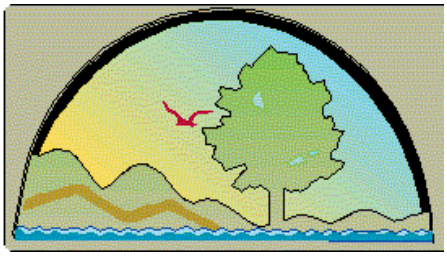
MAXEY FLATS DISPOSAL SITE
ANNUAL REPORT
2019

March 12, 2019



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
ATL	Advanced Technologies and Laboratories
AW	Alluvial Well
BoRP	Balance of Remedial Phase
Commonwealth	Commonwealth of Kentucky
DOE	Department of Energy
DCW	Drainage Channel Water
EDB	East Detention Basin
EPA	Environmental Protection Agency
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
REI	Reasonably Exposed Individual
RML	Radioactive Material License
SOW	Statement of Work
SWMF	Storm Water Management Feature
TEDE	Total Effective Dose Equivalent
USGS	United States Geological Survey

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List of Appendices

Included electronically

Appendix A **Maxey Flats Disposal Site Analytical Data 2019**
2019 MFDS Tritium Data.xlsx

Appendix B **Maxey Flats Disposal Site Well Conditions 2019**
2019 MFDS Alluvial Well Levels.xlsx
2019 MFDS West Perimeter Well Levels.xlsx

Appendix C **Maxey Flats Disposal Site Compliance Information 2019**
2019 MFDS LLRW Report.pdf
MFDS RML No71 2018_2019.pdf
MFDS RML No72 2019_2020.pdf

Appendix D **Maxey Flats Disposal Site Erosion Monitoring 2019**

Not included: pending delivery of report from contracted surveyor

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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

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 final vegetative cap at the Maxey Flats Disposal Site (MFDS) was competed in 2017. EPA approval of the MFDS Final Closure Period Remedial Action Construction Report dated April 2018 concluded obligations of the Settling Parties and the Balance of Remedial Phase (BoRP) became the sole responsibility of the Commonwealth. A period of function and operation was initiated upon certification of Substantial Completion of the Final Closure Period (FCP) cap construction to evaluate new site conditions and develop the Institutional Control (IC) Work Plan as described in the Record of Decision (ROD). The function and operation period extended throughout 2019 as the IC Work Plan review, revision, and submission continued. Institutional Control site maintenance and relevant IMP monitoring activities continue until the EPA approves the IC Work Plan.

The following IMP Work Plan requirements were continued during the function and operation period:

- 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 currently used to evaluate the release of contamination at the MFDS. The site laboratory is specifically designed to detect low tritium concentrations in water. No surface water annual average activity exceeded specified screening levels in 2019. Tritium activity levels for all surface water samples appear in Appendix A: *2019 MFDS Tritium 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 2019, 23 rain event samples were collected and analyzed. The tritium activity ranged from 0.09 to 2.18 pCi/mL. Figure 1 provides the annual average tritium activity data for 2015-2019.

As a result of the vegetative cap construction, the post-precipitation detention and discharge volume at the EDB was significantly reduced compared to IRP calculations. The reduction in discharge volume is a result of channeling 40 percent of the surface water runoff to the south and west drains, percolation through the soil, and vegetative transpiration. Annual discharge at the EDB was approximately 80 million cubic feet in 2014, after cap completion in 2018, the discharge was 10.5 million cubic feet. This is an 87 percent reduction in the volume of water released to the East Drainage Channel and that trend continued 2019 as the discharge was 21 million cubic feet in 2019. No IMP storm event produced discharge rates that exceeded predevelopment flow, therefore, IMP mandated storm event flow rate comparison calculations are no longer necessary at the EDB discharge and will no longer be performed.

