waste storage, characterization, treatment, and disposal requirements. The investigation-derived waste produced during sampling included spent and unused sample material, personal protective equipment, miscellaneous sampling supplies, decontamination water, purge water, and samples. The LF site representative provided a determination for the disposition of all waste (including purge water) that is based on a waste determination.

2.5 Sample Handling, Packaging, and Shipping

All personnel handling samples wore personal protective equipment commensurate with the level of hazard and facility procedures. The exterior of the filled sample container(s) was decontaminated as appropriate. Sample containers were properly secured pending shipment. The sample custodian/shipper was responsible for ensuring that bottle caps were checked for tightness, a tamper-evident seal placed across bottle caps, and samples were properly packaged for custody transfer and shipment to the laboratory. Samples for radioactivity analysis did not require refrigeration.

2.6 Field Screening for Radioactivity

Screening filled sample containers for radioactivity was not performed prior to sample shipment.

3.0 Leachate Tritium Analysis Results

Attachment B is a summary table of the leachate samples collected at 54 landfills, and the previous studies (2004 and 2005) annual samples analyzed for tritium. The range of tritium results by sampling event are:

- 2004 samples ranged from 7 to 93,500 pCi/L, with a mean concentration of 24,400 pCi/L.
- 2005 samples ranged from -62.1 to 182,000 pCi/L, with a mean concentration of 20,900 pCi/L.
- 2nd quarter 2007 samples ranged from 378 to 356,774 pCi/L, with a mean concentration of 37,471 pCi/Liter
- 3rd quarter 2007 samples ranged from 30 to 325,484 pCi/L, with a mean concentration of 46,085 pCi/L.
- 4th quarter 2007 samples ranged from -38 to 192,387 pCi/L, with a mean concentration of 37.984 pCi/L.
- 1st quarter 2008 samples ranged from 68 to 188,192 pCi/L, with a mean concentration of 28,149 pCi/L
- 2nd quarter 2008 samples ranged from 13 to 178,889 pCi/L, with a mean concentration of 31,457 pCi/L.

Attachment C presents the summary statistics (average or mean, standard deviation, minimum, maximum and median) for each of the 54 landfill leachate sample results from 2004 through the 2nd quarter of 2008 (7 samples). The results of the quarterly samples for each landfill display a wide range of variability. The majority of the landfill sample results are normally distributed (the mean and median value of the 7 sample points are approximately equal and the standard deviation is a fraction of the mean, albeit a large fraction). Other landfills display "spikes" in activity concentration (an increase in activity concentration of 2 to 3 times the previous quarter's result).

4.0 Conclusions

Any conclusions about the leachate results are subject to the following principal limitations:

- The sampling campaign was performed as a single grab sample composite of raw leachate at each LF, quarterly. Variation in recent rainfall and LF infiltration is expected to have the greatest impact on tritium concentrations in leachate. Temporal compositing would provide samples more representative of changes in leachate quality due to seasonal and operational influences.
- Other factors that mitigate the tritium source term (i.e., the extent to which disposed tritium is available for release to the environment) were not evaluated. The principal factors are: LF disposal cells may be capped and thus lessen the fraction of tritium released, new sources of tritium may be disposed in a LF cell, the physical decay of tritium, and hydrogeological features.
- No LF-specific environmental control (precipitation, groundwater, surface water) samples were planned to be obtained as part of the sampling campaign. Consequently, it was not possible to establish a concurrent baseline against which these leachate results may be compared.

As presented earlier, positive determinations for tritium were observed in the majority of the samples analyzed. The corresponding tritium MDC range was 300 to 400 pCi/L. Differences in tritium concentrations were expected when planning the SAP and such differences were observed. The magnitude and 'scatter' of the differences suggests that the concentrations are affected by more than annual variations in weather (namely precipitation).

