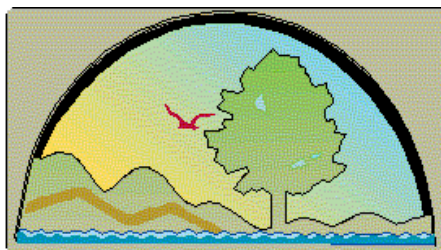


MAXEY FLATS DISPOSAL SITE ANNUAL REPORT 2018

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	Stormwater Management Feature
TEDE	Total Effective Dose Equivalent
USGS	United States Geological Survey

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Appendix A	Maxey Flats Disposal Site Data 2018 <i>2018 MFDS Tritium Data.xlsx</i>
Appendix B	Maxey Flats Disposal Site Well Conditions 2018 <i>2018 MFDS Alluvial Well Levels.xlsx</i> <i>2018 MFDS West Perimeter Well Levels.xlsx</i>
Appendix C	Maxey Flats Disposal Site Compliance Information 2018 <i>2018 MFDS Waste Disposal - LSV.pdf</i> <i>MFDS 2018 LLW Report.pdf</i> <i>MFDS RML No70 AE 2018_2019.pdf</i>
Appendix D	Maxey Flats Disposal Site Erosion Monitoring 2018 <i>2018 MFDS East Drain Cross Section Areas.xls</i> <i>2018 MFDS East Drain Spring Erosion Monitoring.pdf</i>

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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 completed in 2017. The Balance of Remedial Phase (BoRP) is the full 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 the new site conditions and develop the Institutional Control (IC) Work Plan as described in the Record of Decision (ROD). Relevant IMP monitoring activities will continue until the EPA approves the IC Work Plan. The IC Work Plan was revised during 2018 to conform with EPA guidance document *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: URP-QAPP Manual*, EPA-505-B-04-900A, March 2005. The revised plan was submitted to EPA on August 7, 2018, and was under review for the remainder of the year.

The following IMP Work Plan obligations will continue 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 current indicator isotope used to evaluate the release of contamination at the MFDS. No surface water annual average activity exceeded specified screening levels in 2018. Tritium activity levels for all surface water samples appear in Appendix A: *2018 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 2018, 23 rain event samples were collected for tritium analysis. The tritium activity ranged from 0.09 to 2.18 pCi/mL. Figure 1 provides the annual average tritium activity data for 2014-2018.

As a result of the vegetative cap construction, the post-precipitation detention and discharge volume at the EDB has been greatly reduced from the 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 transpiration by the vegetation. Annual discharge at the EDB was approximately 80 million cubic feet in 2014 and about 10.5 million cubic feet in 2018. This is an 87 percent reduction in the volume of water released to the East Drainage Channel. No IMP storm event produced discharge rates that exceeded predevelopment flow, therefore, IMP mandated storm event flow rate comparison calculations are no longer necessary for EDB discharge, and will no longer be performed for this location.

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 samples are compared to a screening level of 10 pCi/mL, and an action level of 20 pCi/mL. During 2018, 1,721 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 2014-2018.

Sample location 122A is the environmental background for tritium activity for the Maxey Flats area. 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 2018, 348 samples were collected at this location for tritium analysis. The activity ranged from -0.53 to 0.76 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 2018, 346 samples were collected from this location for tritium analysis. The activity ranged from 0.58 to 9.30 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 2018, 334 samples were collected from this location for tritium analysis. The activity ranged from 0.06 to 1.00 pCi/mL.

Sample location 103E is located on Drip Springs Creek downstream from the West Drainage Channel and sample location 107C. During 2018, 350 samples were collected from this location for tritium analysis. The activity ranged from 0.03 to 1.39 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 2018, 343 samples were collected from this location for tritium analysis. The activity ranged from -0.06 to 0.94 pCi/mL. The 2018 annual average at 102D was 0.39 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 that 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 2018, 989 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 2014-2018.

Sample location C107 is located near the base of the West Drainage Channel above Stormwater Management Feaure (SWMF) 3 and the confluence with Drip Springs Creek. During 2018, 310 samples were collected from this location for tritium analysis. Activity ranged from 0.92 pCi/mL to 21.24 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 2018, 334 samples were collected from this location for tritium analysis. Activity ranged from -0.14 pCi/mL to 3.56 pCi/mL.

Sample location 144 is located in the East Drainage Channel approximately 100 yards above the discharge into No Name Branch. During 2018, 345 samples were collected from this location for tritium analysis. Activity ranged from 1.73 pCi/mL to 97.23 pCi/mL.

Maxey Flats Disposal Site
Annual Average Tritium Activity (pCi/mL)
 2014-2018

	Perennial Surface Water						Drainage Channel Water		
	EDB	122A	106	122C	103E	102D	C107	143	144
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
2018	0.92	0.02	2.58	0.49	0.52	0.39	8.81	0.68	29.33

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, except during events beyond control such as freezing lines, washouts, equipment failure, lack of flow, or power outages. The SWMF monitoring equipment is functional and data from this monitoring equipment was assessed periodically throughout 2018. 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: *2018 MFDS Tritium Data.xlsx*. Water level monitoring tables for alluvial and perimeter wells are contained in Appendix B: *2018 MFDS Alluvial Well Levels* and *2018 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 inhabitation. 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 3.45 pCi/mL from the 1st 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.