3.2 Perennial Surface Water

Perennial Surface Water (PSW) is monitored at five locations in three streams that receive surface water runoff from the MFDS. These locations are monitored using composite samplers that collect four aliquots daily. The PSW sample results are compared the drinking water standard of 20 pCi/mL. A 10 pCi/mL screening level was established to evaluate the annual average activity at each location. During 2019, 1,763 PSW samples were collected for tritium analysis with no anomalous data reported. The annual average tritium activity at all five sampling locations were below the screening level of 10 pCi/mL. Figure 1 provides the annual average tritium activity for 2015-2019.

Sample location 122A is the environmental background for tritium activity at MFDS. It is located on Rock Lick Creek upstream from the confluence with No Name Branch, and receives no surface water flow from the MFDS. During 2019, 359 samples were collected at this location for tritium analysis. The activity ranged from -0.84 to 0.30 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 above the East Drainage Channel. During 2019, 353 samples were collected from this location for tritium analysis. The activity ranged from 0.54 to 9.67 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 related to the East and South drainage channels. During 2019, 358 samples were collected from this location for tritium analysis. The activity ranged from -0.35 to 2.10 pCi/mL.

Sample location 103E is located on Drip Springs Creek downstream from the West Drainage Channel and sample location 107C. During 2019, 357 samples were collected from this location for tritium analysis. The activity ranged from -0.46 to 2.44 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 2019, 336 samples were collected from this location for tritium analysis. The activity ranged from -0.65 to 1.30 pCi/mL. The 2019 annual average at 102D was 0.37 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 in the west, south, and east drainage systems, which receive intermittent surface water flow from the vegetative cap. These locations are sampled using automated samplers that collect a four aliquot daily composite. The tritium activity at these monitoring locations is compared to the 25 mrem/year Total Effective Dose Equivalent (TEDE) standard, an annual average screening level of 50 pCi/mL , and an annual average action level of 100 pCi/mL. In 2019, 1017 samples were collected at the DCW locations for tritium analysis. No location exceeded the 50 pCi/mL annual average screening level, therefore no additional analyses were required. Figure 1 provides the annual average tritium concentrations for 2015-2019.

Sample location C107 is located near the base of the West Drainage Channel above Storm Water Management Feature (SWMF) 3 and the confluence with Drip Springs Creek. During 2019, 327 samples were collected from this location for tritium analysis. Activity ranged from 1.26 pCi/mL to 44.52 pCi/mL.

Sample location 143 is located near the base of the South Drainage Channel above SWMF 2 and the confluence with Rock Lick Creek. During 2019, 339 samples were collected from this location for tritium analysis. Activity ranged from -0.22 pCi/mL to 8.58 pCi/mL.

Sample location 144 is located in the East Drainage Channel approximately 100 yards above the discharge into No Name Branch. During 2019, 351 samples were collected from this location for tritium analysis. Activity ranged from 1.89 pCi/mL to 112.39 pCi/mL.

Maxey Flats Disposal Site
Annual Average Tritium Activity (pCi/mL)
2015-2019

		Perennial Surface Water					Drainage Channel Water		
	EDB	**122A**	**106**	**122C**	**103E**	**102D**	**C107**	**143**	**144**
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
2018	0.92	0.02	2.58	0.49	0.52	0.39	8.81	0.68	29.33
2019	**1.69**	**-0.04**	**2.91**	**0.50**	**0.67**	**0.37**	**16.07**	**1.11**	**37.03**

Figure 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, but do not collect samples during events beyond control such as freezing lines, washouts, equipment failure, lack of flow, or power outages. The “beyond control” events are documented in the sampling log and in the database for reference. The SWMF monitoring equipment is functional and data from this monitoring equipment was assessed periodically throughout 2019. Adjustments to flow calculations, sampling intervals, and programing were made as necessary in preparation for Institutional Control monitoring.