Despite the fact that tritium has ubiquitous environmental presence[2], most of the observed 2005 leachate tritium concentrations exceed typical environmental concentrations, which are generally below an MDC of 200 pCi/L in surface water and precipitation samples. Possible sources of this leachate tritium include NRC "generally licensed" gaseous tritium light source (GTLS) devices that are unused and no longer needed or wanted ("disused sources"), and that are unknowingly disposed of as a solid waste. It is not an

[2] Tritium is produced naturally in the upper atmosphere by cosmic ray interaction with 14N in air. Tritium is also produced artificially during nuclear weapons explosions, as a byproduct in nuclear power production, and in defense production reactors via neutron activation of 6Li. In the atmosphere, tritium exists in low concentrations in three different chemical forms: hydrogen (HT), water vapor (HTO) and hydrocarbons (CH3T). The steady-state global inventory is approximately 2.65 kilograms. By comparison, total U.S. tritium production since 1955 has been approximately 225 kilograms, an estimated 150 kilograms of which have decayed into helium-3, leaving a current (1996) artificial inventory of approximately 75 kilograms.

uncommon occurrence for disused GTSL to be accidentally disposed in landfills.[3] Most notable among these devices are GTLS emergency 'EXIT' signs that are used to satisfy the National Fire Protection Association (NFPA) Life Safety Code 101 mandate for illuminated exit markers. The October 3, 2005 report1 of the 2004 tritium SAP results contains additional information on GTLS devices.

Manufacturers of GTLS devices are licensed to do so under NRC in 10 CFR 32.51. Restrictions for transfer from the manufacturer to the user, who is granted a general license under 10 CFR 31.5, require that each device bear a clearly visible label stating the instructions and precautions necessary to assure: safe installation, operation, and servicing of the device; identification of radioactive material by isotope, quantity of radioactivity, and date of determination of the quantity; and specific wording notifying the reader of the regulations governing the use of the device and the words "Caution – Radioactive Material." In addition to labeling, the manufacturer must provide the user, or general licensee, with information stating the regulations applicable to the use, transfer or disposal of the device. Specifically, the owner must be made aware that ownership of the device may be transferred only to those persons specifically licensed or to another general licensee if the device remains in place.

4.1 Applicable or Relevant and Appropriate Requirement Standard of Consideration

The introduction of above-normal concentrations of tritium to the environment from leachate effluent may have regulatory implications that are best understood in the context of applicable or relevant and appropriate requirement (ARAR) standards for radioactive effluents. Both the NRC and the EPA have promulgated ARARs for tritium in liquid effluents. The NRC's effluent limits apply to licensed operations and are contained in Appendix B to 10 CFR Part 20, *Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage.*

The EPA limits the annual average concentration of tritium in drinking water under authority of the *National Primary Drinking Water Regulations* (NPDWR; 40 CFR 141). The NRC and EPA limitations and possible inferences prompted by the leachate results are discussed below.

4.1.1 NRC Limitations

[3] December 2005 NRC Event Notification Report 42225 (http://www.nrc.gov/reading-rm/doc-collections/eventstatus/event/2005/20051229en.html, accessed April 5, 2006). A licensee removed 56 exit signs from a building prior to demolition and subsequently lost control of the signs. The licensee reported that "No paperwork was found for the disposal and it appears they were sent to a landfill with the general trash." The total activity was estimated at 1,680 Ci.

In Subpart K of 10 CFR 20, the NRC authorizes licensees to dispose of licensed material in effluents (§20.2001(a)(3)) and to sanitary sewers ((§20.2001(a)(4)) within nuclide-specific effluent concentration limitations. The effluent concentration limits were established to ensure that the total effective dose equivalent (TEDE) to individual members of the public from all licensed operation radiation sources does not exceed 100 mrem (1 mSv) in a year (§20.1301(a)(1)). To accomplish this objective, the NRC derived annual average liquid effluent concentration limits (e.g., 1×10^6 pCi/L as ^3H) corresponding to a 'Reference Man' TEDE of 50 mrem/year. In contrast, the monthly average concentration sanitary sewer limits (e.g., 1×10^7 pCi/L as ^3H) were derived to correspond to a 'Reference Man' committed effective dose equivalent (CEDE) of 500 mrem. It is notable that §20.1301(a)(1) specifically excludes dose contributions attributed to radionuclides in sanitary sewer discharges from licensee compliance demonstrations with the 100 mrem/year public TEDE limit. The practice of radionuclide disposal by release into sanitary sewerage is limited by several §20.2003 conditions, most importantly that the:

- Released materials are readily soluble (or dispersible biological material).
- Quantity of material released in month, divided by the average monthly volume of water released into the sewer by the licensee, does not exceed the Appendix B, Table 3 monthly average sewer concentration limits (e.g., 1×10^7 pCi/L as ^3H).
- Total annual quantity of radioactive material released into sanitary sewerage does not exceed 5 Ci of ^3H, 1 Ci of ^{14}C, and 1 Ci of all other radioactive material combined.