2018 Alluvial Well Tritium Activity

Location	Date	Activity (pCi/ml)	Error +/-	MDA	Frequency
AW-6	12/11/18	0.24	0.11	0.34	Annual
AW-7	4/3/18	3.45	0.16	0.35	Quarterly
	6/19/18	3.73	0.16	0.32	
	9/28/18	3.05	0.15	0.33	
	12/1/18	2.68	0.15	0.34	
AW-12	12/11/18	0.14	0.10	0.34	Annual
AW-16	4/3/18	0.24	0.11	0.35	Quarterly to establish baseline, then quarterly
	6/19/18	0.29	0.10	0.32	
	9/28/18	0.34	0.11	0.33	
	12/11/18	0.34	0.11	0.34	
AW-17	4/3/18	-0.01	0.11	0.35	Quarterly to establish baseline, then annually
	6/19/18	0.13	0.10	0.32	
	9/28/18	-0.02	0.10	0.33	
	12/11/18	0.15	0.10	0.34	

Figure 2

4.2 West Perimeter Monitoring Wells

Water levels in the west perimeter monitoring wells were measured quarterly in 2018. Levels were characteristic of recent data, including the near dry condition of N2B. The 2018 perimeter monitoring well water level measurements are presented in Figure 3. Historical measurements are retained in Appendix B: *2018 MFDS West Perimeter Well Levels.xlsx* for comparative evaluation. Monitoring wells N2B and UK-1 were sampled on a semi annual schedule. Monitoring well FCP-1 was sampled quarterly to establish baseline conditions. Monitoring well N2B did not have sufficient volume for sampling in 2018. Monitoring well UK-1 and FCP-1 were sampled according to schedule. Tritium analysis results for the west perimeter monitoring wells can be found in Appendix A: *2018 MFDS Tritium Data.xlsx*.

2018 West Perimeter Monitoring Well Measurements

Well ID	Ground Elevation* (ft)	Ground to Water (ft) 4/02/18	Ground to Water (ft) 7/03/18	Ground to Water (ft) 9/28/18	Ground to Water (ft) 12/19/18
ESI-2	1047.50	9.73	11.85	11.49	8.50
ESI-4	1048.00	12.39	12.50	12.41	12.46
N2B	1044.50	9.13	9.22	9.18	9.10
UK-1	1046.10	10.60	10.69	10.68	10.61
FCP-1	1040.00	12.65	12.64	12.68	12.85

* 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 2018, 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 2018 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. The measured rainfall at the EDB gauge during 2018 was 57.68 inches. Compared to the 20th century Kentucky Climate Division 4 average of 46.90 inches, as reported by the NOAA National Climatic Data Center, precipitation at the site was well above normal. Because environmental tritium activity and trending is indelibly linked to rainfall, the annual precipitation data appears along with tritium data in Appendix A: *2018 MFDS Tritium Data.xlsx*.

7.0 IMP Inspections

There were 95 modified inspections performed in 2018 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 contracted, off-site disposal. Bionomics, Inc. was contracted by the Commonwealth in November of 2018 to courier and broker the disposal of five 55 gallon drums of accumulated liquid scintillation waste. Bionomics, Inc. transported the drums to Perma-Fix of Florida, Inc. The contents of the drums were incinerated in accordance with the radiological materials license of Perma-Fix of Florida, Inc. . All documentation of this disposal is included in Appendix C: *2018 MFDS Waste Disposal.pdf*. The site's Annual Low Level Waste Report is also included in Appendix C: *2018 MFDS LLW Report.pdf*.

9.0 Erosion Monitoring

Curd Surveying & Land Consulting was contracted to conduct the spring erosion monitoring using the IMP Shaw methodology. The data collected was used to produce profiles and area calculations of the eight East Drainage Channel cross-sections. The 2018 East Drainage Channel erosion data is 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. The rip rap armor installed in the west drain in 2017 has minimized the erosion in that drain. Frequent visual inspection following heavy rains revealed an observable decrease in the accumulation of debris at the base of the drain and soil scouring throughout the drain. The rainfall total for 2018 was twelve inches above normal annual precipitation. Of note was a monthly total of 9 inches, and a 3.74 inch 24 hour storm event, both in September. Because the erosion conditions in the west drain remained satisfactory despite the extraordinary precipitation events, the Commonwealth postponed the construction of a detention basin above the west drain pending further evaluation of of the armorment repair.

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 2018.

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 2018.

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. New signage was posted every 200 feet. Solar street lamps were installed at 250-300 foot 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 and remain in good condition. The haul road and road in the buffer zone were graded and maintained by the MFDS staff. Concern regarding the slope failure below the haul road resulted in collaboration with the Kentucky Department of Transportation for a repair strategy. It was determined that a T-rail system installed along the edge of the haul road adjacent to the failure would secure the road. A contract has been awarded and construction will begin in January 2019.

12.0 Other Activities and Developments

The vegetative cap performed satisfactorily in 2018. 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. An area of the south peak of the cap will require soil augmentation, lime, fertilizer, and overseeding to improve vegetative growth. The process will be documented and conducted as outlined in the IC Operations and Maintenance Manual, when conditions permit, in the spring of 2019.

The landslides above Borrow Area 4 were monitored visually in 2018. Monuments installed above the moving area in 2017 have been surveyed to determine baseline latitude, longitude, and elevation. These parameters will be compared annually as a means of detecting hillside movement near the vegetative cap. The monuments will be visually inspected quarterly as defined in the IC Work Plan to detect catastrophic movement. A comprehensive monitoring plan is outlined in the IC Work Plan.

13.0 Conclusion

A review of all data collected to evaluate current site conditions revealed results below defined screening levels for all IMP monitoring requirements, and no action levels were triggered. The current monitoring requirements 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.