FOURTH FIVE-YEAR REVIEW REPORT FOR MAXEY FLATS DISPOSAL SITE FLEMING COUNTY, KENTUCKY

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Prepared by

U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

Franklin E. Hill, Director
Superfund Division

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
EDB	East Detention Basin
EMDC	East Main Drainage Channel
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
IMP	Interim Maintenance Period
KY DEP	Kentucky Department of Environmental Protection
LR/D	Leachate Removal/Disposal
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MFDS	Maxey Flats Disposal Site
µg/L	Micrograms per Liter
mrem/year	Millirem per Year
N/A	Not Available
NCP	National Contingency Plan
NECO	Nuclear Engineering Company, Inc.
NPL	National Priorities List
NRWQC	National Recommended Water Quality Criteria
O&M	Operation and Maintenance
OU	Operable Unit
pCi/L	PicoCuries per Liter
PRP	Potentially Responsible Party
PVC	Polyvinyl Chloride
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SPP	Settling Private Parties
SWMF	Surface Water Management Feature
TBC	To-Be-Considered
VISL	Vapor Intrusion Screening Level

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) [40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)], and considering EPA policy.

This is the fourth FYR for the Maxey Flats Disposal Site (MFDS or Site). The triggering action for this statutory review is the signature date of the previous FYR report, September 2012. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

The Site consists of a single operational unit (OU) that addresses soil, groundwater, and surface water contamination. The entire OU will be addressed in this FYR.

The FYR was led by the EPA remedial project manager (RPM), Pam Scully, with support from TechLaw, Inc. Participants included Jon Richards from EPA Region 4, Scott Wilburn from Kentucky Department of Environmental Protection (KY DEP), and Curt Pendergrass from Kentucky Radiation Health Branch. Relevant entities were notified of the initiation of the FYR. The review began on February 27, 2017.

Site Background

The MFDS, located in Fleming County, Kentucky, is an inactive low-level radioactive waste site encompassing approximately 770 acres, including an approximately 252-acre disposal tract and an approximately 464-acre buffer zone. The Commonwealth of Kentucky (Commonwealth) owns the disposal Site and surrounding buffer zone.

In 1963, the Commonwealth of Kentucky issued a license to a commercial organization, Nuclear Engineering Company, Inc. (NECO), for the disposal of solid by-product, source, and special nuclear waste at the MFDS. From May 1963 to December 1977, NECO managed and operated the disposal of an estimated 4.75 million cubic feet of low-level radioactive waste at the MFDS.

Environmental monitoring conducted by the Commonwealth in 1972 revealed possible migration of radionuclides from a 45-acre tract designated as the "Restricted Area." A study performed by the Commonwealth in 1974 confirmed that tritium and other radioactive contaminants were migrating out of disposal trenches, and that some radioactive material had migrated into unrestricted areas. In 1977, it was determined that leachate was migrating through the subsurface geology and NECO was ordered to cease the receipt and burial of radioactive waste. In 1986, MFDS was listed on the EPA's National Priorities List (NPL). Notice letters were issued to 832 Potentially Responsible Parties (PRPs) informing them of their potential liability with respect to contamination. In March 1987, 82 PRPs signed an Administrative Order by Consent to perform a Remedial Investigation (RI) and Feasibility Study (FS).

Subsequent to completion of the RI/FS, a Record of Decision (ROD) was signed for the Site on September 30, 1991, documenting the selected remedy for the MFDS. Explanations of Significant Difference (ESDs) were issued for the Site in February 2013 and September 2014.

The land surrounding the Site is primarily mixed woodlands and open farmland. The area is sparsely populated and mostly undeveloped. The few residences in the area use a public water supply system. Future land uses are expected to remain consistent with historical land uses.

Appendix A includes a list of references used for this FYR. Appendix B includes a site chronology. Appendix C includes additional background information about the Site, including site history and physical characteristics. Appendix D includes site figures.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Maxey Flats Disposal Site		
EPA ID: KYD980729107		
Region: 4	**State:** KY	**City/County:** Fleming County
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** No (Construction Completion expected October 2017)	
REVIEW STATUS		
Lead agency: EPA		
Author name: Pam Scully, with support from TechLaw, Inc.		
Author affiliation: EPA, Region 4		
Review period: February 27, 2017 - September 7, 2017		
Date of site inspection: April 25, 2017		
Type of review: Statutory		
Review number: 4		
Triggering action date: September 26, 2012		
Due date *(five years after triggering action date)*: September 2017		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The MFDS has approximately 4.75 million cubic feet of low-level radioactive waste buried onsite. Radionuclides and other chemical (non-radionuclide) contaminants have been detected in groundwater, soil and surface water at the Site. The human health risk assessment (HHRA) indicated that, unless remedial action is taken, exposure to soil, drinking water, surface water, and sediment at and in close proximity to the Site in the future would pose an unacceptable risk to human health, defined as a greater than 1E-04 risk (i.e., one additional case of fatal cancer for every 1,000 persons engaging in the off-site exposure pathways). The HHRA also estimated that the risk from all combined off-site exposure pathways would pose an unacceptable risk to human health. The selected remedy will reduce these risks to 1E-04 or less. The EPA deems a risk of 1E-04 to be generally protective of human health and the environment.

Indicator contaminants, as identified in the 1991 ROD, are listed below in Table 1. Tritium (Hydrogen-3) is the most abundant and most mobile of the indicator contaminants and has, therefore, been identified as the primary contaminant of concern.

Table 1: Indicator Contaminants

Radionuclides	Non-Radionuclides
Hydrogen-3 (Tritium)	Arsenic
Carbon-14	Benzene
Cobalt-60	Bis(2-ethylhexyl)phthalate
Strontium-90	Chlorobenzene
Iodine-129	1, 2-Dichloroethane
Cesium-137	Lead
Radium-226	Nickle
Thorium-232	Toluene
Plutonium-238	Trichloroethylene
Plutonium-239	Vinyl Chloride
Americium-241	

Response Actions

Between 1973 and April 1986, an evaporator was operated at the Site as a means of managing a large volume of water infiltrating the disposal trenches as well as waste water generated by on-site activities. The evaporator processed over 6,000,000 gallons of liquids during its operation, and the evaporator concentrates were disposed of on-site. In addition, in 1981, a polyvinyl chloride (PVC) cover was placed over the disposal trenches as a means of minimizing the infiltration of rainfall into the trenches. Liquid storage tanks remained on-site for future storage of site-generated liquids and emergency trench overflow pumping operations. Those steps, however, were temporary.

In November 1988, the EPA notified the PRPs of an imminent threat to public health, welfare and the environment posed by the potential release of liquids stored in the on-site storage tanks. The threat arose from the presence of eleven 20,000 gallon tanks located in a tank farm building that had been present

on-site for 10 to 15 years, and whose structural integrity was of great concern. The unstable condition of the tanks posed an immediate threat to public health and the environment. The PRPs declined the offer to participate in the removal actions; therefore, on December 19, 1988, the EPA initiated phase one of their removal.

Phase one consisted of the installation of heaters in the tank farm building to prevent the freezing, and subsequent rupturing, of tank valves and fittings which were submerged under water that had infiltrated the tank farm building. Phase one, which was completed in February 1989, also included the installation of additional storage capacity on-site.

Phase two of the removal was initiated by the EPA in June 1989. Phase two began with the solidification of approximately 286,000 gallons of radioactive liquids stored in the eleven tanks and of water that had accumulated on the floor of the tank farm building. Solidification activities were completed in November 1989, and resulted in the generation of 216 blocks of solidified tank and tank floor liquids. Burial of these blocks on-site, which were stored on-site and above-ground, was initiated in August 1991.

In March 1987, 82 PRPs signed an Administrative Order by Consent to perform a RI/FS. The RI Report for the MFDS was approved by the EPA in July 1989. The FS for the MFDS was finalized and submitted to the public in May 1991. A ROD was signed for the Site on September 30, 1991, documenting the selected remedy for the MFDS.

The remedial action objectives (RAOs) presented in the ROD are as follows:

- Minimize the infiltration of rainwater and groundwater into the trench areas and migration from the trenches;
- Stabilize the Site such that an engineered cap that will require minimal care and maintenance over the long-term can be placed over the trench disposal area;
- Minimize the mobility of trench contaminants by extracting trench leachate, to the extent practicable;
- Promote Site drainage and minimize potential for erosion to protect against natural degradation;
- Implement institutional controls to permanently prevent unrestricted use of the Site; and,
- Implement a Site performance and environmental monitoring program.

The first and second ROD RAOs were subsequently expanded in the Administrative Order by Consent Statement of Work to include the following components:

- Prevent or mitigate the continued release of hazardous substances, pollutants and contaminants from the Site to underlying bedrock formations and groundwater aquifers;
- Prevent or mitigate the continued release of hazardous substances, pollutants and contaminants from the Site to surface water bodies and sediments;
- Reduce the risks to human health associated with direct contact with hazardous substances, pollutants or contaminants within the Site;
- Eliminate or reduce the risks to human health from inhalation of hazardous substances, pollutants or contaminants from the Site;
- Eliminate or minimize the threat posed to human health and the environment from current and potential migration of hazardous substances from the Site in the surface water, groundwater, and subsurface and surface soil and rock;

- Minimize the infiltration of rainwater and groundwater into the trench areas and migration from the trenches; and,
- Allow natural stabilization of the Site to provide a foundation for a final cap over the trench disposal area that will require minimal care and maintenance over the long term.

The remedy selected at the MFDS is natural stabilization, which will allow the materials in the trenches to subside naturally to a stable condition prior to installation of a final engineered cap. The major components of the selected remedy include the following:

- Excavation of additional on-site disposal trenches for disposal of Site debris and solidified leachate;
- Demolition and on-site disposal of Site structures;
- Extraction, solidification, and on-site disposal of approximately three million gallons of trench leachate;
- Installation of an initial cap consisting of clay and a synthetic liner;
- Re-contouring of capped disposal area to enhance management of surface water run-on and runoff;
- Installation of a groundwater flow barrier, if necessary;
- Installation of an infiltration monitoring system to continuously verify remedy performance and detect the accumulation of leachate in disposal trenches;
- Monitoring of groundwater, surface water, air, selected environmental indicators, and rates of subsidence;
- Procurement of a buffer zone adjacent to the existing Site property boundary, estimated to range from 200 to 400 acres, for the purposes of preventing deforestation of the hillslopes or other activities which would accelerate hillslope erosion and affect the integrity of the selected remedy, and providing frequent and unrestricted access to areas adjacent to the Site to allow monitoring;
- Installation of a multi-layer engineered soil cap with synthetic liner after natural subsidence process is complete;
- Five-year reviews to evaluate the protectiveness of the remedy and to ensure the selected remedy is achieving the necessary remedial action objectives; and,
- Institutional controls to restrict the use of the MFDS and to ensure monitoring and maintenance in perpetuity.

Applicable or Relevant and Appropriate Requirements (ARARs) for groundwater and surface water contaminants of concern (COCs) (for both chemical and radiological contaminants) are listed below and evaluated further in Section V (Technical Assessment).

Table 2: Groundwater COC ARARs

COC	1991 ROD ARAR (in µg/L unless noted)
Arsenic	50
Benzene	5
Bis(2-ethylhexyl)phthalate	4
Chlorobenzene	100
Chloroform (trihalomethanes)	100
1,2-Dichloroethane	5
Lead	50
Nickel	100
Toluene	1000
Trichloroethene	5
Vinyl Chloride	2
Radionuclides	
Beta particle and photon radioactivity	4 mrem/year
Gross alpha particles	15 pCi/L
Radium-226 and Radium-228 (total)	5 pCi/L

µg/L = micrograms per Liter
mrem/year = millirems per year
pCi/L = picoCuries per Liter
N/A = Not available

Table 3: Surface Water COC ARARs (Chemical Contaminants)

COC	1991 ROD ARAR (Human Health – Fish Consumption) (µg/L)	1991 ROD ARAR (Aquatic Life – Chronic) (µg/L)	1991 ROD ARAR (Aquatic Life – Acute) (µg/L)
Arsenic	0.175	N/A	N/A
Benzene	400	N/A	5,300
Bis(2-ethylhexyl)phthalate	N/A	3	940
Chlorobenzene	488	50	250
Chloroform (trihalomethanes)	157	1,240	28,900
1,2-Dichloroethane	2,430	20,000	118,000
Lead	N/A	3.2	82
Nickel	100	160	1400
Toluene	424,000	160	17,500
Trichloroethene	807	21,900	45,000
Vinyl Chloride	5,246	N/A	N/A

µg/L = micrograms per Liter

Table 4: Surface Water COC ARARs (Radiological Contaminants)

COC	1991 ROD ARAR (in pCi/mL unless noted)*
Total whole body exposure (all media)	25 mrem/year
Americium-241	0.02
Carbon-14	30
Cesium-137	1
Cobalt-60	3
Hydrogen-3 (Tritium)	1,000
Iodine-129	0.2
Plutonium-238	0.02
Plutonium-239	0.02
Radium-226	0.06
Strontium-90	0.5
Technetium-99	60

*It is noted that these values are inconsistent with those listed in Table A-1, Applicable Action-Specific and Contaminant-Specific Requirements for Remedial Alternatives at Maxey Flats. However, according to Section 8.2, Contaminant-Specific ARARs, of the ROD, "The federal standards were lowered in May 1991 so as to limit the allowable dose in unrestricted areas to 100 mrem/year and to provide specific radionuclide concentrations in Appendix B, Table II. In that these new federal standards are more stringent than the Kentucky regulations, the federal standards shall be the governing ARARs for allowable doses in unrestricted areas." Therefore, the values listed above are based on the federal standards (i.e., 10 CFR Part 20, Subpart O, Appendix B: Table 2, Column 2, "Water"; https://www.ecfr.gov/cgi-bin/text-idx?SID=9398224a6c8f44c47e2b05f5fc913a0e&mc=true&node=ap10.1.20_12402.b&rgn=div9 and 10 CFR Part 61.41; https://www.nrc.gov/reading-rm/doc-collections/cfr/part061/part061-0041.html).
mrem/year = millirems per year
pCi/L = picoCuries per milliliter

Status of Implementation

The remedy for the Site is divided into four phases: the Initial Closure Period, the Interim Maintenance Period, the Final Closure Period, and the Custodial Maintenance Period. The remedy selection in the ROD led to the division of the remedy into the Initial Remedial Phase, which incorporates the activities described as the Initial Closure Period, and the Balance of the Remedial Phase, which incorporates the activities described as the Interim Maintenance Period and the Final Closure Period. The final phase of the project, termed the Custodial Maintenance Period in the ROD, is called the Institutional Control Period, and includes continued monitoring for 100 years followed by the Post-Institutional Control Period, which will allow for monitoring in perpetuity.

Two initial construction phases took place in 2003 as part of the Initial Remedial Phase: (1) leachate removal/disposal and (2) "remaining work" (i.e., building demolition, southeast cap construction, and east detention basin). The leachate removal/disposal phase included the following activities:

- Removing leachate from the trenches by pumping from specified sumps;
- Conveying removed leachate to field collection tanks;

- Transferring the leachate from the field collection tanks to leachate storage tanks and sample process control testing to confirm the proper leachate-to-cement ratio;
- Metering leachate from the storage tanks and cement from a storage silo into a transit mix truck for mixing; and,
- Transferring leachate-cement mixture to bunkers where the mixture solidified.

The "remaining work" phase included the following activities:

- Demolition of buildings and on-site disposal of debris;
- Construction of a geomembrane cap to direct storm water away from disposal trenches to the East Detention Basin (EDB) and minimize storm water infiltration into the trenches;
- Enlarging the EDB to accommodate a range of storm events including a 100-year, 24-hour storm event. (The EDB contains storm water from the cap area and directs the water in a controlled manner to the East Main Drainage Channel [EMDC]. Storm water is released from the EDB at rates below the pre-development condition at the Site);
- Construction of a geomembrane and soil cover cap in the southeastern corner of the Site immediately outside of the restricted area to prevent infiltration of rainwater into the subsurface near several disposal trenches;
- Modifying/constructing the perimeter drainage channels to direct storm water to the EDB; and,
- Construction of erosion monuments along the East Main Drainage Channel.

During the Initial Remedial Phase, the Commonwealth performed the following activities:

- Acquisition of the additional buffer zone property;
- Buffer zone building demolition;
- Acquiring deed restrictions for the entire MFDS;
- Environmental monitoring; and,
- Continued Site maintenance.

The above-referenced deed restrictions, implemented on December 5, 2003, are as follows:

- Groundwater at the property shall not be used for drinking or other domestic, agricultural, or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes;
- No action shall be taken, allowed, suffered, or omitted on the property if such action or omission is reasonably likely to (1) create a risk of migration of hazardous substances, pollutants, or contaminants or a potential hazard to human health or the environment or (2) result in a disturbance of the structural integrity of any engineering controls designed or utilized at the property to contain hazardous substances, pollutants, or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging tress on the side-slopes of the Site;
- Access shall be restricted to Commonwealth personnel and agents; and,
- The property shall not be sold, transferred, leased, or conveyed, nor allowed to be occupied by any person other than Commonwealth personnel and agent until such time as the property owner and the EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

The balance of the remedial phase is divided into the Interim Maintenance Period (IMP) and the Final Closure Period. The Commonwealth is responsible for implementation of the balance of the remedial phase. The primary objective of the IMP, which began in 2003, was to allow the trenches to stabilize by natural subsidence. During this period, the following activities were also required:

- Initial Remedial Phase cap maintenance and replacement as necessary;
- Trench leachate management and monitoring;
- Subsidence monitoring, periodic surveys, and repairs as necessary;
- Erosion evaluation in channels along the hillslopes;
- General site maintenance;
- Stream monitoring;
- Alluvial well monitoring;
- Data collection, analysis and reporting to the EPA;
- Maintenance of Site drainage and erosion control features; and,
- Waste burial.

It is noted that during the second FYR (September 2007), the need to process an ESD was identified to address decisions made during the Initial Remedial Phase and the IMP that are different from the specific requirements of the ROD. The ESD was to address three specific points from the ROD: (1) installation of an infiltration monitoring system to continuously verify remedy performance and detect the accumulation of leachate in disposal trenches; (2) use of a tiered approach to sampling and analysis for compounds other than tritium; and (3) determination that no horizontal flow barrier other than the North Channel, as constructed, is necessary.

The Final Closure Period began in November 2012, which includes the installation of a permanent vegetative cap, installation of permanent surface water control features, and installation of surface monuments to identify the location of buried waste.

An ESD was issued in February 2013 to document two changes that were implemented during the IMP: (1) the decision to discontinue electronic water level monitoring in favor or manual monitoring and (2) confirmation that no horizontal flow barrier other than the North Channel is necessary. An ESD was also issued in September 2014. The changes documented in the 2014 ESD were based on revised cap layers utilizing modern technologies evaluated in the Remedial Design of the Final Cap including (1) use of a geosynthetic clay liner in-place of the two-foot layer of compacted clay described in the ROD; (2) use of a 60-millimeter geomembrane liner rather than an 80-millimeter geomembrane liner described in the ROD; and, (3) use of a geonet drainage layer in-place of the one-foot of crushed rock with a minimum permeability of 1E-03 centimeter/second. Additionally, geogrid reinforcing layers were added to ensure the stability of the cap over the trenches, and applicable location-specific Endangered Species Act requirements were identified. It is noted that the first two issues identified in the second FYR listed above were not subsequently addressed by an ESD.

Final cap construction began in 2015 and was completed in 2016; however, monitoring of the vegetative cover is ongoing and the Final Closure Period has yet to be designated as complete. This designation is expected in 2017. Once the Final Closure Period is completed, MFDS will enter into an institutional control period of 100 years, which will include monitoring, maintenance and facility control.

Systems Operations/Operation & Maintenance (O&M)

Following completion of the balance of the remedial phase (when the remedial action has been fully performed and the performance standards have been achieved), the Commonwealth will then be responsible for the Custodial Maintenance Period, or Institutional Control Period. The Institutional Control Period shall be conducted for 100 years following the EPA issuance of the Certification of Completion of the Remedial Action. The Post-Institutional Control Period will follow the Institutional Control Period with the necessary operations and maintenance activities to be performed in perpetuity.

III. PROGRESS SINCE THE LAST REVIEW

This is the fourth FYR for the Site.

Protectiveness Statement from Third FYR

The following is the Protectiveness Statement from the Third FYR:

The selected remedy at the MFDS is expected to be protective of human health and the environment at the conclusion of the remedial action, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Status of Recommendations from Third FYR

No recommendations or required actions were needed to correct deficiencies affecting protectiveness based on the Third FYR. The following "Other Comments" were included as recommendations in the Third FYR:

1. *The Commonwealth's IMP Work Plan, Appendix C, the Performance Standard and Verification Plan, states that analysis for other contaminants will not occur unless any annual average concentration of tritium exceeds 50% of the screening assessment (20pCi/ml or 100 pCi/ml as applicable) during the previous five years. Based on the third Five Year review, one sampling location exceeded the 50% of the screening assessment and therefore triggers the collection of additional analytical data, including radionuclides other than tritium and some volatile organic compounds.*

To address the above-listed recommendation, an analysis of current groundwater and surface water COC concentrations was conducted in 2012, subsequent to the Third FYR. Groundwater samples were collected from the 14 alluvial wells located at the Site. In addition, surface water samples were collected from four surface water sampling locations at the Site. Results of the sampling and analysis are discussed under "Question B" in Section V (Technical Assessment).

2. *Based upon the Horizontal Flow Barrier evaluation and statistical analysis, a Horizontal Flow barrier is not needed at this time. This information will be included in an ESD subsequent to the completion of this Five Year Review. EPA still plans to address the discontinuation of the continuous level monitors in the ESD as well.*

An ESD was issued in February 2013 to document two changes that were implemented during the IMP: (1) the decision to discontinue electronic water level monitoring in the trench sumps in favor or manual monitoring and (2) confirmation that no horizontal flow barrier other than the North Channel is necessary.

3. *Pursuant to the statements in the previous Five-Year Review, the Commonwealth and EPA have had numerous discussions and meetings relative to subsidence completion and initiation of the FCP* [Final Closure Period]. *The Commonwealth has appropriated additional funding to implement the FCP... and, subsequent to the completion of this Five-Year Review, plans to provide documentation to EPA demonstrating that the trench stabilization criteria have been achieved. EPA's written approval of the Commonwealth's submission of meeting the trench stabilization criteria will initiate the FCP.*

The EPA approved the Commonwealth's submission of meeting the trench stabilization criteria on November 12, 2016.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

Activities to involve the community in the FYR were initiated with a notification of the initiation of the FYR in five local papers in August 2017. The results of the review and the FYR report will be made available at the Site's information repository located at the Fleming County Public Library, Bypass Boulevard, Flemingsburg, Kentucky, 41041. The public notice and table identifying where and when it was published are provided in Appendix E.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. The results of these interviews are summarized below:

Interviews were conducted with several EPA and Commonwealth representatives regarding their knowledge of and/or concerns with Site activities. All of the interviewed regulators expressed a positive outlook on the remedy and its effectiveness at the Site. There was a general consensus that implementation of the final cap was key to contaminant containment and that progress was due to efficient collaboration at the State and federal regulatory levels. There were no outlier issues or problems raised by the regulators. Additional interview information and detailed responses are provided in Appendix H.

Data Review

This data review includes the data collected and reported by the Commonwealth pursuant to the IMP Work Plan. Findings are presented in two subsections: (1) physical conditions and (2) contaminant monitoring. The physical conditions include erosion monitoring of the drainage channels, interim cap maintenance, leachate level monitoring, and EDB discharge flow monitoring. Contaminant monitoring includes surface water sampling, alluvial and perimeter well sampling, and drainage channel sampling.

Copies of the Annual Reports prepared by the Commonwealth that support this data review are provided in Appendix L. Site maps are provided in Appendix D.

Physical Conditions – Erosion Monitoring

The erosion monitoring program monitors the EMDC, the South Drainage Channel and the West Drainage Channel. The EMDC extends from the outlet of the EDB to its confluence with No-Name Creek. As part of the Initial Remedial Phase design, all storm water from the cap area was routed to the EDB. As a result, no storm water runoff from the cap flows down the South or West Drainage Channels. During the Initial Remedial Phase, 22 fixed monuments (11 cross sections) were installed in the EMDC and surveyed to establish baseline conditions.

Erosion control monitoring was conducted semi-annually unless otherwise noted via collection of cross-sectional measurements and visual inspections per the IMP Work Plan. Results of the monitoring for years 2012 through 2016 are discussed below.

Between 2012 and 2015, the inspections revealed no new erosion concerns. It is noted that in 2015, the cap drainage system was altered to facilitate construction of the final cap. This allowed water to flow from the cap via sheet flow to the South and West Drainage Channels and to other smaller drains on the west and south hill slopes. Visual inspections of these drains indicted that the sheet flow increased the rate of erosion in the drains on the west hillside. In addition, in 2015, MFDS staff noted that the monuments at cross section 3.5 were damaged during Final Closure Period construction; this area was not surveyed for 2015. All other cross-sectional area data were consistent with historical data. In 2016, the spring survey was not completed. The fall survey was completed in December of 2016. The 2016 inspections revealed no erosion concerns in the east and south drains; however, the Final Closure Period construction activities and the new storm water management functions of the cap resulted in notable erosion in the West Drain. New erosion monuments and monitoring criteria for the three drains (East, West, and South) receiving surface water flow from the final cap are being developed for the Institutional Control Period Work Plan.

Physical Conditions – Interim Cap Maintenance

A total of 95 interim cap inspections were conducted each year between 2012 and 2016, including monthly geomembrane liner, subsistence, and articulating concrete block mat system monitoring; bimonthly diversion berm and anchor trench inspections; headwall maintenance; drainage channel inspections; and, former leachate storage facility area inspections.

Between 2012 and 2016, no unsatisfactory notations were recorded that presented a persistent problem. All unsatisfactory items either received actions to return them to satisfactory status or were designated for monitoring.

Physical Conditions – Leachate Level Monitoring

Sump leachate levels are collected for two primary purposes: (1) detect recharge conditions that may require leachate management or liner maintenance, and (2) provide data for evaluation of possible horizontal flow barrier in addition to the North Channel installed during the Initial Remedial Phase. Leachate levels may also be used in evaluating subsidence as subsidence may affect localized water levels.

Leachate levels were monitored up until 2014 when the sumps were abandoned to facilitate construction of the final cap. In 2012, 2013, and 2014, the average loss of freeboard (available sump column from baseline elevation to top of casing elevation) for all sumps was 1.3% (i.e., leachate collected in only 1.3% of the sump column).

Physical Conditions – EDB Discharge Flow Monitoring

Pursuant to the ROD and Initial Remedial Phase design, discharge from the EDB should be released to the EMDC at a rate not to exceed predevelopment flow conditions. Following storm events exceeding 2.8 inches of rainfall in 24 hours (2-year storm event or greater), the Commonwealth is required to collect recordings and report findings. These results are then evaluated by comparing the actual EDB outflow rates and rainfall to the predicted flow rate/rainfall curve used in the outfall design (included in the IMP Work Plan). If this screening comparison shows flow rates above predevelopment levels, then the design model must be run to evaluate actual hydrographic conditions.

Based on data collected from the East Drain rain gauge, no rain event in 2012, 2013, or 2014 exceeded the two-year storm event criteria; therefore, no comparison of current flow rate versus pre-developed flow rate was required in those years.

In 2015, the East Drain rain gauge recorded a two-year storm event on April 3rd with a rainfall depth of 2.9 inches in 24 hours. A comparison of the discharge flow at the EDB flume to a predevelopment flow rate of 11 cubic feet per second confirmed the predevelopment rate was not exceeded.

In 2016, the East Drain rain gauge recorded a two-year storm event on August 2nd. A total of 3.17 inches of rain fell in a 24-hour period. A comparison of the discharge flow at the EDB flume to the predevelopment flow rate was not possible because the EDB flume was undergoing demolition and renovation at the time the storm event occurred. The Final Closure Period-constructed EDB flume was designed with a discharge rate below that of the IMP flume.

Contaminant Monitoring – Surface Water Sampling

Perennial surface water is monitored at five locations in three streams influenced by surface water runoff from the MFDS. Sample location 122A serves as the source for background samples; it is located on Rock Lick Creek, free from Site influence. Sample locations 106, 122C, and 103E are within the perennial streams in the buffer zone area. Sample location 102D is the only sampling station outside the established buffer zone at the MFDS. It is located downstream of all surface water runoff from the MFDS and is the designated EPA compliance point. These locations are monitored using sequential samplers that collect a four aliquot daily composite. Samples are analyzed for tritium and compared to an action level of 20 pCi/mL and a screening level of 10 pCi/mL.

Based on the Commonwealth's collection of historical data and data obtained during the Initial Remedial Phase, the configuration of the Site, the mobility of tritium, and the use of realistic exposure pathways, compliance testing and monitoring related to source control focuses on water borne pathways for tritium. Tritium is the most mobile and easily detectable contaminant at the Site. Other radiological and chemical contaminants have not been historically detected in soils, groundwater, and surface water unless tritium activities approach action levels.

A summary of the data collected between 2012 and 2016 is as follows:

- During 2012, a total of 1,771 samples were collected and analyzed for tritium with no anomalous data reported. The maximum activity reported was 13.35 pCi/mL at sample location 106.
- During 2013, a total of 1,819 samples were collected and analyzed for tritium with no anomalous data reported. The maximum activity reported was 9.59 pCi/mL at sample location 106.
- During 2014, total of 1,771 samples were collected and analyzed for tritium with no anomalous data reported. The maximum activity reported was 9.78 pCi/mL at sample location 106.
- During 2015, a total of 1,755 samples were collected and analyzed for tritium with no anomalous data reported. The maximum activity reported was 9.89 pCi/mL at sample location 106.
- During 2016, a total of 1,718 samples were collected and analyzed for tritium with no anomalous data reported. The maximum activity reported was 12.30 pCi/mL at sample location 106.

Between 2012 and 2016, all samples were below the average annual tritium screening level of 10 pCi/mL. A table summarizing the data is presented below. Tritium activity trend graphs are included in Appendix N. In addition, in accordance with the IMP Work Plan, the Reasonably Maximally Exposed Individual comparison indicated that none of the annual averages at location 102D (i.e., the compliance point) exceeded the 4 mrem/year dose limit (equivalent to 20 pCi/mL).

Table 5: Annual Average Tritium Activity (pCi/mL) at Perennial Surface Water Sample Locations (2012-2016)

	Perennial Surface Water Sample Locations				
Year	**122A**	**106**	**122C**	**103E**	**102D**
2012	0.05	3.88	1.19	0.51	0.82
2013	0.05	3.61	1.00	0.44	0.67
2014	0.07	3.80	1.12	0.43	0.80
2015	0.07	2.79	0.77	0.39	0.52
2016	-0.02	4.05	0.61	0.50	0.39

Contaminant Monitoring – Drainage Channel Sampling

Drainage channel water is monitored at the west, south, and east drains that receive intermittent flow from the cap. The three locations that are sampled represent the points of compliance at the former licensed Site boundary. These locations were chosen to ensure early detection of releases from within the Site boundary. Sample location C107 is located at the base of the West Drain, which discharges into Drip Springs Creek. Sample location 143 is located near the base of the South Drain, which discharges into Rock Lick Creek. Sample location 144 is located at the base of the East Drain, which discharges into No Name Branch. These locations are monitored using automated samplers that collect a four aliquot daily composite. The activity at these monitoring locations is compared to a 25 mrem/year Total

Effective Dose Equivalent standard, an annual average action level of 100 pCi/mL, and an additional screening level of 50 pCi/mL.

A summary of the data collected between 2012 and 2016 is as follows:

- In 2012, 919 samples were collected for tritium analysis. The average annual activity was less than the average annual action level of 100 pCi/mL. The maximum activity reported in 2012 was 188.38 pCi/mL at sample location 144.

- In 2013, 947 samples were collected for tritium analysis. The average annual activity was less than the average annual action level of 100 pCi/mL. The maximum activity reported in 2013 was 151.03 pCi/mL at sample location 144.

- In 2014, 826 samples were collected for tritium analysis. The average annual activity was less than the average annual action level of 100 pCi/mL. The maximum activity reported in 2014 was 149.41 pCi/mL at sample location 144.

- In 2015, 869 samples were collected for tritium analysis. The average annual activity was 55.32 pCi/mL, which is less than the average annual action level of 100 pCi/mL. The maximum activity reported in 2015 was 128.23 pCi/mL at sample location 144.

- In 2016, 825 samples were collected for tritium analysis. The average annual activity was 23.89 pCi/mL, which is less than the average annual action level of 100 pCi/mL. The maximum activity reported in 2016 was 163.08 pCi/mL at sample location 144.

Between 2012 and 2016, all samples were below the average annual action level of 100 pCi/mL. A table summarizing the data is presented below. Tritium activity trend graphs are included in Appendix N.

Table 6: Annual Average Tritium Activity (pCi/mL) at Drainage Channel Water Sample Locations (2012-2016)

	Drainage Channel Water Sample Locations		
Year	C107	143	144
2012	12.96	0.06	67.85
2013	10.42	0.07	59.34
2014	11.01	0.06	46.01
2015	8.81	0.03	46.49
2016	15.86	0.10	55.73

It is noted that location 144 has higher tritium concentrations than the other two sample locations because it is influenced by the east hillside seeps that receive intermittent flow from the cap. During this FYR period, individual annual average tritium concentrations at location 144 exceeded 50% of the screening assessment level (100 pCi/mL), which triggers the need for additional radionuclide, metals, and volatile organic compound analysis pursuant to the Commonwealth's IMP Work Plan.

Contaminant Monitoring – Alluvial and Perimeter Well Sampling

Groundwater monitoring at the MFDS is conducted via alluvial and perimeter monitoring wells. Fourteen alluvial wells are located at the Site; currently, only four (AW-6, AW-7, AW-10, and AW-12) are sampled regularly due to tritium concentrations in the remaining wells not exceeding the drinking water standard or other applicable site-specific criterion. It is further noted that these four wells provide coverage for assessing potential impacts to drinking water offsite. In addition, 12 of 16 perimeter monitoring wells originally located at the Site were removed during construction of the final cap; installation of one additional perimeter monitoring well is pending. The alluvial wells, located in the buffer zone, were installed during the Initial Remedial Phase. 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, and a gate was installed to further limit access. The perimeter monitoring wells, located along the west perimeter of the restricted area, were installed as investigative monitoring points. The 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 Site's Radioactive Material License.

During the preparation of the previous FYR in 2012, it was determined that surface water sampling location 144 exceeded 50% of the established screening level for tritium. In accordance with requirements of the IMP Work Plan, a sampling event was conducted specifically to quantify the concentrations of COCs in groundwater as identified in the ROD. Therefore, in 2012, groundwater samples were collected from all 14 alluvial wells located at the Site. Results indicated that concentrations of arsenic in wells AW-1, AW-6, AW-13 and AW-14 exceeded the EPA Maximum Contaminant Level (MCL) of 10 micrograms per Liter (ug/L). The Commonwealth proposed quarterly sampling and analysis for arsenic for a minimum of four quarters. The sampling for this evaluation ended in 2014 with concentrations in three out of the four wells falling below the MCL. Arsenic was not detected in well AW-13 in the final three sampling events. Well AW-1 had an average concentration of 27µg/L, which is within the historical range for isolated areas with Ohio Shale outcrops.

Five of the 14 alluvial wells were sampled between 2012 and 2015: samples were collected annually from wells AW-6, AW-10, and AW-12, and samples were collected quarterly from wells AW-1 and AW-7. Construction of Storm Water Management Feature (SWMF) #3 as part of the final cap necessitated the removal of AW-1 in February 2015. Therefore, only four wells were sampled in 2016. Between 2012 and 2016, all results were typical of historical ranges. Trend graphs are in included in Appendix N. The maximum radioactivity was reported at AW-7 each year, and concentrations ranged from 5.70 pCi/mL in 2012 to 6.66 pCi/mL in 2014. Comparison of the maximum concentrations at AW-7 each year to 50 percent of the 20 pCi/mL ARAR requirement indicated that additional analysis was not necessary.

Water levels were measured in the 16 perimeter monitoring wells on a quarterly basis each year. A table summarizing the data is presented below. Measurements for all years indicated water levels typical of historical data. With the exception of three wells (UF-5, UF-37, UF-45), water levels have generally decreased between 2012 and 2016. In addition, the Site's Radioactive Material License-required tritium analysis for select perimeter wells (i.e., wells N2B, UE-2, UF-2, UF-10a, UK-1) were typical of historical data and trends for each year. Trend graphs are included in Appendix N. Tritium concentrations were observed to be generally decreasing in each perimeter well between 2012 and 2016.

Table 7: Average of Quarterly Water Level Measurements by Year (2012-2016)

Well ID	2012	2013	2014	2015	2016
ESI-1	14.13	14.31	14.62	12.32	Abandoned
ESI-2	11.79	11.82	11.87	10.76	11.05
ESI-4	12.36	12.40	12.58	12.02	12.05
ESI-5	13.33	13.40	13.38	13.20	Abandoned
ESI-12	19.12	19.17	19.62	18.57	Abandoned
ESI-19	14.10	14.16	14.34	13.74	Abandoned
N2B	9.04	9.12	9.38	8.71	8.60
UE-2	14.23	14.29	14.46	13.90	Abandoned
UE-11	14.32	13.47	14.32	13.86	Abandoned
UF-1	14.06	13.46	12.75	12.17	Abandoned
UF-2	10.22	10.30	10.46	9.89	Abandoned
UF-5	6.49	3.79	7.42	9.41	Abandoned
UF-10a	28.42	28.26	Abandoned	Abandoned	Abandoned
UF-37	13.09	13.13	13.55	13.83	Abandoned
UF-45	14.41	14.49	14.51	14.55	Abandoned
UK-1	11.30	10.54	10.74	10.18	10.19

Institutional Controls

The following deed restrictions (see Appendix M) were implemented for the Site on December 5, 2003:

- Groundwater at the property shall not be used for drinking or other domestic, agricultural, or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes;
- No action shall be taken, allowed, suffered, or omitted on the property if such action or omission is reasonably likely to (1) create a risk of migration of hazardous substances, pollutants, or contaminants or a potential hazard to human health or the environment or (2) result in a disturbance of the structural integrity of any engineering controls designed or utilized at the property to contain hazardous substances, pollutants, or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging tress on the side-slopes of the Site;
- Access shall be restricted to Commonwealth personnel and agents; and,
- The property shall not be sold, transferred, leased, or conveyed, nor allowed to be occupied by any person other than Commonwealth personnel and agent until such time as the property owner and the EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

In conjunction with the FYR, the deeds at the Fleming County Court House were reviewed to verify the restrictions are still legally in place. No issues were identified in this review.

Engineering Controls

On January 15, 2016, the Kentucky Geologic Survey visited the MFDS to make preliminary observations of a landslide complex that had damaged an embankment along the toe of the southwest facing slope of the landfill due to the excavation of soil borrow pits for construction of the final cap. The main landslide area lies within the Estill Shale. The purpose of the visit was to observe the ground conditions, local geology, geomorphic setting, landslide features, property damage, and report the findings. Several landslide features were observed along the southwest slope below the storage facility. The toe of the slope had been excavated in September 2015 in order to mitigate a preexisting landslide, and to harvest soil material for the disposal facility cap. After excavation, the soil material was re-compacted to form an embankment with a similar slope angle to pre-excavation. Accelerated landslide movement began in late September 2015. It was determined that the causes of the slide are a complex interaction between slope modification and the physical properties of the rocks, soil, and slope morphology. The weak bedrock geology, weak soils, steep slopes, and groundwater flow are cumulative causes that when triggered (by a combination of slope modification and rainfall), produce stress conditions leading to slope failure. Preexisting landslide activity, slope modification, varying lithology, geomorphology, soil strength, and hydrologic conditions are all complex variables, and the forces that act on a slope combined with these variables make landslide hazard assessment difficult. Landslide monitoring and an in-depth geotechnical investigation were recommended in order to confirm the extent of the hazard and address possible mitigation techniques.

Subsequently, an investigation was conducted to image subsurface features along geophysical electrical resistivity survey lines to determine the extent and severity of the landslides. Five electrical resistivity lines were laid out to conduct surveys, including a higher resolution line up the slope (Borrow Pit 4) and across the smaller landslide complex. The investigation concluded that Borrow Pit 4 of the Estill Shale below the Main Slide Complex will continue to have episodic landslide events. However, the processes of weathering and erosion were concluded to be slow and should leave ample time to develop a monitoring program and repair the slopes. It was also concluded that the landslides are likely episodic in nature and will reactivate. Continued slope stability measures and monitoring were recommended.

A site inspection was conducted on April 25, 2017, as part of this FYR. The southwestern corner of the landfill was observed to inspect the former borrow areas. The site inspection participants observed the former borrow areas, included Borrow Area 4 where the most significant slips had occurred, which had been seeded in 2016. Healthy vegetative growth was observed in the former borrow areas and on the hillsides where slips had developed during the remediation work to install the landfill cap. The slips had been repaired by installing surface and subsurface drains, grading, and re-seeding the areas. The slips above the tree line were not addressed but are being monitored. KY DEP stated that no noticeable movement had been observed in the slips since February 2017, but some bulging had been observed.

An O&M Plan is currently being prepared as part of an Institutional Control Period Work Plan for Institutional Control Period, and it will provide the details for the activities needed to maintain the integrity of the remedy upon the EPA issuance of the Final Closure Period. Anticipated O&M activities may include, but are not limited, to the following:

- Final Closure Cap Monitoring, Inspection, and Maintenance
- Southeast Cap Inspection and Maintenance
- Roadways Inspection and Maintenance
- Stormwater System Inspection and Maintenance

- Site Access and Security Inspection and Maintenance
- Buffer Zone Inspection and Maintenance
- Settlement/Subsidence Monitoring, Inspection, and Maintenance
- Erosion Monitoring, Inspection, and Maintenance
- Equipment Inspection and Maintenance
- Environmental Sampling and Monitoring
- Data Acquisition and Reporting

Site Inspection

The site inspection took place on April 25, 2017. In attendance were representatives of the EPA, KY DEP, Kentucky Department for Public Health – Radiation Health Branch, and TechLaw, Inc. (EPA contractor). The purpose of the inspection was to assess the protectiveness of the remedy. For a full list of site inspection activities, including a list of those in attendance, see the Site Inspection Checklist in Appendix F. Site photographs are available in Appendix G.

Participants met in a conference room in the KY DEP office building that is located at the Site. KY DEP On-site Remediation Coordinator Scott Wilburn gave a PowerPoint presentation that covered the history of the Site and remediation activities completed to-date. The final landfill cover installation was completed in fall 2016. A number of items had yet to be completed, including installation of closed circuit television cameras and re-seeding of areas with sparse vegetation on the landfill cover. Mr. Wilburn informed the attendees that the contractors had three to six weeks of "touch-up work" to complete, including cleanup of the perimeter drainage, removal of temporary erosion control features, and checking the check dams. Mr. Wilburn reported that KY DEP had begun implementing the Institutional Control Period Work Plan. At the time, they were awaiting completion of erosion surveys to establish new baseline data and receipt of final as-built drawings and other documents.

After the meeting, participants conducted an inspection, walking around the capped area of the landfill on the paved perimeter road. The area was accessed through the gate located southwest of the KY DEP office building which provided access to the paved perimeter road. A new fence and gates had been installed as part of the final closure period. Some work remained to be completed on the gates. Another fence surrounded the landfill cap area and prevented direct access to the landfill from the perimeter road. Gates at the southwest corner of the landfill and to the southeast of the KY DEP building provide access to the landfill cap. Participants observed radiation warning monuments at the north end of the landfill, south of the KY DEP building, and near the center of the landfill cap. Buried radiation waste caution signs were posted on the fence at numerous locations around the fence line. Vegetative growth was well established on most of the landfill cap area; however, several areas of sparse vegetation were observed. The landfill cap was seeded in late summer and fall of 2016. KY DEP's Scott Wilburn stated that the company that seeded the area would return to re-seed areas with sparse vegetation. Contractors were observed on the landfill picking up rocks during the perimeter walk. Perimeter lights with solar panels were installed at a number of locations around perimeter fence. Work was still being completed on the drainage at the north end of the landfill, to the east of the KY DEP building.

After completing the walk around the landfill perimeter, the participants loaded into vehicles and were taken over the hill down the haul road at the southwestern corner of the landfill to inspect the former borrow areas. The participants observed the former borrow areas, which had been seeded in 2016. Healthy vegetative growth was observed in the former borrow areas and on the hillsides where slips had

developed during the remediation work to install the landfill cap. The most significant slips had occurred in former Borrow Area 4. The slips had been repaired by installing surface and subsurface drains, grading, and re-seeding the areas. The slips above the tree line were not addressed but are being monitored. KY DEP's Scott Wilburn stated that no noticeable movement had been observed in the slips since February 2017 but some bulging had been observed. A geologic study had been conducted in 2016, which concluded that the slips on the hillsides in the valleys were not a threat to compromise the landfill integrity; however, long term monitoring of erosion was recommended.

The participants drove to the area to inspect drainage flow at the base of the hill that originated at the EDB of the landfill. Survey markers were observed along and near the drainage flow path. The survey markers were installed for monitoring erosion. SWMFs were inspected on the east side (SWMF #2) and west side (SWMF #3). The SWMFs are retention ponds for managing storm water flow. No problems were observed with the SWMFs. A small pond was observed on the west side, en route to SWMF #3. Kentucky Radiation Health personnel stated that radioisotopes of uranium and strontium had been detected in the pond water. A stake marked the location near the pond where a monitoring well was to be installed.

After inspecting the former borrow areas and SWMFs, the participants returned to the KY DEP office building for a wrap-up meeting. KY DEP's Scott Wilburn gave an overview of the status of final documents related to the final closure. The final perimeter survey was in progress, but had not been completed. Plans for potentially using light detection and ranging technology to survey and monitor for erosion in the long-term had not been finalized. Wells planned for installation were expected to be completed prior to finalization of this FYR. The O&M Plan for the Final Closure Period is currently being prepared. KY DEP stated that the Site health and safety plan and contingency plan were being updated, and would be submitted when completed.

After the meeting was adjourned, Michelle Dallessandro and Gene Nance of TechLaw conducted a walkthrough inspection of the landfill cap area. Vegetation was well-established over most of the landfill cap, but areas of sparse vegetation were observed. The areas with sparse vegetation were primarily in areas that were seeded later in the fall of 2016, including the haul road across the landfill that was used to transport loads of fill dirt onto the landfill. TechLaw observed the radiation warning monument installed near the center of the landfill and a tower base where the closed circuit television cameras were to be installed. Some minor erosion rills were observed in an area with sparse vegetation near the radiation warning monument. The maximum depth of the rills was measure at approximately two inches. Turf reinforcement mat was observed to have been installed in areas where higher storm runoff would be expected. Vehicle tire ruts were observed near the southwestern access gate. No evidence of trespassing was observed on the landfill cap and the former borrow areas. Minor issues noted (e.g., sparse vegetation, minor erosion) during the inspection will be addressed as part of ongoing O&M activities which will be incorporated into the O&M Plan which is currently being prepared. These ongoing activities are further detailed in the Site Inspection Checklist in Appendix F.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

The Site's remedy has not been fully implemented. The Final Closure Period began in November 2012, which includes the installation of a permanent vegetative cap, installation of permanent surface water control features, and installation of surface monuments to identify the location of buried waste. The initial phases of the final capping plan also included the purchase of additional property surrounding the Site. This measure increased the distance between the restricted areas of the Site and the public. Final cap construction began in 2015 and was completed in 2016; however, monitoring of the vegetative cover is ongoing and the Final Closure Period has yet to be designated as complete. This designation is expected in 2017. Once the Final Closure Period is completed, MFDS will enter into an institutional control period of 100 years which will include monitoring, maintenance and facility control.

The site inspection, interviews, and monitoring results (i.e., erosion monitoring of the drainage channels, interim cap maintenance, leachate level monitoring, EDB discharge flow monitoring, surface water sampling, alluvial and perimeter well groundwater sampling, and drainage channel sampling) discussed herein indicate that the remedy is functioning as intended by the 1991 ROD. The final cap prevents direct exposure to contaminated soil and waste materials, and minimizes the potential for migration of COCs to groundwater and surface water. Institutional controls are in place to prevent use of groundwater at the Site for drinking or other domestic, agricultural, or industrial purposes. Additional engineering controls, including fences and surface monuments, are in place to restrict unauthorized access to the Site and prevent trespassing.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection still valid?

Question B Summary:

The 1991 ROD ARARs for groundwater and surface water (for both chemical and radiological contaminants) were compared with current ARARs to assess their validity. Table J-1 in Appendix J presents the review of groundwater ARARs and Tables J-2 and J-3 present the review of surface water ARARs. The results of this assessment are discussed further below.

Groundwater

The 1991 ROD ARARs for groundwater COCs were based on the federal National Primary Drinking Water Regulations [i.e., the MCLs]. These 1991 values were compared with the current MCLs. The 1991 ROD ARAR values also were compared to current EPA Regional Screening Levels (RSLs) (May 2016) for tap water (i.e., To-Be-Considered values). The analysis in Appendix J (Table J-1) indicates that the 1991 ROD ARARs for arsenic, chloroform, and lead exceed the current MCLs. In addition, based on comparison of the 1991 ROD ARARs to the May 2016 RSLs, the 1991 ROD ARARs for arsenic, chlorobenzene, chloroform, lead, trichloroethene, and vinyl chloride result in a cancer risk level that exceeds 1E-04 and/or a non-cancer hazard quotient (HQ) that exceeds one. Specifically, the 1991 ROD ARARs for the aforementioned COCs result in the following cancer risk and/or non-cancer hazard estimates:

- An arsenic concentration of 50 µg/L results in a cancer risk of 9.62E-04 and an HQ of 8.3;
- A chlorobenzene concentration of 100 µg/L results in an HQ of 1.3;
- A chloroform concentration of 100 µg/L results in a cancer risk of 4.55E-04;

- A lead concentration of 50 µg/L results in an HQ of 3.3;
- A trichloroethene concentration of 5 µg/L results in an HQ of 1.8; and,
- A vinyl chloride concentration of 2 µg/L results in a cancer risk of 1.05E-04.

It is noted that while the 1991 ROD ARARs for chlorobenzene, trichloroethene, and vinyl chloride result in a cancer risk greater that 1E-04 or a non-cancer HQ greater that one, none of the values exceed the current MCLs (as the enforceable drinking water standards). Therefore, the 1991 ROD ARARs for chlorobenzene, trichloroethene, and vinyl chloride remain valid. However, given that the 1991 ROD ARARs for arsenic, chloroform, and lead exceed the current MCLs and result in a cancer risk that exceeds 1E-04 and/or non-cancer HQ that exceeds one, revision to these values may warrant consideration.

In addition to review of the validity of the 1991 ROD ARARs, an analysis of current groundwater COC concentrations was conducted. In 2012, subsequent to the third FYR, groundwater samples were collected from the 14 alluvial wells located at the Site. This sampling was required because, as reported in the third FYR, the annual average concentration of tritium detected at one surface water sampling location exceeded 50% of the screening level for tritium during the previous five years, and, therefore, triggered the collection of additional analytical data for all COCs.

