



REPLY TO  
ATTENTION OF

**DEPARTMENT OF THE ARMY**  
US ARMY INSTALLATION MANAGEMENT COMMAND  
2405 GUN SHED ROAD  
JOINT BASE SAN ANTONIO FORT SAM HOUSTON, TX 78234-1223

April 24, 2019

ATTN: Document Control Desk  
Deputy Director, Division of Decommissioning, Uranium Recovery and Waste Programs  
Office of Nuclear Material Safety and Safeguards  
Mailstop T8 F5  
US Nuclear Regulatory Commission  
Washington, DC 20555-0001

Dear Deputy Director:

Reference US Nuclear Regulatory Commission (NRC) license number SUC-1593 (docket 040-09083) issued to HQ US Army Installation Management Command (IMCOM) for possession of residual depleted uranium on Army ranges.

License condition 11 requires us to perform periodic environmental radiation monitoring. I enclose a summary report of the results of our calendar year 2018 environmental radiation monitoring program for your information and to make it available to the public on your web-based ADAMS.

You may reach me at (210) 466-0368 or robert.n.cherry.civ@mail.mil.

Sincerely,

Robert N. Cherry  
License Radiation Safety Officer

Enclosure

NM5501

---

**FINAL**

**RADIATION MONITORING REPORT SUMMARY OF RESULTS  
FOR 2018 SAMPLING EVENTS**

**FOR MATERIALS LICENSE SUC-1593, DOCKET NO. 040-09083**

---

April 2019

**Submitted By:**

**U.S. ARMY INSTALLATION MANAGEMENT COMMAND**

ATTN: IMSO, Building 2261

2405 Gun Shed Road

Fort Sam Houston, Texas 78234-1223

**Submitted To:**

**U.S. NUCLEAR REGULATORY COMMISSION**

Office of Nuclear Material Safety and Safeguards

11545 Rockville Pike, Two White Flint North

Rockville, Maryland 20852-2738

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

## TABLE OF CONTENTS

	Page
LIST OF APPENDICES .....	ii
LIST OF FIGURES .....	ii
LIST OF TABLES .....	iii
ACRONYMS AND ABBREVIATIONS .....	iv
1. INTRODUCTION .....	1-1
2. ERM RESULTS FOR DONNELLY TRAINING AREA, FORT WAINWRIGHT, ALASKA .....	2-1
3. ERM RESULTS FOR FORT BENNING, GEORGIA .....	3-1
4. ERM RESULTS FOR FORT BRAGG, NORTH CAROLINA .....	4-1
5. ERM RESULTS FOR FORT CAMPBELL, KENTUCKY .....	5-1
6. ERM RESULTS FOR FORT CARSON, COLORADO .....	6-1
7. ERM RESULTS FOR FORT GORDON, GEORGIA .....	7-1
8. ERM RESULTS FOR FORT HOOD, TEXAS .....	8-1
9. ERM RESULTS FOR FORT HUNTER LIGGETT, CALIFORNIA .....	9-1
10. ERM RESULTS FOR FORT JACKSON, SOUTH CAROLINA .....	10-1
11. ERM RESULTS FOR FORT KNOX, KENTUCKY .....	11-1
12. ERM RESULTS FOR FORT POLK, LOUISIANA .....	12-1
13. ERM RESULTS FOR FORT RILEY, KANSAS .....	13-1
14. ERM RESULTS FOR FORT SILL, OKLAHOMA .....	14-1
15. ERM RESULTS FOR JOINT BASE LEWIS-McCHORD, WASHINGTON .....	15-1
16. ERM RESULTS FOR JOINT BASE McGUIRE-DIX-LAKEHURST, NEW JERSEY .....	16-1
17. ERM RESULTS FOR POHAKULOA TRAINING AREA, HAWAII .....	17-1
18. ERM RESULTS FOR SCHOFIELD BARRACKS, HAWAII .....	18-1
19. ERM RESULTS FOR YAKIMA TRAINING CENTER, WASHINGTON .....	19-1
20. CONCLUSIONS AND RECOMMENDATIONS .....	20-1
21. REFERENCES .....	21-1



## LIST OF APPENDICES

Appendix A.	Relative Uranium-238/Uranium-234 Activity Ratios for Mixtures of Depleted and Natural Uranium
Appendix B.	Field Logbook Pages Donnelly Training Area, Fort Wainwright, Alaska
Appendix C.	Field Logbook Pages Fort Benning, Georgia
Appendix D.	Field Logbook Pages Fort Bragg, North Carolina
Appendix E.	Field Logbook Pages Fort Campbell, Kentucky
Appendix F.	Field Logbook Pages Fort Carson, Colorado
Appendix G.	Field Logbook Pages Fort Gordon, Georgia
Appendix H.	Field Logbook Pages Fort Hood, Texas
Appendix I.	Field Logbook Pages Fort Hunter Liggett, California
Appendix J.	Field Logbook Pages Fort Jackson, South Carolina
Appendix K.	Field Logbook Pages Fort Knox, Kentucky
Appendix L.	Field Logbook Pages Fort Polk, Louisiana
Appendix M.	Field Logbook Pages Fort Riley, Kansas
Appendix N.	Field Logbook Pages Fort Sill, Oklahoma
Appendix O.	Field Logbook Pages Joint Base Lewis-McChord, Washington
Appendix P.	Field Logbook Pages Joint Base McGuire-Dix-Lakehurst, New Jersey
Appendix Q.	Field Logbook Pages Pohakuloa Training Area, Hawaii
Appendix R.	Field Logbook Pages Schofield Barracks, Hawaii
Appendix S.	Field Logbook Pages Yakima Training Center, Washington
Appendix T.	Data Quality Assessment

## LIST OF FIGURES

	Page
Figure 2-1. Sampling Locations Donnelly Training Area, Fort Wainwright, Alaska.....	2-2
Figure 3-1. Sampling Locations Fort Benning, Georgia.....	3-2
Figure 4-1. Sampling Locations Fort Bragg, North Carolina .....	4-2
Figure 5-1. Sampling Locations Fort Campbell, Kentucky .....	5-2
Figure 6-1. Sampling Locations Fort Carson, Colorado.....	6-2
Figure 7-1. Sampling Locations Fort Gordon, Georgia.....	7-2
Figure 8-1. Sampling Locations Fort Hood, Texas.....	8-2
Figure 9-1. Sampling Locations Fort Hunter Liggett, California .....	9-2
Figure 10-1. Sampling Locations Fort Jackson, South Carolina .....	10-2
Figure 11-1. Sampling Locations Fort Knox, Kentucky.....	11-2
Figure 12-1. Sampling Locations Fort Polk, Louisiana.....	12-2
Figure 13-1. Sampling Locations Fort Riley, Kansas.....	13-2
Figure 14-1. Sampling Locations Fort Sill, Oklahoma.....	14-2
Figure 15-1. Sampling Locations Joint Base Lewis-McChord, Washington.....	15-2
Figure 16-1. Sampling Locations Joint Base McGuire-Dix-Lakehurst, New Jersey.....	16-2
Figure 17-1. Sampling Locations Pohakuloa Training Area, Hawaii .....	17-2
Figure 18-1. Sampling Locations Schofield Barracks, Hawaii.....	18-2
Figure 19-1. Sampling Locations Fort Yakima Training Center, Washington.....	19-2
Figure 19-2. Sampling Locations Fort Yakima Training Center, Washington.....	19-3

## LIST OF TABLES

	Page
Table 2-1. Uranium in Surface Water, Donnelly Training Area, Fort Wainwright, Alaska .....	2-3
Table 2-2. Uranium in Sediment, Donnelly Training Area, Fort Wainwright, Alaska .....	2-3
Table 3-1. Uranium in Surface Water, Fort Benning, Georgia .....	3-3
Table 3-2. Uranium in Sediment, Fort Benning, Georgia .....	3-3
Table 4-1. Uranium in Surface Water, Fort Bragg, North Carolina .....	4-3
Table 4-2. Uranium in Sediment, Fort Bragg, North Carolina .....	4-3
Table 5-1. Uranium in Surface Water, Fort Campbell, Kentucky .....	5-3
Table 5-2. Uranium in Sediment, Fort Campbell, Kentucky .....	5-3
Table 6-1. Uranium in Surface Water, Fort Carson, Colorado .....	6-3
Table 6-2. Uranium in Sediment, Fort Carson, Colorado .....	6-3
Table 7-1. Uranium in Surface Water, Fort Gordon, Georgia .....	7-3
Table 7-2. Uranium in Sediment, Fort Gordon, Georgia .....	7-3
Table 8-1. Uranium in Surface Water, Fort Hood, Texas .....	8-3
Table 8-2. Uranium in Sediment, Fort Hood, Texas .....	8-3
Table 9-1. Uranium in Surface Water, Fort Hunter Liggett, California .....	9-3
Table 9-2. Uranium in Sediment, Fort Hunter Liggett, California .....	9-3
Table 10-1. Uranium in Surface Water, Fort Jackson, South Carolina .....	10-3
Table 10-2. Uranium in Sediment, Fort Jackson, South Carolina .....	10-3
Table 11-1. Uranium in Surface Water, Fort Knox, Kentucky .....	11-3
Table 11-2. Uranium in Sediment, Fort Knox, Kentucky .....	11-3
Table 12-1. Uranium in Surface Water, Fort Polk, Louisiana .....	12-3
Table 12-2. Uranium in Sediment, Fort Polk, Louisiana .....	12-3
Table 13-1. Uranium in Surface Water, Fort Riley, Kansas .....	13-3
Table 13-2. Uranium in Sediment, Fort Riley, Kansas .....	13-3
Table 14-1. Uranium in Surface Water, Fort Sill, Oklahoma .....	14-3
Table 14-2. Uranium in Sediment, Fort Sill, Oklahoma .....	14-3
Table 15-1. Uranium in Surface Water, JBLM, Washington .....	15-3
Table 15-2. Uranium in Sediment, JBLM, Washington .....	15-3
Table 16-1. Uranium in Surface Water, JBMDL, New Jersey .....	16-3
Table 16-2. Uranium in Sediment, JBMDL, New Jersey .....	16-3
Table 17-1. Uranium in Sediment, PTA, Hawaii .....	17-3
Table 18-1. Uranium in Surface Water, Schofield Barracks, Hawaii .....	18-3
Table 18-2. Uranium in Sediment, Schofield Barracks, Hawaii .....	18-4
Table 19-1. Uranium in Surface Water, YTC, Washington .....	19-4
Table 19-2. Uranium in Sediment, YTC, Washington .....	19-5
Table 20-1. Summary of Sampling Results for Uranium in Surface Water (Winter 2018) .....	20-2
Table 20-2. Summary of Sampling Results for Uranium in Sediment Water (Winter 2018) .....	20-3
Table 20-3. Summary of Sampling Results for Uranium in Surface Water (Spring 2018) .....	20-4
Table 20-4. Summary of Sampling Results for Uranium in Sediment (Spring 2018) .....	20-5
Table 20-5. Summary of Sampling Results for Uranium in Surface Water (Summer 2018) .....	20-6
Table 20-6. Summary of Sampling Results for Uranium in Sediment (Summer 2017) .....	20-7
Table 20-7. Summary of Sampling Results for Uranium in Surface Water (Fall 2018) .....	20-8
Table 20-8. Summary of Sampling Results for Uranium in Sediment (Fall 2018) .....	20-9

## ACRONYMS AND ABBREVIATIONS

DQA	Data Quality Objective
DQO	Data Quality Objective
DU	Depleted Uranium
ERM	Environmental Radiation Monitoring
ERMP	Environmental Radiation Monitoring Program
GIS	Geographic Information System
GPS	Global Positioning System
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry
JBLM	Joint Base Lewis-McChord
JBMDL	Joint Base McGuire-Dix-Lakehurst
MDC	Minimum Detectable Concentration
NRC	(U.S.) Nuclear Regulatory Commission
pCi/g	Picocuries per Gram
pCi/L	Picocuries per Liter
PTA	Pohakuloa Training Area
QA	Quality Assurance
QAP	Quality Assurance Plan
QC	Quality Control
RCA	Radiation Control Area
SML	Source Material License
TA	Training Area
TPU	Total Propagated Uncertainty
U-234	Uranium-234
U-235	Uranium-235
U-238	Uranium-238
USACE	U.S. Army Corps of Engineers
YTC	Yakima Training Center

## 1. INTRODUCTION

Environmental radiation monitoring (ERM) activities are being conducted at the following U.S. Army garrisons named in the U.S. Nuclear Regulatory Commission (NRC) source material license (SML) number SUC-1593 (ML16343A164) (NRC 2017) for the possession of M101 depleted uranium (DU) spotting rounds and fragments:

- Donnelly Training Area (TA), Fort Wainwright, Alaska
- Fort Benning, Georgia
- Fort Bragg, North Carolina
- Fort Campbell, Kentucky
- Fort Carson, Colorado
- Fort Gordon, Georgia
- Fort Hood, Texas
- Fort Hunter Liggett, California
- Fort Jackson, South Carolina
- Fort Knox, Kentucky
- Fort Polk, Louisiana
- Fort Riley, Kansas
- Fort Sill, Oklahoma
- Joint Base Lewis-McChord (JBLM), Washington
- Joint Base McGuire-Dix-Lakehurst (JBMDL), New Jersey
- Pohakuloa Training Area (PTA), Hawaii
- Schofield Barracks, Hawaii
- Yakima Training Center (YTC), Washington.

All monitoring is conducted in accordance with the approved site-specific Environmental Radiation Monitoring Plan (ERMP) and associated Quality Assurance Plan (QAP) (ML16265A221) (NRC 2016). ERM activities are conducted in response to conditions #18 and #19 in SML SUC-1593. The sampling point for PTA was adjusted to shift the sampling point within the installation boundary, as discussed in the amendment request dated 21 April 2017 (ML17118A184). In addition, Figure 1-2 in the site-specific ERMPs for Fort Polk, Fort Riley, and PTA were revised and the Army submitted an amendment request on 1 June 2017 (ML17158B356) to correct the scaling errors in the figures. The NRC issued Amendment No. 3 on 30 October 2018 (ML18242A352).

During quarterly sampling events, collocated surface water and sediment samples were collected from points downstream from the radiation control areas (RCAs) to determine if any DU is leaving the RCAs. The locations, selected for consistency with historical sampling activities, were digitized from maps included in historical reports as referenced in the site-specific ERMPs. Geographic information system (GIS) professionals converted hardcopy, scanned images into vector data by tracing the features and capturing the coordinates as points, lines, or polygons. Errors may have occurred during the digitization process and/or locations may differ due to inaccuracies in the handheld geographic positioning system (GPS) units that samplers used to navigate to the locations. Consequently, the locations where the samples were actually collected frequently varied from the locations included in the site-specific ERMPs. When samplers traveled to several locations included in the site-specific ERMPs, the points were situated in woods, fields, or other areas distant from surface water bodies. In these cases, the samplers identified alternate locations starting 2017 that were as close as possible to the originally planned locations. In other cases, the samplers may have adjusted sampling locations to avoid dangerous ingress and egress routes (e.g., steep shoreline) or to move locations closer to access roads. In all cases,

surface water and sediment samples were collected, as intended, downstream from the RCA on the same waterway as planned and within the boundary of the installation. Sections 2 through 19 describe the variances and illustrate the planned and actual sampling locations.

The radiological analysis results for uranium are used to distinguish natural uranium from DU. Natural uranium is defined by NRC as "...uranium containing the relative concentrations of isotopes found in nature (0.7 percent uranium-235 [U-235], 99.3 percent uranium-238 [U-238], and a trace amount of uranium-234 [U-234] by mass). In terms of radioactivity, however, natural uranium contains approximately 2.2 percent U-235, 48.6 percent U-238, and 49.2 percent U-234..." (NRC 2012a). U-234 and U-238 in natural uranium exhibit secular equilibrium such that they are present at approximately the same activity concentration. Secular equilibrium is disturbed by the extraction of most U-234 together with the U-235 such that the activity exhibited by DU is about 60 percent of that from natural uranium. Hence, DU is defined by NRC as "...uranium with a percentage of U-235 lower than the 0.7 percent (by mass) contained in natural uranium. (The normal residual U-235 content in depleted uranium is 0.2-0.3 percent, with U-238 comprising the remaining 98.7-98.8 percent.)..." (NRC 2012b).

The concentrations of total and isotopic uranium in surface water and sediment are presented in tables included in Sections 2 through 19. All data are reported with a maximum of two significant digits. Data uncertainties are reported with two standard deviations (95 percent confidence level). The sensitivity reflected by the minimum detectable concentration (MDC) varies across samples, since it is based on several sample-specific factors, such as sample volume, count time, detector efficiency, and sample tracer yield. The MDC is the smallest concentration of radioactivity in a sample that can be detected with a 5 percent probability of erroneously detecting radioactivity, when in fact none was present (Type I error), and a 5 percent probability of not detecting radioactivity, when in fact it is present (Type II error).

The U-238 to U-234 activity ratio and the weight percent U-235 are used to determine whether a given sample is indicative of natural, depleted, or enriched uranium. U-238/U-234 activity ratios of 3.0 or less are representative of natural uranium, whereas higher ratios are potentially indicative of DU. Activity ratios for U-238/U-234 that exceed 3.0 (including total propagated uncertainty [TPU]) determined through alpha spectrometry are investigated further to validate whether a sample result is representative of DU or natural uranium. These additional investigations of ratios exceeding 3.0 include reanalysis by inductively coupled plasma-mass spectrometry (ICP-MS) to confirm both the total mass of uranium present in the sample and the weight percent U-235. These supplemental data are used to augment U-238/U-234 activity information. Given that both natural uranium and DU are commonly present in environmental samples and that low-activity samples exhibit significant TPU, confirmation that a given sample exhibits DU is often problematic, and confirmation by a secondary analytical method is needed to determine if DU is present. Information relative to U-238/U-234 activity ratios for mixtures of depleted and natural uranium is provided in Appendix A. **None of the U-238/U-234 activity ratios for any samples collected during ERM activities at any of the garrisons listed above exceeded the threshold of 3.0;** therefore, the ICP-MS confirmatory analysis was not completed for any samples.

This report summarizes the methodology, results, and conclusions of the quarterly sampling events conducted in February/March, May/June, September, and November/December 2018. Site-specific results from the surface water and sediment sampling are presented and discussed in Sections 2 through 19. Conclusions and recommendations are summarized in Section 20. References cited are identified in Section 21. The appendices of this report include copies of field logbook pages (Appendices B through S) and the data quality assessment (DQA) (Appendix T). All data were determined to meet data quality objectives (DQOs) and criteria presented in the approved site-specific ERMP except for the results associated with a surface water sample collected at Fort Hunter Liggett during the second quarterly event. Further discussion of these results is provided in Section 9 and the DQA.

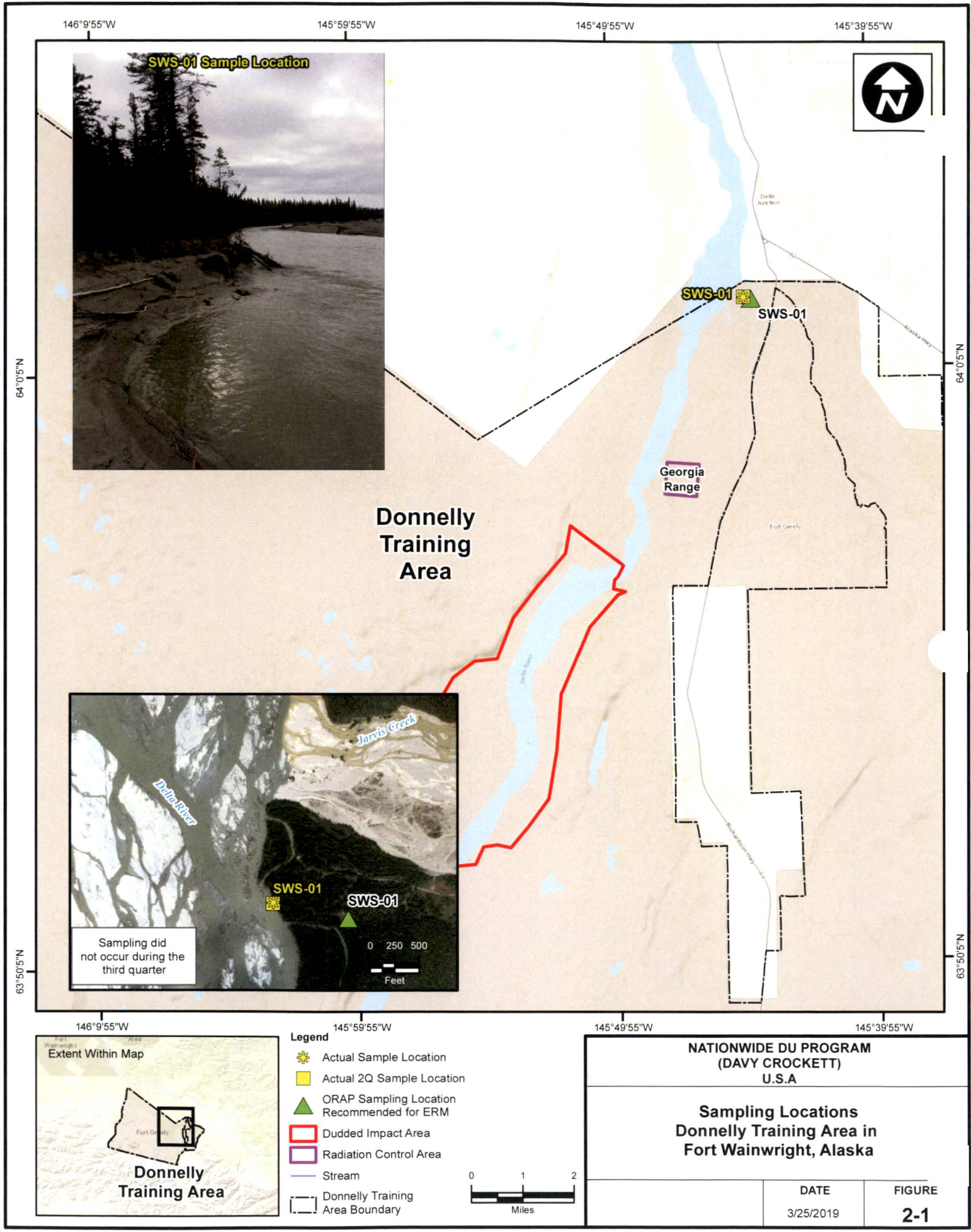
## **2. ERM RESULTS FOR DONNELLY TRAINING AREA, FORT WAINWRIGHT, ALASKA**

A field sampler under contract with the U.S. Army Corps of Engineers (USACE) prepared for and conducted sampling at the Donnelly TA in Fort Wainwright, Alaska on 5 June and 13 September 2018, in accordance with the site-specific ERMP (Annex 1). The first and fourth quarterly sampling events were canceled due to a frozen stream that prevented the collection of the samples. Except for flooding encountered during the second quarterly sampling event, no unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the second and third quarterly sampling events. Appendix B contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the second and third quarterly sampling events, collocated surface water and sediment samples were collected from a point downstream from the RCA in Donnelly TA (Figure 2-1). The planned sampling point, SWS-01, is located on the Delta River, at the installation's northern boundary and upstream of the confluence between the Delta River and Jarvis Creek. When the sampler traveled to the location included in the site-specific ERMP, the point was situated in the woods instead of within the Delta River. As a result, the sampler actually collected samples starting in 2017 from an alternate location on the shore as close as possible to the originally planned location. As shown in Figure 2-1, the surface water and sediment samples were actually collected approximately 800 feet west of the SWS-01 location shown in the site-specific ERMP. During the second quarterly sampling event, the stream stage of the Delta River was elevated, and the samples were collected in the location also shown in Figure 2-1. All future sampling will be conducted at the same location that was sampled during the 2017 and 2018 quarterly events shown in Figure 2-1 and may be modified depending on the location of the shoreline during any future flooding events.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the second and third quarters are presented in Tables 2-1 and 2-2, respectively. As stated above, samples could not be collected during the first and fourth quarters due to the frozen stream. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.





**Table 2-1. Uranium in Surface Water, Donnelly Training Area, Fort Wainwright, Alaska**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
SWS-01	6/5/2018	0.36 +/- 0.09 J	0.012 +/- 0.017 U	0.33 +/- 0.08 J	0.70 +/- 0.12	0.92 +/- 0.33
SWS-01	9/13/2018	0.50 +/- 0.15 J	0.054 +/- 0.054 J	0.44 +/- 0.14 J	0.99 +/- 0.22	0.88 +/- 0.39

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**Table 2-2. Uranium in Sediment, Donnelly Training Area, Fort Wainwright, Alaska**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
SWS-01	6/5/2018	0.63 +/- 0.12	0.026 +/- 0.029 U	0.71 +/- 0.13	1.4 +/- 0.2	1.1 +/- 0.3
SWS-01	9/13/2018	0.78 +/- 0.12	0.057 +/- 0.032 J	0.79 +/- 0.12	1.6 +/- 0.2	1.0 +/- 0.2

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

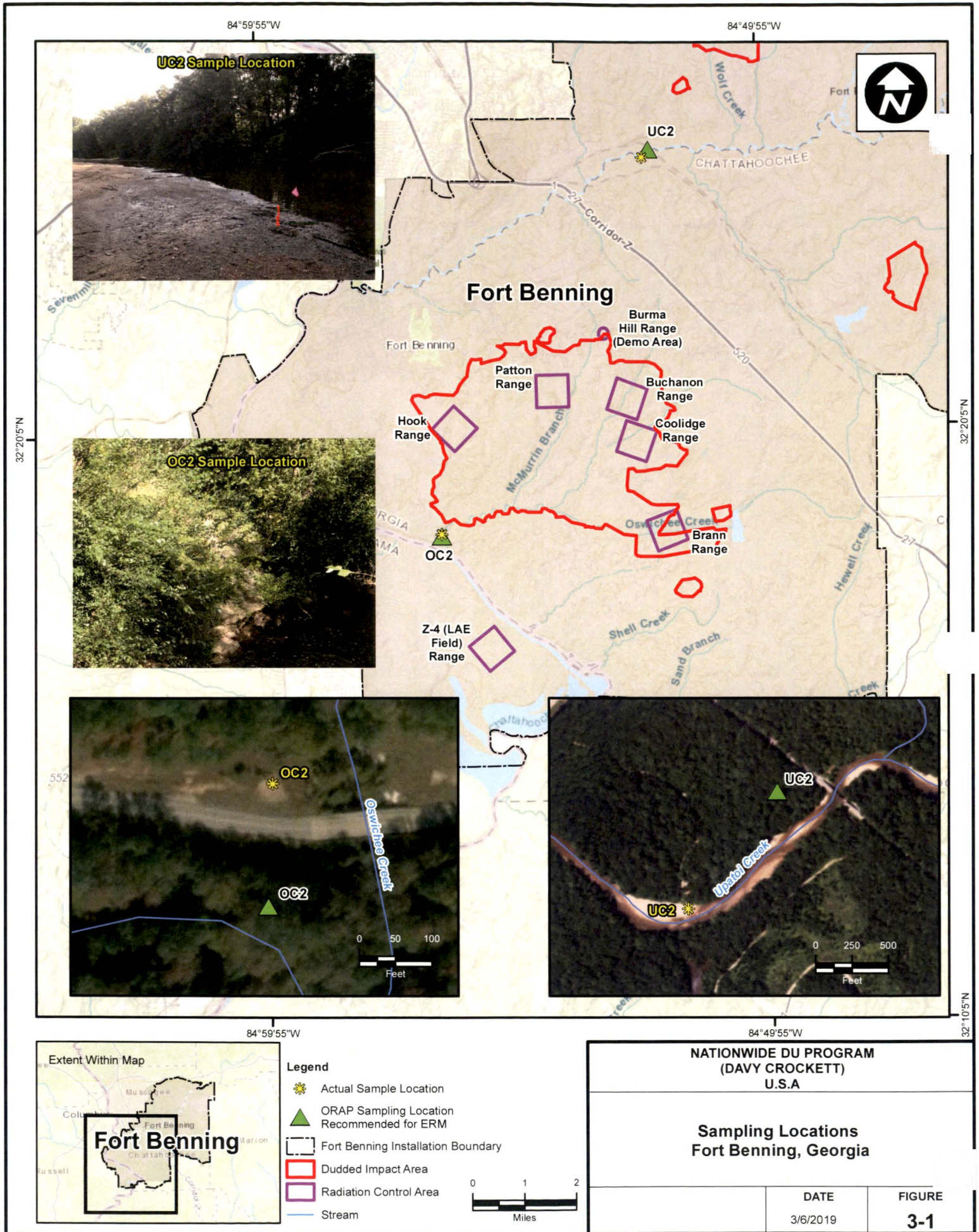
### **3. ERM RESULTS FOR FORT BENNING, GEORGIA**

A field sampler under contract with USACE prepared for and conducted sampling at Fort Benning, Georgia on 6 March, 13 June, 4 September, and 5 December 2018, in accordance with the site-specific ERMP (Annex 2). No other unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix C contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from two points downstream from the RCAs (Figure 3-1). The first sampling point, OC2, is in Upatoi Creek downstream from the RCAs located in the southern portion of the installation and in the Oswichwee Creek watershed. The second sampling point, UC2, is in Upatoi Creek downstream from the RCAs located in the northern portion of the installation and in the Upatoi Creek watershed. When the sampler traveled to the locations included in the site-specific ERMP, the points were situated in the woods instead of along the intended shorelines. As a result, the sampler actually collected samples started in 2017 from alternate locations on the shore as close as possible to the originally planned location. As shown in Figure 3-1, surface water and sediment samples were collected approximately 180 feet from the planned location for OC2, and samples were collected approximately 1,000 feet from the planned location for UC2. Future sampling will be conducted at the locations shown for sampling in Figure 3-1 and may be modified depending on the location of the shoreline during any future flooding events.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 3-1 and 3-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.







**Table 3-1. Uranium in Surface Water, Fort Benning, Georgia**

Sample Location	Date	Uranium-234 (pCi/L)				Uranium-235 (pCi/L)				Uranium-238 (pCi/L)				Total Uranium (pCi/L)			U-238/U-234 Ratio (unitless)
OC2	3/6/2018	0.0037	+/-	0.0158	U	0.0062	+/-	0.0124	U	0.019	+/-	0.023	U	0.029	+/-	0.031	ND
UC2*	3/6/2018	0.015	+/-	0.013	U	0.0017	+/-	0.007	U	0.0023	+/-	0.0098	U	0.019	+/-	0.018	ND
OC2	6/13/2018	0.064	+/-	0.043	J	0.016	+/-	0.022	U	0.013	+/-	0.018	U	0.093	+/-	0.052	ND
UC2*	6/13/2018	0.037	+/-	0.023	UJ	0.0011	+/-	0.01	U	0.033	+/-	0.019	UJ	0.071	+/-	0.032	ND
OC2	9/4/2018	0.030	+/-	0.05	U	-0.0071	+/-	0.0141	U	0.041	+/-	0.047	J	0.064	+/-	0.07	ND
UC2*	9/4/2018	0.076	+/-	0.044	UJ	0.012	+/-	0.019	U	0.038	+/-	0.029	J	0.13	+/-	0.06	ND
OC2	12/5/2018	0.060	+/-	0.06	U	-0.010	+/-	0.01	U	-0.011	+/-	0.027	U	ND			ND
UC2*	12/5/2018	0.083	+/-	0.049	UJ	0.0013	+/-	0.0148	U	0.010	+/-	0.018	U	0.094	+/-	0.054	ND

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

\* – Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 3-2. Uranium in Sediment, Fort Benning, Georgia**

Sample Location	Date	Uranium-234 (pCi/g)				Uranium-235 (pCi/g)				Uranium-238 (pCi/g)				Total Uranium (pCi/g)		U-238/U-234 Ratio (unitless)			
OC2	3/6/2018	0.12	+/-	0.05	J	0.00	+/-	0	U	0.14	+/-	0.05	J	0.26	+/-	0.07	1.2	+/-	0.7
UC2*	3/6/2018	0.13	+/-	0.04	J	-0.00032	+/-	0.01197	U	0.10	+/-	0.04	J	0.23	+/-	0.06	0.77	+/-	0.37
OC2	6/13/2018	0.40	+/-	0.09	J	0.024	+/-	0.024	J	0.43	+/-	0.1	J	0.85	+/-	0.14	1.1	+/-	0.4
UC2*	6/13/2018	0.27	+/-	0.05	J	0.014	+/-	0.015	UJ	0.22	+/-	0.05	J	0.50	+/-	0.07	0.81	+/-	0.24
OC2	9/4/2018	0.21	+/-	0.07	J	0.0022	+/-	0.0212	U	0.17	+/-	0.06	J	0.38	+/-	0.1	0.81	+/-	0.41
UC2*	9/4/2018	0.21	+/-	0.05	J	0.018	+/-	0.015	UJ	0.21	+/-	0.05	J	0.44	+/-	0.07	1.0	+/-	0.3
OC2	12/5/2018	0.13	+/-	0.05	J	0.0061	+/-	0.0121	U	0.12	+/-	0.05	J	0.26	+/-	0.07	0.92	+/-	0.53
UC2*	12/5/2018	0.27	+/-	0.06		0.016	+/-	0.015	U	0.28	+/-	0.05		0.57	+/-	0.08	1.0	+/-	0.3

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

\* – Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

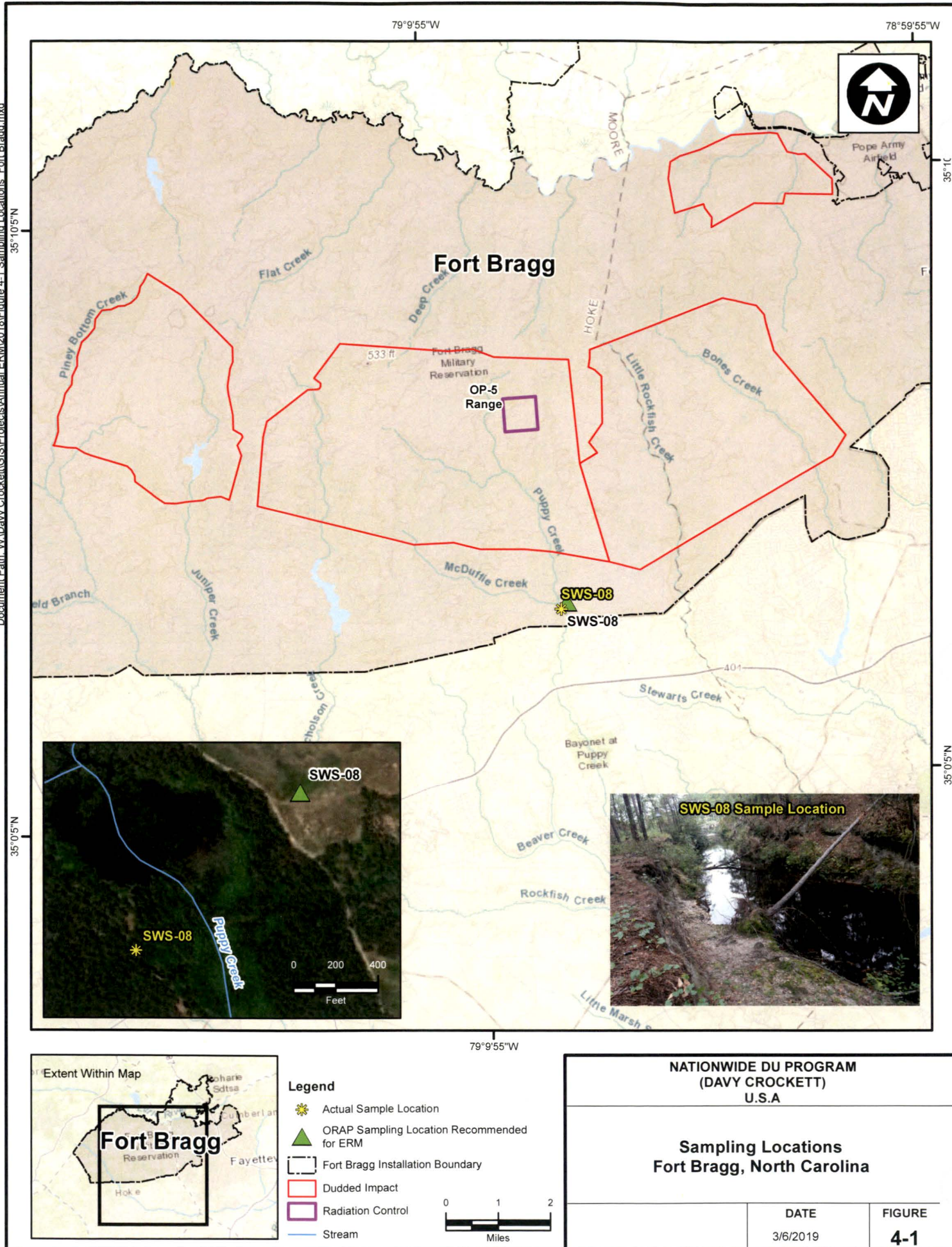
#### **4. ERM RESULTS FOR FORT BRAGG, NORTH CAROLINA**

A field sampler under contract with USACE prepared for and conducted sampling at Fort Bragg, North Carolina on 5 April, 7 June, 12 September, and 12 December 2018, in accordance with the site-specific ERMP (Annex 3). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix D contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, one collocated surface water and sediment sample was collected downstream from the RCA (Figure 4-1). The planned sampling point, SWS-08, is located on Puppy Creek. When the sampler traveled to the location included in the site-specific ERMP, the location was situated in an open field distant from Puppy Creek. As a result, the sampler actually collected samples starting in 2017 from an alternate location on the shore as close as possible to the originally planned location. As shown in Figure 4-1, surface water and sediment samples were collected approximately 1,000 feet from the planned location for SWS-08. All future sampling will be conducted at the same location that was sampled during the 2017 and 2018 quarterly events shown in Figure 4-1.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 4-1 and 4-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.





