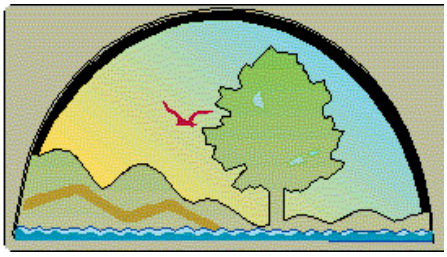
MAXEY FLATS DISPOSAL SITE
ANNUAL REPORT
2014



Energy and Environment Cabinet
Department for Environmental Protection
Division of Waste Management
Superfund Branch

Maxey Flats Disposal Site
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List of Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
BoRP	Balance of Remedial Phase
Commonwealth	Commonwealth of Kentucky
DOE	U.S. Department of Energy
DCW	Drainage Channels Water
FCP	Final Closure Period
IRP	Initial Remedial Phase
IMP	Interim Maintenance Period
MFDS	Maxey Flats Disposal Site
O&M	Operation and Maintenance Requirement Summary
PSVP	Performance Standards Verification Plan
PSW	Perennial Surface Water
REI	Reasonably Exposed Individual
RML	Radioactive Material License
EPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

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List of Appendices
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1.0 Introduction

The Commonwealth is submitting this report in accordance with Section 4.0 of the Performance Standard Verification Plan PSVP (Appendix C of the Interim Maintenance Period (IMP) Work Plan). This report summarizes sampling and maintenance activities listed in the 2003 IMP Work Plan, PSVP, and the Operations and Maintenance (O&M) Requirement Summary (Appendix D of the IMP Work Plan).

2.0 Scope of Work

The Final Closure Period (FCP) is ongoing pursuant to the Consent Decree (Civil Action Number 95-58) signed by the United States Environmental Protection Agency (EPA), the Maxey Flats Steering Committee (Settling Private Parties), and the Commonwealth. As of September 2014, the Maxey Flats Steering Committee disbanded, placing the Commonwealth under EPA regulation. The Commonwealth is responsible for the Balance of Remedial Phase (BoRP), which includes tasks that comprise the IMP and FCP as described in the Record of Decision (ROD). Relevant IMP monitoring activities will continue until they are no longer applicable or interfere with remediation currently ongoing within FCP, and will conclude upon EPA's approval of an Institutional Control Period Work Plan, which is being developed.

The following IMP Work Plan obligations will continue through FCP until no longer applicable:

- Surface/ground water monitoring
- Initial Remedial Phase (IRP) cap maintenance and replacement
- Subsidence monitoring
- Erosion evaluation
- General site maintenance
- Contaminated liquid and waste disposal
- Data collection, analysis, and reporting
- Site drainage and erosion control features

The following IMP Work Plan obligations have been suspended:

- Trench leachate management and monitoring
- Subsidence survey

3.0 Surface Water Monitoring

All IMP surface water monitoring locations are evaluated based on tritium sampling results. The 2014 annual tritium averages for all surface water locations were below their specified screening levels. Tritium results for all surface water monitoring appear in Appendix A: *2014 MFDS Tritium Data*

3.1 East Detention Basin

Surface water runoff from the Maxey Flats Disposal Site (MFDS) is monitored at the East Detention Basin (EDB). Sampling is triggered by storm events of 2.8 inches of rainfall in a 24-hour period. A sequential sampler linked to a meteorological station is programmed to collect a storm event sample at 0.11 inches of rainfall per hour. A total of 28 storm event samples were collected in 2014 and analyzed for tritium; the results range from 0.05 to 3.17 pCi/mL. Figure 3-1 on page 4 provides the annual average for tritium concentrations for 2004-2014. Sample collection from the EDB is a requirement in the Radiological Materials License (RML) issued by the Radiation Health Branch of the Cabinet for Health and Family Services.

Pursuant to the ROD and Initial Remedial Phase (IRP) design, discharge from the East Detention Basin should be released to the East Main Drainage Channel at a rate not to exceed predevelopment flow conditions. Following storm events exceeding 2.8 inches of rainfall in 24 hours (two-year storm event or greater), the Commonwealth is required to conduct an inspection of the interim cap and all three drainage channels, and report findings. Based on data collected from the East Drain rain gauge, no rain event in 2014 exceeded the two-year storm event criteria; therefore, no comparison of current flow rate versus pre-developed flow rate was required. The highest 24-hour recorded rain event for 2014 was 1.87 inches.