The maximum detected concentrations of the COCs in groundwater samples were compared to the current MCLs (Table J-4). Only nickel, arsenic, and radium-226 were detected at concentrations of note:

- No MCL is currently available for nickel; however, the maximum detected concentration of nickel (540 µg/L) exceeded its 1991 ROD ARAR of 100 µg/L. It is noted that the maximum detected concentration results in an HQ of approximately 1.4 when compared with its RSL. No other detected concentrations of nickel exceeded its 1991 ROD ARAR, and the arithmetic mean of nickel concentrations does not exceed its 1991 ROD ARAR.
- Arsenic was detected in four samples (wells AW-1, AW-6, AW-13, AW-14) at concentrations exceeding its current MCL of 10 µg/L; the maximum detected concentration of arsenic was 30.2 µg/L. It is noted that the maximum detected concentration results in an associated cancer risk of 5.81E-04 and an HQ of approximately 5 when compared with its RSLs. As a result of these exceedances, the Commonwealth of Kentucky proposed quarterly sampling and analysis for arsenic for a minimum of four quarters. The sampling for this evaluation ended in 2014 with concentrations in three out of the four wells falling below the MCL. Arsenic was not detected in well AW-13 during the final three sampling events. Well AW-1 had an average concentration of 27 µg/L, which is within the historical range for isolated areas with Ohio Shale outcrops (but still above the EPA's upper brightline for acceptable cancer risk of 1E-04).
- Radium-226 was detected in four samples (wells AW-3 AW-4, AW-6, AW-13) at concentrations exceeding its current MCL of 5 picoCuries per Liter (pCi/L); the maximum detected concentration of radium-226 was 51 pCi/L. All other samples were non-detect for radium-226.

Institutional controls implemented via deed restrictions on December 5, 2003, are in place to prevent use of groundwater at the Site for drinking or other domestic, agricultural, or industrial purposes. In conjunction with the FYR, the deeds at the Fleming County Court House were reviewed to verify the restrictions are still legally in place. No issues were identified in this review. In addition, no issues were identified during the FYR site inspection.

This FYR also evaluated the vapor intrusion exposure pathway using the EPA's Vapor Intrusion Screening Level (VISL) calculator version 3.5.1 (based on the May 2016 RSLs) to identify if any of the volatile groundwater COCs at the Site require further vapor intrusion evaluation (Appendix K). The results of this evaluation demonstrate that the vapor intrusion pathway does not require further evaluation. No volatile groundwater COCs were detected in groundwater at the time of the 2012 sampling event, with the exception of toluene, at a maximum estimated concentration of 1.3 ug/L. No carcinogenic toxicity criterion is available for toluene; therefore, no carcinogenic risk attributable to the vapor intrusion pathway could be projected. The projected residential-use based hazard associated with a toluene concentration in groundwater of 1.3 ug/L is well below unity (1).

Surface Water

The 1991 ROD ARARs for non-radiological surface water COCs were based on the federal Ambient Water Quality Criteria [Section 304(a)(1) of the Clean Water Act]. These values were compared with the current federal water quality criteria (i.e., what are now called the National Recommended Water Quality Criteria) and the State of Kentucky Water Quality Criteria (Kentucky Surface Water Standards, 401 KAR 10:031). The analysis in Appendix J (Table J-2) indicates that the human health-based 1991 ROD ARARs for arsenic; benzene; 1,2-dichloroethane; toluene; trichloroethene; and, vinyl chloride exceed the lowest of the current human health-based ARAR values. In addition, the aquatic life-based 1991 ROD ARARs for lead and nickel exceed the lowest of the current aquatic life-based ARAR values. The 1991 ROD human health-based ARARs for the aforementioned COCs exceed the current human health-based ARARs as follows:

- A benzene concentration of 400 µg/L is 25 times greater than lowest current ARAR;
- A 1,2-dichloroethane concentration of 2,430 µg/L is 66 times greater than the lowest current ARAR;
- A toluene concentration of 424,000 µg/L is 815 times greater than the lowest current ARAR;
- A trichlorethene concentration of 807 µg/L is 115 times greater than the lowest current ARAR; and,
- A vinyl chloride concentration of 5,246 µg/L is 3,279 times greater than the lowest current ARAR.

Based on the analysis described above and presented in Appendix J, revision to the values for arsenic, benzene, 1,2-dichloroethane, lead, nickel, toluene, trichloroethene, and vinyl chloride may warrant consideration.

In addition to the above-described analysis, the radiological surface water COC ARARs also were reviewed for validity. The 1991 ROD ARARs for radiological surface water COCs were based on the Federal Register notice on Nuclear Regulatory Commission revisions to Table II, 56 Federal Register 23409, May 21, 1991. These values were compared with the current values presented at 10 CFR Part 20, Subpart O, Appendix B and 10 CFR Part 61.41. The analysis in Appendix J (Table J-3) indicates that the 1991 ROD ARARs remain valid.

In addition to review of the validity of the 1991 ROD ARARs, an analysis of current surface water COC concentrations was conducted. In 2012, subsequent to the third FYR, surface water samples were collected from four surface water sampling locations at the Site. This sampling was required because, as reported in the third FYR, the annual average concentration of tritium detected at one surface water

sampling location exceeded 50% of the screening level for tritium during the previous five years, and, therefore, triggered the collection of additional analytical data for all contaminants.

The maximum detected concentrations of the COCs detected in surface water samples were compared to the current ARARs (Table J-5 and Table J-6). Arsenic was detected in one sample (1.2 µg/L) at a concentration exceeding the current human-health based ARAR of 0.14 µg/L. In addition, bis(2-ethylhexyl)phthalate was detected in one sample (1.1 µg/L) at a concentration exceeding its current human health-based ARAR of 0.37 µg/L. These exceedances were detected in samples collected from perennial streams within the Site buffer zone area (locations 122C and 103E); no exceedances were detected at the surface water sample location located outside the buffer zone that serves as a point of compliance (location 102D). None of the maximum detected concentrations of radionuclides exceeded their current ARARs.

The RAOs used at the time of remedy selection are still valid.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
None

Issues and Recommendations Identified in the FYR:				
OU(s): N/A (Sitewide)	**Issue Category: Other** **Changes in ARARs - Groundwater**			
	Issue: The 1991 ROD ARARs for arsenic, chloroform, and lead exceed the current MCLs. In addition, based on comparison of the 1991 ROD ARARs to the May 2016 RSLs, the 1991 ROD ARARs for arsenic, chlorobenzene, chloroform, lead, trichloroethene, and vinyl chloride result in a cancer risk level that exceeds 1E-04 and/or a non-cancer HQ that exceeds one.			
	Recommendation: Evaluate whether the 1991 ROD ARAR values for groundwater require revision.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	September 7, 2022

OU(s): N/A (Sitewide)	Issue Category: Other Changes in ARARs – Surface Water			
	Issue: The human health-based 1991 ROD ARARs for arsenic; benzene; 1,2-dichloroethane; toluene; trichloroethene; and, vinyl chloride exceed the lowest of the current human health-based ARAR values. In addition, the aquatic life-based 1991 ROD ARARs for lead and nickel exceed the lowest of the current aquatic life-based ARAR values.			
	Recommendation: Evaluate whether the 1991 ROD ARAR values for arsenic, benzene, 1,2-dichloroethane, lead, nickel, toluene, trichloroethene, and vinyl chloride require revision.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	September 7, 2022

Other Findings

In addition, the following are recommendations identified during this FYR. They do not affect current or future protectiveness:

- Drainage channel water is monitored at the west, south, and east drains that receive intermittent flow from the cap. The three locations (C107, 143, and 144) that are sampled represent the points of compliance at the former licensed Site boundary. The activity at these monitoring locations is compared to a 25 mrem/year Total Effective Dose Equivalent standard, an annual average action level of 100 pCi/mL, and an additional screening level of 50 pCi/mL. During this FYR period, the individual annual average tritium concentrations at location 144 exceeded 50% of the screening assessment level (100 pCi/mL), which triggers the need for collection of one round of surface water and groundwater samples for radionuclide, metals, and volatile organic compound analysis pursuant to the Commonwealth's IMP Work Plan. Surface water locations requiring sampling include 102D, 122A, 122C, and 103; groundwater monitoring well locations requiring sampling include all 14 alluvial wells. This additional sampling should be conducted pursuant to the Commonwealth's IMP Work Plan.

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy at MFDS is protective of human health and the environment in the short-term, because remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks at MFDS.

VIII. NEXT REVIEW

The next FYR for the Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Record of Decision, Summary of Remedial Alternative Selection, Maxey Flats Disposal Site, Fleming County, Kentucky. EPA Region 4. September 1991.

First Five-Year Review Report for MFDS. September 2002.

Second Five-Year Review Report for MFDS. September 2007.

Third Five-Year Review Report for MFDS. September 2012.

Explanation of Significant Differences. EPA Region 4. February 2013.

Maxey Flats Project Annual Report, 2012. March 27, 2013.

Maxey Flats Project Annual Report, 2013. March 24, 2014.

Maxey Flats Project Annual Report, 2014. Undated.

Explanation of Significant Differences. EPA Region 4. September 2014.

Maxey Flats Project Annual Report, 2015. Undated.

Landslide Observations at Maxey Flats, Fleming County, Kentucky: Report for the Kentucky Department for Environmental Protection. Kentucky Geologic Survey. Undated.

Preliminary Electrical Resistivity Survey of the Slide Complex at the Maxey Flats Project. March 13, 2016.

Maxey Flats Project Annual Report, 2016. March 28, 2017.

APPENDIX B – SITE CHRONOLOGY

Table B-1: **Site Chronology**

Event	Date
NECO managed and operated the disposal of approximately 4,750,000 cubic feet of low-level radioactive waste.	May 1963 – December 1977
Evaporator operations processed more than 6,000,000 gallons of liquid.	1973 – April 1986
PVC cover was placed over the disposal trenches.	1981
The EPA lists Maxey Flats Disposal Site on National Priorities List.	1986
PRPs sign Administrative Order by Consent (EPA Docket No. 87-08-C) for the RI/FS. PRPs formed the Maxey Flats Steering Committee.	1987
The EPA performed Emergency Action.	December 1988 – November 1991
The EPA approves the RI Report.	July 1989
The EPA submits the FS and the Administrative Record to the public.	May 1991
The EPA issues the Record of Decision for the MFDS, Fleming County, Kentucky.	September 1991
The EPA issues Special Notice to the Potentially Responsible Parties.	1992
Settling Defendants Consent Decree and Statement of Work, de minimis Consent Decree, Settlement Agreement between the Federal Agencies and the Settling Private Parties (SPPs), Steering Committee Participation and Cost Sharing Agreement, and the Operating Agreement of the Maxey Flats Site IRP, L.L.C. negotiated among SPPs, Commonwealth of Kentucky, Settling Federal Agencies and EPA.	1992-1995
Consent Decree, U.S. District Court for the Eastern District of Kentucky No. 95-58, for the Maxey Flats Disposal Site is lodged. SPPs initiate installation of Construction cover.	July 1995
SPPs complete installation of Construction cover.	October 1995
Consent Decree is entered by the Court. Initial Remedial Phase Remedial Design activities begun by SPPs; Initial Remedial Phase Monitoring and Maintenance activities begun by the Commonwealth.	April 1996
SPPs mobilize to Site, initiate Leachate Removal/Disposal (LR/D) Design Construction.	June 1997
The EPA approves SPP's Final LR/D Design Report.	January 1998
The EPA holds Public Open House at MFDS.	August 1998
SPPs complete LR/D Construction and initiate LR/D operations.	September 1998
The EPA holds Public Meeting, Fleming County Courthouse to discuss LR/D Operations and winter shutdown.	February 1999

Event	Date
SPPs initiate Remaining Work with Southeast Cap construction.	June 1999
The EPA holds Public Open House at MFDS to review ongoing Initial Remedial Phase LR/D activities.	October 1999
The EPA finds Leachate Removal Performance Standards met, Leachate removal operations cease and shutdown/ decommissioning is initiated.	August 2000
The EPA holds Public Open House at MFDS to discuss LR/D decommissioning and RW construction.	September 2000
SPPs initiate balance of RW construction.	October 2000
The EPA conducts Five-Year Review. SPPs continue RW Construction.	June 2002
Commonwealth begins Interim Maintenance Period Monitoring.	January 2003
SPPs complete the Initial Remedial Phase work.	May 2003
SPPs submit Initial Remedial Phase Remedial Action Construction Report to EPA. EPA approves Commonwealth IMP Work Plan.	June 2003
The EPA issues the Initial Remedial Phase Certification of Completion.	October 2003
Commonwealth holds Public Open House at MFDS.	April 2006
The EPA completes second Five-Year review.	September 2007
Commonwealth holds Public Open House at MFDS.	April 2008
Greater than 25-year project storm occurs at Site.	May 2, 2010
Commonwealth holds Public Open House at MFDS.	October 2010
The EPA Initiates third Five-Year Review.	October 2011
The EPA completes third Five-Year Review	September 2012
Final Closure Period begins	November 2012
The EPA issues an ESD for the Site.	February 2013
The EPA issues an ESD for the Site.	September 2014
Final cap construction begins	2015
Final cap construction is completed	To Be Determined

APPENDIX C – SITE BACKGROUND

C-1: Site Description

The MFDS, located in Fleming County, Kentucky, is an inactive low-level radioactive waste site owned by the Commonwealth of Kentucky. The property encompasses approximately 770 acres and includes a disposal tract and buffer zone.

The Site is located in the Knobs physiographic region, which is characterized by hills and relatively flat-topped ridges. The disposal cell is located on a spur of Maxey Flats, one of the larger flat-topped ridges in the region. The Site is bounded by steep slopes on the west, east, and south and is approximately 350 feet above the adjacent valleys.

The land surrounding the Site is primarily mixed woodlands and open farmland. The area is sparsely populated and mostly undeveloped. The few residences in the area have a public water supply system.

C-2: Site History and Operations

In January 1963, the Commonwealth of Kentucky issued a license to NECO for the disposal of solid by-product, source and special nuclear material on a 252-acre disposal tract. From May 1963 through December 1977, NECO managed and operated the disposal of an estimated 4,750,000 cubic feet of low-level radioactive waste at the Site. Environmental monitoring in 1972 by the Commonwealth revealed possible migration of radionuclides from the disposal area known as the "Restricted Area." A special study was performed by the Commonwealth in 1974 that confirmed that tritium and other radioactive contaminants were migrating out of the disposal trenches and that some radioactive material had migrated into unrestricted areas. In 1977, it was determined that leachate was migrating through the subsurface geology and NECO was ordered to cease the receipt and burial of radioactive waste. NECO's license was transferred back to the Commonwealth Department of Natural Resources and Environmental Protection in 1979.

From 1973 through April 1986, an evaporator was operated at the Site as a means of managing the large volume of water infiltrating the disposal trenches as well as waste water generated by on-site activities. The evaporator processed over 6,000,000 gallons of liquids during its operation and the evaporator concentrates were disposed of on-site.

From 1983 to 1986, MFDS was in the process of being listed on the EPA's NPL at the request of the Commonwealth. In 1986, the listing was finalized and the EPA issued general notice letters to 832 PRPs informing them of their potential liability with respect to Site contamination. In March 1987, 82 PRPs signed an Administrative Order by Consent to perform a RI/FS.

In December 1989, the EPA initiated an Emergency Response Action at MFDS due to an imminent threat to public health, welfare, and the environment posed by the potential release of liquids stored in on-site storage tanks. The EPA installed heaters in the tank farm building to prevent freezing and possible rupturing and installed additional storage capacity on-site. The EPA also solidified 286,000 gallons of radioactive liquids stored in the tanks and on the floor of the tank building. These 216 solidified blocks were buried in newly constructed trenches within the Restricted Area.

The RI Report for the MFDS was approved by the EPA in July 1989. The FS for the MFDS was finalized and submitted to the public in May 1991. A ROD was signed for the Site on September 30, 1991.

C-3: Physical Site Characteristics

The MFDS includes an inactive low-level radioactive waste landfill and a 464-acre buffer zone. The whole Site encompasses 770 acres. The Site is owned by the Commonwealth of Kentucky. The landfill is capped to reduce groundwater infiltration.

The MFDS is located in the Appalachian Plateau, in the Knobs physiographic region of northeast Kentucky, an area characterized by relatively flat-topped ridges (flats) and hills (knobs). The MFDS is located on a spur of Maxey Flats, one of the larger flat-topped ridges in the region. The MFDS is bounded by steep slopes to the west, east, and south and is approximately 350 feet above the adjacent valley bottoms.

Numerous studies have reported on the geology of the MFDS. The following text is a summary of the geology, hydrology, and hydrogeology from the RI report and the ROD:

The MFDS lies in a tectonically stable region of North America with few exposed faults and relatively infrequent earthquakes. The rock units exposed in the area surrounding the MFDS consist of shale, siltstone, and sandstone ranging in age from the Silurian to Mississippian (320 to 430 million years old). In the MFDS area, the rock units dip 25 feet per mile (0.3 degrees); regionally they dip to the east at 30 to 50 feet per mile.

The Nancy Member of the Borden Formation is exposed on the hilltop at Maxey Flats and is 27 to 60 feet thick. The unit is mostly shale with two laterally extensive siltstone beds, the Lower Marker Bed and Upper Marker Bed. These beds were up to 2.8 feet thick at locations encountered during drilling operations at Maxey Flats.

Underlying the Nancy Member, the Farmers member of the Borden Formation is characterized as an interbedded siltstone and shale, approximately 29 to 42 feet thick. Underlying the Farmers Member is the 4 to 7 feet thick shale of the Henley Bed, 17 to 18 feet thick Sunbury Shale, and 21 feet thick Bedford Shale. The Ohio Shale lies beneath the Bedford Shale and above the upper part of the Crab Orchard formation.

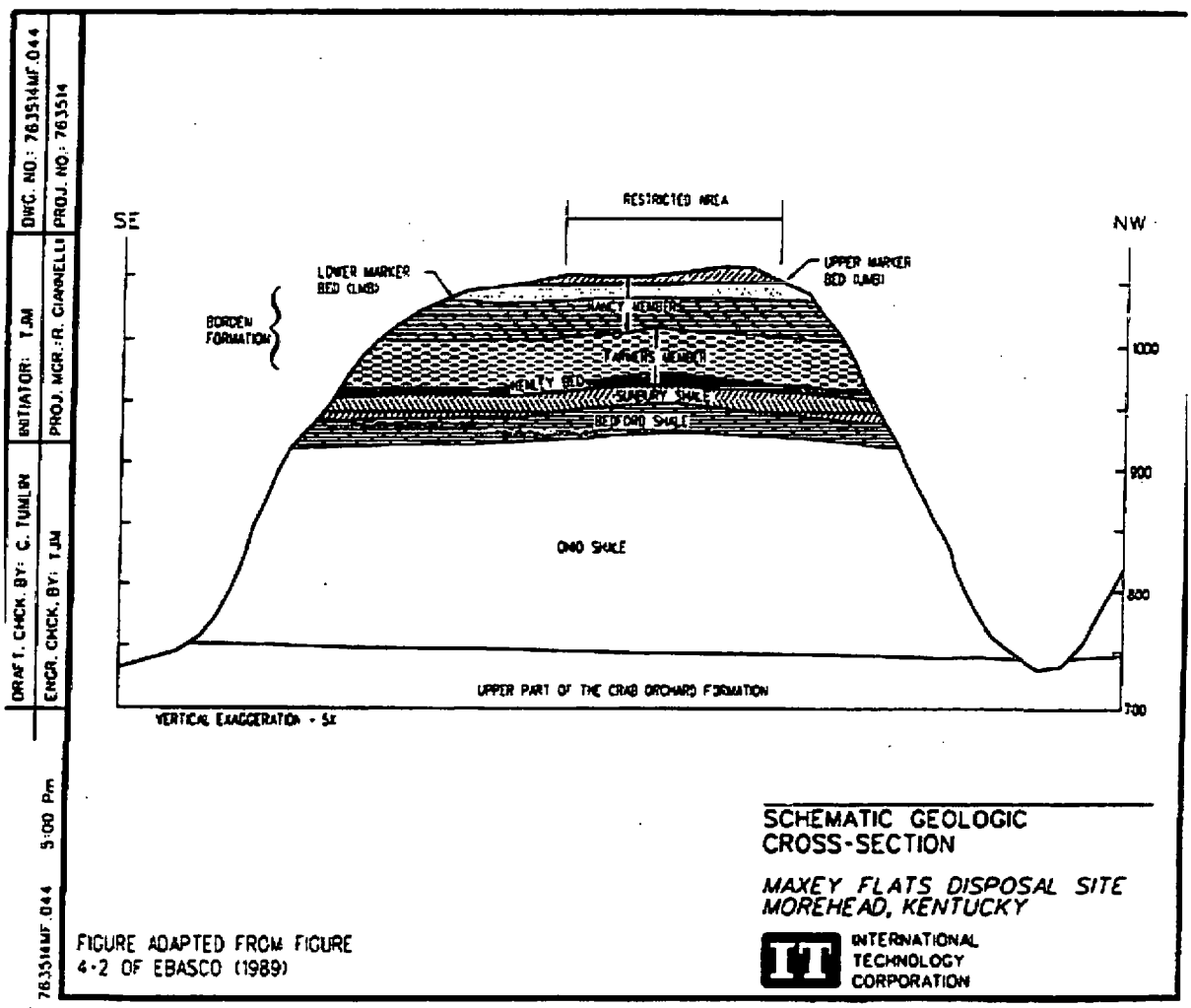
Fractures are present in all rock units at the MFDS with fracture sets oriented in descending 6 order, northeast-southwest, northwest-southeast, and north-south. The fracture sets are generally within 20 degrees of vertical. The weathered shale of the Nancy Member is the most highly fractured.

The distinguishing feature of the Nancy Member, and perhaps that of the MFDS geology, is the Lower Marker Bed of the Nancy Member. The Lower Marker Bed is a thin siltstone layer that is generally flat-lying (some local undulations of the bed are present), fractured and weathered, and lies approximately 15 to 25 feet below ground surface. The Lower Marker Bed has been identified as the principal leachate flow pathway at the MFDS and underlies or intersects the majority of disposal trenches. Consequently, the Lower Marker Bed is a highly contaminated geologic unit at the MFDS. Another distinguishing characteristic of the Lower Marker Bed that underlying units are hydraulically connected to the Lower Marker Bed.

Groundwater resources in a three county area, including the Maxey Flats area, are very limited, with adequate residential supplies (up to 500 gallons per day) generally available only in broad valley bottoms like the Licking River valley. The small valleys adjacent to MFDS would not produce enough water for a dependable domestic water supply. On hills the Borden Formation yields little water (less than 100 gallons per minute), and almost no water from wells drilled in shale. Groundwater is sometimes present in the fractures of rock units. Wells drilled in the Ohio Shale can provide up to 500 gallons per day, but locally can be of poor quality.

The residents of Maxey Flats have been on a public water supply since about 1985. Before then, water was typically obtained from shallow wells dug in the soil or weathered shale of the Nancy Member, which supplied approximately 25 to 50 gallons per day. Most investigators have considered the water to be from a perched water table. The source of this water was apparently from secondary porosity in the soil or weathered rock, and also from roof downspouts routed into the wells. These shallow wells were unreliable sources of water and may have acted more as storage cisterns than as wells.

Below is a geologic cross-section of MFDS:



Vertical migration of groundwater between geological strata is limited by low permeability shale layers, which act as aquitards. Because the MFDS is bounded on the three sides by steep slopes, the contaminated leachate migrating horizontally through the fractured siltstone layers generally moves into the bottom of the soil layer on these hillslopes. However, as evidenced by the occurrence of seeps on the east hillside, not all leachate migrates to the bottom of the soil layer.

Hydrogeologic evaluations of the MFDS indicate that groundwater movement through the rock strata into the disposal trenches may be negligible. Regardless, the potential pathway for groundwater flow into the trenches through the narrow neck at the north side of Maxey Flats where the trench area is connected to the main portion of the Maxey Plateau was partially eliminated during Initial Remedial Phase by construction of the North Channel.

Drip Springs Creek, located on the west side of the MFDS, and No Name Creek, located on the east side of the MFDS, both flow into Rock Lick Creek to the southwest of the MFDS. Rock Lick Creek flows into Fox Creek approximately two miles southwest of Maxey Flats. Fox Creek flows into the Licking River, approximately 6.5 miles west of MFDS, which empties into the Ohio River near Cincinnati, Ohio, approximately 100 miles from Maxey Flats.

APPENDIX D – SITE MAPS

Figure D-1: Site Vicinity Map

Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

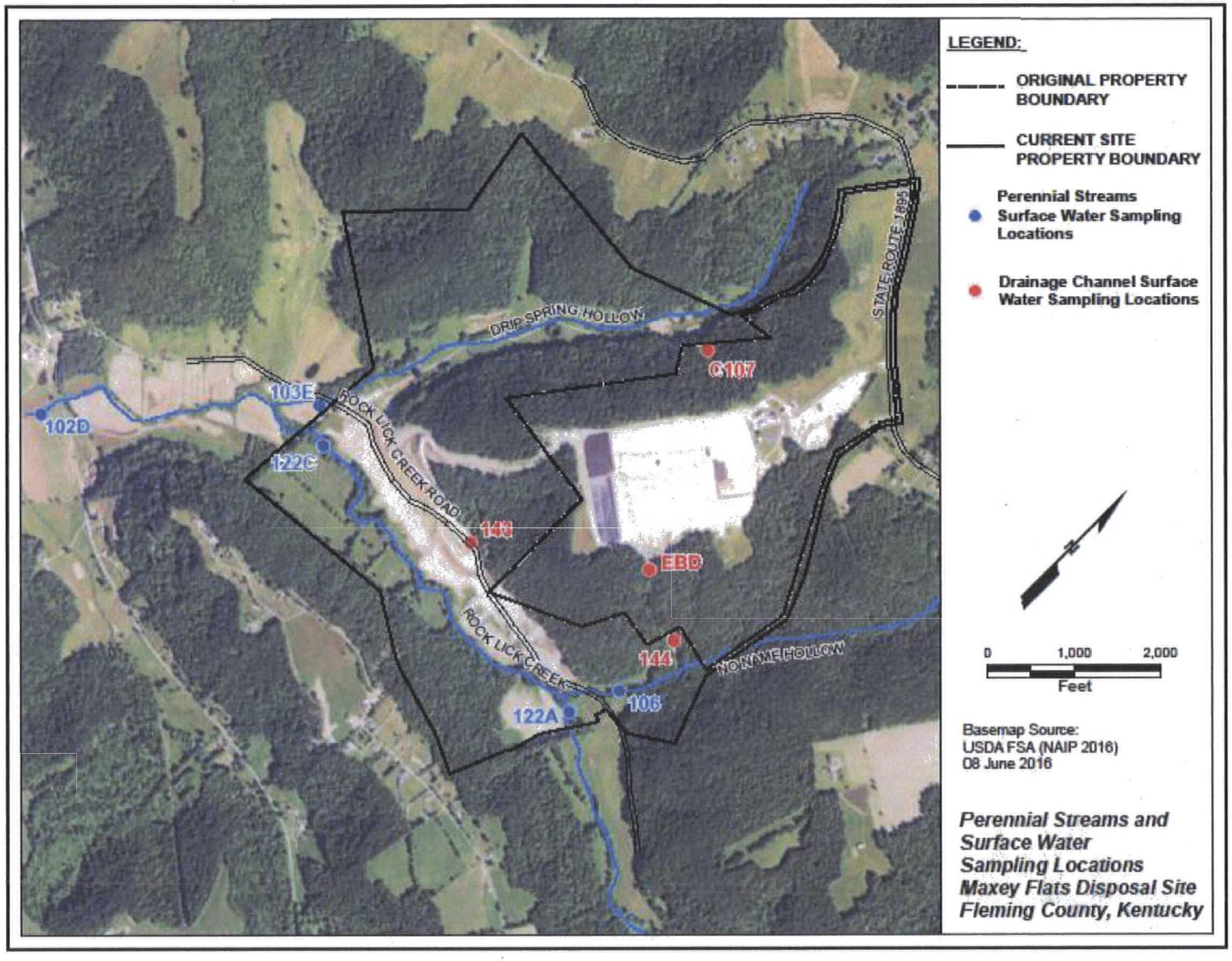
Figure D-2: Site Overview Map

Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Figure D-3: 2016 Areal View of the Maxey Flats Disposal Site

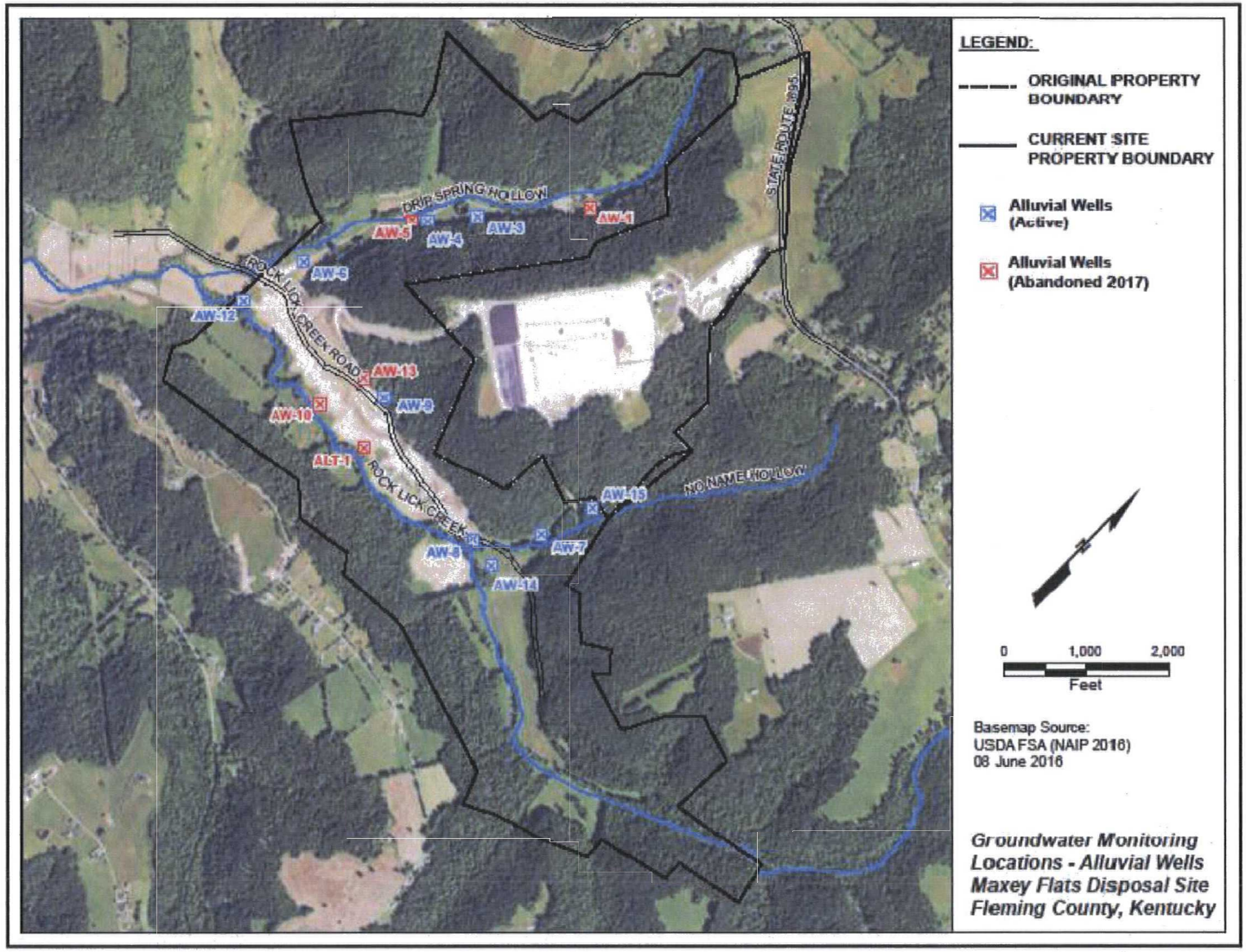
Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Figure D-4: Perennial Streams and Drainage Channel Surface Water Sampling Locations



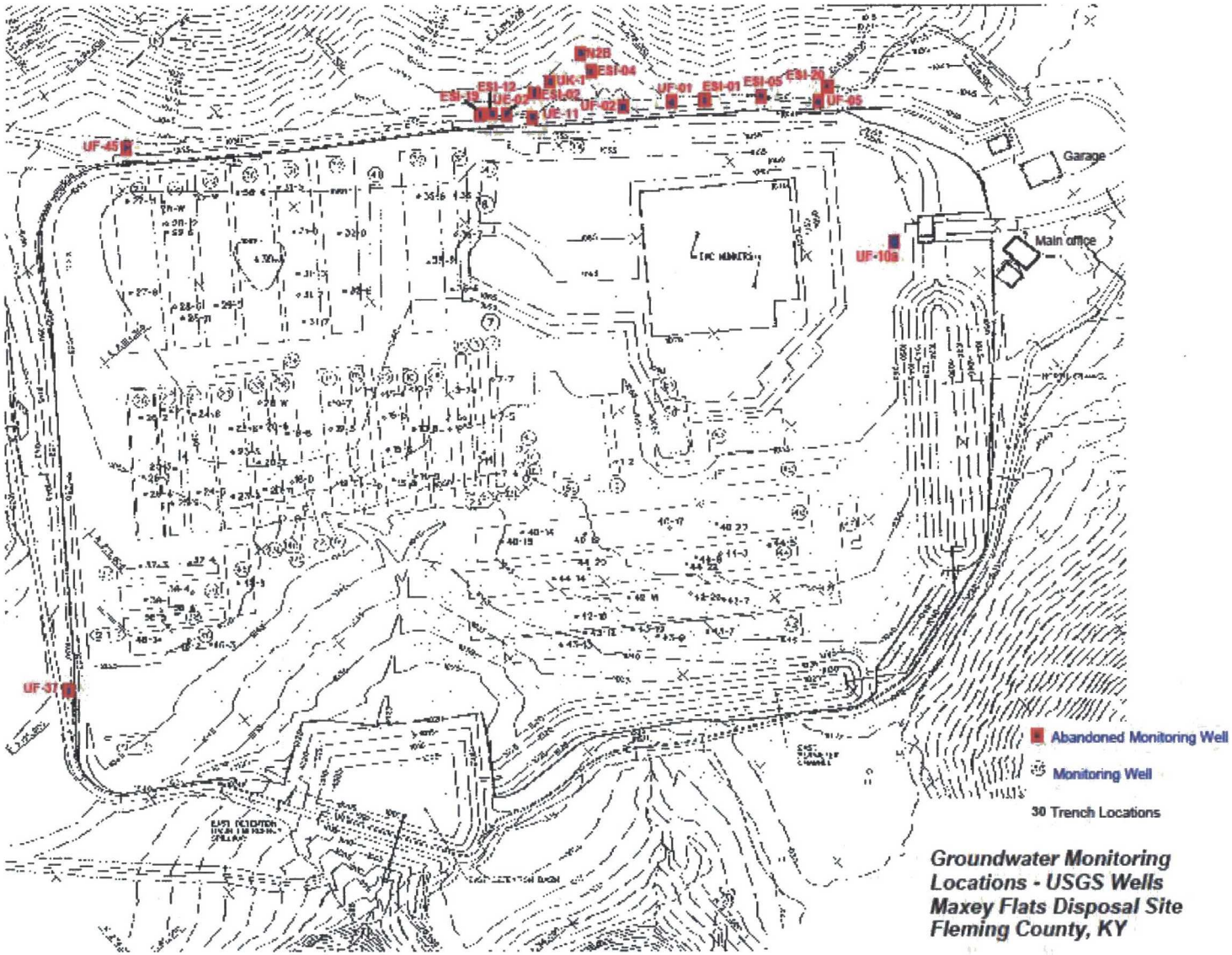
Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Figure D-5: Groundwater Monitoring Locations



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Figure D-6: Additional Site Features of Note



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

APPENDIX E – PRESS NOTICE

U.S. Environmental Protection Agency, Region 4
Announces the Fourth Five-Year Review
for Maxey Flats Nuclear Disposal Site
Fleming County, Kentucky

A Five-Year Review is being conducted by the U.S. Environmental Protection Agency (EPA) of the clean-up activities taken at the Maxey Flats Nuclear Disposal Site (the Site) located in Fleming County, Kentucky. The Superfund law, known as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), requires that Superfund cleanup actions be reviewed every five years, to ensure that the selected remedy remains protective of human health and the environment. Thus the purpose of this Five-Year Review, the fourth for this Site, is to evaluate the performance and effectiveness of the remedy selected, which includes, but is not limited to, an interim cap, natural stabilization of waste, a final cap, stormwater drainage components, and other supporting infrastructure. When completed, a copy of the review report will be placed in the Information Repository located at the Fleming County Public Library, Bypass Blvd., Flemingsburg, KY 41041; (606) 845-7851.

The EPA will also conduct a number of interviews with nearby businesses, residents, local and state officials to solicit feedback on the clean-up process. The EPA will complete the current Five-Year Review process this year.

If you would like more information or have any questions, comments, and/or concerns about the Five-Year Review, you may contact:

Pam Scully
Remedial Project Manager

U.S. EPA, Region 4
61 Forsyth Street, SW.
Atlanta, GA 30303
Phone: 404-562-8935
Email: scully.pam@epa.gov

Stephanie Yvette Brown
Community Involvement Coordinator

U.S. EPA, Region 4
61 Forsyth Street, SW.
Atlanta, GA 30303
Phone: 404-562-8450
E-mail: brown.stephanie@epa.gov

Media Name	Contact	Publication Schedule/Circulation	Comments
Ashland Daily Independent 224 17th Street Ashland, KY 41101 (606) 326-2622	**Kim Harper** **The Daily Independent** kharper@dailyindependent.com	Daily 15,295 **Sunday** Largest Circulation $	Publication on Sunday August 6th
Lexington Herald Leader 100 Midland Avenue Lexington, KY 40508 (859) 231-1361	hllegalads@herald-leader.com Ryan Dixon RDixon@herald-leader.com	Daily 500,060 circulation **Sunday** largest circulation day Must be in by Wed AM	Publication on Sunday August 6th
Maysville Ledger/Independent 41-43 West Second Street P.O. Box 518 Maysville, KY 41506 (606) 564-9091	**Johnna Dorn** Advertising Assistant The Ledger Independent 120 Limestone Street Maysville, Kentucky 41056 Phone: 606-564-9091 ext. 388 or 390 Email: Johnna.Dorn@lee.net	Monday-Saturday 8500 Circulation **Saturday** largest circulation	Publication on Saturday August 5th
Morehead News 722 West First Street Morehead, KY	**Alyssa Dulen** Advertising Coordinator Phone: (606) 784-4116 adulen@themoreheadnews.com	Tuesday and Friday Deadline Friday for Tuesday Wednesday for Friday 5800 Circulation **Friday is the largest circulation**	Publication on Friday August 4th
Flemingsburg Gazette P.O. Box 32 Flemingsburg, KY 41041 (606) 845-9211	Tonya or Charles Charles@kynewsgroup.com	**Wednesdays** only Must have by 12:00 Tuesday 2400 paid circulation	Publication on Wednesday August 9th

APPENDIX F – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Maxey Flats Disposal Site	**Date of Inspection:** April 25, 2017
Location and Region: Fleming County, Kentucky/Region 4	**EPA ID:** KYD980729107
Agency, Office or Company Leading the Five-Year Review: EPA Region 4	**Weather/Temperature:**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Ground water pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other:
- ☐ Monitored natural attenuation
- ☐ Ground water containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (See Appendix H, Interview Documentation)

1. **O&M Site Manager** _____ Name _____ Title _____ Date
   Interviewed ☐ at site ☐ at office ☐ by phone : _____
   Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** _____ Name _____ Title _____ Date
   Interviewed ☐ at site ☐ at office ☐ by phone : _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

   Agency _____
   Contact _____ Name _____ Title _____ Date _____ Phone No.
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____Name _____ Title _____ Date _____ Phone No.
   Problems/suggestions ☐ Report attached:_____

   Agency _____
   Contact _____ Name _____ Title _____ Date _____ Phone No.
   Problems/suggestions ☐ Report attached:_____

   Agency _____
   Contact _____ Name _____ Title _____ Date _____ Phone No.
   Problems/suggestions ☐ Report attached: _____

	Agency _____ Contact _____ _____ _____ _____ Name Title Date Phone No. Problems/suggestions ☐ Report attached:_____
4.	**Other Interviews** (optional) ☐ Report attached: _____

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1.	**O&M Documents**			
	☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: O&M Manual and as-built drawings are currently being prepared and are not final. Final Cap installation completed in Late 2016.			
2.	**Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: HASP & contingency/ER plan currently being updated. Site Mgr will provide for review when updated.			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: O&M records N/A because the O&M plan has not been completed. Inspection team did not review OSHA training records while on Site.			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A
	Remark: The Site has no permits. The Site is currently renewing its nuclear license.			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: Not Applicable			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: Baseline monument survey had not been completed at the time of the Site Inspection.			
7.	**Ground Water Monitoring Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: Records not reviewed while on Site. The EPA has applicable groundwater monitoring records.			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: Not Applicable			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A

☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A

Remarks: Not Applicable

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☐ N/A

Remarks: Site sign-in sheet available. Historical access/security logs were not reviewed while on Site.

IV. O&M COSTS

1. **O&M Organization**

☒ State in-house ☐ Contractor for state

☐ PRP in-house ☐ Contractor for PRP

☐ Federal facility in-house ☐ Contractor for Federal facility

☐ _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☒ Unavailable **O&M plan has not been finalized**

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: New fencing has been installed around the Site and around the landfill cap. Gate controllers had not yet been installed at the time of the Site Inspection; however, gates were secure at the time of the site inspection. The Site contractor subsequently reported that they have been installed.

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Radiation signs were posted on the fence around the perimeter of the landfill cap. Marker monuments were installed at the north end of the landfill and at the approximate center of the landfill.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement***

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by): Personnel on Site

Frequency: Daily (during week days)

Responsible party/agency: Kentucky DEP

Contact	Scott Wilburn	Site Manager	_____	6063562965
	Name	Title	Date	Phone no.

Reporting is up to date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached

No site records were reviewed during site inspection; however, available documents were provided and reviewed following the site inspection.

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: _____

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: No indications of trespassing or vandalism were observed during the Site Inspection.

2. **Land Use Changes On Site** ☒ N/A

Remarks: _____

3. **Land Use Changes Off Site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: Road around landfill cap was installed last year and was in good condition.

B. Other Site Conditions

Remarks: Slips on hillside over the hill near former borrow areas. Some have been repaired, remaining slip areas to be monitored and repaired as necessary. Monitoring will be included in the O&M Plan.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☒ Settlement not evident

Arial extent: _____ Depth: _____

Remarks: _____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident

	Lengths: _____	Widths: _____	Depths: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☐ Erosion not evident
	Arial extent: estimated 5' x 25'		Depth: 2" maximum
	Remarks: Only one small area with some minor erosion channeling was observed in an area with sparse/no vegetation located near monument marker near center of landfill (see Appendix G). Maximum depth of channels 2" depth. Monitoring will be included in the O&M Plan.		
4.	**Holes**	☐ Location shown on site map	☒ Holes not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☒ Grass	☐ Cover properly established
	☐ No signs of stress	☐ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: Most of landfill cap had adequate vegetative cover; however, some areas sparsely vegetated. Some areas were not seeded until late in the Fall 2016. KY DEP had landscaping company scheduled to return to re-seed areas with sparse vegetation.		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☒ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☒ Bulges not evident
	Arial extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent: _____
	☐ Ponding	☐ Location shown on site map	Arial extent: _____
	☐ Seeps	☐ Location shown on site map	Arial extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Arial extent: _____
	Remarks: One area had vehicle tracks where vehicle had driven across the area before it dried after a rain event. KY DEP was aware of this issue and planned for repairs.		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☒ No evidence of slope instability		
	Arial extent: _____		
	Remarks: _____		
B. Benches		☐ Applicable	☒ N/A
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay

Remarks: _____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay

Remarks: _____

C. Letdown Channels ☐ Applicable ☒ N/A

Turf reinforcement mats (TRM) installed in high flow areas of landfill, though not considered Letdown Channels

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement

Arial extent: _____ Depth: _____

Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation

Material type:_____ Arial extent: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion

Arial extent: _____ Depth: _____

Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting

Arial extent: _____ Depth: _____

Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions

☐ Location shown on site map Arial extent: _____

Size: _____

Remarks: _____

6. **Excessive Vegetative Growth** Type: _____

☐ No evidence of excessive growth

☐ Vegetation in channels does not obstruct flow

☐ Location shown on site map Arial extent: _____

Remarks: _____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Gas Monitoring Probes**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

4. **Extraction Wells Leachate**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A

Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☒ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☒ N/A

Remarks: _____

2. **Outlet Rock Inspected** ☒ Functioning ☐ N/A

Remarks: Rock (rip rap) installed around perimeter of landfill cap

G. Detention/Sedimentation Ponds ☒ Applicable ☐ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☐ Siltation not evident

Remarks: Minimal/unmeasurable sediment in East Basin.

2. **Erosion** Area extent: _____ Depth: _____

☒ Erosion not evident

Remarks: _____

3. **Outlet Works** ☒ Functioning ☐ N/A

Remarks: _____

4. **Dam** ☒ Functioning ☐ N/A

Remarks: _____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement: _____ Vertical displacement: _____

Rotational displacement: _____

Remarks: _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident

Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident

Area extent: _____ Depth: _____

Remarks: No siltation in ditches or storm drains in and along the landfill perimeter road.

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☒ Vegetation does not impede flow

Area extent: _____ Type: _____

Remarks: Vegetative growth in drainage swale/ditches along eastern perimeter that drain into east basin. Turf reinforcement mat installed.

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident

Area extent: _____ Depth: _____

Remarks: _____

4. **Discharge Structure** ☐ Functioning ☒ N/A

Remarks: _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident

Area extent: _____ Depth: _____

Remarks: _____

2. ***Performance Monitoring*** *Type of monitoring:*

☐ Performance not monitored

Frequency: _____ ☐ Evidence of breaching

Head differential: _____

Remarks: _____

IX. GROUND WATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A **Containment**

A. Ground Water Extraction Wells, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation*

☐ Air stripping ☐ Carbon adsorbers ☐ In-situ chemical oxidation*

☐ Filters: _____ ☐ Monitored natural attenuation*

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of ground water treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data* Not evaluated during Site Inspection visit; however, available documents were provided and reviewed following the site inspection. The EPA previously received applicable groundwater data/reports.

1. **Monitoring Data**

☐ Is routinely submitted on time ☐ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation*

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

X. OTHER REMEDIES	
If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions). Landfill cap has been installed (completed Fall 2016). Landfill cap is intact and appears to be functioning as intended. Monitoring well data was not reviewed during site inspection visit to evaluate containment effectiveness as this information had undergone subsequent review.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. Landfill cap installation completed in late Fall 2016. O&M Plan has not been completed/finalized.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None observed. However, State Division of Public Health Protection & Safety - Radiation Health Branch personnel indicated that radioisotopes had been detected in a small pond over the hill on the west side of the landfill, near Storm Water Management Feature #3. KY DEP reported that a new monitoring well will be installed near the pond.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Nothing noted.

Site Inspection Participants:

EPA: Pam Scully, Jon Richards, Stephanie Brown
KY DEP: Scott Wilburn, Jeff Webb, Tim Hubbard, Mary Kornman, Tom Stewart
Kentucky Department of Public Health – Radiation Health Branch: Stephanie Brock, AJ Bhuttacharyya, Curt Pendergrass
TechLaw, Inc. (EPA consultant): Michelle Dallessandro, Gene Nance

APPENDIX G – SITE INSPECTION PHOTOS

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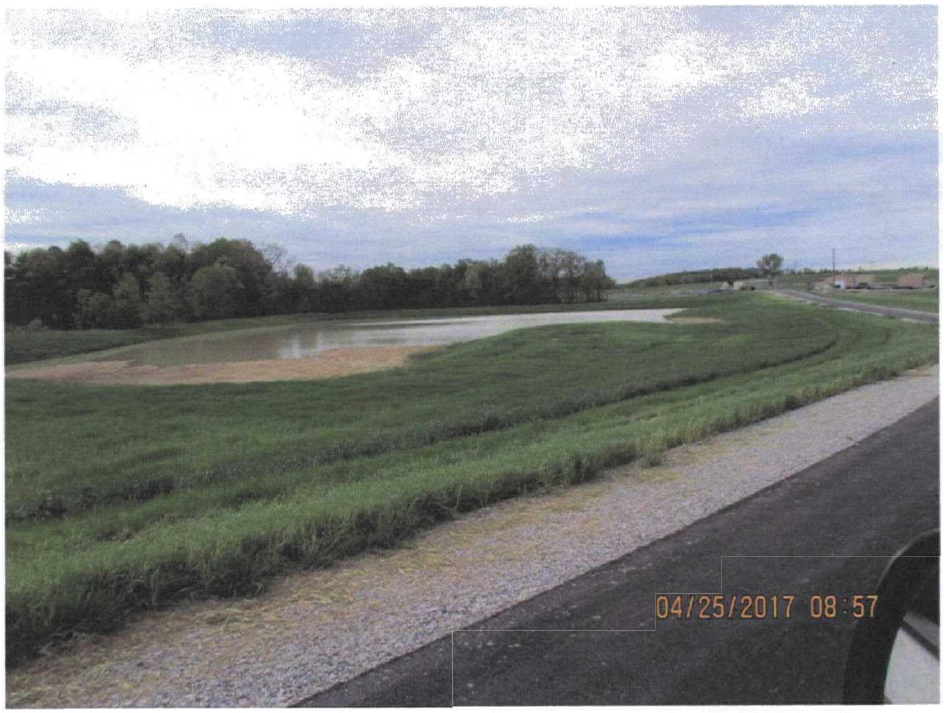
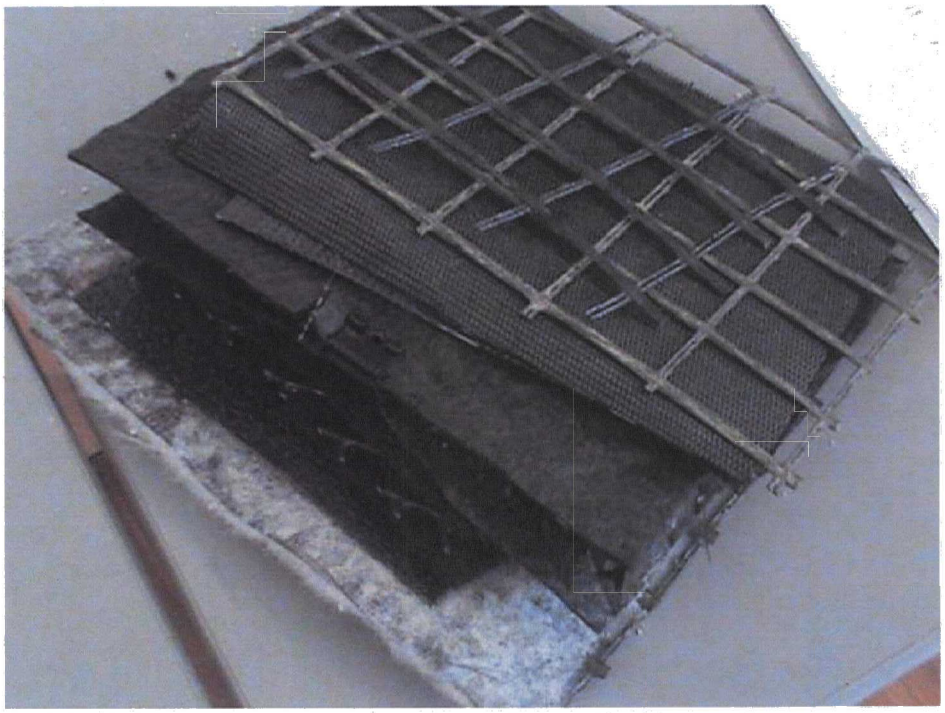


1. Man-made lake in a former borrow area near the KyDEP office.

2. Former borrow area at the entrance to site.

3. A "Do not dig" monument.

4. Close up of the "Do not dig" monument.



5. Landfill (LF) liner materials taken from inside meeting room.

6. Storm drain and culvert to the left and fence and gate to perimeter road in the distance.

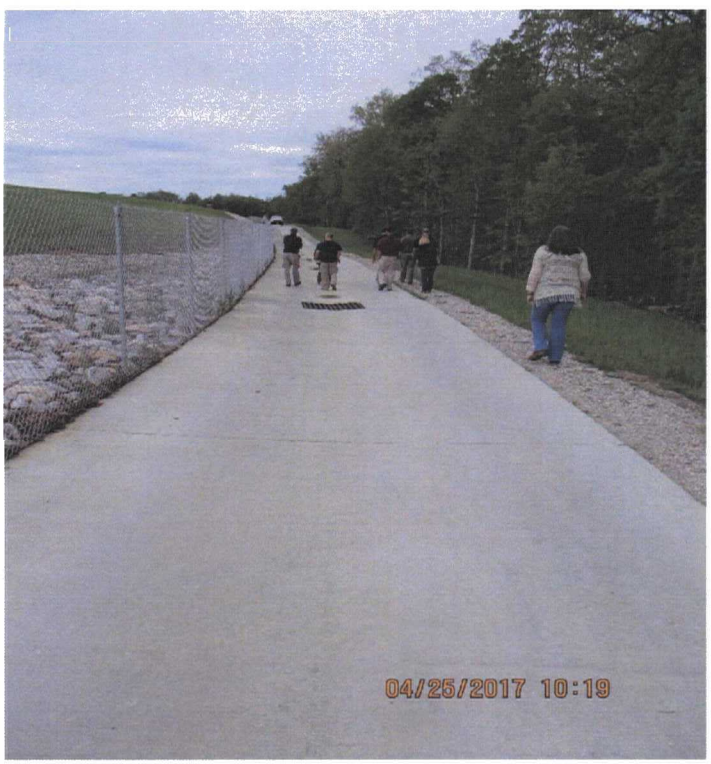
7. Fence around LF cap.