**Table 4-1. Uranium in Surface Water, Fort Bragg, North Carolina**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
SWS-08	4/5/2018	0.34 +/- 0.13 J	0.035 +/- 0.049 U	0.028 +/- 0.039 U	0.40 +/- 0.14	ND
SWS-08	6/7/2018	0.097 +/- 0.078 U	0.024 +/- 0.034 U	0.058 +/- 0.055 U	0.18 +/- 0.1	ND
SWS-08	9/12/2018	0.054 +/- 0.078 U	0.027 +/- 0.076 U	0.011 +/- 0.064 U	ND	ND
SWS-08	12/12/2018	0.063 +/- 0.039 J	0.016 +/- 0.023 U	0.0042 +/- 0.0252 U	0.083 +/- 0.052	ND

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 4-2. Uranium in Sediment, Fort Bragg, North Carolina**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
SWS-08	4/5/2018	0.69 +/- 0.12	0.051 +/- 0.033 J	0.53 +/- 0.1	1.3 +/- 0.2	0.77 +/- 0.2
SWS-08	6/7/2018	0.68 +/- 0.12	0.0089 +/- 0.0166 U	0.59 +/- 0.11 J	1.3 +/- 0.2	0.87 +/- 0.23
SWS-08	9/12/2018	0.69 +/- 0.12	0.0091 +/- 0.018 U	0.48 +/- 0.09	1.2 +/- 0.2	0.70 +/- 0.18
SWS-08	12/12/2018	1.2 +/- 0.2	0.033 +/- 0.03 J	1.1 +/- 0.2	2.3 +/- 0.3	0.92 +/- 0.21

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

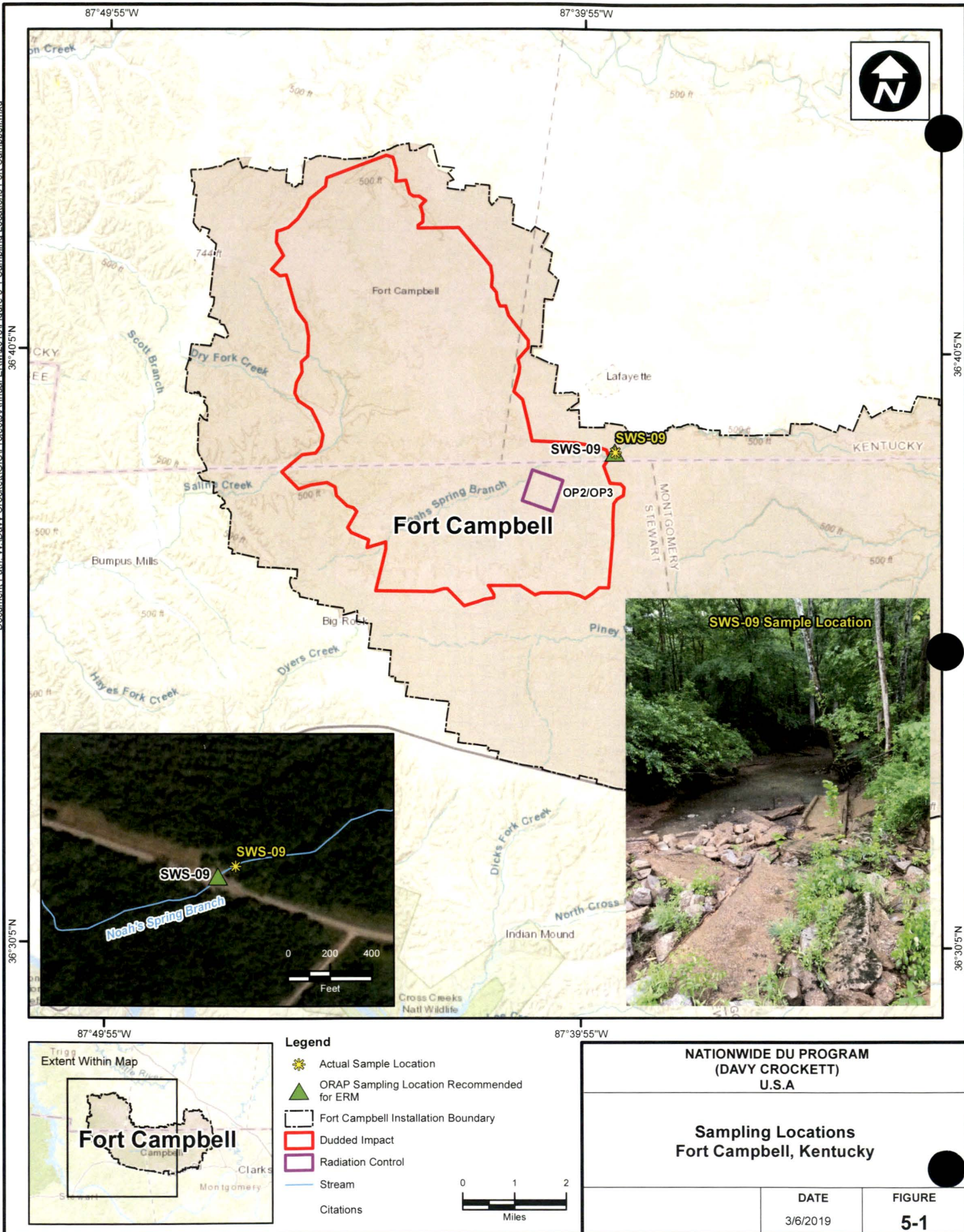
## **5. ERM RESULTS FOR FORT CAMPBELL, KENTUCKY**

A field sampler under contract with USACE prepared for and conducted sampling at Fort Campbell, Kentucky on 7 March, 31 May, 12 September, and 28 November 2018, in accordance with the site-specific ERMP (Annex 4). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix E contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from one point downstream from the RCA (Figure 5-1). The planned sampling point, SWS-09, was located in Noah's Spring Branch along the installation's northern boundary. When the sampler traveled to the location included in the site-specific ERMP, the point was situated in the roadway. As a result, the sampler actually collected samples starting in 2017 from an alternate location as close as possible to the originally planned location on Noah's Spring Branch. As shown in Figure 5-1, surface water and sediment samples were collected approximately 100 feet from the planned location for SWS-09. All future sampling will be conducted at the same location that was sampled during the 2017 and 2018 quarterly events shown in Figure 5-1.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 5-1 and 5-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.







**Table 5-1. Uranium in Surface Water, Fort Campbell, Kentucky**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
SWS-09	3/7/2018	0.038 +/- 0.027 J	-0.019 +/- 0.02 U	0.0023 +/- 0.0189 U	0.021 +/- 0.038	ND
SWS-09	5/31/2018	0.054 +/- 0.038 J	0.00 +/- 0 U	0.034 +/- 0.028 J	0.088 +/- 0.047	0.63 +/- 0.68
SWS-09	9/12/2018	0.055 +/- 0.044 U	0.016 +/- 0.018 J	0.021 +/- 0.028 U	0.092 +/- 0.056	ND
SWS-09	11/28/2018	0.15 +/- 0.08 J	0.00 +/- 0 U	0.11 +/- 0.07 J	0.26 +/- 0.11	0.73 +/- 0.63

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 5-2. Uranium in Sediment, Fort Campbell, Kentucky**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
SWS-09	3/7/2018	0.69 +/- 0.12	0.054 +/- 0.035 J	0.78 +/- 0.14	1.5 +/- 0.2	1.1 +/- 0.3
SWS-09	5/31/2018	0.76 +/- 0.14	0.047 +/- 0.036 J	0.72 +/- 0.14	1.5 +/- 0.2	0.95 +/- 0.26
SWS-09	9/12/2018	0.84 +/- 0.13	0.041 +/- 0.028 J	0.83 +/- 0.13	1.7 +/- 0.2	0.99 +/- 0.21
SWS-09	11/28/2018	0.92 +/- 0.15	0.057 +/- 0.038 J	0.80 +/- 0.14	1.8 +/- 0.2	0.87 +/- 0.21

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

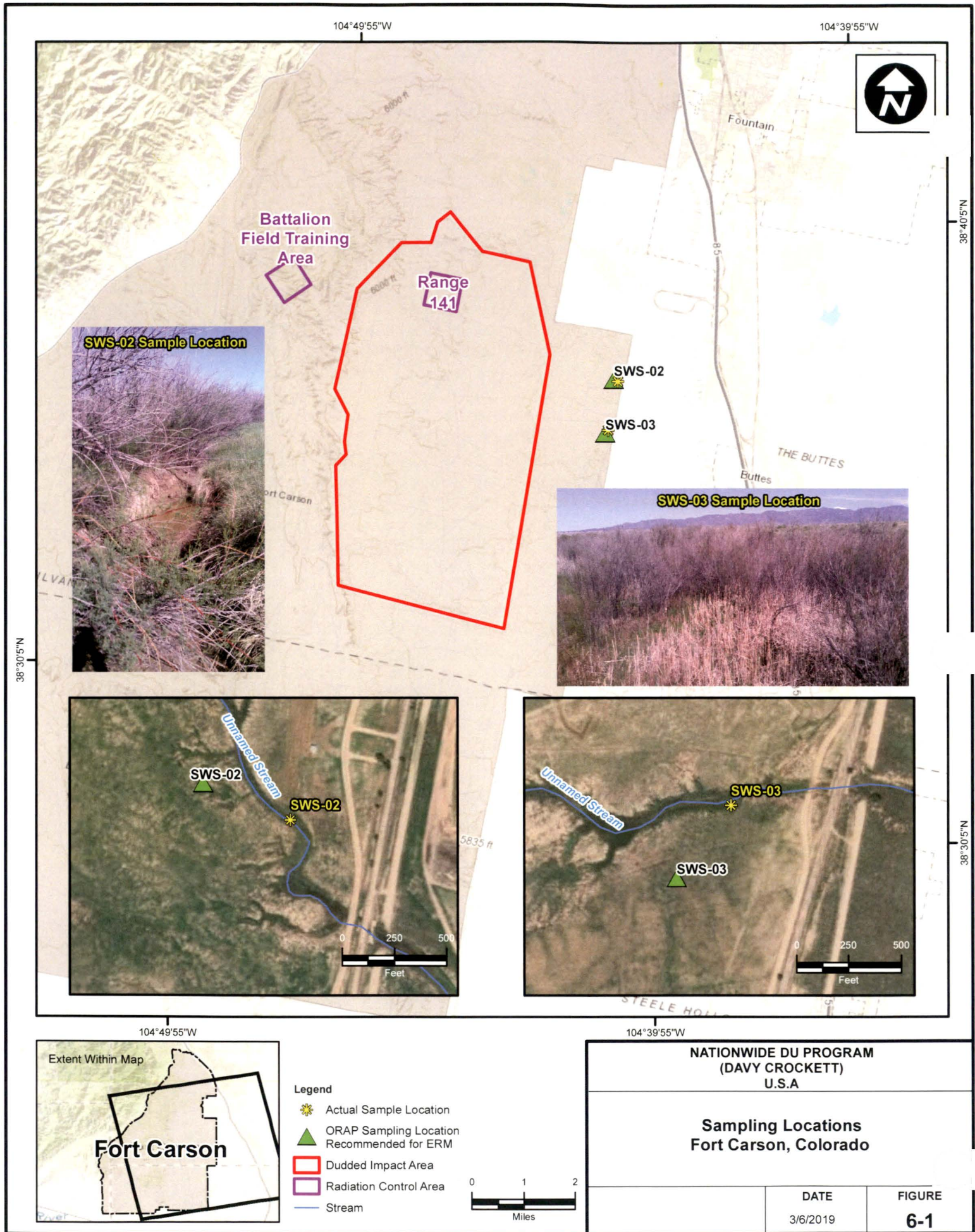
## 6. ERM RESULTS FOR FORT CARSON, COLORADO

A field sampler under contract with USACE prepared for and conducted sampling at Fort Carson, Colorado on 15 March, 24 May, 4 September, and 28 November 2018, in accordance with the site-specific ERMP (Annex 5). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix F contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from two points downstream from the RCAs (Figure 6-1). The first sampling point, SWS-02, is located on the Sand Canyon at the installation's eastern boundary and upstream of the confluence between the Sand Canyon and Fountain Creek. The second sampling point, SWS-03, is located on the unnamed creek, at the installation's eastern boundary and upstream of the confluence between the unnamed creek and Fountain Creek. When the sampler traveled to the locations included in the site-specific ERMP, the points were situated in the brush-covered fields instead of within the unnamed stream. As a result, the sampler actually collected samples starting in 2017 from alternate locations on the shore as close as possible to the originally planned locations but at locations that were closer to access roads. As shown in Figure 6-1, surface water and sediment samples were collected approximately 600 feet from the planned location for SWS-02 and by approximately 500 feet for SWS-03. No surface water was present at SWS-02 during the March, May, and November sampling events; however, surface water was present at SWS-02 during the September sampling event. All future sampling will be conducted at the same locations that were sampled during the 2017 and 2018 quarterly events shown in Figure 6-1.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 6-1 and 6-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.







**Table 6-1. Uranium in Surface Water, Fort Carson, Colorado**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
SWS-02	3/15/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---
SWS-03	3/15/2018	16 +/- 1.48	0.52 +/- 0.15 J	11 +/- 1.09	28 +/- 1.84	0.69 +/- 0.09
SWS-02	5/24/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---
SWS-03	5/24/2018	7.8 +/- 0.9	0.28 +/- 0.12 J	4.9 +/- 0.6	13 +/- 1.05	0.63 +/- 0.1
SWS-02	9/4/2018	27 +/- 2.49	0.86 +/- 0.22 J	18 +/- 1.7	46 +/- 3.02	0.67 +/- 0.09
SWS-03	9/4/2018	9.0 +/- 1	0.33 +/- 0.14 J	6.1 +/- 0.7	15 +/- 1.23	0.68 +/- 0.11
SWS-02	11/28/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---
SWS-03	11/28/2018	8.6 +/- 0.9	0.30 +/- 0.13 J	5.6 +/- 0.7	15 +/- 1.17	0.65 +/- 0.11

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/- --- – Indicates a surface water sample was not collected because water was not present during sampling.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

**Table 6-2. Uranium in Sediment, Fort Carson, Colorado**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
SWS-02	3/15/2018	1.0 +/- 0.2	0.072 +/- 0.042 J	0.97 +/- 0.16	2.0 +/- 0.2	0.97 +/- 0.22
SWS-03	3/15/2018	1.9 +/- 0.2	0.14 +/- 0.06 J	1.7 +/- 0.2	3.7 +/- 0.3	0.89 +/- 0.17
SWS-02	5/24/2018	0.83 +/- 0.15	0.074 +/- 0.045 J	0.86 +/- 0.16	1.8 +/- 0.2	1.0 +/- 0.3
SWS-03	5/24/2018	2.3 +/- 0.3	0.11 +/- 0.06 J	2.0 +/- 0.3	4.4 +/- 0.4	0.87 +/- 0.16
SWS-02	9/4/2018	0.99 +/- 0.16	0.043 +/- 0.035 J	0.81 +/- 0.14	1.8 +/- 0.2	0.82 +/- 0.19
SWS-03	9/4/2018	1.6 +/- 0.2	0.095 +/- 0.053 J	1.5 +/- 0.2	3.2 +/- 0.3	0.94 +/- 0.19
SWS-02	11/28/2018	0.94 +/- 0.15	0.041 +/- 0.03 J	0.84 +/- 0.14	1.8 +/- 0.2	0.89 +/- 0.2
SWS-03	11/28/2018	2.0 +/- 0.3	0.075 +/- 0.042 J	1.8 +/- 0.2	3.9 +/- 0.3	0.90 +/- 0.16

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

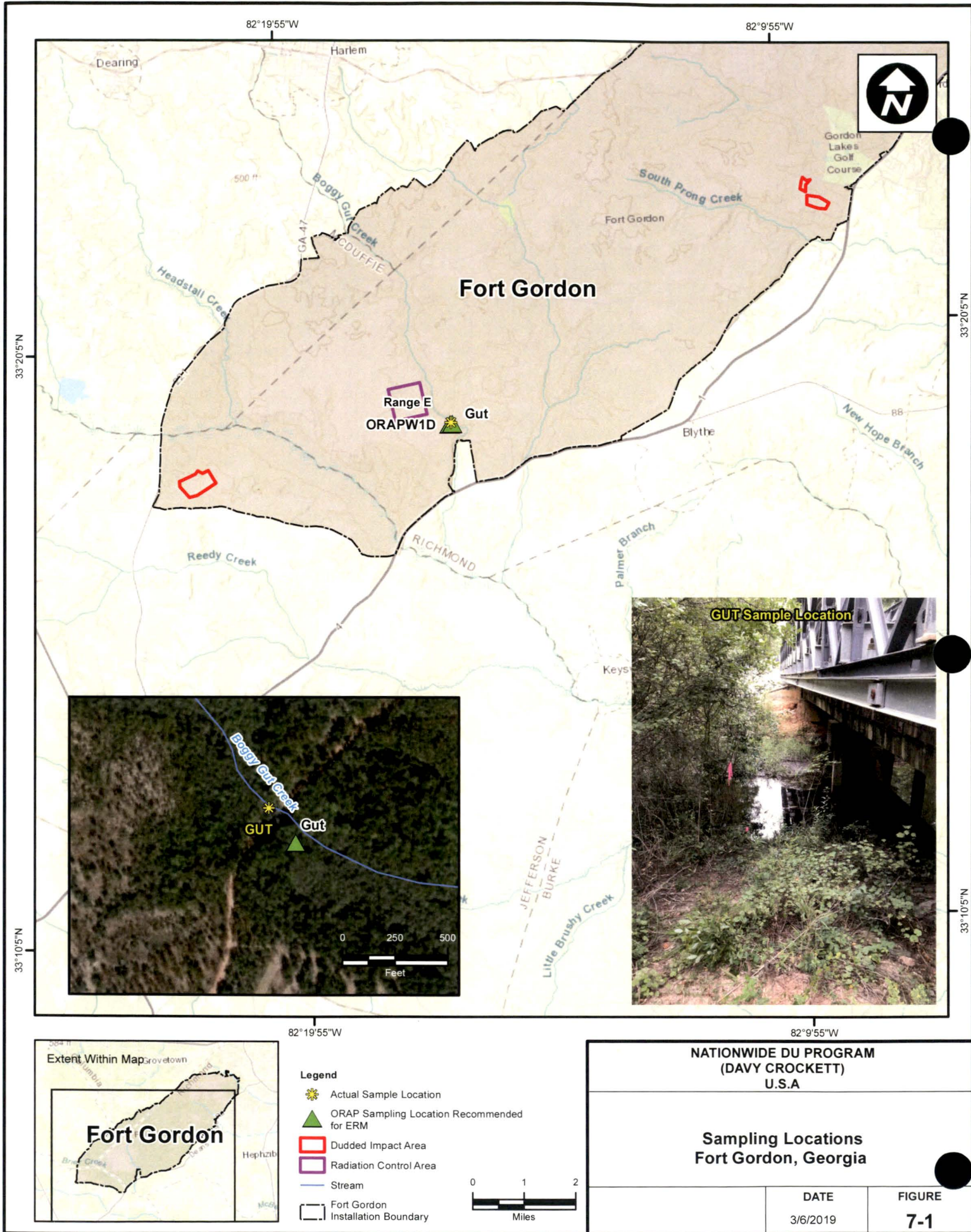
## **7. ERM RESULTS FOR FORT GORDON, GEORGIA**

A field sampler under contract with USACE prepared for and conducted sampling at Fort Gordon, Georgia on 7 March, 12 June, 5 September, and 4 December 2018, in accordance with the site-specific ERMP (Annex 6). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix G contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from one point downstream from the RCA (Figure 7-1). The sampling point, Gut, is located on the Boggy Gut Creek near the installation's southeastern boundary. The entire RCA is located within the Boggy Gut Creek watershed. When the sampler traveled to the location included in the site-specific ERMP, the point was situated in the woods instead of within Boggy Gut Creek. As a result, the sampler actually collected samples starting in 2017 from an alternate location on the shore as close as possible to the originally planned location but at a location that was closer to the access road. As shown in Figure 7-1, surface water and sediment samples were collected approximately 100 to 200 feet from the planned location for Gut. All future sampling will be conducted at the same location that was sampled during the 2017 and 2018 quarterly events shown in Figure 7-1.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 7-1 and 7-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.





**Table 7-1. Uranium in Surface Water, Fort Gordon, Georgia**

Sample Location	Date	Uranium-234 (pCi/L)				Uranium-235 (pCi/L)				Uranium-238 (pCi/L)				Total Uranium (pCi/L)				U-238/U-234 Ratio (unitless)
Gut	3/7/2018	0.018	+/-	0.023	U	0.0041	+/-	0.0151	U	0.023	+/-	0.026	U	0.045	+/-	0.038		ND
Gut	6/12/2018	0.12	+/-	0.05	J	0.0035	+/-	0.0131	U	0.017	+/-	0.02	U	0.14	+/-	0.06		ND
Gut	9/5/2018	0.050	+/-	0.05	U	0.0080	+/-	0.0296	U	0.061	+/-	0.055	J	0.12	+/-	0.08		ND
Gut	12/4/2018	0.057	+/-	0.058	U	0.0020	+/-	0.0278	U	0.040	+/-	0.045	U	0.099	+/-	0.078		ND

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 7-2. Uranium in Sediment, Fort Gordon, Georgia**

Sample Location	Date	Uranium-234 (pCi/g)				Uranium-235 (pCi/g)				Uranium-238 (pCi/g)				Total Uranium (pCi/g)				U-238/U-234 Ratio (unitless)
Gut	3/7/2018	0.43	+/-	0.1	J	0.0034	+/-	0.0128	U	0.32	+/-	0.08	J	0.75	+/-	0.13		0.74 +/- 0.26
Gut	6/12/2018	0.46	+/-	0.1	J	0.033	+/-	0.032	U	0.56	+/-	0.12	J	1.1	+/-	0.2		1.2 +/- 0.4
Gut	9/5/2018	0.24	+/-	0.07	J	0.013	+/-	0.023	U	0.20	+/-	0.07	J	0.45	+/-	0.1		0.83 +/- 0.37
Gut	12/4/2018	0.19	+/-	0.06	J	0.016	+/-	0.019	J	0.19	+/-	0.06	J	0.40	+/-	0.09		1.0 +/- 0.4

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**



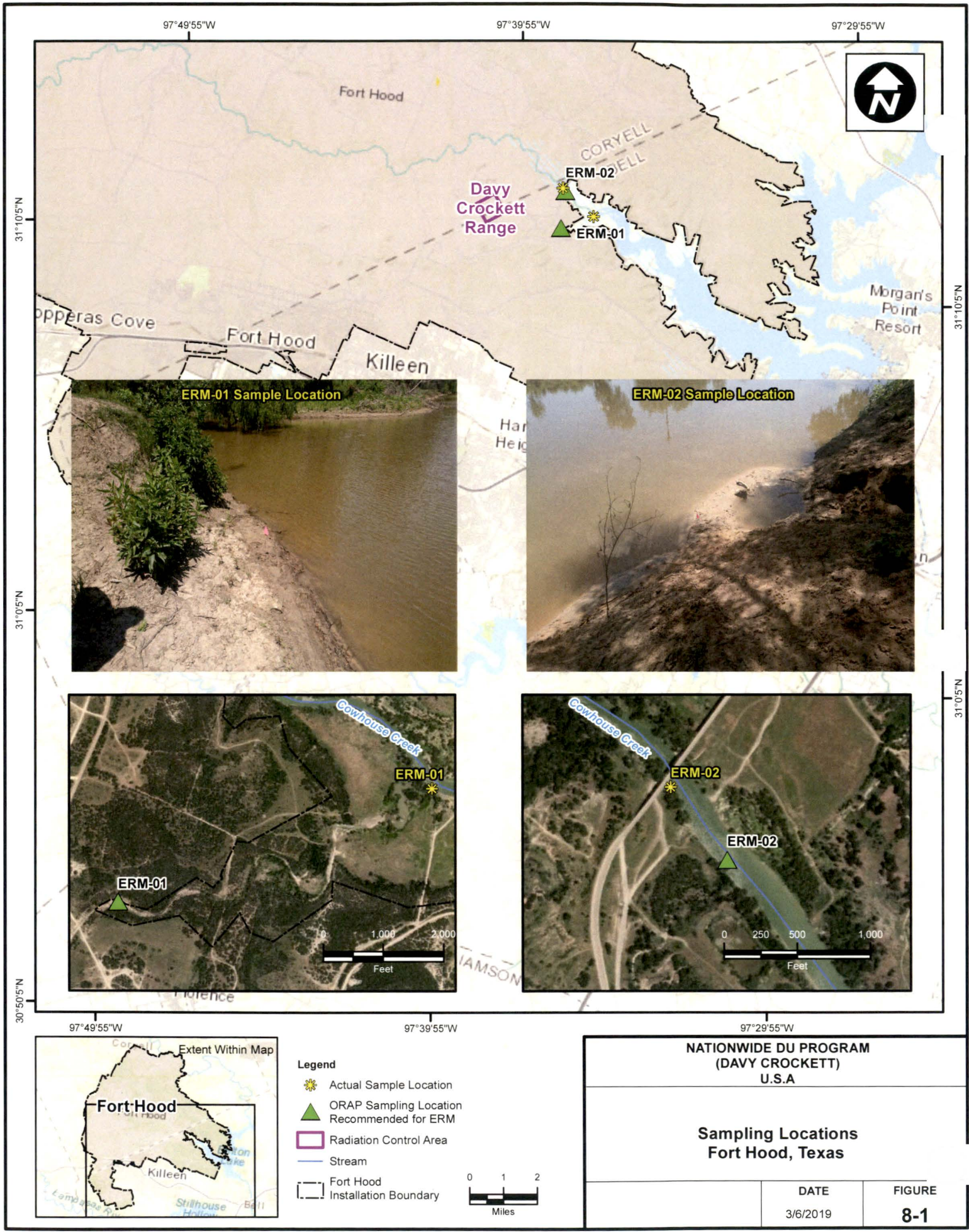
## 8. ERM RESULTS FOR FORT HOOD, TEXAS

A field sampler under contract with USACE prepared for and conducted sampling at Fort Hood, Texas on 27 March, 11 June, 4 September, and 18 December 2018, in accordance with the site-specific ERMP (Annex 7). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix H contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from two points downstream from the RCA (Figure 8-1). The first sampling point, ERM-01, is located on the Oak Branch at the installation boundary. The second sampling point, ERM-02, is located on Cowhouse Creek at the installation boundary. These locations were selected based on the surface hydrology and potential for DU contribution. When the sampler traveled to the ERM-01 location included in the site-specific ERMP, the point was situated in an upland area away from water bodies. As a result, the sampler actually collected samples starting in 2017 from an alternate location on Cowhouse Creek as close as possible to the originally planned location. For location ERM-02, the sampler adjusted the location for sampling to be situated closer to the access road. As shown in Figure 8-1, surface water and sediment samples were collected approximately 5,500 feet from the planned location for ERM-01 and by approximately 630 feet for ERM-02. All future sampling will be conducted at the same locations that were sampled during the 2017 and 2018 quarterly events shown in Figure 8-1.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 8-1 and 8-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.







**Table 8-1. Uranium in Surface Water, Fort Hood, Texas**

Sample Location	Date	Uranium-234 (pCi/L)				Uranium-235 (pCi/L)				Uranium-238 (pCi/L)				Total Uranium (pCi/L)				U-238/U-234 Ratio (unitless)			
ERM-01	3/27/2018	0.29	+/-	0.09	J	0.0040	+/-	0.015	U	0.29	+/-	0.08	J	0.58	+/-	0.12		1.0	+/-	0.4	
ERM-02	3/27/2018	0.31	+/-	0.09	J	0.015	+/-	0.021	U	0.20	+/-	0.07	J	0.53	+/-	0.12		0.65	+/-	0.31	
ERM-01	6/11/2018	0.69	+/-	0.16	J	0.047	+/-	0.05	U	0.23	+/-	0.09	J	0.97	+/-	0.19		0.33	+/-	0.15	
ERM-02	6/11/2018	0.13	+/-	0.07	J	0.00	+/-	0	U	0.15	+/-	0.08	J	0.28	+/-	0.11		1.2	+/-	0.9	
ERM-01	9/4/2018	0.16	+/-	0.09	J	0.013	+/-	0.026	U	0.18	+/-	0.09	J	0.35	+/-	0.13		1.1	+/-	0.8	
ERM-02	9/4/2018	0.33	+/-	0.14	J	0.0027	+/-	0.05	U	0.22	+/-	0.11	J	0.58	+/-	0.18		0.67	+/-	0.44	
ERM-01	12/18/2018	0.58	+/-	0.17	J	0.013	+/-	0.026	U	0.48	+/-	0.15	J	1.1	+/-	0.2		0.83	+/-	0.35	
ERM-02	12/18/2018	1.0	+/-	0.2	J	0.027	+/-	0.038	U	0.57	+/-	0.17	J	1.6	+/-	0.3		0.57	+/-	0.21	

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**Table 8-2. Uranium in Sediment, Fort Hood, Texas**

Sample Location	Date	Uranium-234 (pCi/g)				Uranium-235 (pCi/g)				Uranium-238 (pCi/g)				Total Uranium (pCi/g)				U-238/U-234 Ratio (unitless)			
ERM-01	3/27/2018	0.43	+/-	0.1	J	0.025	+/-	0.025	J	0.50	+/-	0.11	J	0.96	+/-	0.15		1.2	+/-	0.4	
ERM-02	3/27/2018	0.48	+/-	0.1	J	0.017	+/-	0.02	J	0.43	+/-	0.1	J	0.93	+/-	0.14		0.90	+/-	0.28	
ERM-01	6/11/2018	0.47	+/-	0.1	J	0.0034	+/-	0.0126	U	0.49	+/-	0.1	J	0.96	+/-	0.15		1.0	+/-	0.3	
ERM-02	6/11/2017	0.47	+/-	0.1	J	0.015	+/-	0.021	U	0.46	+/-	0.1	J	0.95	+/-	0.15		0.98	+/-	0.3	
ERM-01	9/4/2018	0.37	+/-	0.09	J	0.030	+/-	0.032	U	0.49	+/-	0.11	J	0.89	+/-	0.15		1.3	+/-	0.4	
ERM-02	9/4/2018	0.42	+/-	0.1	J	0.029	+/-	0.026	J	0.44	+/-	0.1	J	0.89	+/-	0.14		1.0	+/-	0.3	
ERM-01	12/18/2018	0.40	+/-	0.09	J	0.012	+/-	0.021	U	0.50	+/-	0.1	J	0.91	+/-	0.14		1.3	+/-	0.4	
ERM-02	12/18/2018	0.40	+/-	0.09	J	0.045	+/-	0.038	U	0.31	+/-	0.08	J	0.76	+/-	0.13		0.78	+/-	0.28	

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

## 9. ERM RESULTS FOR FORT HUNTER LIGGETT, CALIFORNIA

A field sampler under contract with USACE prepared for and conducted sampling at Fort Hunter Liggett, California on 6 March, 7 June, 4 September, and 20 November 2018, in accordance with the site-specific ERMP (Annex 8). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix I contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events in 2018, collocated surface water and sediment samples were collected downstream from the RCAs (Figure 9-1). The planned sampling point, SWS-06, is located on the Nacimienta River before surface water exits the installation boundary, above the Nacimienta Reservoir. During the first quarterly sampling event in 2017, the planned location for SWS-06 was inaccessible due to limited roadways and steep terrain. The surface water and sediment samples were collected from an alternate point as close as possible to the original location that could be reached safely, but the location was situated beyond Fort Hunter Liggett property boundary.

Prior to the second quarterly sampling event in 2017, the surface water hydrology and potential for DU contribution from the RCAs was re-evaluated. Two new sampling points, ERM-01 and ERM-02, were selected. Both selected locations are located on the appropriate waterways prior to the surface water exiting the installation. During the second and third quarterly sampling events in 2017 and all four of the quarterly events in 2018, samples were collected from two points downstream from the RCAs (Figure 9-1). The first sampling point, ERM-01, is located on the Nacimienta River before surface water exits the installation boundary, upstream of the planned location SWS-06. The second sampling point, ERM-02, is located on El Piojo Creek at the installation boundary. Coordinates of these locations were documented by the field sampler during each quarterly sampling event. Surface water was present at both locations during the March and June sampling events, but no surface water was present at either location during the September or November sampling events. All future sampling will be conducted at the same locations that were sampled during the 2018 quarterly events shown in Figure 9-1.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 9-1 and 9-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed. Note that the U-234, U-235, and/or U-238 radiochemical results associated with the surface water sample collected during the second quarter at ERM-02 were qualified as unusable due to the tracer recoveries below 10 percent.

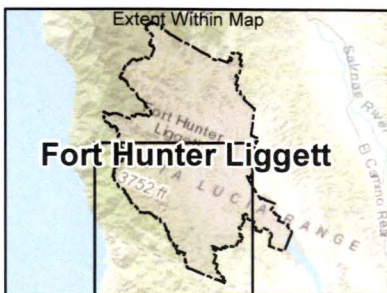
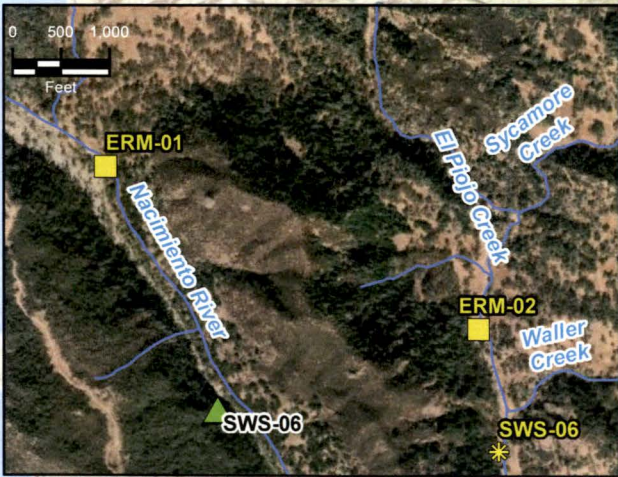


121°19'55"W

121°9'55"W

35°50'5"N

35°50'5"N



**Legend**

- 2017 1Q Sample Location
- Actual Sample Location
- ORAP Sampling Location Recommended for ERM
- Radiation Control Area
- Stream
- Fort Hunter Liggett Installation Boundary



**NATIONWIDE DU PROGRAM  
(DAVY CROCKETT)  
U.S.A**

**Sampling Locations  
Fort Hunter Liggett, California**

**DATE**  
3/6/2019

**FIGURE**  
**9-1**



**Table 9-1. Uranium in Surface Water, Fort Hunter Liggett, California**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
ERM-01	3/6/2018	0.084 +/- 0.044 J	0.0089 +/- 0.0166 U	0.032 +/- 0.03 U	0.12 +/- 0.06	ND
ERM-02	3/6/2018	0.84 +/- 0.15	0.037 +/- 0.038 U	0.69 +/- 0.13	0.16 +/- 0.2	0.82 +/- 0.21
ERM-01	6/7/2018	0.26 +/- 0.15 J	0.017 +/- 0.035 U	0.083 +/- 0.079 U	0.36 +/- 0.17	ND
ERM-02	6/7/2018	--- +/- --- R	--- +/- --- R	--- +/- --- R	--- +/- ---	--- +/- ---
ERM-01	9/4/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---
ERM-02	9/4/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---
ERM-01	11/20/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---
ERM-02	11/20/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/---- – Indicates surface water sample was not collected because water was not present during sampling.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

R – Indicates the analyte value reported is unusable. The U-234, U-235, and U-238 results for ERM-02 were reported as 0.58 +/- 0.54 pCi/L, 0.00 +/- 0.1 pCi/L, and 0.97 +/- 0.62 pCi/L, respectively.

**Table 9-2. Uranium in Sediment, Fort Hunter Liggett, California**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
ERM-01	3/6/2018	0.43 +/- 0.1 J	0.024 +/- 0.024 J	0.42 +/- 0.1 J	0.87 +/- 0.14	0.98 +/- 0.32
ERM-02	3/6/2018	0.54 +/- 0.12 J	0.042 +/- 0.034 J	0.52 +/- 0.12 J	1.1 +/- 0.2	0.96 +/- 0.31
ERM-01	6/7/2018	0.65 +/- 0.13	0.016 +/- 0.025 U	0.56 +/- 0.11 J	1.2 +/- 0.2	0.86 +/- 0.24
ERM-02	6/7/2018	0.44 +/- 0.1 J	0.028 +/- 0.025 J	0.39 +/- 0.09 J	0.86 +/- 0.14	0.89 +/- 0.28
ERM-01	9/4/2018	0.46 +/- 0.1 J	0.024 +/- 0.024 J	0.54 +/- 0.11 J	1.0 +/- 0.2	1.2 +/- 0.4
ERM-02	9/4/2018	0.97 +/- 0.17	0.035 +/- 0.034 U	0.77 +/- 0.15	1.8 +/- 0.2	0.79 +/- 0.2
ERM-01	11/20/2018	0.45 +/- 0.11 J	0.027 +/- 0.03 U	0.36 +/- 0.1 J	0.84 +/- 0.15	0.80 +/- 0.28
ERM-02	11/20/2018	0.25 +/- 0.08 J	0.028 +/- 0.031 U	0.36 +/- 0.09 J	0.64 +/- 0.13	1.4 +/- 0.6

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

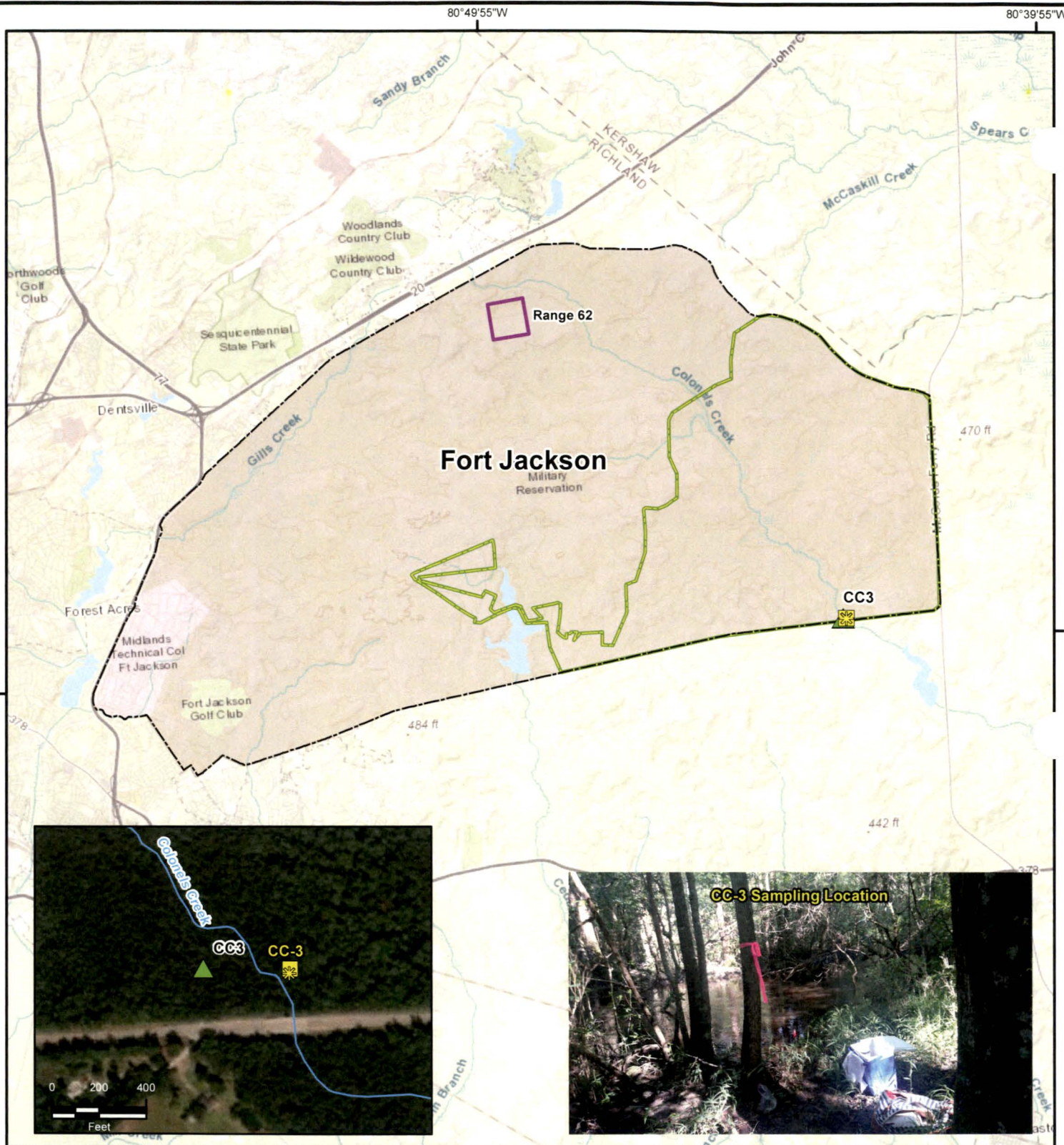
## 10. ERM RESULTS FOR FORT JACKSON, SOUTH CAROLINA

A field sampler under contract with USACE prepared for and conducted sampling at Fort Jackson, South Carolina on 3 April, 5 June, 11 September, and 11 December 2018, in accordance with the site-specific ERMP (Annex 9). Except for flooding encountered during the fourth quarterly sampling event, no unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix J contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from one point downstream from the RCA (Figure 10-1). The planned sampling point, CC3, is located on Colonels Creek southeast of the RCA. When the sampler traveled to the location included in the site-specific ERMP, the point was situated in the woods instead of within Colonels Creek. As a result, the sampler actually collected samples starting in 2017 from an alternate location on the shore as close as possible to the originally planned location. As shown in Figure 10-1, surface water and sediment samples were collected approximately 300 feet from the planned location for CC3. During the fourth quarterly sampling event, the stream stage of Colonels Creek was elevated and the samples were collected in the location also shown in Figure 10-1. All future sampling will be conducted at the same location that was sampled during the 2017 and 2018 quarterly events shown in Figure 10-1 and may be modified depending on the location of the shoreline during any future flooding events.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 10-1 and 10-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.

