

East Waste Disposal Trenches IHSS Briefing Summary

Prepared by Rik Getty

Briefing Summary Revision Number

Rev 0 (1/06)

Introduction

This IHSS briefing is the longest and most complicated of any IHSS briefing I have generated to date. The length and complication of this briefing are due to the large number of trenches and the various remediation strategies that were employed by the site and regulators in addressing contaminants found in them. There are 13 trenches (14 if you count 9a and 9b as 2 trenches) which comprised the East Trenches waste disposal network. The remediation strategies for the East Trenches ranged from source removal of all waste to NFAA (no further accelerated action) approval by the regulators. Details on each trench's history and remediation will follow in this briefing. The reader will note that the discussion and references for trench 7 (T-7) are more detailed than the other trenches due to a series of questions I asked of the site and regulators concerning the proposed T-7 cleanup.

IHSS Group Number

Various group numbers

Trench/IHSS/PAC Number/approximate location

Trench 1/IHSS 108/Northing: 749,475, Easting: 2,086,300
Trench 2 (Ryan's Pit)/IHSS 109/Northing: 748,625, Easting: 2,086,050
Trench 3/IHSS 110/Northing: 749,750, Easting: 2,086,900
Trench 4/IHSS 111.1/Northing: 749,800, Easting: 2,087,250
Trench 5/IHSS 111.2/Northing: 749,700, Easting: 2,087,900
Trench 6/IHSS 111.3/ Northing: 749,650, Easting: 2,087,900
Trench 7/IHSS 111.4/Northing: 749,600, Easting: 2,087,950
Trench 8/IHSS 111.5/Northing: 749,500, Easting: 2,087,950
Trench 9a/IHSS 111.6a/Northing: 749,600, Easting: 2,087,700
Trench 9b/IHSS 111.6b/Northing: 749,550, Easting: 2,087,475
Trench 10/IHSS 111.7/Northing: 749,725, Easting: 2,087,350
Trench 11/IHSS 111.8/Northing: 749,700, Easting: 2,087,100
Trench 12/PAC NE-1412/Northing: 749,450, Easting: 2,087,150
Trench 13/PAC NE-1413/Northing: 749,600, Easting: 2,087,100

Historical Information

(For a detailed history on the East Trenches see References 1 through 5)

General History

When the site began operations in 1953, adequate planning for waste processing had not occurred. The United States Atomic Energy Commission (predecessor agency to DOE) had selected Dow Chemical as the original site contractor and Dow followed waste practices that were common in 1950's era American industry. As the site generated more and more liquid and solid wastes, wastes were burned, stored in the open environment, or buried in disposal trenches.

During the early years of site operations, there was no East Access Road from Indiana Street leading to the site, so the eastern portion of the Industrial Area was relatively isolated from other parts of the site. The general terrain in the eastern portion of the Industrial Area was flat but there were some slopes present. The East Trenches were first constructed in the flat parts of the eastern area in 1954 to dispose of sludge from the site's sanitary and waste water treatment systems. The sludge contained small amounts of radioactivity (primarily uranium with some plutonium), heavy metals, and other contaminants of concern from various processing activities at the site. In addition, other forms of waste were buried in the trenches such as:

- volatile organic compounds (VOCs) from waste drums (primarily chlorinated solvents);
- asphalt planking from the first Solar Ponds (contaminated with actinides and metals);
- crushed drums which contained sludge remnants from uranium and plutonium machining operations; and,
- various types of debris wastes from site activities.

The reader will note that T-1 and T-2 contained different types of waste than the other East Trenches. The differences will be explained in the T-1 and T-2 sections of this briefing.

Each of the trenches varies in length (average length 250 feet), are approximately 10-15 feet wide and are approximately 10 feet deep with 2 additional feet of soil covers on top. They were used from about 1954 to 1968. (Note: from 1968 until 1970 the site disposed of the treatment sludge in the Present Landfill; after 1970 the treatment sludge was shipped offsite for disposal).

A brief historical discussion of each trench follows.

T-1 (References 1 – 3)

T-1 was constructed in 1954 to store drums containing depleted uranium metal (U-238) machine turnings/chips coated with lathe coolant from machining operations in Building 44 (later Building 444). Due to the pyrophoric nature of the uranium metal machine turnings and chips, the site felt that this waste stream could not be stored safely inside a production building without the potential for a fire. The drums of waste were therefore placed in T-1 and covered with dirt. In addition to the depleted uranium metal wastes some drums of cemented cyanide wastes were also buried in T-1. T-1 was used sporadically from 1954 to 1962 for primarily uranium waste disposal. T-1's dimensions were approximately 230 feet long, 15 feet wide, and 5 feet deep (to allow for burial of the 55 gallon drums) with a 1 to 2 foot cover of soil.