8. Survey monument near the northwest corner of the LF.

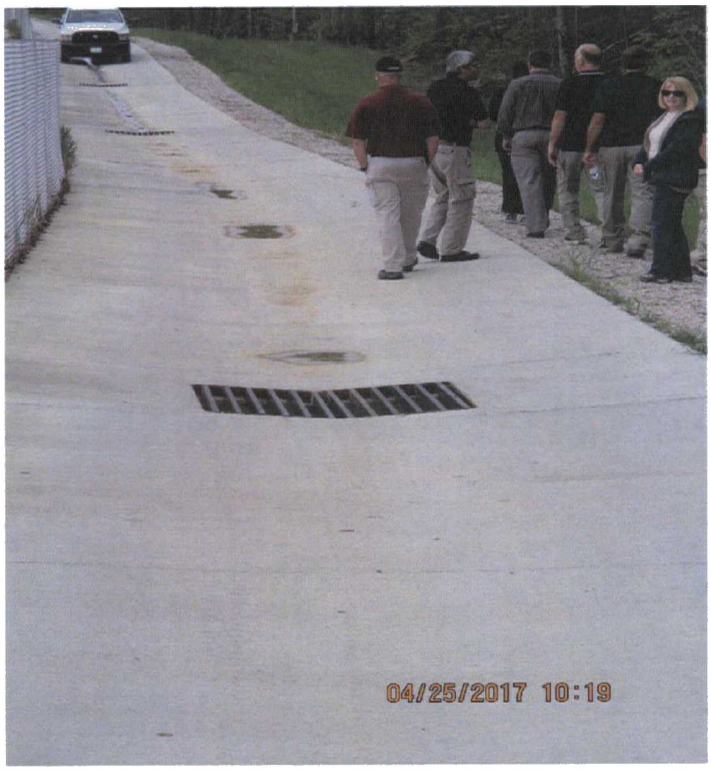
9. Close up of survey monument near the northwest corner of the LF.

10. Radiological caution sign on fence.

11. Looking toward KyDEP facility buildings.



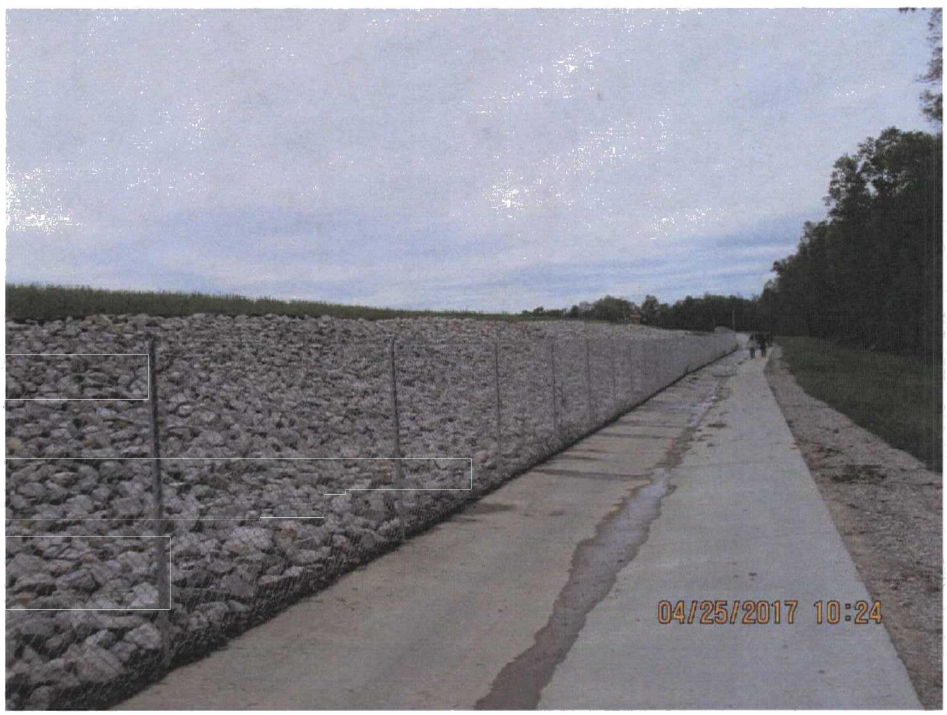
12. Storm drain in the perimeter road in the distance.



13. Storm drain in the perimeter road.

14. West side of the perimeter road.

15. West side of perimeter road.



16. West side of the LF perimeter.

17. Contractors picking up rocks on the LF cap.

18. Facing down into a storm sump, which provides a break in the drainage direction.

19. West side of the perimeter road.

20. A survey monument.

21. Facing down onto a survey monument.

22. West perimeter road and fence.

23. Southwest corner of LF cap and the haul road leading to borrow areas over the hill to the right.

24. Southwest corner fence with access gate and storm drain.

25. Former staging area adjacent to the top of haul road.

26. Access gate at southwest corner of the LF.

27. South perimeter road and fence at the south side of the LF.

28. Storm drain along the south perimeter road.

29. Turf reinforcement mat in drainage path near the south perimeter road.

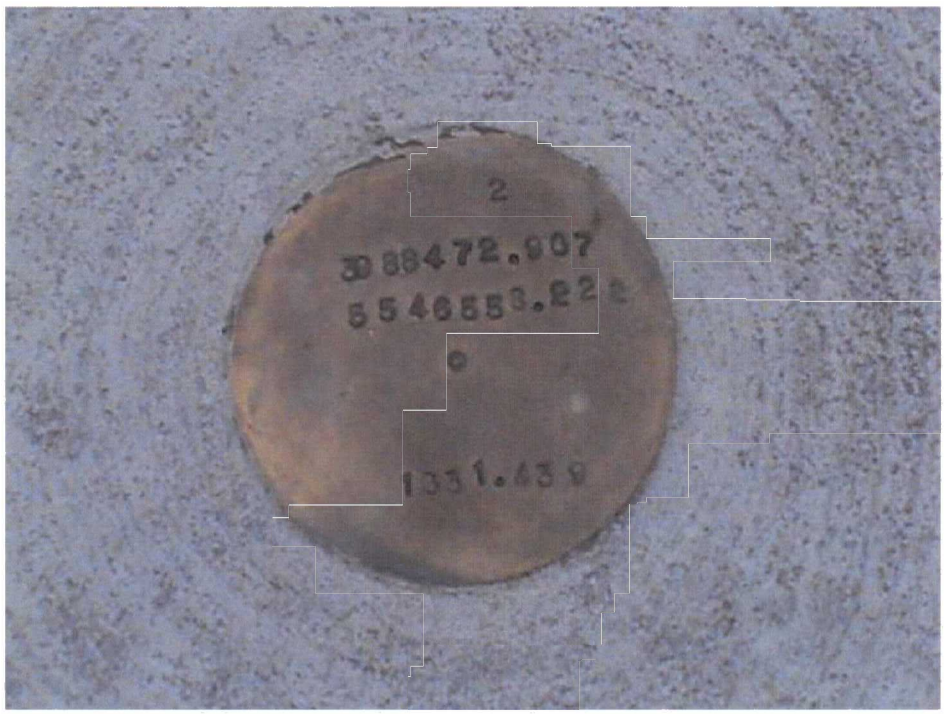
30. Drainage along the south perimeter road.

31. South drain.

32. South drain.

33. Southern survey monument.

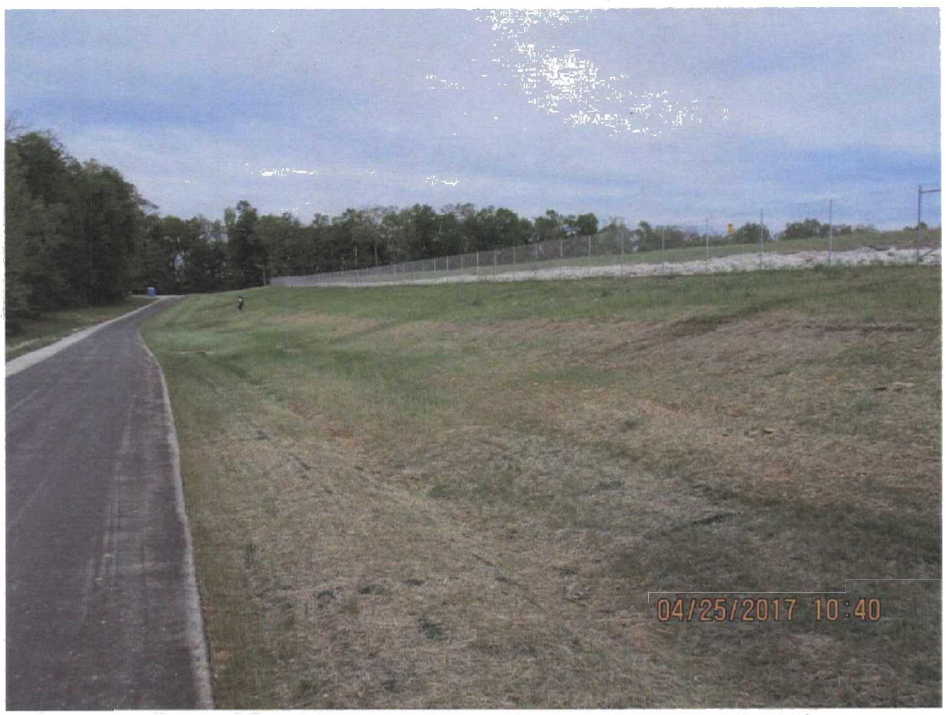
34. Southern survey marker and drain in the distance.



35. Coordinates on the southern marker.

36. Solar panels to power perimeter lighting.

37. Close up of solar panels to power perimeter lighting.



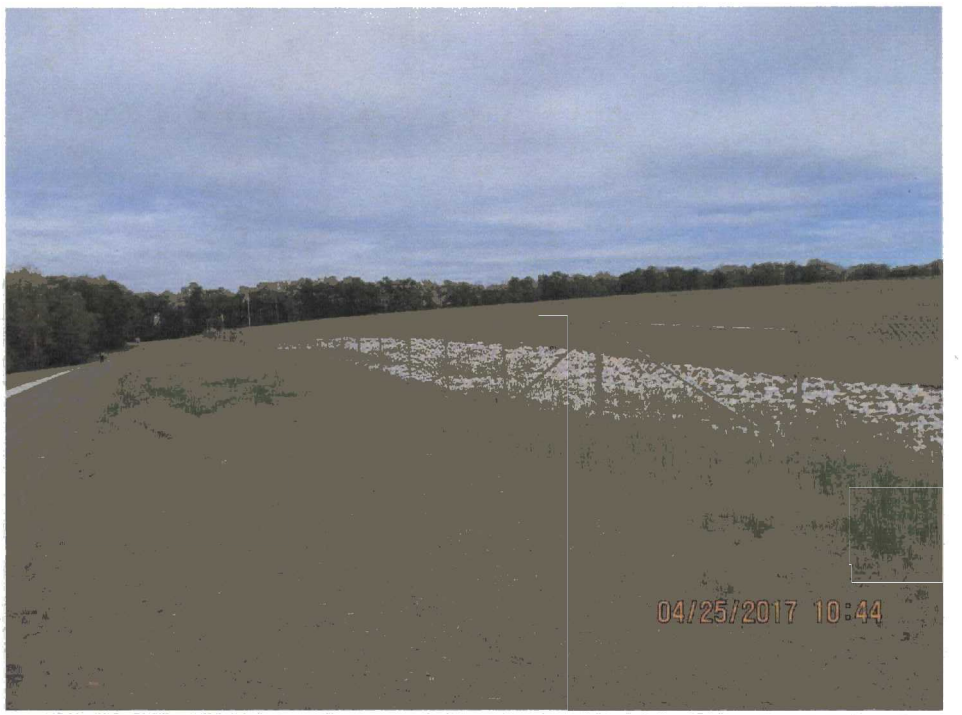
38. A road and fence at the southern perimeter of the LF.

39. Turf reinforcement mat and drainage along the southern perimeter of the LF.

40. Solar panels near southeast corner of the LF.

41. Drainage at southeast corner of the LF.

42. Southeast corner of the LF.



43. Panorama of the LF taken from the southeastern corner, from west to north (Photo 1 of 3).

44. Panorama of the LF taken from the southeastern corner, from west to north (Photo 2 of 3).

45. Panorama of the LF taken from the southeastern corner, from west to north (Photo 3 of 3).

46. LF warning monument near center of the LF.

47. Old and new survey markers near the southeastern corner of the LF.

48. East survey marker.

49. Drainage path between the LF cap and the east perimeter road near the southeastern corner of the LF.

50. The east perimeter road and east drainage basin in the distance.

51. Rock check dam in drainage path to the east basin.

52. East drainage basin.

53. East drainage basin.

54. Panorama of the east drainage basin from west to north (Photo 1 of 3).

55. Panorama of the east drainage basin from west to north (Photo 2 of 3).

56. Panorama of the east drainage basin from west to north (Photo 3 of 3).

57. East drainage basin.

58. East drainage.

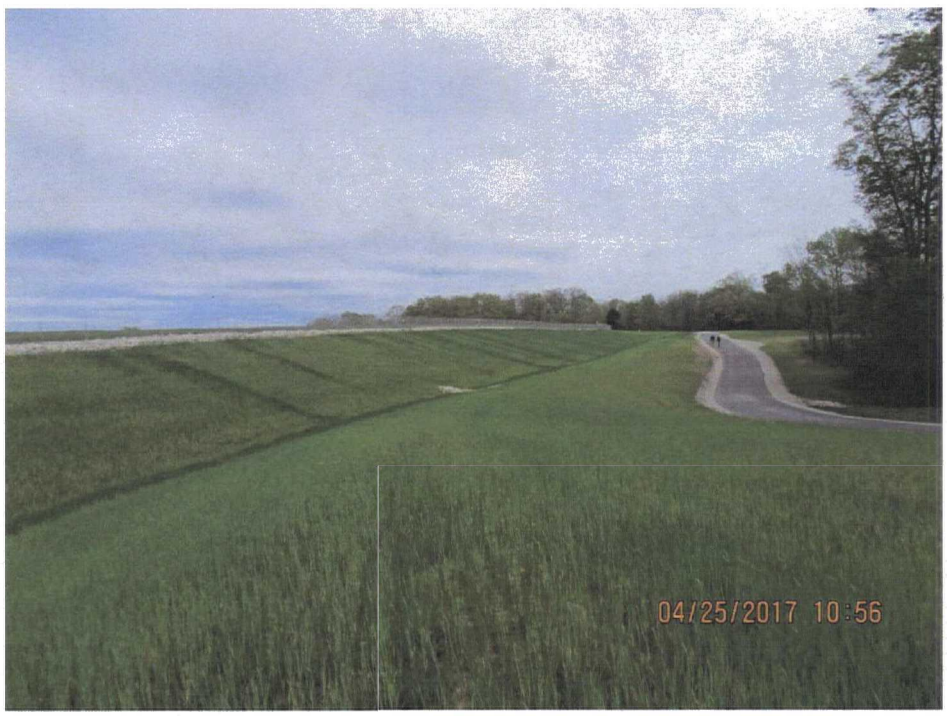
59. East drainage.

60. East drainage basin.

61. East drainage.

62. Fence between LF cap and the East drainage basin at the LF east perimeter.

63. Rock check dam in the drainage path to the East basin.



64. Drainage path to the East basin.

65. East perimeter drainage.

66. Storm drain outlet near the northeastern corner of LF.

67. Close up of a storm outlet near the northeastern corner of the LF.

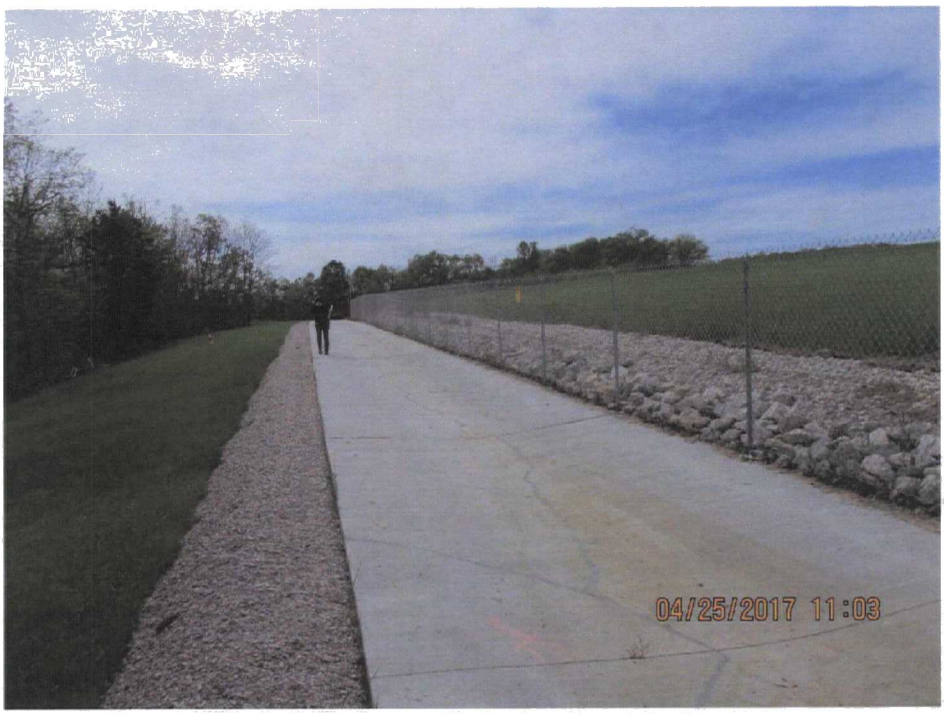
68. Survey monument near the northeastern corner of the LF.

69. Perimeter road and storm drainage near the northeastern corner of the LF.

70. The fence between the LF area and the perimeter road near the northeastern corner of the LF.

71. Perimeter Road and storm drain near the LF northeastern corner of the LF.

72. LF fence and storm drain in the northern perimeter road.



73. Northeastern perimeter road and drainage.

74. Water drainage along the edge of riprap at the edge of the LF.

75. Storm drain at the northern perimeter under the access road to the LF cap.

76. Drainage construction along the northern perimeter of the LF.

77. Drainage and access gate at the north end of the LF.

78. Drainage and access gate at the north end of the LF.

79. Panorama of the northern portion of the LF taken from the access road from east to west (Photo 1 of 4).

80. Panorama of the northern portion of the LF taken from the access road from east to west (Photo 2 of 4).

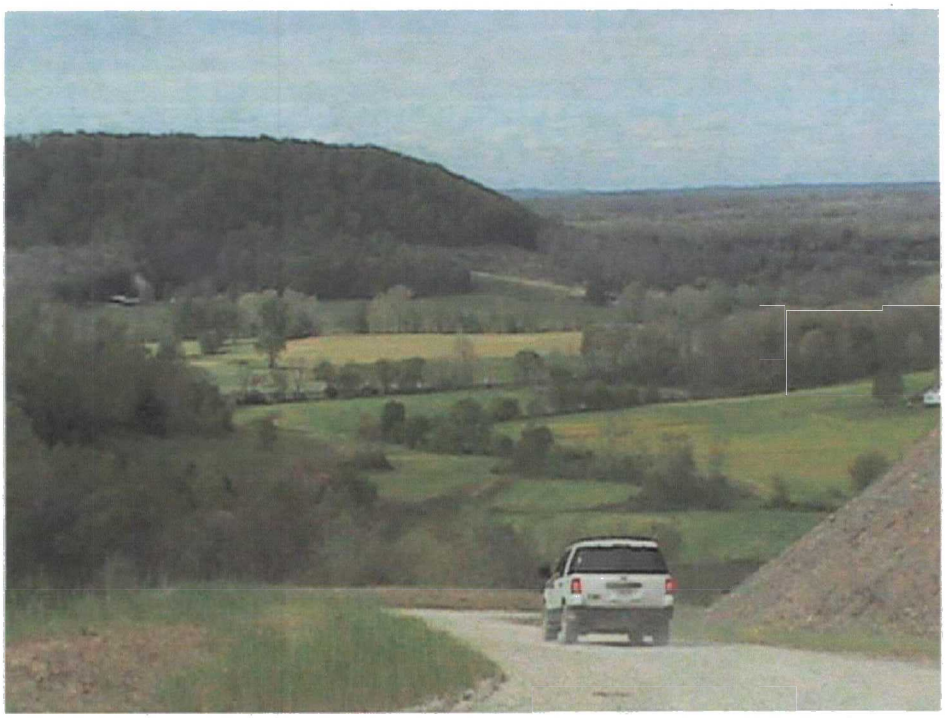
81. Panorama of the northern portion of the LF taken from the access road from east to west (Photo 3 of 4).

82. Panorama of the northern portion of the LF taken from the access road from east to west (Photo 4 of 4).

83. A slip on the hillside and constructed drainage in the former Borrow Area #4.

84. A slip on the hillside and constructed drainage in the former Borrow Area #4.

85. A slip on the hillside and constructed drainage in the former Borrow Area #4.



86. View down the haul road to the borrow areas over the hill.

87. Hillside where slip occurred in Borrow Area #4.

88. Hillside where slip occurred in Borrow Area #4.

89. Hillside where slip occurred in Borrow Area #4.

90. Constructed surface drainage in slip area, Borrow Area #4.

91. A surface drain constructed on the hillside in Borrow Area #4.

92. East drainage at the base of hill.

93. East drainage at the base of the hill.

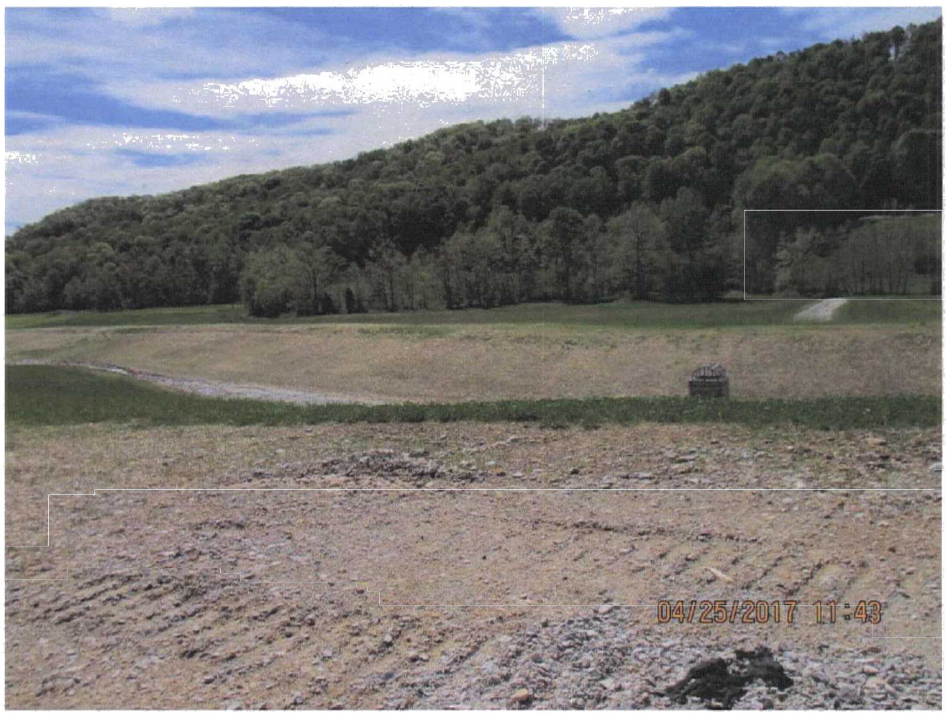
94. East drainage at the base of the hill.

95. East drainage at the base of the hill.

96. A survey marker adjacent to the east drainage at the base of the hill.

97. A former borrow area with vegetative growth.

98. Surface Water Management Feature (SWMF) #2 located at the base of the hill on the east side of the LF.



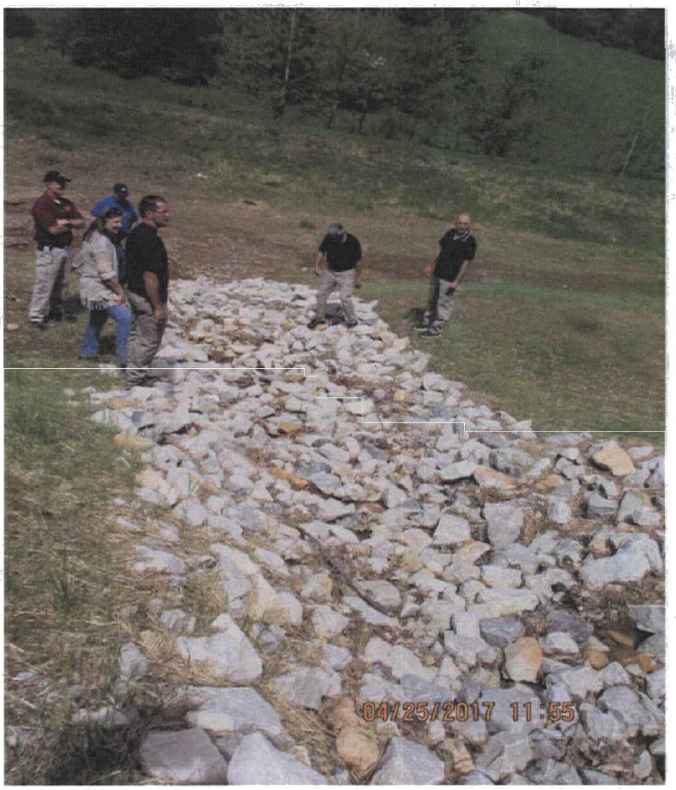
99. SWMF #2 located at the base of the hill on the east side of the LF.

100. SWMF #3 located at the base of the hill on the west side of the LF.

101. Drainage path into SWMF #3.

102. Drainage path into SWMF #3.

103. West drainage.



104. West drainage into SWMF #3

105. SWMF #3.

106. Close up of SWMF #3

107. The northern portion of SWMF #3.

108. Outlet drainage structure from SWMF #3.

109. Outlet drainage structure from SWMF #3.

110. Stakes marking the location where a new monitoring well will be installed near a pond at the base of the hill. Radionuclides were detected in a water sample collected from the pond.

111. Borrow Area #3 where a slip occurred. The slip was repaired and surface drains were installed.

112. The haul road taken from bottom of hill.

113. The haul road taken from bottom of hill.

114. The haul road taken from near the bottom of hill.

115. The north side of LF near the KyDEP office.

116. The north side of LF with the KyDEP office visible on the right.

117. The former haul road across the LF cap with light/sparse vegetation.

118. An area with sparse vegetation near the north end of the LF.

119. Wood chips from an erosion control sock remaining after outer fabric was removed.

120. Sparse vegetation on the former haul road on the LF cap.

121. Panorama of the eastern half of the LF taken from near the top of the LF cap, from north to south (Photo 1 of 4).

122. Panorama of the eastern half of the LF taken from near the top of the LF cap, from north to south (Photo 2 of 4).

123. Panorama of the eastern half of the LF taken from near the top of the LF cap, from north to south (Photo 3 of 4).

124. Panorama of the eastern half of the LF taken from near top of the LF cap, from north to south (Photo 4 of 4).

125. Panorama of the western half of the LF taken from near the highest point of the LF cap, from north to south (Photo 1 of 5).

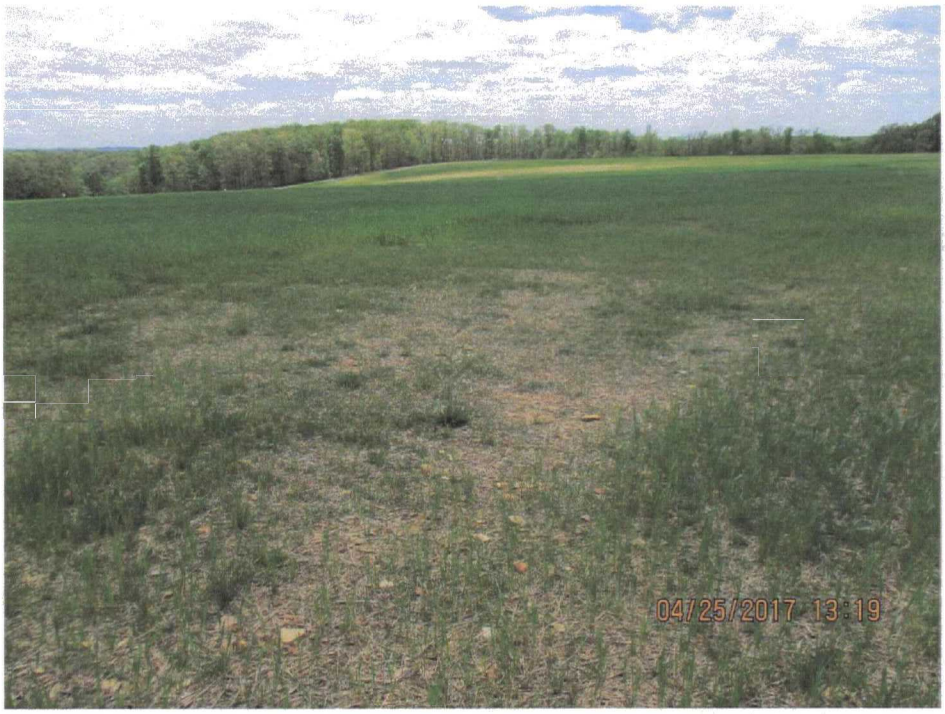
126. Panorama of the western half of the LF taken from near the highest point of the LF cap, from north to south (Photo 2 of 5).

127. Panorama of the western half of the LF taken from near the highest point of the LF cap, from north to south (Photo 3 of 5).

128. Panorama of the western half of the LF taken from near the highest point of the LF cap, from north to south (Photo 4 of 5).

129. Panorama of the western half of the LF taken from near the highest point of the LF cap, from north to south (Photo 5 of 5).

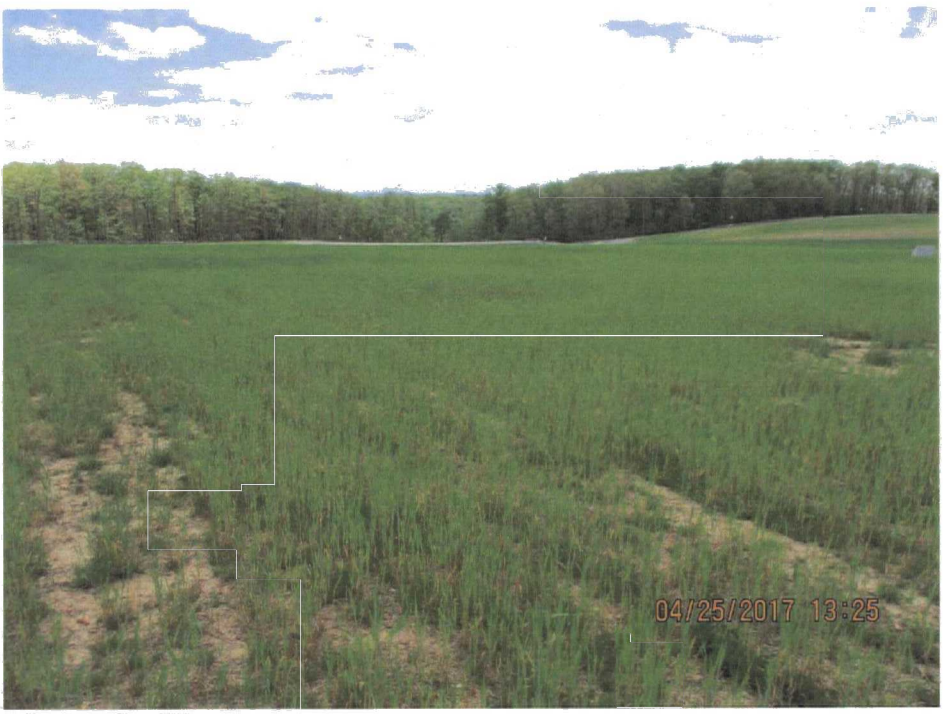
130. Mount for a closed-circuit television (CCTV) surveillance system on top of the LF cap.



131. An area with sparse vegetation near the highest point in the LF.

132. An area with sparse vegetation near the center of the LF.

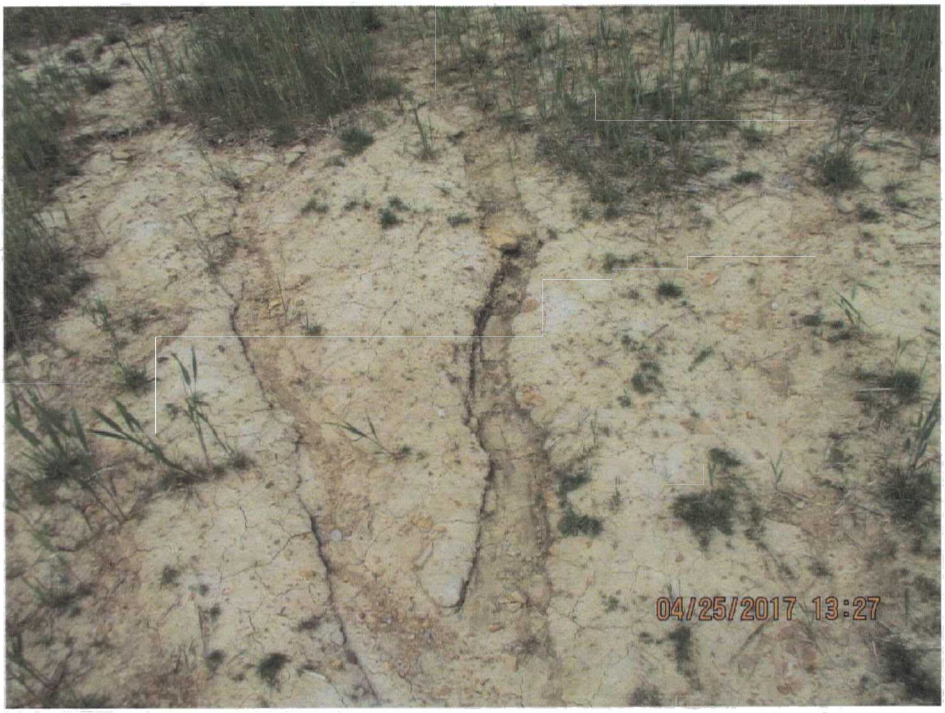
133. A well-established vegetative cover near the center of the LF.



134. Sparse vegetation in the east central area of the LF.

135. A small area with some soil erosion/channeling near the LF monument marker located near the center of the LF.

136. A small area with some soil erosion/channeling near the LF monument marker located near the center of the LF.



137. Close up of soil erosion/channeling area near the LF monument (the channel is 2 inches deep maximum).

138. More erosion channels that extend towards monument and are downgradient of previous photo location.

139. A "Do not dig" monument near the center of the LF cap.

140. Sparse vegetation cover, looking from warning monument toward East Basin.

141. An area with turf reinforcement mat (TRM) that drains towards East Basin.

142. Close up of an area with TRM that drains towards East Basin.

143. An area with sparse vegetation cover located west-southwest of the East Basin.

144. Panorama of the northern portion of the LF, from east to west (Photo 1 of 4).

145. Panorama the northern portion of the LF, from east to west (Photo 2 of 4).

146. Panorama of the northern portion of the LF, from east to west (Photo 3 of 4).

147. Panorama of the northern portion of the LF, from east to west (Photo 4 of 4).

148. Wood chips from erosion control sock remaining on the LF after removal of the outer fabric, located near the East Basin.

149. The East Basin is pictured in the distance.

150. Rocks at the edge of the LF cover on the east side of the LF adjacent to the East Basin.

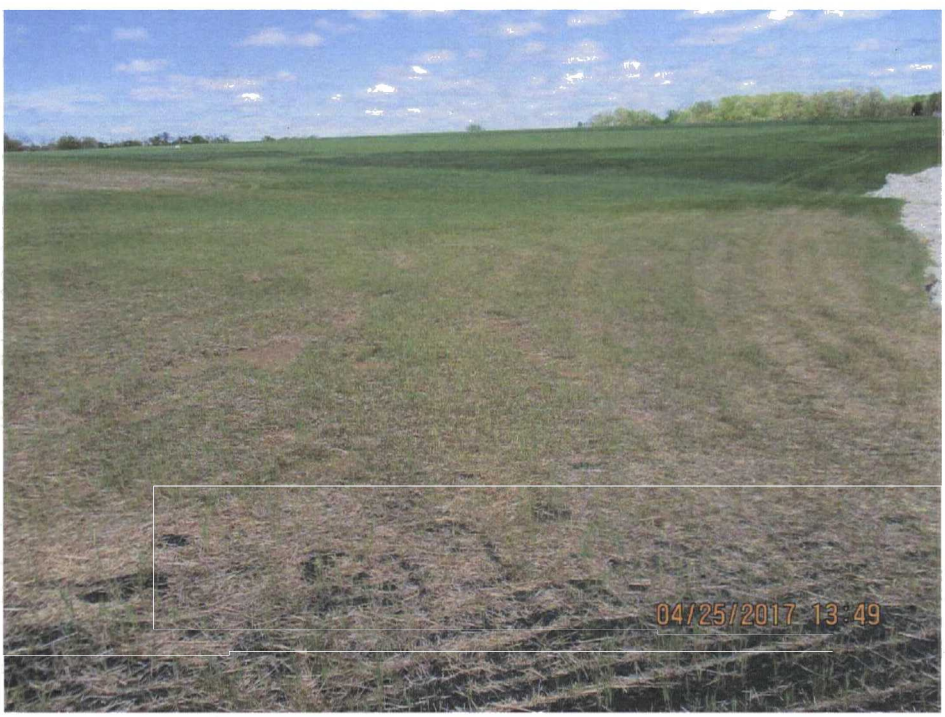
151. Rocks at the edge of the LF cover on the east side of the LF adjacent to the East Basin.

152. Panorama of the east drainage basin from south to north (Photo 1 of 4).

153. Panorama of east drainage basin from south to north (Photo 2 of 4).

154. Panorama of the east drainage basin from south to north (Photo 3 of 4).

155. Panorama of the east drainage basin from south to north (Photo 4 of 4).



156. An area with sparse vegetation located to the southwest of the East Basin.

157. Panorama of the LF taken from near the southeastern corner from north to west (Photo 1 of 3).

158. Panorama of the LF taken from near the southeastern corner from north to west (Photo 2 of 3).

159. Panorama of the LF taken from near the southeastern corner from north to west (Photo 3 of 3).

160. An area of sparse vegetation near the southeastern corner of the LF.

161. Sparse vegetation near the southern end of the LF near the fence.

162. Sparse vegetation on the haul road on the LF cap. The southwestern access gate is visible in the distance.

163. Tire ruts in the LF cap near the southwestern access gate.

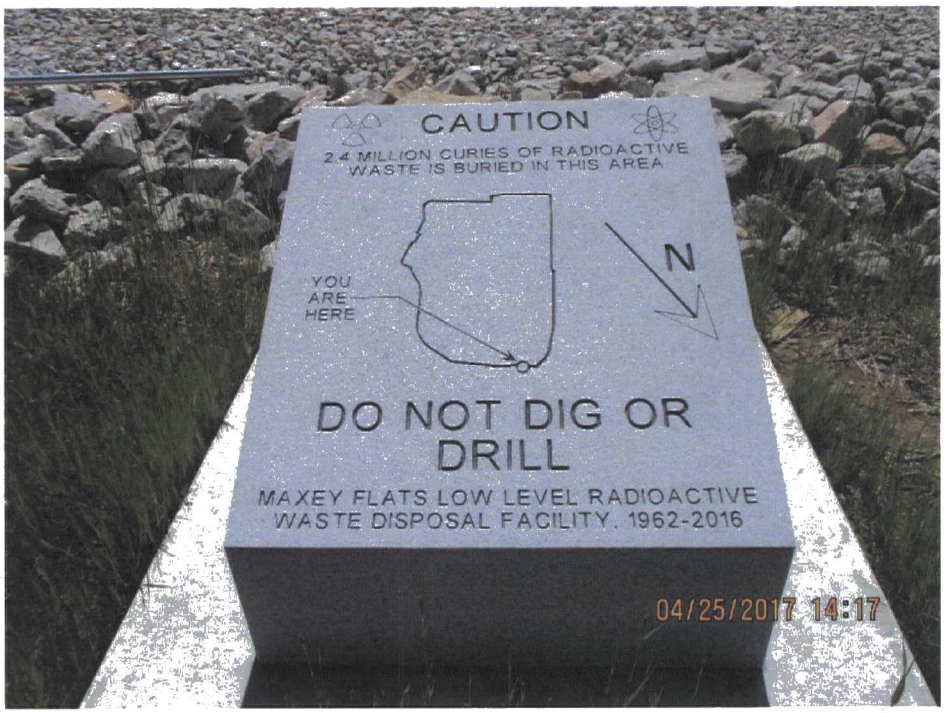
164. Close up of tire ruts in the LF cap near the southwestern access gate.

165. Sparse vegetation on the haul road near the southwestern corner of the LF.

166. Stone at the edge of the LF cap on the south end of the west perimeter.

167. Stone and drainage on the west side of the LF.

168. A monitoring well to the west of the LF.



169. A "Do not dig" monument at the north end of the LF, facing south.

APPENDIX H – INTERVIEW DOCUMENTATION

INTERVIEW DOCUMENTATION FORM			
The following is a list of individuals interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.			
Pam Scully	Remedial Project Manager (RPM)	EPA	5/1/2017
Name	**Title/Position**	**Organization**	**Date**
Jon Richards	RPM and Radiation Expert	EPA	4/27/2017
Name	**Title/Position**	**Organization**	**Date**
Scott Wilburn	On-Site Project Manger	Kentucky Department of Environmental Protection	5/3/2017
Name	**Title/Position**	**Organization**	**Date**
Curt Pendergrass	Supervisor, Radioactive Materials Section	Kentucky Radiation Health Branch	5/1/2017
Name	**Title/Position**	**Organization**	**Date**
Name	**Title/Position**	**Organization**	**Date**
Name	Title/Position	Organization	Date

INTERVIEW RECORD			
Site Name: Maxey Flats		**EPA ID No:**	
Subject: Maxey Flats Fourth Five Year Review Report		**Time:** 0835 - 0844	**Date:** 5/1/2017
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit: n/a**		☐ Incoming	☒ Outgoing
Contact Made By:			
Name: Vivian Lopez	**Title:** Environmental Scientist	**Organization:** TechLaw, Inc.	
Individual Contacted:			
Name: Pam Scully	**Title:** Remedial Project Manager	**Organization:** EPA	
Telephone No.: 404-562-8935 **Fax No.:** **E-Mail Address:** scully.pam@epa.gov		**Street Address, City, State, Zip:** 61 Forsyth Street SW, Atlanta, GA 30303	
Summary of Conversation			
The remedy is functioning as expected and the data shows that contaminants are decreasing at a steady rate. Significant project optimization is underway at the Site and will encourage efficiency of activities from here on out. The Site is under CERCLA compliance and the state of Kentucky has done a very good job ensuring that the issues at Maxey Flats are addressed.			

1. **What is your overall impression of the project? (general sentiment)**
   It is complex, but we have done everything we can do to make it safe in the long term for the public around the facility.

2. **Is the remedy functioning as expected? How well is the remedy performing?**
   Yes, it is functioning as expected.

3. **What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?**
   The problem is that we are dealing with tritium, which will take approximately 100 years to decay. It is decreasing because it has a half-life and so we have to wait for time to assist the process. We have not seen it increase and it is encouraging.

4. **Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.**
   Yes there is. For the last 10 years the same staff have been on the Site. With the low turnover, Site activities have been consistent and efficient. Additionally, the state is heavily involved and keeps it fully funded, which helps with progress on the Site and the consistency of Site activities.

5. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.**
   Yes, previously we had an interim cap in place that required more O&M. The new cap reduces activities and is in the process of being finalized.

6. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.**
   Not to my knowledge.

7. **Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.**
   We have been doing a lot of optimization. The 10 years of data available allow us to modify the frequency of activities and encourage efficiency, now that we have a clear understanding of the baseline.

8. **Do you have any comments, suggestions, or recommendations regarding the project?**
   Not at this time.

9. **What is your position in the Commonwealth of Kentucky?**
   The Commonwealth of Kentucky have a lot staff that have been involved since the beginning and do a good job. I am the EPA remedial project manager for the Site.

10. **Are you aware of any noncompliances with the project?**
    Not on my end. They have had issues with nuclear regulations on the NRC side, but not on the CERCLA side of compliances.

11. **Are you aware of any exceedances of regulatory standards?**
    Not to my knowledge.

12. **Is there unacceptable risk to human health and the environment posed by the site?**
    Not the way we have the cap in place.

13. **Is the Commonwealth of Kentucky complying with the elements of the Consent Decree?**
    Yes they are.

INTERVIEW RECORD			
Site Name: Maxey Flats		**EPA ID No:**	
Subject: Maxey Flats Fourth Five Year Review Report		**Time:** 1204 - 1209	**Date:** 4/27/2017
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:** n/a		☐ Incoming	☒ Outgoing
Contact Made By:			
Name: Vivian Lopez	**Title:** Environmental Scientist	**Organization:** TechLaw, Inc.	
Individual Contacted:			
Name: Jon Richards	**Title:** RPM and Radiation Expert	**Organization:** EPA	
Telephone No.: 404-431-1340 **Fax No.:** **E-Mail Address:** Richards.jon@epa.gov		**Street Address, City, State, Zip:** 61 Forsyth Street SW, Atlanta, GA 30303	
Summary of Conversation			
Placing the final cap on the Site has been pivotal to bringing the Site closer to being safe for the public. While monitoring data was not present at the time of the interview, tritium concentrations are expected to be reducing because of its half-life of 12 years. There have not been any non-compliances and all activities appear to be going well at the Site.			

1. **What is your overall impression of the project? (general sentiment)**
   I am glad that the project is near completion. It has been in progress since 1988.

2. **Is the remedy functioning as expected? How well is the remedy performing?**
   Yes it is. Putting the final cap on was the key to preventing infiltration. Every five-year review will verify that.

3. **What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?**
   The data is not currently in reach to answer the question. Tritium has a half-life of approximately 12 years, so it should be decreasing, especially since the Site has been there since 1962.

4. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.**
   No.

5. **Do you have any comments, suggestions, or recommendations regarding the project?**
   I would suggest additional gross beta testing for tritium.

6. **What is your position in the commonwealth of Kentucky?**
   We [the EPA] have worked well with Kentucky over the years, they are taking over now. Further detail could be provided by Pam, as Pam serves as the EPA regional project manager for the Site. Personally, I have worked well with Kentucky Radiation staff.

7. **Are you aware of any noncompliances with the project?**
   No.

8. **Are you aware of any exceedances of regulatory standards?**
   No.

9. **Is there unacceptable risk to human health and the environment posed by the site?**
   No.

10. **Is the Commonwealth of Kentucky complying with the elements of the Consent Decree?**
    To my knowledge, yes.

INTERVIEW RECORD			
Site Name: Maxey Flats		**EPA ID No:**	
Subject: Maxey Flats Fourth Five Year Review Report		**Time:** 1325 - 1335	**Date:** 5/4/2017
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:** n/a		☐ Incoming	☒ Outgoing
Contact Made By:			
Name: Vivian Lopez	**Title:** Environmental Scientist	**Organization:** TechLaw, Inc.	
Individual Contacted:			
Name: Scott Wilburn	**Title:** Site Manager	**Organization:** Kentucky Department of Environmental Protection	
Telephone No.: 606-783-8680 **Fax No.:** **E-Mail Address:** scott.wilburn@ky.gov		**Street Address, City, State, Zip:** 300 Sower Blvd, Frankfort, KY 40601	
Summary of Conversation			
The overall project has been a success and the remedy is functioning as expected. Monitoring data shows that tritium levels are decreasing and both sampling and O&M activities are in the process of being optimized to reflect the status of this Site. There have been no noncompliances or exceedances of regulatory standards. The Site is moving towards being established for beneficial re-use.			

1. **What is your overall impression of the project? (general sentiment)**
   The project has been a success and expect that it will continue to be a success.

2. **Is the remedy functioning as expected? How well is the remedy performing?**
   Yes it is. Evidence shows that the remedy is functioning very well and that data shows it.

3. **What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?**
   The monitoring data shows that the Site has declining levels of tritium in areas of concern.

4. **Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.**
   Yes there is a continuous on-site O&M presence. There are four full-time staff and an additional part-time employee. Different types of inspections are conducted in intervals of daily, weekly, monthly, semi-annual, and annual time periods.

5. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.**
   Yes, there have been major changes in O&M as a result of the final stage of remediation that is being completed as we speak. I anticipate that the final remediation stage will be completed sometime in June. The protectiveness and effectiveness of the remedy has improved since the remedy has been in place.

6. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.**
   There have not been any O&M difficulties that were unexpected. Many changes have been made to the inspection program based on constantly changing conditions of the Site.

7. **Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.**
   Yes, we are currently in the process of optimizing both O&M and sampling efforts. We have an institutional controls work plan in the works that has a new O&M schedule and an updated sampling plan.

8. **Do you have any comments, suggestions, or recommendations regarding the project?**
   The only comment that I have is that the project continues on its current trajectory. We are currently looking for a way to convert the Site for beneficial re-use, including stream mitigation, establishing honey bee colonies, planting native grasses, and registering the Site with the Department of Fish and Wildlife to open it for select hunts.

9. **What is your position in the Commonwealth of Kentucky?**
   Environmental Scientist, specifically the Facilities RSO and on-site remediation coordinator.

10. **Are you aware of any noncompliances with the project?**
    No.

11. **Are you aware of any exceedances of regulatory standards?**
    No.

12. **Is there unacceptable risk to human health and the environment posed by the site?**
    No.

13. **Is the Commonwealth of Kentucky complying with the elements of the Consent Decree?**
    Yes.

