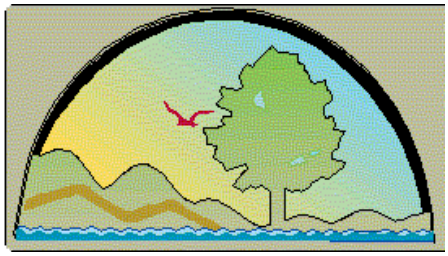
MAXEY FLATS DISPOSAL SITE
ANNUAL REPORT
2017

April 26, 2018



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

Maxey Flats Disposal Site
2597 Maxey Flat Road
Hillsboro, KY 41049
606-783-8681

Table of Contents

Page

Table of Contents

(Continued)

List of Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
ATL	Advanced Technologies and Laboratories
AW	Alluvial Well
BoRP	Balance of Remedial Phase
Commonwealth	Commonwealth of Kentucky
DOE	U.S. Department of Energy
DCW	Drainage Channel Water
EDB	East Detention Basin
EPA	(United States) Environmental Protection Agency
FCP	Final Closure Period
ICP	Institutional Control Period
IRP	Initial Remedial Phase
IMP	Interim Maintenance Period
MFDS	Maxey Flats Disposal Site
O&M	Operation and Maintenance
NOAA	National Oceanographic Atmospheric Administration
PSVP	Performance Standards Verification Plan
PSW	Perennial Surface Water
RECON	Remedial Construction Services, LP
REI	Reasonably maximally Exposed Individual
RML	Radioactive Material License
SOW	Statement of Work
SWMF	Stormwater Management Feature
TEDE	Total Effective Dose Equivalent
TWC	The Walker Company
USGS	United States Geological Survey

Table of Contents

(Continued)

List of eAppendices

Included electronically

List of Figures

Page

THIS PAGE INTENTIONALLY LEFT BLANK

1.0 Introduction

The Commonwealth is submitting this annual report for the Maxey Flats Disposal Site (MFDS) in accordance with Section 4.0 of the Performance Standards Verification Plan (PSVP) (Appendix C of the Interim Maintenance Period (IMP) Work Plan). This report summarizes the 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 Settling Private Parties (represented by the Maxey Flats Steering Committee), and the Commonwealth. The Maxey Flats Steering Committee disbanded in September 2014 as the Settling Private Parties had fulfilled the responsibilities defined in the Consent Decree. With the dissolution of the Maxey Flats Steering Committee, the Balance of Remedial Phase (BoRP) became the full responsibility of the Commonwealth. This includes tasks outlined in the IMP Work Plan and FCP development as described in the Record of Decision (ROD). Relevant IMP monitoring activities will continue until they are no longer applicable or interfere with FCP remediation and will ultimately conclude upon the EPA's approval of an Institutional Control (IC) Work Plan, which was submitted for review in September 2017. The IC Work Plan was reviewed by EPA and an independent contractor hired by EPA. The IC Work Plan is currently under revision to conform with the format outlined in the EPA guidance document *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: URP-QAPP Manual,* EPA-505-B-04-900A, March 2005.

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

- Surface water monitoring
- Groundwater monitoring
- Data management
- IMP inspections
- Contaminated liquid and solid waste handling
- Erosion monitoring
- Custodial care activities

The following IMP Work Plan obligations have been suspended:

- Initial Remedial Phase (IRP) cap maintenance
- Subsidence monitoring and surveying

3.0 Surface Water Monitoring

Tritium is the indicator isotope used to evaluate the release of contamination at the MFDS. No surface water annual average activity exceeded specified screening levels in 2017. Tritium activity levels for all surface water samples appear in Appendix A: *2017 MFDS Data.xlsx*

3.1 East Detention Basin

A sequential sampler connected to a rain gauge is programmed to collect samples at 0.11 inches per hour rainfall rate, which is the divided hourly equivalent of a two-year storm event, or 2.8 inches of rainfall in 24 hours. In 2017, 19 rain event samples were collected for tritium analysis. The tritium activity ranged from -0.14 to 1.42 pCi/mL. Figure 3-1 provides the annual average tritium activity data for 2013-2017.

As a result of Final Cap construction, disposal area rainfall runoff is no longer channeled primarily to the EDB. The resultant post-precipitation detention and discharge volume at the EDB has been dramatically reduced. No pre-FCP storm event produced discharge rates that exceeded predevelopment flow, therefore, IMP mandated two-year storm event flow rate comparison calculations will no longer be performed for EDB discharge.