T-2, a.k.a. Ryan's Pit (References 1-3)

T-2 or Ryan's Pit was named after a member of the site's Waste Disposal Coordination Group who was involved with past solvent disposal. T-2 is located south of the 903 Pad and is isolated from the other East Trenches network. It is the smallest of the East Trenches and is only about 25 feet in length. It was probably used for the disposal of supposedly non-radioactive chemical wastes such as solvents (primarily chlorinated solvents), paint thinners, diesel fuel, and other construction related chemicals/materials. Based on historical information and aerial photographs, T-2 appears to have been used from 1969 – 1971.

T-3 (References 1-5, 12)

Reader's Note: The history of waste disposal at Trenches 3 through 13 were similar to each other.

The types of waste disposed in T-3 were like the majority of the East Trenches wastes which were listed in the previous General History section of this briefing. Sludge, crushed drums containing remnants of VOCs and radionuclides, construction debris, and asphalt planking from the Solar Evaporation Ponds were the types of wastes generally disposed in T-3. T-3 is believed to have been used for waste disposal from 1964 to 1966. T-3 was approximately 130 feet long, 15 feet wide, and 15 feet deep.

T-4 (References 1-4, 12)

Same waste disposal history as T-3. It is believed that T-4 was used for waste disposal activities from 1966 to 1967. T-4 was approximately 145 feet long, 18 feet wide, and 12 feet deep.

T-5 (References 1 – 3, 5, 9)

Similar waste disposal history as T-3; similar dimensions to T-4.

T-6 (References 1 – 3, 5, 9)

Similar waste disposal history as T-3; about ½ the length of T-4.

T-7 (References 1 – 3, 9)

Similar waste disposal history as T-3; approximately 115 feet long, 14 to 16 feet wide and 12 feet deep.

T-8 (References 1-3, 5, 9)

Similar waste disposal history as T-3; similar dimensions to T-7.

T-9a/b (References 1-3, 5, 9)

Similar waste disposal history as T-3; each trench about 200 feet long, 15 feet wide and 12 feet deep.

T-10 (References 1-3, 5, 9)

Similar waste disposal history as T-3; similar dimensions to T-7.

T-11 (References 1-3, 5, 9)

Same as T-10.

T-12 (References 2, 9, 21)

T-12 probably had a similar waste disposal history as T-3 and is approximately 125 feet long, 10 feet wide and only 5 feet deep (much shallower than most of the East Trenches). Trench T-12 was not identified until 1993, after the publication of the first Historical Release Report (HRR) in 1992 (Reference 1). Evidently between the time of its use (estimated to be sometime between 1954 and 1964) and the publication of the HRR its location had not been documented like the rest of the East Trenches. In fact, the East Access Road's south bypass route paved over T-12 in 1964.

T-13 (References 2, 9, 21)

T-13 probably had a similar waste disposal history as T-3 and is approximately 250 feet long with similar width and depth dimensions as T-12. Like T-12, T-13 was not identified until after the original HRR was published. The East Access Road's north bypass route paved over T-13 in 1968.

Pre-remediation Characterization Data

T-1 (References 1, 2, 3, 6)

Although depleted uranium metal (U-238) was the primary contaminant of concern in T-1, VOCs (primarily chlorinated solvents), SVOCs (machining oils), PCBs, and cyanide were known to be present in the T-1 wastes.

T-2, Ryan's Pit (References 1, 2, 8, 9)

The primary contaminants of concern in Ryan's Pit were VOCs, primarily chlorinated solvents such as tetrachloroethylene and perchloroethylene. These VOCs were detected in borehole samples drilled into the Ryan's Pit as well as in a groundwater plume that appeared to be emanating from the Ryan's Pit area. The VOC concentrations exceeded allowable regulatory limits which required a source remedial action. Any radioactive surface soil in the vicinity of Ryan's Pit was assumed to have been dispersed from the 903 Pad and not to originate from any disposal activities associated with Ryan's Pit. The area where Ryan's Pit is located is part of the 903 Lip Area (composed of both an inner lip and an outer lip).

T-3 (References 1, 2, 4, 9, 13)

Pre-remediation contaminants of concern identified in T-3 or the adjacent area included VOCs (primarily chlorinated solvents but also 2-butanone and acetone), SVOCs (such as naphthalene, phthalate esters, anthracene, phenanthrene), metals, and radionuclides. Pre-remediation characterization data indicated soils and groundwater in or near T-3 were primarily contaminated with chlorinated solvents. In fact some samples from boreholes in T-3 contained nonaqueous phase liquid (NAPL) which was primarily a mixture of "free product" chlorinated solvents (primarily carbon tetrachloride, tetrachloroethene, and trichloroethene). Initial radionuclide levels in soils were less than WRW ALs but greater than site background

T-4 (References 1, 2, 4, 9, 13)

Same as T-3.

T-5 (References 1, 2, 5, 9)

Pre-remediation contaminants of concern identified in T-5 or the adjacent area included VOCs, SVOCs, metals, and radionuclides. Data from Reference 9 (1996) indicated that concentrations of the contaminants of concern in soils were below regulatory levels according to the original 1996 RFCA ALs.