INTERVIEW RECORD			
Site Name: Maxey Flats		**EPA ID No:**	
Subject: Maxey Flats Fourth Five Year Review Report		**Time:** 1045 - 1057	**Date:** 5/1/2017
Type: ☒ Telephone ☐ Visit ☐ Other **Location of Visit:** n/a		☐ Incoming	☒ Outgoing
Contact Made By:			
Name: Vivian Lopez	**Title:** Environmental Scientist	**Organization:** TechLaw, Inc.	
Individual Contacted:			
Name: Curt Pendergrass	**Title:** Supervisor, Radioactive Materials Section	**Organization:** Kentucky Radiation Health Branch	
Telephone No.: 502-564-3700 ext. 4183 **Fax No.:** **E-Mail Address:** curt.pendergrass@ky.gov		**Street Address, City, State, Zip:** 275 East Main Street, Frankfort, KY 40621	
Summary of Conversation			
Significant progress has been made at the Site due to excellent coordination at the state and federal level. Despite the cap remedy being in place for a short amount of time, it appears to be working very well and radionuclide levels have decreased. To reflect the Site's ongoing status, Operation & Maintenance sampling will be reduced from weekly sampling and analysis to weekly sampling that will be composited monthly. There has only been one major contractor issue, but the rest of the Site and contaminant containment have been moving in protective direction.			

1. **What is your overall impression of the project? (general sentiment)**
   A lot of progress has been made on this project and it is very well run due to excellent coordination at the state and federal level. I am biased because my office gives the license for the Site.

2. **Is the remedy functioning as expected? How well is the remedy performing?**
   So far, looking at radionuclide levels in runoff and seeps, it appears that they are decreasing and water flow is decreasing. It has not been long since the cap was installed, but it already appears to be working very well.

3. **What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?**
   I do not have the data in front of me, so I cannot speak to it in detail but from the two sets of data I have seen from the EPA and our own labs, there appears to be a general decreasing trend of radionuclides.

4. **Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.**
   Yes there is a continuous on-site O&M presence and that will be for many years. There is permanent staffing at the Site through another cabinet. This includes five full time employees who are involved in collecting and analyzing samples, contributing to the upkeep and maintenance of the Site and overseeing contractors.

5. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.**
   Yes there have been major changes through the years. All sumps and monitoring wells have been removed as part of the final closure. We are currently in progress of changing the monitoring plan, which includes replacing monitoring wells that were lost. We also want to scale back activities significantly by altering sampling from weekly sampling and weekly analysis to weekly sampling, monthly compositing, and monthly sampling. This change in sampling and analysis has not happened yet but is in progress.

6. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.**
   There have been a few final closure difficulties. A contractor did not plan very well for the Site, requiring a final closure plan revision based on the reality of the Site. However, another contractor was doing a very good job on-site and was able to help work through most issues.

7. **Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.**
   We are currently in the process right now to find a schedule that reflects the Site's ongoing status. Very significant changes will be made in the near future (e.g., the same radionuclides will still be monitored monthly, but with less frequent analysis).

8. **Do you have any comments, suggestions, or recommendations regarding the project?**
   None that have not been evaluated and taken into account already. A very cooperative process exists for this Site, I have been very pleased.

9. **What is your position in the commonwealth of Kentucky?**
   I am the supervisor of the Radiation Materials Section and the Radiation Health Branch.

10. **Are you aware of any noncompliances with the project?**
    Not to my knowledge.

11. **Are you aware of any exceedances of regulatory standards?**
    Not to my knowledge.

12. **Is there unacceptable risk to human health and the environment posed by the site?**
    Not at the moment.

13. Is the Commonwealth of Kentucky complying with the elements of the Consent Decree?
Yes we are.

APPENDIX I – DETAILED ARARs REVIEW

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally ARAR. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed. All ARARs are listed in Table I-1, including the requirement description and whether there has been a change in the ARAR since the 1991 ROD.

Groundwater ARARs

Appendix B of the 1991 ROD identified multiple potential chemical-specific ARARs and to-be-considered (TBC) values for groundwater. However, only the following ARARs were used as a basis for selection of groundwater cleanup goals:

- Federal National Primary Drinking Water Standards –MCLs and Maximum Contaminant Level Goals (MCLGs) (40 CFR Parts 141, 142, and 143)
- Kentucky Drinking Water Standards (MCLs) (401 KAR 6:015)

The recently added MCLs and MCLGs will supplement the Kentucky MCLs as relevant and appropriate requirements at the MFDS, because groundwater at the Site is a current and/or future potential source of drinking water.

This FYR compared groundwater ARARs in the 1991 ROD against the current National Drinking Water MCLs (See Table I-2, Groundwater ARAR Review). The ARARs for arsenic, bis(2-ethylhexyl)phthalate, chloroform, lead, and nickel have changed since the 1991 ROD.

Surface Water ARARs

Appendix B of the 1991 ROD selected several potential chemical-specific ARARs for surface water. Potential surface water ARARs include:

- National Recommended Water Quality Criteria (NRWQC), Human Health Criteria
- NRWQC, Aquatic Life Criteria for freshwater (acute) and freshwater (chronic)
- Kentucky Surface Water Quality Standards (401 KAR 5:026 - :035)

This FYR compared the ARARs for human health criteria (fish consumption only) and aquatic life as listed in Appendix B of the 1991 ROD to the current human health criteria (consumption of organisms only) and aquatic life values as listed in the NRWQC and the Kentucky Surface Water Quality Standards [see Table I-3, Surface Water ARAR Review (Chemical Contaminants)]. One or more of the ARAR values for each COC have changed since the 1991 ROD.

The surface water ARARs for radionuclides require that combined doses from air, water, drinking water, and soil pathways shall not exceed 25 mrem/year effective dose equivalent to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ of any member of the public. Compliance with the 25 mrem/year standard is measured at the current licensed Site boundary. None of the ARARs for

radionuclides have changes since the 1991 ROD [see Table I-4, Surface Water ARAR Review (Radiological Contaminants)].

Soil ARARs

Appendix B of the 1991 ROD did not identify chemical-specific ARARs for soil.

Table I-2			
Groundwater ARAR Review			
Contaminant of Concern	**1991 ROD ARARs[a] (in ug/L unless noted)**	**Current ARAR[b] (in ug/L unless noted)**	**Change in ARAR?**
Arsenic	50	10	Yes
Benzene	5	5	No
Bis(2-ethylhexyl)phthalate	4	6	Yes
Chlorobenzene	100	100	No
Chloroform (trihalomethanes)	100	80	Yes
1,2-Dichloroethane	5	5	No
Lead	50	15	Yes
Nickel	100	N/A	Yes
Toluene	1000	1000	No
Trichloroethene	5	5	No
Vinyl chloride	2	2	No
Radionuclides			
Beta particle and photon radioactivity	4 mrem/year	4 mrem/year	No
Gross alpha particles	15 pCi/L	15 pCi/L	No
Radium-226 and Radium -228 (total)	5 pCi/L	5 pCi/L	No

Notes:

a. Groundwater ARARs presented in the 1991 Record of Decision.

b. National Primary Drinking Water Regulations, 40 CFR 141, MCLs; https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations.

Acronyms:

ARAR = Applicable, Relevant and Appropriate Requirements
MCL = Maximum Contaminant Level
mrem/year = millirem per year
N/A = Not available
NA = Not applicable
pCi/L = picoCuries per Liter
ROD = Record of Decision
ug/L = micrograms per Liter

Table I-3

Surface Water ARAR Review (Chemical Contaminants)

Contaminant of Concern	1991 ROD ARARs[a]			Current ARARs						Change in one or more ARAR?
				Kentucky Water Quality Criteria[b]			National Recommended Water Quality Criteria			
				Human Health Criteria	Warm Water Aquatic Habitat Criteria		Human Health Criteria[c]	Aquatic Life Criteria[d]		
	Human Health (Fish Consumption) (ug/L)	Aquatic Life (Acute) (ug/L)	Aquatic Life (Chronic) (ug/L)	Fish (ug/L)	Acute (ug/L)	Chronic (ug/L)	Consumption of Organism Only (ug/L)	Freshwater (Acute) (ug/L)	Freshwater (Chronic) (ug/L)	
Arsenic	0.175	N/A	N/A	N/A	340	150	0.14	340	150	Yes
Benzene	400	5,300	N/A	51	N/A	N/A	16-58	N/A	N/A	Yes
Bis(2-ethylhexyl)phthalate	N/A	940	3	2.2	N/A	N/A	0.37	N/A	N/A	Yes
Chlorobenzene	488	250	50	1600	N/A	N/A	800	N/A	N/A	Yes
Chloroform (trihalomethanes)	157	28,900	1,240	470	N/A	N/A	2,000	N/A	N/A	Yes
1,2-Dichloroethane	2,430	118,000	20,000	37	N/A	N/A	650	N/A	N/A	Yes
Lead	N/A	82[e]	3.2[e]	N/A	65[f]	2.5[f]	N/A	65	2.5	Yes
Nickel	100	1400[e]	160[e]	4600	470[g]	52[g]	4,600	470	52	Yes
Toluene	424,000	17,500	N/A	15000	N/A	N/A	520	N/A	N/A	Yes
Trichloroethene	807	45,000	21,900	30	N/A	N/A	7	N/A	N/A	Yes
Vinyl chloride	5,246	N/A	N/A	2.4	N/A	N/A	1.6	N/A	N/A	Yes

Notes:

a. Surface water ARARs presented in the 1991 Record of Decision.

b. Kentucky Surface Water Standards, 401 KAR 10:031, Table 1; http://www.lrc.ky.gov/kar/401/010/031.htm.

c. NRWQC, Human Health Criteria Table; https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table; Accessed May 2017.

d. NRWQC, Aquatic Life Criteria Table; https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table; Accessed May 2017.

e. The toxicity of lead and nickel are dependent on the hardness of the water column. A hardness of 100 mg/L was assumed. The acute criteria were calculated using the following formula: $e^{[0.8460\ [\ln(\text{hardness})] + 3.3612]}$. The chronic criteria were calculated using the following formula: $e^{[0.8460\ [\ln(\text{hardness})] + 1.1645]}$.

f: The acute criterion is based on the following formula: $e^{[1.273\ [\ln(\text{hardness})] - 1.460]}$. The chronic criterion is based on following formula: $e^{[1.273\ [\ln(\text{hardness})] - 4.705]}$.

g: The acute criterion is based on the following formula: $e^{[0.8460\ [\ln(\text{hardness})] + 2.255]}$. The chronic criterion is based on following formula: $e^{[0.8460\ [\ln(\text{hardness})] + 0.0584]}$.

Acronyms:

ARAR = Applicable, Relevant and Appropriate Requirements
N/A = Not available
NA = Not applicable
NRWQC = National Recommended Water Quality Criteria
ROD = Record of Decision
USEPA = United States Environmental Protection Agency
ug/L = micrograms per Liter

Table I-4			
Surface Water ARAR Review (Radiological Contaminants)			
Contaminant of Concern	**1991 ROD ARARs[a] (in pCi/mL unless noted)**	**Current ARAR[b] (in pCi/mL unless noted)**	**Change in ARAR?**
Americium-241	0.02	0.02	No
Carbon-14	30	30	No
Cesium-137	1	1	No
Cobalt-60	3	3	No
Hydrogen-3 (Tritium)	1,000	1,000	No
Iodine-129	0.2	0.2	No
Plutonium-238	0.02	0.02	No
Plutonium-239	0	0	No
Radium-226	0	0	No
Strontium-90	0.5	0.5	No
Technetium-99	60	60	No
Thorium-232	0.03	0.03	No
Total whole body exposure (all media)	25 mrem/year	25 mrem/year[c]	No

Notes:

It is noted that 1991 ROD ARAR values listed herein are inconsistent with those listed in Table A-1, Applicable Action-Specific and Contaminant-Specific Requirements for Remedial Alternatives at Maxey Flats. However, according to Section 8.2, Contaminant-Specific ARARs, of the ROD, "The federal standards were lowered in May 1991 so as to limit the allowable dose in unrestricted areas to 100 mrem/year and to provide specific radionuclide concentrations in Appendix B, Table II. In that these new federal standards are more stringent than the Kentucky regulations, the federal standards shall be the governing ARARs for allowable doses in unrestricted areas."

a. Surface water ARARs presented in the 1991 Record of Decision.

b. 10 CFR Part 20, Subpart O, Appendix B: Table 2, Column 2, "Water"; https://www.ecfr.gov/cgi-bin/text-idx?SID=9398224a6c8f44c47e2b05f5fc913a0e&mc=true&node=ap10.1.20_12402.b&rgn=div9.

c. 10 CFR Part 61.41; https://www.nrc.gov/reading-rm/doc-collections/cfr/part061/part061-0041.html.

Acronyms:

ARAR = Applicable, Relevant and Appropriate Requirements
mrem/year = millirem per year
pCi/mL = picoCuries per milliliter
ROD = Record of Decision

APPENDIX J – DETAILED RISK REVIEW

Table J-1 Review of Groundwater ARARs						
Contaminant of Concern	1991 ROD ARARs[a] (in ug/L unless noted)	Current ARAR	Current TBC Values		ARAR Risk and Hazard Levels based on Current TBC Values[d]	
			Tapwater RSL[c]			
		MCL[b] (in ug/L unless noted)	Target Risk = 1E-06 (in ug/L)	HQ = 1 (in ug/L)	Risk	Hazard
Arsenic	50	10	0.052	6	9.62E-04	8.3
Benzene	5	5	0.46	33	1.09E-05	0.2
Bis(2-ethylhexyl)phthalate	4	6	5.6	400	7.14E-07	0.0
Chlorobenzene	100	100	N/A	78	NA	1.3
Chloroform (trihalomethanes)	100	80	0.22	97	4.55E-04	1.0
1,2-Dichloroethane	5	5	0.17	13	2.94E-05	0.4
Lead	50	15	N/A	15	NA	3.3
Nickel	100	N/A	N/A	390	NA	0.3
Toluene	1000	1000	N/A	1100	NA	0.9
Trichloroethene	5	5	0.49	2.8	1.02E-05	1.8
Vinyl chloride	2	2	0.019	44	1.05E-04	0.05
Radionuclides						
Beta particle and photon radioactivity	4 mrem/year	4 mrem/year	N/A	N/A	NA	NA
Gross alpha particles	15 pCi/L	15 pCi/L	N/A	N/A	NA	NA
Radium-226 and Radium -228 (total)	5 pCi/L	5 pCi/L	N/A	N/A	NA	NA
Uranium	N/A	30	N/A	60	NA	NA

Notes:

The 1991 groundwater ARARs were compared to the current MCLs and USEPA RSLs for Resident Tapwater to assess their validity. The 1991 ROD ARARs for groundwater contaminants of concern were based on the federal National Primary Drinking Water Regulations (i.e., the MCLs). These values were compared with the current MCLs. In addition, these values also were compared to current EPA RSLs (May 2016) for tap water (i.e., To-Be-Considered values).

Those ARARs exceeding the current MCLs and resulting in a risk greater than 1E-04 or a HQ greater than 1 are highlighted in yellow.

Those ARARs not exceeding the current MCLs but resulting in a risk greater than 1E-04 or a HQ greater than 1 are highlighted in green.

a. Groundwater ARARs presented in the 1991 Record of Decision.

b. National Primary Drinking Water Regulations, 40 CFR 141, MCLs; https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations.

c. USEPA RSLs for Resident Tapwater, May 2016; https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2016; Accessed May 2017.

d. Carcinogenic risk was calculated as follows: (ARAR ÷ Carcinogenic RSL) x 1E-06. Non-carcinogenic hazard was calculated as follows: (ARAR ÷ Non-carcinogenic RSL).

Acronyms:

ARAR = Applicable, Relevant and Appropriate Requirements
HQ = Hazard Quotient
MCL = Maximum Contaminant Level
mrem/year = millirem per year
N/A = Not available
NA = Not applicable
pCi/L = picoCuries per Liter
ROD = Record of Decision
RSL = Regional Screening Level
TBC = To-Be-Considered
ug/L = micrograms per Liter
USEPA = United States Environmental Protection Agency

Table J-2

Review of Surface Water ARARs for Chemical Contaminants

Contaminant of Concern	1991 ROD ARARs[a]			Current ARARs						Ratio of ROD ARAR to Lowest of Current Human Health-Based ARARs[h]
				Kentucky Water Quality Criteria[b]			National Recommended Water Quality Criteria			
				Human Health Criteria	Warm Water Aquatic Habitat Criteria		Human Health Criteria[c]	Aquatic Life Criteria[d]		
	Human Health (Fish Consumption) (ug/L)	Aquatic Life (Acute) (ug/L)	Aquatic Life (Chronic) (ug/L)	Fish (ug/L)	Acute (ug/L)	Chronic (ug/L)	Consumption of Organism Only (ug/L)	Freshwater (Acute) (ug/L)	Freshwater (Chronic) (ug/L)	
Arsenic	0.175	N/A	N/A	N/A	340	150	0.14	340	150	1
Benzene	400	5,300	N/A	51	N/A	N/A	16-58	N/A	N/A	25
Bis(2-ethylhexyl)phthalate	N/A	940	3	2.2	N/A	N/A	0.37	N/A	N/A	NA
Chlorobenzene	488	250	50	1600	N/A	N/A	800	N/A	N/A	0.61
Chloroform (trihalomethanes)	157	28,900	1,240	470	N/A	N/A	2,000	N/A	N/A	0.33
1,2-Dichloroethane	2,430	118,000	20,000	37	N/A	N/A	650	N/A	N/A	66
Lead	N/A	82[e]	3.2[e]	N/A	65[f]	2.5[f]	N/A	65	2.5	NA
Nickel	100	1400[e]	160[e]	4600	470[g]	52[g]	4,600	470	52	0.02
Toluene	424,000	17,500	N/A	15000	N/A	N/A	520	N/A	N/A	815
Trichloroethene	807	45,000	21,900	30	N/A	N/A	7	N/A	N/A	115
Vinyl chloride	5,246	N/A	N/A	2.4	N/A	N/A	1.6	N/A	N/A	3,279

Notes:

The 1991 ROD surface water ARARs were compared to the current Kentucky and federal ARARs to assess their validity. The 1991 ROD ARARs for non-radiological surface water COCs were based on the federal Ambient Water Quality Criteria [Section 304(a)(1) of the Clean Water Act]. These values were compared with the current federal water quality criteria (i.e., what are now called the National Recommended Water Quality Criteria) and the State of Kentucky Water Quality Criteria (Kentucky Surface Water Standards, 401 KAR 10:031).

Those 1991 ROD ARARs exceeding a current ARAR are highlighted in yellow.

a. Surface water ARARs presented in the 1991 Record of Decision.

b. Kentucky Surface Water Standards, 401 KAR 10:031, Table 1; http://www.lrc.ky.gov/kar/401/010/031.htm.

c. NRWQC, Human Health Criteria Table; https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table; Accessed May 2017.

d. NRWQC, Aquatic Life Criteria Table; https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table; Accessed May 2017.

e. The toxicity of lead and nickel are dependent on the hardness of the water column. A hardness of 100 mg/L was assumed. The acute criteria were calculated using the following formula: $e^{[0.8460\ [\ln(\text{hardness})] + 3.3612]}$. The chronic criteria were calculated using the following formula: $e^{[0.8460\ [\ln(\text{hardness})] + 1.1645]}$.

f: The acute criterion is based on the following formula: $e^{[1.273\ [\ln(\text{hardness})] - 1.460]}$. The chronic criterion is based on following formula: $e^{[1.273\ [\ln(\text{hardness})] - 4.705]}$.

g: The acute criterion is based on the following formula: $e^{[0.8460\ [\ln(\text{hardness})] + 2.255]}$. The chronic criterion is based on following formula: $e^{[0.8460\ [\ln(\text{hardness})] + 0.0584]}$.

h: Those current ARARs considered in the ratio of human health-based ROD ARARs to the lowest of the current human health-based ARARs are in red text. It is further noted that there is no consistent health basis for the ROD or current ARARs; therefore, this ratio does not represent a level or risk or linear relationship to toxic health implications. It only represents the degree to which the ROD ARARs have been superseded by the current ARARs.

Acronyms:

ARAR = Applicable, Relevant and Appropriate Requirements
N/A = Not available
NA = Not applicable
NRWQC = National Recommended Water Quality Criteria
ROD = Record of Decision
USEPA = United States Environmental Protection Agency
ug/L = micrograms per Liter

Table J-3 Review of Surface Water ARARs for Radiological Contaminants		
Contaminant of Concern	**1991 ROD ARARs[a] (in pCi/mL unless noted)**	**Current ARAR[b] (in pCi/mL unless noted)**
Americium-241	0.02	0.02
Carbon-14	30	30
Cesium-137	1	1
Cobalt-60	3	3
Hydrogen-3 (Tritium)	1,000	1,000
Iodine-129	0.2	0.2
Plutonium-238	0.02	0.02
Plutonium-239	0	0
Radium-226	0	0
Strontium-90	0.5	0.5
Technetium-99	60	60
Thorium-232	0.03	0.03
Total whole body exposure (all media)	25 mrem/year	25 mrem/year[c]

Notes:

The surface water ARARs were compared to the current Kentucky and federal ARARs to assess their validity. The 1991 ROD ARARs for radiological surface water COCs were based on the Federal Register notice on Nuclear Regulatory Commission revisions to Table II, 56 Federal Register 23409, May 21, 1991. These values were compared with the current values presented at 10 CFR Part 20, Subpart O, Appendix B and 10 CFR Part 61.41.

a. Surface water ARARs presented in the 1991 Record of Decision.

b. 10 CFR Part 20, Subpart O, Appendix B: Table 2, Column 2, "Water"; https://www.ecfr.gov/cgi-bin/text-idx?SID=9398224a6c8f44c47e2b05f5fc913a0e&mc=true&node=ap10.1.20_12402.b&rgn=div9.

c. 10 CFR Part 61.41; https://www.nrc.gov/reading-rm/doc-collections/cfr/part061/part061-0041.html.

Acronyms:

ARAR = Applicable, Relevant and Appropriate Requirements
mrem/year = millirem per year
pCi/L = picoCuries per milliliter
ROD = Record of Decision

Table J-4

Comparison of Groundwater Data to Current ARARs

Contaminant of Concern	Minimum Detected Concentration (in ug/L unless noted)	Maximum Detected Concentration (in ug/L unless noted)	Location of Maximum Detected Concentration	Mean of Detected Concentrations (in ug/L unless noted)	1991 ROD ARARs[a] (in ug/L unless noted)	Current ARAR	Current TBC Values		Risk and Hazard Levels based on Current TBC Values[d]	
							Tapwater RSL[c]			
						MCL[b] (in ug/L unless noted)	Target Risk = 1E-06 (ug/L)	HQ = 1 (ug/L)	Risk	Hazard
Arsenic	1.2 J	30.2	AW-1	8.46	50	10	0.052	6	5.81E-04	5.0
Benzene	ND	ND	NA	NA	5	5	0.46	33	NA	NA
Bis(2-ethylhexyl)phthalate	2.8 J	2.8 J	AW-13	2.8	4	6	5.6	400	5.00E-07	0.007
Chlorobenzene	ND	ND	NA	NA	100	100	N/A	78	NA	NA
Chloroform (trihalomethanes)	ND	ND	NA	NA	100	80	0.22	97	NA	NA
1,2-Dichloroethane	ND	ND	NA	NA	5	5	0.17	13	NA	NA
Lead	0.23 J	6.9	AW-13	1.64	50	15	N/A	15	NA	0.5
Nickel	3.0 J	540	AW-13	63.33	100	N/A	N/A	390	NA	1.4
Toluene	1.2 J	1.3 J	AW-6/AW-8/AW-12/AW-14	1.28	1000	1000	N/A	1100	NA	0.001
Trichloroethene	ND	ND	NA	NA	5	5	0.49	2.8	NA	NA
Vinyl chloride	ND	ND	NA	NA	2	2	0.019	44	NA	NA
Radionuclide[e]										
Radium-226	22 pCi/L	51 pCi/L	AW-4	36.5 pCi/L	5 pCi/L	5 pCi/L	N/A	N/A	NA	NA

Notes:

Data were collected in October 2012.

Data were collected from 18 sample locations.

Concentrations that exceed the current MCLs and result in a risk greater than 1E-04 and/or a HQ greater than 1 are highlighted in yellow.

Green highlight indicates no current MCL is available but the maximum detected concentration results in a risk greater than 1E-04 and/or a HQ greater than 1.

a. Groundwater ARARs presented in the 1991 Record of Decision.

b. National Primary Drinking Water Regulations, 40 CFR 141, MCLs; https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations.

c. USEPA RSLs for Resident Tapwater, May 2016; https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2016; Accessed May 2017.

d. Carcinogenic risk was calculated as follows: (MDC ÷ Carcinogenic RSL) x 1E-06. Non-carcinogenic hazard was calculated as follows: (MDC ÷ Non-carcinogenic RSL).

e. Only radium-226 was sampled for in 2012.

Acronyms:

ARAR = Applicable, Relevant and Appropriate Requirements
HQ = Hazard Quotient
J = Estimated value
MCL = Maximum Contaminant Level
MDC = Maximum detected concentration
N/A = Not available
NA = Not applicable
ND = Not detected
pCi/L = picoCuries per Liter
ROD = Record of Decision
RSL = Regional Screening Level
TBC = To-Be-Considered
USEPA = United States Environmental Protection Agency

Table J-5

Comparison of Surface Water Data to Current ARARs (Chemical Contaminants)

Contaminant of Concern	Minimum Detected Concentration (ug/L)	Maximum Detected Concentration (ug/L)	Location of Maximum Detected Concentration	Mean of Detected Concentrations (ug/L)	1991 ROD ARARs[a]			Current ARARs						Ratio of Maximum Detected Concentration to Lowest of Current Human Health-Based ARARs[h]
								Kentucky Water Quality Criteria[b]			National Recommended Water Quality Criteria			
								Human Health Criteria	Warm Water Aquatic Habitat Criteria		Human Health Criteria[c]	Aquatic Life Criteria[d]		
					Human Health (Fish Consumption) (ug/L)	Aquatic Life (Acute) (ug/L)	Aquatic Life (Chronic) (ug/L)	Fish (ug/L)	Acute (ug/L)	Chronic (ug/L)	Consumption of Organism Only (ug/L)	Freshwater (Acute) (ug/L)	Freshwater (Chronic) (ug/L)	
Arsenic	1.2 B	1.2 B	ISCO 122C	1.2	0.175	N/A	N/A	N/A	340	150	0.14	340	150	9
Benzene	ND	ND	NA	NA	400	5,300	N/A	51	N/A	N/A	16-58	N/A	N/A	NA
Bis(2-ethylhexyl)phthalate	1.1 J	1.1 J	ISCO 103E	1.1	N/A	940	3	2.2	N/A	N/A	0.37	N/A	N/A	3
Chlorobenzene	ND	ND	NA	NA	488	250	50	1600	N/A	N/A	800	N/A	N/A	NA
Chloroform (trihalomethanes)	ND	ND	NA	NA	157	28,900	1,240	470	N/A	N/A	2,000	N/A	N/A	NA
1,2-Dichloroethane	ND	ND	NA	NA	2,430	118,000	20,000	37	N/A	N/A	650	N/A	N/A	NA
Lead	0.24	0.24 B	ISCO 102D	0.24	N/A	82[e]	3.2[e]	N/A	65[f]	2.5[f]	N/A	65	2.5	NA
Nickel	3.3	11.9	ISCO 103E	5.92	100	1400[e]	160[e]	4600	470[g]	52[g]	4,600	470	52	NA
Toluene	ND	ND	NA	NA	424,000	17,500	N/A	15000	N/A	N/A	520	N/A	N/A	NA
Trichloroethene	ND	ND	NA	NA	807	45,000	21,900	30	N/A	N/A	7	N/A	N/A	NA
Vinyl chloride	ND	ND	NA	NA	5,246	N/A	N/A	2.4	N/A	N/A	1.6	N/A	N/A	NA

Notes:

Data were collected in October 2012.

Data were collected from four sample locations.

Concentrations that exceed the current ARARs are highlighted in yellow.

a. Surface water ARARs presented in the 1991 Record of Decision.

b. Kentucky Surface Water Standards, 401 KAR 10:031, Table 1; http://www.lrc.ky.gov/kar/401/010/031.htm.

c. NRWQC, Human Health Criteria Table; https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table; Accessed May 2017.

d. NRWQC, Aquatic Life Criteria Table; https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table; Accessed May 2017.

e. The toxicity of lead and nickel are dependent on the hardness of the water column. A hardness of 100 mg/L was assumed. The acute criteria were calculated using the following formula: $e^{[0.8460 [\ln (hardness)] + 3.3612]}$. The chronic criteria were calculated using the following formula: $e^{[0.8460 [\ln (hardness)] + 1.1645]}$

f: The acute criterion is based on the following formula: $e^{[1.273 [\ln (hardness)] - 1.460]}$. The chronic criterion is based on following formula: $e^{[1.273 [\ln (hardness)] - 4.705]}$

g: The acute criterion is based on the following formula: $e^{[0.8460 [\ln (hardness)] + 2.255]}$. The chronic criterion is based on following formula: $e^{[0.8460 [\ln (hardness)] - 0.0584]}$

h: Those current ARARs considered in the ratio of the maximum detected concentration to the lowest of the current human health-based ARARs are in red text. It is further noted that there is no consistent health basis for the ROD or current ARARs; therefore, this ratio does not represent a level or risk or linear relationship to toxic health implications. It only represents the degree to which the maximum detected concentration exceeds the current ARARs.

Acronyms:

ARAR = Applicable, Relevant and Appropriate Requirements
B = Estimated result, less than reporting limit
J = Estimated value
mg/L = milligrams per Liter
N/A = Not available
NA = Not applicable
ND = Not detected
NRWQC = National Recommended Water Quality Criteria
ROD = Record of Decision
USEPA = United States Environmental Protection Agency

Table J-6 Comparison of Surface Water Data to Current ARARs (Radiological Contaminants)					
Contaminant of Concern	**Maximum Detected Concentration (in pCi/mL unless noted)**	**Location of Maximum Detected Concentration**	**1991 ROD ARARs[a] (in pCi/mL unless noted)**	**Current ARAR[b] (in pCi/mL unless noted)**	**Ratio of Maximum Detected Concentration to Current ARAR**
Americium-241	ND	NA	0.02	0.02	NA
Carbon-14	ND	NA	30	30	NA
Cesium-137	ND	NA	1	1	NA
Cobalt-60	ND	NA	3	3	NA
Hydrogen-3 (Tritium)	1.16	ISCO 102D	1,000	1,000	0.001
Iodine-129	ND	NA	0.2	0.2	NA
Plutonium-238	ND	NA	0.02	0.02	NA
Plutonium-239	ND	NA	0.02	0.02	NA
Radium-226	0.049	ISCO 122A	0.06	0.06	0.82
Strontium-90	ND	NA	0.5	0.5	NA
Technetium-99	ND	NA	60	60	NA
Thorium-232	0.000068	ISCO 122A	0.03	0.03	0.002
Total whole body exposure (all media)	N/A	NA	25 mrem/year	25 mrem/year[c]	NA

Notes:

Data were collected in October 2012.

Concentrations that exceed the current ARARs are highlighted in yellow.

a. Surface water ARARs presented in the 1991 Record of Decision.

b. 10 CFR Part 20, Subpart O, Appendix B: Table 2, Column 2, "Water"; https://www.ecfr.gov/cgi-bin/text-idx?SID=9398224a6c8f44c47e2b05f5fc913a0e&mc=true&node=ap10.1.20_12402.b&rgn=div9.

c. 10 CFR Part 61.41; https://www.nrc.gov/reading-rm/doc-collections/cfr/part061/part061-0041.html.

Acronyms:

ARAR = Applicable, Relevant and Appropriate Requirements
mrem/year = millirem per year
N/A = Not available
NA = Not applicable
ND = Not detected
pCi/L = picoCuries per milliliter
ROD = Record of Decision

APPENDIX K – VAPOR INTRUSION SCREENING

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (°C)	Tgw	25	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m³)	VI Carcinogenic Risk CR	VI Hazard HQ
108-88-3	Toluene	1.3E+00	3.53E-01	No IUR	6.8E-05

Inhalation Unit Risk IUR (ug/m³)⁻¹	IUR Source*	Reference Concentration RfC (mg/m³)	RFC Source*	Mutagenic Indicator
		5.00E+00	I	

Notes:

(1) **Inhalation Pathway Exposure Parameters (RME):**

Exposure Scenario	Units	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Averaging time for carcinogens	(yrs)	ATc_R_GW	70	ATc_C_GW	70	ATc_GW	70
Averaging time for non-carcinogens	(yrs)	ATnc_R_GW	26	ATnc_C_GW	25	ATnc_GW	26
Exposure duration	(yrs)	ED_R_GW	26	ED_C_GW	25	ED_GW	26
Exposure frequency	(days/yr)	EF_R_GW	350	EF_C_GW	250	EF_GW	350
Exposure time	(hr/day)	ET_R_GW	24	ET_C_GW	8	ET_GW	24

(2) **Generic Attenuation Factors:**

Source Medium of Vapors		Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Groundwater	(-)	AFgw_R_GW	0.001	AFgw_C_GW	0.001	AFgw_GW	0.001
Sub-Slab and Exterior Soil Gas	(-)	AFss_R_GW	0.03	AFss_C_GW	0.03	AFss_GW	0.03

(3) **Formulas**

Cia, target = MIN(Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

Trichloroethylene

	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
	mIURTCE_R_GW	1.00E-06	mIURTCE_C_GW	0.00E+00	mIURTCE_GW	1.00E-06
	IURTCE_R_GW	3.10E-06	IURTCE_C_GW	4.10E-06	IURTCE_GW	3.10E-06

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

Age Cohort	Exposure Duration	Age-dependent adjustment factor
0 - 2 years	2	10
2 - 6 years	4	3
6 - 16 years	10	3
16 - 26 years	10	1

Mutagenic-mode-of-action (MMOA) adjustment factor 72 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

Notation:
I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html
P = PPRTV: EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml
A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html
CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp
H = HEAST: EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml
S = See RSL User Guide, Section 5
X = PPRTV Appendix
Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).
VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).
TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).
Yellow highlighting indicates site-specific parameters that may be edited by the user.
Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.
Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

APPENDIX L – ANNUAL REPORTS

ENERGY AND ENVIRONMENT CABINET

Steven L. Beshear
Governor

Leonard K. Peters
Secretary

DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
MAXEY FLATS PROJECT
2597 MAXEY FLAT ROAD
HILLSBORO, KY 41049
PHONE (606) 783-8680
http://waste.ky.gov

March 27, 2013

Ms. Pam Scully, SRPM, Kentucky/Tennessee Section
USEPA-Region IV
Sam Nunn Federal Center
61 Forsyth Street SW
11th Floor
Atlanta, GA 30303-8960

Subject: Maxey Flats Project – 2012 Annual Report

Dear Ms. Scully;

The Commonwealth of Kentucky is submitting the 2012 Annual Report for the Maxey Flats Project to fulfill the requirements of Section 4.0 of the Performance Verification Standard Plan (PSVP). The report was prepared by the Maxey Flats Section and summarizes information from the period of January 2012 through December 2012.

If you have any questions, please contact me at (606)-783-8680.

Sincerely,

Scott Wilburn

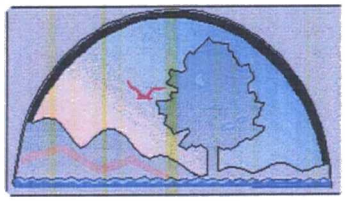
Scott Wilburn, Project Coordinator

e-attachment

cc: Nicole Barkasi, de maximis, inc.
Michelle Miller, USDOE
Jane Powell, USDOE
Gwen Hooten, USDOE
Matt McKinley, CHFS, Radiation Health Branch
Tim Hubbard, DEP, Division of Waste Management

MAXEY FLATS PROJECT
ANNUAL REPORT
2012

March 27, 2013



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

Maxey Flats Project
2597 Maxey Flat Road
Hillsboro, KY 41049
606-783-8680

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List of Acronyms

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IMP	Interim Maintenance Period
MFP	Maxey Flats Project
O&M	Operation and Maintenance Requirement Summary
PSVP	Performance Standards Verification Plan
PSSW	Perennial Streams Surface Water
REI	Reasonably Exposed Individual
RML	Radioactive Material License
US EPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

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List of Appendices
(Files separate from Main Report included on disc)

1.0 Introduction

The Commonwealth is submitting this report in accordance with Section 4.0 of the PSVP. The report summarizes sampling and maintenance activities listed in the Interim Maintenance Period Work Plans, PSVP, and the O&M.

2.0 Scope of Work

The IMP is ongoing pursuant to the Consent Decree (Civil Action Number 95-58) signed by the USEPA, the Maxey Flats Steering Committee (Settling Private Parties), and the Commonwealth. The Commonwealth is responsible for completion of the BoRP that includes the Interim Maintenance Period, Final Closure Period, and Associated Remedial Activities and Performance Monitoring.

The Interim Maintenance Period Work Plan describes the tasks to be completed including:

- Surface/ground water monitoring
- IRP cap maintenance and replacement
- Trench leachate management and monitoring
- Subsidence monitoring and surveys
- Erosion evaluation
- General site maintenance
- Contaminated liquid and waste disposal
- Data collection, analysis, and reporting
- Site drainage and erosion control features

3.0 Surface Water Monitoring

All IMP Surface water monitoring locations are evaluated based on tritium sampling results. The 2012 annual tritium averages for all surface water locations yielded results below their specified screening assessment levels. Tritium results for all surface water monitoring appear in Appendix A: Maxey Flats Project Analytical Data 2012; *2012 MFP Tritium Data.xlsx*.

3.1 East Detention Basin

The first point of monitoring surface water runoff from the MFP is at the East Detention Basin (EDB). Sampling is performed at the EDB as a requirement of the RML, not the IMP Work Plan. Sampling occurs based on storm events of 2.8 inches of rainfall in a 24-hour period. In order for the sequential sampler to collect a storm event sample, the sampler is programmed to collect a sample based on 0.11 inches of rainfall per hour. A total of 34 samples were collected in 2012 and analyzed for tritium. Results range from -0.14 to 2.33 pCi/mL. Figure 3-1 on page 3 provides the IMP Annual Average for Tritium Concentrations for 2004-2012.

Pursuant to the ROD and 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 rainfall in 24 hours (2 year storm event or greater), the Commonwealth is required to collect recordings and report findings. Based on data collected from the East Drain Rain Gauge, no rain events in 2012 exceeded the storm event criteria; therefore no screening comparison of current flow rate versus pre-developed flow rate was required.

3.2 Perennial Streams Surface Water

Perennial Streams Surface Water (PSSW) monitoring is conducted at five locations in three streams inside and outside the MFP's boundary. These locations are monitored using sequential samplers that collect a four aliquot daily composite. The PSSW samples are compared to a specific action level of 20 pCi/mL and a screening level of 50% of the Action Level. A total of 1,819 PSSW samples were collected and analyzed for tritium during 2012 with no anomalous data reported. For 2012, all PSSW locations were below the average annual tritium screening level of 10 pCi/mL; ensuring that the 4 mrem/yr IMP specified dose limit has been met. Figure 3-1 on Page 3 provides the IMP Annual Average Tritium Concentrations for 2004-2012.

Sample location 122A serves as the background sample. It is located on Rock Lick Creek up-gradient from site influence. For 2012, this location yielded 360 samples for tritium analysis. Tritium results range from -0.27 to 0.92 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 drain 144. For 2012, this location yielded 366 samples for tritium analysis. Tritium results range from -0.03 to 13.35 pCi/mL.

Sample location 122C is located on Rock Lick Creek, downstream of 106 and 143 influences. For 2012, this location yielded 363 samples for tritium analysis. Tritium results range from 0.35 to 3.00 pCi/mL.

Sample location 103E is located on Drip Springs Creek and receives influence from Drain 107. For 2012, this location yielded 365 samples for tritium analysis. Tritium results range from -0.07 to 2.71 pCi/mL.

Sample location 102D is the only PSSW sampler located outside the Buffer Zone. Due to its location below the confluence of three streams; and its location outside the Buffer Zone, 102D is designated as the compliance point for site runoff. This location is the point for monitoring the Reasonably Exposed Individual (REI) and is compared to a 4 mrem/year dose limit. For 2012, this location yielded 365 samples for tritium analysis. Tritium results range from 0.09 to 2.10. The annual average was well below the action level, ensuring compliance to the 4 mrem/yr dose limit.

3.3 Drainage Channels Surface Water

Drainage Channels Surface Water (DCSW) monitoring is conducted at three locations inside the MFP's boundary. The three primary drains that produce intermittent flow are monitored and compared to a 25 mrem/year Total Effective Dose Equivalent standard and a more restrictive annual 100 pCi/mL action level. These drains are sampled as a composite by automated samplers that collect a four aliquot daily sample. For 2012, all DCSW locations had annual averages below the 100 pCi/mL action level, ensuring compliance to the 25 mrem/yr standard. A total of 919 samples were collected from the drains for tritium analysis. Figure 3-1, below provides the IMP Annual Average Tritium Concentrations for 2004-2012.

Sample location C107 is located at the base of the West Drain, which discharges into Drip Springs Creek. For 2012, this location yielded 199 samples for tritium analysis. Results range from 1.64 pCi/mL to 30.55 pCi/mL

Sample location 143 is located near the base of the South Drain, which discharges into Rock Lick Creek. For 2012, this location yielded 359 samples for tritium analysis. Results range from -0.19 pCi/mL to 0.30 pCi/mL

Sample location 144 is located at the base of the East Drain, which discharges into No Name Branch. For 2012, this location yielded 361 samples for tritium analysis. Results range from 1.64 pCi/mL to 188.38 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 Project
Annual Average Tritium Concentration (pCi/mL)
2004-2012

		Perennial Streams Surface Water					Drainage Channels Surface 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

4.0 Groundwater Monitoring Wells

Groundwater monitoring at MFP is accomplished using Alluvial and Perimeter Monitoring Wells. The alluvial wells, located in the buffer zone, were installed during the IRP to satisfy the requirements of the SOW. Seventeen monitoring wells referred to as Perimeter Monitoring Wells are located along the west perimeter fence of the restricted area, with the exception of one interior well, which is located within the restricted area between the EMC bunker and North Channel. Sixteen of the seventeen perimeter wells were installed as investigative monitoring points prior to the Consent Decree. Originally, over 300 investigative monitoring wells were installed; IRP operations removed all but the remaining sixteen. The one interior well was installed during the IRP. These seventeen wells are maintained for water level monitoring to satisfy the requirements of the IMP Work Plan and sampled to satisfy the contaminant monitoring requirements of the RML. Tritium analyses for all the wells are contained in Appendix A: Maxey Flats Project Analytical Data 2012; *2012 MFP Tritium Data.xlsx*. Water level monitoring tables for both alluvial and perimeter wells are contained in Appendix B: Maxey Flats Project Well Levels 2012; *2012 MFP Alluvial Well Levels.xlsx and 2012 MFP Perimeter Well Levels.xlsx.*

4.1 Alluvial Wells

Alluvial well samples for 2012 were collected as outlined in the PSVP and the 2007 US EPA Five Year Review. Five wells were sampled in 2012: AW-6, 10, and 12 were sampled once (annual), and AW-1 and 7 were sampled on a quarterly basis. During this reporting period, a total of 20 alluvial well samples were collected and analyzed for tritium, yielding results typical of historic range.

Additional sampling of all alluvial wells was completed as part of the USEPA 2007-2012 Five Year Review. Section 15 of this annual report contains further details on this sampling.

For 2012, AW-7 yielded the highest tritium concentration, with a value of 5.70 pCi/mL. Comparison of this value to 50% of the 20 pCi/mL ARAR screening assessment level indicated that action levels for additional radiological analysis were not exceeded.

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.

4.2 Perimeter Monitoring Wells

Well water levels were collected from the seventeen Perimeter Monitoring Wells quarterly. The 2012 measurements indicated the water levels are typical of historic data. In past years these measurements were used to develop a potentiometeric surface map but this requirement was rescinded in accordance with Technical Change 10.

The 2012 tritium results for the Perimeter Wells were typical of historical data and trends. Contamination monitoring of the Perimeter Monitoring Wells is a requirement of the RML, not the IMP Work Plan.

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. Data is reviewed and validated by DeNuke, Inc., a third party contractor that specializes in radiation services. Following data validation, the results are entered into the site's database and transmitted to USEPA, USDOE, *de maximis, inc.* and the Commonwealth. These packets are available on site for review. Analytical results are contained in the electronic file, Appendix A: Maxey Flats Project Analytical Data 2012; *2012 MFP Tritium Data.xlsx*

6.0 Rainfall Data

Presently, there are three rain gauge locations associated with the MFP: the East Detention Basin (EDB), sampling location 102D, and the main office. The official annual rainfall data is obtained from the EDB rain gauge, when available. This rain gauge was chosen because of its conjunction with the sampler at the EDB. Rainfall data from an alternate rain gauge, maintained at the main office, may be used to determine official rainfall totals if the EDB rain gauge is non-functional. A total of 39.40 inches of rainfall was measured at the EDB gauge during 2012. This is compared to an annual average precipitation of 47.33 inches (NOAA, National Climatic Data Center; Farmers, Kentucky). Annual precipitation data appears in Appendix C: Maxey Flats Project Precipitation 2012; *2012 MFP Daily Rainfall.xlsx.*

7.0 Initial Remedial Phase Cap Maintenance

7.1 Geomembrane Liner and Boots

The liner covering the trench cap and the sump boots were inspected monthly as part of the monthly inspection. The comprehensive visual and air lancing inspections were completed in April and May as part of the annual inspection. During 2012, a total of 57 repairs were made to the liner and boots. A total of 465 repairs have been made from 2004-2012. The repair map appears in Appendix D: Maxey Flats Project IRP Cap 2012; *2012 MFP Liner Repair Map.pdf.*

Permanent geomembrane repairs continue to become more difficult with each passing year. This is likely due to the more rapid aging of the geomembrane as a result of the exposed installation of the IRP cap. The effects of full UV exposure and the expected process of oxidation have made it difficult to bond new patching material to the existing geomembrane. Due to the ineffectiveness of the IMP prescribed repair method, anticipated installation of the final cap, and the observed effectiveness of

Tapecoat G-25 temporary patch material, the Commonwealth submitted Technical Change 11 (Appendix D: Maxey Flats Project IRP Cap 2012; *USEPA Change Req 2012 No 11.pdf.* Technical Change 11 instituted the use of temporary patches for small defects. These temporary patches will be inspected annually and replaced if their integrity appears to be compromised.

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/leaves were removed numerous times from the trash grate and restricting plate of the upstream headwall of the northeast corner piping. Removal of the leaves/debris will be a continuous maintenance issue for the site.

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 2012. 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: Maxey Flats Project IRP Cap 2012; *2012 MFP Subsidence Tracking Form 2003-2012.xlsx* contains the subsidence repair tracking information.

Estes Land Surveying performed the annual engineering subsidence survey of the trench cap in June 2012. Elevations were obtained for the 28 subsidence control points established during the remedial work and six additional points established in 2008. The measured variations between the 2011 and 2012 subsidence control points range from +0.17 feet to -0.01 feet. The variations between the 2004 (baseline) and the 2012 subsidence control points range from +0.08 feet to -0.48 feet. No particular area of significant subsidence was indicated. The report provided by Estes Land Surveying is available in Appendix D: Maxey Flats Project IRP Cap 2012; *2012 MFP Subsidence Measurements Estes Surveying.pdf.*

7.4 Diversion Berms

The diversion berms were inspected twice a month as required by the O&M. Excluding possible liner repairs, 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. A significant hole was located during the 2008 annual inspection on the perimeter Anchor Trench (at LP 363) along the restricted area fence near the north perimeter channel. This hole has not been permanently patched. There is an excessive amount

of moisture in the soil which renders the welding process ineffective. Due to the location, this hole does not impact the protectiveness of the liner to prevent infiltration that would affect trench liquid levels. All other anchor trenches appear to be functioning to design.

7.6 Drainage Channels

All drainage channels were inspected during 2012 as required by the O&M. Maintenance within the drains included control of vegetation in the Articulating Block mats and gabions. This was accomplished by spraying the areas with weed killer and/or manually removing the vegetation.

7.7 Articulating Concrete Block Mat (AB Mat) System

The AB mat system was inspected monthly as required by the O&M. Buildup of sediment within the AB mats has been observed, but appears to have minimal impact on reducing the velocity of water flowing to the EDB, nor does it appear to have impacted 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 continue to be monitored. One section of blocks in the east drainage channel on LP-191EX continues to be monitored closely due to accelerated erosion of the concrete blocks, but no decrease in performance has been observed.

7.8 Former Leachate Storage Facility Area

The covered area of the former leachate storage facility 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.

7.9 Inspections

A total of 95 inspections were performed in 2012. Excluding the items discussed in Section 7.5 and 7.7, no unsatisfactory notations were recorded that presented 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 2007 US EPA Five Year Review. The purpose of collection and evaluation of the trench sump leachate levels is to detect recharge conditions that may require leachate management.

The average loss of freeboard for all sumps is 1.30%. Three sumps have a greater than 10% loss of freeboard. Sumps 7-4, 46-1, and 46-2 have a freeboard percentage loss of 71%, 18%, and 13%, respectively. Due to freeboard loss of greater than 50%, Sump 7-4 continues to be evaluated under the 2011 revised Leachate Management Engineering Evaluation.

In addition to the previously mentioned documents, Appendix E: Maxey Flats Project Trench Sump Information 2012 contains tables for trench freeboard, leachate levels, sump bottom measurements and a graph of leachate levels of Trench Sump 7-4.

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.*

For 2012, no liquid beneath the trench cap liner was managed. No solid waste was disposed of on site during this reporting period. Solid and liquid waste generated from laboratory, radiological activities and site maintenance is temporarily stored in a secured area.

Appendix F: Maxey Flats Project Compliance Information 2012, contains the Annual Low Level Radioactive Waste Report submitted to the Cabinet for Health and Family Services, Radiation Health Branch (RHB); *2012 MFP LLRW Report.pdf.*

10.0 Erosion Monitoring

Estes Land Surveying was contracted for the fifth consecutive measurement to complete erosion monitoring and to produce a drain profile of the east drain using IMP Methodology. Estes Land Surveying conducted erosion measurements in May and November of 2012. The IMP Methodology cross-sections and tables for the 2011-2012 East drain erosion measurements and the calculated areas are presented in Appendix G: Maxey Flats Project Drainage Channel Erosion Monitoring 2012; *MFP 2012 East Drain Shaw Monuments.pdf.*

The Maxey Flats Project staff completed the 2012 erosion screening measurements in March using the USGS methodology. Results of this screening appear in Appendix G: Maxey Flats Project Drainage Channel Erosion Monitoring 2012; *MFP East Drain Erosion USGS Monuments 2003-2012.xlsx*,

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 since those noted in 2011.

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 USEPA for approval. Technical Change 11 was submitted to US EPA on May 3, 2102 and appears in Appendix D: Maxey Flats Project IRP Cap 2012; *US EPA Change Req 2012 No11.pdf.* Technical Change 11 expands the use of temporary patches from temporary to permanent with the requirement of annual inspections to ensure patch integrity. Technical Change 11 will be utilized until completion of the final cap installation.

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

In addition to the established buildings receiving routine maintenance, a storage bunker was constructed to hold gravel and sand. In addition to routine grounds maintenance, an excavator was used to make needed improvements around sampling location 106B.

12.3 Security Fence

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

12.4 Roadway Maintenance

In addition to routine maintenance on all facility owned roadways, 128 tons of gravel was placed on the perimeter road and around maintenance buildings.