Although none of the landfills sampled are NRC-licensed facilities (and if the leachate is released as an effluent to waters of the state or a sewer), all of the leachate tritium concentrations measured by this sampling campaign are below the NRC effluent and sewer concentration limits discussed above, assuming those grab sample results are indicative of actual average monthly concentrations. In addition, if the observed highest leachate tritium activity concentration (356,774 pCi/L) persisted as a sanitary sewerage discharge over the course of a year, the total leachate volume released would have to approach several million gallons before the §20.2003 5 Ci limitation would be of concern.

4.1.2 US EPA Limitations

In a final rulemaking for Subpart G of the NPDWR (40 CFR 141) in 2000, the EPA established maximum contaminant levels (MCLs) for radionuclides (§141.66) in drinking water furnished by any community

water system (CWS)[4] including an MCL for 'beta particle and photon radioactivity' (§141.66(d)). This CWS MCL indirectly limits the beta particle and photon radioactivity in drinking water to annual average concentration not to exceed an annual dose equivalent to the total body or any internal organ of 4 mrem/year. For all radionuclides except ^{3}H and ^{90}Sr, conversion of activity concentration to dose equivalent must be performed assuming a drinking water ingestion rate of 2 L/day and the National Bureau of Standards (NBS) Handbook 69 (published 1959 and amended 1963; also referred to as NCRP Report 22) compilation of maximum permissible concentrations (MPCs) in water.

In Table A of §141.66, the EPA directly established 20,000 pCi/L as the annual average concentration of tritium in drinking water that was assumed to produce a total body or organ dose of 4 mrem/year, the MCL. The concentrations for these contaminants were derived from a historical dosimetry model (ICRP Publication 2) used at the time the Subpart G rule was promulgated in 1976. When these risks are calculated in accordance with the latest dosimetry models described in Federal Guidance Report 13 (FGR 13)[5], the risks associated with these concentrations, while varying considerably, generally fall within the EPA's current risk target range for drinking water contaminants of 10^{-4} to 10^{-6}. Accordingly, the EPA did not change the MCL for beta particle and photon radioactivity during its final rulemaking in 2000. Using contemporary ICRP Publication 30 dosimetry, the concentration of tritium [as HTO] needed to deliver the MCL 4 mrem in one year is approximately 86,000 pCi/L, over four times the concentration in the current NPDWS. Thus, the current EPA 20,000 pCi/L MCL appears to be conservative by over a factor of four.

The following fraction of landfill leachate tritium concentrations measured by this sampling campaign are above 20,000 pCi/L, the EPA NPDWS assumed to equal the 4 mrem/year MCL:

- 2nd quarter 2007 – 29 of 54 landfills sampled (54%) with a max concentration exceeding the MCL by a factor of 18.
- 3rd quarter 2007 - 29 of 54 landfills sampled (54%) with a max concentration exceeding the MCL by a factor of 16.
- 4th quarter 2007 - 28 of 54 landfills sampled (52%) with a max concentration exceeding the MCL by a factor of 9.6.

[4] Community water systems are privately or publicly-owned and provide water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serve an average of at least 25 people year-round.
[5] http://www.epa.gov/radiation/docs/federal/402-r-99-001.pdf accessed March 28, 2006.

- 1st quarter of 2008 - 24 of 54 landfills sampled (44%) with a max concentration exceeding the MCL by a factor of 9.4.
- 2nd quarter of 2008 - 23 of 54 landfills sampled (43%) with a max concentration exceeding the MCL by a factor of 8.9.

It is apparent, then, that a potential exists for CWS to be adversely affected if the CWS influent is developed within the treated leachate 'watershed.' However, the scope of the leachate sampling campaign does not permit a determination of which, if any, CWS are vulnerable under the NPDWS and the implications for CWS distribution point radionuclide monitoring frequency pursuant to §141.26(b) and §141.26(c).