T-6 (References 1, 2, 5, 9)

Same as T-5 except no metals above background.

T-7 (References 1, 2, 9)

Same as T-5 except 2 of the 3 borehole sample locations in Trench 7 from characterization activities performed in Reference 5 exceeded 1996 RFCA ALs for Pu and Am. The highest Pu value from the sampling performed in Reference 5 was 2,450 pCi/g while the highest Am value was 410 pCi/g.

T-8 (References 1, 2, 5, 9)

Same as T-5.

T-9a/b (References 1, 2, 5, 9)

Same as T-5.

T-10 (References 1, 2, 5, 9)

Same as T-5.

T-11 (References 1, 2, 5, 9)

Same as T-5.

T-12 (References 2, 9, 21)

The primary contaminants of concern based on characterization results from Reference 9 in 1996 were radionuclides and metals. No VOCs or SVOCs were detected during the characterization.

T-13 (References 2, 9, 21)

Same as T-12 except VOCs and SVOCs were detected during characterization.

Remedial Actions Taken

T-1 (References 2, 6, and 7)

The site performed remediation of T-1 following the requirements of a CERCLA decision document known as a PAM (Proposed Action Memorandum), which was approved by the regulators before remediation commenced. The excavation phase of the source removal action specified in the PAM commenced on June 10, 1998, and was completed on August 20, 1998. Materials removed from the 230 foot T-1 during the source removal remediation included the following:

- 160 drums of depleted uranium;
- 10 drums of cemented cyanide;
- 1 cardboard carton containing depleted uranium; and,
- various amounts of soil and debris.

Soils from the excavation and other investigation-derived material soil which met the cleanup levels specified in the PAM document were returned to T-1.

T-2, Ryan's Pit (References 2, 8, 9, 10, 11)

The site performed remediation of Ryan's Pit using a CERCLA PAM decision document (similar to T-1's PAM) approved by the regulators for a source removal remediation. In addition to the source removal a treatment process to remove VOCs from the contaminated soil and debris was installed which utilized a low temperature thermal desorption process. The source removal process was started and completed in September 1995 while the final treatment was

completed in February 1996. Approximately 180 cubic yards of contaminated soil and debris was excavated and treated. After excavation and treatment, the soil was tested for VOCs and radionuclides. The results were below regulatory limits which allowed the site to put the soil back into the excavation.

One additional remedial action for Ryan's Pit took place in July 2005. The site's CERCLA decision document for groundwater, an IM/IRA (Interim Measure/Interim Remedial Action), required the site to drill boreholes into Ryan's Pit and insert a hydrogen-releasing compound (HRC) to degrade any VOCs which might be present in groundwater near Ryan's Pit. Ten insertion points were drilled and HRC[®] and HRC-X[™] were added.

T-3 (References 2, 4, 11, 12, 13)

Based on pre-remediation characterization data, a source removal for the remediation of T-3 was performed. VOCs were contaminating groundwater and a contaminated groundwater plume was emanating from T-3 and T-4 moving downgradient towards the South Walnut Creek drainage where it could contaminate surface water.

As with many other site remedial actions, the source removal and treatment of VOC-contaminated soil and debris was carried out using a regulator-approved PAM (Reference 13). The contaminated soil and debris was excavated from T-3 and treated using a low temperature thermal desorption process. After approval of the PAM by the regulators in March 1996, excavation/treatment of T-3 VOC-contaminated soils and debris was completed by July 1996. The excavation of T-3 was approximately 136 feet long, 18 – 24 feet wide, and 15 feet deep resulting in the removal of about 1,706 cubic yards of material including about 200 cubic yards of crushed drums. The drums were removed, treated for VOCs as necessary, and packaged for off-site disposal. However during packaging operations about 1 – 2 pounds of black material spilled from a drum onto soil in a small work area. The material was found to be depleted uranium (U-238) and the contaminated soil was removed for off-site disposal. Treated soil which met regulatory guidelines was returned to the excavation while debris such as the crushed drums was sent to the Nevada Test Site waste disposal area.

In addition to the source removal/treatment at T-3 (and also T-4), an extensive groundwater collection and treatment system was constructed to treat VOC-contaminated groundwater before it could reach South Walnut Creek. The East Trenches Plume (as it is called) is composed of VOC-contaminated groundwater from T-3 and T-4 as well as a suspected contribution from the 903 Pad and possibly other East Trenches. The East Trenches Plume Treatment System (ETPTS) consists of a 1,200 foot-long collection system and two reactive iron treatment cells for the degradation of the VOCs. The ETPTS was completed in 1999. Normal operation of the ETPTS consists of collection and treatment of VOC-contaminated groundwater before discharge into surface water. The two treatment cells require periodic change-out of the iron filings treatment media.