13.0 Cathodic Protection

Operation of the cathodic protection system installed on the 20,000 gallon UST within the restricted area has been checked monthly with all readings documented within the accepted range. Jeffery D. Harris of Corrosion Concerns, LLC completed the 2012 annual evaluation of the cathodic system on June 15. The system evaluation report appears in Appendix H: Maxey Flats Project Cathodic Protection Inspection 2012; *2012 MFP Cathodic Protection Evaluation.pdf.*

14.0 Non IMP Work Plan Activities and Developments

The main purpose of this document is to summarize completion of the tasks required by the IMP Work Plan for the calendar year. Many other activities and developments relevant to MFP operations took place during 2012. Some of the major Non-IMP Work Plan activities and developments undertaken are included in this section.

In September of 2012, the DWM formally requested entry into the Final Closure Period (FCP) with the submission of the Trench Stabilization Criteria Evaluation report to US EPA (Appendix I: Maxey Flats Project Non-IMP Information 2012; *Trench Stabilization Criteria Eval 092112*). On November 16th, the DWM received confirmation from US EPA that Trench Stabilization Criteria had been met, officially placing the MFP in the Final Closure Period (Appendix I: Maxey Flats Project Non-IMP Information 2012; *Trench Stabilization Criteria US EPA Approval 111612.pdf*).

Concurrent with the request to enter FCP, the DWM and KY Finance Cabinet initiated a request for proposal (RFP) for Cap Design and development of the FCP Remedial Design Work Plan. The following events led to the selection of the FCP design contractor:

- October 16th and 18th: the MFP hosted open house events for prospective bidders.
- November 28th: a selection committee evaluated the submitted proposals to select a short list of three companies to formally present their design proposals.
- December 12th: a detailed facility tour was provided to the three companies selected.
- January 16th: the short list contractors presented their proposals to the selection committee. URS, Inc. was selected as the design contractor.

Pending contract approval, URS will begin FCP Remedial Design activities the spring of 2013.

During September 2011, the MFP office was approached by Jerry Gibbs, the administrator of 38 acres of land that borders the MFP site boundary. Mr. Gibbs presented an offer to sell the property to the Commonwealth below market value. The Commonwealth Finance Cabinet finalized purchase of the property in October 2012. The Commonwealth Finance Cabinet is evaluating the purchase of two more tracts of land (Jent and Conn Properties) that would provide multiple benefits for FCP.

Appendix I contains the Maxey Flats Project monthly reports file, *2012 MFP Monthly Reports.pdf*. These reports are generated for the purpose of keeping the Commonwealth's Superfund Branch informed of ongoing IMP, RML, and other administrative activities. The reports also contain further details about the topics discussed in this report.

15.0 2012 Five Year Review

The third five year review process was completed in September 2012. As required by the review, all surface water locations were further evaluated based on annual averages and compared to 50% of the screening assessment level. Drainage channel sampling location (location 144) exceeded this screening assessment level. In accordance with Figure 13 of the IMP PSVP, additional radiological and non-radiological analyses was performed for all 14 alluvial wells, and sampling stations 102D, 122A, 122C, and 103E. Both radiological and non-radiological results for specified surface and ground water monitoring locations appear in Appendix A: Maxey Flats Project Analytical Data 2012; *2012 MFP 5YR Rev Non Rad Analyses.pdf.* Also included in Appendix A is the summary submitted to US EPA with recommendations for further actions as related to the analyses (*2012 MFP VOC Summary to US EPA.pdf*).

The 2012 Five Year Review stated that no recommendations or required actions were needed to correct deficiencies in protectiveness of the selected remedy. The 2012 review stated: "The selected remedy at the MFDS is expected to be protective of human health and the environment at the conclusion of the RA, and in the interim, exposure pathways that could result in unacceptable risks are being controlled."

16.0 Conclusions

This concludes the textual outlining of the IMP activities at the Maxey Flats Project for 2012. If copies of inspections or deliverables not included in this report are required, please contact the MFP office.

ENERGY AND ENVIRONMENT CABINET

Steven L. Beshear
Governor

Leonard K. Peters
Secretary

DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
MAXEY FLATS PROJECT
2597 MAXEY FLAT ROAD
HILLSBORO, KY 41049
PHONE (606) 783-8680
http://waste.ky.gov

March 24, 2014

Ms. Pam Scully, SRPM, Kentucky/Tennessee Section
USEPA-Region IV
Sam Nunn Federal Center
61 Forsyth Street SW
11th Floor
Atlanta, GA 30303-8960

Subject: Maxey Flats Project – 2013 Annual Report

Dear Ms. Scully;

The Commonwealth of Kentucky is submitting the 2013 Annual Report for the Maxey Flats Project to fulfill the requirements of Section 4.0 of the Performance Verification Standard Plan (PSVP). The report was prepared by the Maxey Flats Section and summarizes information from the period of January 2013 through December 2013.

If you have any questions, please contact me at (606)-783-8680.

Sincerely,

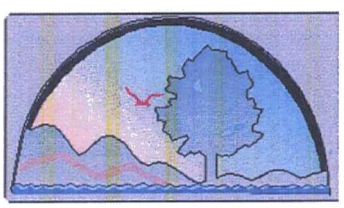
Scott Wilburn
Environmental Scientist III

e-attachment

cc: Nicole Barkasi, de maximis, inc.
Michelle Miller, USDOE
Gwen Hooten, USDOE
Matt McKinley, CHFS, Radiation Health Branch
Larry Hughes, DWM, Superfund Branch

MAXEY FLATS DISPOSAL SITE
ANNUAL REPORT
2013

March 24, 2014



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
606-783-8680

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1.0 Introduction

The Commonwealth is submitting this report in accordance with Section 4.0 of the PSVP. The report summarizes sampling and maintenance activities listed in the 2003 Interim Maintenance Period Work Plans, PSVP, and the O&M.

2.0 Scope of Work

The IMP is ongoing pursuant to the Consent Decree (Civil Action Number 95-58) signed by the USEPA, the Maxey Flats Steering Committee (Settling Private Parties), and the Commonwealth. The Commonwealth is responsible for completion of the BoRP that includes the Interim Maintenance Period, Final Closure Period (FCP), and Associated Remedial Activities and Performance Monitoring. Although the MFDS is officially in the FCP relevant IMP activities will be completed throughout the FCP as long as they are applicable and don't interfere with remedial progress. IMP activities will cease upon US EPA's approval of a Institutional Control Period Work Plan.

The Interim Maintenance Period Work Plan describes the tasks to be completed including:

- Surface/ground water monitoring
- IRP cap maintenance and replacement
- Trench leachate management and monitoring
- Subsidence monitoring and surveys
- Erosion evaluation
- General site maintenance
- Contaminated liquid and waste disposal
- Data collection, analysis, and reporting
- Site drainage and erosion control features

3.0 Surface Water Monitoring

All IMP Surface water monitoring locations are evaluated based on tritium sampling results. The 2013 annual tritium averages for all surface water locations yielded results below their specified screening assessment levels. Tritium results for all surface water monitoring appear in Appendix A: Maxey Flats Disposal Site Analytical Data 2013; *2013 MFDS Tritium Data.xlsx*.

3.1 East Detention Basin

The first point of monitoring surface water runoff from the MFDS is at the East Detention Basin (EDB). Sampling is performed at the EDB as a requirement of the RML, not the IMP Work Plan. Sampling occurs based on storm events of 2.8 inches of rainfall in a 24-hour period. In order for the sequential sampler to collect a storm event sample, the sampler is programmed to collect a sample based on 0.11 inches of

rainfall per hour. A total of 34 samples were collected in 2013 and analyzed for tritium. Results range from 0.06 to 2.77 pCi/mL. Figure 3-1 provides the IMP Annual Average for Tritium Concentrations for 2004-2013.

Pursuant to the ROD and 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 rainfall in 24 hours (2 year storm event or greater), the Commonwealth is required to collect recordings and report findings. Based on data collected from the East Drain Rain Gauge, no rain event in 2013 exceeded the storm event criteria; therefore no screening comparison of current flow rate versus pre-developed flow rate was required. The highest 24 hour recorded rain event for 2013 was 1.92".

3.2 Perennial Streams Surface Water

Perennial Streams Surface Water (PSSW) 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. The PSSW samples are compared to a specific action level of 20 pCi/mL and a screening level of 50% of the Action Level. A total of 1,819 PSSW samples were collected and analyzed for tritium during 2013 with no anomalous data reported. For 2013, all PSSW locations were below the average annual tritium screening level of 10 pCi/mL; ensuring that the 4 mrem/yr IMP specified dose limit has been met. Figure 3-1 on Page 3 provides the IMP Annual Average Tritium Concentrations for 2004-2013.

Sample location 122A serves as the background sample. It is located on Rock Lick Creek up-gradient from site influence. For 2013, this location yielded 365 samples for tritium analysis. Tritium results range from -0.24 to 1.55 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 drain 144. For 2013, this location yielded 365 samples for tritium analysis. Tritium results range from 0.41 to 9.59 pCi/mL.

Sample location 122C is located on Rock Lick Creek, downstream of 106 and 143 influences. For 2013, this location yielded 365 samples for tritium analysis. Tritium results range from 0.37 to 2.74 pCi/mL.

Sample location 103E is located on Drip Springs Creek and receives influence from Drain 107. For 2013, this location yielded 365 samples for tritium analysis. Tritium results range from -0.07 to 1.29 pCi/mL.

Sample location 102D is the only PSSW sampler located outside the Buffer Zone. Due to its location below the confluence of three streams; and its location outside the Buffer Zone, 102D is designated as the compliance point for site runoff. This location is the point for monitoring the Reasonably Exposed Individual (REI) and is compared to a 4 mrem/year dose limit. For 2013, this location yielded 359 samples for tritium analysis. Tritium results range from -0.20 to 2.23. The annual average was well below the action level, ensuring compliance to the 4 mrem/yr dose limit.

3.3 Drainage Channels Surface Water

Drainage Channels Surface Water (DCSW) 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 standard and a more restrictive annual 100 pCi/mL action level. These drains are sampled as a composite by automated samplers that collect a four aliquot daily sample. For 2013, all DCSW locations had annual averages below the 100 pCi/mL action level, ensuring compliance to the 25 mrem/yr standard. A total of 947 samples were collected from the drains for tritium analysis. Figure 3-1, below provides the IMP Annual Average Tritium Concentrations for 2004-2013.

Sample location C107 is located at the base of the West Drain, which discharges into Drip Springs Creek. For 2013, this location yielded 218 samples for tritium analysis. Results range from 0.35 pCi/mL to 24.14 pCi/mL.

Sample location 143 is located near the base of the South Drain, which discharges into Rock Lick Creek. For 2013, this location yielded 365 samples for tritium analysis. Results range from -0.24 pCi/mL to 0.81 pCi/mL.

Sample location 144 is located at the base of the East Drain, which discharges into No Name Branch. For 2013, this location yielded 364 samples for tritium analysis. Results range from 0.29 pCi/mL to 151.03 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)
2004-2013

		Perennial Streams Surface Water					Drainage Channels Surface 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

4.0 Groundwater Monitoring Wells

Groundwater monitoring at MFDS is accomplished using Alluvial and Perimeter Monitoring Wells. The alluvial wells, located in the buffer zone, were installed during the IRP to satisfy the requirements of the SOW. Seventeen monitoring wells referred to as Perimeter Monitoring Wells are located along the west perimeter fence of the restricted area, with the exception of one interior well, which is located within the restricted area between the EMC bunker and North Channel. Sixteen of the seventeen perimeter wells were installed as investigative monitoring points prior to the Consent Decree. Originally, over 300 investigative monitoring wells were installed; IRP operations removed all but the remaining sixteen. The one interior well was installed during the IRP. These seventeen wells are maintained for water level monitoring to satisfy the requirements of the IMP Work Plan and sampled to satisfy the contaminant monitoring requirements of the RML. Tritium analyses for all the wells are contained in Appendix A: Maxey Flats Disposal Site Analytical Data 2013; *2013 MFDS Tritium Data.xlsx*. Water level monitoring tables for both alluvial and perimeter wells are contained in Appendix B: Maxey Flats Disposal Site Well Levels 2013; *2013 MFDS Alluvial Well Levels.xlsx and 2013 MFDS Perimeter Well Levels.xlsx.*

4.1 Alluvial Wells

4.1.1 Tritium Evaluation 2013

Alluvial well samples for 2013 were collected for tritium analysis as outlined in the PSVP and the 2007 US EPA Five Year Review. Five wells were sampled in 2013; an annual sample is collected from AW-6, 10, and 12, and quarterly samples were collected from AW-1 and 7. During this reporting period, a total of 18 alluvial well samples were collected and analyzed for tritium, yielding results typical of historic range.

For 2013, AW-7 yielded the highest tritium concentration, with a value of 6.05 pCi/mL. Comparison of this value to 50% of the 20 pCi/mL ARAR screening assessment level indicated that action levels for additional radiological analysis were not exceeded.

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.

4.1.2 Arsenic Evaluation 2012-2013

During the course of preparing the Five Year Review in 2012, it was determined surface water sampling location 144 exceeded 50% of the established screening level for tritium. In accordance with requirements of the Interim Maintenance Plan (IMP), a sampling event was conducted specifically to quantify the concentrations of contaminants of concern in groundwater as identified in the Record of Decision. Fourteen alluvial wells and four stream sampling locations were sampled and extensively analyzed in September 2012. The Third Party (Test America) laboratory results identified four

locations that exceeded the current 10 µg/L Maximum Contaminant Level (MCL) for arsenic: alluvial well locations AW-1, AW-6, AW-13 and AW-14. The Commonwealth proposed quarterly sampling and analysis specifically for arsenic at the four wells for a minimum of four quarters to evaluate the environmental criterion. The results of this study will be used to determine the appropriate course of action.

Laboratory results and subsequent inquires to experts in drinking water well conditions or local geology have proven inconclusive. Jerry Martin with the Kentucky Division of Water (DOW) informed MFP that no Arsenic Level Profile has ever been done for the area and Robert Blair (DOW) stated the levels of arsenic in wells at MFP were very similar to the levels he is finding in his study of Ohio River Basin drink water wells. A study of the Ohio/Sunbury Shale Formation by Geologist Charles Mason at Morehead State University identified high levels of arsenic in the Ohio Shale Formation, a prominent geologic feature at MFP. A meeting with Dr. Mason is scheduled to discuss the possible influences Ohio Shale in the alluvium could have on alluvial well water.

The results of this sampling are presented in Appendix A: Maxey Flats Disposal Site Analytical Data 2013; *2013 MFDS Alluvial Well Arsenic Study.xlsx.*

4.2 Perimeter Monitoring Wells

Well water levels were collected from the seventeen Perimeter Monitoring Wells on a quarterly basis. The 2013 measurements indicate the water levels are typical of historic data.

The 2013 tritium results for the Perimeter Wells were typical of historical data and trends. Contamination monitoring of the Perimeter Monitoring Wells is a requirement of the RML, not the IMP Work Plan.

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. Data is reviewed and validated by DeNuke, Inc., a third party contractor that specializes in radiation services. Following data validation, the results are entered into the site's database and transmitted to USEPA, USDOE, *de maximis, inc.* and the Commonwealth. These packets are available on site for review. Analytical results are contained in the electronic file, Appendix A: Maxey Flats Disposal Site Analytical Data 2013; *2013 MFDS Tritium Data.xlsx*

6.0 Rainfall Data

Presently, there are three rain gauge locations associated with the MFDS: the East Detention Basin (EDB), sampling location 102D, and the main office. The official annual rainfall data is obtained from the EDB rain gauge. This rain gauge was chosen because of its conjunction with the sampler at the EDB. Rainfall data from an alternate rain gauge, maintained at the main office, may be used to determine official rainfall totals if the EDB rain gauge is non-functional. A total of 42.51 inches of rainfall was measured at the EDB gauge during 2013. This is compared to an annual average precipitation of 47.33 inches (NOAA, National Climatic Data Center; Farmers, Kentucky). Annual precipitation data appears in Appendix C: Maxey Flats Disposal Site Precipitation 2013; *2013 MFDS Daily Rainfall.xlsx.*

7.0 Initial Remedial Phase Cap Maintenance

7.1 Geomembrane Liner and Boots

The liner covering the trench cap and the sump boots were inspected monthly as part of the monthly inspection. The comprehensive visual and air lancing inspections were completed in April and May as part of the annual inspection. During 2013, a total of 46 repairs were made to the liner and boots. A total of 511 repairs have been made from 2004-2013. The repair map appears in Appendix D: Maxey Flats Disposal Site IRP Cap 2013; *2013 MFDS Liner Repair Map.pdf.*

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/leaves were removed numerous times from the trash grate and restricting plate of the upstream headwall of the northeast corner piping. Removal of the leaves/debris will be a continuous maintenance issue for the site.

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 2013. 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: Maxey Flats Disposal Site IRP Cap 2013; *2013 MFDS Subsidence Tracking Form 2003-2013.xlsx* contains the subsidence repair tracking information. Monitoring of these areas will continue in the FCP but any required subsidence repairs not deemed critical will be addressed during cap construction.

Estes Land Surveying performed the annual engineering subsidence survey of the trench cap in June 2013. Elevations were obtained for the 28 subsidence control points established during the remedial work and six additional points established in 2008. The measured variations between the 2012 and 2013 subsidence control points range from +0.20 feet to -0.32 feet. The variations between the 2004/2008 (baseline) and the 2013 subsidence control points range from +0.17 feet to -0.59 feet. Monitoring points 20 and 29 have been identified as having significant subsidence.

These areas will be closely monitored in 2014 and addressed during cap design and construction. No particular area of significant subsidence was indicated. The report provided by Estes Land Surveying is available in Appendix D: Maxey Flats Disposal Site IRP Cap 2013; *2013 MFDS Subsidence Measurements Estes Surveying.pdf.*

7.4 Diversion Berms

The diversion berms were inspected twice a month as required by the O&M. Excluding possible liner repairs, 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 to design.

7.6 Drainage Channels

All drainage channels were inspected during 2013 as required by the O&M. Maintenance within the drains included control of vegetation in the Articulating Block mats and gabions. This was accomplished by spraying the areas with weed killer and/or manually removing the vegetation.

7.7 Articulating Concrete Block Mat (AB Mat) System

The AB mat system was inspected monthly as required by the O&M. Buildup of sediment within the AB mats has been observed, but appears to have minimal impact on reducing the velocity of water flowing to the EDB, nor does it appear to have impacted 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 continue to be monitored. One section of blocks in the east drainage channel on LP-191EX continues to be monitored closely due to accelerated erosion of the concrete blocks, but no decrease in performance has been observed.

7.8 Former Leachate Storage Facility Area

The covered area of the former leachate storage facility 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.

7.9 Inspections

A total of 95 inspections were performed in 2013. Excluding the item discussed in 7.7, no unsatisfactory notations were recorded that presented 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 2007 US EPA Five Year Review. The purpose of collection and evaluation of the trench sump leachate levels is to detect recharge conditions that may require leachate management.

The average loss of freeboard for all sumps is 1.30%. Three sumps have a greater than 10% loss of freeboard. Sumps 7-4, 46-1, and 46-2 have a freeboard percentage loss of 71%, 17%, and 12%, respectively. Due to freeboard loss of greater than 50%, Sump 7-4 continues to be evaluated under the 2011 revised Leachate Management Engineering Evaluation.

Appendix E: Maxey Flats Disposal Site Trench Sump Information 2013 contains tables for trench freeboard, leachate levels, sump bottom measurements and a graph of leachate levels of Trench Sump 7-4.

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.*

For 2013, no liquid beneath the trench cap liner was managed. No solid waste was disposed of on site during this reporting period. Solid and liquid waste generated from laboratory, radiological activities and site maintenance is temporarily stored in a secured area.

Appendix F: Maxey Flats Disposal Site Compliance Information 2013, contains the Annual Low Level Radioactive Waste Report submitted to the Cabinet for Health and Family Services, Radiation Health Branch (RHB); *2013 MFDS LLRW Report.pdf.*

10.0 Erosion Monitoring

Estes Land Surveying was contracted for the seventh (based on the area report spreadsheet) consecutive measurement to complete erosion monitoring and to produce a drain profile of the east drain using IMP Methodology. Estes Land Surveying conducted erosion measurements in May and November of 2013. The IMP Methodology cross-sections and tables for the 2011-2013 East drain erosion measurements and the calculated areas are presented in Appendix G: Maxey Flats Disposal Site Drainage Channel Erosion Monitoring 2013; *MFDS 2013 East Drain Shaw Monuments.pdf.*

The Maxey Flats Disposal Site staff completed the 2013 erosion screening measurements in April using the USGS methodology. Results of this screening appear in Appendix G: Maxey Flats Disposal Site Drainage Channel Erosion Monitoring 2013; *MFDS East Drain Erosion USGS Monuments 2011-2013.xlsx.*

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 since those noted in 2011.

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 USEPA for approval.

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

In addition to the established buildings receiving routine maintenance, a storage bunker was constructed to hold gravel and sand. In addition to routine grounds maintenance, an excavator was used to make needed improvements around sampling location 106B.

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 UST within the restricted area has been checked monthly with all readings documented within the accepted range. Jeffery D. Harris of Corrosion Concerns, LLC completed the 2013 annual evaluation of the cathodic system on July 31st. The system evaluation report appears in Appendix H: Maxey Flats Disposal Site Cathodic Protection Inspection 2013; *2013 MFDS Cathodic Protection Evaluation.pdf.*

14.0 Non IMP Work Plan Activities and Developments

The main purpose of this document is to summarize completion of the tasks required by the IMP Work Plan for the calendar year. Many other activities and developments relevant to MFDS operations took place during 2013. Some of the major Non-IMP Work Plan activities and developments undertaken are included in this section.

January 2013: The initial RCP Remedial Design Work Plan prepared by DWM was submitted to US EPA. URS, Inc. was selected as the design contractor. URS submitted the draft final Remedial Design Work Plan to KDEP and EPA on June 21, 2013. This plan was revised and finalized by URS and submitted to US EPA during November 2013.

April 2013: URS contacted Photo Science for completion of LiDAR map of MFDS.

May 2013: URS completed geological hydro evaluation study that evaluated the need for additional capping north of the IRP cap. This study was presented to CHFS and discussed during meetings in July. It was later concluded that additional capping was not warranted.

June 2013: Explanation of Significant Difference identifying elements in the ROD that should be modernized submitted to US EPA for approval. US EPA approves URS as the Supervising Contractor.

July 2013: KY Governor Steve Beshear, KY Senator Walter Blevins, KY Representative Mike Denham and other dignitaries visited the site to announce funding and the beginning of the FCP process. The event had forty attendees.

April 2013: The design contract with URS was finalized. The contract includes: information gathering, cost estimates, completion of Remedial Design Work Plans; development of sump abandonment method, preparation of sump abandonment bid package, sump abandonment oversight and Final Closure Period Cap Design. Cap Construction Oversight will also be performed by URS.

August 2013: Sump Abandonment Bid Package Submitted to US EPA for approval.

October 2013: URS completed Geotechnical Work that included: 17 cone penetrometers, 14 hollow stem auger boreholes, 9 hand auger boreholes and 20 soil test pits. Over 80 samples were submitted for geotechnical laboratory testing. In addition, all drains flowing from the cap area were evaluated and a route for the haul road was chosen.

November 2013: Sump abandonment Bid Package received approval from US EPA. The bid package was posted on the Commonwealth's procurement webpage.

December 2013: URS submitted Maxey Flats Final Cap 30% Design Package to US EPA. Sump Abandonment Site tour bid meeting completed. Sump Abandonment Bids to be submitted and contractor selected in January 2014.

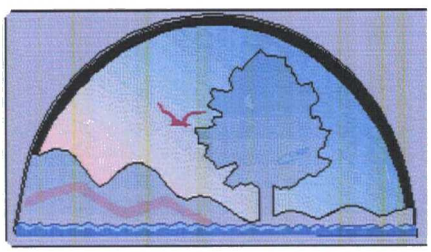
The Commonwealth Finance Cabinet initiated purchase of the Conn Property located at the end of Upper Rock Lick road during 2013. An appraisal and sales contract have been completed for the purchase. The survey work was started in 2013 but won't be completed until 2014. Additional work remaining is the environmental impact study and renewal of the sales contract.

Appendix I contains the Maxey Flats Disposal Site monthly reports file, *2013 MFDS Monthly Reports.pdf*. These reports are generated for the purpose of informing the Commonwealth's Superfund Branch of ongoing IMP, RML, and other administrative activities. The reports also contain further details about the topics discussed in this report.

15.0 Conclusions

This concludes the textual outlining of the IMP activities at the Maxey Flats Disposal Site for 2013. If copies of inspections or deliverables not included in this report are required, please contact the MFDS office.

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
2597 Maxey Flat Road
Hillsboro, KY 41049
606-783-8680

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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
Included on Disc

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.

February 2014: RECON was awarded the contract for sump abandonment.

April 2014: RECON mobilized and began sump abandonment.

June 2014:

- 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.

September 2014: 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.

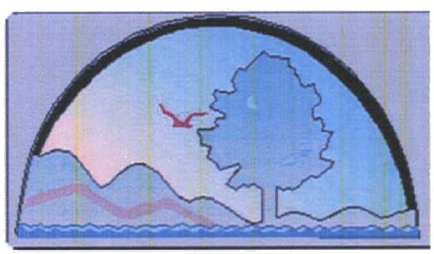
November 2014:

- 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.

MAXEY FLATS DISPOSAL SITE
ANNUAL REPORT
2015



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
606-783-8680

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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
EPA	U.S. Environmental Protection Agency
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 maximally Exposed Individual
RML	Radioactive Material License
SWMF	Stormwater Management Feature
USGS	U.S. Geological Survey

List of eAppendices
Included on Disc

Appendix A **Maxey Flats Disposal Site Analytical Data 2015**
2015 MFDS Tritium Data.xlsx

Appendix B **Maxey Flats Disposal Site Well Levels 2015**
2015 MFDS Alluvial Well Levels.xlsx
2015 MFDS Perimeter Well Levels.xlsx

Appendix C **Maxey Flats Disposal Site Precipitation 2015**
2015 MFDS Daily Rainfall.xlsx

Appendix D **Maxey Flats Disposal Site Compliance Information 2015**
2015 MFDS LLRW Report.pdf
2015-16 MFDS RML.pdf

Appendix E **Maxey Flats Disposal Site Drainage Channel Erosion Monitoring 2015**
2011-2015 MFDS East Drain Erosion USGS Monuments.xlsx
2015 MFDS East Drain Erosion Shaw Monuments.pdf

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 EPA's approval of an Institutional Control Period (ICP) Work Plan, which is currently under development.

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

- Surface/ground water 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
- Initial Remedial Phase (IRP) cap maintenance
- Subsidence monitoring

3.0 Surface Water Monitoring

Radioactivity as a result of tritium concentration is used to evaluate the spread of contamination at MFDS. No annual average activity for any surface water location exceeded specified screening levels for 2015. The tritium activity for all surface water monitoring samples appear in Appendix A: *2015 MFDS Tritium Data.xlsx*

3.1 East Detention Basin

Surface water runoff from the Initial Remedial Phase (IRP) cap is monitored at the East Detention Basin (EDB). 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 (2.8 inches of rainfall in 24 hours). In 2015, 39 rain event samples were collected for analysis; the activity ranged from -0.14 to 1.56 pCi/mL. Figure 3-2 on page 4 provides the annual average for tritium concentrations for 2004-2015.

Pursuant to the ROD and Initial Remedial Phase (IRP) design, discharge from the East Detention Basin is released into the East Main Drainage Channel at a rate not to exceed predevelopment flow conditions. Following a 2.8 inch, 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. The East Drain rain gauge recorded a two year storm event on April 3rd with a rainfall depth of 2.9 inches. A comparison of the discharge flow at the EDB flume to a predevelopment flow rate of 11 cfs confirms the predevelopment rate was not exceeded. Figure 3-1 details the 4/3/15 storm event.

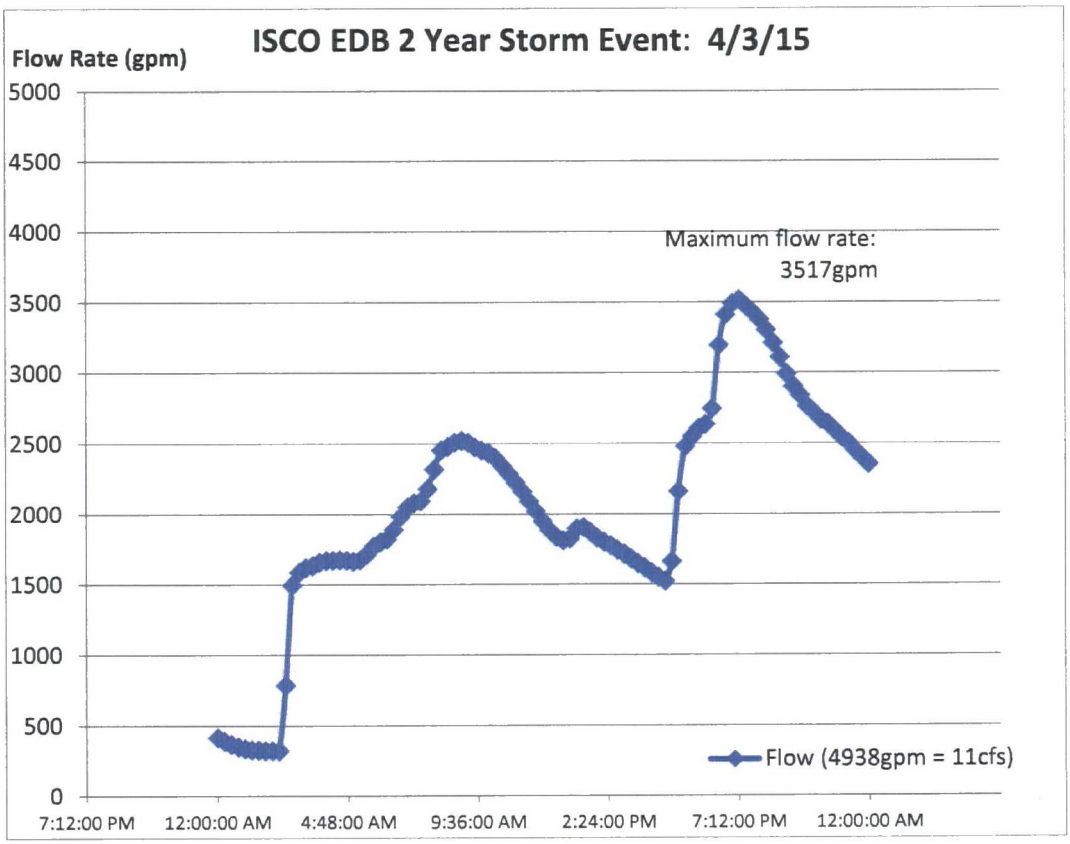


Figure 3-1

3.2 Perennial Surface Water

Perennial Surface Water (PSW) monitoring is conducted 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 2015, 1,755 PSW samples were collected for analysis with no anomalous data reported. All PSW location averages were below the screening level of 10 pCi/mL. Figure 3-2 on page 4 provides the IMP Annual Average Tritium Activity for 2004-2015.

Sample location 122A serves as the source for background samples. It is located on Rock Lick Creek up gradient from site influence. During 2015, 344 samples were collected at this location for analysis. The activity ranged from -0.47 to 6.33 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 activity fluctuation consistent with location 144. During 2015, 348 samples were collected from this location for analysis. The activity ranged from -1.12 to 9.89 pCi/mL.

Sample location 122C is located on Rock Lick Creek, downstream of 106 and 143 influences. During 2015, 356 samples were collected from this location for analysis. The activity ranged from -1.15 to 2.57 pCi/mL.

Sample location 103E is located on Drip Springs Creek and receives influence from Drain 107. During 2015, 353 samples were collected from this location for analysis. The activity ranged from -0.56 to 1.79 pCi/mL.

Sample location 102D is the only sampling station outside the established buffer zone at the MFDS. It is deliberately located below the confluence of the three streams influenced by surface water from the MFDS and is the designated EPA compliance point for site runoff. During 2015, 360 samples were collected from this location for analysis. The activity ranged from -1.11 to 2.15 pCi/mL. The 2015 annual average at 102D was 0.52 pCi/ml. In accordance with the IMP Work Plan, the Reasonably maximally 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 Channels Water

Drainage Channels Water (DCW) monitoring is conducted at the three primary drains that receive intermittent flow from the IRP cap using automated samplers that collect a four aliquot daily composite. The 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 additional screening level of 50 pCi/mL. In 2015, 869 samples were collected at the DCW locations for analysis. No location exceeded the 50 pCi/mL screening level. No additional

investigation was required. Figure 3-2 provides the IMP Annual Average Tritium Concentrations for 2004-2015.

Sample location C107 is located at the base of the West Drain, which discharges into Drip Springs Creek. During 2015, 224 samples were collected from this location for analysis. Activity ranged from 1.56 pCi/mL to 18.00 pCi/mL.

Sample location 143 is located near the base of the South Drain, which discharges into Rock Lick Creek. During 2015, 308 samples were collected from this location for analysis. Activity ranged from -1.18 pCi/mL to 0.65 pCi/mL.

Sample location 144 is located at the base of the East Drain, which discharges into No Name Branch. During 2015, 337 samples were collected from this location for analysis. Activity ranged from 1.52 pCi/mL to 128.23 pCi/mL.

Maxey Flats Disposal Site
Annual Average Tritium Activity (pCi/mL)
2011-2015

		Perennial Surface Water					Drainage Channels Water		
	EDB	**122A**	**106**	**122C**	**103E**	**102D**	**C107**	**143**	**144**
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
2015	**0.37**	**0.07**	**2.79**	**0.77**	**0.39**	**0.52**	**8.81**	**0.03**	**46.49**

Figure 3-2

3.4 Sampling Equipment Status

A reliable ISCO sampler is in operation at each sampling location. Samplers perform in accordance with the PSVP, except during events beyond control such as: freezing lines, washouts, equipment failure, lack of flow, or power outages. In the spring of 2015, the sampler at 107C was damaged by a falling tree and replaced with the back up unit. Multiple replacement units will be purchased at the completion of FCP.

4.0 Groundwater Monitoring Wells

Groundwater monitoring at the MFDS is conducted at 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 located along the west perimeter fence of the restricted area were installed as investigative monitoring points prior to the Consent Decree. The 16 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. Multiple perimeter wells are scheduled for removal to accommodate FCP construction requirements. Analytical results for all groundwater samples are contained in Appendix A: *2015 MFDS Tritium Data.xlsx.* Water level monitoring tables for both alluvial and perimeter wells are contained in Appendix B: *2015 MFDS Alluvial Well Levels* and *2015 MFDS Perimeter Well Levels.xlsx.*

4.1 Alluvial Wells

4.1.1 Tritium Evaluation 2015

Alluvial well (AW) samples were collected for analysis as outlined in the PSVP and the 2007 EPA Five Year Review. Five wells were sampled in 2015: annual samples were collected from AW-6, 10, and 12, and quarterly samples were collected from AW-1 and 7. Construction of Storm Water Management Feature (SWMF) 3 necessitated the removal of AW-1 in February. During 2015, 7 alluvial well samples were collected for analysis. Results were typical of historical ranges. The Commonwealth reports a lapse in AW-7 sample collection for the third quarter, a result of overwhelming FCP demands, specifically the slope failure in borrow area 4A.

The maximum activity at AW-7 was 6.36 pCi/mL. Comparison of this value to 50 percent of the 20 pCi/mL applicable or relevant and appropriate (ARAR) requirement indicated that additional analysis was 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 was installed to further limit access.

4.2 Perimeter Monitoring Wells

Water levels were measured in the 16 perimeter monitoring wells on a quarterly basis. The 2015 measurements indicate water levels typical of historic data.

The RML required tritium analysis for the perimeter wells in 2015 were typical of historical data and trends.

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. ATL, a radiation service contractor, completes third party data validation for the MFDS. Following data validation, the results are entered into the MFDS electronic 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.

6.0 Rainfall Data

Presently, there are three rain gauge locations associated with the MFDS: 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. Rainfall data from the main office rain gauge can be used for official rainfall totals in the event of an EDB rain gauge malfunction. The measured rainfall at the EDB gauge during 2015 was 50.34 inches. 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: *2015 MFDS Daily Rainfall.xlsx.*

7.0 Initial Remedial Phase Cap Maintenance

7.1 Geomembrane Liner and Boots

The liner covering the trench cap was inspected monthly. The comprehensive visual and air lancing (annual) inspection was suspended for 2015 to accommodate FCP activities. The integrity of the IRP was evaluated during the placement of leveling fill and every effort was made to maintain that integrity.

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. FCP construction activities focused on the North Channel through September 2015, including completion of leveling fill placement in this area.

7.3 Subsidence Monitoring and Repair

Subsidence inspections were conducted monthly in accordance with the O&M, Section 3.3.3; Subsidence Monitoring. Areas near trenches 15, 21, 36, 37, and 46 were visually monitored monthly for subsidence qualification until these areas were covered with leveling fill. The annual engineering subsidence survey of the IRP 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 until leveling fill was placed over them. 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 until leveling fill was placed over them. All anchor trenches functioned as designed.

7.6 Drainage Channels

All drainage channels were inspected during 2015 as required by the O&M until leveling fill was placed over them. 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 until leveling fill was placed over them.

7.8 Former Leachate Storage Facility Area

The former leachate storage facility (LFS) area was grouted in place during the Sump Abandonment construction in 2014. The storage tank was used for the disposal of the generated waste during construction. A complete list of disposed waste will be available in the FCP Final Report.

7.9 Inspections

A total of 95 inspections were performed in 2015. 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

Sump abandonment was completed by RECON in 2014. Trench leachate management and monitoring is no longer 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.

Solid and liquid waste generated from laboratory, radiological, and maintenance activities is stored in a secured area in the on site Radiological Laboratory. All radiological waste is transferred to 55 gallon drums and will accumulate until space restrains require contracted, off site disposal. One 55 gallon drum was accumulated during 2015.

The Annual Low Level Radioactive Waste Report is included in Appendix F: *2015 MFDS LLRW Report.pdf*.

10.0 Erosion Monitoring

MFDS staff completed the annual evaluation of the East Main Drainage channel in December of 2015. The monuments at cross section 3.5 were damaged during FCP construction; this area was not surveyed for 2015. All other cross-sectional area data was consistent with historical data. New monuments will be placed for all survey points as part of FCP construction. A new erosion monitoring plan will be developed at the conclusion of FCP.

Curd Surveying & Land Consulting was contracted to complete erosion monitoring and to produce a cross-sectional profile of the East Drain using IMP methodology. This survey was conducted in May and November of 2015. The cross-sections and tables for the 2011-2015 East Drain erosion measurements and the calculated areas are presented in Appendix G: *2015 MFDS East Drain Erosion Shaw Monuments.pdf.*

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.

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 2015.

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 former tank storage/restricted area access building surveyed for unrestricted use by ATL in 2014 has since undergone major renovation for beneficial reuse. This building can now be used as a conference/meeting room, interpretive center, or open house location.

12.3 Security Fence

The security fence surrounding the site has been dramatically changed. All of the previous galvanized fencing was removed for cap construction. The office complex fencing has been replaced with a more aesthetic aluminum fence. The restricted area fence was removed and replaced with temporary rope and signage to facilitate cap construction. Discussion regarding the restricted area fencing will ensue after cap construction completion.

12.4 Roadway Maintenance

Routine maintenance was performed on all facility-owned roadways. Upper Rock Lick Road that traversed the buffer zone was removed from County maintenance. The Commonwealth has assumed maintenance responsibilities and installed a gate at the site boundary to restrict public access.

13.0 Cathodic Protection

The cathodic protection system installed on the 20,000 gallon Underground Storage Tank (UST) within the restricted area was removed during sump abandonment activities in 2014. No further annual evaluation of the cathodic system will be performed.

14.0 Other Activities and Developments

The main purpose of this document is to summarize the requirements of the IMP Work Plan. Other activities and developments in 2015 include:

- The Walker Company completely covered the existing cap with leveling fill before demobilizing for the winter.

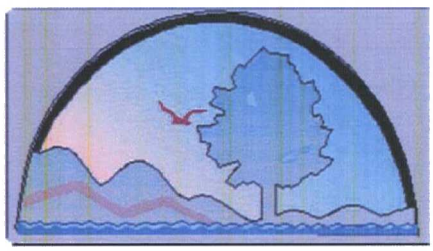
- The development of several landslides above Borrow Area 4 occurred in September. Repairs were completed in 2015; but resurgence will require continued monitoring.

15.0 Conclusion

This concludes the textual outlining of the IMP activities at the MFDS for 2015. If copies of inspections or deliverables not included in this report are required, please contact the MFDS office.

MAXEY FLATS DISPOSAL SITE
ANNUAL REPORT
2016

March 28, 2017



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
606-783-8680

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List of Figures

List of Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
ATL	Advanced Technologies and Laboratories
AW	Alluvial Wells
BoRP	Balance of Remedial Phase
Commonwealth	Commonwealth of Kentucky
DOE	U.S. Department of Energy
DCW	Drainage Channels Water
EDB	East Detention Basin
EPA	U.S. 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 Requirement Summary
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	U.S. Geological Survey

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(Continued)

List of eAppendices
Included electronically

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 Period (ICP) Work Plan, which is currently under development.

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 spread of contamination at the MFDS. No surface water annual average activity exceeded specified screening levels for 2016. Tritium activity levels for all surface water samples appear in Appendix A: *2016 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 (2.8 inches of rainfall in 24 hours). In 2016, 29 rain event samples were collected for analysis; the activity ranged from -0.31 to 0.76 pCi/mL. Figure 3-1 provides the annual average for tritium concentrations for 2011-2016.

As a result of Final Cap construction, 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 resulted in 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.

The East Drain rain gauge recorded a two year storm event on August 2nd. A total of 3.17 inches of rain fell in a 24 hour period starting at 1 pm on August 1st. A comparison of the discharge flow at the East Detention Basin (EDB) flume to the predevelopment flow rate was not possible because the EDB flume was undergoing demolition and renovation at the time the storm event occurred. The FCP constructed EDB flume was designed with a discharge rate below that of the IMP flume.

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 2016, 1,718 PSW samples were collected for analysis with no anomalous data reported. All PSW location averages were below the screening level of 10 pCi/mL. Figure 3-1 provides the IMP Annual Average Tritium Activity for 2011-2016.

Sample location 122A serves as the source for background samples. It is located on Rock Lick Creek, free from site influence. During 2016, 349 samples were collected at this location for analysis. The activity ranged from -0.47 to 0.72 pCi/mL.

Sample location 106 is located on No Name Branch, a tributary of Rock Lick Creek. Location 106 receives runoff from Drain 144 and exhibits seasonal activity fluctuation consistent with location 144. During 2016, 300 samples were collected from this location for analysis. The activity ranged from 0.29 to 12.30 pCi/mL.

Sample location 122C is located on Rock Lick Creek, downstream of locations 106 and 143. During 2016, 350 samples were collected from this location for analysis. The activity ranged from -0.20 to 2.00 pCi/mL.

Sample location 103E is located on Drip Springs Creek downstream of Drain 107. During 2016, 359 samples were collected from this location for analysis. The activity ranged from -0.18 to 2.81 pCi/mL.

Sample location 102D is the only sampling station outside the established buffer zone at the MFDS. It is located downstream of all surface water runoff from the MFDS and is the designated EPA compliance point. During 2016, 360 samples were collected from this location for analysis. The activity ranged from -0.35 to 1.50 pCi/mL. The 2016 annual average at 102D was 0.39 pCi/ml. In accordance with the IMP Work Plan, the Reasonably maximally 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 that receive intermittent flow from the FCP cap. These locations are monitored using automated samplers that collect a four aliquot daily composite. The 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 additional screening level of 50 pCi/mL. In 2016, 825 samples were collected at the DCW locations for analysis. No location exceeded the 50 pCi/mL screening level. No additional investigation was required. Figure 3-1 provides the IMP Annual Average Tritium Concentrations for 2011-2016.

Sample location C107 is located at the base of the West Drain, which discharges into Drip Springs Creek. During 2016, 219 samples were collected from this location for analysis. Activity ranged from 0.37 pCi/mL to 44.28 pCi/mL.

Sample location 143 is located near the base of the South Drain, which discharges into Rock Lick Creek. During 2016, 277 samples were collected from this location for analysis. Activity ranged from -0.38 pCi/mL to 4.29 pCi/mL.

Sample location 144 is located at the base of the East Drain, which discharges into No Name Branch. During 2016, 329 samples were collected from this location for analysis. Activity ranged from 0.29 pCi/mL to 163.08 pCi/mL.

Maxey Flats Disposal Site
Annual Average Tritium Activity (pCi/mL)
2011-2016

		Perennial Surface Water					Drainage Channel Water		
	EDB	**122A**	**106**	**122C**	**103E**	**102D**	**C107**	**143**	**144**
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
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**

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. Replacement units and spares were purchased and received at the end of 2016. These samplers will be installed in early 2017 according to a USEPA approved Institutional Control Period (ICP) Field Sampling and Analysis Plan.

4.0 Groundwater Monitoring Wells

Groundwater monitoring at the MFDS is conducted via 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 located along the west perimeter of the restricted area were installed as investigative monitoring points prior to the Consent Decree. The 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. Analytical results for all groundwater samples are contained in Appendix A: *2016 MFDS Tritium Data.xlsx.* Water level monitoring tables for both alluvial and perimeter wells are contained in Appendix B: *2016 MFDS Alluvial Well Levels* and *2016 MFDS Perimeter Well Levels.xlsx.*

4.1 Alluvial Wells

Alluvial well (AW) samples were collected for analysis as outlined in the PSVP and the 2007 EPA Five Year Review. Four wells were sampled in 2016. Annual samples

were collected from AW-6, 10 and 12, and quarterly samples were collected from AW-7, resulting in 7 alluvial well samples collected for analysis. Results were typical of historical ranges. 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 additional analysis was 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 is restricted from public use and a gate was installed to further limit access.

4.2 Perimeter Monitoring Wells

Perimeter monitoring well water levels were measured and recorded in February before FCP cap construction activities along the west side necessitated the closure of 12 of the 16 wells. Water levels were measured in the four remaining wells on a quarterly basis and samples were collected for tritium analysis from N2B and UK-1 on a semi-annual basis, as required by the RML. Only three samples were collected during 2016; N2B was dry during the 4th quarter sampling event. The tritium analyses for the perimeter well locations in 2016 were typical of historical data and seasonal trends.

5.0 Data Management

Data packages are prepared 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 for third party data validation. Following validation, data is entered into the MFDS electronic 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.

6.0 Rainfall Data

Presently, there are three rain gauge locations associated with the MFDS: 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 can be used for official rainfall totals in the event of an EDB rain gauge malfunction. The measured rainfall at the EDB gauge during 2016 was 41.14 inches. This can be compared to the annual average precipitation of 47.33 inches (NOAA, National Climatic Data Center; Farmers, KY). Annual precipitation data appears in Appendix C: *2016 MFDS Daily Rainfall.xlsx.*

7.0 IMP Inspections

There were 95 modified inspections performed in 2016 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 stored in a secured area in the on-site Radiological Laboratory. All radiological waste is transferred to 55 gallon drums and will accumulate until space restraints require contracted, off-site disposal. Approximately one 55 gallon drum of accumulated waste was collected during 2016.

The Annual Low Level Radioactive Waste Report is included in Appendix D: *2016 MFDS LLRW Report.pdf.*

9.0 Erosion Monitoring

Curd Surveying & Land Consulting was contracted to complete erosion monitoring and produce a cross-sectional profile of the East Drain using IMP (Shaw) methodology. The spring survey was not completed. The fall survey was completed in December of 2016. The 2016 East Drain erosion measurements are presented in Appendix E: *2016 MFDS East Drain Erosion Shaw Monuments.pdf.*

The fall erosion screening conducted by the MFDS staff using the USGS methodology was not performed in 2016. New erosion monuments and monitoring criteria for the three drains receiving surface water flow from the Final Cap are being developed for the ICP Work Plan.

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. The FCP construction activities and the new storm water management functions of the cap have resulted in notable erosion in the West Drain. This erosion data will be evaluated in the 2017 Five Year Review.

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 2016.

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 2016. The ICP Work Plan is currently under joint development by AECOM and the Commonwealth.

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 temporary rope and signage for cap construction was replaced with six foot aluminized chain link fencing in December. The office complex and disposal area are now enclosed in the same fenced area with gates at the main entrance, West and East sides and a cap access gate at the South. New signage was posted every 200 feet.

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 construction of the FCP cap was complete. 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.

12.0 Other Activities and Developments

The main purpose of this document is to summarize the requirements of the IMP Work Plan being performed until the ICP Workplan is approved. Other activities and developments in 2016 include:

- The Walker Company filed and achieved Substantial Completion in December 2016. A vegetative cover across the cap was established before the growing season ended resulting in minimal erosion on the cap surface.

- 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 2016. If copies of inspections or deliverables not included in this report are required, please contact the MFDS office.

APPENDIX M – DEED RESTRICTIONS

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Department for Natural Resources and Environmental Protection as provided in Executive Order 79-170 (Declarant).

WHEREAS, Declarant is the owner of real property located at 2597 Maxey Flats Road, Hillsboro, (in Fleming County), Kentucky 41049 (the Property), more particularly described in Deed Book 120, Page 274, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the site pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

MAXEY FLAT
DEED DESCRIPTION

Beginning at a set stone in the southwest right of way line of KY 1895; thence S 26°59'45"W, 744.25 feet to an iron pin in a fence post; thence S 55°48'12"E, 180.19 feet to an iron pin in a 14" black oak stump; thence S 21°46'03"E, 128.61 feet to an iron pin in a 24" black oak stump; thence S 09°12'09"E, 200.17 feet to an iron pin; thence S 06°34'53"W, 115.91 feet to an iron pin; thence S 13°27'16"E, 167.65 feet to an iron pin in a fence corner; thence S 06°18'00"W, 132.39 feet to an iron pin in a 30" white oak tree; thence S 20°38'34"W, 264.36 feet to an iron pin in a 6" white oak tree; thence S 02°06'07"E, 352.95 feet to an iron pin in a 30" white oak tree, said point also being a fence corner; thence S 85°00'49"E, 484.75 feet to an iron pin in a 15" maple tree; thence S 33°23'31"W, 1167.05 feet to an iron pin; thence S 28°57'56"E, 299.37 feet to an iron pin in an 18" black oak tree; thence S 37°22'57"W, 982.00 feet to an iron pin in a poplar and dogwood tree; thence S 32°50'53"W, 1376.27 feet to an iron pin in a black oak stump; thence N 88°49'24"E, 1395.07 feet to an iron pin; thence S 79°41'01"E, 221.80 feet to an iron pin; thence S 01°03'00"W, 1299.17 feet to a point in the north right of way line of KY 158; thence N 62°35'05"E, 1125.23 feet to a tack in a 40" white oak tree; thence N 17°41'13"E, 497.63 feet to an iron pin; thence S 76°40'00"E, 594.01 feet to an iron pin; thence N 28°23'50"E, 258.24 feet to an iron pin in a 12" white oak stump; thence N 88°35'28"E, 567.87 feet to an iron pin in a white oak stump; thence N 06°30'40"E, 1102.81 feet to an iron pin in a 36" white oak stump; thence N 21°30'38"W, 548.72 feet to an iron pin in an 18" black oak stump; thence N 39°04'07"W, 438.44 feet to an iron pin in an 18" white oak tree; thence N 39°01'34"W, 511.22 feet to an iron pin; thence N 23°41'43"W, 672.60 feet to an iron pin in a 26" white oak stump; thence N 48°35'07"W, 31.31 feet to an iron pin in existing fence; thence with the existing fence N 07°27'50"W, 649.39 feet to an iron pin in a fence post; thence N 32°07'04"E, 135.03 feet to an iron pin in a fence post, said point also being in the southwest right of way line of KY 1895; thence with said right of way line N 47°18'24"W, 174.61 feet, N 47°09'36"W, 207.76 feet, N 45°20'29"W, 182.89 feet, N 41°10'10"W, 194.06 feet, N 37°14'20"W, 210.19 feet, N 34°08'09"W, 185.87 feet, N 31°26'48"W, 139.44 feet, N 29°46'28"W, 185.78 feet, N 33°09'33"W, 228.48 feet; N 37°40'06"W, 198.12 feet, N 43°23'04"W, 310.64 feet, N 53°33'47"W, 120.97 feet to the point of beginning, containing 278.94 acres.