3.2 Perennial Surface Water

Perennial Surface Water (PSW) is monitored at five locations in three streams influenced by surface water runoff from the MFDS. These locations are monitored using sequential samplers that collect a four aliquot daily composite. The PSW samples are compared to an action level of 20 pCi/mL and a screening level of 10 pCi/mL. During 2017, 1,756 PSW samples were collected for tritium analysis with no anomalous data reported. All PSW location averages were below the screening level of 10 pCi/mL. Figure 3-1 provides the annual average tritium activity for 2013-2017.

Sample location 122A is the source for environmental background samples. It is located on Rock Lick Creek upstream from the No Name Branch confluence. During 2017, 340 samples were collected at this location for tritium analysis. The activity ranged from -0.25 to 0.66 pCi/mL.

Sample location 106 is located on No Name Branch. No Name Branch receives effluent from the EDB and surface water influence from seeps within the East Drainage Channel. During 2017, 353 samples were collected from this location for tritium analysis. The activity ranged from 0.37 to 6.39 pCi/mL.

Sample location 122C is located on Rock Lick Creek, downstream of the confluences of No Name Branch and the South Drainage Channel, but upstream of the confluence with Drip Springs Creek. Location 122C is representative of the activity associated with the East and South drainage channels at the site. During 2017, 347 samples were collected from this location for tritium analysis. The activity ranged from -0.04 to 1.32 pCi/mL.

Sample location 103E is located on Drip Springs Creek downstream from the West Drainage Channel and sample location 107C. During 2017, 354 samples were collected from this location for tritium analysis. The activity ranged from -0.59 to 1.56 pCi/mL.

Sample location 102D is located on Rock Lick Creek at KY 158, downstream of the convergence of all surface water runoff from the MFDS and is the designated EPA compliance point. During 2017, 362 samples were collected from this location for tritium analysis. The activity ranged from -0.02 to 1.07 pCi/mL. The 2017 annual average at 102D was 0.36 pCi/ml, well below the 10 pCi/ml screening level. In accordance with the IMP Work Plan, the Reasonably Exposed Individual (REI) comparison indicated that the annual average did not exceed the 4 mrem/year dose limit (equivalent to 20 pCi/mL).

3.3 Drainage Channel Water

Drainage Channel Water (DCW) is monitored at the west, south, and east drains, which receive intermittent flow from the FCP cap. These locations are monitored using automated samplers that collect a four aliquot daily composite. The tritium activity at these monitoring locations is compared to a 25 mrem/year Total Effective Dose Equivalent (TEDE) standard, an annual average action level of 100 pCi/mL, and an annual average screening level of 50 pCi/mL. In 2017, 969 samples were collected at the DCW locations for tritium analysis. No location exceeded the 50 pCi/mL annual average screening level. No additional analyses were required. Figure 3-1 provides the annual average tritium concentrations for 2013-2017.

Sample location C107 is located at the base of the West Drain, which discharges into Drip Springs Creek. During 2017, 298 samples were collected from this location for tritium analysis. Activity ranged from 0.19 pCi/mL to 18.06 pCi/mL.

Sample location 143 is located near the base of the South Drain, which discharges into Rock Lick Creek. During 2017, 333 samples were collected from this location for tritium analysis. Activity ranged from -0.19 pCi/mL to 2.52 pCi/mL.

Sample location 144 is located at the base of the East Drain, which discharges into No Name Branch. During 2017, 338 samples were collected from this location for tritium analysis. Activity ranged from 0.98 pCi/mL to 91.66 pCi/mL.

Maxey Flats Disposal Site
Annual Average Tritium Activity (pCi/mL)
2013-2017

		Perennial Surface Water					Drainage Channel Water		
	EDB	**122A**	**106**	**122C**	**103E**	**102D**	**C107**	**143**	**144**
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
2015	0.37	0.07	2.79	0.77	0.39	0.52	8.81	0.03	46.49
2016	0.18	-0.02	4.05	0.61	0.50	0.39	15.86	0.10	55.73
2017	**0.48**	**0.02**	**2.57**	**0.47**	**0.42**	**0.36**	**7.86**	**0.49**	**34.45**

Figure 3-1

3.4 Sampling Equipment Status

A reliable ISCO sampler is in operation at each sampling location. Sampler performance is in accordance with the PSVP, except during events beyond control such as freezing lines, washouts, equipment failure, lack of flow, or power outages. The new samplers purchased at the end of 2016 were installed in early 2017 at the East, South, and West Stormwater Management Features. They are collecting samples on a trial basis as part of the Function and Operation Period.