Prior to the physical closure of the site on October 13, 2005, the site's Groundwater IM/IRA (Reference 11) selected phytoremediation as an additional polishing treatment for VOC-contaminated groundwater in the vicinity of the ETPTS. Phytoremediation is a natural process where certain types of vegetation uptake contaminated groundwater in their normal life cycle,

thus removing the contaminated groundwater from an existing plume. The site planted a large number of saplings near the ETPTS in order to help treat the VOC-contaminated groundwater. Although phytoremediation is not normally a “stand-alone” treatment process, it can be coupled to other treatments to help minimize contamination of groundwater. So in the case of the ETPTS the reactive treatment cells and phytoremediation were coupled together for a more effective treatment process.

T-4 (References 2, 4, 11, 12, 13)

The remedial actions taken at T-4 were discussed in the T-3 section. However there is some additional information to pass on to the reader of this briefing. The source removal at T-4 consisted of an excavation about 148 feet long, 19 – 22 feet wide, and approximately 12 feet deep, except where the excavation proceeded to bedrock at 26 feet. The excavated soil was approximately 2,090 cubic yards of material. In addition 150 cubic yards of flattened drums and miscellaneous construction debris was excavated. The excavated soils, flattened drums, and other debris were treated by the low temperature thermal desorption process. The excavation and treatment was completed in August 1996.

T-5 (References 2, 5)

Based on soil and groundwater results from Reference 5, no remedial actions were proposed by the site. After review of supporting characterization data the regulators approved NFAA status for T-5 in 2003. However additional remedial actions were undertaken at T-5 as discussed in the next section of Post-Remediation Remaining Contamination.

T-6 (References 2, 5)

Same as T-5.

T-7 (References 2, 9, 15)

Based on the Pu and Am exceedances of their RFCA ALS (original 1996 RFCA ALs) as noted in Reference 9, the site originally proposed a source removal of T-7’s contents (estimated 800 cubic yards) in a draft ERRSOP notification in November 2002 (Reference 15). However during this same time period in late 2002 and early 2003 the RFCA parties were negotiating a new set of ALs for soils. The new 2003 RFCA Modifications allowed for the Pu and Am in T-7 due to the depth of the contamination (below 3 feet) and the subsurface risk screen analysis that was performed. The site proposed a NFAA status for T-7 and the regulators approved the NFAA status in July 2003. Therefore no remedial action for T-7 was required at this time.

T-8 (References 2, 5)

Same as T-5.

T-9a/b (References 2, 5)

Same as T-5.

T-10 (References 2, 5)

Same as T-5.

T-11 (References 2, 5)
Same as T-5.

T-12 (References 2, 21)
Additional sampling of T-12 and the adjacent area was performed in 2003. Two locations adjacent to the south side of T-12 exceeded WRW Pu ALs (88 & 133 pCi/g). These two locations were attributed to the 903 Lip Area and were remediated as part of that remedial action project. This remedial action included removing the asphalt section overlaying T-12.

T-13 (References 2, 21)
Additional sampling of T-13 and the adjacent area was performed in 2003. There were no exceedances of WRW ALs and therefore no remedial actions were taken.

Post-remediation Remaining Contamination

T-1 (References 2 and 7)
The source removal at T-1 resulted in no remaining contaminants of concern at levels which exceed the Wildlife Refuge Worker Action Levels (WRW ALs) specified in the Rocky Flats Cleanup Agreement Modifications of 2003. As a result of the successful source removal remediation at T-1 the regulators granted T-1 NFAA (No Further Accelerated Action) status in February 2002.

T-2, Ryan's Pit (References 2, 10, 11)
The source removal and VOC treatment remedial action at Ryan's Pit left only small amounts of remaining VOC contamination. There are no remaining contaminants of concern which exceed the RFCA WRW ALs for soils. However, there are still small quantities of VOCs in groundwater near Ryan's Pit and as previously mentioned, HRC has been injected into the groundwater to reduce the VOC concentrations. The effect of this HRC treatment will be tracked by monitoring wells in the Ryan's Pit vicinity.

T-3 (References 2, 4, 14)
The source removal and treatment of VOC-contaminated soils and debris in T-3 resulted in confirmation samples which were all below RFCA regulatory requirements of the PAM. However, about 250 cubic yards of soil from both T-3 and T-4 were segregated due to radionuclide content which potentially exceeded what was termed RFCA Tier II action levels (ALs) in 1996 (Reference 4). After discussions among the RFCA parties (CDPHE, DOE, EPA) it was determined that all treated soils could be returned to T-3 and T-4 but that the 250 cubic yards of soil from T-3 and T-4 which potentially exceeded Tier II radionuclide ALs would need to be segregated from the rest in case it needed to be removed in the future.