[For each landfill with a sampled leachate tritium activity concentration above 20,000 pCi/L that is discharged to surface waters of the Commonwealth, DEP determined the approximate dilution available from the leachate discharge structure to the nearest downstream drinking water intake. The dilution factors ranged from 0.000004 (278,000:1) to 0.11 (9:1), with resulting concentrations of tritium calculated at less than 200 pCi/L, a value that is below the minimum detectable concentration reported by the laboratory for all measurements.]

Attachment A

Sample Plan

Attachment B

Radioactive Concentration Data Display

PA Landfill Leachate Tritium Study Sample Results (all results in units of pCi/liter)											
General Facility Information				Previous Study		2007			2008		Action Level
Facility Name	Permit	County	Municipality	2004	2005	2nd Q	3rd Q	4th Q	1st Q	2nd Q	at Discharge
Alliance Sanitary MWLF	100933	Lackawanna	Ransom&Taylor Boros	27,813	13,300	19,876	42,400	36,935	25,618	101,399	127,176,686
Arden, Inc MWLF	100172	Washington	Chartiers Twp	21,183	7,203	19,309	16,491	26,440	21,925	38,237	1,809,424,400
Bethlehem Steel Corp RWLF	100020	Chester	E. Fallowfield Twp	282	1,340	378	421	44	171	215	17,123
BFI Conestoga MWLF	101509	Berks	New Morgan Boro	55,974	181,655	356,774	325,484	192,387	171,237	102,306	4,894,795
BFI Imperial MWLF	100620	Allegheny	Findley Twp	63,652	15,703	24,611	39,511	57,199	29,476	35,830	18,998,956
Brunner MWLF	101439	Beaver	New Sewickley Twp	10,894	5,774	25,449	24,211	18,298	10,066	16,280	121,489,924
Chrin Brothers, Inc MWLF	100022	Northampton	Williams Twp	44,362	20,547	33,788	51,112	52,370	40,618	38,366	155,868,988
Clarion County MWLF	101187	Clarion	Farmington Twp	14,576	628	17,095	18,851	27,310	28,163	28,664	214,645,036
Commonwealth Env Sys MWLF	101615	Schuylkill	Foster Twp	19,116	12,367	15,232	38,134	38,610	20,383	31,068	555,320,965
Cumberland County MWLF	100945	Cumberland	Hopewell Twp	31,813	28,890	60,363	76,609	70,620	43,045	36,516	3,205,266
DCSWA (Rolling Hills) MWLF	100345	Berks	Exeter Twp	23,603	5,814	27,479	30,190	23,729	16,615	25,200	16,317,131
Deep Valley C&D LF	101176	Allegheny	North Fayette Twp	3,577	-62	5,524	987	1,204	592	977	50,935,539
Evergreen MWLF	100434	Indiana	Brush Valley Twp	585	5,675	1,553	1,528	4,338	2,357	2,787	2,979,088
GLRA MWLF	101544	Lebanon	North Lebanon Twp	9,769	6,724	20,155	47,402	13,702	8,027	11,043	2,487,959