3.2 Perennial Surface Water Monitoring

Perennial surface water (PSW) monitoring is conducted at five locations in three streams inside and outside the site boundary. These locations are monitored using sequential samplers that collect a four-aliquot daily composite sample. The PSW samples are compared to a specific action level of 20 pCi/mL and a screening level of 50 percent of the action level. A total of 1,771 PSW samples were collected and analyzed for tritium during 2014 with no anomalous data reported. During 2014, all PSW locations were below the average annual tritium screening level of 10 pCi/mL. Figure 3-1 on page 4 provides the IMP Annual Average Tritium Concentrations for 2004-2014.

Sample location 122A serves as the source for background samples. It is located on Rock Lick Creek up gradient from site influence. During 2014, 355 samples were collected from this location for tritium analysis. Tritium results range from -0.23 to 1.04 pCi/mL.

Sample location 106 is located on No Name Branch, a tributary to Rock Lick Creek. Location 106 receives direct influence from Drain 144 and exhibits seasonal tritium level fluctuation concurrent with location 144. During 2014, 356 samples were collected from this location for tritium analysis. Tritium results range from 1.08 to 9.78 pCi/mL.

Sample location 122C is located on Rock Lick Creek, downstream of 106 and 143 influences. During 2014, 355 samples were collected from this location for tritium analysis. Tritium results range from 0.04 to 2.71 pCi/mL.

Sample location 103E is located on Drip Springs Creek and receives influence from Drain 107. During 2014, 345 samples were collected from this location for tritium analysis. Tritium results range from -0.09 to 1.86 pCi/mL.

Sample location 102D is the only PSW sampler located outside the buffer zone. Because of its location below the confluence of three streams influenced by surface water from MFDS, 102D is designated as the compliance point for site runoff. This location is the monitoring point for the reasonably exposed individual (REI) and is compared to a 4 mrem/year dose limit. During 2014, 360 samples were collected from this location for tritium analysis. Tritium results range from 0.18 to 1.99 pCi/mL. The annual average at 102D is 0.08 pCi/ml.

3.3 Drainage Channels Water

Drainage channels water (DCW) monitoring is conducted at three locations inside the MFDS's boundary. The three primary drains that produce intermittent flow are monitored and compared to a 25 mrem/year total effective dose equivalent (TEDE) standard and a more restrictive annual 100 pCi/mL action level. These drains are sampled by automated samplers that collect a four-aliquot daily composite sample. In 2014, the annual average for all DCW locations was below the 100 pCi/mL action level. A total of 826 samples were collected from the drains for tritium analysis. Figure 3-1 provides the IMP Annual Average Tritium Concentrations for 2004-2014.

Sample location C107 is located at the base of the West Drain, which discharges into Drip Springs Creek. During 2014, 156 samples were collected from this location for tritium analysis. Results range from 0.49 pCi/mL to 21.93 pCi/mL.

Sample location 143 is located near the base of the South Drain, which discharges into Rock Lick Creek. During 2014, 333 samples were collected from this location for tritium analysis. Results range from 0.19 pCi/mL to 0.64 pCi/mL.

Sample location 144 is located at the base of the East Drain, which discharges into No Name Branch. During 2014, 364 samples were collected from this location for tritium analysis. Results range from 0.90 pCi/mL to 149.41 pCi/mL.

3.4 Sampling Equipment Status

Samples were collected in accordance with the PSVP, unless problems occurred beyond control such as: freezing lines, washouts, equipment failure, no flow, or power outages.

Figure 3-1
Maxey Flats Disposal Site
Annual Average Tritium Concentration (pCi/mL)
2004-2014

		Perennial Surface Water					Drainage Channels Water		
	EDB	**122A**	**106B**	**122C**	**103E**	**102D**	**C107**	**143**	**144**
2004	0.14	0.06	4.55	1.10	0.90	0.78	14.58	0.21	60.66
2005	0.16	0.05	4.23	1.01	0.67	0.79	16.97	0.10	40.03
2006	0.16	0.05	3.41	0.86	0.47	0.62	8.62	0.10	43.35
2007	0.55	0.02	5.24	1.27	0.62	0.93	13.28	0.07	70.03
2008	0.05	-0.10	3.33	0.87	0.47	0.62	10.42	-0.11	33.76
2009	0.90	0.07	3.39	0.88	0.36	0.58	5.87	0.10	44.34
2010	0.59	0.06	4.41	1.34	0.49	0.79	10.99	0.06	61.60
2011	0.38	0.06	3.21	0.91	0.37	0.61	8.63	0.03	56.43
2012	0.72	0.05	3.88	1.19	0.51	0.82	12.96	0.06	67.85
2013	0.94	0.05	3.61	1.00	0.44	0.67	10.42	0.07	59.34
2014	0.59	0.07	3.80	1.12	0.43	0.80	11.01	0.06	46.01