The 250 cubic yards of soil from T-3 and T-4 which potentially exceeded Tier II radionuclide ALs was segregated as follows:

- 60 feet of geotextile grid liner was placed as a marker at approximately 8 feet deep at the west end of T-4;
- the 250 cubic yards of soil was placed on top of the liner;
- a second layer of geotextile grid was placed over the soil which was at a depth of about 4 feet; and,

- the marked-off soils were then covered with the other treated T-4 soils which met Tier II ALs, and top soil (the separated soil is also known as the T-4 Burrito)

The regulators approved a NFAA designation for T-3 in 2001. However in 2004 additional sampling of T-3 was required by the regulators. The site had discovered that the typical 2 foot soil covers of the East Trenches had not been adequately characterized. T-6 and T-8 soil covers were found to be contaminated with Pu that exceeded the WRW ALs of 50 picocuries per gram of soil. Based on this new data for T-6 and T-8 the regulators required the site to re-sample the soil covers for Pu and Am in T-3, T-4, T-5, T-10, and T-11. Pu and Am sampling results for the T-3 soil cover were all less than the WRW ALs so no further remedial actions were required. An updated NFAA for T-3 was issued in 2005.

T-4 (References 2, 4, 14)

See T-3 discussion. In addition, a NFAA was approved by the regulators for T-4 in 1999. In 2003 the regulators again reviewed the NFAA status for T-4 based on the new 2003 RFCA Action Level Modifications and NFAA status was granted. Then in 2004 T-4's soil cover was sampled, as mentioned in the T-3 discussion, and the soil cover was found to contain Pu which exceeded the WRW AL of 50 picocuries per gram of soil at one isolated "hot spot" location. The sample result was 74 pCi/g Pu. The isolated "hot spot" (4 feet wide by 4 feet long by 1.3 feet deep) was remediated in 2004. Subsequently a new NFAA status for T-4 was granted by the regulators in 2005 (Note: the T-4 "burrito" still remains buried).

T-5 (References 2, 5)

Data gaps in the characterization of the East Trenches soil covers (typically 2 feet thick) were discovered in 2004 which led to a subsequent round of sampling. Additional sampling of T-5 showed that there were no exceedances of WRW radionuclide ALS in the soil cover of T-5. The regulators approved a new NFAA status for T-5 in 2005 based on the additional soil cover characterization results.

T-6 (References 2, 5)

Additional characterization of the T-6 soil cover led to extensive remediation of the soil cover. Sample results in the soil cover were reported above the WRW Pu ALs (one sample as high as 237 pCi/g Pu). Additional sampling at greater depths showed no WRW AL exceedances. A remedial action soil excavation commenced covering approximately 115 feet long, 23 feet wide, and 3 feet deep. Confirmation sampling after the additional accelerated remedial action showed the T-6 soil cover to have no exceedances of the WRW Pu ALs. A new NFAA status for T-6 was granted by the regulators in 2005.

T-7 (References 2, 9, 16, 17, 18, 19)

As I was reviewing the documentation for T-7, especially the NFAA justification in Reference 16, I came up with a series of questions concerning the regulators approval of NFAA status for T-7. The questions are detailed in Reference 17 (Attachment 1). The RFCA parties' response can be seen in Reference 18 (Attachment 2). My response to the RFCA parties can be seen in Reference 20 (Attachment 3).

My primary concern was with the supporting documentation in the NFAA justification. I believed the pre-remediation characterization of T-7 as discussed in the NFAA justification was lacking. My position was based on a figure in the NFAA justification which showed the 3 boreholes drilled into T-7 for sampling to be grouped in very close proximity to each other (10-15 feet out of the total T-7 length of 115 feet). In the RFCA parties' response to me they noted that the NFAA figure depicting the borehole locations was not accurate and that indeed the boreholes were spread out over more of the length of T-7. Independently of their response I had discovered this as well after obtaining a copy of Reference 9 (Trenches and Mound Site Report) which showed the actual locations of the 3 boreholes into T-7.

As with other East Trenches, the original 2003 NFAA for T-7 had to be changed based on sampling of the soil covers in 2004 for radionuclides. Based on the additional sampling, two Pu hotspots (66 pCi/g & 109 pCi/g) were discovered in the T-7 soil cover. These hotspots were remediated to below the WRW Pu AL of 50 pCi/g in 2004. A new NFAA (Reference) for T-7 was approved by the regulators in 2005.

Note: The problem with the contaminated soil covers for some of the East Trenches underscores how important it is for the regulators to receive accurate data for review and approval. In the case of the soil covers, the original NFAA decisions were not accurate based on incomplete characterization of the trenches.

T-8 (References 2, 5)

T-8 exhibited similar problems as T-6 concerning Pu and Am contamination found in its soil cover which exceeded the WRW AL. As with T-6 additional sampling at greater depths showed no WRW AL exceedances. Additional T-8 remedial action consisted of an excavation of 122 feet long, 20 feet wide, and 3 feet deep. After confirmation sampling indicated Pu and Am were below WRW ALs, the regulators approved a new NFAA for T-8 in 2005.

T-9a/b (References 2, 5)

Same as T-5 except additional sampling at depth beneath the soil cover did not reveal any WRW AL exceedances.

T-10 (References 2, 5)

Same as T-5.

