RAS 14518

# Army Barta Exh. # 2-D

[Originally Attached As EXHIBIT MLB #5 to Witness Barta's pre-filed testimony]

U.S. NUCLEAR REGULATORY COMMISSION
In the Matter of US ARMY (JEFFERSON PROVING GROUND)
Docket No. 40-8838-MLA Official Exhibit No. ARMY EXH. #2-D
OFFERED by: (Applicant/Licensee) Intervenor _____
NRC Staff Other _____
IDENTIFIED on _____ Witness/Panel _____
Action Taken: ADMITTED REJECTED WITHDRAWN
Reporter/Clerk _____

SEG. 1996. Jefferson Proving Ground Depleted Uranium Impact Area Characterization Survey Report. Volume 1. Oak Ridge, Tennessee. February.



TEMPLATE = SECY-028

SECY-02

AR-JPG-002

# Jefferson Proving Ground Depleted Uranium Impact Area

## *Characterization Survey Report Volume 1*

**February 1996**
**Revision 0**


SCIENTIFIC ECOLOGY GROUP, INC.

**Radiological Engineering & Decommissioning Services**

- Penetrator Soil Samples.

  Surface and subsurface samples were collected directly under penetrators, or penetrator fragments. Twenty locations were identified where penetrators, or fragments, were visible on the surface, in areas of undisturbed soil. The areas from which penetrator soil samples were collected are shown in Figure 3-2, Figure 3-4 describes in detail the penetrator and fragment locations.

- Random Soil Samples.

  Surface and subsurface samples were collected at twenty randomly selected locations in the affected area. The random locations were selected by dividing the affected area into 50 meter by 50 meter grids. A random number was assigned to each 50m grid that was at least 50% affected. The random numbers were then sorted from higher to lowest, and the highest 20 selected for sampling. The soil sample was taken in the center of the 50 meter grid.

  Figure 3-5 shows the locations of the random soil samples.

Vegetation Samples

Vegetation samples were collected from ten locations in the affected area. Locations chosen for these samples were within three feet of the first ten penetrator fragments referenced in the above section. Vegetation sample numbers identify the sample with its adjacent penetrator.

Samples were washed with deionized water prior to analysis, and the wash water analyzed separately from the vegetation sample to determine the amount of uranium on the surface of, and in the sample. The sample consisted of approximately one gallon (200 g) of lichens, leaves or grasses.

Ground Water Samples

Ground water samples were collected from each of the eleven groundwater monitoring wells surrounding the impact area. The wells were purged of water, then allowed to refill over a period of 24 hrs. Once refilled, the wells were sampled by lowering a PVC bailer into the well and transferring the contents into a 1000 ml plastic bottle. The samples were filtered to remove particulates, sample locations are shown in Figure 3-3.

Chain-of-custody and radioactive material shipping paperwork was completed and the samples shipped within 24 hours to the off-site lab for uranium isotopic analysis. Samples were acidified on-site in order to preserve the soluble constituents prior to analysis.

Surface Water Samples

Surface water samples were collected from seven locations in the affected areas. Samples were also collected at three locations in the unaffected area; these were the points at which Big Creek entered and exited the proving ground, and where Middlefork Creek exited the proving ground. Approximately one liter was collected and filtered to remove particulate matter, assigned unique identifiers and shipped within 24 hours to the off-site lab for uranium isotopic analysis. Samples were acidified on-site in order to preserve the soluble constituents prior to analysis. Sample locations are shown in Figure 3-3.

Sediment Samples

Sediment samples of approximately 200 g each were collected from the bottoms of streams and creeks in the same locations as the surface water samples. Samples were collected by lightly dredging a portion of the stream bed with a hand scoop, removing larger stones and debris, and transferring the contents of the scoop into a plastic container. Excess water was drained from the container and the operation repeated until the container was filled. Samples were given a unique identifier, chain-of-custody and radioactive material shipping paperwork completed, and the samples shipped to the off-site lab for uranium isotopic analysis. Sample locations are shown in Figure 3-3.

Biological Samples

The following biological samples were collected:

- Two samples of approximately ten clams each were collected from Big Creek, a stream running through the affected area. One sample was collected east of the D Road bridge, and one sample west of the bridge.

- Two samples of fish were collected from streams running through the affected area. As with the clams, samples were collected from Big Creek, both east and west of the D Road bridge.

- One soft-shelled turtle sample was collected from the affected area, adjacent to Big Creek.

- Samples of liver, kidney and bone were collected from a 4-5 year old female deer killed in the impact area.

All biota samples were frozen after collection and prior to shipment. Sample preparation was performed at the off-site laboratory.