DOCUMENT# 12849
DATE: 1-6-04 TIME: 9:42
DEED TAX
MARILYN SPENCER, FLEMING CO. CLERK
BY Dawnella Jarvis DC
BOOK D217 PAGE 182

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING WAS FOUND IN BOOK D217 PAGE 182 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 2013

JARROD R. FRITZ, CLERK

Dawnella Jarvis DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5 2003 by the Commonwealth of Kentucky, for the use and benefit of the Department for Natural Resources and Environmental Protection as provided in Executive Order 79-170 (Declarant).

WHEREAS, Declarant is the owner of real property located at 2597 Maxey Flats Road, Hillsboro, (in Fleming County), Kentucky 41049 (the Property), more particularly described in Deed Book 148, Page 65, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the site pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

BEGINNING at the fence post by the County road on the boundary between W. G. Cox and Sterl Cox; thence S 34 deg. 14 minutes W 129.9 feet to a fence post; thence S 9 degrees 47 minutes E 680.6 feet to an 18 inch white oak; thence W 45 degrees 33 minutes W 2288.0 feet; thence N 27 degrees 18 minutes E 800.0 feet to county road; thence S 36 degrees 31 minutes E 400.0 feet; thence S 31 degrees 30 minutes E 464.0 feet; thence S 37 degrees 35 minutes E 506.0 feet; thence S 46 degrees 18 minutes E 601.9 feet to the beginning, containing 27.586 acres.

DOCUMENT# 12851
DATE: 1-5-04 TIME: 9:44
DEED TAX
MARILYN SPENCER, FLEMING CO CLERK
BY Dawnella Faris DC
BOOK D217 PAGE 188

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING 2451 FOUND IN BOOK D217 PAGE 188 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 2018

JARROD R. FRITZ, CLERK

Dawnella Faris DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 181, Page 548, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Michael J. Alcorn
Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

TRACT NO. I. A certain tract or parcel of land lying in Fleming County, Kentucky, on the waters of Rocklick, bounded as follows: BEGINNING at a stone; thence N 78 E 122 poles, Robinson corner; thence N 69 E 125 poles to a black oak S 30 W 125 poles to a white oak; thence with an agreed straight line to the beginning, containing 100 acres, more or less. This land is sold by the boundary and not by the acre.

TRACT NO. II.: A certain tract or parcel of land lying in Fleming County, Kentucky, on the waters of Rock Lick Creek and described by boundary in the absence of a general survey. Bounded on the North by the lands of R.Y. Hutton, on the East by the lands of W.G. Cox, on the South by the lands of Russell McLain, and on the West by the lands of Bert Johnson, and containing 75 acres, more or less, be what it may.

TRACT NO. III.: A certain tract or parcel of land lying and being in Fleming County, Kentucky, and bounded and described as follows: On the waters of Rock Lick Creek, bounded on the North by the lands of R.M. Bowalin and Thomas L. McClain; on the East by the lands of A.T. Denton Heirs; on the South by the lands of A.T. Denton Heirs and on the West by the lands of R.M. Bowalin, containing 25 acres, more or less.

This being the same property conveyed to the Grantors by C.L. Armstrong and Freda Armstrong, his wife; Paul J. Reynolds and Mable C. Reynolds, his wife; and Homer Gregory and Ada Gregory, his wife by Deed dated June 30, 1972 and recorded in Deed Book 134, Page 255, in the Office of the Fleming County Clerk.

DOCUMENT# 12845
DATE: 1-5-04 TIME: 9:38
DEED TAX_____
MARILYN SPENCER, FLEMING CO CLERK
BY Danielle Farris DC
BOOK D217 PAGE 170

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY, DO HEREBY CERTIFY THE FOREGOING DEED FOUND IN BOOK D217 PAGE 172 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 10 DAY OF 9 2012

JARROD R. FRITZ, CLERK

Danielle Farris DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 105 ~~183~~, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

BEGINNING at a point corner to Rock Lick Road and the land of Roscoe Johnson at an iron stake 150 feet E. to an iron stake; thence 292 feet S. to a stake; thence at a right angle 150 feet W. to a stake; thence a right angle 292 feet N. to the stake at the beginning, containing 1 acre, more or less.

Being the same property conveyed Marcus Ball, married, by Deed from Gienna Ball (now Rawlings) and Roland Rawlings, her husband, dated August 28, 1985, and recorded in Deed Book 160, Page 506 in the Fleming County Clerk's Office.

DOCUMENT# 12846
DATE: 1-5-04 TIME: 9:39
DEED TAX ______
MARILYN SPENCER, FLEMING CO. CLERK
BY [signature] DC
BOOK D217 PAGE 173

STATE OF KENTUCKY)
COUNTY OF FLEMING)
I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING Deed FOUND IN BOOK D217 PAGE 173 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE.
WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 2013
JARROD R. FRITZ, CLERK
[signature] DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 178, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

"Exhibit A"

D E E D D E S C R I P T I O N

PARCEL 37B

A certain tract or parcel of land located in Flemming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Road, 1 mile east of KY 158 and being more particularly described as follows:

Beginning at a PK Nail in the center of Rock Lick Road, corner to Willie Skaggs, thence with Rock Lick Road and Willie Skaggs;

South 80°59'06" West 16.05 feet to a Nail & Cap, thence;

South 83°35'13" West 61.12 feet to a Nail & Cap, thence;

South 85°16'31" West 63.59 feet to a Nail & Cap, thence;

South 86°16'09" West 75.92 feet to a Nail & Cap, thence;

South 89°55'51" West 62.13 feet to a PK Nail, corner to John Vise, thence leaving Rock Lick Road with John Vise;

North 06°16'54" West 16.33 feet to an Iron Pin, thence;

North 34°30'09" East 397.96 feet to an Iron Pin at a 48" Beech, corner to Willie Skaggs, thence with Willie Skaggs;

South 09°28'32" East 308.00 feet to an 8" Oak, thence;

South 09°34'41" East 21.10 feet to a the beginning.

Parcel 37B contains 1.12± Acres and is the same property as conveyed to Wendell McCarty from Willie Skaggs, by deed, dated February 1990, as recorded in Deed Book 171, Page 765, in the Flemming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed March 1995.

DOCUMENT# 12847
DATE: 1-5-04 TIME: 9:40
DEED TAX
MARILYN SPENCER, FLEMING CO CLERK
BY Darrella Fares DC
BOOK D217 PAGE 176

STATE OF KENTUCKY }
COUNTY OF FLEMING }

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING DEED FOUND IN BOOK D217 PAGE 176 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 2012

JARROD R. FRITZ, CLERK

DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 189, Page 501, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

A certain parcel fronting on the Old County Road, (formerly known as the King Road), leading off the Upper Rock Lick Road, in Fleming County, Kentucky and BEGINNING at a point in the center of the old County Road; thence in a general Westerly direction 157 feet; thence in a general Northerly direction 186 feet; thence in a general Easterly direction 121 feet; thence in a general Southerly direction 139 feet to the point of beginning.

This being the same property conveyed to the Grantors by Rufus McRoberts and Helen McRoberts, his wife, by Deed dated January 6, 1975 and recorded in Deed Book 138, Page 586, in the Office of the Fleming County Clerk.

DOCUMENT# 12849
DATE: 1-5-04 TIME: 9:41
DEED TAX _____
MARILYN SPENCER, FLEMING CO CLERK
BY Darnella Jarvis DC
BOOK D217 PAGE 179

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING WAS FOUND IN BOOK D217 PAGE 179 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 2012

JARROD R. FRITZ, CLERK

Darnella Jarvis DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 173, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

"E A"

DEED DESCRIPTION

PARCEL 37A

A certain tract or parcel of land located in Flemming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Road, 1.1 miles east of KY 158 and being more particularly described as follows:

Beginning at a PK Nail the center of Rock Lick Creek Road, corner to Willie Skaggs, thence with Rock Lick Road and Willie Skaggs;

North 81°25'48" West 78.03 feet to a Nail & Cap, thence;

North 78°35'42" West 91.32 feet to a PK Nail, corner to Willie Skaggs, thence leaving Rock Lick Road with Willie Skaggs;

North 13°57'52" East 22.47 feet to a 20" White Oak, thence;

North 13°57'47" East 111.67 feet to a 15" Tulip Poplar, thence;

South 71°49'24" East 169.53 feet to an 8" Maple, thence;

South 14°02'45" West 84.73 feet to a 26" White Oak, thence;

South 14°02'44" West 25.55 feet to the beginning.

Parcel 37A contains 0.48± Acres and is the same property as conveyed to Willie Skaggs, Jr. by deed from Willie Skaggs, dated October 27, 1990, as recorded in Deed Book 170, Page 527, in the Flemming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed March 1995.

DOCUMENT# 12850
DATE: 1-5-04 TIME: 9:43
DEED TAX
MARILYN SPENCER FLEMING CO CLERK
BY Darnella Faris DC
BOOK D217 PAGE 185

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING WAS FOUND IN BOOK D217 PAGE 185 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 4 2012

JARROD R. FRITZ, CLERK

Darnella Faris DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 168, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions: (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Michael T. Abramson
Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

"Exhibit A"

D E E D D E S C R I P T I O N

PARCEL 37

A certain tract or parcel of land located in Flemming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Road, 1 mile east of KY 158 and being more particularly described as follows:

Beginning at a spike in the center of Rock Lick Road, corner to John Vise and Wendell McCarty, thence with Rock Lick Road and Wendell McCarty;

North 89°55'51" East 62.13 feet to a Nail & Cap, thence;

North 86°16'09" East 75.92 feet to a Nail & Cap, thence;

North 85°16'31" East 63.59 feet to a Nail & Cap, thence;

North 83°35'13" East 61.12 feet to a Nail & Cap, thence;

North 80°59'06" East 16.05 feet to a PK Nail, thence leaving Rock Lick Road with Wendell McCarty;

North 09°34'41" West 21.10 feet to an 8" Oak, thence;

North 09°28'32" West 308.00 feet to an Iron Pin at 48" Beech, corner to John Vise, thence leaving Wendell McCarty with John Vise;

North 38°34'07" East 677.42 feet to an Iron Pin at a 30" White Oak, thence;

North 45°39'15" East 601.03 feet to an Iron Pin, corner to the Commonwealth of Kentucky, thence leaving John Vise with the Commonwealth of Kentucky;

South 82°10'17" East 221.31 feet to an Iron Pin, thence;

South 00°57'17" East 1299.17 feet to an Iron Pin, thence;

North 60°41'52" East 1124.08 feet to a 40" White Oak, corner to Roscoe Johnson, thence leaving the Commonwealth of Kentucky with Roscoe Johnson;

South 11°29'07" West 672.30 feet to a spike in the center of Rock Lick Road, corner to John Vise, thence leaving Roscoe Johnson with John Vise;

South 05°23'35" East 216.96 feet to a 24" Sweet Gum, thence;

South 04°15'30" East 1488.01 feet to an iron pin, corner to Charles Blevins, thence leaving John Vise with Charles Blevins;

North 76°30'28" West 989.78 feet to an iron pin, corner to Edson Whitt, thence leaving Charles Blevins with Edson Whitt;

North 58°11'17" West 378.79 feet to an iron pin at a 14" Maple, thence;

North 56°33'16" West 524.98 feet to an iron pin at a 24" Maple, thence;

South 83°08'12" West 445.16 feet to an iron pin, corner to Edson Whitt and John Vise, thence leaving Edson Whitt with John Vise;

North 06°16'57" West 1184.13 feet to the beginning.

Parcel 37 contains (by this description) 100.62± Acres, however, there is included within this boundary a parcel of land owned by Willie Skaggs, Jr. (Parcel 37A) which contains 0.48± Acre, and is deducted from the net area, leaving a remainder of 100.14± Acres, and is a part of the same property as conveyed to Willie Skaggs from Arvel Ratliff, by deed, dated July 19, 1974, as recorded in Deed Book 137, Page 765, in the Flemming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed March 1995.

DOCUMENT# 1285a
DATE: 1-5-04 TIME: 9:45
DEED TAX
MARILYN SPENCER, FLEMING CO CLERK
BY Darnella Jarvis DC
BOOK D217 PAGE 191

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING WAS FOUND IN BOOK D217 PAGE 191 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 19 DAY OF 1 2012

JARROD R. FRITZ, CLERK

Darnella Jarvis DEPUTY CLERK

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 368, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

"Exhibit A"

D E E D D E S C R I P T I O N

PARCEL 41

A certain tract or parcel of land located in Flemming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Road, 1.3 miles east of KY 158 and being more particularly described as follows:

Beginning at a Spike in the center of Rock Lick Road, corner to John Vise, thence with Rock Lick Road and John Vise;

North 89°13'32" West 87.97 feet to a Nail & Cap, thence;

South 89°22'26" West 58.85 feet to a Nail & Cap, thence;

North 89°43'24" West 55.49 feet to a Nail & Cap, thence;

North 87°39'21" West 59.73 feet to a Nail & Cap, thence;

North 84°50'08" West 61.02 feet to a Nail & Cap, thence;

North 83°36'50" West 57.62 feet to a Nail & Cap, thence;

North 85°13'30" West 200.13 feet to a Nail & Cap, thence;

North 85°47'00" West 59.28 feet to a Nail & Cap, thence;

North 86°21'13" West 60.75 feet to Spike, corner to Willie Skaggs, thence leaving Rock Lick Road and John Vise, with Willie Skaggs;

North 11°29'07" East 672.30 feet to a 40" White Oak, corner to Commonwealth of Kentucky, thence leaving Willie Skaggs with the Commonwealth of Kentucky;

North 15°35'15" East 500.08 feet to an Iron Pin, thence;

South 78°40'17" East 594.01 feet to an Iron Pin, thence;

North 26°23'33" East 258.24 feet to an Iron Pin in a Stump, thence;

North 86°35'11" East 567.87 feet to an Iron Pin, corner to Alla Huffman, thence leaving the Commonwealth of Kentucky with Alla Huffman;

South 21°09'38" East 616.63 feet to an iron pin, thence;

South 21°09'38" East 616.63 feet to an iron pin, corner to Roscoe Johnson, thence leaving Alla Huffman with Roscoe Johnson;

South 63°08'19" West 663.34 feet to a Spike in the center of Rock Lick Road, thence continuing with Roscoe Johnson and Rock Lick Road;

North 73°17'51" West 73.84 feet to a Nail & Cap, thence;

North 67°19'09" West 58.81 feet to a Nail & Cap, thence;

North 63°27'43" West 62.97 feet to a Spike, thence;

North 70°16'43" West 56.42 feet to a Nail & Cap, thence;

North 80°03'38" West 55.82 feet to a Spike, thence leaving Rock Lick Road and continuing with Roscoe Johnson;

South 09°15'43" West 123.10 feet to an Iron Pin, thence;

South 80°00'44" East 72.69 feet to an Iron Pin at a 8" Wild Cherry tree, thence;

South 29°31'03" West 373.31 feet to an Iron Pin, thence;

South 22°23'26" West 69.87 feet to an Iron Pin, corner to John Vise, thence leaving Roscoe Johnson with John Vise;

North 08°18'39" West 37.59 feet to a point in Rock Lick Creek, thence continuing with John Vise and Rock Lick Creek;

North 58°24'25.221" West 57.4366 feet to a point in the creek, thence;

North 38°36'39.214" West 25.0614 feet to a point in the creek, thence;

North 14°03'53.401" West 36.4538 feet to a point in the creek, thence;

North 05°12'51.819" East 72.4890 feet to a point in the creek, thence;

North 52°36'44.337" West 23.4814 feet to a point in the creek, thence;

North 63°03'32.289" West 54.0442 feet to a point in the creek, thence;

North 82°32'56.976" West 44.3646 feet to a point in the creek, thence;

South 77°30'18.395" West 49.1050 feet to a point in the creek, thence;

South 82°00'02.823" West 65.1267 feet to a point in the creek, thence;

South 86°36'16.725" West 67.5386 feet to a point in the creek, thence;

North 87°18'23.589" West 78.8641 feet to a point in the creek, at a ditch, thence leaving Rock Lick Creek with the ditch;

North 59°03'53.852" East 63.3051 feet to a point in the ditch, thence;

North 44°16'04.840" East 111.5849 feet to a point in the ditch, thence;

North 42°45'57.592" East 30.4931 feet to a point in the ditch, thence;

North 26°29'36.273" East 14.3064 feet to a point in the ditch, thence;

North 10°59'50.283" East 29.2929 feet to a point in the ditch, thence;

North 01°29'34.342" West 46.3677 feet to a point in the ditch, thence;

North 11°54'02.983" East 19.3969 feet to a point in the ditch, thence;

North 16°42'29.301" East 35.7848 feet to a point in the ditch, thence;

North 27°33'26.479" East 54.9265 feet to the beginning.

Parcel 41 contains (by this description) 50.72± Acres, however, there is included within this boundary a parcel of land owned by Marcus Ball (Parcel 39) which contains 1.00± Acre, and is deducted from the net area, leaving a remainder of 49.72± Acres, and is a part of the same property as conveyed to Roscoe Johnson from Lois McKee, by by deed, dated April 12, 1971, as recorded in Deed Book 132, Page 201, in the Flemming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed March 1995.

DOCUMENT# 12853
DATE: 1-5-04 TIME: 9:46
DEED TAX
MARILYN SPENCER, FLEMING CO CLERK
BY Dawnella Jarvis DC
BOOK D217 PAGE 195

STATE OF KENTUCKY)
COUNTY OF FLEMING)

I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING WAS FOUND IN BOOK D21 PAGE 195 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 14 DAY OF 9 2018

JARROD R. FRITZ, CLERK

Dawnella Jarvis DEPUTY CLERK

3 of 3

DECLARATION OF RESTRICTIONS

THIS DECLARATION is made as of December 5, 2003 by the Commonwealth of Kentucky, for the use and benefit of the Natural Resources and Environmental Protection Cabinet (Declarant).

WHEREAS, Declarant is the owner of real property located at Rock Lick Road, in Fleming County, Kentucky (the Property), more particularly described in Deed Book 182, Page 64, of the Fleming County Clerk's Office as indicated in Exhibit A.

WHEREAS, this property is adjacent to (and serves as a "buffer zone" for) a low-level nuclear disposal site with a history of releases to the environment, specifically the Maxey Flats site (site). The site is on the National Priority List pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

WHEREAS, this site has been the subject of a Remedial Action and is undergoing Operations and Maintenance pursuant to a Consent Decree with the U.S. Environmental Protection Agency (Civil Action Number 95-58). The site has been capped to control exposure to the hazardous substances, pollutants or contaminants by restricting direct contact and diverting rainfall.

WHEREAS, U.S. Environmental Protection Agency (EPA) has approved the Remedial Action and Interim Maintenance Period Workplan at the site (a document which governs Operations and Maintenance activities, among other items), and the Commonwealth of Kentucky is performing the actions required by the approved Workplan. However, tritium and other radioactive isotopes remain onsite in amounts that could pose risks above the de minimum levels for all exposure scenarios if the Remedy were to fail. Any releases could migrate to this property.

WHEREAS, further information concerning the site may be obtained by contacting the Custodian of Records of the Division of Waste Management at 14 Reilly Road, Frankfort, Kentucky 40601.

NOW THEREFORE, pursuant to the Consent Decree, and the Remedial Action as specified in the Record of Decision, Declarant imposes the following restrictions:

1.) Definitions. (A) "Residential use" means any use of the property related to a (i) residence or dwelling, including but not limited to a house, apartment, or condominium, or (ii) school, hospital, day care center, playground, or outdoor recreational area. (B) "Owner" means the Declarant or any successor owner or owners.

2.) Restrictions Applicable to the Property. Declarant shall assure that the use, occupancy, and activity of and at the Property are restricted as follows:

A. Groundwater. Groundwater at the Property shall not be used for drinking or other domestic, agricultural or industrial purposes. Groundwater will only be used for sampling and/or investigation purposes.

B. Except as necessary to protect human health, safety or the environment, no action shall be taken, allowed, suffered, or omitted on the Property if such action or omission is reasonably likely to:

i. Create a risk of migration of hazardous substances, pollutants or contaminants or a potential hazard to human health or the environment; or

ii. Result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Property to contain hazardous substances, pollutants or contaminants or limit human exposure to hazardous substances, pollutants or contaminants. This includes cutting or otherwise damaging trees on the sideslopes of the site.

C. Access shall be restricted to Commonwealth of Kentucky personnel and agents. Persons other than Commonwealth of Kentucky personnel and agents may access the property with permission of the Commonwealth of Kentucky for purposes of investigation, remediation, or support activities related to investigation and remediation. Also, members of the public may access portions of the property pursuant to a Community Relations Plan. However, such activity shall be carried out under a Health and Safety Plan meeting Occupational Safety and Health Act requirements. Note this restriction precludes residential and industrial uses.

3.) Restrictions Run With Land.

(A) Declarant shall not sell, transfer, lease, or convey this property, nor allow it to be occupied by any person other than Commonwealth of Kentucky personnel and agents (with exceptions as stated in (2).C, above), until such time as Declarant and EPA enter into an agreement formally executed by a legal instrument, which is agreed to by both parties.

(B). Unless canceled, altered or amended under the provisions of paragraph 4 of this Declaration, these restrictions are to run with the land and shall be binding on Declarant, his successors, heirs and assigns unless an instrument signed by the Declarant and EPA has been recorded, agreeing to change these restrictions in whole or in part.

(C). Except as provide in paragraph 4 of this Declaration, the Declarant hereby declares that the Property shall hereafter be held, transferred, sold, leased, conveyed and occupied subject to the restrictions set forth herein, each and all of which is and are for, and shall inure to the benefit of and pass with each and every part of the Property and shall apply to and bind the heirs, assignees and successors in interest of the Declarant.

4.) Release of Restriction. These restrictions may not be canceled, altered or amended without the affirmative action of the Declarant and EPA, in an instrument executed by both parties agreeing to change these restrictions in whole or in part.

5.) Effect of Invalidation. Invalidation of any one of these restrictions, conditions or covenants by judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

IN WITNESS WHEREOF, Declarant has executed this Declaration of Restrictions as of the date set forth above.

Recommended:

Natural Resources and
Environmental Protection Cabinet

Examined:

Gary Bale, General Counsel
Finance and Administration Cabinet

Approved:

Gordon C. Duke, Secretary
Finance and Administration Cabinet

Examined:

Counsel to the Governor

Commonwealth of Kentucky:

Paul E. Patton, Governor

PARCEL 34

A certain tract or parcel of land located in Fleming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Creek Road, 0.6 mile east of KY 158 and being more particularly described as follows:

Beginning at a spike in the center of Rock Lick Creek Road, corner to Bill Hall and Richard Brumagen, thence leaving Rock Lick Creek Road with Richard Brumagen;

North 01 degree 12'43" East 577.50 feet to an iron pin, thence;

North 66 degrees 14'57" West 435.94 feet to a 6" Hickory, corner to Parcel 34A, thence with Parcel 34A;

North 04 degrees 48'35" East 109.50 feet to a 24" Poplar, thence;

North 19 degrees 13'20" East 224.95 feet to a 16" Chestnut Oak, thence;

North 33 degrees 12'46" East 100.57 feet to a 22" Tulip Poplar, thence;

South 85 degrees 25'56" East 167.48 feet to a 36" White Oak, corner to Ray Lambert, thence with Ray Lambert;

South 64 degrees 14'07" East 623.86 feet to an iron pin, corner to Hurl Johnson, thence with Hurl Johnson;

South 67 degrees 05'58" East 159.56 feet to a point in the center of the gravel road, thence with the gravel road and Hurl Johnson;

North 01 degree 46'42" West 46.74 feet to a point in the center of the gravel road, thence;

North 04 degrees 48'07" East 62.83 feet to a point in the gravel road, thence;

North 07 degrees 28'08" East 46.43 feet to a point in the center of the gravel road, corner to Ray Lambert, thence with Ray Lambert;

North 10 degrees 52'22" East 74.07 feet to a point in the center of the gravel road, thence;

North 13 degrees 16'35" East 61.29 feet to a point in the center of the gravel road, thence;

North 18 degrees 33'37" East 75.53 feet to a point in the center of the gravel road, thence;

North 80 degrees 26'33" East 467.56 feet to an iron pin, corner to Commonwealth of Kentucky, Maxey Flats, thence with Commonwealth of Kentucky;

North 86 degrees 49'17" East 1395.07 feet to an iron pin, corner to Willie Skaggs, thence with Willie Skaggs;

South 45 degrees 39'15" West 601.03 feet to an iron pin at a 30" White Oak, thence;

South 38 degrees 34'07" West 677.42 feet to an iron pin at a 48" Beech, corner to Wendell McCarty, thence with Wendell McCarty;

South 34 degrees 30'09" West 397.96 feet to an iron pin, thence;

South 06 degrees 16'54" East 16.33 feet to a spike in the center of Rock Lick Creek Road, corner to Willie Skaggs, thence with Willie Skaggs;

South 06 degrees 16'57" East 1184.13 feet to an iron pin, corner to Edson Whitt, thence with Edson Whitt;

South 82 degrees 00'56" West 1641.96 feet to an iron pin, corner to Bill Hall, thence with Bill Hall;

North 01 degree 12'43" East 1373.00 feet to the beginning.

Parcel 34 contains 99.530 Acres and is the same or a part of the same property as conveyed to John Vise from Linda Denton, by deed dated April 11, 1953, as recorded in Deed Book 111, Page 219, in the Fleming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed January 1995.

PARCEL A

A certain tract or parcel of land located in Fleming County, Kentucky, on the waters of Rock Lick Creek, and being more particularly described as follows:

Beginning at a 6" Hickory, corner to John Vise and Richard Brumagen, thence with Richard Brumagen;

North 63 degrees 49'14" West 924.55 feet to an iron pin, thence;

North 40 degrees 56'11" East 496.64 feet to an iron pin, corner to Ray Lambert, thence with Ray Lambert;

South 64 degrees 14'07" East 898.94 feet to a 36" White Oak, corner to John Vise, thence with John Vise;

North 85 degrees 25'56" West 167.48 feet to a 22" Tulip Poplar, thence;

South 33 degrees 12'46" West 100.57 feet to a 16" Chestnut Oak, thence;

South 19 degrees 13'20" West 224.95 feet to a 24" Poplar, thence;

South 04 degrees 48'35" West 109.50 feet to the beginning.

Parcel A contains 9.120 Acres and may be a part of property owned by Ray Lambert or John Vise. Deed descriptions of Ray Lambert and John Vise do not precisely describe the area (Parcel A) in question. Both Ray Lambert and John Vise believe Parcel 34A to be part of their respective lands.

This description prepared by Palmer Engineering from a survey performed January 1995.

PARCEL 38

A certain tract or parcel of land located in Fleming County, Kentucky, on the waters of Rock Lick Creek, situated along Rock Lick Creek Road, 1.3 miles east of KY 158, and being more particularly described as follows:

Beginning at a spike in the center of Rock Lick Creek Road, corner to Willie Skaggs and Roscoe Johnson, thence with the center of Rock Lick Creek Road and Roscoe Johnson;

South 86 degrees 21'13" East 60.75 feet to a nail and cap in the center of the road, thence;

South 85 degrees 47'00" East 59.28 feet to a nail and cap in the center of the road, thence;

South 85 degrees 13'00" East 200.13 feet to a nail and cap in the center of the road, thence;

South 83 degrees 36'50" East 57.62 feet to a nail and cap in the center of the road, thence;

South 84 degrees 50'08" East 61.02 feet to a nail and cap in the center of the road, thence;

South 87 degrees 39'21" East 59.73 feet to a nail and cap in the center of the road, thence;

South 89 degrees 43'24" East 55.49 feet to a nail and cap in the center of the road, thence;

North 89 degrees 22'26" East 58.85 feet to a nail and cap in the center of the road, thence;

South 89 degrees 13'32" East 87.97 feet to a spike in the center of the road, at the ditch, thence leaving the road continuing with Roscoe Johnson down and meandering with the ditch;

South 27 degrees 33'26.479" West 54.9265 feet to an iron pin, thence;

South 16 degrees 42'29.301" West 35.7848 feet to a point, thence;

South 11 degrees 54'02.983" West 19.3969 feet to a point, thence;

South 01 degree 29'34.342" East 46.3677 feet to a point, thence;

South 10 degrees 59'50.283" West 29.2929 feet to a point, thence;

South 26 degrees 29'36.273" West 14.3064 feet to a point, thence;

South 42 degrees 45'57.592" West 30.4931 feet to a point, thence;

South 44 degrees 16'04.840" West 111.5849 feet to an iron pin, thence;

South 59 degrees 03'53.852" West 63.3051 feet to a point in Rock Lick Creek, thence down and meandering with Rock Lick Creek;

South 87 degrees 18'23.589" East 78.8641 feet to a point, thence;

North 86 degrees 36'16.725" East 67.5386 feet to a point, thence;

North 82 degrees 00'02.823" East 65.1267 feet to a point, thence;

North 77 degrees 30'18.395" East 49.1050 feet to a point, thence;

South 82 degrees 32'56.976" East 44.3646 feet to a point, thence;

South 63 degrees 03'32.289" East 54.0442 feet to a point, thence;

South 52 degrees 36'44.337" East 23.4814 feet to a point, thence;

South 05 degrees 12'51.819" West 72.4890 feet to a point, thence;

South 14 degrees 03'53.401" East 36.4538 feet to a point, thence;

South 38 degrees 36'39.214" East 25.0614 feet to a point, thence;

South 58 degrees 24'25.221" East 57.4366 feet to a point at the mouth of a drain, thence up and meandering with the drain;

South 08 degrees 18'39.377" East 37.5938 feet to a point, thence;

South 25 degrees 19'12.958" West 158.6171 feet to a point, thence;

South 19 degrees 17'25.797" West 101.5081 feet to a point, thence;

South 28 degrees 22'16.338" West 45.7740 feet to a point, thence;

South 10 degrees 31'35.301" West 40.6043 feet to a point, thence;

South 34 degrees 37'56.069" West 40.9532 feet to a point, thence;

South 21 degrees 25'58.962" West 55.7450 feet to a point, thence;

South 32 degrees 20'21.707" West 40.5341 feet to a point, thence;

South 49 degrees 45'04.050" West 29.8371 feet to a point, thence;

South 00 degrees 50'07.788" West 31.8894 feet to a point, thence;

South 00 degrees 13'26.221" West 30.4452 feet to a point, thence;

South 31 degrees 41'40.921" West 21.0928 feet to a point, thence;

South 12 degrees 29'04.052" East 20.5991 feet to a point, thence;

South 17 degrees 49'03.108" East 28.6712 feet to a point, thence;

South 06 degrees 10'43.593" East 21.4808 feet to a point, thence;

South 26 degrees 10'10.682" West 20.8013 feet to a point, thence;

South 03 degrees 23'43.878" East 38.0899 feet to a point, thence;

South 11 degrees 24'51.212" West 12.7134 feet to a point, thence;

South 06 degrees 11'38.969" West 40.1212 feet to a point, thence;

South 52 degrees 57'05.072" West 14.1081 feet to a point, thence;

South 11 degrees 02'23.488" East, 13.9379 feet to a point, thence;

South 33 degrees 04'50.615" West 15.3347 feet to a point, thence;

South 09 degrees 06'46.741" West 21.3282 feet to a point, thence;

South 14 degrees 33'11.765" East 80.4720 feet to a point, thence;

South 04 degrees 53'12.185" West 61.8177 feet to a point, thence;

South 02 degrees 20'44.689" West 57.0248 feet to a point, thence;

South 05 degrees 41'22.104" East 18.0861 feet to a point, thence;

South 04 degrees 35'14.098" West 59.9922 feet to a point, thence;

South 05 degrees 03'19.826" East 37.4146 feet to a point, thence;

South 22 degrees 31'14.454" West 44.4811 feet to a point, thence;

South 15 degrees 27'19.237" West 85.8090 feet to a point, thence;

South 14 degrees 01'04.208" West 52.8437 feet to a point, thence;

South 14 degrees 13'53.067" West 87.0815 feet to a 24" Gum, corner to Gary Johnson, thence with Gary Johnson;

North 65 degrees 23'25" West 383.44 feet to an iron pin, corner to Virginia Reeder, thence with Virginia Reeder;

North 65 degrees 23'25" West 137.52 feet to an iron pin, corner to Charles Blevins, thence with Charles Blevins;

North 65 degrees 23'25" West 25.29 feet to an iron pin, corner to Willie Skaggs, thence with Willie Skaggs;

North 04 degrees 15'30" West 1488.01 feet to an iron pin at a 24" Sweet Gum, thence;

Parcel 38 contains 27.705 Acres and is the same property as conveyed to John Vise from Charles R. Molton, by deed, dated April 18, 1957, as recorded in Deed Book 114, Page 352, in the Fleming County Clerk's Office.

This description prepared by Palmer Engineering from a survey performed January 1995.

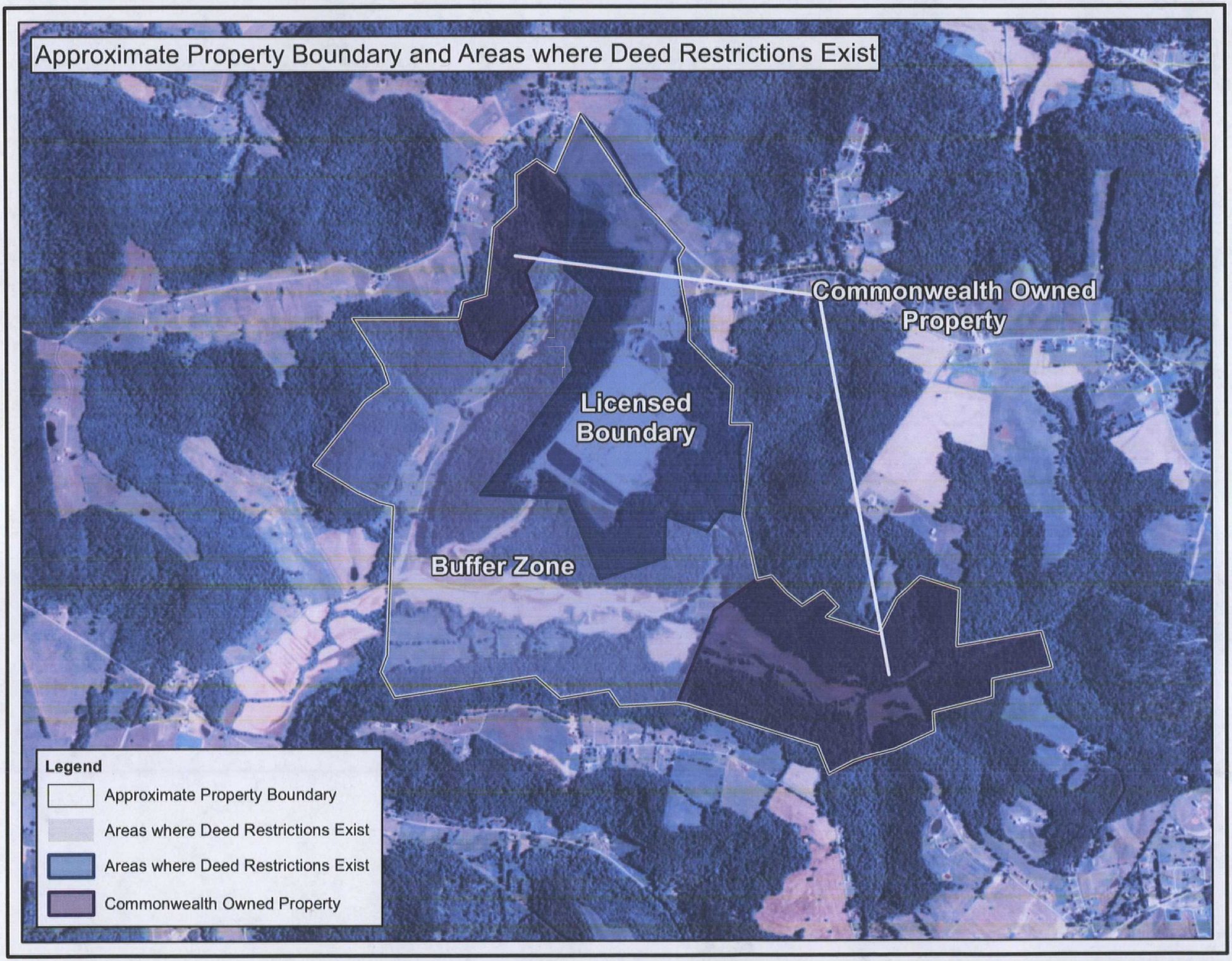
DOCUMENT# 12854
DATE: 1-5-04 TIME: 9:47
DEED TAX
MARILYN SPENCER, FLEMING CO CLERK
BY Darnella Price DC
BOOK D917 PAGE 200

STATE OF KENTUCKY)
)
COUNTY OF FLEMING)

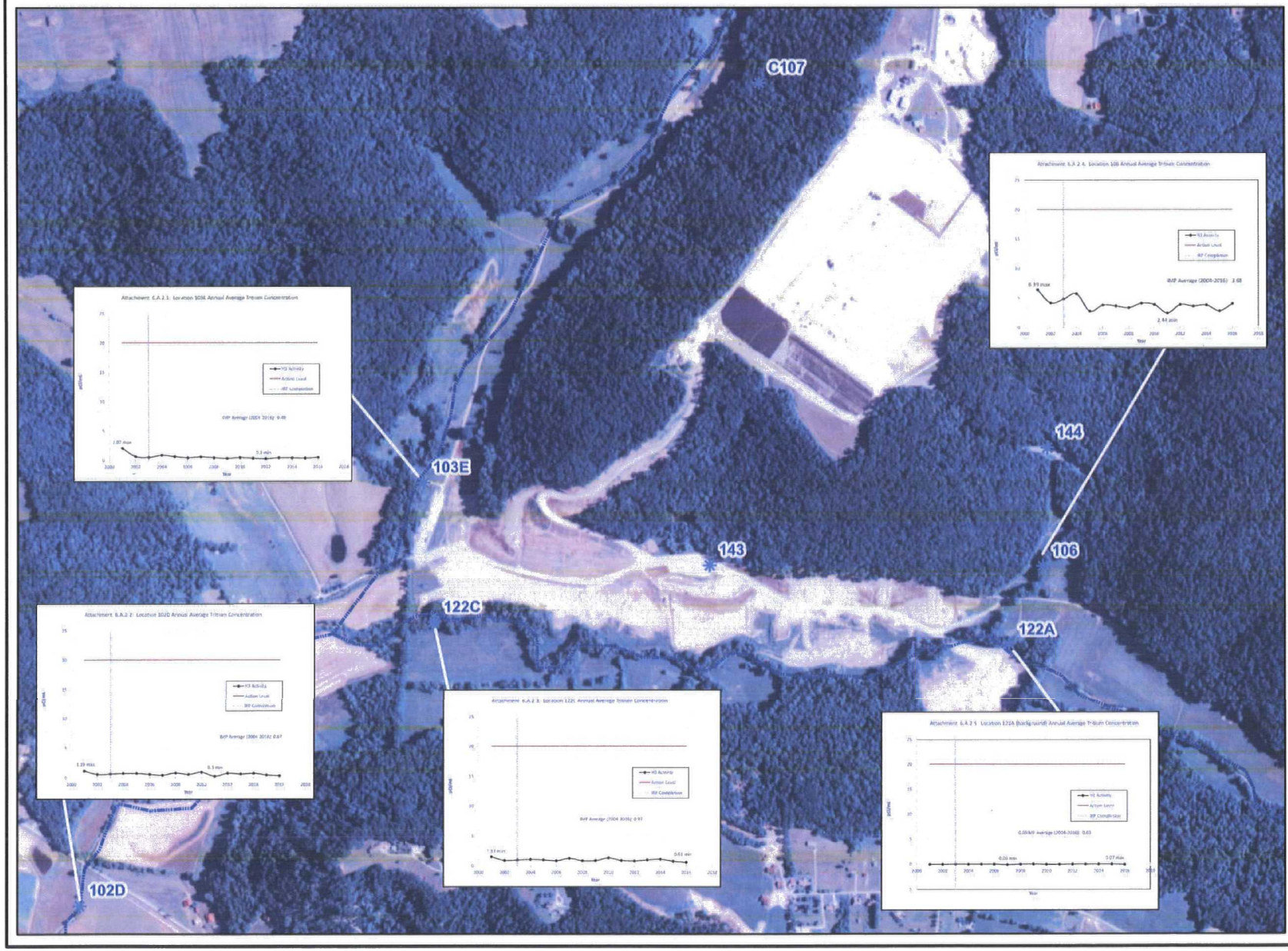
I, JARROD R. FRITZ, CLERK OF FLEMING COUNTY DO HEREBY CERTIFY THE FOREGOING DEED FOUND IN BOOK D917 PAGE 200 A TRUE AND CORRECT COPY IN THE FLEMING COUNTY CLERKS OFFICE. WITNESS IN HAND AND SEAL THIS THE 13 DAY OF 4 2012

JARROD R. FRITZ, CLERK

Darnella Price, DEPUTY CLERK


Approximate Property Boundary and Areas where Deed Restrictions Exist
Commonwealth Owned Property
Licensed Boundary
Buffer Zone
Legend
Approximate Property Boundary
Areas where Deed Restrictions Exist
Areas where Deed Restrictions Exist
Commonwealth Owned Property

APPENDIX N – CONTAMINANT TREND GRAPHS



Attachment 6.A.1

Contaminant Monitoring of Surface Water Sampling Locations subject to 4 mrem/yr Standard

Maxey Flats
Fleming County, Kentucky

Map Legend

- Surface Water Sampling Point
- Waterway

Basemap Source:
USDA FSA (NAIP 2016)
08 June 2016

Spatial Projection

Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

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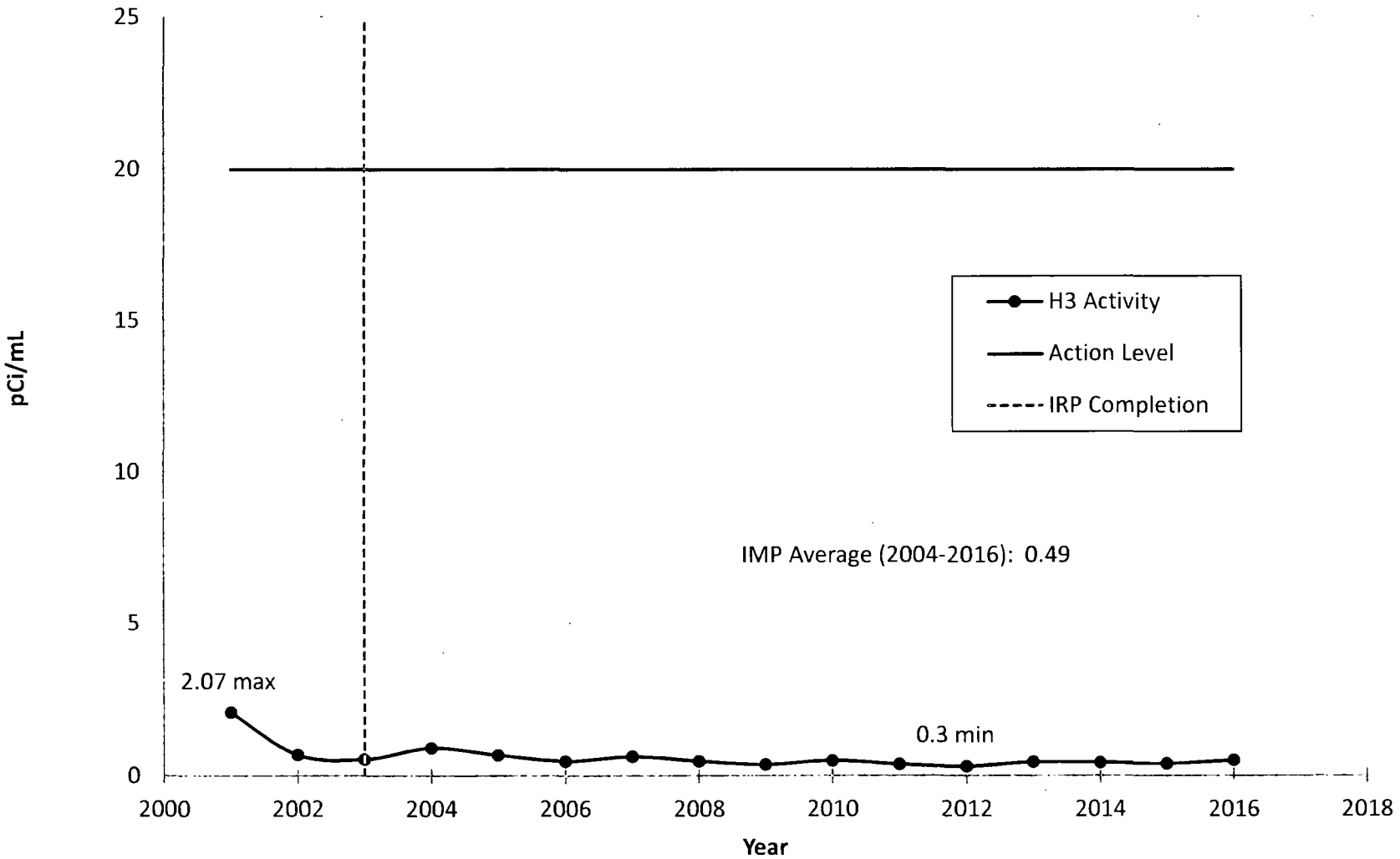
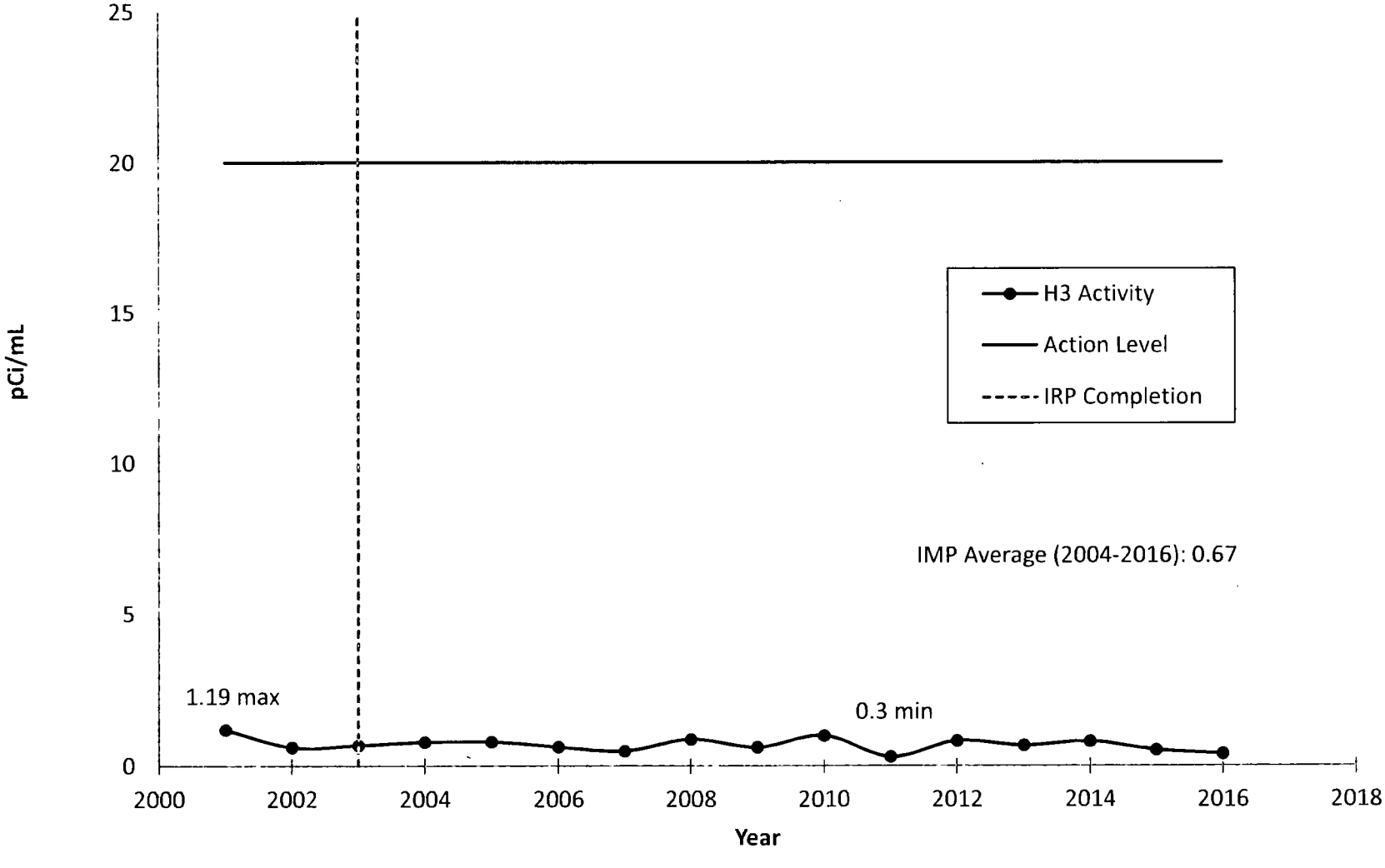
Feet