T-11 (References 2, 5)

Same as T-5.

T-12 (Reference 2)

There are no RFCA WRW AL exceedances remaining at T-12 and the regulators approved a NFAA in 2003.

T-13 (Reference 2)

Same as T-12.

Potential Exposure Pathways to Remaining Contamination

Portions of the East Trenches area (especially the T-3 and T-4) remain a threat to surface water in the South Walnut Creek drainage due to a VOC-contaminated groundwater plume arising from the East Trenches with possible VOC contribution from the 903 Pad. The East Trenches Plume Treatment System was constructed to minimize this threat to surface water. Fortunately the majority of the East Trenches are located on flat terrain with very little groundwater movement through the trench contents. Ryan's Pit (T-2) has a contribution to a VOC-contaminated groundwater plume in the Woman Creek drainage. None of the East Trenches are in areas that are prone to landslides which could lead to erosion and exposure of remaining contamination.

Long-term Stewardship Controls

In order to protect surface water in the South Walnut Creek drainage from the East Trenches plume it will be necessary for the site to adopt long-term stewardship controls for both the East Trenches themselves and the East Trenches passive groundwater treatment system and monitoring network. These controls include the following:

- continued post-closure groundwater monitoring of the East Trenches area;
- prohibitions against drilling, building, and groundwater uses in the East Trenches area;
- treatment system maintenance and inspection activities specified in the site's Long-Term Surveillance & Maintenance Plan;
- access controls to help minimize vandalism damage to the treatment system;
- continued groundwater and surface water monitoring to determine effectiveness of the treatment system; and,
- institutional controls spelled out in the post-closure regulatory agreement restricting activities surrounding the treatment system and monitoring network.

Notes

1. Some of the cited references have pending CERCLA AR#s. When these AR#s are located this document will be revised.

Document references

1. 1992 Historical Release Report (document path, CERCLA AR# SW-A-000378)
2. FY2005 Final Historical Release Report, Volumes I and II (document path, CERCLA AR# pending)
3. A Historical Summation of Environmental Incidents Affecting Soils at or Near the USAEC Rocky Flats Plant, J.B Owen and L.M. Steward, 1974 (heavily referenced historical document quoted in the Historical Release Report, not available on any database, hard copy available at Front Range Library)
4. Completion Report for the Source Removal at Trenches T-3 and T-4 (IHSS's 110 and 111.1), September 1996 (document path, CERCLA AR# BZ-A-00199)
5. Close-out Report for IHSS Group 900-12, East Trenches, February 2005 (document path, CERCLA AR# pending)
6. Final Proposed Action Memorandum for the Source Removal at Trench 1, IHSS 108, March 1998 (document path, CERCLA AR# pending)
7. Closeout Report for the Source Removal at the Trench 1 Site, IHSS 108, June 1999 (document path, CERCLA AR# pending)

8. Final Proposed Action Memorandum for the Remediation of Individual Hazardous Substance Site 109, Ryan's Pit, August 1995 (document path, CERCLA AR# pending)
9. Trench and Mound Site Characterization Report, September 1996, (document path, AR# pending)
10. Closeout Report for the Remediation of Individual Hazardous Substance Site 109, Ryan's Pit, July 1997 (document path, AR CERCLA# pending)
11. IM/IRA for Groundwater, 2005 (document path, AR CERCLA# pending)
12. Final East Trenches Plume Project Closeout Report, February 1999 (document path, CERCLA AR# pending)
13. Proposed Action Memorandum for the Source Removal at Trenches T-3 and T-4, IHSSs 110 and 111.1, March 1996 (document path, CERCLA AR# pending)
14. Addendum, No Further Accelerated Action Justification for Trenches T-3 and T-4, February 2005 (document path, CERCLA AR# pending)
15. Draft Environmental Restoration RFCA Standard Operating Protocol for Routine Soil Remediation FY03 Notification #03-01, IHSS 111.4, Trench T-7, November 2002 (document path, CERCLA AR# pending)
16. Annual Update for the Historical Release Report, September 2003 (document path, CERCLA AR# pending)
17. Analysis of Trench T-7 Assignment, May 25, 2005, RFCLOG Memorandum to RFCA Parties
18. RFCA Parties Response to RFCLOG Questions on Trench T-7, June 30, 2005 memo via e-mail transmission
19. Addendum No Further Accelerated Action Justification for Trench T-7, February 2005 (CERCLA AR# pending)
20. July 1, 2005 email of RFCLOG staff response to RFCA parties memorandum on T-7 issues.
21. Buffer Zone Sampling and Analysis Plan Fiscal Year 2002, Addendum #BZ-02-01, November 2002 (document path, CERCLA AR# pending)

Attachment 1. Analysis of Trench T-7 Assignment, May 25, 2005, RFCLOG Memorandum to RFCA Parties

Rocky Flats Coalition of Local Governments

Boulder County City and County of Broomfield Jefferson County
City of Arvada City of Boulder City of Westminster Town of Superior