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). These wells were evaluated in 2017, resulting in the closure of four wells and the installation of two new wells. Monitoring wells located outside the west perimeter

of the FCP cap were installed as investigative monitoring points prior to the Consent Decree. Cap construction resulted in the closure of all but four of the perimeter wells and the installation of one new perimeter well. The west perimeter wells are maintained for water level monitoring, a requirement of the IMP Work Plan, and the wells are sampled to satisfy a tritium monitoring requirement in the Radioactive Materials License (RML). Tritium analysis results for all groundwater samples are contained in Appendix A: *2019 MFDS Tritium Data.xlsx.* Water level monitoring tables for alluvial and perimeter wells are contained in Appendix B: *2019 MFDS Alluvial Well Levels* and *2019 MFDS Perimeter Well Levels.xlsx.*

4.1 Alluvial Wells

The Commonwealth has restricted public access in the buffer zone by removing the county road right-of-way through the buffer zone and installing a secure gate at the property boundary. Daily surveillance at the site further precludes lengthy public occupancy. Therefore, the alluvial wells are not considered a drinking water source and do not represent a potential radiological dose to the public.

Alluvial well (AW) samples were collected for tritium analysis as outlined in the IMP PSVP and the 2007 EPA Five Year Review sampling amendment. Tritium analysis of the fourteen samples collected from five different wells was consistent with historical data. This data is presented in Figure 2. The maximum sample activity was 3.24 pCi/mL from the 3rd quarter sample at AW-7. Comparison of this maximum value to 50 percent of the 20 pCi/mL applicable or relevant and appropriate (ARAR) requirement indicated no additional analyses were required.

2019 Alluvial Well Tritium Activity

Location	Date	Activity (pCi/ml)	Error +/-	MDA	Comment
AW-6	12/4/19	-0.06	0.10	0.34	
AW-7	3/28/19	3.03	0.15	0.35	
	6/28/19	2.46	0.14	0.32	
	9/30/19	3.24	0.15	0.33	
	12/5/19	2.45	0.14	0.34	
AW-12	12/4/19	-0.01	0.10	0.34	
AW-16	3/28/19	-0.01	0.11	0.35	
	6/28/19	0.16	0.10	0.32	
	9/30/19	0.32	0.11	0.33	
	12/4/19	0.06	0.10	0.34	
AW-17	3/28/19	0.24	0.11	0.35	Sampled for 8 Qtrs to establish baseline, annually starting Dec. 2019
	6/28/19	0.12	0.10	0.32	
	12/4/19	0.01	0.10	0.34	

Figure 2

4.2 West Perimeter Monitoring Wells

Water levels in the west perimeter monitoring wells were measured quarterly in 2019. Levels were characteristic of recent data, including the near dry condition of N2B. The 2019 perimeter monitoring well water level measurements are presented in Figure 3. Historical measurements are retained in Appendix B: *2019 MFDS West Perimeter Well Levels.xlsx* for comparative evaluation. Monitoring wells N2B and UK-1 were sampled on a semiannual schedule. Monitoring well FCP-1 was sampled quarterly to establish baseline conditions. Monitoring well N2B did not have sufficient volume for sampling in 2019, UK-1 did not have sufficient volume for sampling in December and FCP-1 were sampled as scheduled. Tritium analysis results for the west perimeter monitoring wells can be found in Appendix A: *2019 MFDS Tritium Data.xlsx.*

2019 West Perimeter Monitoring Well Measurements

Well ID	Ground Elevation* (ft)	Ground to Water (ft) 3/27/19	Ground to Water (ft) 6/27/19	Ground to Water (ft) 9/30/19	Ground to Water (ft) 12/12/19
ESI-2	1047.50	**9.09**	**11.79**	**11.91**	**12.13**
ESI-4	1048.00	**12.47**	**12.51**	**12.54**	**13.07**
N2B	1044.50	**12.48**	**12.37**	**12.73**	**12.98**
UK-1	1046.10	**9.18**	**9.22**	**9.21**	**9.29**
FCP-1	1040.00	**10.64**	**10.68**	**10.68**	**11.27**