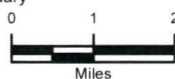




#### Legend

- Actual 1Q/2Q/3Q Sample Location
- Actual 4Q Sample Location
- ORAP Sampling Location Recommended for ERM
- Streams
- McCrady Training Center
- Fort Jackson Installation Boundary
- Radiation Control

80°49'55\"/>



**NATIONWIDE DU PROGRAM  
(DAVY CROCKETT)  
U.S.A**

### Sampling Locations Fort Jackson, South Carolina

**DATE**  
3/6/2019

**FIGURE**  
**10-1**



**Table 10-1. Uranium in Surface Water, Fort Jackson, South Carolina**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
CC-3	4/3/2018	0.031 +/- 0.045 U	-0.0048 +/- 0.0096 U	0.0093 +/- 0.0187 U	ND	ND
CC-3	6/5/2018	0.077 +/- 0.04 J	0.0062 +/- 0.0124 U	0.030 +/- 0.024 J	0.11 +/- 0.05	0.39 +/- 0.38
CC-3	9/11/2018	0.027 +/- 0.066 U	0.011 +/- 0.023 U	0.00 +/- 0 U	ND	ND
CC-3	12/11/2018	0.072 +/- 0.052 U	0.0052 +/- 0.0314 U	0.034 +/- 0.04 U	0.11 +/- 0.07	ND

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 10-2. Uranium in Sediment, Fort Jackson, South Carolina**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
CC-3	4/3/2018	0.79 +/- 0.14	0.047 +/- 0.034 J	0.73 +/- 0.13	1.6 +/- 0.2	0.92 +/- 0.23
CC-3	6/5/2018	0.57 +/- 0.12 J	0.020 +/- 0.023 J	0.54 +/- 0.12 J	1.1 +/- 0.2	0.95 +/- 0.28
CC-3	9/11/2018	0.74 +/- 0.12	0.056 +/- 0.032 J	0.58 +/- 0.1	1.4 +/- 0.2	0.78 +/- 0.19
CC-3	12/11/2018	1.1 +/- 0.2	0.052 +/- 0.037 J	1.0 +/- 0.2	2.2 +/- 0.2	0.91 +/- 0.2

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**



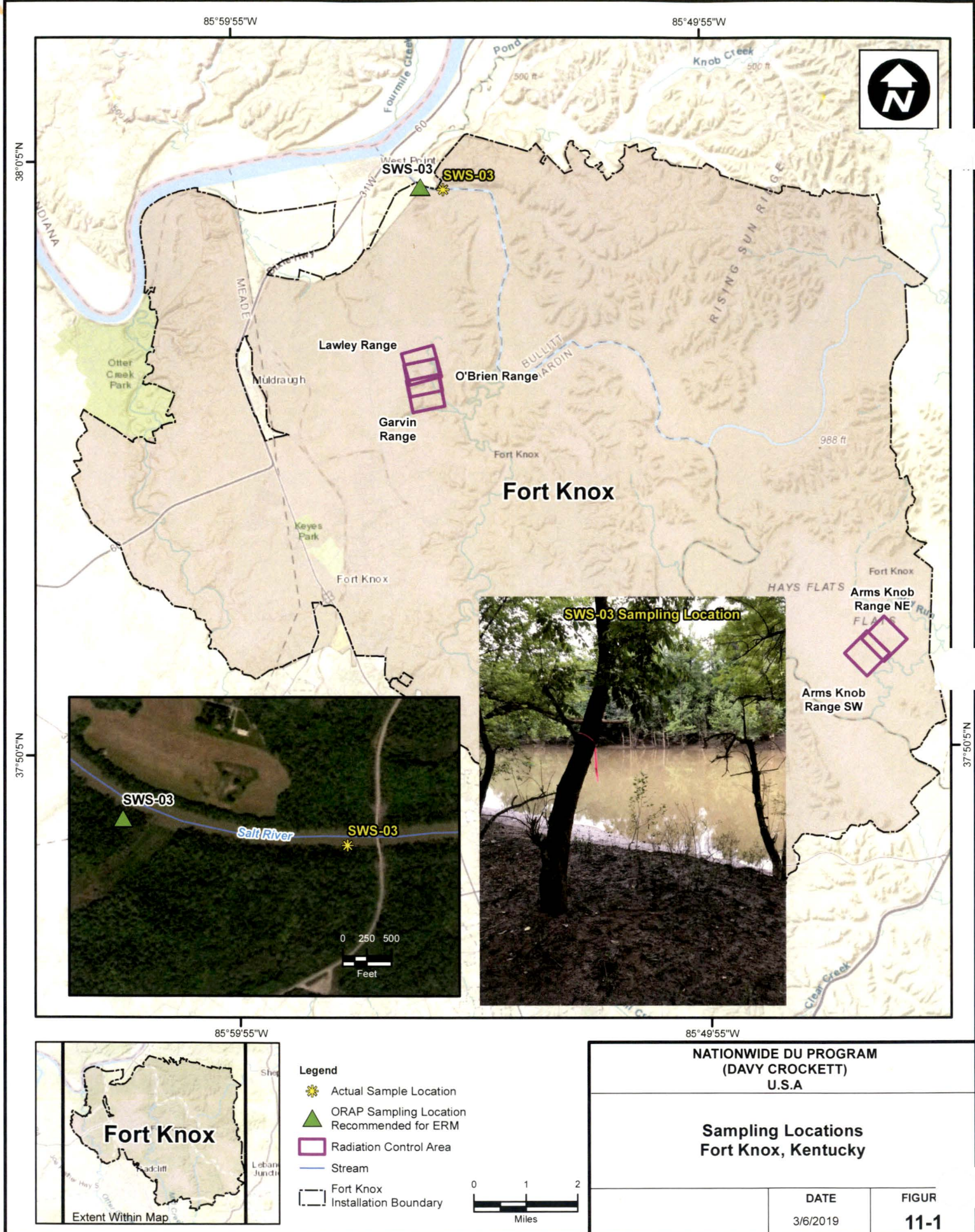
## 11. ERM RESULTS FOR FORT KNOX, KENTUCKY

A field sampler under contract with USACE prepared for and conducted sampling at Fort Knox, Kentucky on 6 March, 30 May, 11 September, and 27 November 2018, in accordance with the site-specific ERMP (Annex 10). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix K contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from one point downstream from the RCAs (Figure 11-1). The planned sampling point, SWS-03, is located on the Salt River at the installation's northern boundary, upstream from mixing with inflow from the Ohio River. When the sampler traveled to the location included in the site-specific ERMP, the point was situated in the woods instead of within the Salt River. As a result, the sampler actually collected samples starting in 2017 from an alternate location on the shore and closer to the access road close to the originally planned location. As shown in Figure 11-1, surface water and sediment samples were collected approximately 2,300 feet from the planned location for SWS-03. All future sampling will be conducted at the same location that was sampled during the 2017 and 2018 quarterly events shown in Figure 11-1.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 11-1 and 11-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.







**Table 11-1. Uranium in Surface Water, Fort Knox, Kentucky**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
SWS-03	3/6/2018	0.22 +/- 0.07 J	0.016 +/- 0.022 U	0.11 +/- 0.05 J	0.35 +/- 0.09	0.50 +/- 0.28
SWS-03	5/30/2018	0.29 +/- 0.08 J	0.023 +/- 0.026 U	0.18 +/- 0.06 J	0.49 +/- 0.11	0.62 +/- 0.28
SWS-03	9/11/2018	0.15 +/- 0.06 J	0.00 +/- 0 U	0.14 +/- 0.05 J	0.29 +/- 0.08	0.93 +/- 0.05
SWS-03	11/27/2018	0.29 +/- 0.11 J	0.0020 +/- 0.0275 U	0.11 +/- 0.07 J	0.40 +/- 0.13	0.38 +/- 0.27

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**Table 11-2. Uranium in Sediment, Fort Knox, Kentucky**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
SWS-03	3/6/2018	0.91 +/- 0.16	0.071 +/- 0.041 J	1.1 +/- 0.2	2.1 +/- 0.2	1.2 +/- 0.3
SWS-03	5/30/2018	0.98 +/- 0.16	0.083 +/- 0.045 J	0.94 +/- 0.16	2.0 +/- 0.2	0.96 +/- 0.22
SWS-03	9/11/2018	1.0 +/- 0.2	0.046 +/- 0.029 J	0.90 +/- 0.14	1.9 +/- 0.2	0.90 +/- 0.19
SWS-03	11/27/2018	0.86 +/- 0.15	0.040 +/- 0.035 U	1.0 +/- 0.2	1.9 +/- 0.2	1.2 +/- 0.3

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

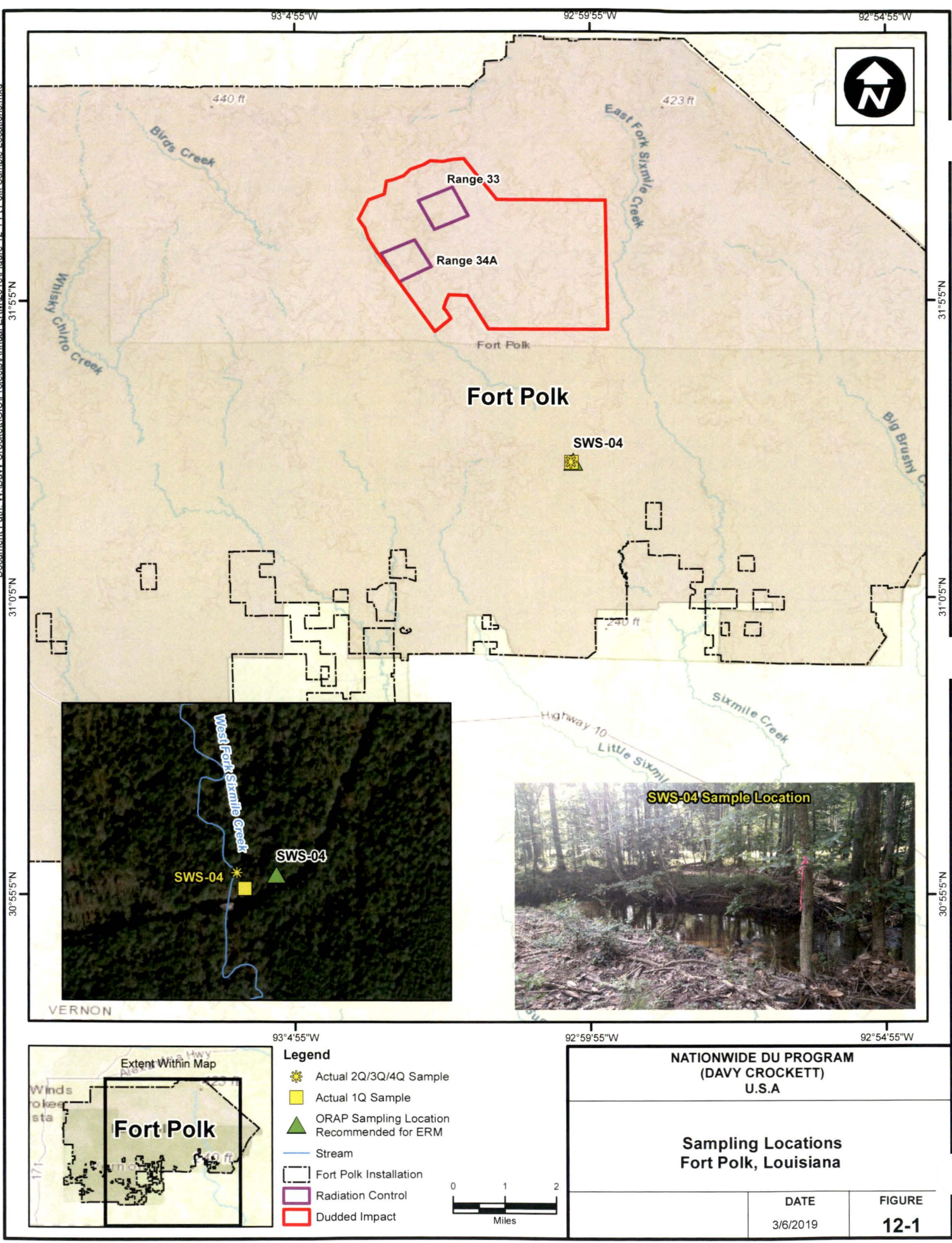
## 12. ERM RESULTS FOR FORT POLK, LOUISIANA

A field sampler under contract with USACE prepared for and conducted sampling at Fort Polk, Louisiana on 29 March, 13 June, 5 September, and 19 December 2018, in accordance with the site-specific ERMP (Annex 11). Except for flooding encountered during the first quarterly sampling event, no unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix L contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from one point downstream from the RCAs (Figure 12-1). The planned sampling point, SWS-04, is located on West Fork Sixmile Creek at the installation's southern boundary. When the sampler traveled to the location included in the site-specific ERMP, the point was situated in the woods instead of within West Fork Sixmile Creek. As a result, the sampler actually collected samples starting in 2017 from an alternate location on the shore as close as possible to the originally planned location. As shown in Figure 12-1, surface water and sediment samples were collected approximately 300 feet from the planned location for SWS-04. During the first quarterly sampling event, the stream stage of West Fork Sixmile Creek was elevated and the samples were collected in the location also shown in Figure 12-1. All future sampling will be conducted at the same location that was sampled during the 2017 and 2018 quarterly events shown in Figure 12-1 and may be modified depending on the location of the shoreline during any future flooding events.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 12-1 and 12-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.







**Table 12-1. Uranium in Surface Water, Fort Polk, Louisiana**

Sample Location	Date	Uranium-234 (pCi/L)				Uranium-235 (pCi/L)				Uranium-238 (pCi/L)				Total Uranium (pCi/L)			U-238/U-234 Ratio (unitless)		
SWS-04	3/29/2018	0.016	+/-	0.029	U	0.0010	+/-	0.0141	U	0.017	+/-	0.026	U	0.034	+/-	0.041	ND		
SWS-04	6/13/2018	0.069	+/-	0.038	J	0.022	+/-	0.025	U	0.030	+/-	0.026	U	0.12	+/-	0.05	ND		
SWS-04	9/5/2018	0.096	+/-	0.068	J	-0.012	+/-	0.016	U	0.029	+/-	0.04	U	0.11	+/-	0.08	ND		
SWS-04	12/19/2018	0.23	+/-	0.11	J	0.027	+/-	0.039	U	0.033	+/-	0.038	J	0.29	+/-	0.12	0.14	+/-	0.18

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 12-2. Uranium in Sediment, Fort Polk, Louisiana**

Sample Location	Date	Uranium-234 (pCi/g)				Uranium-235 (pCi/g)				Uranium-238 (pCi/g)				Total Uranium (pCi/g)			U-238/U-234 Ratio (unitless)		
SWS-04	3/29/2018	0.17	+/-	0.06	J	0.0089	+/-	0.0166	U	0.21	+/-	0.07	J	0.39	+/-	0.09	1.2	+/-	0.6
SWS-04	6/13/2018	0.073	+/-	0.04	J	-0.0023	+/-	0.0045	U	0.12	+/-	0.05	J	0.19	+/-	0.06	1.6	+/-	1.1
SWS-04	9/5/2018	0.085	+/-	0.043	J	0.0074	+/-	0.0196	U	0.062	+/-	0.038	J	0.15	+/-	0.06	0.73	+/-	0.58
SWS-04	12/19/2018	0.060	+/-	0.035	J	-0.0025	+/-	0.0049	U	0.089	+/-	0.044	J	0.15	+/-	0.06	1.5	+/-	1.1

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

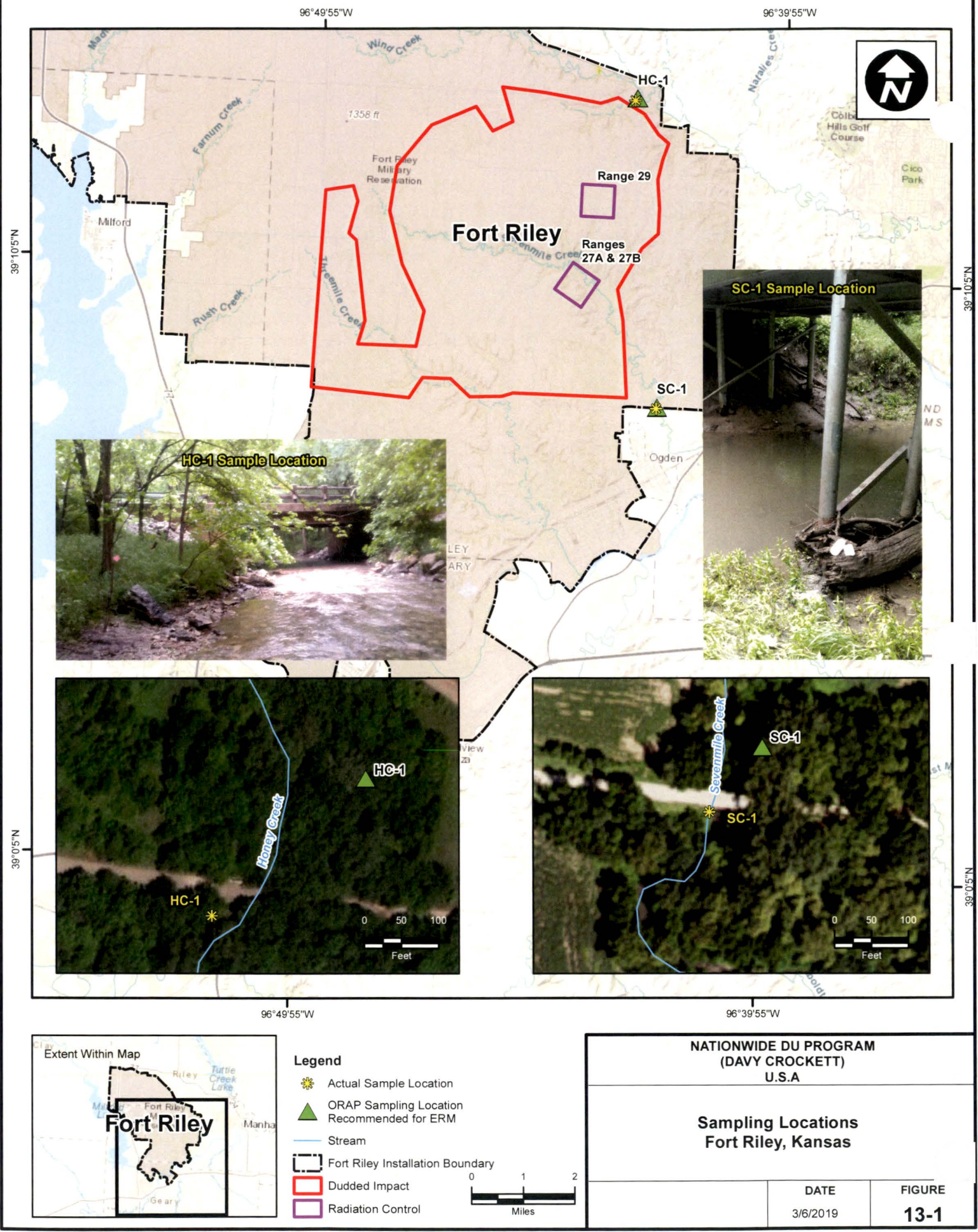
### 13. ERM RESULTS FOR FORT RILEY, KANSAS

A field sampler under contract with USACE prepared for and conducted sampling at Fort Riley, Kansas on 13 March, 22 May, 6 September, and 27 November 2018, in accordance with the site-specific ERMP (Annex 12). Except for flooding encountered during the third quarterly sampling event and the heavy snow accumulation during the fourth quarterly sampling event, no unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix M contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from two points downstream from the RCAs (Figure 13-1). The planned first sampling point, SC-1, is located on Sevenmile Creek, downstream from the Ranges 27A and 27B RCA and the southern portion of the Range 29 RCA. The sampling location SC-1 is located upstream of the Kansas River and at the installation boundary. The second planned sampling point, HC-1, is located on Honey Creek, downstream from the northern portion of the Range 29 RCA. The sampling location HC-1 was located immediately upstream of the confluence with Wildcat Creek and within the installation boundary. When the sampler traveled to the locations included in the site-specific ERMP, the points were situated in the woods away from Sevenmile Creek (SC-1) and Honey Creek (HC-1). As a result, the sampler actually collected samples starting in 2017 from alternate locations on the shore as close as possible to the originally planned locations. As shown in Figure 13-1, surface water and sediment samples were collected approximately 100 feet from the planned location for SC-1 and by approximately 200 feet for HC-1. No surface water was present at HC-1 during the March and May sampling events; however, surface water was present at HC-1 during the September sampling event. Sediment was collected at HC-1 during the March, May, and September sampling events. The location was inaccessible due to the accumulated snow during the November sampling event; therefore, neither sediment nor surface water samples were collected at HC-1. The collocated surface water and sediment samples were collected as planned at SC-1 during all four quarterly sampling events. All future sampling will be conducted at the same locations that were sampled during the 2017 and 2018 quarterly events shown in Figure 13-1.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 13-1 and 13-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.







**Table 13-1. Uranium in Surface Water, Fort Riley, Kansas**

Sample Location	Date	Uranium-234 (pCi/L)			Uranium-235 (pCi/L)			Uranium-238 (pCi/L)			Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)		
HC-1	3/13/2018	---	+/-	---	---	+/-	---	---	+/-	---	---	+/-	---	---
SC-1*	3/13/2018	0.73	+/-	0.11	0.034	+/-	0.024	0.72	+/-	0.11	1.5	+/-	0.2	0.99
HC-1	5/22/2018	---	+/-	---	---	+/-	---	---	+/-	---	---	+/-	---	---
SC-1*	5/22/2018	0.66	+/-	0.2	0.050	+/-	0.058	0.53	+/-	0.17	1.2	+/-	0.3	0.80
HC-1	9/6/2018	0.51	+/-	0.15	0.00	+/-	0	0.37	+/-	0.13	0.88	+/-	0.2	0.73
SC-1*	9/6/2018	0.48	+/-	0.11	0.013	+/-	0.019	0.44	+/-	0.1	0.93	+/-	0.15	0.92
HC-1	11/27/2018	---	+/-	---	---	+/-	---	---	+/-	---	---	+/-	---	---
SC-1*	11/27/2018	1.5	+/-	0.2	0.11	+/-	0.05	1.0	+/-	0.2	2.6	+/-	0.3	0.67

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/- --- – Indicates surface water sample was not collected either because water was not present during sampling or the location was inaccessible.

\* – Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**Table 13-2. Uranium in Sediment, Fort Riley, Kansas**

Sample Location	Date	Uranium-234 (pCi/g)			Uranium-235 (pCi/g)			Uranium-238 (pCi/g)			Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)		
HC-1	3/13/2018	0.64	+/-	0.12	0.036	+/-	0.032	0.66	+/-	0.13	1.3	+/-	0.2	1.0
SC-1*	3/13/2018	0.57	+/-	0.08	0.036	+/-	0.021	0.61	+/-	0.08	1.2	+/-	0.1	1.1
HC-1	5/22/2018	0.61	+/-	0.13	0.050	+/-	0.041	0.75	+/-	0.15	1.4	+/-	0.2	1.2
SC-1*	5/22/2018	0.90	+/-	0.14	0.045	+/-	0.034	0.90	+/-	0.13	1.8	+/-	0.2	1.0
HC-1	9/6/2018	0.61	+/-	0.12	0.068	+/-	0.045	0.89	+/-	0.15	1.6	+/-	0.2	1.5
SC-1*	9/6/2018	0.61	+/-	0.09	0.028	+/-	0.02	0.75	+/-	0.1	1.4	+/-	0.1	1.2
HC-1	11/27/2018	---	+/-	---	---	+/-	---	---	+/-	---	---	+/-	---	---
SC-1*	11/27/2018	0.60	+/-	0.08	0.065	+/-	0.028	0.59	+/-	0.08	1.3	+/-	0.1	0.98

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/- --- – Indicates sediment was not collected because the location was inaccessible.

\* – Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**



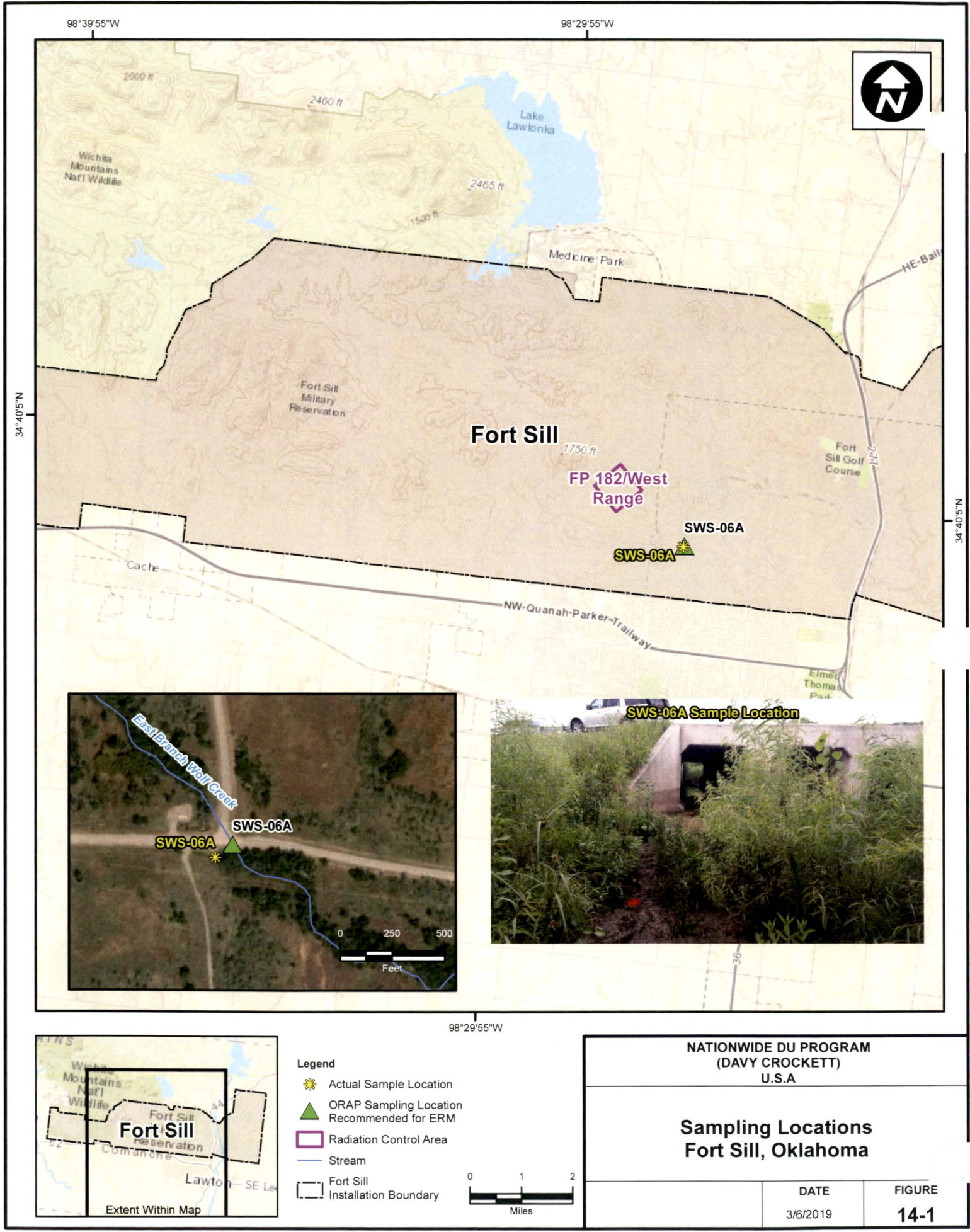
## 14. ERM RESULTS FOR FORT SILL, OKLAHOMA

A field sampler under contract with USACE prepared for and conducted sampling at Fort Sill, Oklahoma on 27 February, 30 May, 11 September, and 12 December 2018, in accordance with the site-specific ERMP (Annex 13). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix N contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from one point downstream from the RCA (Figure 14-1). The planned sampling point, SWS-06A, is located on the East Branch of Wolf Creek downgradient from the part of the West Range where the RCA is located. When the sampler traveled to the location included in the site-specific ERMP, the point was not situated on a water body. Consequently, the sampler actually collected the samples starting in 2017 from an alternate location as close as possible to the originally planned location. As shown in Figure 14-1, surface water and sediment samples were collected approximately 150 feet from the planned location for SWS-06A. Surface water was present at the location during the February, May, and December sampling events, but was not present during the September sampling event. All future sampling will be conducted at the same location that was sampled during the 2017 and 2018 quarterly events shown in Figure 14-1.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 14-1 and 14-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.







**Table 14-1. Uranium in Surface Water, Fort Sill, Oklahoma**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
SWS-06A*	2/27/2018	0.77 +/- 0.08	0.031 +/- 0.015 UJ	0.56 +/- 0.06	1.4 +/- 0.1	0.73 +/- 0.11
SWS-06A*	5/30/2018	0.35 +/- 0.07 J	0.018 +/- 0.018 U	0.28 +/- 0.06 J	0.65 +/- 0.1	0.80 +/- 0.24
SWS-06A	9/11/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---
SWS-06A*	12/12/2018	0.54 +/- 0.11 J	0.046 +/- 0.038 UJ	0.39 +/- 0.09 J	0.98 +/- 0.15	0.72 +/- 0.23

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/---- – Indicates surface water sample was not collected because water was not present during sampling.

\* – Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**Table 14-2. Uranium in Sediment, Fort Sill, Oklahoma**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
SWS-06A*	2/27/2018	0.57 +/- 0.08	0.029 +/- 0.019 UJ	0.63 +/- 0.09	1.2 +/- 0.1	1.1 +/- 0.2
SWS-06A*	5/30/2018	0.61 +/- 0.09	0.030 +/- 0.02 UJ	0.58 +/- 0.08	1.2 +/- 0.1	0.95 +/- 0.19
SWS-06A*	9/11/2018	0.54 +/- 0.07	0.013 +/- 0.011 UJ	0.54 +/- 0.07	1.1 +/- 0.1	1.0 +/- 0.2
SWS-06A*	12/12/2018	0.44 +/- 0.07 J	0.019 +/- 0.016 UJ	0.53 +/- 0.08	0.99 +/- 0.11	1.2 +/- 0.3

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

\* – Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

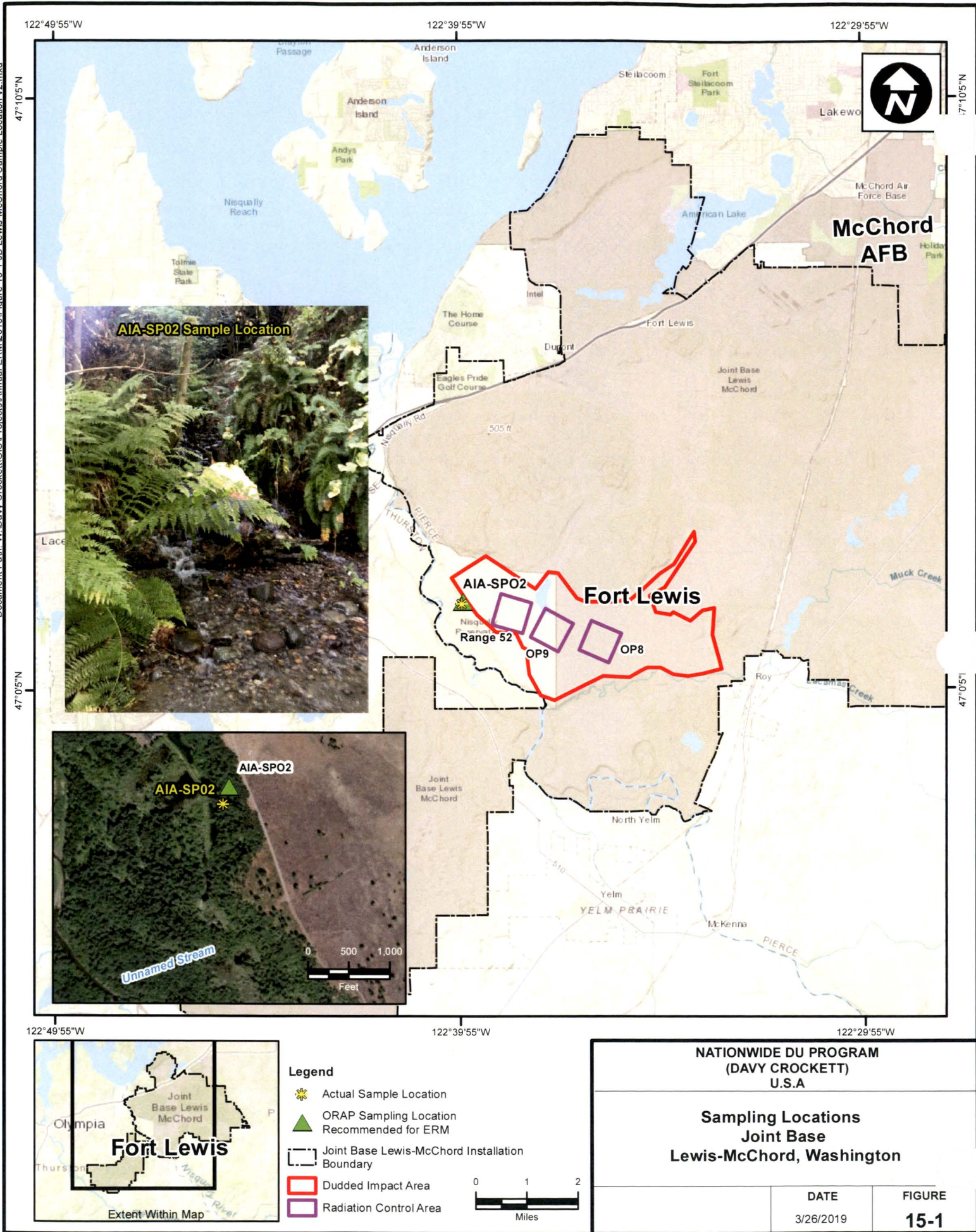
## 15. ERM RESULTS FOR JOINT BASE LEWIS-McCHORD, WASHINGTON

A field sampler under contract with USACE prepared for and conducted sampling at JBLM, Washington on 5 March, 4 June, 6 September, and 20 November 2018, in accordance with the site-specific ERMP (Annex 14). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix O contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from one point downstream from the RCAs (Figure 15-1). The planned sampling point, AIA-SP02, is located in a waterway from the RCAs to the Nisqually Clear Creek Fish Hatchery and to the Nisqually River. The point was inaccessible due to dense vegetation and a steep grade. After plotting the location following the first quarterly sampling event in 2017, the U.S. Army escort and sampler identified an alternate location that was closer to the originally planned location and was safer to access. As shown in Figure 15-1, surface water and sediment samples were collected approximately 319 feet from the planned location for AIA-SP02 during the 2018 quarterly sampling events. All future sampling will be conducted at the same location that was sampled during the 2017 and 2018 quarterly events shown in Figure 15-1.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 15-1 and 15-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.