Sample Analysis

All samples were analyzed by alpha spectroscopy for U-234, U-235 and U-238. The laboratory used for sample analysis, Lockheed Analytical, of Las Vegas, Nevada, is accredited by the American Association for Laboratory Accreditation. Sample results were reviewed, tabulated and are presented in Section 4.0 of this report.

**Table 4-7**
**Vegetation Sample Results**

| SAMPLE NUMBER | U-234 (pCi/g) | U-235 (pCi/g) | U-238 (pCi/g) | U-238/ U-234 | TOTAL URANIUM (pCi/g) |
|---|---|---|---|---|---|
| VP-01 | 45.8 | 5.3 | 312 | 6.81 | 363.1 ± 23.01 |
| VP-02 | 363 | 44 | 3040 | 8.37 | 3447.0 ± 217.83 |
| VP-03 | 2.41 | 0.25 | 15.3 | 6.35 | 18.0 ± 1.26 |
| VP-04 | 214 | 44 | 1310 | 6.12 | 1568.0 ± 106.23 |
| VP-05 | 5.76 | 0.64 | 45.1 | 7.83 | 51.5 ± 3.22 |
| VP-06 | 2 | 0.236 | 15.5 | 7.75 | 17.7 ± 1.03 |
| VP-07 | 1.94 | 04 | 14.7 | 7.58 | 17.0 ± 1.26 |
| VP-08 | 38.2 | 3.9 | 261 | 6.83 | 303.1 ± 19.99 |
| VP-09 | 43 | 7.4 | 361 | 8.40 | 411.4 ± 25.93 |
| VP-10 | 10.6 | 1.21 | 66.8 | 6.30 | 78.6 ± 5.37 |

**Table 4-8**
**Vegetation Root Wash Sample Results**

| SAMPLE NUMBER | WASH VOLUME (ml) | SAMPLE VOLUME (ml) | U-234 (pCi/sample) | U-235 (pCi/sample) | U-238 (pCi/sample) | U-238/ U-234 | TOTAL URANIUM (pCi/sample) |
|---|---|---|---|---|---|---|---|
| VP-01 | 680 | 2 | 519 | 74 | 3330 | 6.42 | 3923.0 ± 229.63 |
| VP-02 | 595 | 0.5 | 1510 | 208 | 12540 | 8.30 | 14258.0 ± 846.85 |
| VP-03 | 795 | 100 | 6.9 | 1.16 | 45.2 | 6.55 | 53.3 ± 3.36 |
| VP-04 | 760 | 1 | 870 | 128 | 6650 | 7.64 | 7648.0 ± 455.30 |
| VP-05 | 830 | 100 | 6.51 | 1.2 | 38.4 | 5.90 | 46.1 ± 3.08 |
| VP-06 | 715 | 100 | 8.6 | 1.95 | 58.9 | 6.85 | 69.5 ± 4.18 |
| VP-07 | 740 | 100 | 7.4 | 1.34 | 41.7 | 5.64 | 50.4 ± 3.41 |
| VP-08 | 810 | 7 | 118 | 20.3 | 794 | 6.73 | 932.3 ± 59.86 |
| VP-09 | 1000 | 12 | 106 | 23.2 | 677 | 6.39 | 806.2 ± 48.46 |
| VP-10 | 700 | 7 | 105 | 22.8 | 773 | 7.36 | 900.8 ± 58.66 |

## 4.7 Biological Samples

Results of samples taken of deer, clams, fish and turtle are presented in Table 4-9. Statistical evaluation was not performed due to the small sample population.

Lab sample analyses are in Appendix C.

**Table 4-9**
**Biological Sample Results**

| SAMPLE NUMBER | SAMPLE TYPE | U-234 (pCi/g) | U-235 (pCi/g) | U-238 (pCi/g) | U-238/ U-234 | TOTAL URANIUM (pCi/g) |
|---|---|---|---|---|---|---|
| D-01 | Deer Liver | 0.051 | 0.008 | 0.032 | 0.63 | 0.091 ± 0.03 |
| D-02 | Deer Kidney | 0.091 | 0.021 | 0.039 | 0.43 | 0.151 ± 0.05 |
| D-03 | Deer Bone | 0.221 | 0.053 | 0.142 | 0.64 | 0.416 ± 0.07 |
| C-01 | Freshwater Clams | 0.343 | 0.054 | 0.377 | 1.10 | 0.774 ± 0.11 |
| C-02 | Freshwater Clams | 0.154 | 0.009 | 0.171 | 1.11 | 0.334 ± 0.07 |
| F-01 | Fish | 0.069 | 0.002 | 0.079 | 1.14 | 0.150 ± 0.04 |
| F-02 | Fish | 0.115 | 0.033 | 0.134 | 1.17 | 0.282 ± 0.06 |
| T-01 | Soft Shelled Turtle | 0.112 | 0.024 | 0.099 | 0.81 | 0.245 ± 0.06 |