* IMP Work Plan, As-Built Table AB-12

Figure 3

5.0 Data Management

Data is organized into discrete packages for all samples collected and analyzed at the MFDS. Data packages contain cover page including signatures, raw data sheets, reduced data sheets, instrument quality control (QC) charts, and chain of custody forms. Advanced Technologies and Laboratories (ATL) is contracted by the Commonwealth to perform third party data validation. Throughout 2019, 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 the EPA, the Department of Energy (DOE), and multiple organizations within the Commonwealth. All 2019 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 failure. The data from the rain gauge at 102D is collected and maintained exclusively by the USGS and serves as a reference to site data. The measured rainfall at the EDB gauge during 2019 was 54.21 inches. This is 7.3 inches more than the 20th century Kentucky Climate Division 4 average of 46.90 inches, as reported by the NOAA National Climatic Data Center. Because environmental tritium activity and trending is indelibly linked to rainfall, the annual precipitation data appears along with tritium data in Appendix A: *2019 MFDS Tritium Data.xlsx.*

7.0 IMP Inspections

There were 95 modified inspections performed in 2019 to the areas unaffected by FCP construction.

8.0 Contaminated Liquid and Solid Waste

Contaminated liquid and waste generated on site was 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 off-site disposal.

9.0 Erosion Monitoring

Curd Surveying & Land Consulting has conducted the spring erosion monitoring using the IMP Shaw methodology for the previous ten years. Personnel issues within this company forced MFDS to find another surveyor to perform the Shaw erosion monitoring. It took a considerable amount of time to find a survey contractor with an expertise in environmental data collection. Dyer and Associates performed the erosion monitoring, subsidence survey, and the mass land movement survey in December, but have not provided a report to date. The results will be added to this report when it is received.

Seasonal visual erosion monitoring of the east, south, and west drainage channels was completed in compliance with IMP Work Plan requirements. The spring inspection revealed excessive erosion at the top of the West Drain. It seemed to be related to the surface water from the paved and graveled areas of the office complex, also directed to that drain. Large stones and rip rap were placed in the eroded areas to absorb the energy of the flow, very similar to the repairs made by The Walker Company in 2017.

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 2019.

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 2019.

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 in accordance with 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. Signage is posted every 200 feet. Solar street lamps line the perimeter fence at 250-300 feet intervals and a solar powered pan tilt zoom security camera at the apex of the FCP cap increases surveillance within the controlled area.

11.4 Roadway Maintenance

The entry road, parking lot, and asphalt sections of the perimeter road were asphalt sealed in October and are in good condition. The hual road and graveled roads in the buffer zone were graded and maintained by the MFDS staff regularly.The T-rail system installed in January along the edge of the haul road adjacent to the slope failure has secured the haul road.

12.0 Other Activities and Developments

The vegetative cap perfomed satisfactorily in 2019. Surface erosion was minimal, as sediment from the cap is not being transported to the drainage systems. Discharge at the three drainage channels remained clear despite heavy precipitation. The entire cap was broadcast with pelletized lime in April and a fall fertilizer, grass seed mixture was broadcast in October. The effects of these soil improvements will be evaluated spring 2020.

The monuments installed above the landslide area in 2017 were surveyed in December. The results are not available at this time, but will be compared to the baseline latitude, longitude, and elevation collected in 2018. These parameters are a means of detecting hillside movement near the vegetative cap. The monuments were visually inspected quarterly as defined in the IC Work Plan as a means of detecting castophic movement. The quarterly inspections revealed no observable movement at the monuments. A comprehensive monitoring plan is outlined in the IC Work Plan.

13.0 Conclusion

A review of all data collected to evaluate current site performance revealed results below defined screening levels for all IMP monitoring requirements, and no action levels were triggered. The current monitoring activities will continue until the IC Work Plan is approved. New site requirements will be defined in the IC Work Plan including monitoring criteria, screening levels, and action levels. If copies of inspections or deliverables not included in this report are required, please contact the MFDS office.