**Table 15-1. Uranium in Surface Water, JBLM, Washington**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
AIA-SP02	3/5/2018	0.031 +/- 0.025 J	0.010 +/- 0.019 U	0.00086 +/- 0.012 U	0.042 +/- 0.034	ND
AIA-SP02	6/4/2018	0.034 +/- 0.031 J	0.015 +/- 0.022 U	0.017 +/- 0.026 U	0.066 +/- 0.046	ND
AIA-SP02	9/6/2018	0.14 +/- 0.07 J	0.011 +/- 0.023 U	0.024 +/- 0.033 U	0.18 +/- 0.08	ND
AIA-SP02	11/20/2018	0.065 +/- 0.057 U	0.013 +/- 0.026 U	-0.0088 +/- 0.0124 U	0.069 +/- 0.064	ND

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 15-2. Uranium in Sediment, JBLM, Washington**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
AIA-SP02	3/5/2018	0.21 +/- 0.07 J	0.021 +/- 0.024 U	0.28 +/- 0.08 J	0.51 +/- 0.11	1.3 +/- 0.6
AIA-SP02	6/4/2018	0.20 +/- 0.07 J	0.00 +/- 0 U	0.31 +/- 0.09 J	0.51 +/- 0.11	1.6 +/- 0.7
AIA-SP02	9/6/2018	0.17 +/- 0.07 J	0.022 +/- 0.026 J	0.25 +/- 0.08 J	0.44 +/- 0.11	1.5 +/- 0.8
AIA-SP02	11/20/2018	0.33 +/- 0.09 J	0.0030 +/- 0.024 U	0.23 +/- 0.07 J	0.56 +/- 0.12	0.70 +/- 0.29

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

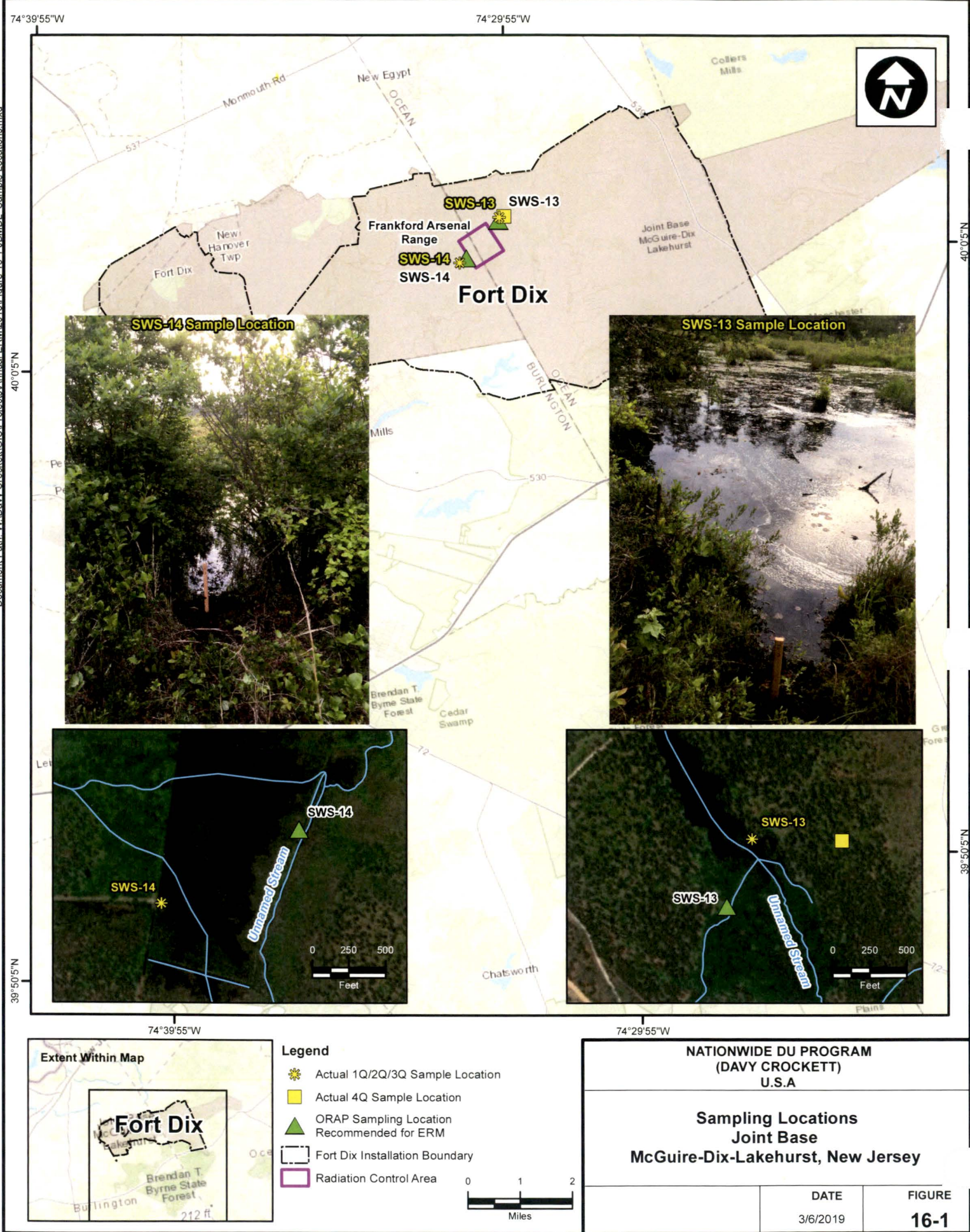
## **16. ERM RESULTS FOR JOINT BASE McGUIRE-DIX-LAKEHURST, NEW JERSEY**

A field sampler under contract with USACE prepared for and conducted sampling at JBMDL, New Jersey on 6 March, 5 June, 6 September, and 27 November 2018, in accordance with the site-specific ERMP (Annex 16). Except for flooding encountered during the fourth quarterly sampling event, no unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix P contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from two points downstream from the RCA (Figure 16-1). The first sampling point, SWS-13, is located just upstream of Brindle Lake on a stream that drains the southeastern portion of the RCA. The second sampling point, SWS-14, is located just outside the western boundary of the RCA on a stream that drains the west-central portion of the RCA. When the sampler traveled to the locations included in the site-specific ERMP, the points were situated in the woods instead of within the unnamed streams selected for sampling. As a result, the sampler actually collected samples starting in 2017 from alternate locations on the shore as close as possible to the originally planned locations. As shown in Figure 16-1, surface water and sediment samples were collected approximately 500 feet from the planned location for SWS-13 and by approximately 1,000 feet from the planned location for SWS-14. During the fourth quarterly sampling event, the stream stage was elevated, and the SWS-13 sample was collected in the location also shown in Figure 16-1. All future sampling will be conducted at the same locations that were sampled during the 2017 and 2018 quarterly events shown in Figure 16-1 and may be modified depending on the location of the shoreline during any future flooding events.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 16-1 and 16-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.







**Table 16-1. Uranium in Surface Water, JBMDL, New Jersey**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
SWS-13	3/6/2018	0.061 +/- 0.044 J	0.0089 +/- 0.0234 U	0.025 +/- 0.028 U	0.095 +/- 0.058	ND
SWS-14	3/6/2018	0.046 +/- 0.039 U	-0.0072 +/- 0.0182 U	0.0027 +/- 0.0215 U	0.042 +/- 0.048	ND
SWS-13	6/5/2018	0.055 +/- 0.042 J	0.0072 +/- 0.0143 U	0.055 +/- 0.037 J	0.12 +/- 0.06	1.0 +/- 1
SWS-14	6/5/2018	0.023 +/- 0.025 U	-0.011 +/- 0.011 U	0.017 +/- 0.023 U	0.029 +/- 0.036	ND
SWS-13	9/6/2018	0.41 +/- 0.15 J	0.035 +/- 0.059 U	0.090 +/- 0.068 J	0.54 +/- 0.18	0.2 +/- 0.19
SWS-14	9/6/2018	0.044 +/- 0.049 U	0.00 +/- 0 U	0.042 +/- 0.043 J	0.086 +/- 0.066	ND
SWS-13	11/27/2018	0.14 +/- 0.14 U	0.00 +/- 0 U	0.016 +/- 0.061 U	0.16 +/- 0.016	ND
SWS-14	11/27/2018	0.012 +/- 0.03 U	0.0093 +/- 0.0392 U	0.020 +/- 0.028 U	0.041 +/- 0.057	ND

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 16-2. Uranium in Sediment, JBMDL, New Jersey**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
SWS-13	3/6/2018	0.082 +/- 0.044 J	0.017 +/- 0.02 J	0.097 +/- 0.046 J	0.20 +/- 0.07	1.2 +/- 0.9
SWS-14	3/6/2018	0.16 +/- 0.06 J	0.00093 +/- 0.0129 U	0.065 +/- 0.038 J	0.23 +/- 0.07	0.41 +/- 0.29
SWS-13	6/5/2018	0.31 +/- 0.08 J	0.035 +/- 0.031 U	0.41 +/- 0.09 J	0.76 +/- 0.13	1.3 +/- 0.5
SWS-14	6/5/2018	0.14 +/- 0.06 J	0.0011 +/- 0.0147 U	0.11 +/- 0.05 J	0.25 +/- 0.08	0.79 +/- 0.47
SWS-13	9/6/2018	0.21 +/- 0.07 J	0.039 +/- 0.035 U	0.38 +/- 0.09 J	0.63 +/- 0.12	1.8 +/- 0.7
SWS-14	9/6/2018	0.12 +/- 0.05 J	0.0058 +/- 0.0116 U	0.097 +/- 0.043 J	0.22 +/- 0.07	0.81 +/- 0.49
SWS-13	11/27/2018	0.11 +/- 0.05 J	0.011 +/- 0.016 U	0.089 +/- 0.041 J	0.21 +/- 0.06	0.81 +/- 0.51
SWS-14	11/27/2018	0.19 +/- 0.07 J	0.0047 +/- 0.0173 U	0.093 +/- 0.051 J	0.29 +/- 0.09	0.49 +/- 0.32

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

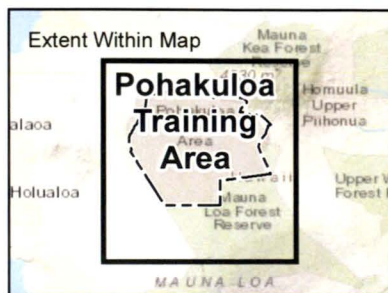
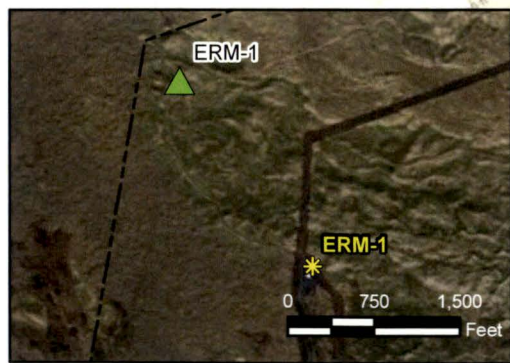
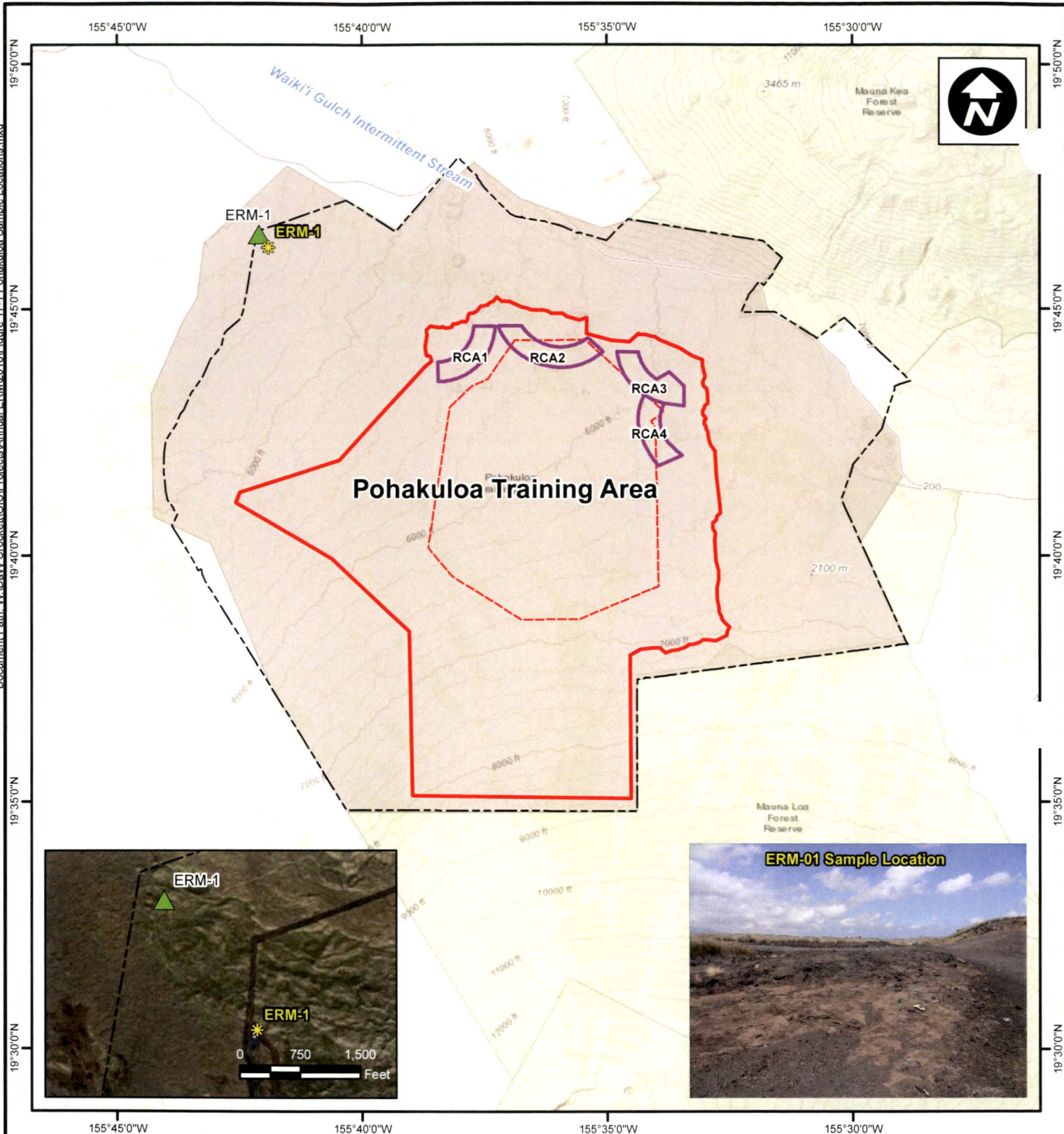


## 17. ERM RESULTS FOR POHAKULOA TRAINING AREA, HAWAII

A field sampler under contract with USACE prepared for and conducted sampling at PTA, Hawaii on 20 February, 20 June, 10 September, and 13 December 2018, in accordance with the site-specific ERMP (Annex 17). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix Q contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, sediment samples were collected from one point downstream from the RCAs (Figure 17-1), but no surface water was present for sampling during any of the quarterly events. The sampling point, ERM-01, is located at an intermittent stream at the installation's northern boundary, downstream from the RCAs. When the sampler traveled to the location included in the site-specific ERMP, the point was outside of the installation boundary. As a result, the sampler actually collected the sediment samples from an alternate location as close as possible to the originally planned location. As shown in Figure 17-1, sediment samples were collected approximately 1,900 feet from the planned location for ERM-01. All future sampling will be conducted at the same location that was sampled during the 2017 and 2018 quarterly events shown in Figure 17-1.

The concentrations of total and isotopic uranium in sediment are presented in Table 17-1. Since all sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.



- Legend**
- Actual Sample Location
  - ORAP Sampling Location Recommended for ERM
  - Pohakuloa Training Area Installation Boundary
  - Radiation Control
  - Duded Impact
  - ICM

0 1 2  
Miles

**NATIONWIDE DU PROGRAM  
(DAVY CROCKETT)  
U.S.A**

### Sampling Locations Pohakuloa Training Area, Hawaii

**DATE**  
4/15/2019

**FIGURE**  
**17-1**

**Table 17-1. Uranium in Sediment, PTA, Hawaii**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
ERM-01	2/20/2018	0.19 +/- 0.06 J	0.0088 +/- 0.0165 U	0.25 +/- 0.07 J	0.45 +/- 0.09	1.3 +/- 0.6
ERM-01	6/20/2018	0.22 +/- 0.07 J	0.0057 +/- 0.0114 U	0.14 +/- 0.05 J	0.37 +/- 0.09	0.64 +/- 0.3
ERM-01	9/10/2018	0.18 +/- 0.05 J	0.0042 +/- 0.0084 U	0.15 +/- 0.05 J	0.33 +/- 0.07	0.83 +/- 0.35
ERM-01	12/13/2018	0.23 +/- 0.07 J	0.0087 +/- 0.0162 U	0.14 +/- 0.05 J	0.38 +/- 0.09	0.61 +/- 0.29

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

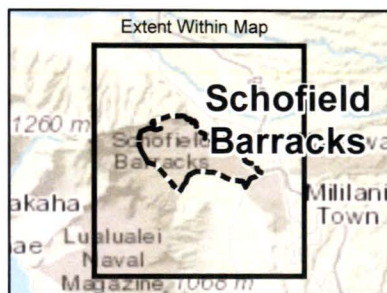
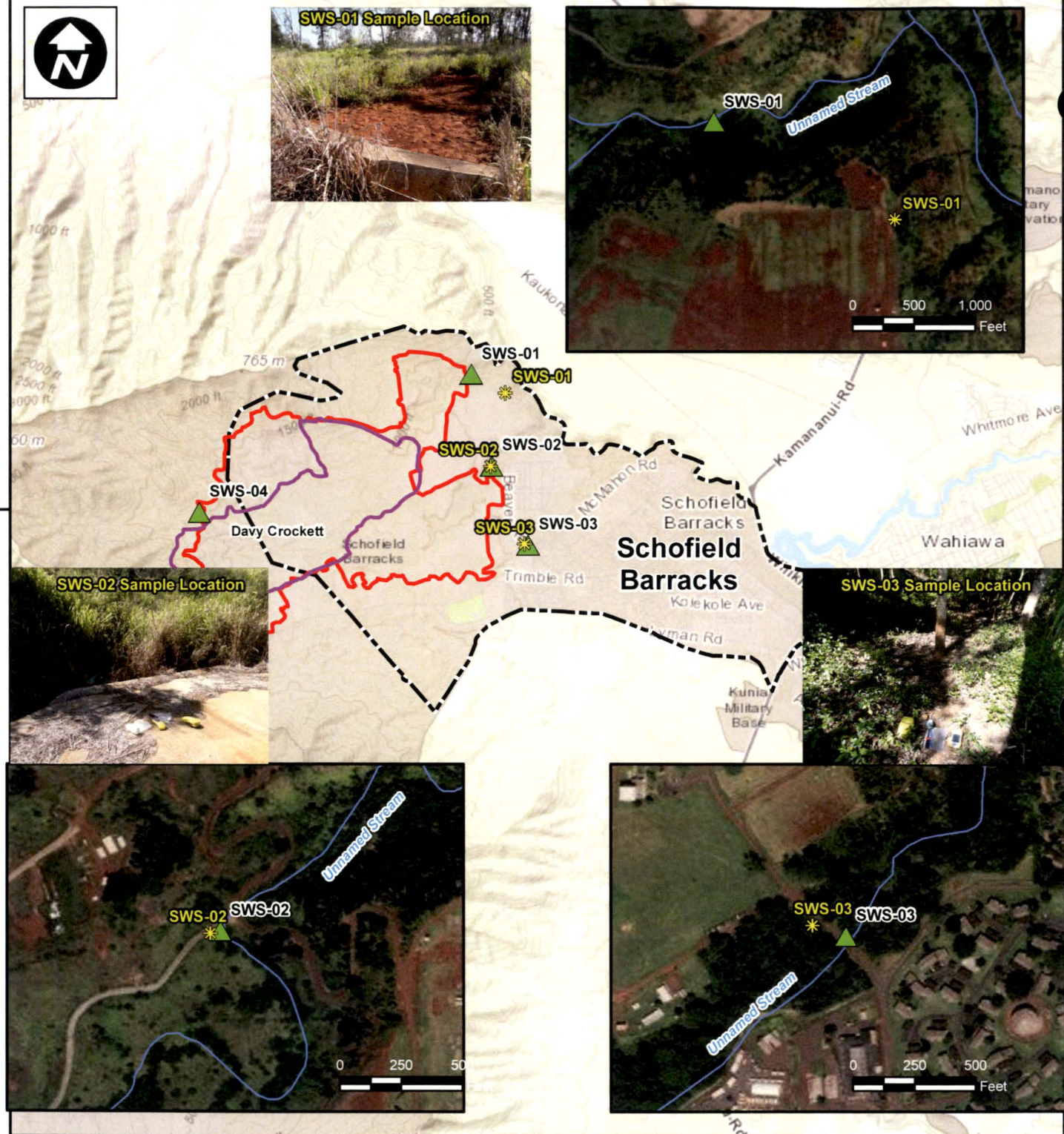
## **18. ERM RESULTS FOR SCHOFIELD BARRACKS, HAWAII**

A field sampler under contract with USACE prepared for and conducted sampling at Schofield Barracks, Hawaii on 21 February, 18 June, 7 September, and 11 December 2018, in accordance with the site-specific ERMP (Annex 18). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix R contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

During the quarterly sampling events, collocated surface water and sediment samples were collected from three points downstream from the RCA (Figure 18-1). The first sampling point, SWS-01, is located on Haleauau Gulch near the installation boundary. The second sampling point, SWS-02, is located on Mohiakea Gulch near the installation boundary. The third sampling point, SWS-03, also is located on Waikoloa Gulch near the installation boundary. When the sampler traveled to the locations included in the site-specific ERMP, the points were situated in the fields away from water bodies. As a result, the sampler actually collected samples from alternate locations as close as possible to the originally planned locations. As shown in Figure 18-1, samples were collected approximately 1,600 feet from the planned location for SWS-01, approximately 35 feet from the planned location for SWS-02 and approximately 140 feet from the planned location for SWS-03. Surface water was present at all three locations for the December sampling event. No surface water was present at any locations during the February, June, and September sampling events. All future sampling will be conducted at the same locations that were sampled during the 2017 and 2018 quarterly events shown in Figure 18-1.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 18-1 and 18-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.





NATIONWIDE DU PROGRAM (DAVY CROCKETT) U.S.A		
Sampling Locations Schofield Barracks, Hawaii		
	DATE	FIGURE
	3/6/2019	18-1



**Table 18-1. Uranium in Surface Water, Schofield Barracks, Hawaii**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
SWS-01	2/21/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---
SWS-02	2/21/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---
SWS-03	2/21/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---
SWS-01	6/18/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---
SWS-02	6/18/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---
SWS-03	6/18/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---
SWS-01	9/7/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---
SWS-02	9/7/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---
SWS-03	9/7/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---
SWS-01	12/11/2018	0.25 +/- 0.1 J	0.0068 +/- 0.0252 U	0.024 +/- 0.033 U	0.28 +/- 0.11	ND
SWS-02	12/11/2018	0.35 +/- 0.2 J	0.084 +/- 0.097 J	0.060 +/- 0.122 U	0.49 +/- 0.25	ND
SWS-03	12/11/2018	0.70 +/- 0.25 J	0.043 +/- 0.091 U	0.084 +/- 0.101 U	0.83 +/- 0.28	ND

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/- --- – Indicates surface water sample was not collected because water was not present during sampling.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 18-2. Uranium in Sediment, Schofield Barracks, Hawaii**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
SWS-01	2/21/2018	1.0 +/- 0.2	0.048 +/- 0.039 J	0.84 +/- 0.15	1.9 +/- 0.2	0.84 +/- 0.21
SWS-02	2/21/2018	0.31 +/- 0.08 J	0.0062 +/- 0.0164 U	0.27 +/- 0.07 J	0.59 +/- 0.11	0.87 +/- 0.33
SWS-03	2/21/2018	0.55 +/- 0.11 J	0.017 +/- 0.025 U	0.49 +/- 0.1 J	1.1 +/- 0.1	0.89 +/- 0.25
SWS-01	6/18/2018	0.90 +/- 0.15	0.049 +/- 0.035 J	0.76 +/- 0.14	1.7 +/- 0.2	0.84 +/- 0.21
SWS-02	6/18/2018	0.29 +/- 0.08 J	0.018 +/- 0.021 J	0.21 +/- 0.07 J	0.52 +/- 0.11	0.72 +/- 0.31
SWS-03	6/18/2018	0.66 +/- 0.13	0.016 +/- 0.022 U	0.57 +/- 0.12 J	1.2 +/- 0.2	0.86 +/- 0.24
SWS-01	9/7/2018	0.27 +/- 0.08 J	0.011 +/- 0.023 U	0.29 +/- 0.08 J	0.57 +/- 0.12	1.1 +/- 0.4
SWS-02	9/7/2018	0.32 +/- 0.09 J	0.0097 +/- 0.0181 U	0.29 +/- 0.08 J	0.62 +/- 0.12	0.91 +/- 0.35
SWS-03	9/7/2018	0.54 +/- 0.11 J	0.032 +/- 0.028 J	0.48 +/- 0.1 J	1.1 +/- 0.2	0.89 +/- 0.26
SWS-01	12/11/2018	0.82 +/- 0.14	0.042 +/- 0.032 J	0.96 +/- 0.16	1.8 +/- 0.2	1.2 +/- 0.3
SWS-02	12/11/2018	0.37 +/- 0.09 J	0.022 +/- 0.022 J	0.32 +/- 0.08 J	0.71 +/- 0.12	0.86 +/- 0.29
SWS-03	12/11/2018	0.68 +/- 0.13	0.030 +/- 0.027 J	0.70 +/- 0.13	1.4 +/- 0.2	1.0 +/- 0.3

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

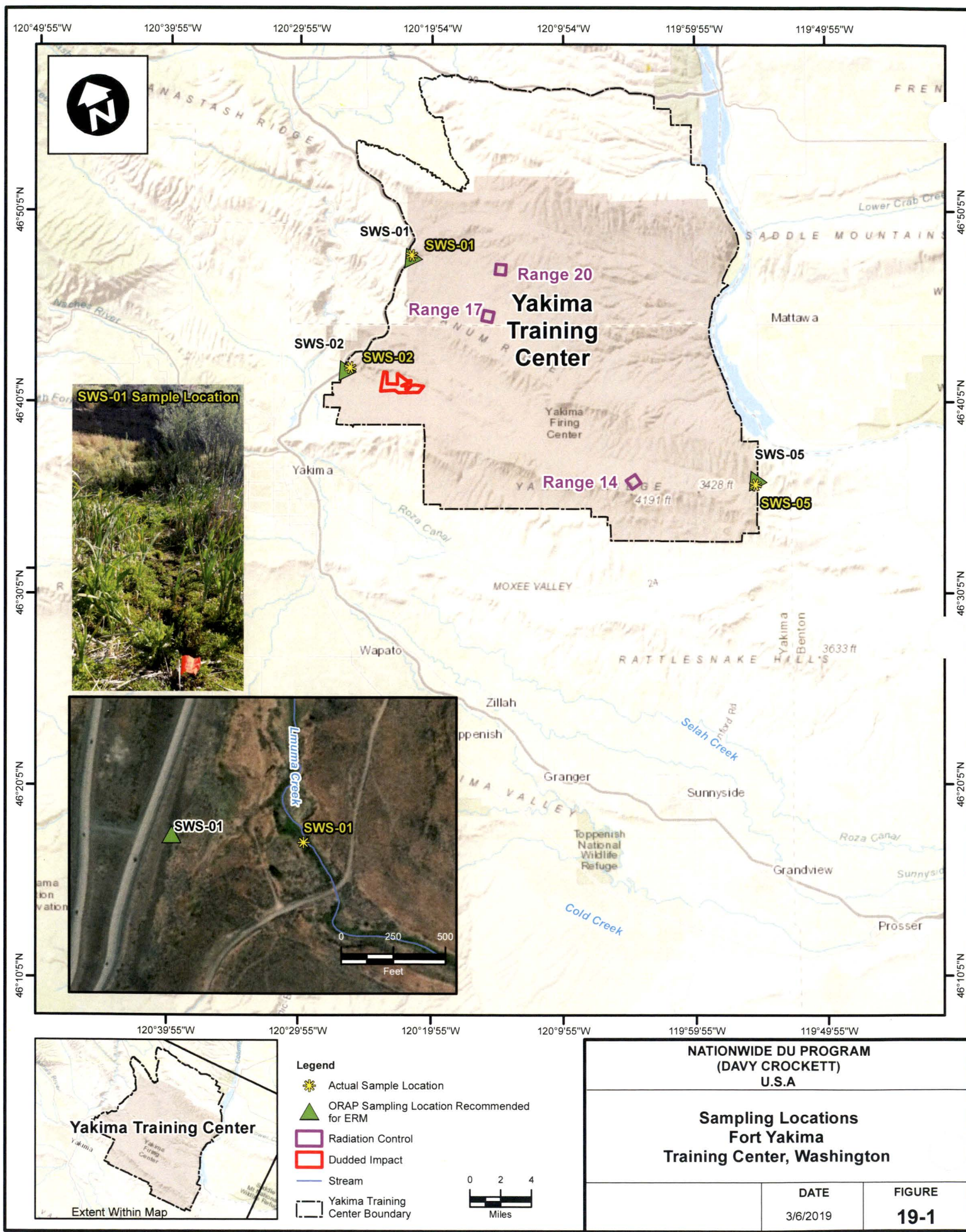
## 19. ERM RESULTS FOR YAKIMA TRAINING CENTER, WASHINGTON

A field sampler under contract with USACE prepared for and conducted sampling at YTC, Washington on 28 February, 12 June, 5 September, and 14 December 2018, in accordance with the site-specific ERMP (Annex 15). No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, elevated radiation levels) were observed during the sampling events. Appendix S contains a copy of the field logbook pages, which document ERM field activities during the sampling efforts.

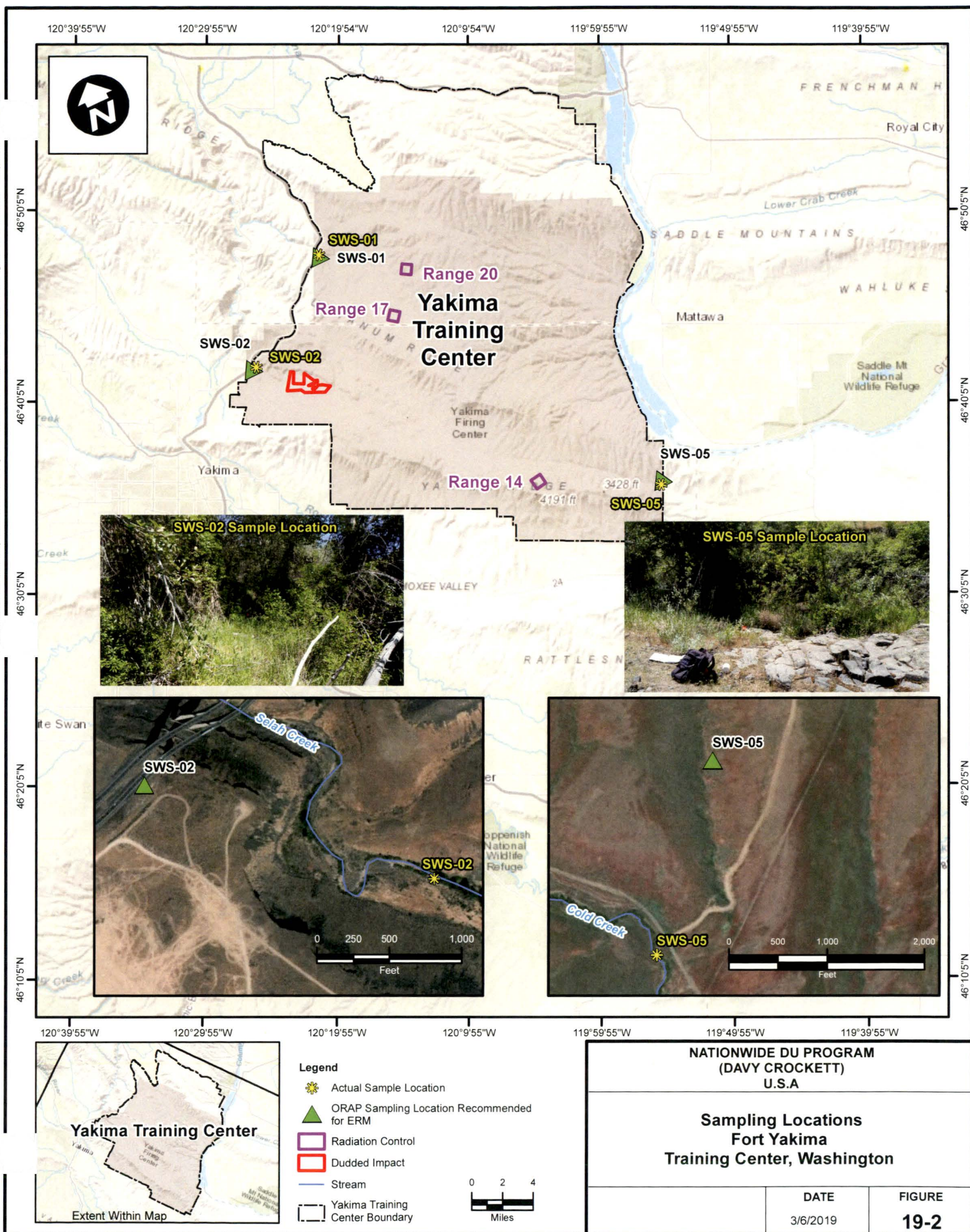
During the quarterly sampling events, collocated surface water and sediment samples were collected from three points downstream from the RCAs (Figures 19-1 and 19-2). The first sampling point, SWS-01, is located on Lmuma Creek in the Upper Yakima River watershed downstream from Ranges 17 and 20 RCAs where Lmuma Creek exits the installation. The second sampling point, SWS-02, is located on Selah Creek in the Upper Yakima watershed downstream from Ranges 14, 17, and 20 RCAs where Selah Creek exits the installation. The third sampling point, SWS-05, is located on Selah Creek downstream from RCA Range 14 where Selah Creek exits the installation to the Columbia River. In all of the cases, samples were collected, as intended, downstream from RCAs on the same waterway as planned and within the boundary of YTC. However, when the sampler traveled to the locations included in the site-specific ERMP, the points were not located on the intended waterway. The sampler actually collected samples from alternate locations on the shore as close as possible to the originally planned locations. As shown in Figures 19-1 and 19-2, surface water and sediment samples were collected approximately 600 feet from the planned location for SWS-01 and approximately 2,000 feet from the planned location for SWS-02 and SWS-05. Surface water was not present at one of the three locations, SWS-02, for the June and September sampling events, but surface water was present at all three locations during the February and December sampling events. All future sampling will be conducted at the same locations that were sampled during the 2017 and 2018 quarterly events shown in Figures 19-1 and 19-2.

The concentrations of total and isotopic uranium in surface water and sediment samples collected during the quarterly sampling events are presented in Tables 19-1 and 19-2, respectively. Since all surface water and sediment samples exhibited U-238/U-234 activity ratios of less than the investigation level of 3.0, confirmatory analysis by ICP-MS was not needed.











**Table 19-1. Uranium in Surface Water, YTC, Washington**

Sample Location	Date	Uranium-234 (pCi/L)	Uranium-235 (pCi/L)	Uranium-238 (pCi/L)	Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)
SWS-01	2/28/2018	0.75 +/- 0.14	0.046 +/- 0.035 J	0.36 +/- 0.09 J	1.2 +/- 0.2	0.48 +/- 0.15
SWS-02	2/28/2018	0.93 +/- 0.17	0.042 +/- 0.035 J	0.52 +/- 0.12 J	1.5 +/- 0.2	0.56 +/- 0.16
SWS-05	2/28/2018	0.36 +/- 0.09 J	0.013 +/- 0.018 U	0.19 +/- 0.07 J	0.56 +/- 0.11	0.53 +/- 0.23
SWS-01	6/12/2018	0.44 +/- 0.17 J	0.025 +/- 0.036 U	0.30 +/- 0.11 J	0.77 +/- 0.21	0.68 +/- 0.37
SWS-02	6/12/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---
SWS-05	6/12/2018	0.26 +/- 0.1 J	0.036 +/- 0.044 U	0.14 +/- 0.07 J	0.44 +/- 0.13	0.54 +/- 0.34
SWS-01	9/5/2018	0.84 +/- 0.2 J	0.00 +/- 0 U	0.38 +/- 0.13 J	1.2 +/- 0.2	0.45 +/- 0.19
SWS-02	9/5/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---
SWS-05	9/5/2018	0.61 +/- 0.17 J	0.025 +/- 0.036 U	0.14 +/- 0.08 J	0.78 +/- 0.19	0.23 +/- 0.14
SWS-01	12/14/2018	1.7 +/- 0.3	0.0094 +/- 0.0348 U	0.25 +/- 0.12 J	2.0 +/- 0.4	0.15 +/- 0.08
SWS-02	12/14/2018	1.3 +/- 0.3 J	0.035 +/- 0.049 U	0.54 +/- 0.18 J	1.9 +/- 0.3	0.42 +/- 0.17
SWS-05	12/14/2018	3.1 +/- 0.4	0.12 +/- 0.08 J	0.27 +/- 0.11 J	3.5 +/- 0.5	0.087 +/- 0.037

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/- --- – Indicates surface water sample was not collected because water was not present during sampling.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.



**Table 19-2. Uranium in Sediment, YTC, Washington**

Sample Location	Date	Uranium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)	Total Uranium (pCi/g)	U-238/U-234 Ratio (unitless)
SWS-01	2/28/2018	0.44 +/- 0.09 J	0.020 +/- 0.02 J	0.41 +/- 0.09 J	0.87 +/- 0.13	0.93 +/- 0.28
SWS-02	2/28/2018	0.67 +/- 0.13	0.031 +/- 0.03 U	0.55 +/- 0.11 J	1.3 +/- 0.2	0.82 +/- 0.23
SWS-05	2/28/2018	0.53 +/- 0.11	-0.0023 +/- 0.0046 U	0.54 +/- 0.11	1.1 +/- 0.2	1.0 +/- 0.3
SWS-01	6/12/2018	0.56 +/- 0.11	0.035 +/- 0.031 U	0.39 +/- 0.09 J	0.99 +/- 0.15	0.70 +/- 0.21
SWS-02	6/12/2018	1.1 +/- 0.2	0.072 +/- 0.041 J	0.72 +/- 0.13	1.9 +/- 0.2	0.65 +/- 0.15
SWS-05	6/12/2018	0.57 +/- 0.11 J	0.052 +/- 0.035 J	0.41 +/- 0.09 J	1.0 +/- 0.2	0.72 +/- 0.22
SWS-01	9/5/2018	0.38 +/- 0.09 J	0.035 +/- 0.029 J	0.32 +/- 0.08 J	0.74 +/- 0.13	0.84 +/- 0.3
SWS-02	9/5/2018	0.66 +/- 0.13	0.013 +/- 0.022 U	0.46 +/- 0.1 J	1.1 +/- 0.2	0.70 +/- 0.2
SWS-05	9/5/2018	0.50 +/- 0.11	0.0080 +/- 0.0392 U	0.43 +/- 0.1 J	0.94 +/- 0.15	0.86 +/- 0.28
SWS-01	12/14/2018	0.89 +/- 0.15	0.037 +/- 0.03 J	0.48 +/- 0.1 J	1.4 +/- 0.2	0.54 +/- 0.14
SWS-02	12/14/2018	0.74 +/- 0.13	0.024 +/- 0.024 U	0.55 +/- 0.11	1.3 +/- 0.2	0.74 +/- 0.19
SWS-05	12/14/2018	0.62 +/- 0.12	0.023 +/- 0.023 J	0.54 +/- 0.11	1.2 +/- 0.2	0.87 +/- 0.25

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

## 20. CONCLUSIONS AND RECOMMENDATIONS

The February/March, May/June, September, and November/December 2018, sampling events were conducted in accordance with the approved site-specific ERMP and QAP (ML16265A221). DU was not detected in any environmental media samples based on interpretation of U-238 to U-234 activity ratios, as specified in the ERMP. Since none of the U-238/U-234 activity ratios in any samples exceeded 3.0, no further investigation was needed to validate whether a sample result was representative of DU or natural uranium.