4.0 Groundwater Monitoring Wells

Groundwater monitoring at MFDS is performed using the existing alluvial and perimeter monitoring wells. The alluvial wells, located in the buffer zone, were installed during the IRP to satisfy the requirements of the Statement of Work (SOW). The perimeter monitoring wells are located along the west perimeter fence of the restricted area, and were installed as investigative monitoring points prior to the Consent Decree. Originally, over 300 investigative monitoring wells were installed; IRP operations removed all but 17. Perimeter well UF-10a, located within the restricted area was removed during the sump abandonment phase of FCP. The remaining 16 wells are maintained for water level monitoring, satisfying the requirements of the IMP Work Plan, and sampled to satisfy the tritium monitoring requirements in the RML. Tritium analyses for all the wells are contained in Appendix A: *2014 MFDS Tritium Data.* Water level monitoring tables for both alluvial and perimeter wells are contained in Appendix B: *2014 MFDS Alluvial Well Levels* and *2014 MFDS Perimeter Well Levels.*

4.1 Alluvial Wells

4.1.1 Tritium Evaluation 2014

Alluvial well (AW) samples were collected for tritium analysis as outlined in the PSVP and the 2007 EPA Five Year Review. Five wells were sampled in

2014; annual samples were collected from AW-6, 10, and 12, and quarterly samples from AW-1 and 7. During 2014, a total of 14 alluvial well samples were collected and analyzed for tritium. Results were typical of historical ranges.

The maximum tritium concentration at AW-7 was 6.66 pCi/mL. Comparison of this value to 50 percent of the 20 pCi/mL applicable or relevant and appropriate (ARAR) requirements indicated that additional radiological analyses were not necessary.

Access to the alluvium within the buffer zone is controlled by the Commonwealth, therefore the alluvial wells are not considered a drinking water source and do not represent a potential radiological dose to the public. The county road extending through the buffer zone has been closed and a gate has been installed to further limit access.

4.1.2 Arsenic Evaluation 2012-2014

During the course of preparing the Five Year Review in 2012, it was determined surface water sampling location 144 exceeded 50 percent of the established screening level for tritium. In accordance with requirements of the IMP, a sampling event was conducted specifically to quantify the concentrations of contaminants of concern in groundwater as identified in the ROD. In September 2012, 14 alluvial wells and four stream sampling locations were sampled and analyzed by a third-party laboratory (Test America). Results indicated AW-1, AW-6, AW-13 and AW-14 exceeded the currently established EPA 10 µg/L maximum contaminant level (MCL) for arsenic. The Commonwealth proposed quarterly sampling and analysis for arsenic for a minimum of four quarters. The sampling for this evaluation ended in 2014 with three out of the four wells falling below the 10 µg/L MCL. AW-13 registered "Not Detected" for arsenic in the final three sampling analysis. AW-1 has an average concentration of 27µg/L, which is within the historical range for isolated areas with Ohio Shale outcrops.

The results of this sampling are presented in Appendix A: *2014 MFDS Alluvial Well Arsenic Study.*

4.2 Perimeter Monitoring Wells

Water levels were measured in the 16 perimeter monitoring wells on a quarterly basis. The 2014 measurements indicate water levels typical of historic data.

The 2014 tritium results for the perimeter wells were typical of historical data and trends. Tritium analysis of the perimeter monitoring wells is a requirement of the RML.

5.0 Data Management

A data package is prepared for each group of samples analyzed on-site. The data package contains the tritium instruments' QC charts (efficiency and background), chain of custody forms, raw data sheets, and data reduction sheets. The radiation service contractor, DeNuke, Inc., hired by the Commonwealth to complete third party data validation for MFDS, was purchased by ATL during 2014. ATL fulfilled the contractual obligations of DeNuke, Inc., and renewed the contract for 2015. Following data validation, the results are entered into the site's database and transmitted to EPA, United States Department of Energy (DOE), and multiple groups within the Commonwealth. These packets are available on-site for review. Analytical results are contained in the electronic file, Appendix A: *2014 MFDS Tritium Data.*