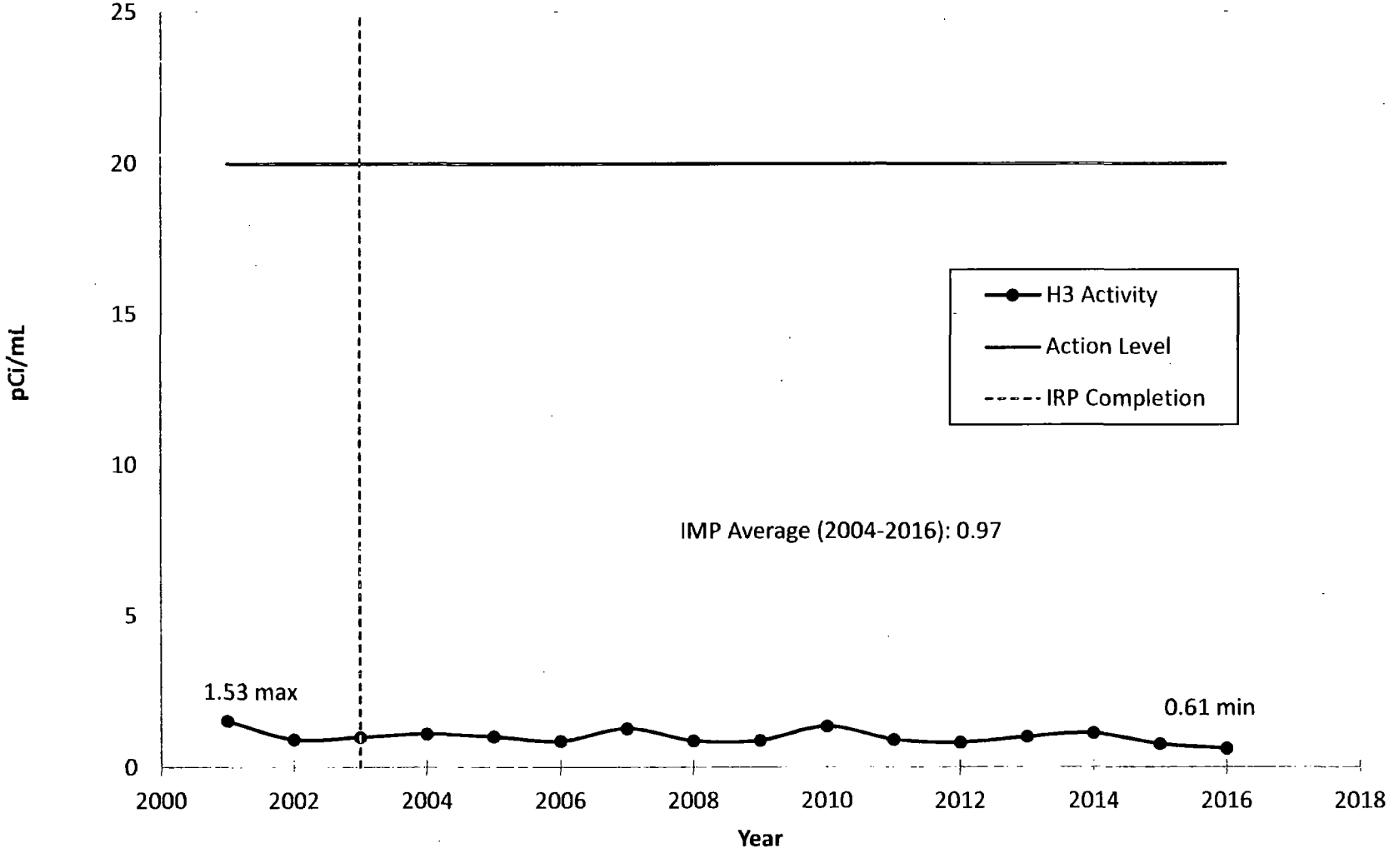
Attachment 6.A.2.1: Location 103E Annual Average Tritium Concentration



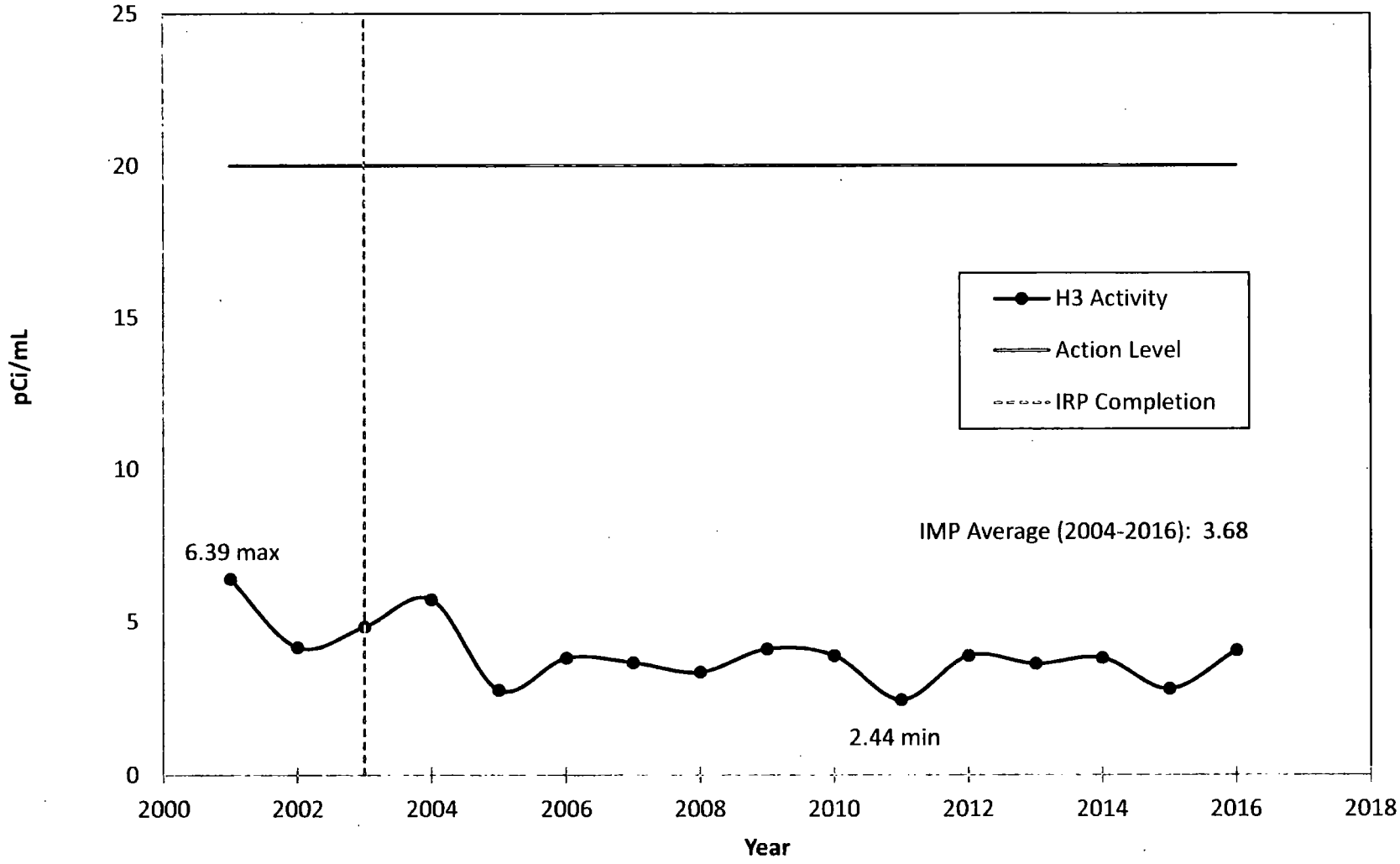
Attachment 6.A.2.2: Location 102D Annual Average Tritium Concentration



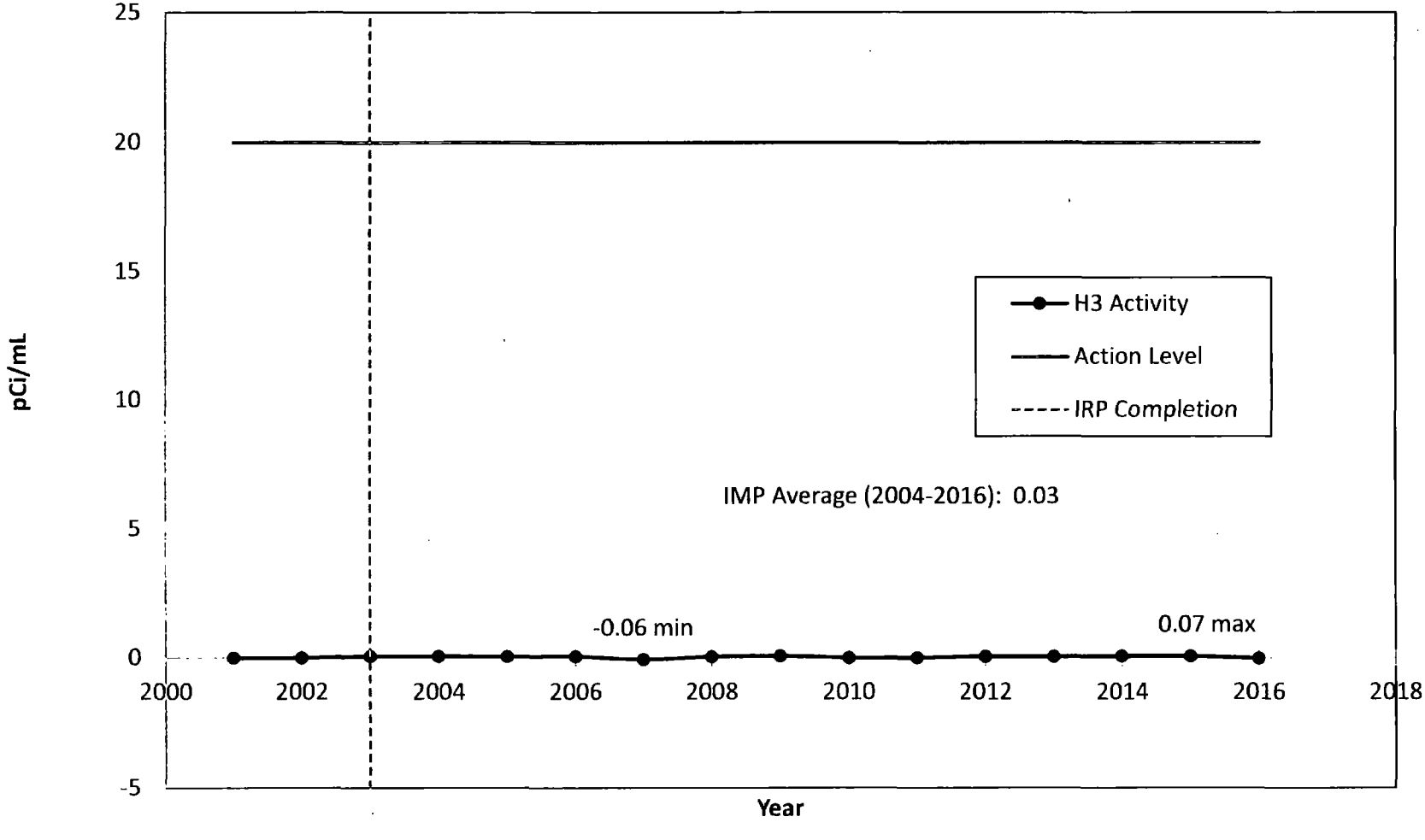
Attachment 6.A.2.3: Location 122C Annual Average Tritium Concentration

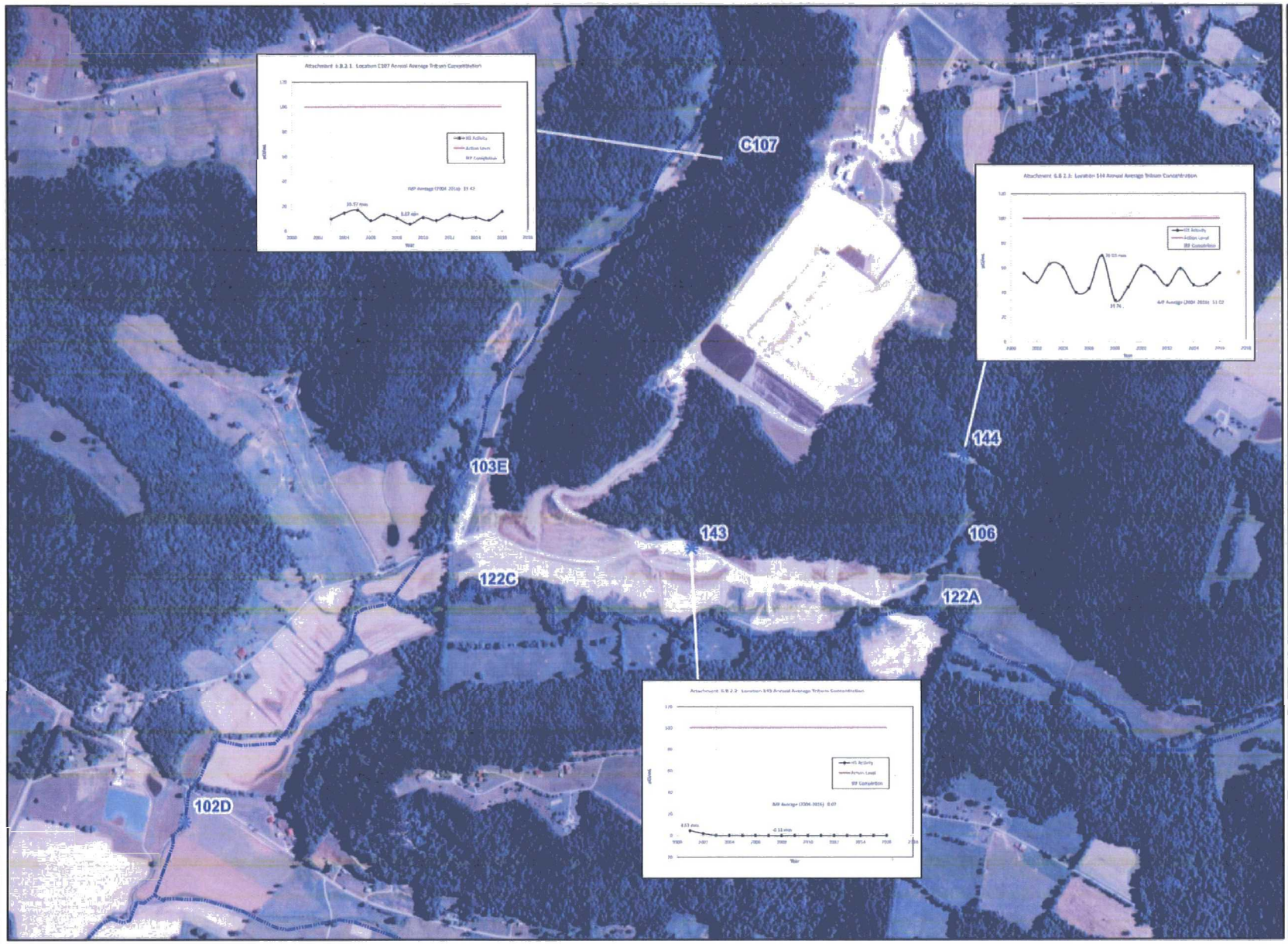


Attachment 6.A.2.4: Location 106 Annual Average Tritium Concentration



Attachment 6.A.2.5: Location 122A (background) Annual Average Tritium Concentration





Attachment 6.B.1

Contaminant Monitoring of Surface Water Sampling Locations subject to 25 mrem/yr Standard

Maxey Flats
Fleming County, Kentucky

Map Legend

- Surface Water Sampling Point
- Waterway

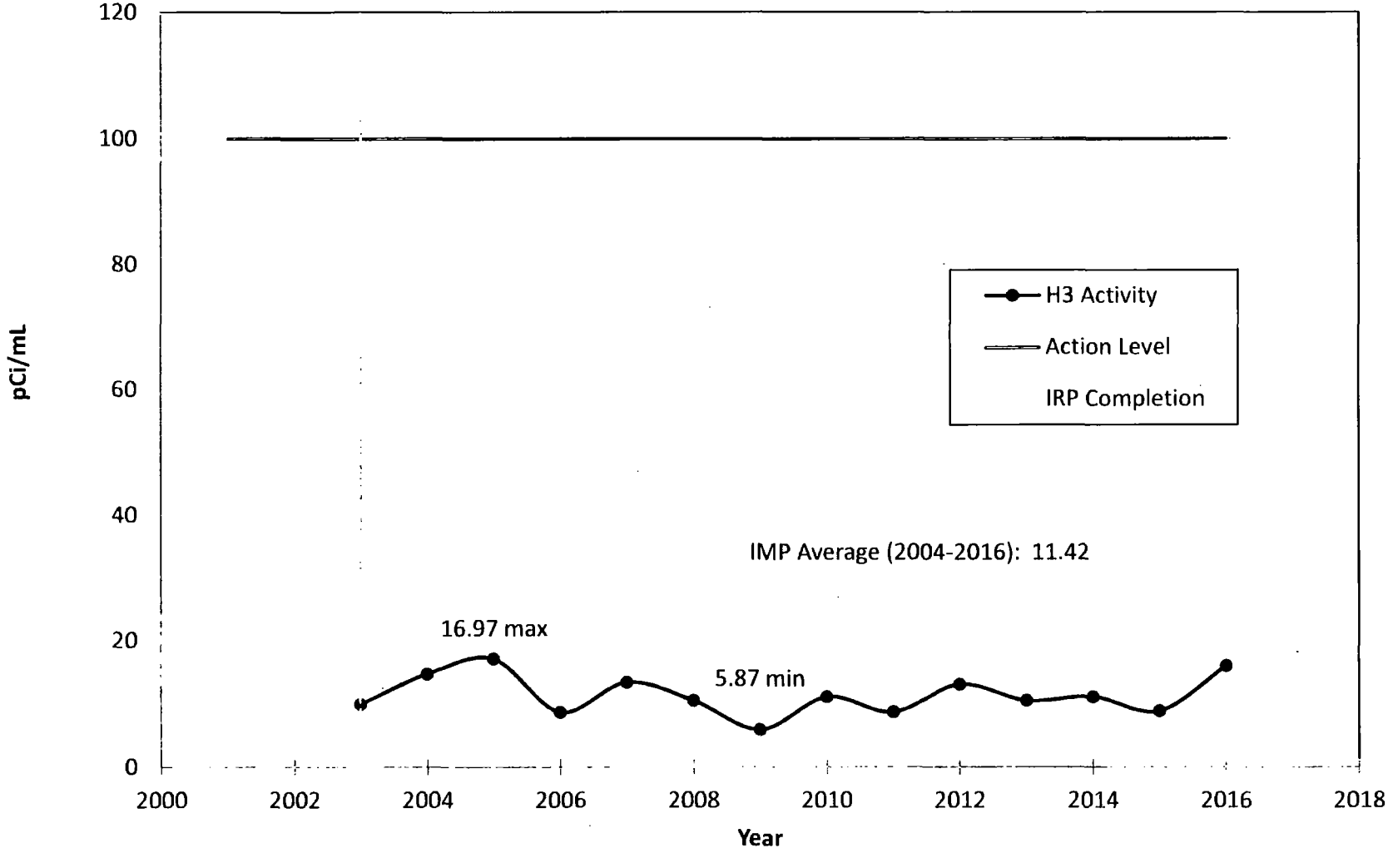
Basemap Source:
USDA FSA (NAIP 2016)
08 June 2016

Spatial Projection

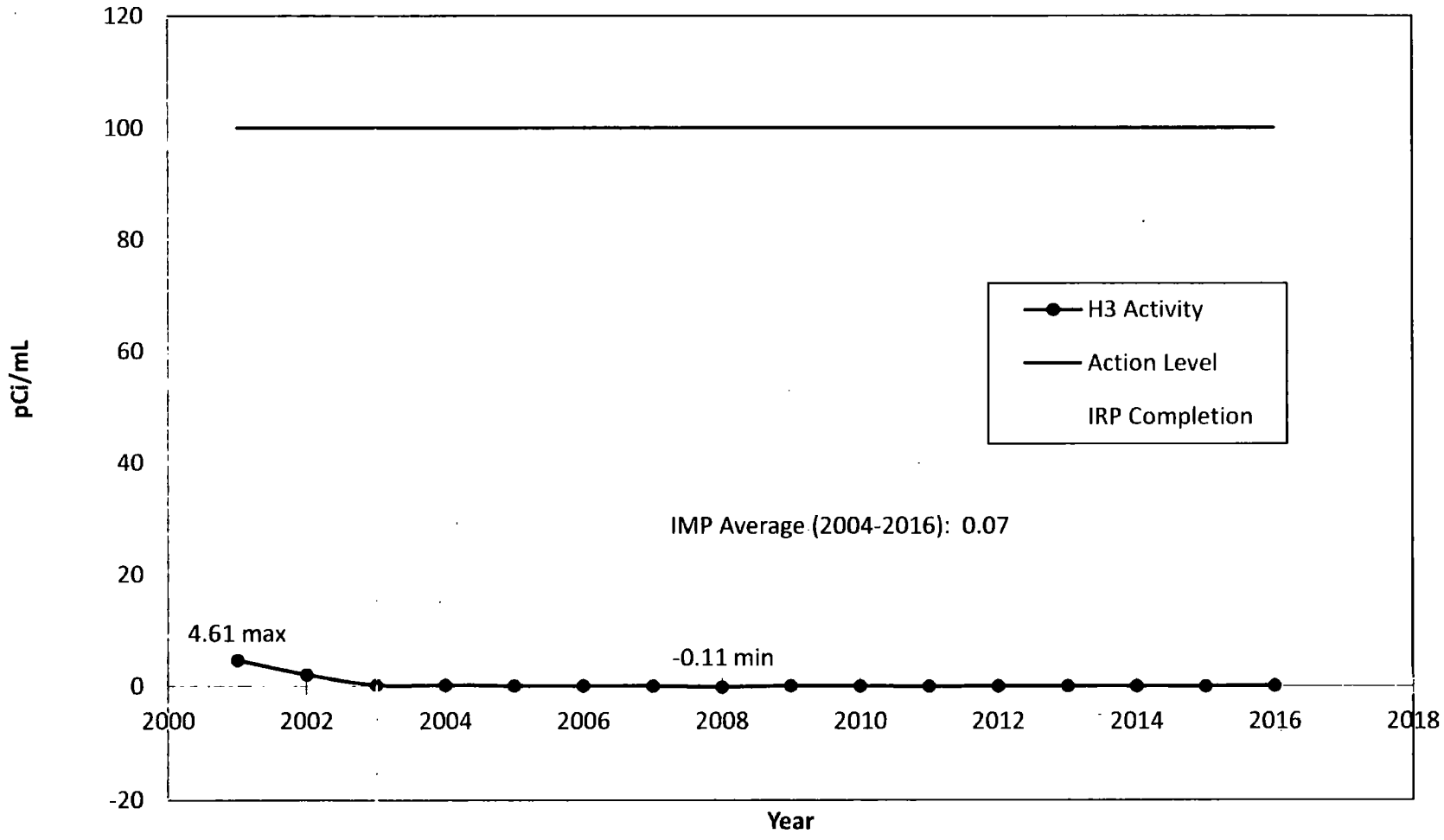
Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

0 500 1,000
Feet

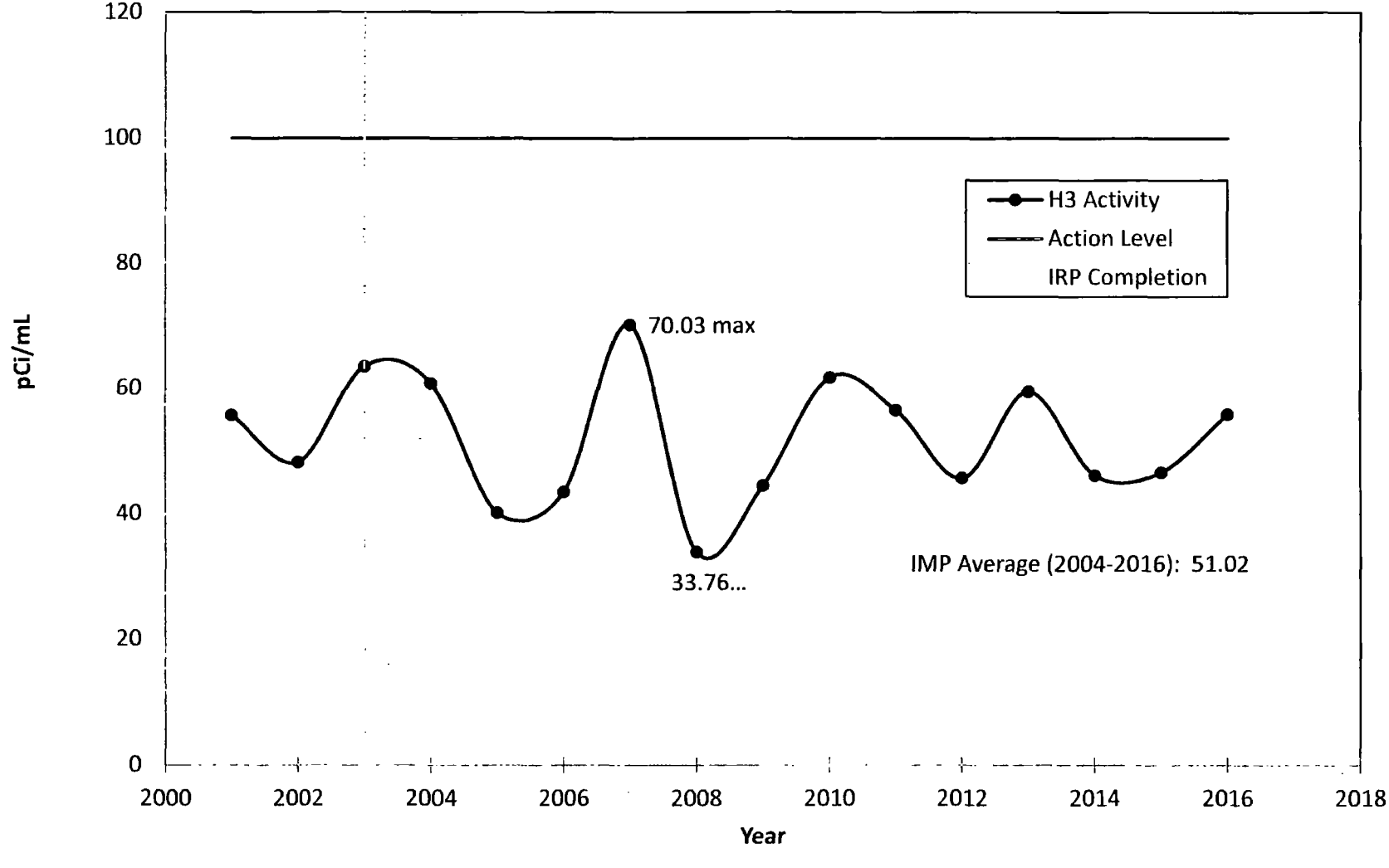
Attachment 6.B.2.1: Location C107 Annual Average Tritium Concentration

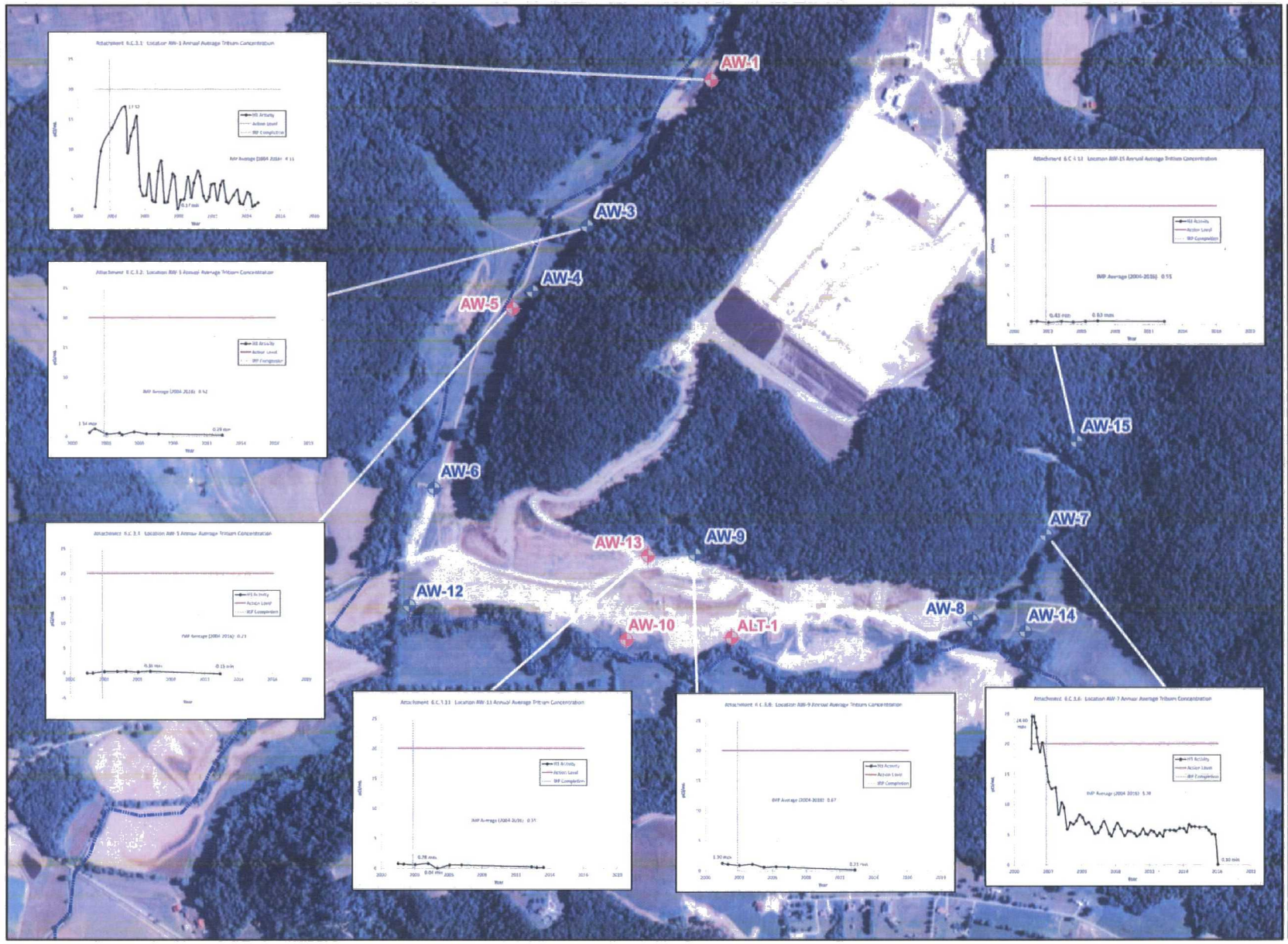


Attachment 6.B.2.2: Location 143 Annual Average Tritium Concentration



Attachment 6.B.2.3: Location 144 Annual Average Tritium Concentration





Attachment 6.C.1

Contaminant Monitoring of Alluvial Well Locations (odd numbered) subject to 4 mrem/yr Standard

Maxey Flats
Fleming County, Kentucky

Map Legend

- Alluvial Well (Active)
- Alluvial Well (Abandoned 2017)
- Waterway

Basemap Source:
USDA FSA (NAIP 2016)
08 June 2016

Spatial Projection

Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

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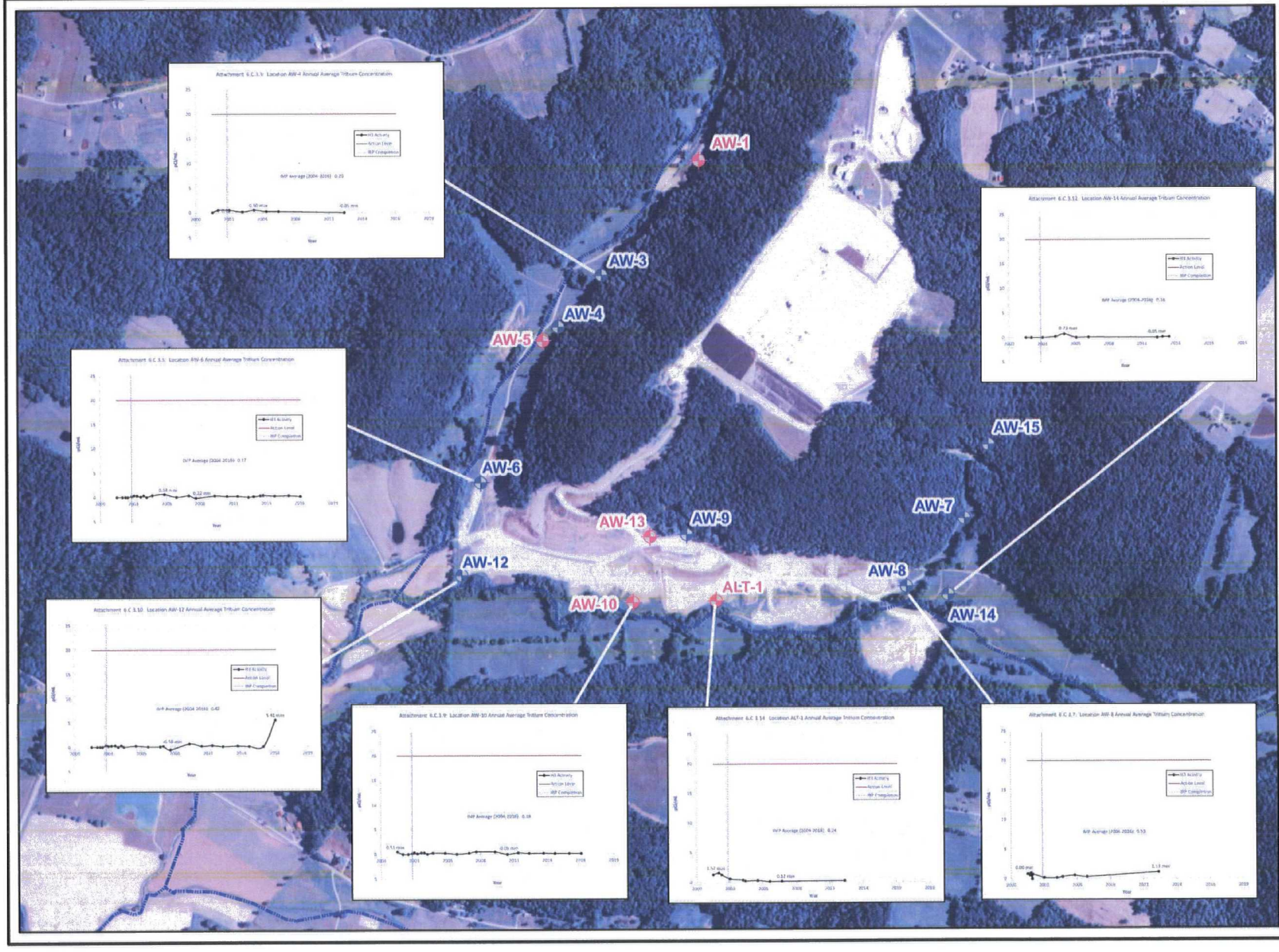
Feet



Attachment 6.C.2

Contaminant Monitoring of Alluvial Well Locations (even numbered) subject to 4 mrem/yr Standard

Maxey Flats
Fleming County, Kentucky

Map Legend

- Alluvial Well (Active)
- Alluvial Well (Abandoned 2017)
- Waterway

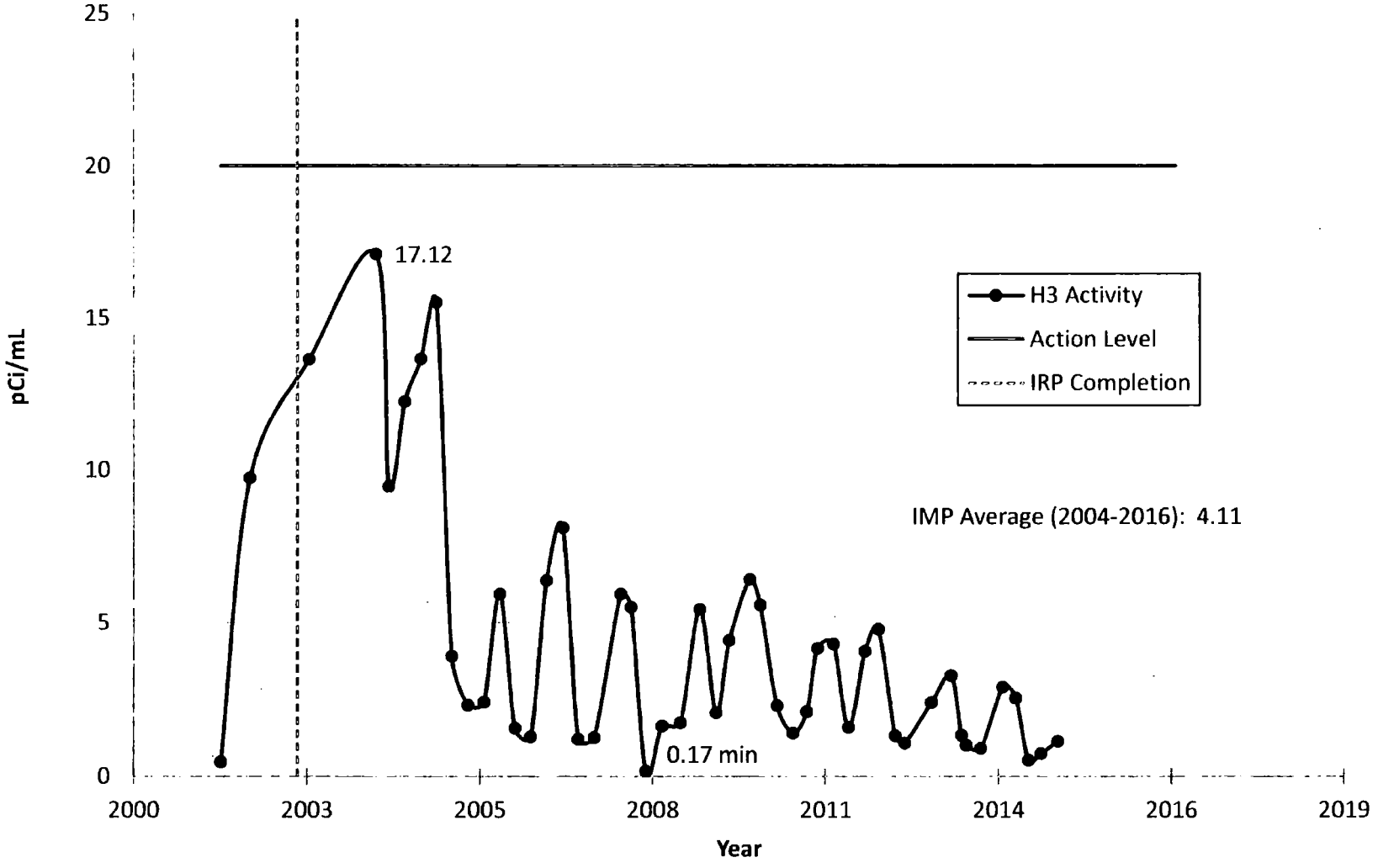
Basemap Source:
USDA FSA (NAIP 2016)
08 June 2016

Spatial Projection

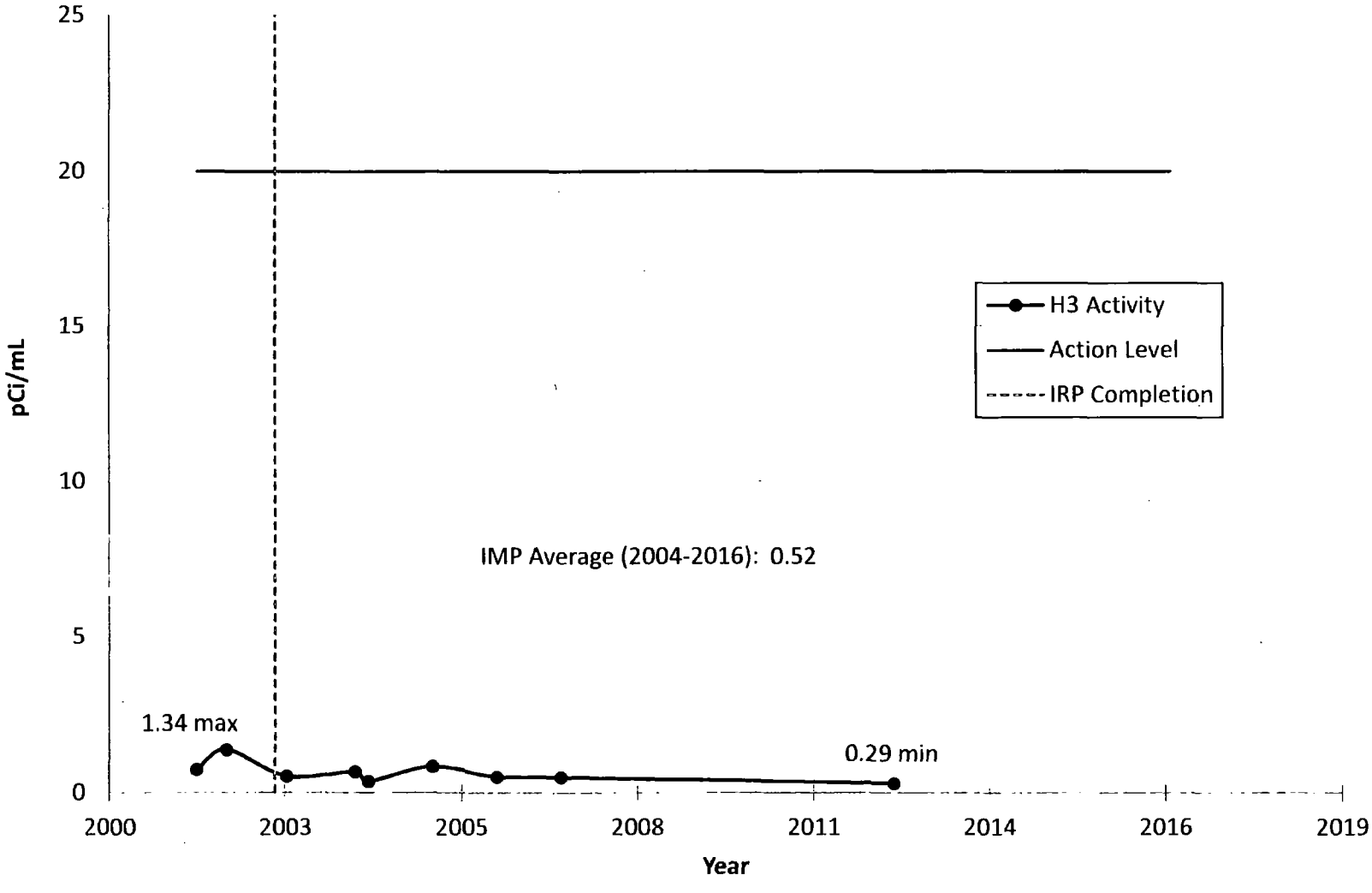
Coordinate System:
Kentucky State Plane North
FIPS Zone: 1601
Units: Feet
Datum: NAD83

0 500 1,000
Feet

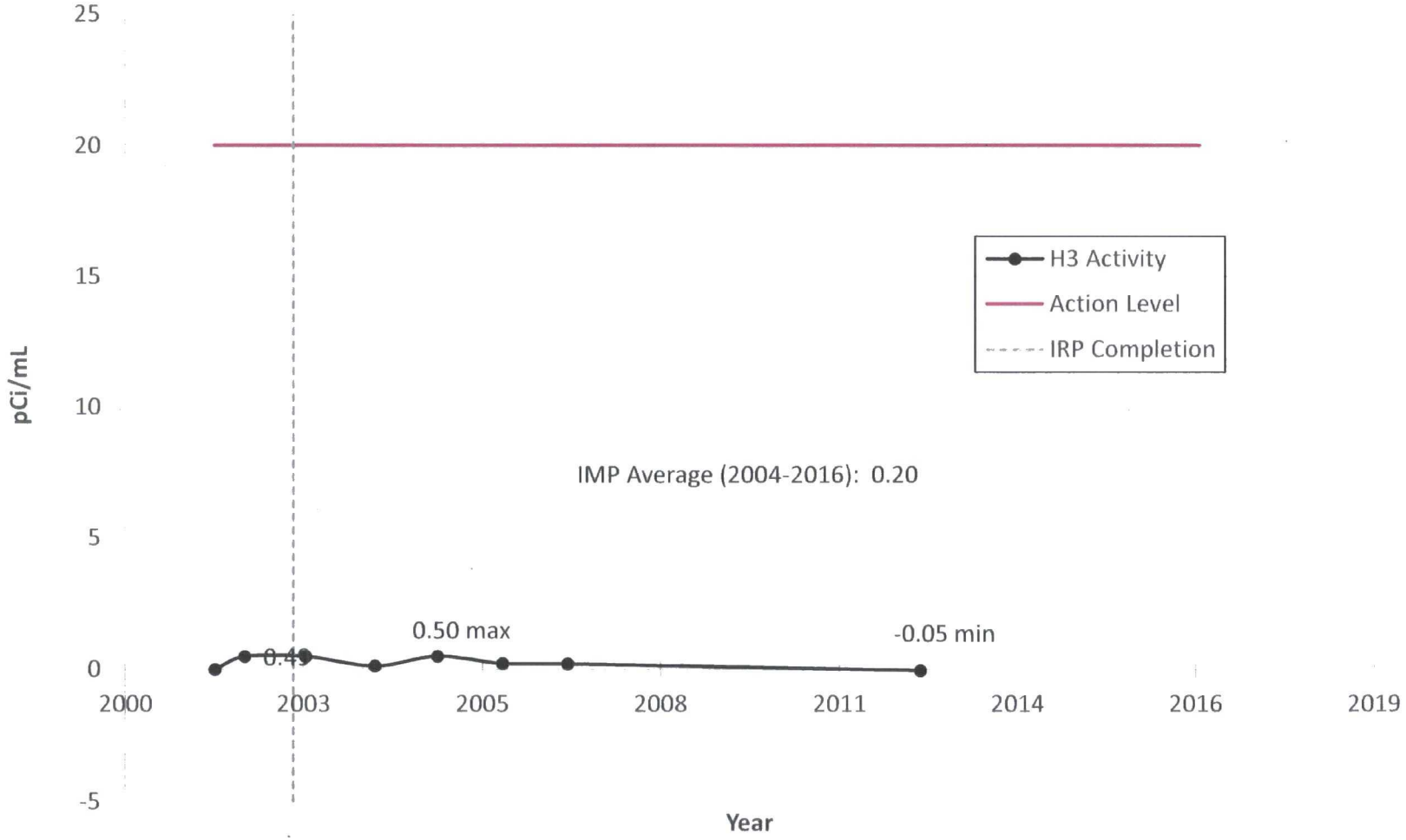
Attachment 6.C.3.1: Location AW-1 Annual Average Tritium Concentration



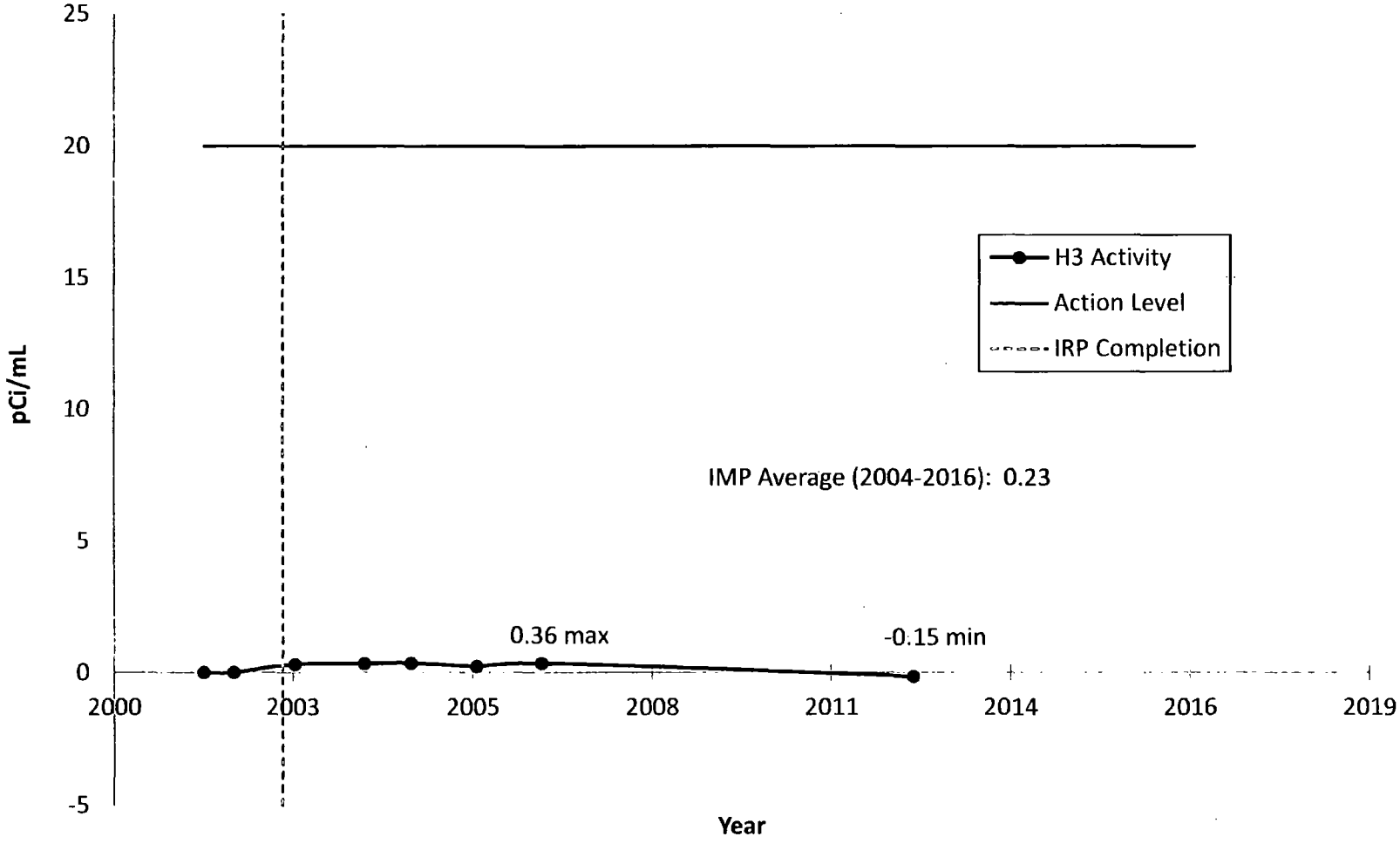
Attachment 6.C.3.2: Location AW-3 Annual Average Tritium Concentration



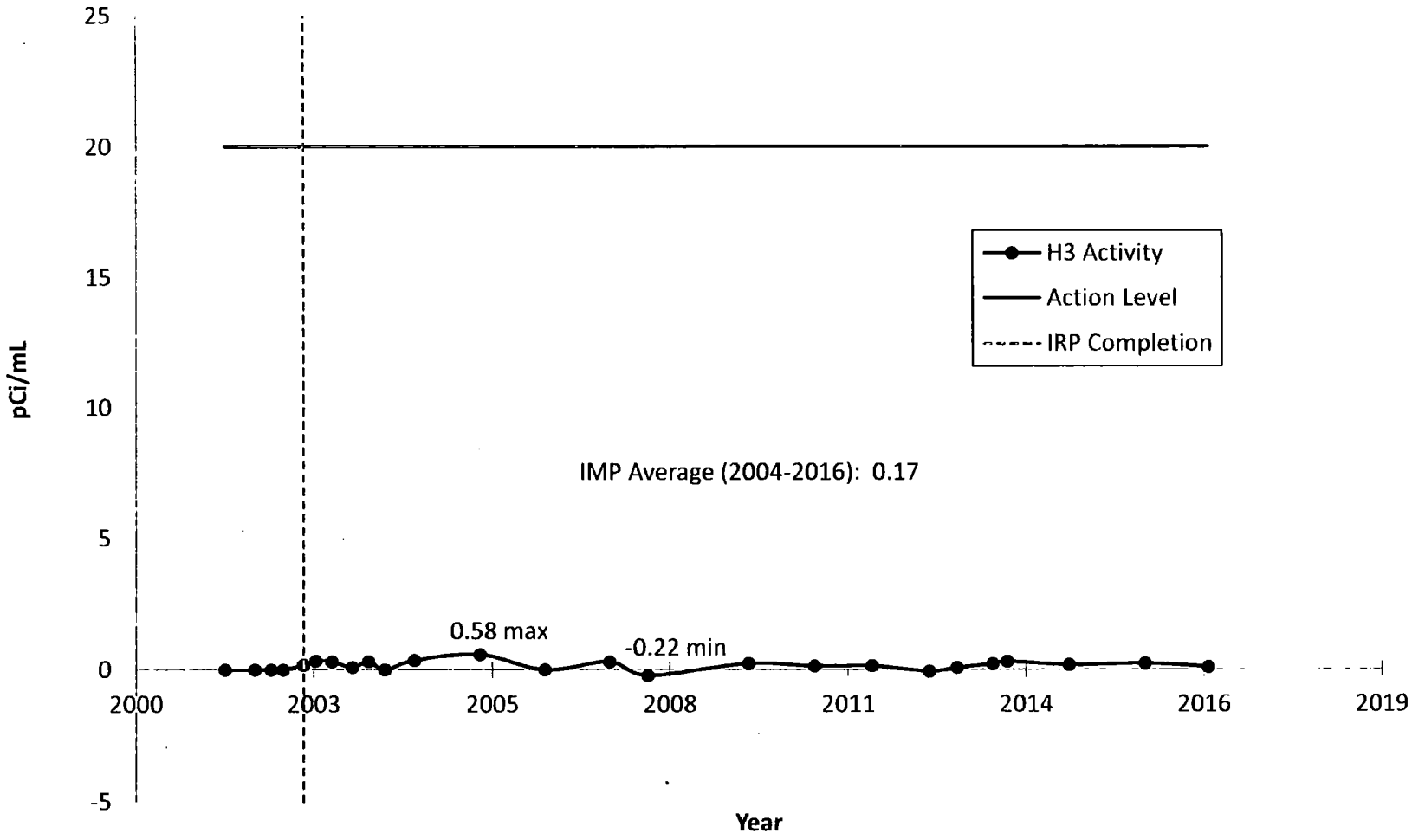
Attachment 6.C.3.3: Location AW-4 Annual Average Tritium Concentration