As noted in Sections 2 through 19 and Tables 20-1 through 20-8, these results support the conclusion that total uranium concentrations are compliant with applicable criteria and DU is not leaving any RCAs.

In conclusion, no action levels defined in the U.S. Army's license were exceeded, and future environmental monitoring will continue to be completed in accordance with the approved ERMP.



**Table 20-1. Summary of Sampling Results for Uranium in Surface Water (Winter 2018)**

Installation	Sample Location	Date	Surface Water					U-238/U-234 Ratio (unitless)
			Uranium 234 (pCi/L)	Uranium 235 (pCi/L)	Uranium 238 (pCi/L)	Total Uranium (pCi/L)		
Fort Benning, GA	UC2 *	3/6/2018	0.015 +/- 0.013 U	0.0017 +/- 0.007 U	0.0023 +/- 0.0098 U	0.019 +/- 0.018	ND	
	OC2	3/6/2018	0.0037 +/- 0.0158 U	0.0062 +/- 0.0124 U	0.019 +/- 0.023 U	0.029 +/- 0.031	ND	
Fort Bragg, NC	SWS-08	4/5/2018	0.34 +/- 0.13 J	0.035 +/- 0.049 U	0.028 +/- 0.039 U	0.40 +/- 0.14	ND	
Fort Campbell, KY	SWS-09	3/7/2018	0.038 +/- 0.027 J	-0.019 +/- 0.02 U	0.0023 +/- 0.0189 U	0.021 +/- 0.038	ND	
Fort Carson, CO	SWS-02	3/15/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---	
	SWS-03	3/15/2018	16 +/- 1.48	0.52 +/- 0.15 J	11 +/- 1.09	28 +/- 1.84	0.69 +/- 0.09	
Fort Gordon, GA	Gut	3/7/2018	0.018 +/- 0.023 U	0.0041 +/- 0.0151 U	0.023 +/- 0.026 U	0.045 +/- 0.038	ND	
Fort Hood, TX	ERM-01	3/27/2018	0.29 +/- 0.09 J	0.0040 +/- 0.015 U	0.29 +/- 0.08 J	0.58 +/- 0.12	1.0 +/- 0.4	
	ERM-02	3/27/2018	0.31 +/- 0.09 J	0.015 +/- 0.021 U	0.20 +/- 0.07 J	0.53 +/- 0.12	0.65 +/- 0.31	
Fort Hunter-Liggett, CA	ERM-01	3/6/2018	0.084 +/- 0.044 J	0.0089 +/- 0.0166 U	0.032 +/- 0.03 U	0.12 +/- 0.06	ND	
	ERM-02	3/6/2018	0.84 +/- 0.15	0.037 +/- 0.038 U	0.69 +/- 0.13	1.6 +/- 0.2	0.82 +/- 0.21	
Fort Jackson, SC	CC-3	4/3/2018	0.031 +/- 0.045 U	-0.0048 +/- 0.0096 U	0.0093 +/- 0.0187 U	ND	ND	
Fort Knox, KY	SWS-03	3/6/2018	0.22 +/- 0.07 J	0.016 +/- 0.022 U	0.11 +/- 0.05 J	0.35 +/- 0.09	0.50 +/- 0.28	
Fort Polk, LA	SWS-04	3/29/2018	0.016 +/- 0.029 U	0.0010 +/- 0.0141 U	0.017 +/- 0.026 U	0.034 +/- 0.041	ND	
Fort Riley, KS	HC-1	3/13/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---	
	SC-1 *	3/13/2018	0.73 +/- 0.11	0.034 +/- 0.024	0.72 +/- 0.11	1.5 +/- 0.2	0.99 +/- 0.21	
Fort Sill, OK	SWS-06A *	2/27/2018	0.77 +/- 0.08	0.031 +/- 0.015 UJ	0.56 +/- 0.06	1.4 +/- 0.1	0.73 +/- 0.11	
JBLM, WA	AIA-SP02	3/5/2018	0.031 +/- 0.025 J	0.010 +/- 0.019 U	0.00086 +/- 0.012 U	0.042 +/- 0.034	ND	
YTC, WA	SWS-01	2/28/2018	0.75 +/- 0.14	0.046 +/- 0.035 J	0.36 +/- 0.09 J	1.2 +/- 0.2	0.48 +/- 0.15	
	SWS-02	2/28/2018	0.93 +/- 0.17	0.042 +/- 0.035 J	0.52 +/- 0.12 J	1.5 +/- 0.2	0.56 +/- 0.16	
	SWS-05	2/28/2018	0.36 +/- 0.09 J	0.013 +/- 0.018 U	0.19 +/- 0.07 J	0.56 +/- 0.11	0.53 +/- 0.23	
JBMDL, NJ	SWS-13	3/6/2018	0.061 +/- 0.044 J	0.0089 +/- 0.0234 U	0.025 +/- 0.028 U	0.095 +/- 0.058	ND	
	SWS-14	3/6/2018	0.046 +/- 0.039 U	-0.0072 +/- 0.0182 U	0.0027 +/- 0.0215 U	0.042 +/- 0.048	ND	
PTA, HI	ERM-01	2/20/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---	
Schofield Barracks, HI	SWS-01	2/21/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---	
	SWS-02	2/21/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---	
	SWS-03	2/21/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---	---	

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/---- – Indicates surface water sample was not collected because water was not present during sampling.

\* – Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 20-2. Summary of Sampling Results for Uranium in Sediment Water (Winter 2018)**

Installation	Sample Location	Date	Sediment						U-238/U-234 Ratio (unitless)
			Uranium 234 (pCi/g)	Uranium 235 (pCi/g)	Uranium 238 (pCi/g)	Total Uranium (pCi/g)			
Fort Benning, GA	UC2 *	3/6/2018	0.13 +/- 0.04 J	-0.00032 +/- 0.01197 U	0.10 +/- 0.04 J	0.23 +/- 0.06			0.77 +/- 0.37
	OC2	3/6/2018	0.12 +/- 0.05 J	0.00 +/- 0 U	0.14 +/- 0.05 J	0.26 +/- 0.07			1.2 +/- 0.7
Fort Bragg, NC	SWS-08	4/5/2018	0.69 +/- 0.12	0.051 +/- 0.033 J	0.53 +/- 0.1	1.3 +/- 0.2			0.77 +/- 0.2
Fort Campbell, KY	SWS-09	3/7/2018	0.69 +/- 0.12	0.054 +/- 0.035 J	0.78 +/- 0.14	1.5 +/- 0.2			1.1 +/- 0.3
Fort Carson, CO	SWS-02	3/15/2018	1.0 +/- 0.2	0.072 +/- 0.042 J	0.97 +/- 0.16	2.0 +/- 0.2			0.97 +/- 0.22
	SWS-03	3/15/2018	1.9 +/- 0.2	0.14 +/- 0.06 J	1.7 +/- 0.2	3.7 +/- 0.3			0.89 +/- 0.17
Fort Gordon, GA	Gut	3/7/2018	0.43 +/- 0.1 J	0.0034 +/- 0.0128 U	0.32 +/- 0.08 J	0.75 +/- 0.13			0.74 +/- 0.26
Fort Hood, TX	ERM-01	3/27/2018	0.43 +/- 0.1 J	0.025 +/- 0.025 J	0.50 +/- 0.11 J	0.96 +/- 0.15			1.2 +/- 0.4
	ERM-02	3/27/2018	0.48 +/- 0.1 J	0.017 +/- 0.02 J	0.43 +/- 0.1 J	0.93 +/- 0.14			0.90 +/- 0.28
Fort Hunter-Liggett, CA	ERM-01	3/6/2018	0.43 +/- 0.1 J	0.024 +/- 0.024 J	0.42 +/- 0.1 J	0.87 +/- 0.14			0.98 +/- 0.32
	ERM-02	3/6/2018	0.54 +/- 0.12 J	0.042 +/- 0.034 J	0.52 +/- 0.12 J	1.1 +/- 0.2			0.96 +/- 0.31
Fort Jackson, SC	CC-3	4/3/2018	0.79 +/- 0.14	0.047 +/- 0.034 J	0.73 +/- 0.13	1.6 +/- 0.2			0.92 +/- 0.23
Fort Knox, KY	SWS-03	3/6/2018	0.91 +/- 0.16	0.071 +/- 0.041 J	1.1 +/- 0.2	2.1 +/- 0.2			1.2 +/- 0.3
Fort Polk, LA	SWS-04	3/29/2018	0.17 +/- 0.06 J	0.0089 +/- 0.0166 U	0.21 +/- 0.07 J	0.39 +/- 0.09			1.2 +/- 0.6
Fort Riley, KS	HC-1	3/13/2018	0.64 +/- 0.12	0.036 +/- 0.032 U	0.66 +/- 0.13	1.3 +/- 0.2			1.0 +/- 0.3
	SC-1 *	3/13/2018	0.57 +/- 0.08	0.036 +/- 0.021 UJ	0.61 +/- 0.08	1.2 +/- 0.1			1.1 +/- 0.2
Fort Sill, OK	SWS-06A *	2/27/2018	0.57 +/- 0.08	0.029 +/- 0.019 UJ	0.63 +/- 0.09	1.2 +/- 0.1			1.1 +/- 0.2
JBLM, WA	AIA-SP02	3/5/2018	0.21 +/- 0.07 J	0.021 +/- 0.024 U	0.28 +/- 0.08 J	0.51 +/- 0.11			1.3 +/- 0.6
YTC, WA	SWS-01	2/28/2018	0.44 +/- 0.09 J	0.020 +/- 0.02 J	0.41 +/- 0.09 J	0.87 +/- 0.13			0.93 +/- 0.28
	SWS-02	2/28/2018	0.67 +/- 0.13	0.031 +/- 0.03 U	0.55 +/- 0.11 J	1.3 +/- 0.2			0.82 +/- 0.23
	SWS-05	2/28/2018	0.53 +/- 0.11	-0.0023 +/- 0.0046 U	0.54 +/- 0.11	1.1 +/- 0.2			1.0 +/- 0.3
JBMDL, NJ	SWS-13	3/6/2018	0.082 +/- 0.044 J	0.017 +/- 0.02 J	0.097 +/- 0.046 J	0.20 +/- 0.07			1.2 +/- 0.9
	SWS-14	3/6/2018	0.16 +/- 0.06 J	0.00093 +/- 0.0129 U	0.065 +/- 0.038 J	0.23 +/- 0.07			0.41 +/- 0.29
PTA, HI	ERM-01	2/20/2018	0.19 +/- 0.06 J	0.0088 +/- 0.0165 U	0.25 +/- 0.07 J	0.45 +/- 0.09			1.3 +/- 0.6
Schofield Barracks, HI	SWS-01	2/21/2018	1.0 +/- 0.2	0.048 +/- 0.039 J	0.84 +/- 0.15	1.9 +/- 0.2			0.84 +/- 0.21
	SWS-02	2/21/2018	0.31 +/- 0.08 J	0.0062 +/- 0.0164 U	0.27 +/- 0.07 J	0.59 +/- 0.11			0.87 +/- 0.33
	SWS-03	2/21/2018	0.55 +/- 0.11 J	0.017 +/- 0.025 U	0.49 +/- 0.1 J	1.1 +/- 0.1			0.89 +/- 0.25

+/- -- Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/---- -- Indicates surface water sample was not collected because water was not present during sampling.

\* -- Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J -- Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U -- Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND -- Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 20-3. Summary of Sampling Results for Uranium in Surface Water (Spring 2018)**

Installation	Sample Location	Date	Surface Water						U-238/U-234 Ratio (unitless)
			Uranium 234 (pCi/L)	Uranium 235 (pCi/L)	Uranium 238 (pCi/L)	Total Uranium (pCi/L)			
Donnelly TA, AK	SWS-01	6/5/2018	0.36 +/- 0.09 J	0.012 +/- 0.017 U	0.33 +/- 0.08 J	0.70 +/- 0.12			0.92 +/- 0.33
Fort Benning, GA	UC2 *	6/13/2018	0.037 +/- 0.023 UJ	0.0011 +/- 0.01 U	0.033 +/- 0.019 UJ	0.071 +/- 0.032			ND
	OC2	6/13/2018	0.064 +/- 0.043 J	0.016 +/- 0.022 U	0.013 +/- 0.018 U	0.093 +/- 0.052			ND
Fort Bragg, NC	SWS-08	6/7/2018	0.097 +/- 0.078 U	0.024 +/- 0.034 U	0.058 +/- 0.055 U	0.18 +/- 0.1			ND
Fort Campbell, KY	SWS-09	5/31/2018	0.054 +/- 0.038 J	0.00 +/- 0 U	0.034 +/- 0.028 J	0.088 +/- 0.047			0.63 +/- 0.68
Fort Carson, CO	SWS-02	5/24/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---			---
	SWS-03	5/24/2018	7.8 +/- 0.9	0.28 +/- 0.12 J	4.9 +/- 0.6	13 +/- 1.05			0.63 +/- 0.1
Fort Gordon, GA	Gut	6/12/2018	0.12 +/- 0.05 J	0.0035 +/- 0.0131 U	0.017 +/- 0.02 U	0.14 +/- 0.06			ND
Fort Hood, TX	ERM-01	6/11/2018	0.69 +/- 0.16 J	0.047 +/- 0.05 U	0.23 +/- 0.09 J	0.97 +/- 0.19			0.33 +/- 0.15
	ERM-02	6/11/2018	0.13 +/- 0.07 J	0.00 +/- 0 U	0.15 +/- 0.08 J	0.28 +/- 0.11			1.2 +/- 0.9
Fort Hunter-Liggett, CA	ERM-01	6/7/2018	0.26 +/- 0.15 J	0.017 +/- 0.035 U	0.083 +/- 0.079 U	0.36 +/- 0.17			ND
	ERM-01	6/7/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---			---
	ERM-02	6/7/2018	--- +/- --- R	--- +/- --- R	--- +/- --- R	--- +/- ---			---
Fort Jackson, SC	CC-3	6/5/2018	0.077 +/- 0.04 J	0.0062 +/- 0.0124 U	0.030 +/- 0.024 J	0.11 +/- 0.05			0.39 +/- 0.38
Fort Knox, KY	SWS-03	5/30/2018	0.29 +/- 0.08 J	0.023 +/- 0.026 U	0.18 +/- 0.06 J	0.49 +/- 0.11			0.62 +/- 0.28
Fort Polk, LA	SWS-04	6/13/2018	0.069 +/- 0.038 J	0.022 +/- 0.025 U	0.030 +/- 0.026 U	0.12 +/- 0.05			ND
Fort Riley, KS	HC-1	5/22/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---			---
	SC-1 *	5/22/2018	0.66 +/- 0.2 J	0.050 +/- 0.058 U	0.53 +/- 0.17 J	1.2 +/- 0.3			0.80 +/- 0.35
Fort Sill, OK	SWS-06A *	5/30/2018	0.35 +/- 0.07 J	0.018 +/- 0.018 U	0.28 +/- 0.06 J	0.65 +/- 0.1			0.80 +/- 0.24
JBLM, WA	AIA-SP02	6/4/2018	0.034 +/- 0.031 J	0.015 +/- 0.022 U	0.017 +/- 0.026 U	0.066 +/- 0.046			ND
YTC, WA	SWS-01	6/12/2018	0.44 +/- 0.17 J	0.025 +/- 0.036 U	0.30 +/- 0.11 J	0.77 +/- 0.21			0.68 +/- 0.37
	SWS-02	6/12/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---			---
	SWS-05	6/12/2018	0.26 +/- 0.1 J	0.036 +/- 0.044 U	0.14 +/- 0.07 J	0.44 +/- 0.13			0.54 +/- 0.34
JBMDL, NJ	SWS-13	6/5/2018	0.055 +/- 0.042 J	0.0072 +/- 0.0143 U	0.055 +/- 0.037 J	0.12 +/- 0.06			1.0 +/- 1
	SWS-14	6/5/2018	0.023 +/- 0.025 U	-0.011 +/- 0.011 U	0.017 +/- 0.023 U	0.029 +/- 0.036			ND
PTA, HI	ERM-01	6/20/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---			---
Schofield Barracks, HI	SWS-01	6/18/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---			---
	SWS-02	6/18/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---			---
	SWS-03	6/18/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---			---

+/- -- Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/---- -- Indicates surface water sample was not collected because water was not present during sampling.

\* -- Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J -- Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U -- Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND -- Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

R -- Indicates the analyte value reported is unusable. The U-234, U-235, and U-238 results for ERM-02 were reported as 0.58 +/- 0.54 pCi/L, 0.00 +/- 0.1 pCi/L, and 0.97 +/- 0.62 pCi/L, respectively.



**Table 20-4. Summary of Sampling Results for Uranium in Sediment (Spring 2018)**

Installation	Sample Location	Date	Sediment						U-238/U-234 Ratio (unitless)
			Uranium 234 (pCi/g)	Uranium 235 (pCi/g)	Uranium 238 (pCi/g)	Total Uranium (pCi/g)			
Donnelly TA, AK	SWS-01	6/5/2018	0.63 +/- 0.12	0.026 +/- 0.029 U	0.71 +/- 0.13	1.4 +/- 0.2			1.1 +/- 0.3
Fort Benning, GA	UC2 *	6/13/2018	0.27 +/- 0.05 J	0.014 +/- 0.015 UJ	0.22 +/- 0.05 J	0.50 +/- 0.07			0.81 +/- 0.24
	OC2	6/13/2018	0.40 +/- 0.09 J	0.024 +/- 0.024 J	0.43 +/- 0.1 J	0.85 +/- 0.14			1.1 +/- 0.4
Fort Bragg, NC	SWS-08	6/7/2018	0.68 +/- 0.12	0.0089 +/- 0.0166 U	0.59 +/- 0.11 J	1.3 +/- 0.2			0.87 +/- 0.23
Fort Campbell, KY	SWS-09	5/31/2018	0.76 +/- 0.14	0.047 +/- 0.036 J	0.72 +/- 0.14	1.5 +/- 0.2			0.95 +/- 0.26
Fort Carson, CO	SWS-02	5/24/2018	0.83 +/- 0.15	0.074 +/- 0.045 J	0.86 +/- 0.16	1.8 +/- 0.2			1.0 +/- 0.3
	SWS-03	5/24/2018	2.3 +/- 0.3	0.11 +/- 0.06 J	2.0 +/- 0.3	4.4 +/- 0.4			0.87 +/- 0.16
Fort Gordon, GA	Gut	6/12/2018	0.46 +/- 0.1 J	0.033 +/- 0.032 U	0.56 +/- 0.12 J	1.1 +/- 0.2			1.2 +/- 0.4
Fort Hood, TX	ERM-01	6/11/2018	0.47 +/- 0.1 J	0.0034 +/- 0.0126 U	0.49 +/- 0.1 J	0.96 +/- 0.15			1.0 +/- 0.3
	ERM-02	6/11/2018	0.47 +/- 0.1 J	0.015 +/- 0.021 U	0.46 +/- 0.1 J	0.95 +/- 0.15			0.98 +/- 0.3
Fort Hunter-Liggett, CA	ERM-01	6/7/2018	--- +/- ---	--- +/- ---	--- +/- ---	--- +/- ---			---
	ERM-01	6/7/2018	0.65 +/- 0.13	0.016 +/- 0.025 U	0.56 +/- 0.11 J	1.2 +/- 0.2			0.86 +/- 0.24
	ERM-02	6/7/2018	0.44 +/- 0.1 J	0.028 +/- 0.025 J	0.39 +/- 0.09 J	0.86 +/- 0.14			0.89 +/- 0.28
Fort Jackson, SC	CC-3	6/5/2018	0.57 +/- 0.12 J	0.020 +/- 0.023 J	0.54 +/- 0.12 J	1.1 +/- 0.2			0.95 +/- 0.28
Fort Knox, KY	SWS-03	5/30/2018	0.98 +/- 0.16	0.083 +/- 0.045 J	0.94 +/- 0.16	2.0 +/- 0.2			0.96 +/- 0.22
Fort Polk, LA	SWS-04	6/13/2018	0.073 +/- 0.04 J	-0.0023 +/- 0.0045 U	0.12 +/- 0.05 J	0.19 +/- 0.06			1.6 +/- 1.1
Fort Riley, KS	HC-1	5/22/2018	0.61 +/- 0.13 J	0.050 +/- 0.041 J	0.75 +/- 0.15	1.4 +/- 0.2			1.2 +/- 0.4
	SC-1 *	5/22/2018	0.90 +/- 0.14 J	0.045 +/- 0.034 UJ	0.90 +/- 0.13	1.8 +/- 0.2			1.0 +/- 0.2
Fort Sill, OK	SWS-06A *	5/30/2018	0.61 +/- 0.09	0.030 +/- 0.02 UJ	0.58 +/- 0.08	1.2 +/- 0.1			0.95 +/- 0.19
JBLM, WA	AIA-SP02	6/4/2018	0.20 +/- 0.07 J	0.00 +/- 0 U	0.31 +/- 0.09 J	0.51 +/- 0.11			1.6 +/- 0.7
YTC, WA	SWS-01	6/12/2018	0.56 +/- 0.11	0.035 +/- 0.031 U	0.39 +/- 0.09 J	0.99 +/- 0.15			0.70 +/- 0.21
	SWS-02	6/12/2018	1.1 +/- 0.2	0.072 +/- 0.041 J	0.72 +/- 0.13	1.9 +/- 0.2			0.65 +/- 0.15
	SWS-05	6/12/2018	0.57 +/- 0.11 J	0.052 +/- 0.035 J	0.41 +/- 0.09 J	1.0 +/- 0.2			0.72 +/- 0.22
JBMDL, NJ	SWS-13	6/5/2018	0.31 +/- 0.08 J	0.035 +/- 0.031 U	0.41 +/- 0.09 J	0.76 +/- 0.13			1.3 +/- 0.5
	SWS-14	6/5/2018	0.14 +/- 0.06 J	0.0011 +/- 0.0147 U	0.11 +/- 0.05 J	0.25 +/- 0.08			0.79 +/- 0.47
PTA, HI	ERM-01	6/20/2018	0.22 +/- 0.07 J	0.0057 +/- 0.0114 U	0.14 +/- 0.05 J	0.37 +/- 0.09			0.64 +/- 0.3
Schofield Barracks, HI	SWS-01	6/18/2018	0.90 +/- 0.15	0.049 +/- 0.035 J	0.76 +/- 0.14	1.7 +/- 0.2			0.84 +/- 0.21
	SWS-02	6/18/2018	0.29 +/- 0.08 J	0.018 +/- 0.021 J	0.21 +/- 0.07 J	0.52 +/- 0.11			0.72 +/- 0.31
	SWS-03	6/18/2018	0.66 +/- 0.13	0.016 +/- 0.022 U	0.57 +/- 0.12 J	1.2 +/- 0.2			0.86 +/- 0.24

+/- -- Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/- --- -- Indicates surface water sample was not collected because water was not present during sampling.

\* -- Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J -- Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U -- Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND -- Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 20-5. Summary of Sampling Results for Uranium in Surface Water (Summer 2018)**

Installation	Sample Location	Date	Surface Water																	
			Uranium 234 (pCi/L)				Uranium 235 (pCi/L)				Uranium 238 (pCi/L)				Total Uranium (pCi/L)		U-238/U-234 Ratio (unitless)			
Donnelly TA, AK	SWS-01	9/13/2018	0.50	+/-	0.15	J	0.054	+/-	0.054	J	0.44	+/-	0.14	J	0.99	+/-	0.22	0.88	+/-	0.39
Fort Benning, GA	UC2 *	9/4/2018	0.076	+/-	0.044	UJ	0.012	+/-	0.019	U	0.038	+/-	0.029	J	0.13	+/-	0.06	ND		
	OC2	9/4/2018	0.030	+/-	0.05	U	-0.0071	+/-	0.0141	U	0.041	+/-	0.047	J	0.064	+/-	0.07	ND		
Fort Bragg, NC	SWS-08	9/12/2018	0.054	+/-	0.078	U	0.027	+/-	0.076	U	0.011	+/-	0.064	U	ND		ND			
Fort Campbell, KY	SWS-09	9/12/2018	0.055	+/-	0.044	U	0.016	+/-	0.018	J	0.021	+/-	0.028	U	0.092	+/-	0.056	ND		
Fort Carson, CO	SWS-02	9/4/2018	27	+/-	2.49		0.86	+/-	0.22	J	18	+/-	1.7		46	+/-	3.02	0.67	+/-	0.09
	SWS-03	9/4/2018	9.0	+/-	1		0.33	+/-	0.14	J	6.1	+/-	0.7		15	+/-	1.23	0.68	+/-	0.11
Fort Gordon, GA	Gut	9/5/2018	0.050	+/-	0.05	U	0.0080	+/-	0.0296	U	0.061	+/-	0.055	J	0.12	+/-	0.08	ND		
Fort Hood, TX	ERM-01	9/4/2018	0.16	+/-	0.09	J	0.013	+/-	0.026	U	0.18	+/-	0.09	J	0.35	+/-	0.13	1.1	+/-	0.8
	ERM-02	9/4/2018	0.33	+/-	0.14	J	0.027	+/-	0.05	U	0.22	+/-	0.11	J	0.58	+/-	0.18	0.67	+/-	0.44
Fort Hunter-Liggett, CA	ERM-01	9/4/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	---		
	ERM-02	9/4/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	---		
Fort Jackson, SC	CC-3	9/11/2018	0.027	+/-	0.066	U	0.011	+/-	0.023	U	0.00	+/-	0	U	ND		ND			
Fort Knox, KY	SWS-03	9/11/2018	0.15	+/-	0.06	J	0.00	+/-	0	U	0.14	+/-	0.05	J	0.29	+/-	0.08	0.93	+/-	0.5
Fort Polk, LA	SWS-04	9/5/2018	0.096	+/-	0.068	J	-0.012	+/-	0.016	U	0.029	+/-	0.04	U	0.11	+/-	0.08	ND		
Fort Riley, KS	HC-1	9/6/2018	0.51	+/-	0.15	J	0.00	+/-	0	U	0.37	+/-	0.13	J	0.88	+/-	0.2	0.73	+/-	0.33
	SC-1 *	9/6/2018	0.48	+/-	0.11	J	0.013	+/-	0.019	U	0.44	+/-	0.1	J	0.93	+/-	0.15	0.92	+/-	0.29
Fort Sill, OK	SWS-06A	9/11/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	ND		
JBLM, WA	AIA-SP02	9/6/2018	0.14	+/-	0.07	J	0.011	+/-	0.023	U	0.024	+/-	0.033	U	0.18	+/-	0.08	ND		
YTC, WA	SWS-01	9/5/2018	0.84	+/-	0.2	J	0.00	+/-	0	U	0.38	+/-	0.13	J	1.2	+/-	0.2	0.45	+/-	0.19
	SWS-02	9/5/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	---		
	SWS-05	9/5/2018	0.61	+/-	0.17	J	0.025	+/-	0.036	U	0.14	+/-	0.08	J	0.78	+/-	0.19	0.23	+/-	0.14
JBMDL, NJ	SWS-13	9/6/2018	0.41	+/-	0.15	J	0.035	+/-	0.059	U	0.090	+/-	0.068	J	0.54	+/-	0.18	0.22	+/-	0.19
	SWS-14	9/6/2018	0.044	+/-	0.049	U	0.00	+/-	0	U	0.042	+/-	0.043	J	0.086	+/-	0.066	ND		
PTA, HI	ERM-01	9/10/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	---		
Schofield Barracks, HI	SWS-01	9/7/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	---		
	SWS-02	9/7/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	---		
	SWS-03	9/7/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	---		

+/- -- Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/- --- -- Indicates surface water sample was not collected because water was not present during sampling.

\* -- Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J -- Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U -- Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND -- Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 20-6. Summary of Sampling Results for Uranium in Sediment (Summer 2017)**

Installation	Sample Location	Date	Sediment																		
			Uranium 234 (pCi/g)			Uranium 235 (pCi/g)			Uranium 238 (pCi/g)			Total Uranium (pCi/g)			U-238/U-234 Ratio (unitless)						
Donnelly TA, AK	SWS-01	9/13/2018	0.78	+/-	0.12		0.057	+/-	0.032	J	0.79	+/-	0.12		1.6	+/-	0.2		1.0	+/-	0.2
Fort Benning, GA	UC2 *	9/4/2018	0.21	+/-	0.05	J	0.018	+/-	0.015	UJ	0.21	+/-	0.05	J	0.44	+/-	0.07		1.0	+/-	0.3
	OC2	9/4/2018	0.21	+/-	0.07	J	0.0022	+/-	0.0212	U	0.17	+/-	0.06	J	0.38	+/-	0.1		0.81	+/-	0.41
Fort Bragg, NC	SWS-08	9/12/2018	0.69	+/-	0.12		0.0091	+/-	0.018	U	0.48	+/-	0.09		1.2	+/-	0.2		0.70	+/-	0.18
Fort Campbell, KY	SWS-09	9/12/2018	0.84	+/-	0.13		0.041	+/-	0.028	J	0.83	+/-	0.13		1.7	+/-	0.2		0.99	+/-	0.21
Fort Carson, CO	SWS-02	9/4/2018	0.99	+/-	0.16		0.043	+/-	0.035	J	0.81	+/-	0.14		1.8	+/-	0.2		0.82	+/-	0.19
	SWS-03	9/4/2018	1.6	+/-	0.2		0.095	+/-	0.053	J	1.5	+/-	0.2		3.2	+/-	0.3		0.94	+/-	0.19
Fort Gordon, GA	Gut	9/5/2018	0.24	+/-	0.07	J	0.013	+/-	0.023	U	0.20	+/-	0.07	J	0.45	+/-	0.1		0.83	+/-	0.37
Fort Hood, TX	ERM-01	9/4/2018	0.37	+/-	0.09	J	0.030	+/-	0.032	U	0.49	+/-	0.11	J	0.89	+/-	0.15		1.3	+/-	0.4
	ERM-02	9/4/2018	0.42	+/-	0.1	J	0.029	+/-	0.026	J	0.44	+/-	0.1	J	0.89	+/-	0.14		1.0	+/-	0.3
Fort Hunter-Liggett, CA	ERM-01	9/4/2018	0.46	+/-	0.1	J	0.024	+/-	0.024	J	0.54	+/-	0.11	J	1.0	+/-	0.2		1.2	+/-	0.4
	ERM-02	9/4/2018	0.97	+/-	0.17		0.035	+/-	0.034	U	0.77	+/-	0.15		1.8	+/-	0.2		0.79	+/-	0.2
Fort Jackson, SC	CC-3	9/11/2018	0.74	+/-	0.12		0.056	+/-	0.032	J	0.58	+/-	0.1		1.4	+/-	0.2		0.78	+/-	0.19
Fort Knox, KY	SWS-03	9/11/2018	1.0	+/-	0.2		0.046	+/-	0.029	J	0.90	+/-	0.14		1.9	+/-	0.2		0.90	+/-	0.19
Fort Polk, LA	SWS-04	9/5/2018	0.085	+/-	0.043	J	0.0074	+/-	0.0196	U	0.062	+/-	0.038	J	0.15	+/-	0.06		0.73	+/-	0.58
Fort Riley, KS	HC-1	9/6/2018	0.61	+/-	0.12	J	0.068	+/-	0.045	J	0.89	+/-	0.15		1.6	+/-	0.2		1.5	+/-	0.4
	SC-1 *	9/6/2018	0.61	+/-	0.09	J	0.028	+/-	0.02	UJ	0.75	+/-	0.1		1.4	+/-	0.1		1.2	+/-	0.2
Fort Sill, OK	SWS-06A *	9/11/2018	0.54	+/-	0.07		0.013	+/-	0.011	UJ	0.54	+/-	0.07		1.1	+/-	0.1		1.0	+/-	0.2
JBLM, WA	AIA-SP02	9/6/2018	0.17	+/-	0.07	J	0.022	+/-	0.026	J	0.25	+/-	0.08	J	0.44	+/-	0.11		1.5	+/-	0.8
YTC, WA	SWS-01	9/5/2018	0.38	+/-	0.09	J	0.035	+/-	0.029	J	0.32	+/-	0.08	J	0.74	+/-	0.13		0.84	+/-	0.3
	SWS-02	9/5/2018	0.66	+/-	0.13		0.013	+/-	0.022	U	0.46	+/-	0.1	J	1.1	+/-	0.2		0.70	+/-	0.2
	SWS-05	9/5/2018	0.50	+/-	0.11		0.0080	+/-	0.0392	U	0.43	+/-	0.1	J	0.94	+/-	0.15		0.86	+/-	0.28
JBMDL, NJ	SWS-13	9/6/2018	0.21	+/-	0.07	J	0.039	+/-	0.035	U	0.38	+/-	0.09	J	0.63	+/-	0.12		1.8	+/-	0.7
	SWS-14	9/6/2018	0.12	+/-	0.05	J	0.0058	+/-	0.0116	U	0.097	+/-	0.043	J	0.22	+/-	0.07		0.81	+/-	0.49
PTA, HI	ERM-01	9/10/2018	0.18	+/-	0.05	J	0.0042	+/-	0.0084	U	0.15	+/-	0.05	J	0.33	+/-	0.07		0.83	+/-	0.35
Schofield Barracks, HI	SWS-01	9/7/2018	0.27	+/-	0.08	J	0.011	+/-	0.023	U	0.29	+/-	0.08	J	0.57	+/-	0.12		1.1	+/-	0.4
	SWS-02	9/7/2018	0.32	+/-	0.09	J	0.0097	+/-	0.0181	U	0.29	+/-	0.08	J	0.62	+/-	0.12		0.91	+/-	0.35
	SWS-03	9/7/2018	0.54	+/-	0.11	J	0.032	+/-	0.028	J	0.48	+/-	0.1	J	1.1	+/-	0.2		0.89	+/-	0.26

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/---- – Indicates surface water sample was not collected because water was not present during sampling.

\* – Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.



**Table 20-7. Summary of Sampling Results for Uranium in Surface Water (Fall 2018)**

Installation	Sample Location	Date	Surface Water																	
			Uranium 234 (pCi/L)			Uranium 235 (pCi/L)			Uranium 238 (pCi/L)			Total Uranium (pCi/L)	U-238/U-234 Ratio (unitless)							
Fort Benning, GA	UC2 *	12/5/2018	0.083	+/-	0.049	UJ	0.0013	+/-	0.0148	U	0.010	+/-	0.018	U	0.094	+/-	0.054	ND		
	OC2	12/5/2018	0.060	+/-	0.06	U	-0.010	+/-	0.01	U	-0.011	+/-	0.027	U	ND			ND		
Fort Bragg, NC	SWS-08	12/12/2018	0.063	+/-	0.039	J	0.016	+/-	0.023	U	0.0042	+/-	0.0252	U	0.083	+/-	0.052	ND		
Fort Campbell, KY	SWS-09	11/28/2018	0.15	+/-	0.08	J	0.00	+/-	0	U	0.11	+/-	0.07	J	0.26	+/-	0.11	0.73	+/-	0.63
Fort Carson, CO	SWS-02	11/28/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	---	+/-	---
	SWS-03	11/28/2018	8.6	+/-	0.9		0.30	+/-	0.13	J	5.6	+/-	0.7		15	+/-	1.17	0.65	+/-	0.11
Fort Gordon, GA	Gut	12/4/2018	0.057	+/-	0.058	U	0.0020	+/-	0.0278	U	0.040	+/-	0.045	U	0.099	+/-	0.078	ND		
Fort Hood, TX	ERM-01	12/18/2018	0.58	+/-	0.17	J	0.013	+/-	0.026	U	0.48	+/-	0.15	J	1.1	+/-	0.2	0.83	+/-	0.35
	ERM-02	12/18/2018	1.0	+/-	0.2	J	0.027	+/-	0.038	U	0.57	+/-	0.17	J	1.6	+/-	0.3	0.57	+/-	0.21
Fort Hunter-Liggett, CA	ERM-01	11/20/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	---		
	ERM-02	11/20/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	---		
Fort Jackson, SC	CC-3	12/11/2018	0.072	+/-	0.052	U	0.0052	+/-	0.0314	U	0.034	+/-	0.04	U	0.11	+/-	0.07	ND		
Fort Knox, KY	SWS-03	11/27/2018	0.29	+/-	0.11	J	0.0020	+/-	0.0275	U	0.11	+/-	0.07	J	0.40	+/-	0.13	0.38	+/-	0.27
Fort Polk, LA	SWS-04	12/19/2018	0.23	+/-	0.11	J	0.027	+/-	0.039	U	0.033	+/-	0.038	J	0.29	+/-	0.12	0.14	+/-	0.18
Fort Riley, KS	SC-1 *	11/27/2018	1.5	+/-	0.2		0.11	+/-	0.05	J	1.0	+/-	0.2	J	2.6	+/-	0.3	0.67	+/-	0.14
Fort Sill, OK	SWS-06A *	12/12/2018	0.54	+/-	0.11	J	0.046	+/-	0.038	UJ	0.39	+/-	0.09	J	0.98	+/-	0.15	0.72	+/-	0.23
JBLM, WA	AIA-SP02	11/20/2018	0.065	+/-	0.057	U	0.013	+/-	0.026	U	-0.0088	+/-	0.0124	U	0.069	+/-	0.064	ND		
YTC, WA	SWS-01	12/14/2018	1.7	+/-	0.3		0.0094	+/-	0.0348	U	0.25	+/-	0.12	J	2.0	+/-	0.4	0.15	+/-	0.08
	SWS-02	12/14/2018	1.3	+/-	0.3	J	0.035	+/-	0.049	U	0.54	+/-	0.18	J	1.9	+/-	0.3	0.42	+/-	0.17
	SWS-05	12/14/2018	3.1	+/-	0.4		0.12	+/-	0.08	J	0.27	+/-	0.11	J	3.5	+/-	0.5	0.087	+/-	0.037
JBMDL, NJ	SWS-13	11/27/2018	0.14	+/-	0.14	U	0.00	+/-	0	U	0.016	+/-	0.061	U	0.16	+/-	0.16	ND		
	SWS-14	11/27/2018	0.012	+/-	0.03	U	0.0093	+/-	0.0392	U	0.020	+/-	0.028	U	0.041	+/-	0.057	ND		
PTA, HI	ERM-01	12/13/2018	---	+/-	---		---	+/-	---		---	+/-	---		---	+/-	---	---		
Schofield Barracks, HI	SWS-01	12/11/2018	0.25	+/-	0.1	J	0.0068	+/-	0.0252	U	0.024	+/-	0.033	U	0.28	+/-	0.11	ND		
	SWS-02	12/11/2018	0.35	+/-	0.2	J	0.084	+/-	0.097	J	0.060	+/-	0.122	U	0.49	+/-	0.25	ND		
	SWS-03	12/11/2018	0.70	+/-	0.25	J	0.043	+/-	0.091	U	0.084	+/-	0.101	U	0.83	+/-	0.28	ND		

+/- – Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/- --- – Indicates surface water sample was not collected because water was not present during sampling.

\* – Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**Table 20-8. Summary of Sampling Results for Uranium in Sediment (Fall 2018)**

Installation	Sample Location	Date	Sediment																	
			Uranium 234 (pCi/g)				Uranium 235 (pCi/g)				Uranium 238 (pCi/g)				Total Uranium (pCi/g)		U-238/U-234 Ratio (unitless)			
Fort Benning, GA	UC2 *	12/5/2018	0.27	+/-	0.06		0.016	+/-	0.015	U	0.28	+/-	0.05	0.57	+/-	0.08	1.0	+/-	0.3	
	OC2	12/5/2018	0.13	+/-	0.05	J	0.0061	+/-	0.0121	U	0.12	+/-	0.05	J	0.26	+/-	0.07	0.92	+/-	0.53
Fort Bragg, NC	SWS-08	12/12/2018	1.2	+/-	0.2		0.033	+/-	0.03	J	1.1	+/-	0.2	2.3	+/-	0.3	0.92	+/-	0.21	
Fort Campbell, KY	SWS-09	11/28/2018	0.92	+/-	0.15		0.057	+/-	0.038	J	0.80	+/-	0.14	1.8	+/-	0.2	0.87	+/-	0.21	
Fort Carson, CO	SWS-02	11/28/2018	0.94	+/-	0.15		0.041	+/-	0.03	J	0.84	+/-	0.14	1.8	+/-	0.2	0.89	+/-	0.2	
	SWS-03	11/28/2018	2.0	+/-	0.3		0.075	+/-	0.042	J	1.8	+/-	0.2	3.9	+/-	0.3	0.90	+/-	0.16	
Fort Gordon, GA	Gut	12/4/2018	0.19	+/-	0.06	J	0.016	+/-	0.019	J	0.19	+/-	0.06	J	0.40	+/-	0.09	1.0	+/-	0.4
Fort Hood, TX	ERM-01	12/18/2018	0.40	+/-	0.09	J	0.012	+/-	0.021	U	0.50	+/-	0.1	J	0.91	+/-	0.14	1.3	+/-	0.4
	ERM-02	12/18/2018	0.40	+/-	0.09	J	0.045	+/-	0.038	U	0.31	+/-	0.08	J	0.76	+/-	0.13	0.78	+/-	0.28
Fort Hunter-Liggett, CA	ERM-01	11/20/2018	0.45	+/-	0.11	J	0.027	+/-	0.03	U	0.36	+/-	0.1	J	0.84	+/-	0.15	0.80	+/-	0.28
	ERM-02	11/20/2018	0.25	+/-	0.08	J	0.028	+/-	0.031	U	0.36	+/-	0.09	J	0.64	+/-	0.13	1.4	+/-	0.6
Fort Jackson, SC	CC-3	12/11/2018	1.1	+/-	0.2		0.052	+/-	0.037	J	1.0	+/-	0.2	2.2	+/-	0.2	0.91	+/-	0.2	
Fort Knox, KY	SWS-03	11/27/2018	0.86	+/-	0.15		0.040	+/-	0.035	U	1.0	+/-	0.2	1.9	+/-	0.2	1.2	+/-	0.3	
Fort Polk, LA	SWS-04	12/19/2018	0.060	+/-	0.035	J	-0.0025	+/-	0.0049	U	0.089	+/-	0.044	J	0.15	+/-	0.06	1.5	+/-	1.1
Fort Riley, KS	SC-1 *	11/27/2018	0.60	+/-	0.08		0.065	+/-	0.028	J	0.59	+/-	0.08	1.3	+/-	0.1	0.98	+/-	0.19	
Fort Sill, OK	SWS-06A *	12/12/2018	0.44	+/-	0.07	J	0.019	+/-	0.016	UJ	0.53	+/-	0.08	0.99	+/-	0.11	1.2	+/-	0.3	
JBLM, WA	AIA-SP02	11/20/2018	0.33	+/-	0.09	J	0.0030	+/-	0.024	U	0.23	+/-	0.07	J	0.56	+/-	0.12	0.70	+/-	0.29
YTC, WA	SWS-01	12/14/2018	0.89	+/-	0.15		0.037	+/-	0.03	J	0.48	+/-	0.1	J	1.4	+/-	0.2	0.54	+/-	0.14
	SWS-02	12/14/2018	0.74	+/-	0.13		0.024	+/-	0.024	U	0.55	+/-	0.11	1.3	+/-	0.2	0.74	+/-	0.19	
	SWS-05	12/14/2018	0.62	+/-	0.12		0.023	+/-	0.023	J	0.54	+/-	0.11	1.2	+/-	0.2	0.87	+/-	0.25	
JBMDL, NJ	SWS-13	11/27/2018	0.11	+/-	0.05	J	0.011	+/-	0.016	U	0.089	+/-	0.041	J	0.21	+/-	0.06	0.81	+/-	0.51
	SWS-14	11/27/2018	0.19	+/-	0.07	J	0.0047	+/-	0.0173	U	0.093	+/-	0.051	J	0.29	+/-	0.09	0.49	+/-	0.32
PTA, HI	ERM-01	12/13/2018	0.23	+/-	0.07	J	0.0087	+/-	0.0162	U	0.14	+/-	0.05	J	0.38	+/-	0.09	0.61	+/-	0.29
Schofield Barracks, HI	SWS-01	12/11/2018	0.82	+/-	0.14		0.042	+/-	0.032	J	0.96	+/-	0.16	1.8	+/-	0.2	1.2	+/-	0.3	
	SWS-02	12/11/2018	0.37	+/-	0.09	J	0.022	+/-	0.022	J	0.32	+/-	0.08	J	0.71	+/-	0.12	0.86	+/-	0.29
	SWS-03	12/11/2018	0.68	+/-	0.13		0.030	+/-	0.027	J	0.70	+/-	0.13	1.4	+/-	0.2	1.0	+/-	0.3	

+/- -- Laboratory uncertainties are specified with two standard deviations (95 percent confidence level).

--- +/- --- -- Indicates surface water sample was not collected because water was not present during sampling.

\* -- Indicates a duplicate sample was collected to fulfill QA/QC requirements and was combined into a single reported result.

J -- Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

U -- Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

ND -- Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**



## 21. REFERENCES

- NRC (Nuclear Regulatory Commission). 2012a. NRC Homepage, Glossary:. Page last reviewed/updated 10 December.
- NRC. 2012b. NRC Homepage, Background Information on Depleted Uranium: <http://www.nrc.gov/reading-rm/basic-ref/glossary/depleted-uranium.html>. Page last reviewed/updated 10 December.
- NRC. 2016. Site-Specific Environmental Radiation Monitoring Plans and Associated Quality Assurance Plan. ADAMS Accession Number: ML16265A221. 15 September.
- NRC. 2017. Materials License. United States Army Installation Management Command. ADAMS Accession Number: ML16343A164. 9 February.

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

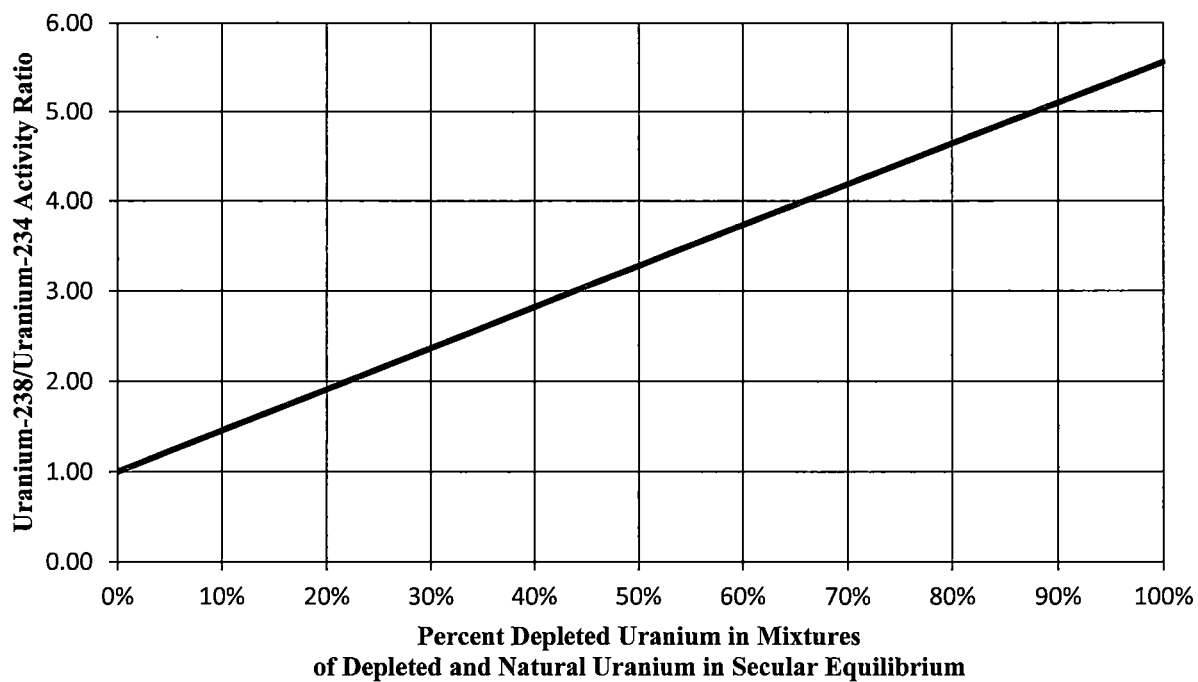
## **APPENDIX A**

### **RELATIVE URANIUM-238/URANIUM-234 ACTIVITY RATIOS FOR MIXTURES OF DEPLETED AND NATURAL URANIUM**



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

**Relative Uranium-238/Uranium-234 Activity Ratios  
for Mixtures of Depleted and Natural Uranium**



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**



**APPENDICES B THROUGH S**  
**FIELD LOGBOOK PAGES**

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

The Army maintains a larger version of this report that includes field notes collected during all sampling events. Please contact the Army's License Radiation Safety Officer, Dr. Robert N. Cherry, by telephone at (210) 466-0368 or by email at [robert.n.cherry.civ@mail.mil](mailto:robert.n.cherry.civ@mail.mil) for copies.



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

**APPENDIX T**  
**DATA QUALITY ASSESSMENT**

**THIS PAGE WAS INTENTIONALLY LEFT BLANK**



## TABLE OF CONTENTS

	Page
T. DATA QUALITY ASSESMENT.....	T-1
T.1 SUMMARY OF ENVIRONMENTAL RADIATION MONITORING DATA REVIEW AND VALIDATION.....	T-1
T.2 DATA REVIEW OF FIRST QUARTER SAMPLES (FEBRUARY/MARCH/APRIL 2018) .....	T-2
T.2.1 Donnelly Training Area, Fort Wainwright, Alaska.....	T-3
T.2.2 Fort Benning, Georgia.....	T-3
T.2.3 Fort Bragg, North Carolina.....	T-3
T.2.4 Fort Campbell, Kentucky .....	T-3
T.2.5 Fort Carson, Colorado .....	T-3
T.2.6 Fort Gordon, Georgia .....	T-4
T.2.7 Fort Hood, Texas .....	T-4
T.2.8 Fort Hunter Liggett, California.....	T-4
T.2.9 Fort Jackson, South Carolina.....	T-4
T.2.10 Fort Knox, Kentucky .....	T-5
T.2.11 Fort Polk, Louisiana .....	T-5
T.2.12 Fort Riley, Kansas .....	T-5
T.2.13 Fort Sill, Oklahoma .....	T-5
T.2.14 Joint Base Lewis-McChord, Washington.....	T-6
T.2.15 Joint Base McGuire-Dix-Lakehurst, New Jersey .....	T-6
T.2.16 Pohakuloa Training Area, Hawaii .....	T-6
T.2.17 Schofield Barracks, Hawaii .....	T-6
T.2.18 Yakima Training Center, Washington.....	T-7
T.3 DATA REVIEW OF SECOND QUARTER SAMPLES (MAY/JUNE 2018).....	T-7
T.3.1 Donnelly Training Area, Fort Wainwright, Alaska.....	T-7
T.3.2 Fort Benning, Georgia.....	T-8
T.3.3 Fort Bragg, North Carolina.....	T-8
T.3.4 Fort Campbell, Kentucky .....	T-8
T.3.5 Fort Carson, Colorado .....	T-8
T.3.6 Fort Gordon, Georgia .....	T-9
T.3.7 Fort Hood, Texas .....	T-9
T.3.8 Fort Hunter Liggett, California.....	T-9
T.3.9 Fort Jackson, South Carolina.....	T-10
T.3.10 Fort Knox, Kentucky.....	T-10
T.3.11 Fort Polk, Louisiana .....	T-10
T.3.12 Fort Riley, Kansas .....	T-10
T.3.13 Fort Sill, Oklahoma .....	T-11
T.3.14 Joint Base Lewis-McChord, Washington.....	T-11
T.3.15 Joint Base McGuire-Dix-Lakehurst, New Jersey .....	T-11
T.3.16 Pohakuloa Training Area, Hawaii .....	T-12
T.3.17 Schofield Barracks, Hawaii .....	T-12
T.3.18 Yakima Training Center, Washington.....	T-12
T.4 DATA REVIEW OF THIRD QUARTER SAMPLES (SEPTEMBER 2018) .....	T-12
T.4.1 Donnelly Training Area, Fort Wainwright, Alaska.....	T-13
T.4.2 Fort Benning, Georgia.....	T-13
T.4.3 Fort Bragg, North Carolina.....	T-13

## TABLE OF CONTENTS (Continued)

	Page
T.4.4 Fort Campbell, Kentucky .....	T-13
T.4.5 Fort Carson, Colorado .....	T-14
T.4.6 Fort Gordon, Georgia .....	T-14
T.4.7 Fort Hood, Texas .....	T-14
T.4.8 Fort Hunter Liggett, California .....	T-14
T.4.9 Fort Jackson, South Carolina .....	T-15
T.4.10 Fort Knox, Kentucky .....	T-15
T.4.11 Fort Polk, Louisiana .....	T-15
T.4.12 Fort Riley, Kansas .....	T-15
T.4.13 Fort Sill, Oklahoma .....	T-16
T.4.14 Joint Base Lewis-McChord, Washington .....	T-16
T.4.15 Joint Base McGuire-Dix-Lakehurst, New Jersey .....	T-16
T.4.16 Pohakuloa Training Area, Hawaii .....	T-17
T.4.17 Schofield Barracks, Hawaii .....	T-17
T.4.18 Yakima Training Center, Washington .....	T-17
 T.5 DATA REVIEW OF FOURTH QUARTER SAMPLES (NOVEMBER/DECEMBER 2018) .....	 T-17
T.5.1 Donnelly Training Area, Fort Wainwright, Alaska .....	T-18
T.5.2 Fort Benning, Georgia .....	T-18
T.5.3 Fort Bragg, North Carolina .....	T-18
T.5.4 Fort Campbell, Kentucky .....	T-18
T.5.5 Fort Carson, Colorado .....	T-19
T.5.6 Fort Gordon, Georgia .....	T-19
T.5.7 Fort Hood, Texas .....	T-19
T.5.8 Fort Hunter Liggett, California .....	T-19
T.5.9 Fort Jackson, South Carolina .....	T-20
T.5.10 Fort Knox, Kentucky .....	T-20
T.5.11 Fort Polk, Louisiana .....	T-20
T.5.12 Fort Riley, Kansas .....	T-20
T.5.13 Fort Sill, Oklahoma .....	T-21
T.5.14 Joint Base Lewis-McChord, Washington .....	T-21
T.5.15 Joint Base McGuire-Dix-Lakehurst, New Jersey .....	T-21
T.5.16 Pohakuloa Training Area, Hawaii .....	T-22
T.5.17 Schofield Barracks, Hawaii .....	T-22
T.5.18 Yakima Training Center, Washington .....	T-22
 T.6 REFERENCES .....	 T-22

## LIST OF TABLES

	<b>Page</b>
Table T-1. Overall Sampling Summary and Analytical Completeness .....	T-1
Table T-2. Qualified Sample Results – First Quarter Event .....	Attach. T-1
Table T-3. Qualified Sample Results – Second Quarter Event.....	Attach. T-4
Table T-4. Qualified Sample Results – Third Quarter Event.....	Attach. T-7
Table T-5. Qualified Sample Results – Fourth Quarter Event.....	Attach. T-10
Table T-6. QC Sample Summary – First Quarter Event.....	T-2
Table T-7. QC Sample Summary – Second Quarter Event .....	T-7
Table T-8. QC Sample Summary – Third Quarter Event .....	T-13
Table T-9. QC Sample Summary – Fourth Quarter Event.....	T-18
Table T-10. Sample Summary Table – First Quarter Event .....	Attach. T-13
Table T-11. Sample Summary Table – Second Quarter Event.....	Attach. T-15
Table T-12. Sample Summary Table – Third Quarter Event.....	Attach. T-15
Table T-13. Sample Summary Table – Fourth Quarter Event.....	Attach. T-19



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

## T. DATA QUALITY ASSESMENT

### T.1 SUMMARY OF ENVIRONMENTAL RADIATION MONITORING DATA REVIEW AND VALIDATION

This report contains the technical review and validation of the 2018 data collected during the environmental radiation monitoring (ERM) activities conducted at 18 U.S. Army garrisons named in the U.S. Nuclear Regulatory Commission (NRC) source material license (SML) SUC-1593 (ML16343A164) for possession of M101 depleted uranium (DU) spotting rounds and fragments. The data quality assessment is designed to ensure that data collected are of sufficient quality to support the objectives of the approved Site-Specific Environmental Radiation Monitoring Plan (ERMP) and Associated Quality Assurance Plan (QAP) (ML16265A221).

The technical review and validation were conducted in accordance with the criteria set forth in the Quality Systems Manual (QSM) Version 5.0 (DOD 2013) and qualified per Leidos Quality Assurance Technical Procedure (QATP) Environmental Science and Engineering (ESE) DM-05, *Data Verification and Validation* (Revision 0, 1/2015) (Leidos 2015). The technical review and validation were based on the information and documentation supplied by the associated laboratory. The analyses were evaluated against criteria established in the related analytical procedures and the project data quality requirements.

Attachment tables to this appendix provides a tabular summary of all surface water and sediment samples collected during the first quarterly (February/March/April 2018) (Table T-10), second quarterly (May/June 2018) (Table T-11), third quarterly (September 2018) (Table T-12), and fourth quarterly (November/December 2018) (Table T-13) sampling events. Table T-1 indicates the number of samples collected and valid data points generated, indicating completeness objectives were met for the four quarterly sampling events.

**Table T-1. Overall Sampling Summary and Analytical Completeness**

Summary – February/March/April 2018	
Number of Samples Planned <sup>a</sup>	62
Number of Samples Collected <sup>b</sup>	54
Total Number of Analytical Data Points <sup>d</sup>	216
Number of Rejected Data Points	0
Percent Analytical Completeness (valid data/total analytical data) <sup>c</sup>	100%
Summary – May/June 2018	
Number of Samples Planned <sup>a</sup>	62
Number of Samples Collected <sup>b</sup>	55
Total Number of Analytical Data Points <sup>d</sup>	220
Number of Rejected Data Points	3
Percent Analytical Completeness (valid data/total analytical data)	98.6%
Summary – September 2018	
Number of Samples Planned <sup>a</sup>	62
Number of Samples Collected <sup>b</sup>	53
Total Number of Analytical Data Points <sup>d</sup>	212
Number of Rejected Data Points	0
Percent Analytical Completeness (valid data/total analytical data)	100%
Summary – November/December 2018	
Number of Samples Planned <sup>a</sup>	62
Number of Samples Collected <sup>b</sup>	54
Total Number of Analytical Data Points <sup>d</sup>	216
Number of Rejected Data Points	0
Percent Analytical Completeness (valid data/total analytical data)	100%

Notes:

<sup>a</sup>Includes primary samples and field duplicates.

<sup>b</sup>At several locations, streams were dry and no surface water could be collected or frozen conditions precluded sample collection.

<sup>c</sup>Adverse environmental conditions (e.g., dry streams, frozen matrices) were known to be a temporal possibility; therefore, surface water samples not collected due to environmental constraints were not accounted for in completeness calculations.

<sup>d</sup>The laboratory analyzed samples to include total uranium as a reported (noncritical) analyte.

Attachment 2 to this appendix provides the sample data analytical results summary forms for the samples associated with the first, second, third, and fourth quarterly sampling events. These summary sheets identify the analytical values and the qualifiers for each sample and parameter.

Tables T-2 through T-5 (provided at the end of the appendix) provide a summary of data that were qualified as a result of the validation and indicate the validation qualifiers and reason codes applied to the data. The following items (as applicable) have been addressed during the validation review:

- Sample custody, integrity, and preservation
- Sample handling and preparation
- Holding times
- Dilution factors
- Detection limits
- Laboratory background and carry-over
- Alpha spectrometry quality control (QC)
  - Calibration checks and background
  - Preparation blanks
  - Uncertainty/detected value comparison
  - Laboratory control samples
  - Field blanks (if available)
  - Field duplicates (if available)
  - Matrix spike/matrix spike duplicate (MS/MSD) pairs (if available)
  - Chemical yield (tracer recovery)
  - Laboratory duplicates.

## **T.2 DATA REVIEW OF FIRST QUARTER SAMPLES (FEBRUARY/MARCH/APRIL 2018)**

Isotopic uranium, specifically uranium-234 (U-234), uranium-235 (U-235), and uranium-238 (U-238), were determined by alpha spectrometry U.S. Department of Energy (DOE) Health and Safety Laboratory (HASL) Method 300 by Test America St. Louis. Total uranium, reported by Test America St. Louis as a noncritical analyte, was calculated using the published specific activity values of each nuclide. The surface water samples were filtered and acidified for preservation by the laboratory upon arrival. The first quarterly sampling event was conducted 20 February through 5 April 2018.

Table T-2 summarizes qualified sample results for sediment and surface water samples and provides the validation qualifiers and the appropriate validation code. Table T-6 summarizes the QC samples and associated locations. QC samples were collected at a frequency of 1 field duplicate per 10 samples and 1 MS/MSD pair per 20 samples; these QC sample results met criteria unless otherwise noted in the discussions below.

**Table T-6. QC Sample Summary – First Quarter Event**

Facility Name	Sample Location	Field Quality Control
Fort Riley, Kansas	SC-1 (Surface Water and Sediment)	Field Duplicate
Fort Benning, Georgia	UC2 (Surface Water and Sediment)	Field Duplicate
Fort Campbell, Kentucky	SWS-09 (Surface Water and Sediment)	MS/MSD
Fort Sill, Oklahoma	SWS-06A (Surface Water and Sediment)	Field Duplicate
Fort Jackson, South Carolina	CC-3 (Surface Water and Sediment)	MS/MSD

### ***T.2.1 Donnelly Training Area, Fort Wainwright, Alaska***

The weather conditions at Donnelly Training Area at Fort Wainwright, Alaska prohibited first quarter sampling. Surface water and sediment samples were not collected.

### ***T.2.2 Fort Benning, Georgia***

The first quarterly sampling event at Fort Benning, Georgia occurred on 6 March 2018. Collocated surface water and sediment samples at two locations plus field duplicate samples at one location were collected. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (six data points) were qualified as estimated when measurement uncertainty and the method data analysis (MDA) were greater than 10 percent of the sample activity with reason code T13.
- **Field Duplicate Results**—Location UC2 surface water and sediment were collected in duplicate. The relative error ration (RER) control limits were met.

### ***T.2.3 Fort Bragg, North Carolina***

The first quarterly sampling event at Fort Bragg, North Carolina occurred on 5 April 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

### ***T.2.4 Fort Campbell, Kentucky***

The first quarterly sampling event at Fort Campbell, Kentucky occurred on 7 March 2018. Collocated surface water and sediment samples plus extra volume for MS/MSD analysis were collected at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

### ***T.2.5 Fort Carson, Colorado***

The first quarterly sampling event at Fort Carson, Colorado occurred on 15 March 2018. Collocated surface water at one location and sediment samples at two locations were collected. The streambed at SWS-02 was dry and a surface water sample could not be obtained. All results were compliant except:

- U-235 radiochemical sample results (one data point) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-235 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.



- U-235 radiochemical sample result (one data point) was qualified as estimated when the duplicate relative percent difference (RPD) was above control limits with reason code J01.

#### ***T.2.6 Fort Gordon, Georgia***

The first quarterly sampling event at Fort Gordon, Georgia occurred on 7 March 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.2.7 Fort Hood, Texas***

The first quarterly sampling event at Fort Hood, Texas occurred on 27 March 2018. Collocated surface water and sediment samples were collected at two locations. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (six data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.2.8 Fort Hunter Liggett, California***

The first quarterly sampling event at Fort Hunter Liggett, California occurred on 6 March 2018. Collocated surface water and sediment samples were collected at two locations. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.2.9 Fort Jackson, South Carolina***

The first quarterly sampling event at Fort Jackson, South Carolina occurred on 3 April 2018. Collocated surface water and sediment samples plus extra volume for MS/MSD analysis were collected at one location. All results were compliant except:

- U-235 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.2.10 Fort Knox, Kentucky***

The first quarterly sampling event at Fort Knox, Kentucky occurred on 6 March 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.2.11 Fort Polk, Louisiana***

The first quarterly sampling event at Fort Polk, Louisiana occurred on 29 March 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.2.12 Fort Riley, Kansas***

The first quarterly sampling event at Fort Riley, Kansas occurred on 13 March 2018. Collocated surface water and sediment samples were collected at two locations plus a field duplicate at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-235 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- **Field Duplicate Results**—Location SC-1 surface water and sediment were collected in duplicate. U-235 did not meet RER control limits for surface water. Field duplicate results are not qualified due to duplicates alone.

#### ***T.2.13 Fort Sill, Oklahoma***

The first quarterly sampling event at Fort Sill, Oklahoma occurred on 27 February 2018. Collocated surface water and sediment samples plus a field duplicate were collected from one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- **Field Duplicate Results**—Location SWS-06A surface water and sediment were collected in duplicate. The RER control limits were met.

#### ***T.2.14 Joint Base Lewis-McChord, Washington***

The first quarterly sampling event at Joint Base Lewis-McChord occurred on 5 March 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.2.15 Joint Base McGuire-Dix-Lakehurst, New Jersey***

The first quarterly sampling event at Joint Base McGuire-Dix-Lakehurst, New Jersey occurred on 6 March 2018. Collocated surface water and sediment samples were collected at two locations. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (six data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.2.16 Pohakuloa Training Area, Hawaii***

The first quarterly sampling event at Pohakuloa Training Area, Hawaii occurred on 20 February 2018. A sediment sample was collected from one location. The streambed was dry and a surface water sample could not be obtained at the location. All results were compliant except:

- U-238 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.2.17 Schofield Barracks, Hawaii***

The first quarterly sampling event at Schofield Barracks, Hawaii occurred on 21 February 2018. Sediment samples were collected from three locations. Dry streambeds were encountered at all three locations; therefore, only sediment samples were obtained. All results were compliant except:

- U-238 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when tracer recovery was above the upper control limits (UCL) with reason code G01.

### ***T.2.18 Yakima Training Center, Washington***

The first quarterly sampling event at Yakima Training Center, Washington occurred on 28 February 2018. Collocated surface water and sediment samples were collected at three locations. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when tracer recovery was above the UCL with reason code G01.
- U-234, U-235, and/or U-238 radiochemical sample results (five data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (five data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

## **T.3 DATA REVIEW OF SECOND QUARTER SAMPLES (MAY/JUNE 2018)**

Isotopic uranium, specifically U-234, U-235, and U-238, were determined by alpha spectrometry DOE HASL Method 300 by Test America St. Louis. Total uranium, reported by Test America St. Louis for the second quarterly events as a noncritical analyte, was calculated using the published specific activity values of each nuclide. Samples were collected in non-preserved bottles for both surface water and sediment samples. The surface water samples were filtered and acidified for preservation by the laboratory upon arrival. The second quarterly sampling event was conducted 22 May and 20 June 2018.

Table T-3 summarizes qualified sample results for sediment and surface water samples collected during the second quarterly sampling event and provides the validation qualifiers and the appropriate validation code. Table T-7 summarizes the QC samples and associated locations. QC samples were collected at a frequency of 1 field duplicate per 10 samples and 1 MS/MSD pair per 20 samples; these QC sample results met criteria unless otherwise noted in the discussions below.

**Table T-7. QC Sample Summary – Second Quarter Event**

Facility Name	Sample Location	Field Quality Control
Fort Riley, Kansas	SC-1 (Surface Water and Sediment)	Field Duplicate
Fort Benning, Georgia	UC2 (Surface Water and Sediment)	Field Duplicate
Fort Campbell, Kentucky	SWS-09 (Surface Water and Sediment)	MS/MSD
Fort Sill, Oklahoma	SWS-06A (Surface Water and Sediment)	Field Duplicate
Fort Jackson, South Carolina	CC-3 (Surface Water and Sediment)	MS/MSD

### ***T.3.1 Donnelly Training Area, Fort Wainwright, Alaska***

The second quarterly sampling event at Donnelly Training Area at Fort Wainwright, Alaska occurred on 5 June 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.



### ***T.3.2 Fort Benning, Georgia***

The second quarterly sampling event at Fort Benning, Georgia occurred on 13 June 2018. Collocated surface water and sediment were collected from two locations plus field duplicates were collected from one of the two locations. All results were compliant except:

- U-234, U-235, and U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and U-238 radiochemical sample results (seven data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and U-238 radiochemical sample results (four data points) were qualified as estimated due to method blank contamination with reason code F12.
- **Field Duplicate Results**—Location UC2 surface water and sediment were collected in duplicate. The RPD control limits were met.

### ***T.3.3 Fort Bragg, North Carolina***

The second quarterly sampling event at Fort Bragg, North Carolina occurred on 7 June 2018. Collocated surface water and sediment samples were collected at one location. One or more samples required reanalysis at a reduced aliquot volume, which resulted in the laboratory using increased count times to achieve the MDA detection goal; the reported results met method and project requirements. All results were compliant except:

- U-238 radiochemical sample result (one data point) was qualified as estimated due to method blank contamination with reason code F12.

### ***T.3.4 Fort Campbell, Kentucky***

The second quarterly sampling event at Fort Campbell, Kentucky occurred on 31 May 2018. Collocated surface water and sediment samples plus extra volume for MS/MSD analysis were collected at one location. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

### ***T.3.5 Fort Carson, Colorado***

The second quarterly sampling event at Fort Carson, Colorado occurred on 24 May 2018. Collocated surface water and sediment samples were collected at one location. A sediment sample was collected from a second location. The streambed was dry and a surface water sample could not be obtained from SWS-02. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

### ***T.3.6 Fort Gordon, Georgia***

The second quarterly sampling event at Fort Gordon, Georgia occurred on 12 June 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant except:

- U-234 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234 radiochemical sample result (one data point) was qualified as estimated due to method blank contamination with reason code F12.

### ***T.3.7 Fort Hood, Texas***

The second quarterly sampling event at Fort Hood, Texas occurred on 11 June 2018. Collocated surface water and sediment samples were collected at two locations. One or more samples required reanalysis at a reduced aliquot volume, which resulted in the laboratory using increased count times to achieve the MDA detection goal; the reported results met method and project requirements. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

### ***T.3.8 Fort Hunter Liggett, California***

The second quarterly sampling event at Fort Hunter Liggett, California occurred on 7 June 2018. Collocated surface water and sediment samples were collected at two locations. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-238 radiochemical sample result (one data point) was qualified as estimated due to method blank contamination with reason code F12.
- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as unusable due to tracer recoveries below 10 percent with reason code G07.

### ***T.3.9 Fort Jackson, South Carolina***

The second quarterly sampling event at Fort Jackson, South Carolina occurred on 5 June 2018. Collocated surface water and sediment samples were collected plus extra volume for MS/MSD analysis at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-238 radiochemical sample result (one data point) was qualified as estimated due to method blank contamination with reason code F12.

### ***T.3.10 Fort Knox, Kentucky***

The second quarterly sampling event at Fort Knox occurred on 30 May 2018. Collocated surface water and sediment samples were collected at one location. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

### ***T.3.11 Fort Polk, Louisiana***

The second quarterly sampling event at Fort Polk, Louisiana occurred on 13 June 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated due to method blank contamination with reason code F12.

### ***T.3.12 Fort Riley, Kansas***

The second quarterly sampling event at Fort Riley, Kansas occurred on 22 May 2018. Collocated surface water and sediment samples were collected plus extra volume for field duplicate at one location. A sediment sample was collected from a second location. The streambed was dry and a surface water sample could not be obtained from HC-1. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (six data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

- U-234, U-235, and/or U-238 radiochemical sample result (four data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- **Field Duplicate Results**—Location SC-1 surface water and sediment were collected in duplicate. The RPD control limits were met.

#### ***T.3.13 Fort Sill, Oklahoma***

The second quarterly sampling event at Fort Sill, Oklahoma occurred on 30 May 2018. Collocated surface water and sediment samples were collected plus extra volume for field duplicate from one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- **Field Duplicate Results**—Location SWS-06A surface water and sediment were collected in duplicate. The RPD control limits were met.

#### ***T.3.14 Joint Base Lewis-McChord, Washington***

The second quarterly sampling event at Joint Base Lewis-McChord occurred on 4 June 2018. Collocated surface water and sediment samples were collected at one location. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.3.15 Joint Base McGuire-Dix-Lakehurst, New Jersey***

The second quarterly sampling event at Joint Base McGuire-Dix-Lakehurst, New Jersey occurred on 5 June 2018. Collocated surface water and sediment samples were collected at two locations. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (five data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-238 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated due to method blank contamination with reason code F12.



### ***T.3.16 Pohakuloa Training Area, Hawaii***

The second quarterly sampling event at Pohakuloa Training Area, Hawaii occurred on 20 June 2018. A sediment sample was collected from one location. The streambed was dry and a surface water sample could not be obtained from ERM-01. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

### ***T.3.17 Schofield Barracks, Hawaii***

The second quarterly sampling event at Schofield Barracks, Hawaii occurred on 18 June 2018. Sediment samples were collected from three locations. The streambeds were dry at all three locations; therefore, surface water samples could not be obtained. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.

### ***T.3.18 Yakima Training Center, Washington***

The second quarterly sampling event at Yakima Training Center, Washington occurred on 12 June 2018. Collocated surface water and sediment samples were collected at two locations. A sediment sample was collected from a third location. The streambed was dry at the third location; therefore, a surface water sample could not be obtained from SWS-02. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (five data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.

## **T.4 DATA REVIEW OF THIRD QUARTER SAMPLES (SEPTEMBER 2018)**

Isotopic uranium, specifically U-234, U-235, and U-238, were determined by alpha spectrometry DOE HASL Method 300 by Test America St. Louis. Total uranium, reported by Test America St. Louis as a noncritical analyte, was calculated using the published specific activity values of each nuclide. The surface water samples were filtered and acidified for preservation by the laboratory upon arrival. The third quarterly sampling event was conducted 4 September through 13 September 2018.

Table T-4 summarizes qualified sample results for sediment and surface water samples collected during the third quarterly sampling event and provides the validation qualifiers and the appropriate validation code. Table T-8 summarizes the QC samples and associated locations. QC samples were collected at a frequency of 1 field duplicate per 10 samples and 1 MS/MSD pair per 20 samples; these QC sample results met criteria unless otherwise noted in the discussions below.

**Table T-8. QC Sample Summary – Third Quarter Event**

Facility Name	Sample Location	Field Quality Control
Fort Riley, Kansas	SC-1 (Surface Water and Sediment)	Field Duplicate
Fort Benning, Georgia	UC2 (Surface Water and Sediment)	Field Duplicate
Fort Campbell, Kentucky	SWS-09 (Surface Water and Sediment)	MS/MSD
Fort Sill, Oklahoma	SWS-06A (Surface Water and Sediment)	Field Duplicate
Fort Jackson, South Carolina	CC-3 (Surface Water and Sediment)	MS/MSD

**T.4.1 Donnelly Training Area, Fort Wainwright, Alaska**

The third quarterly sampling event at Donnelly Training Area at Fort Wainwright, Alaska occurred on 13 September 2018. Collocated surface water and sediment were collected from one location. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample result (one data point) was qualified as estimated when the duplicate RPD was above control limits with reason code J01.

**T.4.2 Fort Benning, Georgia**

The third quarterly sampling event at Fort Benning, Georgia occurred on 4 September 2018. Collocated surface water and sediment were collected from two locations plus field duplicates were collected from one of the two locations. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and U-238 radiochemical sample results (11 data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- **Field Duplicate Results**—Location UC2 surface water and sediment were collected in duplicate. The RPD control limits were met.

**T.4.3 Fort Bragg, North Carolina**

The third quarterly sampling event at Fort Bragg, North Carolina occurred on 12 September 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant.