6.0 Rainfall Data

Presently, there are three rain gauge locations associated with MFDS: the East Detention Basin (EDB), sampling location 102D, and the main office. The official annual rainfall data for MFDS is collected at the EDB rain gauge. This rain gauge is linked to the sampler at the EDB. Rainfall data from an alternate rain gauge maintained at the main office may be used for official rainfall totals if the EDB rain gauge is nonfunctional. A total of 37.29 inches of rainfall was measured at the EDB gauge during 2014. This is compared to an annual average precipitation of 47.33 inches (NOAA, National Climatic Data Center; Farmers, KY.). Annual precipitation data appears in Appendix C: *2014 MFDS Daily Rainfall.*

7.0 Initial Remedial Phase Cap Maintenance

7.1 Geomembrane Liner and Boots

The liner covering the trench cap and the sump boots was inspected as part of the monthly inspection. The comprehensive visual and air lancing inspections were suspended for 2014 to accommodate FCP activities. All liner repairs were made within the scope of work for sump abandonment by RECON or RECON subcontractors. A complete accounting of the repairs made during sump abandonment will be available in the sump abandonment final report.

7.2 Headwall Maintenance

Headwall maintenance includes four headwalls and associated items along the North Channel, the northeast corner piping, geomembrane liner battens, and the liquid collection system.

During this reporting period, debris and leaves were removed numerous times from the trash grate and restricting plate at the upstream headwall of the northeast corner inlet pipe. Removal of the leaves and debris will be a continuous maintenance issue at this headwall.

7.3 Subsidence Monitoring and Repair

Subsidence inspections were conducted monthly in accordance with the O&M, Section 3.3.3; *Subsidence Monitoring*. No areas warranted subsidence repair during 2014. Areas near trenches 15, 21, 36, 37, and 46 are being visually monitored monthly for subsidence qualification. A total of four subsidence repairs have been made since the 2003 Certification of Completion. Appendix D: *2014 MFDS Subsidence Tracking Form 2003-2014* contains subsidence repair tracking information. Monitoring of these areas will continue throughout FCP. Any required subsidence repairs not deemed critical will be addressed during cap construction. The annual engineering subsidence survey of the trench cap has been suspended as a result of FCP.

7.4 Diversion Berms

The diversion berms were inspected twice a month as required by the O&M. All were found to be in satisfactory condition.

7.5 Anchor Trenches

The anchor trenches were inspected twice a month as required by the O&M. All anchor trenches appear to be functioning as designed.

7.6 Drainage Channels

All drainage channels were inspected during 2014 as required by the O&M. Unrestricted flow through the articulating block mats and gabions was maintained using herbicides and/or manual removal of vegetation.

7.7 Articulating Concrete Block Mat (AB Mat) System

The AB mat system was inspected monthly as required by the O&M. A buildup of sediment within the AB mats has been observed. This appears to have minimal impact in reducing the velocity of water flowing to the EDB and it does not appear to impact the EDB's ability to control flow. This buildup of sediment should be expected, as it is an inherent design feature of AB mats. In various locations, the cable linking the blocks is showing signs of stress; this has been observed for several years and will be monitored. One section of AB blocks in the East Drainage Channel at LP-191EX continues to erode, but no decrease in performance has been observed.

7.8 Former Leachate Storage Facility Area

The former leachate storage facility (LFS) area was found to be in satisfactory condition. The area shows no signs of subsidence or any damage to the geomembrane liner or boots around the tank extensions at the time sump abandonment was initiated. As defined in the scope of work for sump abandonment, LSF-1 was grouted and closed permanently. All riser pipes and cathodic protection equipment associated with the LSF tanks were removed and disposed in LSF-1.

7.9 Inspections

A total of 95 inspections were performed in 2014. No unsatisfactory notations were recorded that present a persistent problem. All unsatisfactory items either received actions to return them to satisfactory status or were designated for monitoring.

7.10 Equipment Status

All liner repair equipment remains in good working condition.

8.0 Trench Leachate Management and Monitoring

Trench sump liquid level measurements were obtained in accordance with the PSVP, Section 2.3, *Sump Measurement*, and the 2011 revised Leachate Management Engineering Evaluation.

The average loss of freeboard for all sumps is 1.30 percent. Three sumps have a greater than 10 percent loss of freeboard. Sumps 7-4, 46-1, and 46-2 have a freeboard percentage loss of 72 percent, 16 percent, and 12 percent, respectively. The freeboard loss of greater than 50 percent in Sump 7-4 initiated the 2011 revised Leachate Management Engineering Evaluation, and was ongoing for 2014. Appendix E contains tables for trench freeboard, leachate levels, sump bottom measurements and a graph of leachate levels of Sump 7-4.

The sump abandonment process was completed by RECON in 2014. Trench leachate management and monitoring will no longer be performed. The sump abandonment final report will be available upon certificate of completion of FCP.