PA Landfill Leachate Tritium Study Sample Results (all results in units of pCi/liter)											
General Facility Information				Previous Study		2007			2008		Action Level
Facility Name	Permit	County	Municipality	2004	2005	2nd Q	3rd Q	4th Q	1st Q	2nd Q	at Discharge
Grand Central Sanitary MWLF	100265	Northampton	Plainfield Twp	89,132	37,353	90,162	158,650	161,555	127,520	124,674	**
Greenridge Reclamation MWLF	100281	Westmoreland	East Huntingdon Twp	19,651	12,354	51,054	93,517	68,027	34,972	41,691	*
GROWS MWLF	100148	Bucks	Falls Twp	93,545	68,149	137,015	197,212	168,574	164,433	131,242	79,743,918
IESI Bethlehem MWLF	100020	Northampton	Lower Saucon Twp	56,700	409	1,283	2,894	6,311	1,388	3,946	
IESI Blue Ridge MWLF	100934	Franklin	Greene Twp	2,301	1,505	6,313	6,969	6,623	2,422	1,820	4,932,836
J&J (Onyx Chestnut) MWLF	100419	Fayette	German Twp	2,990	679	27,031	7,256	5,891	9,005	2,914	73,927,911
Kelly Run Sanitation MWLF	100663	Allegheny	Forward Twp	3,406	3,945	2,628	6,532	4,945	2,461	2,288	66,819,458
Keystone Sanitary MWLF	101247	Lackawanna	Dunmore Boro	23,790	14,172	56,455	55,879	38,958	35,174	27,479	90,840,490
Lake View MWLF	100329	Erie	Summit Twp	418	1,022	29,831	30,282	33,478	13,327	32,503	*
Lanchester MWLF	100944	Lancaster	Caernarvon Twp	30,859	22,637	137,694	185,766	68,266	28,130	86,321	***
Laurel Highland MWLF	101534	Cambria	Jackson Twp	49,431	130,796	23,086	10,784	41,683	11,293	13,033	165,433,088
LCSWMA (Frey Farm) MWLF	101389	Lancaster	Manor Twp	6,411	6,538	34,497	58,284	13,870	32,928	33,984	220,171,977
Lycoming Co (Allenwood) MWLF	100963	Lycoming	Brady Twp	36,833	48,223	68,845	77,997	89,411	26,058	43,046	82,931,952
MAX Env Tech RW impoundment	N/A	Westmoreland	South Huntingdon Twp	45	59	N/D	37	19,936	198	42	7,872,171
McKean Kness MWLF	100361	McKean	Sergeant Twp	5,566	1,230	3,540	3,566	2,838	3,081	2,613	23,996,414
Mifflin County	101165	Mifflin	Derry Twp	212	160	637	585	620	373	557	59,300,464

PA Landfill Leachate Tritium Study Sample Results (all results in units of pCi/liter)											
General Facility Information				Previous Study		2007			2008		Action Level
Facility Name	Permit	County	Municipality	2004	2005	2nd Q	3rd Q	4th Q	1st Q	2nd Q	at Discharge
SWA MWLF											
Milton Grove C&D LF	101559	Lancaster	Mount Joy Twp	29,307	16,608	67,478	78,330	39,524	37,645	57,758	****
Modern MWLF	100113	York	Lower Windsor Twp	25,920	9,667	57,662	78,351	77,043	74,092	#	37,429,236
Monroeville (Chambers) MWLF	100594	Allegheny	Monroeville Boro	12,879	6,535	10,598	10,024	8,766	2,538	2,900	37,997,912
Mostoller MWLF	101571	Somerset	Somerset Twp	37,496	47,773	9,436	7,095	6,968	9,486	9,496	*****
Mountain View MWLF	101100	Franklin	Antrim Twp	29,785	18,397	62,124	76,288	48,359	42,946	48,035	5,919,403
Northern Tier #2 MWLF	101243	Bradford	West Burlington Twp	6,704	1,014	6,118	4,308	5,531	3,407	3,663	397,427,145
Northwest Sanitary MWLF	100585	Butler	Clay Twp	37,187	12,352	16,671	15,504	10,185	7,361	15,876	4,858,351
Paris Flyash Noncaptive RWLF	300936	Beaver	Hanover Twp	7	128	N/D	30	-38	68	13	542,827,320
Pine Grove MWLF	101427	Schuylkill	Pine Grove Twp	54,278	38,276	20,169	30,347	36,765	6,601	11,090	6,720,719
Pioneer Crossing MWLF	100346	Berks	Exeter Twp	16,462	17,940	56,017	55,054	44,255	23,804	28,653	14,504,116
Pottstown MWLF	100549	Montgomery	West Pottsgrove Twp	11,211	23,589	7,121	33,708	10,440	27,693	6,910	8,702,470
Sandy Run MWLF	101538	Bedford	Broad Twp	87,457	31,119	6,710	26,845	15,604	19,257	67,740	60,529,554
SECCRA MWLF	101069	Chester	London Grove Twp	39,176	31,274	19,731	53,432	56,787	18,999	19,038	*
Seneca MWLF	100403	Butler	Jackson Twp	4,114	6,888	20,155	3,827	5,357	2,347	2,869	2,536,801
Shade MWLF	101421	Somerset	Shade Twp	21,349	103,615	32,506	34,738	41,266	47,337	34,688	397,039,411
South Hills	100592	Allegheny	Union Twp	2,936	13,794	3,393	11,286	3,569	3,328	4,796	89,092,611