8461 Turnpike Drive, Suite 205
Westminster, CO 80031

(303) 412-1200
(303) 412-1211 (f)
www.rfclog.org

MEMORANDUM

TO: Mark Aguilar
Steve Gunderson
John Rampe
FROM: Rik Getty
SUBJECT: Analysis of Trench T-7 NFAA assignment
DATE: June 2, 2005

Introduction

I am requesting help from the RFCA Project Coordinators and their staff in understanding the assignment of NFAA status to Trench T-7 by the EPA in a June 12, 2003 memo to DOE (Reference 1). As you know I have been tasked by the Coalition Board with performing a review of the remaining subsurface contamination at IHSS/PAC/UBC locations and long term stewardship controls which may be required at these locations. Instead of looking at all locations, I am focusing on 20 or 30 areas in which the Coalition has historically been interested. For example, I have reviewed IHSS Group SW-1 (ash pits and incinerator) and the Solar Evaporation Ponds. In those reviews the data on remaining subsurface contamination was straightforward and the close-out reports were very thorough. I was going to do a review of all the East Trenches in one summary but, I have run into some difficulty with T-7.

Issue

My difficulty is I do not understand how the NFAA status could be assigned for T-7 based on the characterization data available to me at this time. I am hopeful that I am missing additional characterization data that would more easily justify the NFAA decision. Before I delve into my concerns on the NFAA decision, I need to provide some historical perspective.

Background

As you may recall, the Site originally planned on removing the buried waste in T-7 as part of an accelerated action (Reference 2). The Site estimated that T-7 contained about 800 cubic yards of waste which required removal. During this same time period, the RFCA Modifications for a risk-based approach were being developed by the RFCA parties. The RFCA parties asked the Coalition for its opinion on the proposed new modifications. The Coalition responded to the

RFCA parties in a letter dated September 9, 2002 (Reference 3). The Coalition approved of the new approach with some qualifications. In particular the Coalition wanted the ash pits, T-3, T-4, and T-7 completely remediated.

Over the next few months the RFCA parties adopted the new RFCA Modifications. Subsequent application of the new RFCA modifications resulted in the assignment of NFAA status to T-7 by the EPA in 2003. At that point in time, the Coalition did not challenge the basis for the NFAA assignment.

Document/Data Review

In the 2003 Annual Update for the Historical Release Report (Reference 4), a request was made by the Site to the regulatory agencies for a NFAA assignment for T-7. The regulatory agencies subsequently approved the NFAA status. The characterization data in Reference 4 is based on three boreholes that were drilled into T-7 and sampled sometime in the 1990's. These boreholes (11895, 11995, and 12095) were clustered together in a 15 to 20 feet area towards the eastern part of T-7. Remember that the dimensions of T-7 are about 115 feet long, 14 feet wide, and 12 feet deep; 10 feet of waste **with a 2 foot soil cover**. The surface area of T-7 is about 150 square meters. There were also six boreholes that were drilled surrounding the trench but outside its footprint.

Reference 4 summarizes the following Pu concentrations for the three boreholes.

<u>Borehole</u>	<u>depth interval (ft)</u>	<u>Pu (pCi/g)</u>
11895	3-5	1,486
11895	8-10	0.01875
11995	3-8	0.03826
11995	8-10	0.01997
12095	3-5	2,450
12095	8-10	0.4501

None of the three boreholes exceed the RFCA soil removal requirements of 3,000 pCi/g in the 3 foot to 6 foot interval. The results also point out the inherent heterogeneous nature of waste disposal sites. The Pu concentrations vary greatly between boreholes and also between different depths of waste.

After the NFAA was assigned by the regulators in June 2003, a review by the Site of additional T-7 characterization data revealed uncertainty regarding levels of contamination within the two foot soil cover. The discovery of the potential soil cover contamination, after the original NFAA designation, is described in Reference 5. Two Pu hotspots above 50 pCi/g in the soil cover were discovered and remediated in November 2004 (1.5 years after the initial NFAA designation).

In addition to T-7, trenches T-6 and T-8 required even more remedial action of the soil cover (Reference 6). Accelerated action sampling revealed surface hotspots in the soil covers of both T-6 and T-8. As soil cover remediation commenced at the hotspot locations, the Site had to "chase" contamination over almost the entire surface of the soil covers for both trenches.

Questions/Comments

I have the following series of questions and comments.