**T.4.4 Fort Campbell, Kentucky**

The third quarterly sampling event at Fort Campbell, Kentucky occurred on 12 September 2018. Collocated surface water and sediment samples were collected at one location plus extra volume for

MS/MSD analyses. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.4.5 Fort Carson, Colorado***

The third quarterly sampling event at Fort Carson, Colorado occurred on 4 September 2018. Collocated surface water and sediment samples were collected at two locations. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.4.6 Fort Gordon, Georgia***

The third quarterly sampling event at Fort Gordon, Georgia occurred on 5 September 2018. Collocated surface water and sediment samples were collected at one location. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.4.7 Fort Hood, Texas***

The third quarterly sampling event at Fort Hood, Texas occurred on 4 September 2018. Collocated surface water and sediment samples were collected at two locations. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (seven data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.4.8 Fort Hunter Liggett, California***

The third quarterly sampling event at Fort Hunter Liggett, California occurred on 4 September 2018. Sediment samples were collected at two locations. Two streambeds were dry and surface water samples could not be obtained. The laboratory noted that homogenization of sediment samples was

hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-235 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.

#### ***T.4.9 Fort Jackson, South Carolina***

The third quarterly sampling event at Fort Jackson, South Carolina occurred on 11 September 2018. Collocated surface water and sediment samples were collected at one location plus an MS/MSD pair was collected from one location. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-235 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.4.10 Fort Knox, Kentucky***

The third quarterly sampling event at Fort Knox occurred on 11 September 2018. Collocated surface water and sediment samples were collected at one location. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.4.11 Fort Polk, Louisiana***

The third quarterly sampling event at Fort Polk, Louisiana occurred on 5 September 2018. Collocated surface water and sediment samples were collected at one location. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.4.12 Fort Riley, Kansas***

The third quarterly sampling event at Fort Riley, Kansas occurred on 6 September 2018. Collocated surface water and sediment samples were collected at two locations plus field duplicates were collected from one of the two locations. The laboratory noted that homogenization of sediment samples



was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (eight data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- **Field Duplicate Results**—Location SC-1 surface water and sediment were collected in duplicate. The RPD control limits were met.

#### ***T.4.13 Fort Sill, Oklahoma***

The third quarterly sampling event at Fort Sill, Oklahoma occurred on 11 September 2018. Sediment samples were collected plus a field duplicate from one location. One streambed was dry and the surface water sample could not be obtained. All results were compliant except:

- U-235 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- **Field Duplicate Results**—Location SWS-06A surface water and sediment were collected in duplicate. The RPD control limits were met.

#### ***T.4.14 Joint Base Lewis-McChord, Washington***

The third quarterly sampling event at Joint Base Lewis-McChord occurred on 6 September 2018. Collocated surface water and sediment samples were collected at one location. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.4.15 Joint Base McGuire-Dix-Lakehurst, New Jersey***

The third quarterly sampling event at Joint Base McGuire-Dix-Lakehurst, New Jersey occurred on 6 September 2018. Collocated surface water and sediment samples were collected at two locations. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (seven data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.4.16 Pohakuloa Training Area, Hawaii***

The third quarterly sampling event at Pohakuloa Training Area, Hawaii occurred on 10 September 2018. A sediment sample was collected from one location. The streambed was dry and a surface water sample could not be obtained. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.
- U-234 radiochemical sample result (one data point) was qualified as estimated due to method blank contamination with reason code F12.

#### ***T.4.17 Schofield Barracks, Hawaii***

The third quarterly sampling event at Schofield Barracks, Hawaii occurred on 7 September 2018. Sediment samples were collected from three locations. The streambeds were dry at all three locations; therefore, surface water samples could not be obtained. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.

#### ***T.4.18 Yakima Training Center, Washington***

The third quarterly sampling event at Yakima Training Center, Washington occurred on 5 September 2018. Collocated surface water and sediment samples were collected at two locations. A sediment sample was collected from one other location. The streambed was dry at one location and surface water samples could not be obtained. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (six data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.

### **T.5 DATA REVIEW OF FOURTH QUARTER SAMPLES (NOVEMBER/DECEMBER 2018)**

Isotopic uranium, specifically U-234, U-235, and U-238, were determined by alpha spectrometry DOE HASL Method 300 by Test America St. Louis. Total uranium, reported by Test America St. Louis as a noncritical analyte, was calculated using the published specific activity values of each nuclide. The surface water samples were filtered and acidified for preservation by the laboratory upon arrival. The fourth quarterly sampling event was conducted 20 November through 19 December 2018.

Table T-5 summarizes qualified sample results for sediment and surface water samples collected during the fourth quarterly sampling event and provides the validation qualifiers and the appropriate validation code. Table T-9 summarizes the QC samples and associated locations. QC samples were collected at a frequency of 1 field duplicate per 10 samples and 1 MS/MSD pair per 20 samples; these QC sample results met criteria unless otherwise noted in the discussions below.

**Table T-9. QC Sample Summary – Fourth Quarter Event**

Facility Name	Sample Location	Field Quality Control
Fort Riley, Kansas	SC-1 (Surface Water and Sediment)	Field Duplicate
Fort Benning, Georgia	UC2 (Surface Water and Sediment)	Field Duplicate
Fort Campbell, Kentucky	SWS-09 (Surface Water and Sediment)	MS/MSD
Fort Sill, Oklahoma	SWS-06A (Surface Water and Sediment)	Field Duplicate
Fort Jackson, South Carolina	CC-3 (Surface Water and Sediment)	MS/MSD

#### ***T.5.1 Donnelly Training Area, Fort Wainwright, Alaska***

The weather conditions at Donnelly Training Area at Fort Wainwright, Alaska prohibited fourth quarter sampling. Surface water and sediment samples were not collected.

#### ***T.5.2 Fort Benning, Georgia***

The fourth quarterly sampling event at Fort Benning, Georgia occurred on 5 December 2018. Collocated surface water and sediment were collected from two locations plus field duplicates were collected from one of the two locations. All results were compliant except:

- U-234, U-235, and U-238 radiochemical sample results (five data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- **Field Duplicate Results**—Location UC2 surface water and sediment were collected in duplicate. The RPD control limits were met.

#### ***T.5.3 Fort Bragg, North Carolina***

The fourth quarterly sampling event at Fort Bragg, North Carolina occurred on 12 December 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant except:

- U-234, U-235, and U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.5.4 Fort Campbell, Kentucky***

The fourth quarterly sampling event at Fort Campbell, Kentucky occurred on 28 November 2018. Collocated surface water and sediment samples were collected at one location plus extra volume for matrix spike and matrix spike duplicate analyses. The laboratory noted that homogenization of sediment

samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.5.5 Fort Carson, Colorado***

The fourth quarterly sampling event at Fort Carson, Colorado occurred on 28 November 2018. Collocated surface water and sediment sample was collected at one location. A sediment sample was collected at one other location. The streambed was dry at one location and surface water samples could not be obtained. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.5.6 Fort Gordon, Georgia***

The fourth quarterly sampling event at Fort Gordon, Georgia occurred on 4 December 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.
- U-235 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.5.7 Fort Hood, Texas***

The fourth quarterly sampling event at Fort Hood, Texas occurred on 18 December 2018. Collocated surface water and sediment samples were collected at two locations. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (six data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.5.8 Fort Hunter Liggett, California***

The fourth quarterly sampling event at Fort Hunter Liggett, California occurred on 20 November 2018. Sediment samples were collected at two locations. Two streambeds were dry and surface water samples could not be obtained. The laboratory noted that homogenization of sediment samples was



hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234 radiochemical sample result (one data point) was qualified as estimated due to the duplicate RPD above control limits with reason code J01.

#### ***T.5.9 Fort Jackson, South Carolina***

The fourth quarterly sampling event at Fort Jackson, South Carolina occurred on 11 December 2018. Collocated surface water and sediment samples were collected at one location plus an MS/MSD pair was collected from one location. All results were compliant except:

- U-235 radiochemical sample result (one data point) was qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.5.10 Fort Knox, Kentucky***

The fourth quarterly sampling event at Fort Knox occurred on 27 November 2018. Collocated surface water and sediment samples were collected at one location. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234 radiochemical sample result (one data point) was qualified as estimated due to method blank contamination with reason code F12.

#### ***T.5.11 Fort Polk, Louisiana***

The fourth quarterly sampling event at Fort Polk, Louisiana occurred on 19 December 2018. Collocated surface water and sediment samples were collected at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234 radiochemical sample result (one data point) was qualified as estimated due to the duplicate RPD above control limits with reason code J01.

#### ***T.5.12 Fort Riley, Kansas***

The fourth quarterly sampling event at Fort Riley, Kansas occurred on 27 November 2018. Collocated surface water and sediment samples were collected at two locations plus field duplicates were collected from one of the two locations. The laboratory noted that homogenization of sediment samples

was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- **Field Duplicate Results**—Location SC-1 surface water and sediment were collected in duplicate. The RPD control limits were met.

#### ***T.5.13 Fort Sill, Oklahoma***

The fourth quarterly sampling event at Fort Sill, Oklahoma occurred on 12 December 2018. Collocated surface water and sediment samples were collected plus a field duplicate at one location. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.
- U-234, U-235, and/or U-238 radiochemical sample results (five data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- **Field Duplicate Results**—Location SWS-06A surface water and sediment were collected in duplicate. The RPD control limits were met.

#### ***T.5.14 Joint Base Lewis-McChord, Washington***

The fourth quarterly sampling event at Joint Base Lewis-McChord occurred on 20 November 2018. Collocated surface water and sediment samples were collected at one location. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.5.15 Joint Base McGuire-Dix-Lakehurst, New Jersey***

The fourth quarterly sampling event at Joint Base McGuire-Dix-Lakehurst, New Jersey occurred on 27 November 2018. Collocated surface water and sediment samples were collected at two locations. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (four data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

- U-234 radiochemical sample result (one data point) was qualified as estimated due to method blank contamination with reason code F12.
- U-234 radiochemical sample result (one data point) was qualified as estimated due to the duplicate RPD above control limits with reason code J01.

#### ***T.5.16 Pohakuloa Training Area, Hawaii***

The fourth quarterly sampling event at Pohakuloa Training Area, Hawaii occurred on 13 December 2018. A sediment sample was collected from one location. The streambed was dry and a surface water sample could not be obtained. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.

#### ***T.5.17 Schofield Barracks, Hawaii***

The fourth quarterly sampling event at Schofield Barracks, Hawaii occurred on 11 December 2018. Collocated surface water and sediment samples were collected at three locations. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (seven data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (two data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.

#### ***T.5.18 Yakima Training Center, Washington***

The fourth quarterly sampling event at Yakima Training Center, Washington occurred on 14 December 2018. Collocated surface water and sediment samples were collected at three locations. The laboratory noted that homogenization of sediment samples was hampered by the sample matrix, which contained varying sizes of rocks. All results were compliant except:

- U-234, U-235, and/or U-238 radiochemical sample results (five data points) were qualified as estimated when measurement uncertainty and the MDA were greater than 10 percent of the sample activity with reason code T13.
- U-234, U-235, and/or U-238 radiochemical sample results (three data points) were qualified as estimated when the MDA was greater than 10 percent of the sample activity with reason code T04.

## **T.6 REFERENCES**

DOD (U.S. Department of Defense). 2013. Quality Systems Manual for Environmental Laboratories. Prepared by the Department of Defense Environmental Data Quality Workgroup. Version 5.0 Final. July.

Leidos. 2015. Quality Assurance Technical Procedure (QATP) Environmental Science and Engineering (ESE) DM-05, Data Verification and Validation Version 0. Final. January.

**ATTACHMENT TABLES**

**DAVY CROCKETT  
SAMPLE DATA SUMMARY**



**THIS PAGE WAS INTENTIONALLY LEFT BLANK**

**Table T-2. Qualified Sample Results – First Quarter Event**

Site	Site ID	Sample ID	Type	Analyte	Result	Unit	Validation Qualifier	Reason Code 1	Reason Code 2
JBLM	AIA-SP02	14LDOS04SD	SEDI	Uranium 234	0.207	pCi/g	J	T13	
JBLM	AIA-SP02	14LDOS04SD	SEDI	Uranium 238	0.281	pCi/g	J	T13	
JBLM	AIA-SP02	14LDOS04SW	SURF	Uranium 234	0.031	pCi/L	J	T13	
Jackson	CC-3	9LDOS04SD	SEDI	Uranium 235	0.047	pCi/g	J	T13	
Pohakuloa	ERM-01	17LDOS04SD	SEDI	Uranium 234	0.185	pCi/g	J	T13	
Pohakuloa	ERM-01	17LDOS04SD	SEDI	Uranium 238	0.246	pCi/g	J	T04	
Hood	ERM-01	7LDOS04SD	SEDI	Uranium 234	0.428	pCi/g	J	T04	
Hood	ERM-01	7LDOS04SD	SEDI	Uranium 235	0.0247	pCi/g	J	T13	
Hood	ERM-01	7LDOS04SD	SEDI	Uranium 238	0.497	pCi/g	J	T04	
Hood	ERM-01	7LDOS04SW	SURF	Uranium 234	0.289	pCi/L	J	T13	
Hood	ERM-01	7LDOS04SW	SURF	Uranium 238	0.291	pCi/L	J	T13	
Hunter Liggett	ERM-01	8LDOS04SD	SEDI	Uranium 234	0.434	pCi/g	J	T04	
Hunter Liggett	ERM-01	8LDOS04SD	SEDI	Uranium 235	0.0236	pCi/g	J	T13	
Hunter Liggett	ERM-01	8LDOS04SD	SEDI	Uranium 238	0.419	pCi/g	J	T04	
Hunter Liggett	ERM-01	8LDOS04SW	SURF	Uranium 234	0.0845	pCi/L	J	T13	
Hood	ERM-02	7LDOS04SD	SEDI	Uranium 234	0.476	pCi/g	J	T04	
Hood	ERM-02	7LDOS04SD	SEDI	Uranium 235	0.0173	pCi/g	J	T13	
Hood	ERM-02	7LDOS04SD	SEDI	Uranium 238	0.434	pCi/g	J	T04	
Hood	ERM-02	7LDOS04SW	SURF	Uranium 234	0.312	pCi/L	J	T13	
Hood	ERM-02	7LDOS04SW	SURF	Uranium 238	0.205	pCi/L	J	T13	
Hunter Liggett	ERM-02	8LDOS04SD	SEDI	Uranium 234	0.544	pCi/g	J	T04	
Hunter Liggett	ERM-02	8LDOS04SD	SEDI	Uranium 235	0.0417	pCi/g	J	T13	
Hunter Liggett	ERM-02	8LDOS04SD	SEDI	Uranium 238	0.516	pCi/g	J	T04	
Gordon	Gut	6LDOS04SD	SEDI	Uranium 234	0.429	pCi/g	J	T13	
Gordon	Gut	6LDOS04SD	SEDI	Uranium 238	0.317	pCi/g	J	T13	
Benning	OC2	2LDOS04SD	SEDI	Uranium 234	0.122	pCi/g	J	T13	
Benning	OC2	2LDOS04SD	SEDI	Uranium 238	0.142	pCi/g	J	T13	
Riley	SC-1	12LDOS04SD	SEDI	Uranium 234	0.548	pCi/g	J	T04	
Riley	SC-1	12LDOS04SD	SEDI	Uranium 235	0.0599	pCi/g	J	T13	
Riley	SC-1	12LDOS04SW	SURF	Uranium 234	0.619	pCi/L	J	T04	
Riley	SC-1	12LDOS04SW	SURF	Uranium 238	0.589	pCi/L	J	T04	
YTC	SWS-01	15LDOS04SD	SEDI	Uranium 234	0.435	pCi/g	J	G01	T04
YTC	SWS-01	15LDOS04SD	SEDI	Uranium 235	0.02	pCi/g	J	G01	T13
YTC	SWS-01	15LDOS04SD	SEDI	Uranium 238	0.415	pCi/g	J	G01	T04

**Table T-2. Qualified Sample Results – First Quarter Event (Continued)**

Site	Site ID	Sample ID	Type	Analyte	Result	Unit	Validation Qualifier	Reason Code 1	Reason Code 2
YTC	SWS-01	15LDOS04SW	SURF	Uranium 235	0.0462	pCi/L	J	T13	
YTC	SWS-01	15LDOS04SW	SURF	Uranium 238	0.363	pCi/L	J	T04	
Schofield	SWS-01	18LDOS04SD	SEDI	Uranium 235	0.0484	pCi/g	J	T13	
YTC	SWS-02	15LDOS04SD	SEDI	Uranium 238	0.551	pCi/g	J	T04	
YTC	SWS-02	15LDOS04SW	SURF	Uranium 235	0.0421	pCi/L	J	T13	
YTC	SWS-02	15LDOS04SW	SURF	Uranium 238	0.518	pCi/L	J	T04	
Schofield	SWS-02	18LDOS04SD	SEDI	Uranium 234	0.315	pCi/g	J	T13	
Schofield	SWS-02	18LDOS04SD	SEDI	Uranium 238	0.269	pCi/g	J	T13	
Carson	SWS-02	5LDOS04SD	SEDI	Uranium 235	0.0716	pCi/g	J	T13	J01
Knox	SWS-03	10LDOS04SD	SEDI	Uranium 235	0.0709	pCi/g	J	T13	
Knox	SWS-03	10LDOS04SW	SURF	Uranium 234	0.22	pCi/L	J	T13	
Knox	SWS-03	10LDOS04SW	SURF	Uranium 238	0.109	pCi/L	J	T13	
Schofield	SWS-03	18LDOS04SD	SEDI	Uranium 234	0.554	pCi/g	J	G01	
Schofield	SWS-03	18LDOS04SD	SEDI	Uranium 238	0.486	pCi/g	J	G01	T04
Carson	SWS-03	5LDOS04SD	SEDI	Uranium 235	0.142	pCi/g	J	T13	
Carson	SWS-03	5LDOS04SW	SURF	Uranium 235	0.519	pCi/L	J	T04	
Polk	SWS-04	11LDOS04SD	SEDI	Uranium 234	0.166	pCi/g	J	T13	
Polk	SWS-04	11LDOS04SD	SEDI	Uranium 238	0.207	pCi/g	J	T13	
YTC	SWS-05	15LDOS04SW	SURF	Uranium 234	0.361	pCi/L	J	T13	
YTC	SWS-05	15LDOS04SW	SURF	Uranium 238	0.194	pCi/L	J	T13	
Sill	SWS-06A	13LDOS04SD	SEDI	Uranium 235	0.025	pCi/g	J	T13	
Sill	SWS-06A	13LDOS04SDFD	SEDI	Uranium 234	0.475	pCi/g	J	T04	
Sill	SWS-06A	13LDOS04SW	SURF	Uranium 235	0.0395	pCi/L	J	T13	
Sill	SWS-06A	13LDOS04SWFD	SURF	Uranium 238	0.544	pCi/L	J	T04	
Bragg	SWS-08	3LDOS04SD	SEDI	Uranium 235	0.0512	pCi/g	J	T13	
Bragg	SWS-08	3LDOS04SW	SURF	Uranium 234	0.337	pCi/L	J	T13	
Campbell	SWS-09	4LDOS04SD	SEDI	Uranium 235	0.0542	pCi/g	J	T13	
Campbell	SWS-09	4LDOS04SW	SURF	Uranium 234	0.0377	pCi/L	J	T13	
JBMDL	SWS-13	16LDOS04SD	SEDI	Uranium 234	0.0818	pCi/g	J	T13	
JBMDL	SWS-13	16LDOS04SD	SEDI	Uranium 235	0.0173	pCi/g	J	T13	
JBMDL	SWS-13	16LDOS04SD	SEDI	Uranium 238	0.0967	pCi/g	J	T13	
JBMDL	SWS-13	16LDOS04SW	SURF	Uranium 234	0.0608	pCi/L	J	T13	
JBMDL	SWS-14	16LDOS04SD	SEDI	Uranium 234	0.164	pCi/g	J	T13	
JBMDL	SWS-14	16LDOS04SD	SEDI	Uranium 238	0.0649	pCi/g	J	T13	
Benning	UC2	2LDOS04SD	SEDI	Uranium 234	0.131	pCi/g	J	T13	

**Table T-2. Qualified Sample Results – First Quarter Event (Continued)**

Site	Site ID	Sample ID	Type	Analyte	Result	Unit	Validation Qualifier	Reason Code 1	Reason Code 2
Benning	UC2	2LDOS04SD	SEDI	Uranium 238	0.101	pCi/g	J	T13	
Benning	UC2	2LDOS04SDFD	SEDI	Uranium 234	0.119	pCi/g	J	T13	
Benning	UC2	2LDOS04SDFD	SEDI	Uranium 238	0.107	pCi/g	J	T13	

**Data Validation Reason Codes**

- F01 Sample data were qualified as a result of the method blank.
- F12 Professional judgment was used to qualify the data.
- F13 Reported blank net result is >1.65 sigma, radiochemistry.
- G07 Radiological chemical recovery was <20%.
- J01 Duplicate RPD/radiological duplicate error ratio (DER) was outside the control limit.
- J06 Radiological duplicate RPD and DER were outside acceptable limits.
- T04 Professional judgment was used to qualify the data.
- T12 Analytical result is less than the associated MDA but greater than the counting uncertainty.
- T13 Analytical result is less than both the associated counting uncertainty and the MDA.



**Table T-3. Qualified Sample Results – Second Quarter Event**

Site	Site ID	Sample ID	Type	Analyte	Result	Units	Validation Qualifier	Reason Code 1	Reason Code 2	Reason Code 2
Riley	SC-1	12LDOS05SD	SEDI	Uranium 234	1.17	pCi/g	J	T04		
Riley	SC-1	12LDOS05SDFD	SEDI	Uranium 234	0.626	pCi/g	J	T04		
Riley	SC-1	12LDOS05SW	SURF	Uranium 234	0.658	pCi/L	J	T13		
Riley	SC-1	12LDOS05SWFD	SURF	Uranium 234	0.655	pCi/L	J	T13		
Riley	SC-1	12LDOS05SD	SEDI	Uranium 235	0.0677	pCi/g	J	T13		
Riley	SC-1	12LDOS05SD	SEDI	Uranium 238	0.892	pCi/g	J	T04		
Riley	SC-1	12LDOS05SWFD	SURF	Uranium 238	0.514	pCi/L	J	T13		
Riley	SC-1	12LDOS05SW	SURF	Uranium 238	0.543	pCi/L	J	T13		
Riley	HC-1	12LDOS05SD	SEDI	Uranium 234	0.606	pCi/g	J	T04		
Riley	HC-1	12LDOS05SD	SEDI	Uranium 235	0.0499	pCi/g	J	T13		
Carson	SWS-02	5LDOS05SD	SEDI	Uranium 235	0.0741	pCi/g	J	T13		
Carson	SWS-03	5LDOS05SD	SEDI	Uranium 235	0.113	pCi/g	J	T13		
Carson	SWS-03	5LDOS05SW	SURF	Uranium 235	0.28	pCi/L	J	T13		
Sill	SWS-06A	13LDOS05SDFD	SEDI	Uranium 234	0.576	pCi/g	J	T04		
Sill	SWS-06A	13LDOS05SDFD	SEDI	Uranium 235	0.0438	pCi/g	J	T13		
Sill	SWS-06A	13LDOS05SDFD	SEDI	Uranium 238	0.496	pCi/g	J	T04		
Sill	SWS-06A	13LDOS05SWFD	SURF	Uranium 234	0.343	pCi/L	J	T13		
Sill	SWS-06A	13LDOS05SW	SURF	Uranium 234	0.35	pCi/L	J	T13		
Sill	SWS-06A	13LDOS05SW	SURF	Uranium 238	0.272	pCi/L	J	T13		
Sill	SWS-06A	13LDOS05SWFD	SURF	Uranium 238	0.282	pCi/L	J	T04		
Knox	SWS-03	10LDOS05SW	SURF	Uranium 234	0.291	pCi/L	J	T13		
Knox	SWS-03	10LDOS05SW	SURF	Uranium 238	0.184	pCi/L	J	T13		
Knox	SWS-03	10LDOS05SD	SEDI	Uranium 235	0.0829	pCi/g	J	T13		
Campbell	SWS-09	4LDOS05SW	SURF	Uranium 234	0.0541	pCi/L	J	T13		
Campbell	SWS-09	4LDOS05SW	SURF	Uranium 238	0.0344	pCi/L	J	T13		
Campbell	SWS-09	4LDOS05SD	SEDI	Uranium 235	0.0466	pCi/g	J	T13		
JBLM	AIA-SP02	14LDOS05SW	SURF	Uranium 234	0.0342	pCi/L	J	T13		
JBLM	AIA-SP02	14LDOS05SD	SEDI	Uranium 234	0.205	pCi/g	J	T13		
JBLM	AIA-SP02	14LDOS05SD	SEDI	Uranium 238	0.314	pCi/g	J	T13		
JBMDL	SWS-13	16LDOS05SW	SURF	Uranium 234	0.0547	pCi/L	J	T13		
JBMDL	SWS-13	16LDOS05SW	SURF	Uranium 238	0.0551	pCi/L	J	T13		
JBMDL	SWS-13	16LDOS05SD	SEDI	Uranium 234	0.307	pCi/g	J	T13		
JBMDL	SWS-13	16LDOS05SD	SEDI	Uranium 238	0.407	pCi/g	J	F13	F12	T04
JBMDL	SWS-14	16LDOS05SD	SEDI	Uranium 234	0.139	pCi/g	J	F13	T13	F12

**Table T-3. Qualified Sample Results – Second Quarter Event (Continued)**

Site	Site ID	Sample ID	Type	Analyte	Result	Units	Validation Qualifier	Reason Code 1	Reason Code 2	Reason Code 2
JBMDL	SWS-14	16LDOS05SD	SEDI	Uranium 238	0.11	pCi/g	J	F13	T13	F12
Jackson	CC-3	9LDOS05SD	SEDI	Uranium 234	0.567	pCi/g	J	T04		
Jackson	CC-3	9LDOS05SW	SURF	Uranium 234	0.0773	pCi/L	J	T13		
Jackson	CC-3	9LDOS05SD	SEDI	Uranium 235	0.0197	pCi/g	J	T13		
Jackson	CC-3	9LDOS05SD	SEDI	Uranium 238	0.544	pCi/g	J	F12	T04	
Jackson	CC-3	9LDOS05SW	SURF	Uranium 238	0.0297	pCi/L	J	T13		
Donnelly	SWS-01	1LDOS05SW	SURF	Uranium 234	0.363	pCi/L	J	T04		
Donnelly	SWS-01	1LDOS05SW	SURF	Uranium 238	0.327	pCi/L	J	T04		
Bragg	SWS-08	3LDOS05SD	SEDI	Uranium 238	0.59	pCi/g	J	F12		
Hunter Liggett	ERM-01	8LDOS05SW	SURF	Uranium 234	0.265	pCi/L	J	T13		
Hunter Liggett	ERM-01	8LDOS05SD	SEDI	Uranium 238	0.564	pCi/g	J	F12	T04	
Hunter Liggett	ERM-02	8LDOS05SD	SEDI	Uranium 234	0.443	pCi/g	J	T04		
Hunter Liggett	ERM-02	8LDOS05SD	SEDI	Uranium 235	0.0281	pCi/g	J	T13		
Hunter Liggett	ERM-02	8LDOS05SD	SEDI	Uranium 238	0.392	pCi/g	J	T04	F01	
Hunter Liggett	ERM-02	8LDOS05SW	SURF	Uranium 234	0.581	pCi/L	R	G07		
Hunter Liggett	ERM-02	8LDOS05SW	SURF	Uranium 235	0	pCi/L	R	G07		
Hunter Liggett	ERM-02	8LDOS05SW	SURF	Uranium 238	0.97	pCi/L	R	T13	G07	
Hood	ERM-01	7LDOS05SW	SURF	Uranium 234	0.691	pCi/L	J	T13		
Hood	ERM-01	7LDOS05SD	SEDI	Uranium 234	0.473	pCi/g	J	T04		
Hood	ERM-01	7LDOS05SD	SEDI	Uranium 238	0.485	pCi/g	J	T04		
Hood	ERM-01	7LDOS05SW	SURF	Uranium 238	0.235	pCi/L	J	T13		
Hood	ERM-02	7LDOS05SW	SURF	Uranium 234	0.131	pCi/L	J	T13		
Hood	ERM-02	7LDOS05SD	SEDI	Uranium 234	0.472	pCi/g	J	T04		
Hood	ERM-02	7LDOS05SD	SEDI	Uranium 238	0.456	pCi/g	J	T04		
Hood	ERM-02	7LDOS05SW	SURF	Uranium 238	0.15	pCi/L	J	T13		
YTC	SWS-01	15LDOS05SW	SURF	Uranium 234	0.444	pCi/L	J	T13		
YTC	SWS-01	15LDOS05SW	SURF	Uranium 238	0.302	pCi/L	J	T04		
YTC	SWS-01	15LDOS05SD	SEDI	Uranium 238	0.391	pCi/g	J	T04		
YTC	SWS-05	15LDOS05SW	SURF	Uranium 234	0.257	pCi/L	J	T13		
YTC	SWS-05	15LDOS05SW	SURF	Uranium 238	0.135	pCi/L	J	T13		
YTC	SWS-05	15LDOS05SD	SEDI	Uranium 234	0.567	pCi/g	J	T04		
YTC	SWS-05	15LDOS05SD	SEDI	Uranium 235	0.0522	pCi/g	J	T13		
YTC	SWS-05	15LDOS05SD	SEDI	Uranium 238	0.408	pCi/g	J	T04		
Gordon	Gut	6LDOS05SW	SURF	Uranium 234	0.12	pCi/L	J	T13	F12	
Gordon	Gut	6LDOS05SD	SEDI	Uranium 234	0.46	pCi/g	J	T04		

**Table T-3. Qualified Sample Results – Second Quarter Event (Continued)**

Site	Site ID	Sample ID	Type	Analyte	Result	Units	Validation Qualifier	Reason Code 1	Reason Code 2	Reason Code 2
Gordon	Gut	6LDOS05SD	SEDI	Uranium 238	0.564	pCi/g	J	T04		
YTC	SWS-02	15LDOS05SD	SEDI	Uranium 235	0.0725	pCi/g	J	T13		
Benning	UC2	2LDOS05SW	SURF	Uranium 234	0.0504	pCi/L	J	T13	F12	
Benning	UC2	2LDOS05SDFD	SEDI	Uranium 234	0.194	pCi/g	J	T13		
Benning	UC2	2LDOS05SD	SEDI	Uranium 234	0.348	pCi/g	J	T13		
Benning	UC2	2LDOS05SDFD	SEDI	Uranium 235	0.0244	pCi/g	J	T13		
Benning	UC2	2LDOS05SDFD	SEDI	Uranium 238	0.176	pCi/g	J	T04	F12	
Benning	UC2	2LDOS05SD	SEDI	Uranium 238	0.26	pCi/g	J	T04	F12	
Benning	UC2	2LDOS05SW	SURF	Uranium 238	0.0435	pCi/L	J	T13		
Polk	SWS-04	11LDOS05SD	SEDI	Uranium 234	0.0727	pCi/g	J	T13		
Polk	SWS-04	11LDOS05SW	SURF	Uranium 234	0.0687	pCi/L	J	T13	F12	
Polk	SWS-04	11LDOS05SD	SEDI	Uranium 238	0.124	pCi/g	J	T13	F12	
Benning	OC2	2LDOS05SD	SEDI	Uranium 234	0.399	pCi/g	J	T04		
Benning	OC2	2LDOS05SW	SURF	Uranium 234	0.0645	pCi/L	J	T13	F12	
Benning	OC2	2LDOS05SD	SEDI	Uranium 235	0.0239	pCi/g	J	T13		
Benning	OC2	2LDOS05SD	SEDI	Uranium 238	0.431	pCi/g	J	T04		
Schofield	SWS-01	18LDOS05SD	SEDI	Uranium 235	0.0487	pCi/g	J	T13		
Schofield	SWS-02	18LDOS05SD	SEDI	Uranium 234	0.295	pCi/g	J	T13		
Schofield	SWS-02	18LDOS05SD	SEDI	Uranium 235	0.0183	pCi/g	J	T13		
Schofield	SWS-02	18LDOS05SD	SEDI	Uranium 238	0.213	pCi/g	J	T13		
Schofield	SWS-03	18LDOS05SD	SEDI	Uranium 238	0.57	pCi/g	J	T04		
Pohakuloa	ERM-01	17LDOS05SD	SEDI	Uranium 234	0.223	pCi/g	J	T13		
Pohakuloa	ERM-01	17LDOS05SD	SEDI	Uranium 238	0.135	pCi/g	J	T13		

**Data Validation Reason Codes**

- F01 Sample data were qualified as a result of the method blank.
- F12 Professional judgment was used to qualify the data.
- F13 Reported blank net result is >1.65 sigma, radiochemistry.
- G07 Radiological chemical recovery was <20%.
- J01 Duplicate RPD/radiological duplicate error ratio (DER) was outside the control limit.
- J06 Radiological duplicate RPD and DER were outside acceptable limits.
- T04 Professional judgment was used to qualify the data.
- T12 Analytical result is less than the associated MDA but greater than the counting uncertainty.
- T13 Analytical result is less than both the associated counting uncertainty and the MDA.

**Table T-4. Qualified Sample Results – Third Quarter Event**

Site	Site ID	Sample ID	Type	Analyte	Result	Units	Validation Qualifier	Reason Code 1	Reason Code 2
Carson	SWS-02	5LDOS06SW	SURF	Uranium 235	0.855	pCi/L	J	T13	
Carson	SWS-02	5LDOS06SD	SEDI	Uranium 235	0.0432	pCi/g	J	T13	
Carson	SWS-03	5LDOS06SD	SEDI	Uranium 235	0.0954	pCi/g	J	T13	
Carson	SWS-03	5LDOS06SW	SURF	Uranium 235	0.333	pCi/L	J	T13	
Benning	UC2	2LDOS06SD	SEDI	Uranium 234	0.195	pCi/g	J	T13	
Benning	UC2	2LDOS06SDFD	SEDI	Uranium 234	0.216	pCi/g	J	T13	
Benning	UC2	2LDOS06SWFD	SURF	Uranium 234	0.132	pCi/L	J	T13	
Benning	UC2	2LDOS06SD	SEDI	Uranium 235	0.0242	pCi/g	J	T13	
Benning	UC2	2LDOS06SDFD	SEDI	Uranium 238	0.237	pCi/g	J	T13	
Benning	UC2	2LDOS06SD	SEDI	Uranium 238	0.176	pCi/g	J	T13	
Benning	UC2	2LDOS06SWFD	SURF	Uranium 238	0.04	pCi/L	J	T13	
Benning	UC2	2LDOS06SW	SURF	Uranium 238	0.0355	pCi/L	J	T13	
Hood	ERM-01	7LDOS06SD	SEDI	Uranium 234	0.372	pCi/g	J	T13	
Hood	ERM-01	7LDOS06SW	SURF	Uranium 234	0.161	pCi/L	J	T13	
Hood	ERM-01	7LDOS06SW	SURF	Uranium 238	0.18	pCi/L	J	T13	
Hood	ERM-01	7LDOS06SD	SEDI	Uranium 238	0.491	pCi/g	J	T04	
Benning	OC2	2LDOS06SD	SEDI	Uranium 234	0.208	pCi/g	J	T13	
Benning	OC2	2LDOS06SD	SEDI	Uranium 238	0.17	pCi/g	J	T13	
Benning	OC2	2LDOS06SW	SURF	Uranium 238	0.0408	pCi/L	J	T13	
Hood	ERM-02	7LDOS06SD	SEDI	Uranium 234	0.424	pCi/g	J	T13	
Hood	ERM-02	7LDOS06SW	SURF	Uranium 234	0.329	pCi/L	J	T13	
Hood	ERM-02	7LDOS06SD	SEDI	Uranium 235	0.0293	pCi/g	J	T13	
Hood	ERM-02	7LDOS06SD	SEDI	Uranium 238	0.44	pCi/g	J	T04	
Hood	ERM-02	7LDOS06SW	SURF	Uranium 238	0.218	pCi/L	J	T13	
Hunter Liggett	ERM-01	8LDOS06SD	SEDI	Uranium 234	0.46	pCi/g	J	T04	
Hunter Liggett	ERM-01	8LDOS06SD	SEDI	Uranium 235	0.0241	pCi/g	J	T13	
Hunter Liggett	ERM-01	8LDOS06SD	SEDI	Uranium 238	0.535	pCi/g	J	T04	
Gordon	Gut	6LDOS06SD	SEDI	Uranium 234	0.24	pCi/g	J	T13	
Gordon	Gut	6LDOS06SD	SEDI	Uranium 238	0.199	pCi/g	J	T13	
Gordon	Gut	6LDOS06SW	SURF	Uranium 238	0.0611	pCi/L	J	T13	
YTC	SWS-05	15LDOS06SW	SURF	Uranium 234	0.612	pCi/L	J	T13	
YTC	SWS-05	15LDOS06SW	SURF	Uranium 238	0.135	pCi/L	J	T13	
YTC	SWS-05	15LDOS06SD	SEDI	Uranium 238	0.431	pCi/g	J	T13	
YTC	SWS-01	15LDOS06SW	SURF	Uranium 234	0.84	pCi/L	J	T04	



**Table T-4. Qualified Sample Results – Third Quarter Event (Continued)**

Site	Site ID	Sample ID	Type	Analyte	Result	Units	Validation Qualifier	Reason Code 1	Reason Code 2
YTC	SWS-01	15LDOS06SW	SURF	Uranium 238	0.375	pCi/L	J	T13	
Polk	SWS-04	11LDOS06SW	SURF	Uranium 234	0.0962	pCi/L	J	T13	
Polk	SWS-04	11LDOS06SD	SEDI	Uranium 234	0.0851	pCi/g	J	T13	
Polk	SWS-04	11LDOS06SD	SEDI	Uranium 238	0.0623	pCi/g	J	T13	
YTC	SWS-01	15LDOS06SD	SEDI	Uranium 234	0.379	pCi/g	J	T13	
YTC	SWS-01	15LDOS06SD	SEDI	Uranium 235	0.0352	pCi/g	J	T13	
YTC	SWS-01	15LDOS06SD	SEDI	Uranium 238	0.325	pCi/g	J	T04	
YTC	SWS-02	15LDOS06SD	SEDI	Uranium 238	0.458	pCi/g	J	T04	
JBMDL	SWS-14	16LDOS06SW	SURF	Uranium 238	0.0424	pCi/L	J	T13	
JBMDL	SWS-14	16LDOS06SD	SEDI	Uranium 234	0.116	pCi/g	J	T13	
JBMDL	SWS-14	16LDOS06SD	SEDI	Uranium 238	0.0974	pCi/g	J	T13	
JBMDL	SWS-13	16LDOS06SW	SURF	Uranium 234	0.407	pCi/L	J	T13	
JBMDL	SWS-13	16LDOS06SW	SURF	Uranium 238	0.0901	pCi/L	J	T13	
JBMDL	SWS-13	16LDOS06SD	SEDI	Uranium 234	0.211	pCi/g	J	T13	
JBMDL	SWS-13	16LDOS06SD	SEDI	Uranium 238	0.377	pCi/g	J	T13	
JBLM	AIA-SP02	14LDOS06SD	SEDI	Uranium 234	0.172	pCi/g	J	T13	
JBLM	AIA-SP02	14LDOS06SD	SEDI	Uranium 235	0.0221	pCi/g	J	T13	
JBLM	AIA-SP02	14LDOS06SD	SEDI	Uranium 238	0.25	pCi/g	J	T13	
JBLM	AIA-SP02	14LDOS06SW	SURF	Uranium 234	0.143	pCi/L	J	T13	
Riley	SC-1	12LDOS06SDFD	SEDI	Uranium 234	0.592	pCi/g	J	T04	
Riley	SC-1	12LDOS06SWFD	SURF	Uranium 234	0.567	pCi/L	J	T13	
Riley	SC-1	12LDOS06SW	SURF	Uranium 234	0.399	pCi/L	J	T13	
Riley	SC-1	12LDOS06SD	SEDI	Uranium 234	0.618	pCi/g	J	T04	
Riley	SC-1	12LDOS06SD	SEDI	Uranium 235	0.0257	pCi/g	J	T13	
Riley	SC-1	12LDOS06SW	SURF	Uranium 238	0.499	pCi/L	J	T13	
Riley	SC-1	12LDOS06SWFD	SURF	Uranium 238	0.373	pCi/L	J	T13	
Riley	HC-1	12LDOS06SW	SURF	Uranium 234	0.508	pCi/L	J	T13	
Riley	HC-1	12LDOS06SD	SEDI	Uranium 234	0.613	pCi/g	J	T04	
Riley	HC-1	12LDOS06SD	SEDI	Uranium 235	0.0678	pCi/g	J	T13	
Riley	HC-1	12LDOS06SW	SURF	Uranium 238	0.367	pCi/L	J	T13	
Schofield	SWS-01	18LDOS06SD	SEDI	Uranium 234	0.269	pCi/g	J	T13	
Schofield	SWS-01	18LDOS06SD	SEDI	Uranium 238	0.293	pCi/g	J	T13	
Schofield	SWS-02	18LDOS06SD	SEDI	Uranium 234	0.318	pCi/g	J	T13	
Schofield	SWS-02	18LDOS06SD	SEDI	Uranium 238	0.29	pCi/g	J	T04	
Schofield	SWS-03	18LDOS06SD	SEDI	Uranium 234	0.536	pCi/g	J	T04	

**Table T-4. Qualified Sample Results – Third Quarter Event (Continued)**

Site	Site ID	Sample ID	Type	Analyte	Result	Units	Validation Qualifier	Reason Code 1	Reason Code 2
Schofield	SWS-03	18LDOS06SD	SEDI	Uranium 235	0.0317	pCi/g	J	T13	
Schofield	SWS-03	18LDOS06SD	SEDI	Uranium 238	0.48	pCi/g	J	T04	
Pohakuloa	ERM-01	17LDOS06SD	SEDI	Uranium 234	0.184	pCi/g	J	T04	F12
Pohakuloa	ERM-01	17LDOS06SD	SEDI	Uranium 238	0.146	pCi/g	J	T04	
Sill	SWS-06A	13LDOS06SDFD	SEDI	Uranium 235	0.017	pCi/g	J	T13	
Jackson	CC-3	9LDOS06SD	SEDI	Uranium 235	0.0563	pCi/g	J	T13	
Knox	SWS-03	10LDOS06SD	SEDI	Uranium 235	0.0457	pCi/g	J	T13	
Knox	SWS-03	10LDOS06SW	SURF	Uranium 234	0.15	pCi/L	J	T13	
Knox	SWS-03	10LDOS06SW	SURF	Uranium 238	0.141	pCi/L	J	T13	
Campbell	SWS-09	4LDOS06SW	SURF	Uranium 235	0.0159	pCi/L	J	T13	
Campbell	SWS-09	4LDOS06SD	SEDI	Uranium 235	0.0408	pCi/g	J	T13	
Donnelly	SWS-01	1LDOS06SW	SURF	Uranium 234	0.497	pCi/L	J	T04	
Donnelly	SWS-01	1LDOS06SW	SURF	Uranium 235	0.0538	pCi/L	J	T13	J01
Donnelly	SWS-01	1LDOS06SW	SURF	Uranium 238	0.442	pCi/L	J	T04	
Donnelly	SWS-01	1LDOS06SD	SEDI	Uranium 235	0.0569	pCi/g	J	T13	

**Data Validation Reason Codes**

- F01 Sample data were qualified as a result of the method blank.
- F12 Professional judgment was used to qualify the data.
- F13 Reported blank net result is >1.65 sigma, radiochemistry.
- G07 Radiological chemical recovery was <20%.
- J01 Duplicate RPD/radiological duplicate error ratio (DER) was outside the control limit.
- J06 Radiological duplicate RPD and DER were outside acceptable limits.
- T04 Professional judgment was used to qualify the data.
- T12 Analytical result is less than the associated MDA but greater than the counting uncertainty.
- T13 Analytical result is less than both the associated counting uncertainty and the MDA.