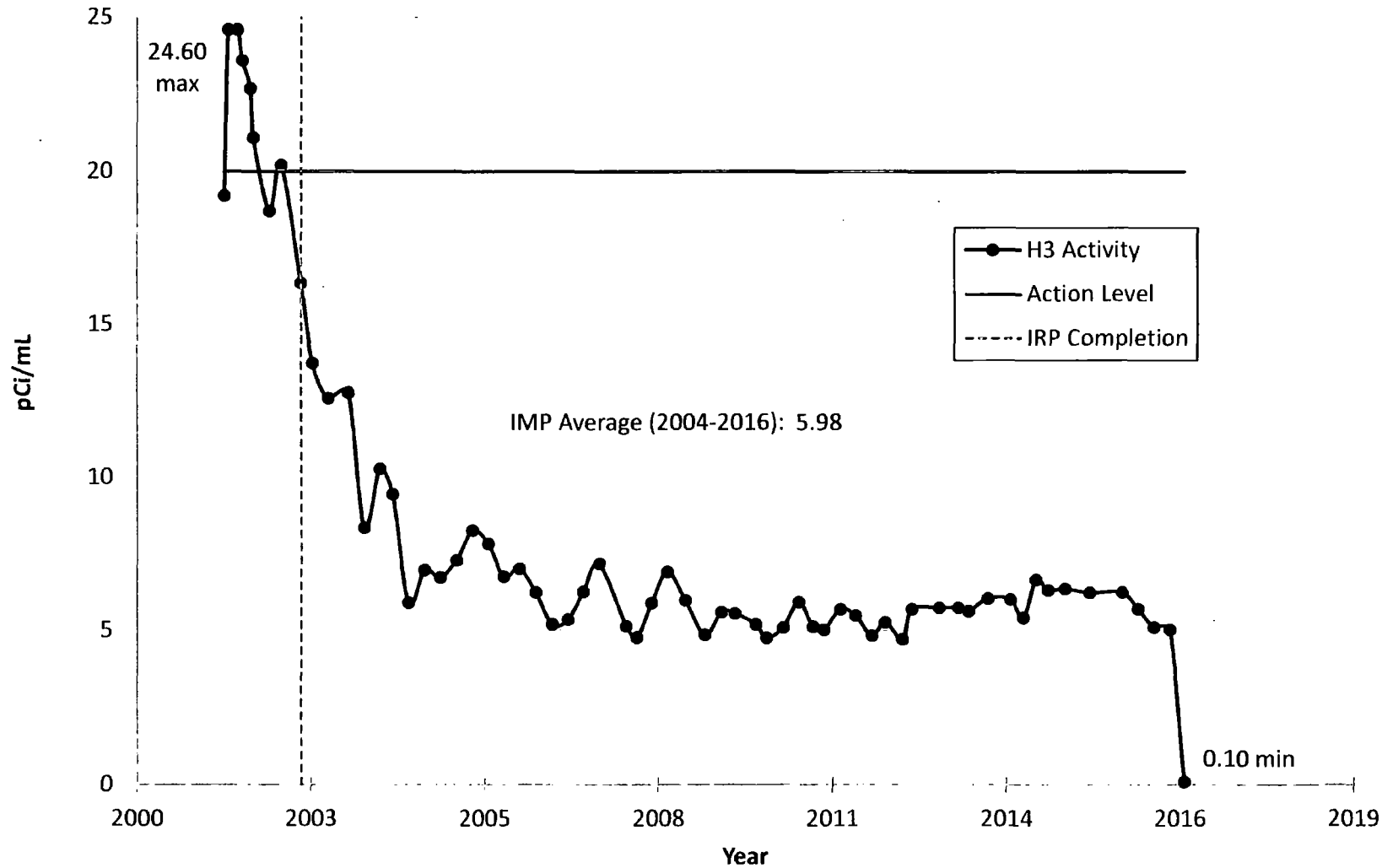
Attachment 6.C.3.4: Location AW-5 Annual Average Tritium Concentration



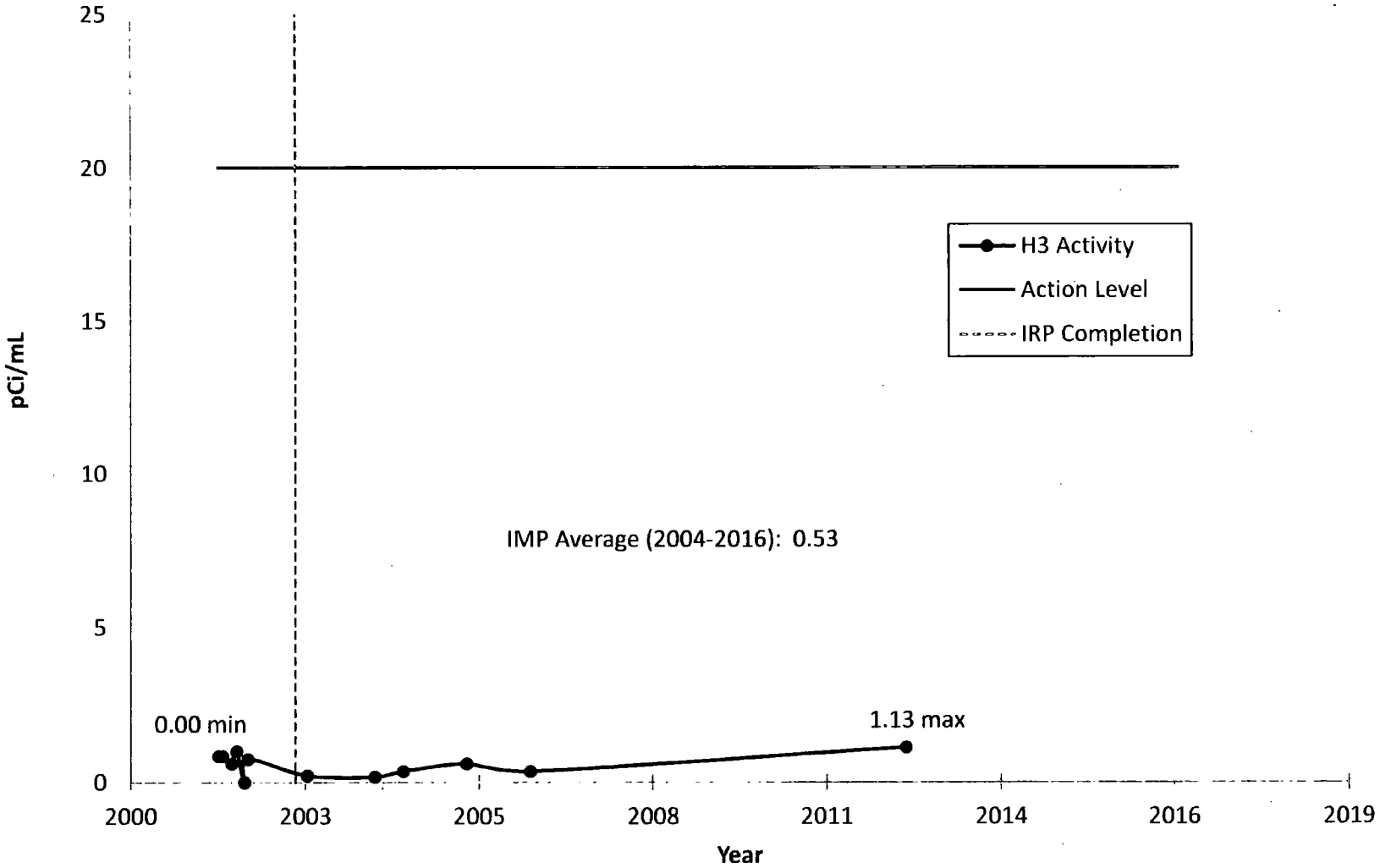
Attachment 6.C.3.5: Location AW-6 Annual Average Tritium Concentration



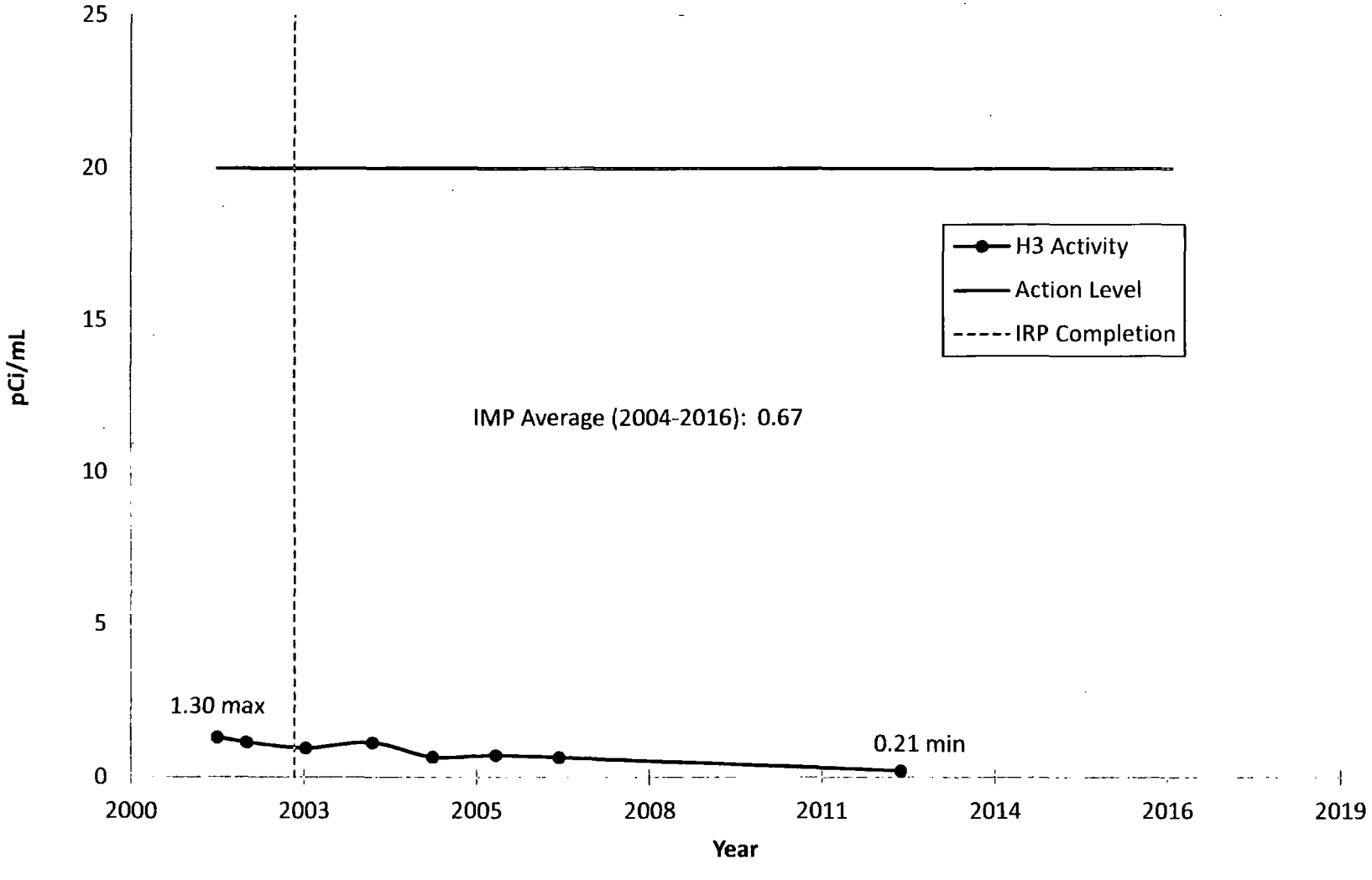
Attachment 6.C.3.6: Location AW-7 Annual Average Tritium Concentration



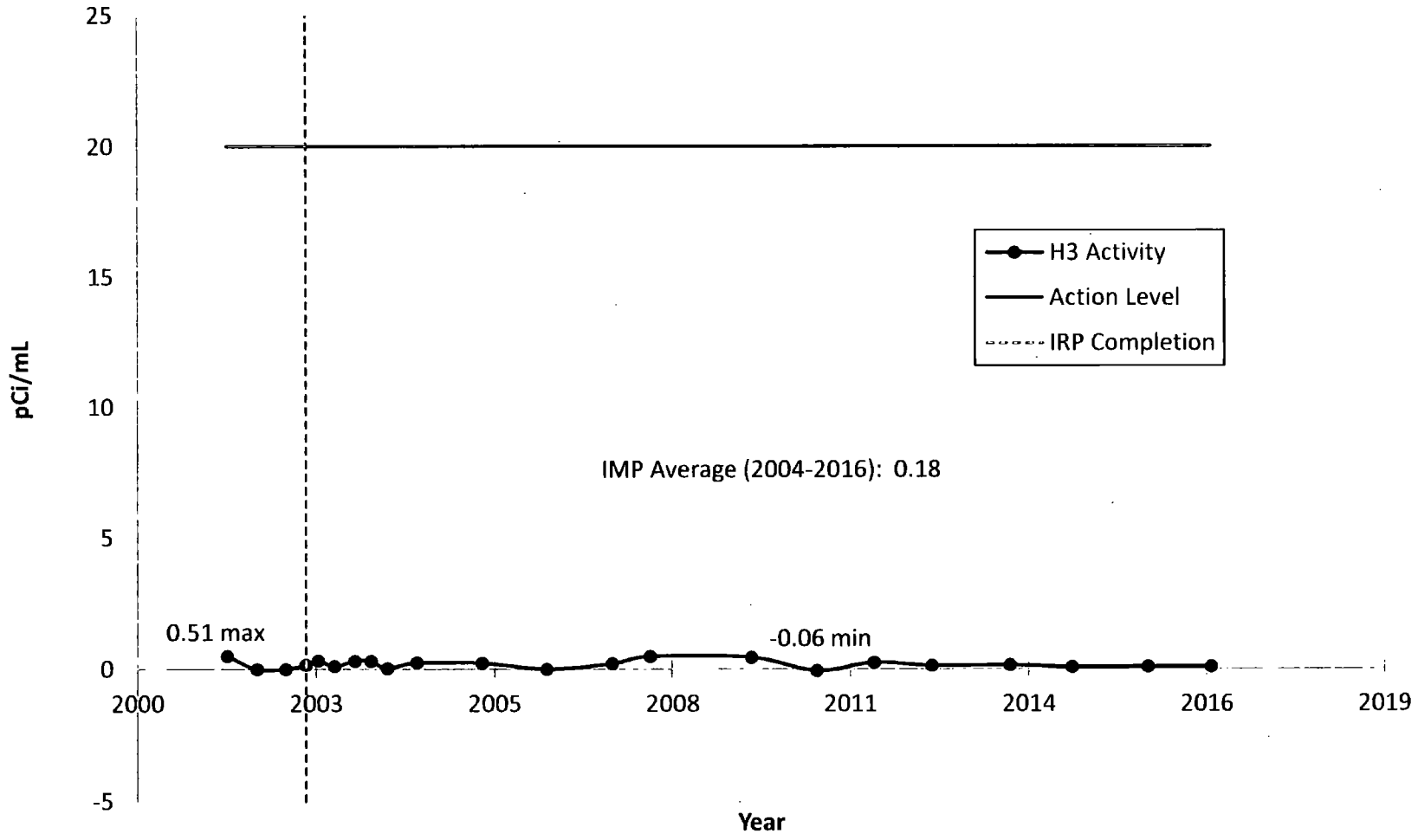
Attachment 6.C.3.7: Location AW-8 Annual Average Tritium Concentration



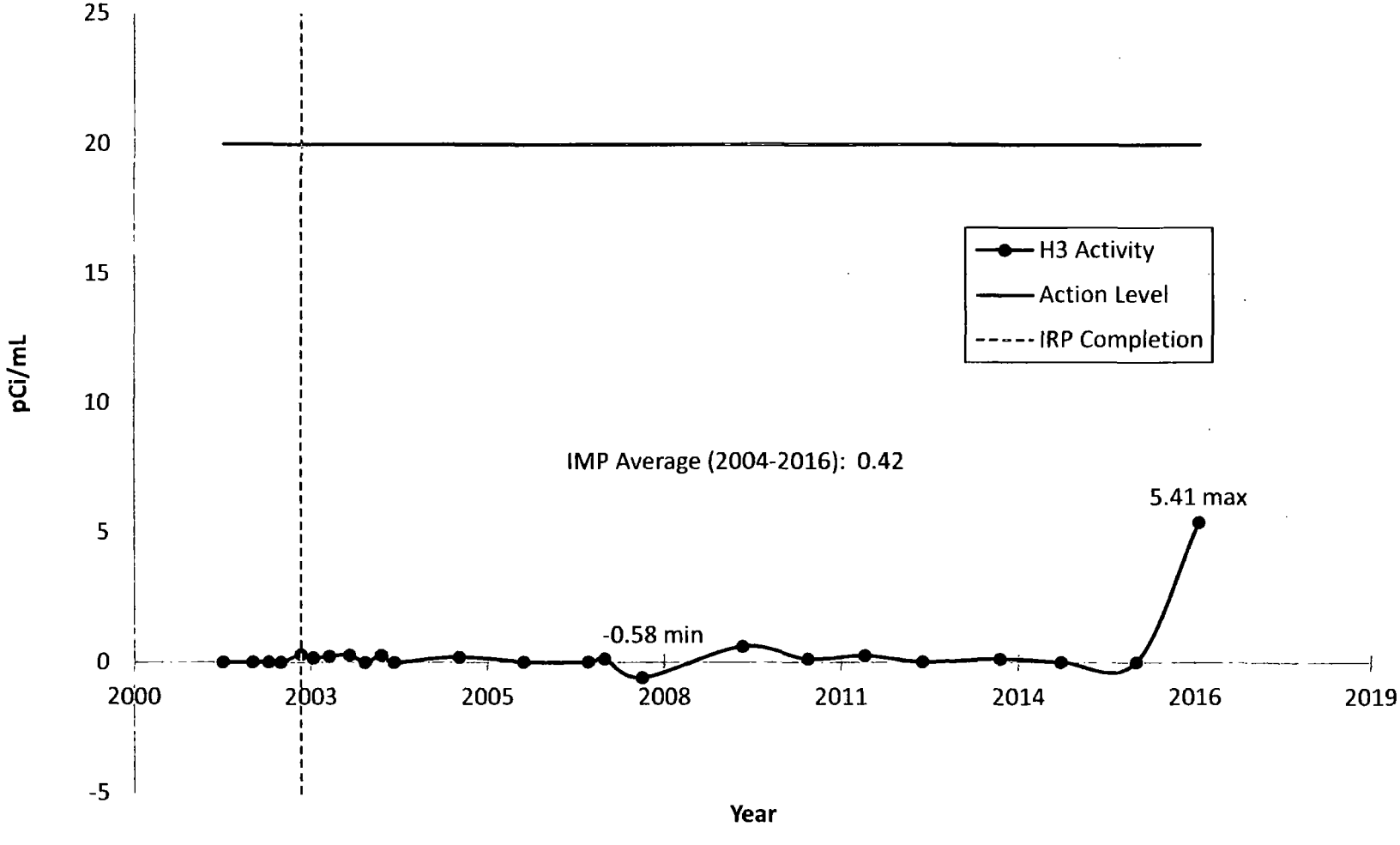
Attachment 6.C.3.8: Location AW-9 Annual Average Tritium Concentration



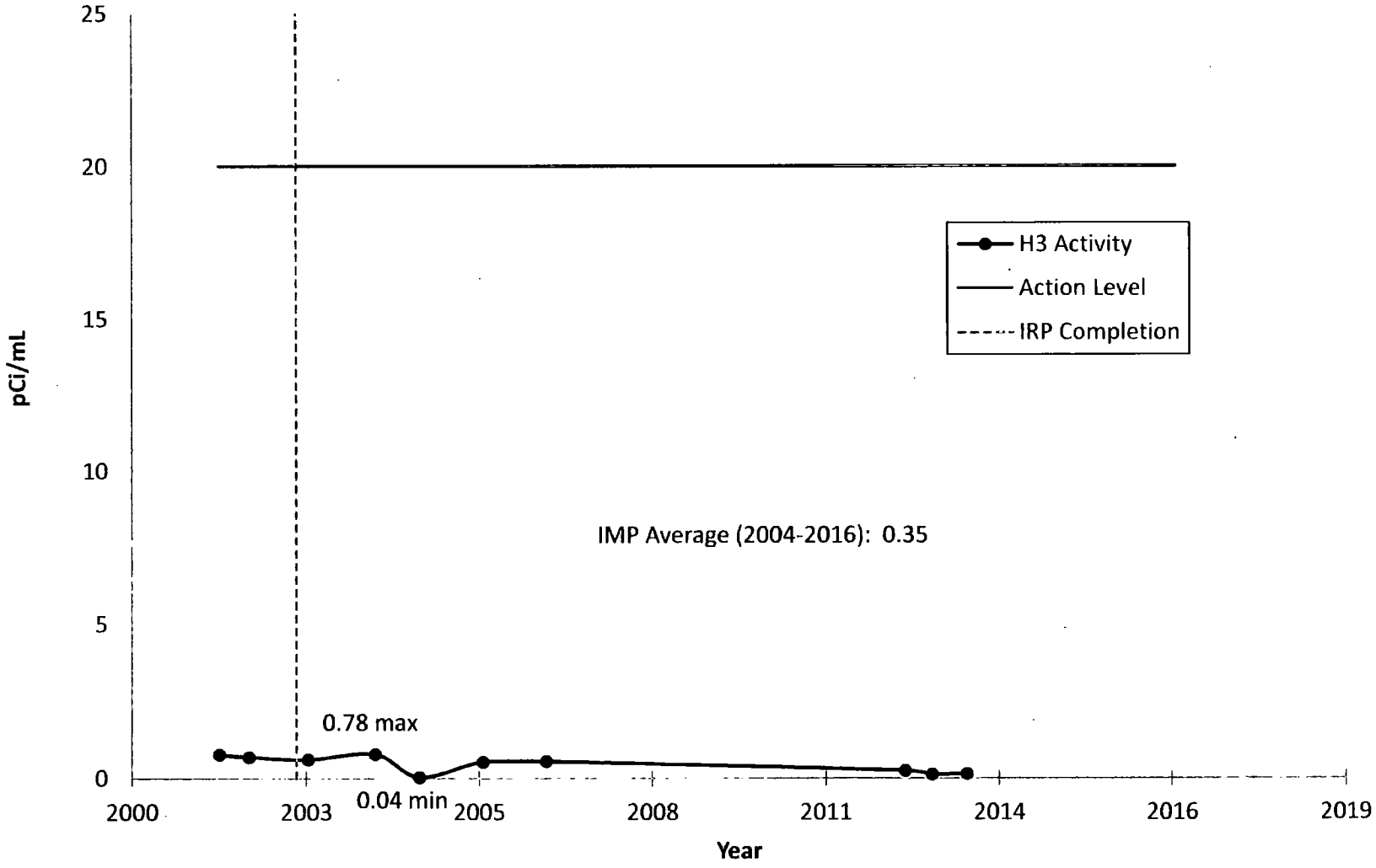
Attachment 6.C.3.9: Location AW-10 Annual Average Tritium Concentration



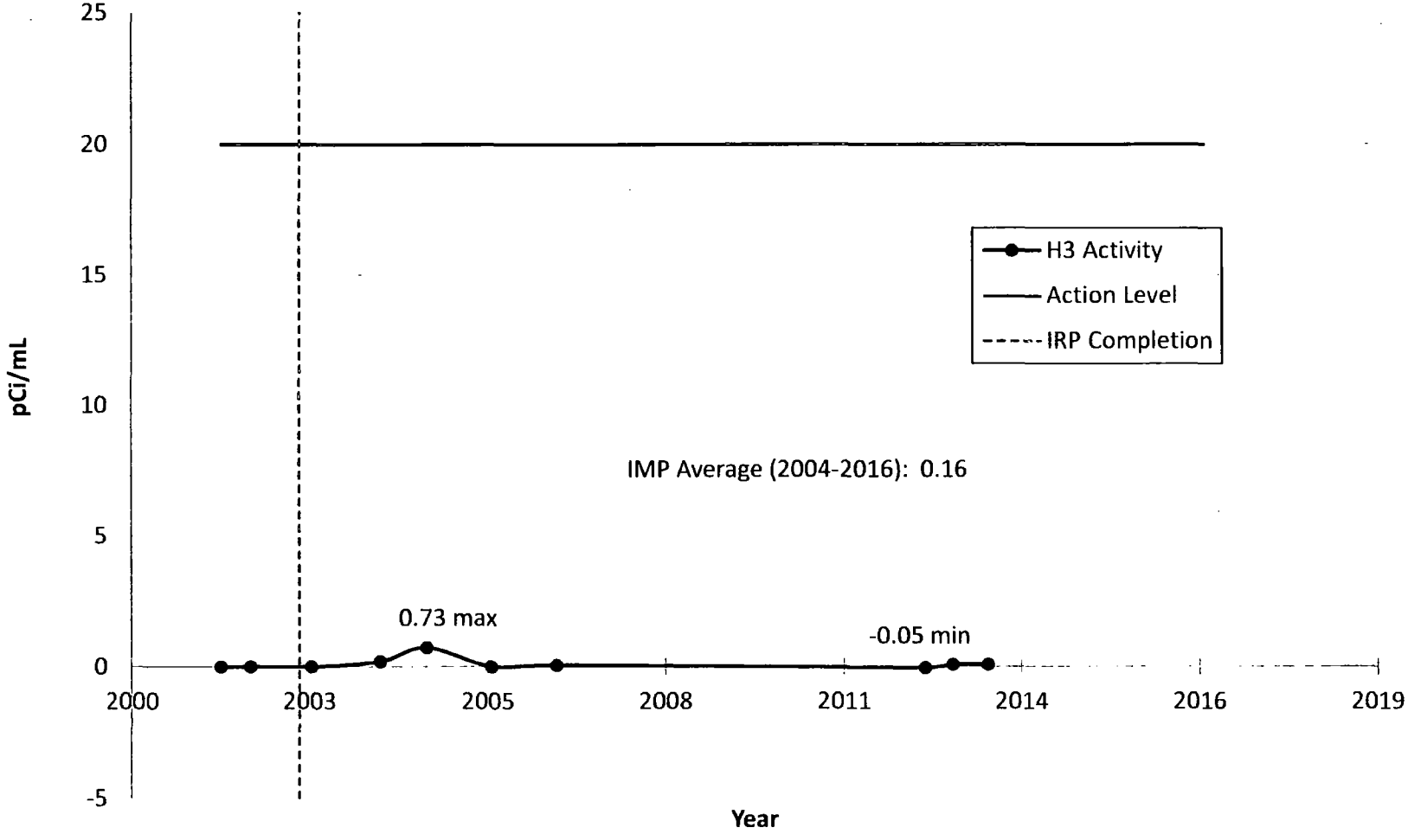
Attachment 6.C.3.10: Location AW-12 Annual Average Tritium Concentration



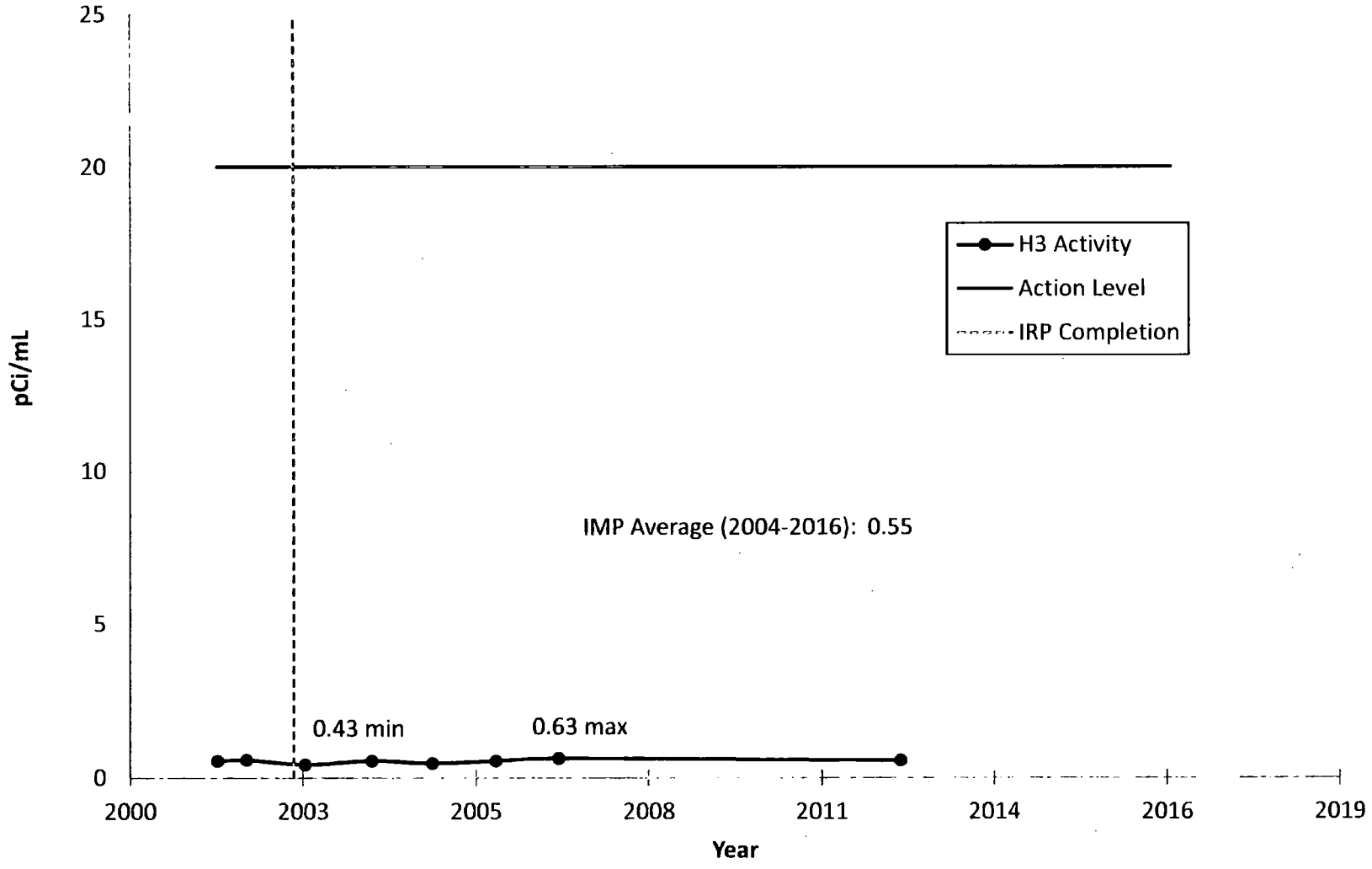
Attachment 6.C.3.11: Location AW-13 Annual Average Tritium Concentration



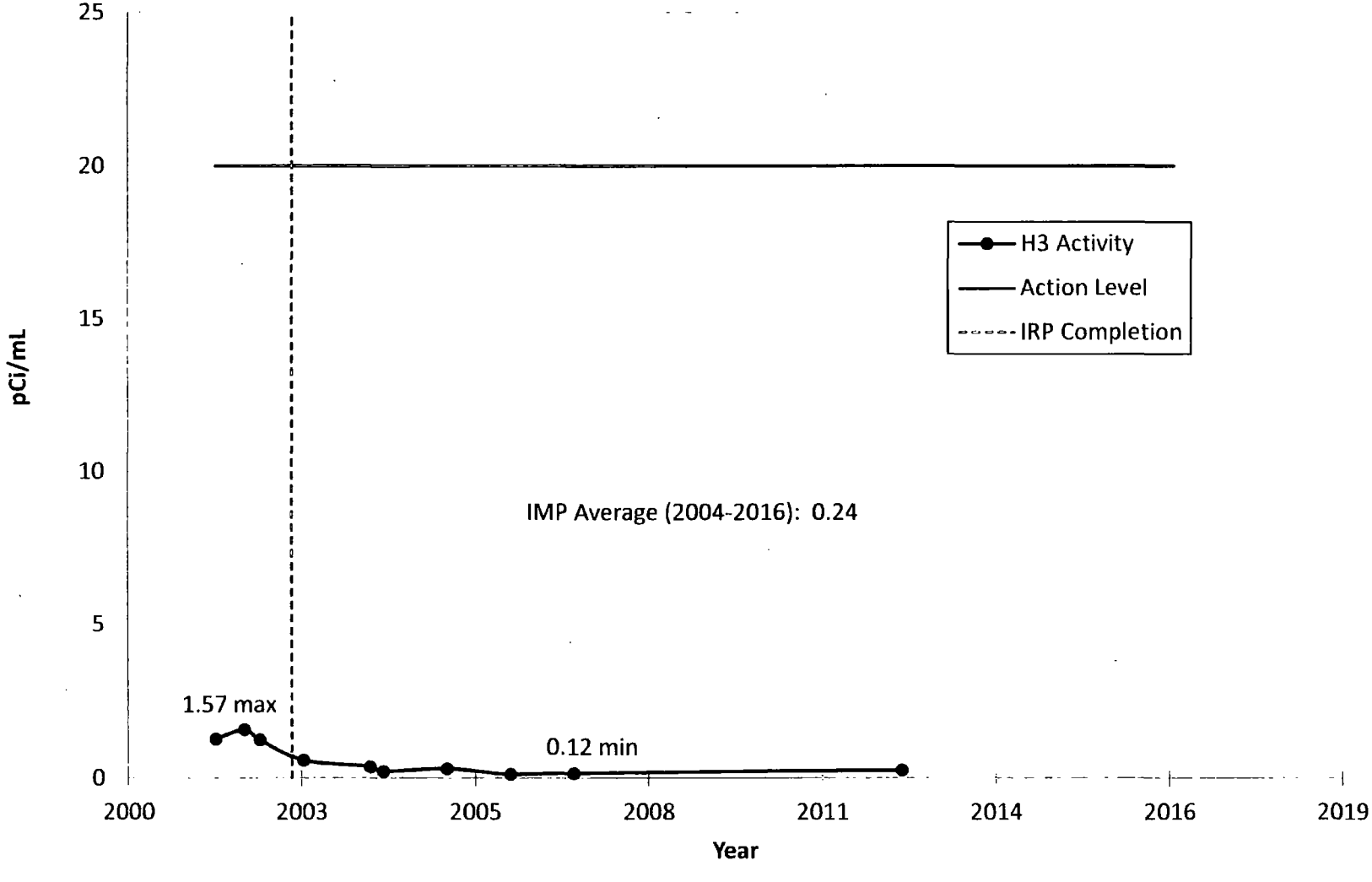
Attachment 6.C.3.12: Location AW-14 Annual Average Tritium Concentration

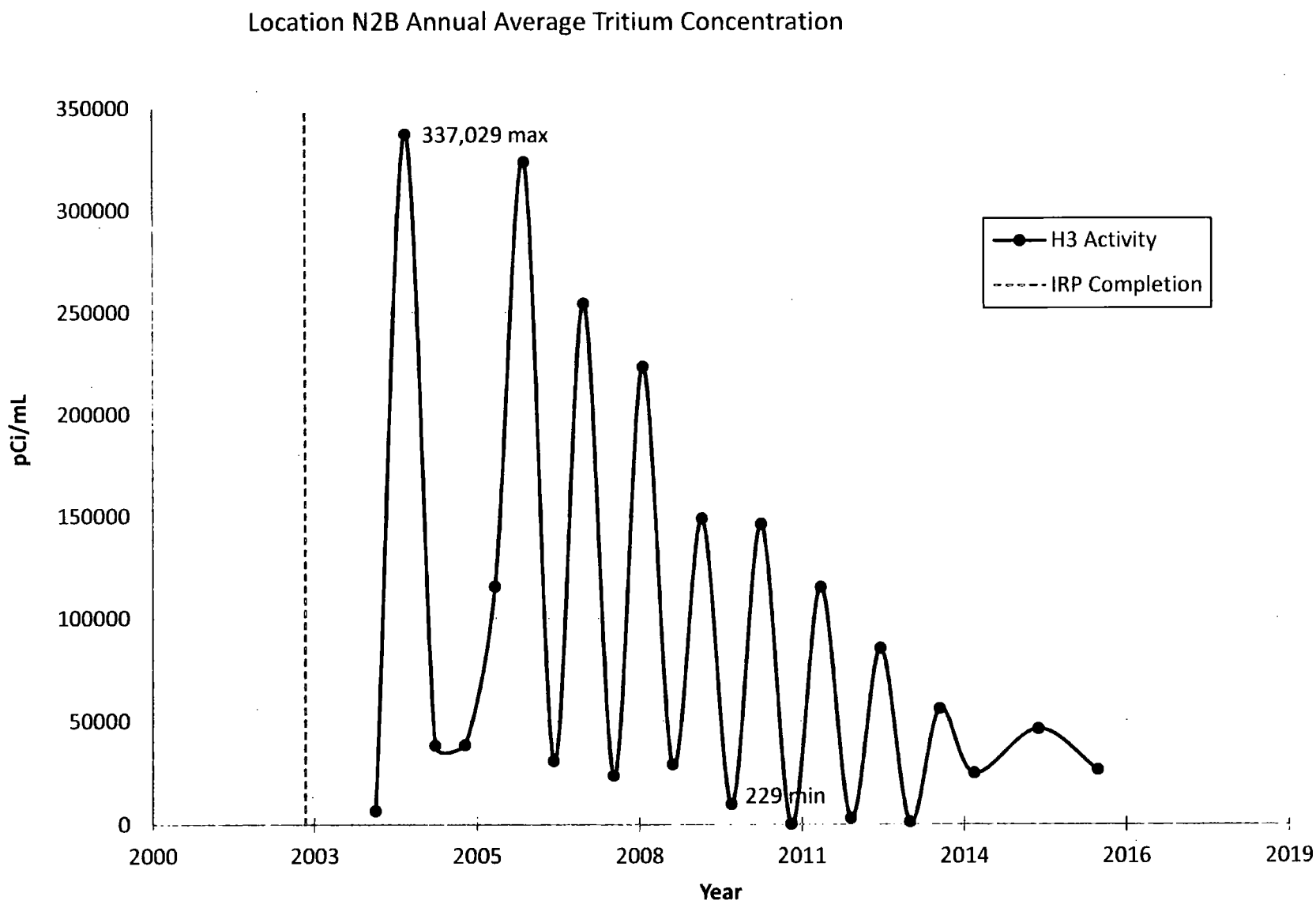


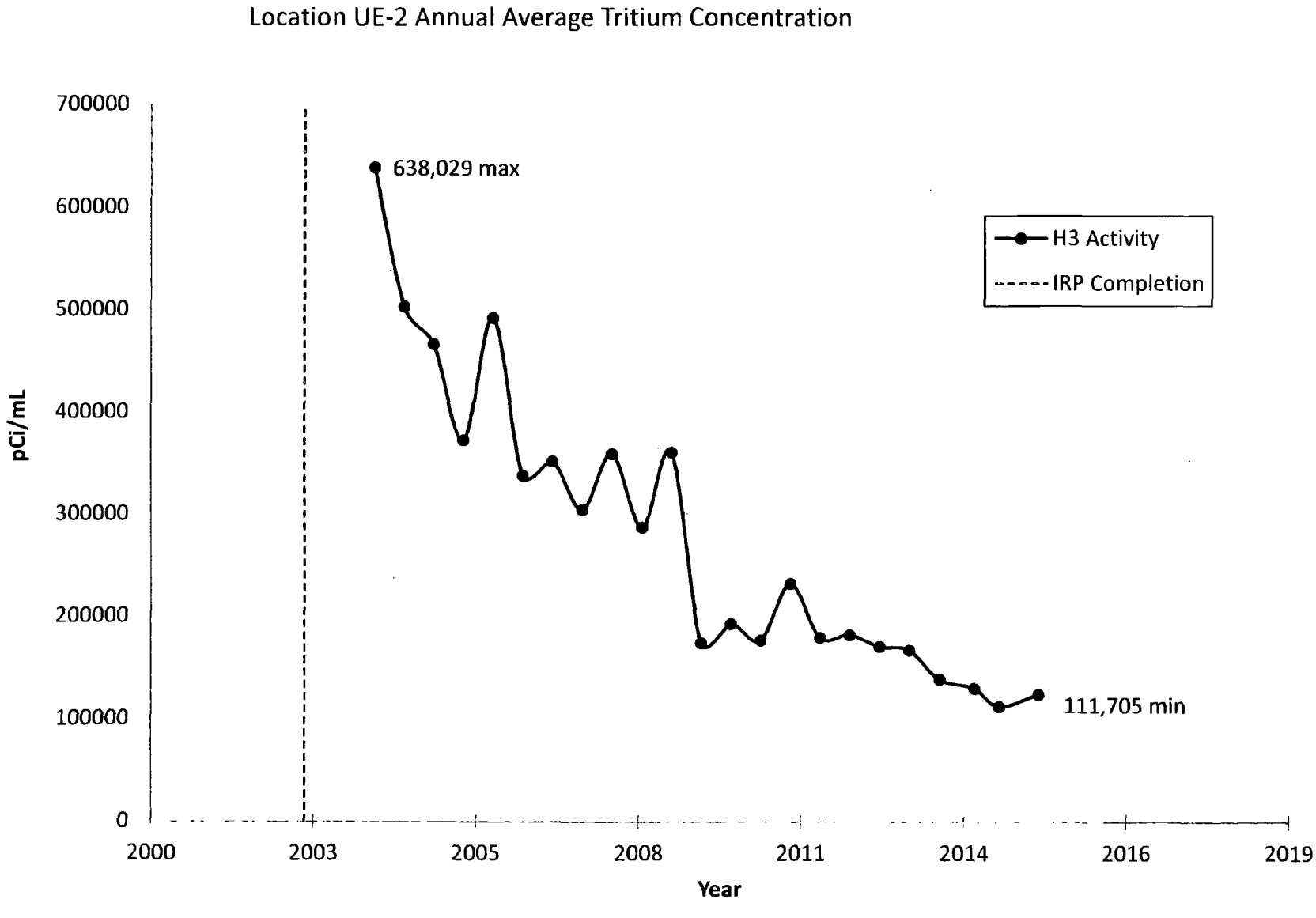
Attachment 6.C.3.13: Location AW-15 Annual Average Tritium Concentration

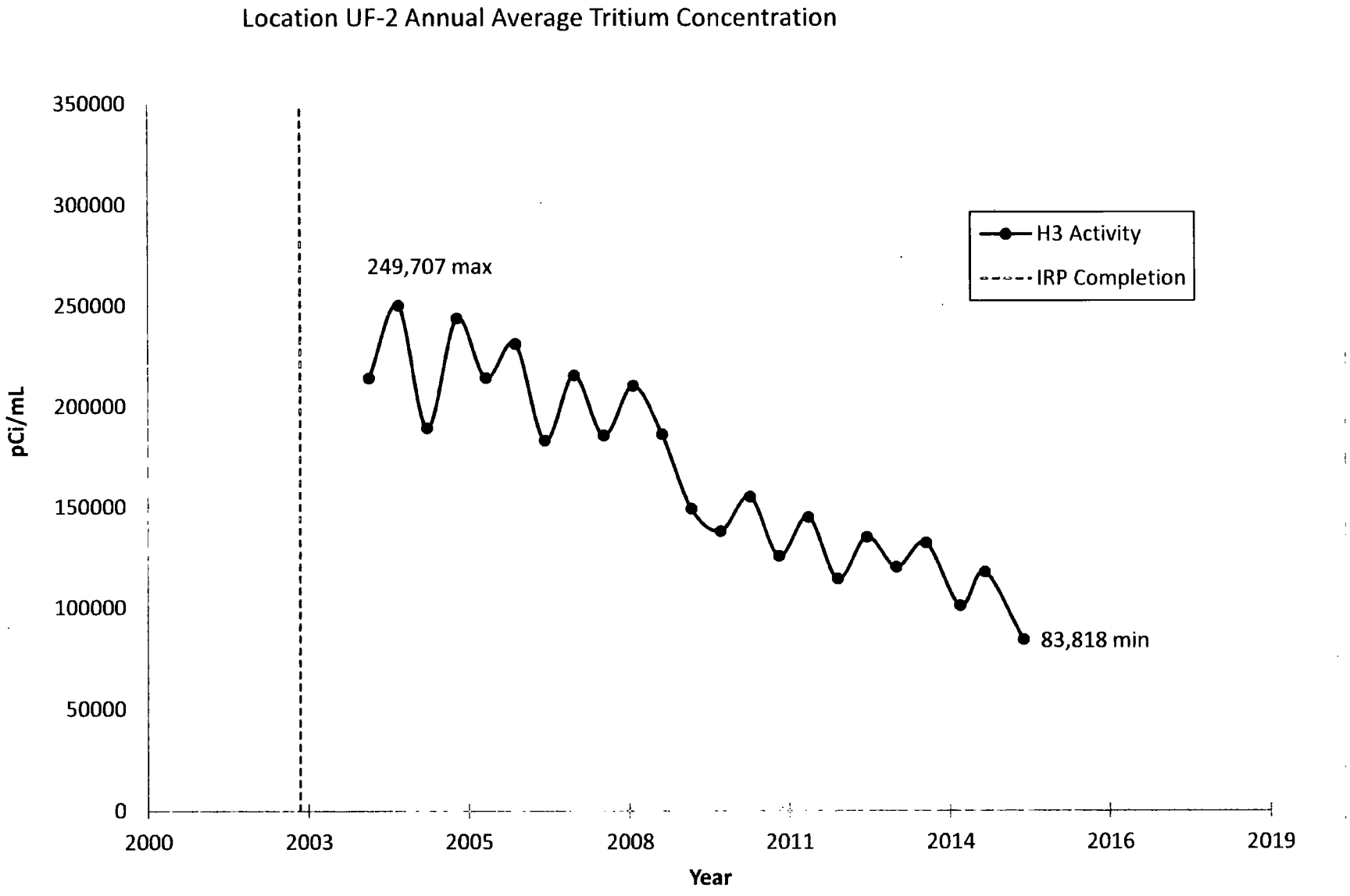


Attachment 6.C.3.14: Location ALT-1 Annual Average Tritium Concentration

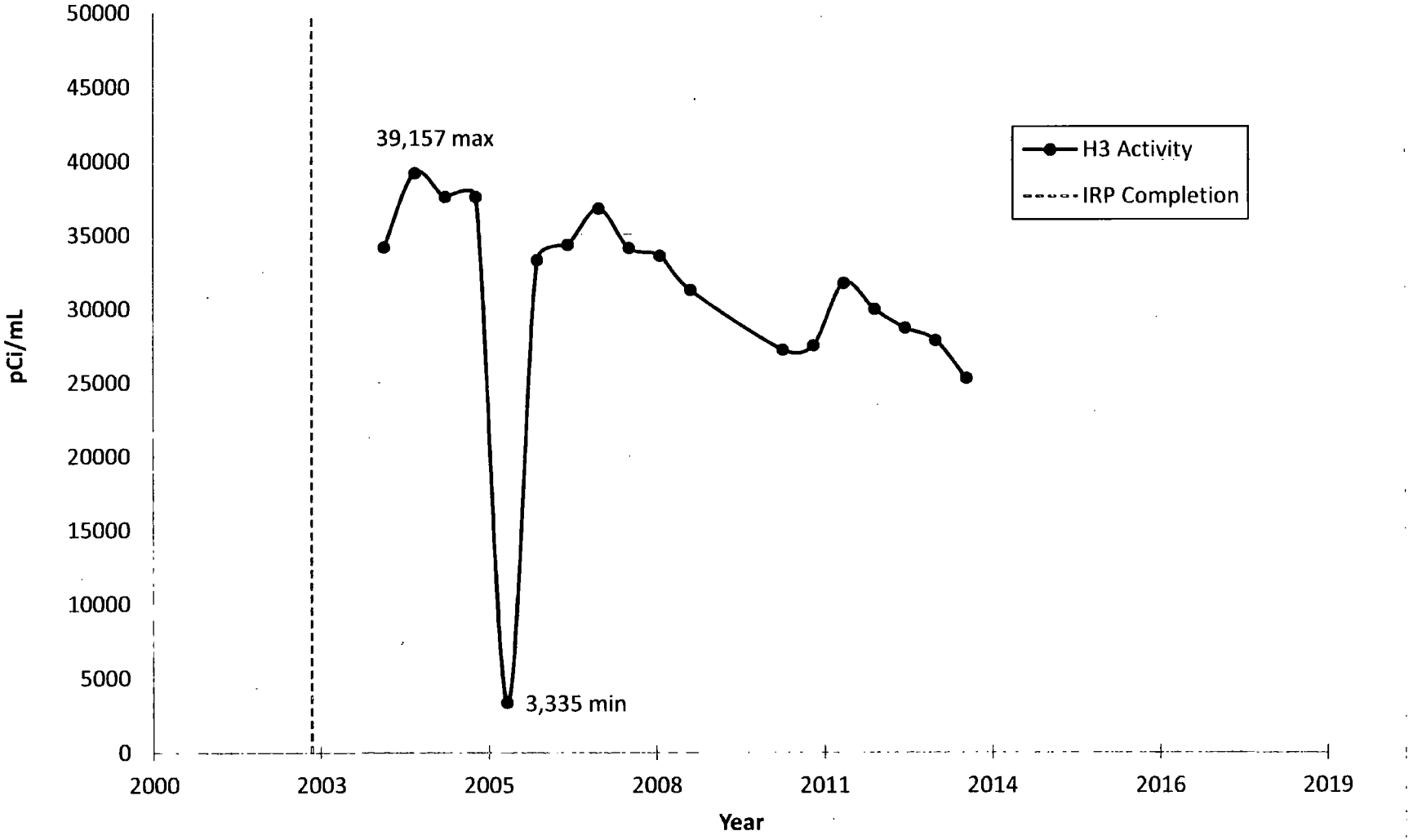



Location N2B Annual Average Tritium Concentration
350000
300000
250000
200000
150000
100000
50000
0
pCi/mL
337,029 max
229 min
H3 Activity
IRP Completion
2000
2003
2005
2008
2011
2014
2016
2019
Year


Location UE-2 Annual Average Tritium Concentration
700000
600000
500000
400000
300000
200000
100000
0
pCi/mL
638,029 max
111,705 min
H3 Activity
IRP Completion
2000
2003
2005
2008
2011
2014
2016
2019
Year


Location UF-2 Annual Average Tritium Concentration
350000
300000
250000
200000
150000
100000
50000
0
pCi/mL
249,707 max
83,818 min
H3 Activity
IRP Completion
2000
2003
2005
2008
2011
2014
2016
2019
Year

Location UF-10a Annual Average Tritium Concentration



Location UK-1 Annual Average Tritium Concentration