4.0 Groundwater Monitoring Wells

Groundwater monitoring at the MFDS is conducted via alluvial and perimeter monitoring wells. Fourteen alluvial wells, located in the buffer zone, were installed during the IRP to satisfy the requirements of the Statement of Work (SOW). Monitoring wells located outside the west perimeter of the FCP cap were installed as investigative monitoring points prior to the Consent Decree. The west perimeter wells are maintained for water level monitoring which satisfies an IMP Work Plan requirement and sampled to satisfy the tritium monitoring requirements in the RML. Tritium analysis results for all groundwater samples are contained in Appendix A: *2017 MFDS Data.xlsx.* Water level monitoring tables for alluvial and perimeter wells are contained in Appendix B: *2017 MFDS Alluvial Well Levels* and *2017 MFDS Perimeter Well Levels.xlsx.*

4.1 Alluvial Wells

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 is restricted from public use.

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 2017. A total of 10 samples were collected for tritium analysis with no anomalous data reported. The maximum activity at AW-7 was 5.71 pCi/mL. Comparison of this value to 50 percent of the 20 pCi/mL applicable or relevant and appropriate (ARAR) requirement indicated no additional analyses were required.

4.1.1 Alluvial Well Abandonments

An assessment of the alluvial wells was conducted in 2016 to evaluate their viability for use through Institutional Control. Monitoring wells AW-10 and Alt-1 were damaged during FCP borrow area excavation. Monitoring well AW-13 was exhibiting surface water intrusion. Monitoring well AW-5 had been damaged by a mowing contractor prior to FCP. Due to these deteriorated conditions, it was determined that Alluvial Wells 5, 10, 13, and Alt 1 would be abandoned. Stantec Consulting Services, Inc. completed the abandonments on September 8, 2017. Details for the four abandonments can be found in Appendix B: *MFDS Final Report - 2017 Stantec Well Installations and Abandonments.pdf*

4.1.2 Alluvial Well Installations

Two new alluvial wells were installed to provide samples representative of previous abandonments within the buffer zone alluvium. AW-16 was installed at the base of the west hillside as the replacement for AW-1, which was abandoned to accommodate Stormwater Management Feature 3. AW-17 was installed in the vicinity of the abandonded AW-10, 13, and Alt-1 wells, and will be the replacement for the annual sampling of AW-10. To establish a baseline, AW-16 and AW-17 will be sampled for eight quarters, then AW-16 will be sampled quarterly, and AW-17 will be sampled annually. Stantec Consulting Services, Inc. completed installation and development on September 8, 2017. Tritium results for AW-16 and AW-17 can be found in Appendix A: *2017 MFDS Data.xlsx.* Details for the installations can be found in Appendix B: *MFDS Final Report - 2017 Stantec Well Installations and Abandonments.pdf*

4.2 West Perimeter Monitoring Wells

The west perimeter monitoring wells were measured for water levels quarterly. Monitoring wells N2B and UK-1 were sampled on a semi annual schedule. Monitoring well N2B did not have sufficient volume for sampling in 2017. Monitoring well UK-1 was sampled according to schedule with no anomolous data reported. Tritium results for the west perimeter monitoring wells can be found in Appendix A: *2017 MFDS Data.xlsx.* Water levels can be found in Appendix B: *2017 MFDS West Perimeter Well Levels.xlsx.*

4.2.1 West Perimeter Monitoring Well Installation

One new west perimeter monitoring well was installed to provide a representative sample for the wells removed during FCP. Monitoring well FCP-1 was initially dry, but produced sufficient volume for sampling during the December sampling event. To establish a baseline, FCP-1 will be sampled for eight quarters, and will then will be placed on the west perimeter monitoring well semi-annual sampling schedule. Tritium results for FCP-1 can be found in Appendix A: *2017 MFDS Data.xlsx.* Details for the installation can be found in Appendix B: *MFDS Final Report - 2017 Stantec Well Installations and Abandonments.pdf*

5.0 Data Management

Data is organized into discrete packages for all samples collected and analyzed at the MFDS. Data packages contain the instrument quality control (QC) charts, chain of custody forms, raw data sheets, and data reduction sheets. Advanced Technologies and Laboratories (ATL), is contracted by the Commonwealth to perform third party data validation. Throughout 2017, ATL found the calculation of selected MDA and sample concentration values were in agreement with the recorded values, daily instrument performance checks indicated acceptable operation, trip blanks did not contain detectable activity, split sample analyses were within accepted limits, chain of custody forms and other paperwork were correctly completed and legible, contamination and direct radiation levels at site facilities continued to be negligible, and tritium concentrations in water samples were well within the established limits. Following validation, data was entered into the MFDS electronic database and transmitted to EPA, United States Department of Energy (DOE), and multiple organizations within the Commonwealth. All 2017 MFDS data is available on site for review.