PA Landfill Leachate Tritium Study Sample Results (all results in units of pCi/liter)											
General Facility Information				Previous Study		2007			2008		Action Level
Facility Name	Permit	County	Municipality	2004	2005	2nd Q	3rd Q	4th Q	1st Q	2nd Q	at Discharge
MWLF											
Southern Alleghenies MWLF	100081	Somerset	Conemaugh Twp	29,885	20,529	9,355	8,453	22,401	9,079	15,303	132,346,470
Superior Greentree MWLF	101397	Elk	Fox Twp	25,989	18,714	46,041	71,741	88,651	40,280	93,717	1,375,163
Tullytown RR MWLF	101494	Bucks	Falls Twp	31,713	95,971	148,794	206,052	177,637	188,192	178,899	79,743,918
Valley MWLF	100280	Westmoreland	Penn Twp	7,529	17,119	6,741	13,726	18,076	5,573	5,060	26,727,783
Wayne Township MWLF	100995	Clinton	Wayne Twp	23,806	12,744	20,092	36,136	32,580	26,053	28,359	69,545,904
Western Berks Comm MWLF	100739	Berks	Cumru Twp	6,066	1,491	3,646	9,159	2,889	2,100	3,650	37,296,299
Westmoreland (Rostraver) MWLF	100277	Westmoreland	Rostraver Twp	3,739	3,920	1,967	2,465	-31	8,323	8,001	73,927,911
White Pines RWLF	301626	Columbia	Pine Twp	26,174	6,104	18,301	12,149	4,401	2,482	3,687	6,074,496
			Average:	24,438	22,414	37,471	46,085	37,984	28,149	31,457	
			Median:	21,266	12,361	20,124	28,518	23,065	14,971	16,280	
			Stdev.:	23,218	34,545	56,967	62,641	46,069	42,027	38,924	
			Min:	7	-62	378	30	-38	68	13	
Sampling Event Summary Statistics			Max:	93,545	181,655	356,774	325,484	192,387	188,192	178,899	

*No discharge at present time

**Unnamed tributary of Waltz Creek: 49,500,682

Unnamed tributary of Little Bushkill: 77,934,494

***Conestoga River: 3,286,506

Schuylkill River: 18,648,149

Chickies Creek: 220,171,977

****Little Chickies Creek: 839,220,542

Swatara Creek: 17,850,824

*****Conemaugh River: 248,149,632

Kimerbly Run: 35,219,154

No sample collected

Attachment C

Analytical Data Summary of 2004, 2005, 2007 and 2008 Samples To Date (7 total)

Summary Statistics By Landfill (all results in units of pCi/liter)						
Facility Name	***Average***	***STDEV***	***MIN***	***MAX***	***Median***	**Comment**
Alliance Sanitary MWLF	38,192	29,539	13,300	101,399	27,813	Spike to 101,399 in 2nd quarter 2008.
Arden, Inc MWLF	21,541	9,479	7,203	38,237	21,183	
Bethlehem Steel Corp RWLF	407	430	44	1,340	282	
BFI Conestoga MWLF	197,974	109,396	55,974	356,774	181,655	Spike to > 300,000 in 2nd & 3rd quarters of 2007.
BFI Imperial MWLF	37,997	17,237	15,703	63,652	35,830	
Brunner MWLF	15,853	7,391	5,774	25,449	16,280	
Chrin Brothers, Inc MWLF	40,166	10,919	20,547	52,370	40,618	
Clarion County MWLF	19,327	10,053	628	28,664	18,851	
Commonwealth Env Sys MWLF	24,987	10,844	12,367	38,610	20,383	
Cumberland County MWLF	49,694	19,350	28,890	76,609	43,045	
DCSWA (Rolling Hills) MWLF	21,804	8,202	5,814	30,190	23,729	
Deep Valley C&D LF	1,828	1,985	-62	5,524	987	
Evergreen MWLF	2,689	1,771	585	5,675	2,357	
GLRA MWLF	16,689	14,250	6,724	47,402	11,043	
Grand Central Sanitary MWLF	112,721	43,973	37,353	161,555	124,674	Spike in 3rd & 4th quarter of 2007
Greenridge Reclamation MWLF	45,895	28,092	12,354	93,517	41,691	
GROWS MWLF	137,167	44,790	68,149	197,212	137,015	