**Table T-5. Qualified Sample Results – Fourth Quarter Event**

Site	Site ID	Sample ID	Type	Analyte	Result	Units	Validation Qualifier	Reason Code 1	Reason Code 2
JBLM	AIA-SP02	14LDOS07SD	SEDI	Uranium 234	0.326	pCi/g	J	T13	
JBLM	AIA-SP02	14LDOS07SD	SEDI	Uranium 238	0.232	pCi/g	J	T13	
Jackson	CC-3	9LDOS07SD	SEDI	Uranium 235	0.0515	pCi/g	J	T13	
Pohakuloa	ERM-01	17LDOS07SD	SEDI	Uranium 234	0.233	pCi/g	J	T13	
Pohakuloa	ERM-01	17LDOS07SD	SEDI	Uranium 238	0.135	pCi/g	J	T13	
Hood	ERM-01	7LDOS07SD	SEDI	Uranium 234	0.402	pCi/g	J	T13	
Hood	ERM-01	7LDOS07SD	SEDI	Uranium 238	0.504	pCi/g	J	T04	
Hood	ERM-01	7LDOS07SW	SURF	Uranium 234	0.58	pCi/L	J	T13	
Hood	ERM-01	7LDOS07SW	SURF	Uranium 238	0.479	pCi/L	J	T13	
Hunter Liggett	ERM-01	8LDOS07SD	SEDI	Uranium 234	0.45	pCi/g	J	T13	
Hunter Liggett	ERM-01	8LDOS07SD	SEDI	Uranium 238	0.362	pCi/g	J	T13	
Hood	ERM-02	7LDOS07SD	SEDI	Uranium 234	0.395	pCi/g	J	T13	
Hood	ERM-02	7LDOS07SD	SEDI	Uranium 238	0.31	pCi/g	J	T13	
Hood	ERM-02	7LDOS07SW	SURF	Uranium 234	0.998	pCi/L	J	T04	
Hood	ERM-02	7LDOS07SW	SURF	Uranium 238	0.568	pCi/L	J	T13	
Hunter Liggett	ERM-02	8LDOS07SD	SEDI	Uranium 234	0.255	pCi/g	J	T13	J06
Hunter Liggett	ERM-02	8LDOS07SD	SEDI	Uranium 238	0.356	pCi/g	J	T13	
Gordon	Gut	6LDOS07SD	SEDI	Uranium 234	0.185	pCi/g	J	T04	
Gordon	Gut	6LDOS07SD	SEDI	Uranium 235	0.0164	pCi/g	J	T13	
Gordon	Gut	6LDOS07SD	SEDI	Uranium 238	0.189	pCi/g	J	T04	
Benning	OC2	2LDOS07SD	SEDI	Uranium 234	0.132	pCi/g	J	T13	
Benning	OC2	2LDOS07SD	SEDI	Uranium 238	0.117	pCi/g	J	T13	
Riley	SC-1	12LDOS07SD	SEDI	Uranium 235	0.0517	pCi/g	J	T13	
Riley	SC-1	12LDOS07SD	SEDI	Uranium 238	0.558	pCi/g	J	T04	
Riley	SC-1	12LDOS07SDFD	SEDI	Uranium 235	0.0784	pCi/g	J	T13	
Riley	SC-1	12LDOS07SW	SURF	Uranium 235	0.12	pCi/L	J	T13	
Riley	SC-1	12LDOS07SW	SURF	Uranium 238	0.954	pCi/L	J	T04	
Riley	SC-1	12LDOS07SWFD	SURF	Uranium 235	0.0936	pCi/L	J	T13	
Riley	SC-1	12LDOS07SWFD	SURF	Uranium 238	1.13	pCi/L	J	T04	
YTC	SWS-01	15LDOS07SD	SEDI	Uranium 235	0.0366	pCi/g	J	T13	
YTC	SWS-01	15LDOS07SD	SEDI	Uranium 238	0.48	pCi/g	J	T04	
YTC	SWS-01	15LDOS07SW	SURF	Uranium 238	0.252	pCi/L	J	T13	
Schofield	SWS-01	18LDOS07SD	SEDI	Uranium 235	0.0424	pCi/g	J	T13	
Schofield	SWS-01	18LDOS07SW	SURF	Uranium 234	0.251	pCi/L	J	T13	
YTC	SWS-02	15LDOS07SW	SURF	Uranium 234	1.29	pCi/L	J	T04	

**Table T-5. Qualified Sample Results – Fourth Quarter Event (Continued)**

Site	Site ID	Sample ID	Type	Analyte	Result	Units	Validation Qualifier	Reason Code 1	Reason Code 2
YTC	SWS-02	15LDOS07SW	SURF	Uranium 238	0.543	pCi/L	J	T04	
Schofield	SWS-02	18LDOS07SD	SEDI	Uranium 234	0.365	pCi/g	J	T04	
Schofield	SWS-02	18LDOS07SD	SEDI	Uranium 235	0.0219	pCi/g	J	T13	
Schofield	SWS-02	18LDOS07SD	SEDI	Uranium 238	0.32	pCi/g	J	T04	
Schofield	SWS-02	18LDOS07SW	SURF	Uranium 234	0.349	pCi/L	J	T13	
Schofield	SWS-02	18LDOS07SW	SURF	Uranium 235	0.084	pCi/L	J	T13	
Carson	SWS-02	5LDOS07SD	SEDI	Uranium 235	0.0414	pCi/g	J	T13	
Knox	SWS-03	10LDOS07SW	SURF	Uranium 234	0.287	pCi/L	J	T13	F12
Knox	SWS-03	10LDOS07SW	SURF	Uranium 238	0.11	pCi/L	J	T13	
Schofield	SWS-03	18LDOS07SD	SEDI	Uranium 235	0.0304	pCi/g	J	T13	
Schofield	SWS-03	18LDOS07SW	SURF	Uranium 234	0.7	pCi/L	J	T13	
Carson	SWS-03	5LDOS07SD	SEDI	Uranium 235	0.0749	pCi/g	J	T13	
Carson	SWS-03	5LDOS07SW	SURF	Uranium 235	0.299	pCi/L	J	T13	
Polk	SWS-04	11LDOS07SD	SEDI	Uranium 234	0.0599	pCi/g	J	T13	J06
Polk	SWS-04	11LDOS07SD	SEDI	Uranium 238	0.089	pCi/g	J	T13	
Polk	SWS-04	11LDOS07SW	SURF	Uranium 234	0.232	pCi/L	J	T13	
Polk	SWS-04	11LDOS07SW	SURF	Uranium 238	0.0329	pCi/L	J	T13	
YTC	SWS-05	15LDOS07SD	SEDI	Uranium 235	0.0231	pCi/g	J	T13	
YTC	SWS-05	15LDOS07SW	SURF	Uranium 235	0.12	pCi/L	J	T13	
YTC	SWS-05	15LDOS07SW	SURF	Uranium 238	0.273	pCi/L	J	T13	
Sill	SWS-06A	13LDOS07SD	SEDI	Uranium 234	0.475	pCi/g	J	T04	
Sill	SWS-06A	13LDOS07SD	SEDI	Uranium 235	0.032	pCi/g	J	T13	
Sill	SWS-06A	13LDOS07SD	SEDI	Uranium 238	0.42	pCi/g	J	T04	
Sill	SWS-06A	13LDOS07SDFD	SEDI	Uranium 234	0.415	pCi/g	J	T04	
Sill	SWS-06A	13LDOS07SW	SURF	Uranium 234	0.473	pCi/L	J	T13	
Sill	SWS-06A	13LDOS07SW	SURF	Uranium 235	0.0364	pCi/L	J	T13	
Sill	SWS-06A	13LDOS07SW	SURF	Uranium 238	0.387	pCi/L	J	T13	
Sill	SWS-06A	13LDOS07SWFD	SURF	Uranium 234	0.613	pCi/L	J	T13	
Sill	SWS-06A	13LDOS07SWFD	SURF	Uranium 238	0.39	pCi/L	J	T04	
Bragg	SWS-08	3LDOS07SD	SEDI	Uranium 235	0.0329	pCi/g	J	T13	
Bragg	SWS-08	3LDOS07SW	SURF	Uranium 234	0.0631	pCi/L	J	T13	
Campbell	SWS-09	4LDOS07SD	SEDI	Uranium 235	0.0571	pCi/g	J	T13	
Campbell	SWS-09	4LDOS07SW	SURF	Uranium 234	0.153	pCi/L	J	T13	
Campbell	SWS-09	4LDOS07SW	SURF	Uranium 238	0.109	pCi/L	J	T13	
JBMDL	SWS-13	16LDOS07SD	SEDI	Uranium 234	0.113	pCi/g	J	T13	J06
JBMDL	SWS-13	16LDOS07SD	SEDI	Uranium 238	0.0893	pCi/g	J	T13	



**Table T-5. Qualified Sample Results – Fourth Quarter Event (Continued)**

Site	Site ID	Sample ID	Type	Analyte	Result	Units	Validation Qualifier	Reason Code 1	Reason Code 2
JBMDL	SWS-14	16LDOS07SD	SEDI	Uranium 234	0.187	pCi/g	J	T13	F12
JBMDL	SWS-14	16LDOS07SD	SEDI	Uranium 238	0.0933	pCi/g	J	T13	
Benning	UC2	2LDOS07SD	SEDI	Uranium 234	0.0659	pCi/g	J	T13	
Benning	UC2	2LDOS07SD	SEDI	Uranium 238	0.114	pCi/g	J	T13	
Benning	UC2	2LDOS07SWFD	SURF	Uranium 234	0.103	pCi/L	J	T13	

**Data Validation Reason Codes**

F01 Sample data were qualified as a result of the method blank.

F12 Professional judgment was used to qualify the data.

F13 Reported blank net result is >1.65 sigma, radiochemistry.

G07 Radiological chemical recovery was <20%.

J01 Duplicate RPD/radiological duplicate error ratio (DER) was outside the control limit.

J06 Radiological duplicate RPD and DER were outside acceptable limits.

T04 Professional judgment was used to qualify the data.

T12 Analytical result is less than the associated MDA but greater than the counting uncertainty.

T13 Analytical result is less than both the associated counting uncertainty and the MDA.

**Table T-10. Sample Summary Table – First Quarter Event**

Site ID	Sample ID	Type	Matrix	Site	Sampling Date	Analysis
ERM-01	17LDOS04SD	SEDI	S	Pohakuloa	2/20/2018	Uranium
SWS-01	18LDOS04SD	SEDI	S	Schofield	2/21/2018	Uranium
SWS-02	18LDOS04SD	SEDI	S	Schofield	2/21/2018	Uranium
SWS-03	18LDOS04SD	SEDI	S	Schofield	2/21/2018	Uranium
SWS-06A	13LDOS04SW	SURF	W	Sill	2/27/2018	Uranium
SWS-06A	13LDOS04SWFD	SURF	W	Sill	2/27/2018	Uranium
SWS-06A	13LDOS04SD	SEDI	S	Sill	2/27/2018	Uranium
SWS-06A	13LDOS04SDFD	SEDI	S	Sill	2/27/2018	Uranium
SWS-05	15LDOS04SD	SEDI	S	YTC	2/28/2018	Uranium
SWS-05	15LDOS04SW	SURF	W	YTC	2/28/2018	Uranium
SWS-01	15LDOS04SD	SEDI	S	YTC	2/28/2018	Uranium
SWS-01	15LDOS04SW	SURF	W	YTC	2/28/2018	Uranium
SWS-02	15LDOS04SD	SEDI	S	YTC	2/28/2018	Uranium
SWS-02	15LDOS04SW	SURF	W	YTC	2/28/2018	Uranium
AIA-SP02	14LDOS04SD	SEDI	S	JBLM	3/5/2018	Uranium
AIA-SP02	14LDOS04SW	SURF	W	JBLM	3/5/2018	Uranium
SWS-14	16LDOS04SW	SURF	W	JBMDL	3/6/2018	Uranium
SWS-14	16LDOS04SD	SEDI	S	JBMDL	3/6/2018	Uranium
ERM-01	8LDOS04SD	SEDI	S	Hunter Liggett	3/6/2018	Uranium
ERM-01	8LDOS04SW	SURF	W	Hunter Liggett	3/6/2018	Uranium
SWS-13	16LDOS04SW	SURF	W	JBMDL	3/6/2018	Uranium
SWS-13	16LDOS04SD	SEDI	S	JBMDL	3/6/2018	Uranium
ERM-02	8LDOS04SD	SEDI	S	Hunter Liggett	3/6/2018	Uranium
ERM-02	8LDOS04SW	SURF	W	Hunter Liggett	3/6/2018	Uranium
UC2	2LDOS04SD	SEDI	S	Benning	3/6/2018	Uranium
UC2	2LDOS04SDFD	SEDI	S	Benning	3/6/2018	Uranium
UC2	2LDOS04SW	SURF	W	Benning	3/6/2018	Uranium
UC2	2LDOS04SWFD	SURF	W	Benning	3/6/2018	Uranium
OC2	2LDOS04SD	SEDI	S	Benning	3/6/2018	Uranium
OC2	2LDOS04SW	SURF	W	Benning	3/6/2018	Uranium
SWS-03	10LDOS04SW	SURF	W	Knox	3/6/2018	Uranium
SWS-03	10LDOS04SD	SEDI	S	Knox	3/6/2018	Uranium
SWS-09	4LDOS04SW	SURF	W	Campbell	3/7/2018	Uranium
SWS-09	4LDOS04SD	SEDI	S	Campbell	3/7/2018	Uranium
Gut	6LDOS04SD	SEDI	S	Gordon	3/7/2018	Uranium
Gut	6LDOS04SW	SURF	W	Gordon	3/7/2018	Uranium
HC-1	12LDOS04SD	SEDI	S	Riley	3/13/2018	Uranium
SC-1	12LDOS04SD	SEDI	S	Riley	3/13/2018	Uranium
SC-1	12LDOS04SDFD	SEDI	S	Riley	3/13/2018	Uranium
SC-1	12LDOS04SW	SURF	W	Riley	3/13/2018	Uranium
SC-1	12LDOS04SWFD	SURF	W	Riley	3/13/2018	Uranium
SWS-03	5LDOS04SD	SEDI	S	Carson	3/15/2018	Uranium
SWS-03	5LDOS04SW	SURF	W	Carson	3/15/2018	Uranium
SWS-02	5LDOS04SD	SEDI	S	Carson	3/15/2018	Uranium
ERM-01	7LDOS04SD	SEDI	S	Hood	3/27/2018	Uranium
ERM-01	7LDOS04SW	SURF	W	Hood	3/27/2018	Uranium
ERM-02	7LDOS04SD	SEDI	S	Hood	3/27/2018	Uranium
ERM-02	7LDOS04SW	SURF	W	Hood	3/27/2018	Uranium
SWS-04	11LDOS04SD	SEDI	S	Polk	3/29/2018	Uranium

**Table T-10. Sample Summary Table – First Quarter Event (Continued)**

Site ID	Sample ID	Type	Matrix	Site	Sampling Date	Analysis
SWS-04	11LDOS04SW	SURF	W	Polk	3/29/2018	Uranium
CC-3	9LDOS04SD	SEDI	S	Jackson	4/3/2018	Uranium
CC-3	9LDOS04SW	SURF	W	Jackson	4/3/2018	Uranium
SWS-08	3LDOS04SD	SEDI	S	Bragg	4/5/2018	Uranium
SWS-08	3LDOS04SW	SURF	W	Bragg	4/5/2018	Uranium

**Data Validation Reason Codes**

- F01 Sample data were qualified as a result of the method blank.  
F12 Professional judgment was used to qualify the data.  
F13 Reported blank net result is >1.65 sigma, radiochemistry.  
G07 Radiological chemical recovery was <20%.  
J01 Duplicate RPD/radiological duplicate error ratio (DER) was outside the control limit.  
J06 Radiological duplicate RPD and DER were outside acceptable limits.  
T04 Professional judgment was used to qualify the data.  
T12 Analytical result is less than the associated MDA but greater than the counting uncertainty.  
T13 Analytical result is less than both the associated counting uncertainty and the MDA.

**Table T-11. Sample Summary Table – Second Quarter Event**

Site ID	Sample ID	Type	Matrix	Site	Sampling Date	Analysis
SC-1	12LDOS05SD	SEDI	S	Riley	5/22/2018	Uranium
SC-1	12LDOS05SDFD	SEDI	S	Riley	5/22/2018	Uranium
SC-1	12LDOS05SW	SURF	W	Riley	5/22/2018	Uranium
SC-1	12LDOS05SWFD	SURF	W	Riley	5/22/2018	Uranium
HC-1	12LDOS05SD	SEDI	S	Riley	5/22/2018	Uranium
SWS-02	5LDOS05SD	SEDI	S	Carson	5/24/2018	Uranium
SWS-03	5LDOS05SD	SEDI	S	Carson	5/24/2018	Uranium
SWS-03	5LDOS05SW	SURF	W	Carson	5/24/2018	Uranium
SWS-06A	13LDOS05SD	SEDI	S	Sill	5/30/2018	Uranium
SWS-06A	13LDOS05SDFD	SEDI	S	Sill	5/30/2018	Uranium
SWS-06A	13LDOS05SW	SURF	W	Sill	5/30/2018	Uranium
SWS-06A	13LDOS05SWFD	SURF	W	Sill	5/30/2018	Uranium
SWS-03	10LDOS05SW	SURF	W	Knox	5/30/2018	Uranium
SWS-03	10LDOS05SD	SEDI	S	Knox	5/30/2018	Uranium
SWS-09	4LDOS05SW	SURF	W	Campbell	5/31/2018	Uranium
SWS-09	4LDOS05SD	SEDI	S	Campbell	5/31/2018	Uranium
AIA-SP02	14LDOS05SW	SURF	W	JBLM	6/4/2018	Uranium
AIA-SP02	14LDOS05SD	SEDI	S	JBLM	6/4/2018	Uranium
SWS-13	16LDOS05SW	SURF	W	JBMDL	6/5/2018	Uranium
SWS-13	16LDOS05SD	SEDI	S	JBMDL	6/5/2018	Uranium
SWS-14	16LDOS05SW	SURF	W	JBMDL	6/5/2018	Uranium
SWS-14	16LDOS05SD	SEDI	S	JBMDL	6/5/2018	Uranium
CC-3	9LDOS05SD	SEDI	S	Jackson	6/5/2018	Uranium
CC-3	9LDOS05SW	SURF	W	Jackson	6/5/2018	Uranium
SWS-01	1LDOS05SD	SEDI	S	Donnelly	6/5/2018	Uranium
SWS-01	1LDOS05SW	SURF	W	Donnelly	6/5/2018	Uranium
SWS-08	3LDOS05SD	SEDI	S	Bragg	6/7/2018	Uranium
SWS-08	3LDOS05SW	SURF	W	Bragg	6/7/2018	Uranium
ERM-01	8LDOS05SW	SURF	W	Hunter Liggett	6/7/2018	Uranium
ERM-01	8LDOS05SD	SEDI	S	Hunter Liggett	6/7/2018	Uranium
ERM-02	8LDOS05SD	SEDI	S	Hunter Liggett	6/7/2018	Uranium
ERM-02	8LDOS05SW	SURF	W	Hunter Liggett	6/7/2018	Uranium
ERM-01	7LDOS05SD	SEDI	S	Hood	6/11/2018	Uranium
ERM-01	7LDOS05SW	SURF	W	Hood	6/11/2018	Uranium
ERM-02	7LDOS05SD	SEDI	S	Hood	6/11/2018	Uranium
ERM-02	7LDOS05SW	SURF	W	Hood	6/11/2018	Uranium
SWS-01	15LDOS05SW	SURF	W	YTC	6/12/2018	Uranium
SWS-01	15LDOS05SD	SEDI	S	YTC	6/12/2018	Uranium
SWS-05	15LDOS05SW	SURF	W	YTC	6/12/2018	Uranium
SWS-05	15LDOS05SD	SEDI	S	YTC	6/12/2018	Uranium
Gut	6LDOS05SD	SEDI	S	Gordon	6/12/2018	Uranium
Gut	6LDOS05SW	SURF	W	Gordon	6/12/2018	Uranium
SWS-02	15LDOS05SD	SEDI	S	YTC	6/12/2018	Uranium
UC2	2LDOS05SD	SEDI	S	Benning	6/13/2018	Uranium
UC2	2LDOS05SDFD	SEDI	S	Benning	6/13/2018	Uranium
UC2	2LDOS05SW	SURF	W	Benning	6/13/2018	Uranium
UC2	2LDOS05SWFD	SURF	W	Benning	6/13/2018	Uranium
SWS-04	11LDOS05SD	SEDI	S	Polk	6/13/2018	Uranium
SWS-04	11LDOS05SW	SURF	W	Polk	6/13/2018	Uranium
OC2	2LDOS05SD	SEDI	S	Benning	6/13/2018	Uranium



**Table T-11. Sample Summary Table – Second Quarter Event (Continued)**

Site ID	Sample ID	Type	Matrix	Site	Sampling Date	Analysis
OC2	2LDOS05SW	SURF	W	Benning	6/13/2018	Uranium
SWS-01	18LDOS05SD	SEDI	S	Schofield	6/18/2018	Uranium
SWS-02	18LDOS05SD	SEDI	S	Schofield	6/18/2018	Uranium
SWS-03	18LDOS05SD	SEDI	S	Schofield	6/18/2018	Uranium
ERM-01	17LDOS05SD	SEDI	S	Pohakuloa	6/20/2018	Uranium

**Data Validation Reason Codes**

- F01 Sample data were qualified as a result of the method blank.  
F12 Professional judgment was used to qualify the data.  
F13 Reported blank net result is >1.65 sigma, radiochemistry.  
G07 Radiological chemical recovery was <20%.  
J01 Duplicate RPD/radiological duplicate error ratio (DER) was outside the control limit.  
J06 Radiological duplicate RPD and DER were outside acceptable limits.  
T04 Professional judgment was used to qualify the data.  
T12 Analytical result is less than the associated MDA but greater than the counting uncertainty.  
T13 Analytical result is less than both the associated counting uncertainty and the MDA.

**Table T-12. Sample Summary Table – Third Quarter Event**

Site ID	Sample ID	Type	Matrix	Site	Sample Date	Analysis
SWS-02	5LDOS06SD	SEDI	S	Carson	9/4/2018	Uranium
SWS-02	5LDOS06SW	SURF	W	Carson	9/4/2018	Uranium
SWS-03	5LDOS06SD	SEDI	S	Carson	9/4/2018	Uranium
SWS-03	5LDOS06SW	SURF	W	Carson	9/4/2018	Uranium
ERM-02	8LDOS06SD	SEDI	S	Hunter Liggett	9/4/2018	Uranium
UC2	2LDOS06SD	SEDI	S	Benning	9/4/2018	Uranium
UC2	2LDOS06SDFD	SEDI	S	Benning	9/4/2018	Uranium
UC2	2LDOS06SW	SURF	W	Benning	9/4/2018	Uranium
UC2	2LDOS06SWFD	SURF	W	Benning	9/4/2018	Uranium
ERM-01	7LDOS06SD	SEDI	S	Hood	9/4/2018	Uranium
ERM-01	7LDOS06SW	SURF	W	Hood	9/4/2018	Uranium
OC2	2LDOS06SD	SEDI	S	Benning	9/4/2018	Uranium
OC2	2LDOS06SW	SURF	W	Benning	9/4/2018	Uranium
ERM-02	7LDOS06SD	SEDI	S	Hood	9/4/2018	Uranium
ERM-02	7LDOS06SW	SURF	W	Hood	9/4/2018	Uranium
ERM-01	8LDOS06SD	SEDI	S	Hunter Liggett	9/4/2018	Uranium
Gut	6LDOS06SD	SEDI	S	Gordon	9/5/2018	Uranium
Gut	6LDOS06SW	SURF	W	Gordon	9/5/2018	Uranium
SWS-05	15LDOS06SD	SEDI	S	YTC	9/5/2018	Uranium
SWS-05	15LDOS06SW	SURF	W	YTC	9/5/2018	Uranium
SWS-01	15LDOS06SW	SURF	W	YTC	9/5/2018	Uranium
SWS-04	11LDOS06SD	SEDI	S	Polk	9/5/2018	Uranium
SWS-04	11LDOS06SW	SURF	W	Polk	9/5/2018	Uranium
SWS-01	15LDOS06SD	SEDI	S	YTC	9/5/2018	Uranium
SWS-02	15LDOS06SD	SEDI	S	YTC	9/5/2018	Uranium
SWS-14	16LDOS06SW	SURF	W	JBMDL	9/6/2018	Uranium
SWS-14	16LDOS06SD	SEDI	S	JBMDL	9/6/2018	Uranium
SWS-13	16LDOS06SW	SURF	W	JBMDL	9/6/2018	Uranium
SWS-13	16LDOS06SD	SEDI	S	JBMDL	9/6/2018	Uranium
AIA-SP02	14LDOS06SD	SEDI	S	JBLM	9/6/2018	Uranium
AIA-SP02	14LDOS06SW	SURF	W	JBLM	9/6/2018	Uranium
SC-1	12LDOS06SD	SEDI	S	Riley	9/6/2018	Uranium
SC-1	12LDOS06SDFD	SEDI	S	Riley	9/6/2018	Uranium
SC-1	12LDOS06SW	SURF	W	Riley	9/6/2018	Uranium
SC-1	12LDOS06SWFD	SURF	W	Riley	9/6/2018	Uranium
HC-1	12LDOS06SD	SEDI	S	Riley	9/6/2018	Uranium
HC-1	12LDOS06SW	SURF	W	Riley	9/6/2018	Uranium
SWS-01	18LDOS06SD	SEDI	S	Schofield	9/7/2018	Uranium
SWS-02	18LDOS06SD	SEDI	S	Schofield	9/7/2018	Uranium
SWS-03	18LDOS06SD	SEDI	S	Schofield	9/7/2018	Uranium
ERM-01	17LDOS06SD	SEDI	S	Pohakuloa	9/10/2018	Uranium
SWS-06A	13LDOS06SD	SEDI	S	Sill	9/11/2018	Uranium
SWS-06A	13LDOS06SDFD	SEDI	S	Sill	9/11/2018	Uranium
CC-3	9LDOS06SD	SEDI	S	Jackson	9/11/2018	Uranium
CC-3	9LDOS06SW	SURF	W	Jackson	9/11/2018	Uranium
SWS-03	10LDOS06SD	SEDI	S	Knox	9/11/2018	Uranium
SWS-03	10LDOS06SW	SURF	W	Knox	9/11/2018	Uranium
SWS-09	4LDOS06SW	SURF	W	Campbell	9/12/2018	Uranium
SWS-09	4LDOS06SD	SEDI	S	Campbell	9/12/2018	Uranium
SWS-08	3LDOS06SD	SEDI	S	Bragg	9/12/2018	Uranium
SWS-08	3LDOS06SW	SURF	W	Bragg	9/12/2018	Uranium
SWS-01	1LDOS06SW	SURF	W	Donnelly	9/13/2018	Uranium
SWS-01	1LDOS06SD	SEDI	S	Donnelly	9/13/2018	Uranium

**Table T-12. Sample Summary Table – Third Quarter Event (Continued)**

**Data Validation Reason Codes**

- F01 Sample data were qualified as a result of the method blank.
- F12 Professional judgment was used to qualify the data.
- F13 Reported blank net result is  $>1.65$  sigma, radiochemistry.
- G07 Radiological chemical recovery was  $<20\%$ .
- J01 Duplicate RPD/radiological duplicate error ratio (DER) was outside the control limit.
- J06 Radiological duplicate RPD and DER were outside acceptable limits.
- T04 Professional judgment was used to qualify the data.
- T12 Analytical result is less than the associated MDA but greater than the counting uncertainty.
- T13 Analytical result is less than both the associated counting uncertainty and the MDA.

**Table T-13. Sample Summary Table – Fourth Quarter Event**

Site ID	Sample ID	Type	Matrix	Site	Sample Date	Analysis
ERM-01	8LDOS07SD	SEDI	S	Hunter Liggett	11/20/2018	Uranium
ERM-02	8LDOS07SD	SEDI	S	Hunter Liggett	11/20/2018	Uranium
AIA-SP02	14LDOS07SW	SURF	W	JBLM	11/20/2018	Uranium
AIA-SP02	14LDOS07SD	SEDI	S	JBLM	11/20/2018	Uranium
SWS-14	16LDOS07SD	SEDI	S	JBMDL	11/27/2018	Uranium
SWS-14	16LDOS07SW	SURF	W	JBMDL	11/27/2018	Uranium
SWS-13	16LDOS07SD	SEDI	S	JBMDL	11/27/2018	Uranium
SWS-13	16LDOS07SW	SURF	W	JBMDL	11/27/2018	Uranium
SC-1	12LDOS07SD	SEDI	S	Riley	11/27/2018	Uranium
SC-1	12LDOS07SDFD	SEDI	S	Riley	11/27/2018	Uranium
SC-1	12LDOS07SW	SURF	W	Riley	11/27/2018	Uranium
SC-1	12LDOS07SWFD	SURF	W	Riley	11/27/2018	Uranium
SWS-03	10LDOS07SW	SURF	W	Knox	11/27/2018	Uranium
SWS-03	10LDOS07SD	SEDI	S	Knox	11/27/2018	Uranium
SWS-02	5LDOS07SD	SEDI	S	Carson	11/28/2018	Uranium
SWS-09	4LDOS07SW	SURF	W	Campbell	11/28/2018	Uranium
SWS-09	4LDOS07SD	SEDI	S	Campbell	11/28/2018	Uranium
SWS-03	5LDOS07SD	SEDI	S	Carson	11/28/2018	Uranium
SWS-03	5LDOS07SW	SURF	W	Carson	11/28/2018	Uranium
Gut	6LDOS07SD	SEDI	S	Gordon	12/4/2018	Uranium
Gut	6LDOS07SW	SURF	W	Gordon	12/4/2018	Uranium
UC2	2LDOS07SD	SEDI	S	Benning	12/5/2018	Uranium
UC2	2LDOS07SDFD	SEDI	S	Benning	12/5/2018	Uranium
UC2	2LDOS07SW	SURF	W	Benning	12/5/2018	Uranium
UC2	2LDOS07SWFD	SURF	W	Benning	12/5/2018	Uranium
OC2	2LDOS07SD	SEDI	S	Benning	12/5/2018	Uranium
OC2	2LDOS07SW	SURF	W	Benning	12/5/2018	Uranium
SWS-01	18LDOS07SD	SEDI	S	Schofield	12/11/2018	Uranium
SWS-01	18LDOS07SW	SURF	W	Schofield	12/11/2018	Uranium
SWS-02	18LDOS07SD	SEDI	S	Schofield	12/11/2018	Uranium
SWS-02	18LDOS07SW	SURF	W	Schofield	12/11/2018	Uranium
CC-3	9LDOS07SD	SEDI	S	Jackson	12/11/2018	Uranium
CC-3	9LDOS07SW	SURF	W	Jackson	12/11/2018	Uranium
SWS-03	18LDOS07SD	SEDI	S	Schofield	12/11/2018	Uranium
SWS-03	18LDOS07SW	SURF	W	Schofield	12/11/2018	Uranium
SWS-08	3LDOS07SD	SEDI	S	Bragg	12/12/2018	Uranium
SWS-08	3LDOS07SW	SURF	W	Bragg	12/12/2018	Uranium
SWS-06A	13LDOS07SW	SURF	W	Sill	12/12/2018	Uranium
SWS-06A	13LDOS07SWFD	SURF	W	Sill	12/12/2018	Uranium
SWS-06A	13LDOS07SD	SEDI	S	Sill	12/12/2018	Uranium
SWS-06A	13LDOS07SDFD	SEDI	S	Sill	12/12/2018	Uranium
ERM-01	17LDOS07SD	SEDI	S	Pohakuloa	12/13/2018	Uranium
SWS-05	15LDOS07SD	SEDI	S	YTC	12/14/2018	Uranium
SWS-05	15LDOS07SW	SURF	W	YTC	12/14/2018	Uranium
SWS-01	15LDOS07SD	SEDI	S	YTC	12/14/2018	Uranium
SWS-01	15LDOS07SW	SURF	W	YTC	12/14/2018	Uranium
SWS-02	15LDOS07SW	SURF	W	YTC	12/14/2018	Uranium
SWS-02	15LDOS07SD	SEDI	S	YTC	12/14/2018	Uranium
ERM-01	7LDOS07SD	SEDI	S	Hood	12/18/2018	Uranium



**Table T-13. Sample Summary Table – Fourth Quarter Event (Continued)**

Site ID	Sample ID	Type	Matrix	Site	Sample Date	Analysis
ERM-01	7LDOS07SW	SURF	W	Hood	12/18/2018	Uranium
ERM-02	7LDOS07SD	SEDI	S	Hood	12/18/2018	Uranium
ERM-02	7LDOS07SW	SURF	W	Hood	12/18/2018	Uranium
SWS-04	11LDOS07SD	SEDI	S	Polk	12/19/2018	Uranium
SWS-04	11LDOS07SW	SURF	W	Polk	12/19/2018	Uranium

**Data Validation Reason Codes**

- F01 Sample data were qualified as a result of the method blank.  
F12 Professional judgment was used to qualify the data.  
F13 Reported blank net result is >1.65 sigma, radiochemistry.  
G07 Radiological chemical recovery was <20%.  
J01 Duplicate RPD/radiological duplicate error ratio (DER) was outside the control limit.  
J06 Radiological duplicate RPD and DER were outside acceptable limits.  
T04 Professional judgment was used to qualify the data.  
T12 Analytical result is less than the associated MDA but greater than the counting uncertainty.  
T13 Analytical result is less than both the associated counting uncertainty and the MDA.