6.0 Rainfall Data

There are three rain gauge locations associated with the MFDS. They are located at the East Detention Basin (EDB), sampling location 102D, and the main office. The official annual rainfall data for the MFDS is collected at the EDB rain gauge. The main office rain gauge is used for official rainfall totals in the event of an EDB rain gauge malfunction or faliure. The data from the rain gauge at 102D is collected and maintained exclusively by the USGS. The measured rainfall at the EDB gauge during 2017 was 44.37 inches. This can be compared to the 20th century Kentucky Climate Division 4 average of 46.90 inches, as reported by the NOAA National Climatic Data Center. Annual precipitation data appears in Appendix A: *2017 MFDS Data.xlsx.*

7.0 IMP Inspections

There were 95 modified inspections performed in 2017 to the areas unaffected by FCP construction.

8.0 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.

Solid and liquid waste generated from laboratory, radiological, and maintenance activities is securely stored in the on-site Radiological Laboratory. All radiological waste is transferred to 55 gallon drums to accumulate until space restraints require contracted, off-site disposal. Approximately four 55 gallon drums of accumulated waste was held in storage during 2017.

The Annual Low Level Radioactive Waste Report is included in Appendix C: *2017 MFDS LLRW Report.pdf*.

9.0 Erosion Monitoring

Curd Surveying & Land Consulting was contracted to complete spring and fall erosion monitoring and produce a cross-sectional profile of the East Drain using IMP (Shaw) methodology. The 2017 East Drain erosion measurements are presented in Appendix D.

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 erosion concerns in the East and South Drains. A 3.19 inch, 24 hour storm event in June resulted in unsatisfactory erosion conditions in the West Drain.

An evaluation of the physical conditions and 5 Year Review erosion monitoring data resulted in the Commonwealth contracting The Walker Company (TWC) to install rip rap in the eroded sections of the drain. This corrective action resulted in satisfactory conditions for the remainder of 2017, which included a 2.91 inch, 24 hour storm event in October. The Commonwealth is currently in the design phase of constructing a detention basin to further reduce erosive forces in the West Drain.

Following a 4.2 inch, 24 hour storm event or greater, the Commonwealth must conduct visual inspections of east drainage channel and report findings. No 4.2 inch, 24 hour storm event inspections were performed in 2017.

10.0 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 2017.

11.0 Custodial Care Activities

11.1 Vegetation

All vegetation was maintained at required height limits in accordance with IMP Work Plan requirements.

11.2 Building and Grounds Maintenance

All routine building and grounds maintenance was performed according to IMP Work Plan requirements.

11.3 Security Fence

The office complex and disposal area are now enclosed in the same fenced area, with gates at the main entrance, west and east borders, and cap access gates at the southwest corner and east detention pond. New signage was posted every 200 feet. Solar street lamps were installed at 250-300 feet intervals around the security fence and a solar powered pan tilt zoom security camera was installed at the apex of the FCP cap to increase surveillance of the controlled area.

11.4 Roadway Maintenance

Tasks pertaining to routine road maintenance were minimized because of the cap construction. The road around the disposal area was improved to asphalt and concrete as part of the FCP cap perimeter drainage system. The entry road and parking lot were also resurfaced after the FCP cap was completed. The Walker Company (TWC) built, improved, and maintained all roads in the buffer zone for borrow hauling. All access roads in the buffer zone were graded and graveled before TWC demobilized for the winter and were in good condition throughout 2017.

12.0 Other Activities and Developments

The Walker Company filed and achieved FCP construction completion in September, 2017. The vegetative cap was limed and fertilized before the growing season ended resulting in minimal surface erosion.

The landslides above Borrow Area 4 are being monitored visually until a comprehensive monitoring plan can be developed. Movement in the slide area has slowed dramatically since the last repair.

13.0 Conclusion

This concludes the textual outlining of the IMP activities at the MFDS for 2017. If copies of inspections or deliverables not included in this report are required, please contact the MFDS office.