Summary Statistics By Landfill (all results in units of pCi/liter)						
Facility Name	***Average***	***STDEV***	***MIN***	***MAX***	***Median***	**Comment**
IESI Bethlehem MWLF	10,419	20,504	409	56,700	2,894	
IESI Blue Ridge MWLF	3,993	2,497	1,505	6,969	2,422	
J&J (Onyx Chestnut) MWLF	7,967	8,876	679	27,031	5,891	
Kelly Run Sanitation MWLF	3,744	1,548	2,288	6,532	3,406	
Keystone Sanitary MWLF	35,987	15,923	14,172	56,455	35,174	
Lake View MWLF	20,123	14,879	418	33,478	29,831	
Lanchester MWLF	79,953	62,033	22,637	185,766	68,266	
Laurel Highland MWLF	40,015	42,869	10,784	130,796	23,086	
LCSWMA (Frey Farm) MWLF	26,645	18,854	6,411	58,284	32,928	
Lycoming Co (Allenwood) MWLF	55,773	23,299	26,058	89,411	48,223	
MAX Env Tech RW impoundment	3,386	8,108	37	19,936	52	
McKean Kness MWLF	3,205	1,305	1,230	5,566	3,081	
Mifflin County SWA MWLF	449	200	160	637	557	
Milton Grove C&D LF	46,664	21,970	16,608	78,330	39,524	
Modern MWLF	53,789	29,308	9,667	78,351	65,877	
Monroeville (Chambers) MWLF	7,749	3,932	2,538	12,879	8,766	
Mostoller MWLF	18,250	16,955	6,968	47,773	9,486	
Mountain View MWLF	46,562	19,231	18,397	76,288	48,035	
Northern Tier #2 MWLF	4,392	1,938	1,014	6,704	4,308	
Northwest Sanitary MWLF	16,448	9,746	7,361	37,187	15,504	
Paris Flyash Noncaptive RWLF	35	57	-38	128	22	
Pine Grove MWLF	28,218	16,750	6,601	54,278	30,347	
Pioneer Crossing MWLF	34,598	16,974	16,462	56,017	28,653	
Pottstown MWLF	17,239	10,897	6,910	33,708	11,211	
Sandy Run MWLF	36,390	29,766	6,710	87,457	26,845	
SECCRA MWLF	34,062	16,246	18,999	56,787	31,274	
Seneca MWLF	6,508	6,207	2,347	20,155	4,114	

Summary Statistics By Landfill (all results in units of pCi/liter)						
Facility Name	***Average***	***STDEV***	***MIN***	***MAX***	***Median***	**Comment**
Shade MWLF	45,071	27,025	21,349	103,615	34,738	
South Hills MWLF	6,157	4,457	2,936	13,794	3,569	
Southern Alleghenies MWLF	16,429	8,190	8,453	29,885	15,303	
Superior Greentree MWLF	55,019	29,908	18,714	93,717	46,041	
Tullytown RR MWLF	146,751	61,965	31,713	206,052	177,637	
Valley MWLF	10,546	5,604	5,060	18,076	7,529	
Wayne Township MWLF	25,681	7,814	12,744	36,136	26,053	
Western Berks Comm MWLF	4,143	2,650	1,491	9,159	3,646	
Westmoreland (Rostraver) MWLF	4,055	3,095	-31	8,323	3,739	
White Pines RWLF	10,471	8,911	2,482	26,174	6,104	

Attachment C

Laboratory Analysis Reports

[15.8 MB]

(Copies of these reports are on file and available upon request)

Rulemaking Comments

From: Ed Repa [EREPA@nswma.org]
Sent: Monday, March 29, 2010 2:04 PM
To: Rulemaking Comments
Subject: January 12 ANPRM
Attachments: NRC.docx; September 2008 Leachate Tritium Report.doc

Rulemakings and Adjudications Staff,

Attached are the National Solid Wastes Management Association's comments on the petition for rulemaking (75 FR 1559). Please contact me if you have any questions.

Ed Repa

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(148.184.100.43) with Microsoft SMTP Server id 8.1.393.1; Mon, 29 Mar 2010
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Thread-Index: AcrPajpC+BJEIN4eTnyeMu5lILKXHA==
From: Ed Repa <EREPA@nswma.org>
To: <Rulemaking.Comments@nrc.gov>
Return-Path: EREPA@nswma.org