9.0 Contaminated Liquid and Solid Waste

Contaminated liquid and waste generated on site will be disposed of in accordance with the IMP Work Plan, Section 3.2: *Treatment of Other Contaminated Liquids*, and Section 3.3: *Waste Burial*.

No liquid beneath the trench cap liner was managed in 2014. Solid waste left from previous IRP activities was disposed of in LSF-1 during sump abandonment. A complete accounting will be available in the FCP sump abandonment final report upon certificate of completion of FCP. Solid and liquid waste generated from laboratory, radiological activities, and site maintenance, since the certificate of completion of IRP in 2003, was temporarily stored in a secured area. This stored radiological waste was released to Bionomics for proper disposal in November 2014. A list of the disposed materials is detailed in Appendix F: *2014 MFDS Waste Disposal.*

The Annual Low Level Radioactive Waste Report submitted to the Cabinet for Health and Family Services, Radiation Health Branch (RHB) is included in Appendix F: *2014 MFDS LLRW Report*.

10.0 Erosion Monitoring

Estes Land Surveying was contracted to complete erosion monitoring and to produce a cross-sectional profile of the East Drain using IMP methodology. Estes Land Surveying conducted erosion measurements in May and November of 2014. The IMP methodology cross-sections and tables for the 2011-2014 East Drain erosion measurements and the calculated areas are presented in Appendix G: *MFDS 2014 East Drain Shaw Monuments.*

The MFDS staff completed the 2014 erosion measurements in November using the USGS methodology. Results of this screening appear in Appendix G: *MFDS East Drain Erosion USGS Monuments 2011-2014.*

Seasonal visual erosion monitoring of the east, south, and west drainage channels was completed in compliance with IMP Work Plan requirements. These inspections revealed no new erosion concerns.

11.0 IMP Work Plan Revisions, Changes, and Correspondence

Revisions and changes to the IMP Work Plan are required to be submitted in writing to EPA for approval. No revisions were submitted in 2014.

12.0 Custodial Care Activities

12.1 Vegetation

All vegetation was maintained below required height limits to permit leachate monitoring.

12.2 Building and Grounds Maintenance

All routine building and grounds maintenance was performed according to IMP Work Plan requirements. The tank storage building used for access to the restricted area was surveyed for unrestricted release by ATL in 2014.

12.3 Security Fence

The security fence surrounding the site remains in satisfactory condition with minor maintenance required.

12.4 Roadway Maintenance

Routine maintenance was performed on all facility-owned roadways.

13.0 Cathodic Protection

Operation of the cathodic protection system installed on the 20,000 gallon Underground Storage Tank (UST) within the restricted area has been terminated during sump abandonment activities. The UST was filled with waste generated during the sump abandonment process and any waste left from previous IRP activities. An inventory of waste disposal will be available in the FCP sump abandonment final report upon certificate of completion of FCP. No annual evaluation of the cathodic system was completed this year.

14.0 Other Activities and Developments

The main purpose of this document is to summarize completion of the tasks required by the IMP Work Plan. Many other activities and developments relevant to MFDS operations occurred during 2014. Select activities and developments not required by the IMP Work Plan are included in this section.

<u>February 2014:</u> RECON was awarded the contract for sump abandonment.

<u>April 2014:</u> RECON mobilized and began sump abandonment.

<u>June 2014:</u>

- The final sump within the restricted area was abandoned on June 5.
- High point contouring was added to RECON's sump abandonment contract.
- An issue developed with an adjacent property owner regarding access to his property for logging.
- URS submitted the Maxey Flats Final Design Package to EPA.

<u>September 2014:</u> Division of Engineering and Contract Administration (DECA) awarded the final cap construction contract to The Walker Company.

October 2014: Massive sump abandonment patch failure was discovered. The failure was the result of dramatic temperature changes and high winds. Several 50-degree temperature fluctuations were recorded early in the month. A change order was negotiated to finance the repairs. All patches were leistered by RECON subcontractor JH Waters.

November 2014:

- Sump abandonment final completion was declared. The contract included sump abandonment, patch repair, high point contouring, and diversion berm installation.
- The Upper Rock Lick Road extension through the buffer zone was removed from the County Road Maintenance Map and a gate was installed in preparation for FCP.
- MFDS released all temporarily stored liquid and dry radiological waste to Bionomics for proper disposal.

15.0 Conclusions

This concludes the textual outlining of the IMP activities at the Maxey Flats Disposal Site for 2014. If copies of inspections or deliverables not included in this report are required, please contact the MFDS office.