1. When did the Site learn that trench soil covers were potentially contaminated?
2. If this characterization data was available before the NFAA designation, why did the regulatory agencies not receive it?
3. If the data was collected after the NFAA, what triggered its collection?
4. How confident are the RFCA Parties that surface soil from 0 to 3 feet below grade in T-7 has been adequately characterized and that any Pu present is below 50 pCi/g? I ask this question because only 3 accelerated action surface samples were taken along the entire length of T-7. Two of the three locations exceeded RFCA WRW ALs for Pu. Remedial actions were performed at the two locations until ALs were met. However, there is still a large area of T-7's soil cover that may not have been characterized. T-7 sits between T-6 and T-8 and both of them required extensive soil cover remediation.
5. If the only data used to justify the request for NFAA designation of T-7 is limited to Reference 4, then I do not understand how the NFAA designation was made. According to Reference 4, T-7 is 115 feet long. The three boreholes were clustered within close distance to each other (15 to 20 foot area). Is there additional characterization data for the remaining 90 to 100 foot length of T-7? The regulatory agencies approved the NFAA designation without knowing the trench soil covers exceeded Pu ALs. A more detailed characterization of T-7 would have revealed this contamination.
6. If you compare T-7 characterization data in Reference 4 to other Site locations it appears to be less detailed. For example, the Present Landfill Trenches (A, B, and C) had a total of 26 boreholes drilled into the 3 trenches for characterization sampling. The boreholes also went 5 feet below the bottom of each trench. If additional characterization data does not exist for T-7, then perhaps T-7 has not been adequately characterized by the Site's own standards for characterization of known Pu-contaminated locations (statistical and biased sampling approach).
7. Finally I have a question concerning a statement made in Reference 4, beginning at the bottom of page 22 as follows:
"Plutonium is present in the buried waste at a maximum concentration of 2.45 nCi/g, which is below the 3 nCi/g limit that triggers further evaluation and potential soil removal."
What is the Site's measure of confidence that this statement is correct? Is it likely that the maximum concentration of Pu in T-7 is 2.45 nCi/g?

I would appreciate your help in clearing up the questions I have raised concerning T-7 and the NFAA designation. Your help in this effort will assist me in providing the Board with up-to-date, accurate information. In the meantime I will be reviewing the rest of the East Trenches for remaining subsurface contamination as well as other IHSS/PAC/UBC locations of interest to the Coalition.

References

1. EPA letter from Tim Rehder to Rick Disalvo of DOE, June 12, 2003

2. Draft ERRSOP for Routine Soil Remediation FY03 Notification #03-01, IHSS 111.4, Trench T-7, November 2002
3. Coalition End-State Position Letter to RFCA Principals, September 9, 2002 (document path, RFCLOG website, www.rfclog.org, Board Policies)
4. 2003 Annual Update for the Historical Release Report
5. Addendum-No Further Accelerated Action Justification for Trench T-7, February 2005
- 6.. Closeout Report For IHSS Group 900-12 East Trenches....., February 2005.

Attachment 2. RFCA Parties Response to RFCLOG Questions on Trench T-7, June 30, 2005 memo via e-mail transmission



Colorado Department
of Public Health
and Environment



VIA E-MAIL TRANSMISSION
June 30, 2005

TO: Rik Getty
Rocky Flats Coalition of Local Governments

FROM: Steve Gunderson
Colorado Department Public Health and Environment

Mark Aguilar
U.S. Environmental Protection Agency, Region VIII

John Rampe
U.S. Department of Energy, Rocky Flats Project Office

RE: Responses to Questions on Trench T-7

The Colorado Department of Public Health and Environment, the U.S. Environmental Protection Agency, and the U.S. Department of Energy (DOE) have reviewed the questions that you forwarded to us, dated June 2, 2005, regarding environmental conditions at Trench T-7 at the Rocky Flats Environmental Technology Site. Staff from our agencies have jointly prepared responses to your questions, as follows:

1. When did the Site learn that trench soil covers were potentially contaminated?

The Site did not suspect that the trench cover soils were potentially contaminated. However, other trenches in the East Trenches area required sampling to determine if No Further Accelerated Action (NFAA) status was warranted. After characterization at these trenches indicated some contamination in the top three feet, DOE agreed to collect samples from the Trench T-7 cover soils. Samples were collected in the fall of 2004 and indicated plutonium-239/240 activities of 65.72 and 198.59 pCi/g at two locations.

2. If this characterization data was available before the NFAA designation, why did the regulatory agencies not receive it?

The data were not available at that time. The data were collected in the fall of 2004.

3. If the data was collected after the NFAA, what triggered its collection?

The Buffer Zone Sampling and Analysis Plan Addendum of November 2003, although exclusive of T-7, was intended to more fully evaluate the contaminant levels in trench contents. The effort included cover soil sampling, resulting in evidence of radionuclide contamination above Wildlife Refuge Worker Action Levels (WRW ALs). The resulting data prompted the agencies to evaluate the sufficiency of data for the cover soils of each of the remaining East Trenches. Three biased surface soil-sampling points, with consideration of statistical sample frequency, were added through a contact record dated October 21, 2004. The three biased sampling locations provided more sampling coverage than the statistical grid. (Subsurface soils were not sampled reflecting the June 12, 2003 approval of the T-7 NFAA.)

4. How confident are the RFCA Parties that surface soil from 0 to 3 feet below grade in T-7 has been adequately characterized and that any Pu present is below 50 pCi/g? I ask this question because only 3 accelerated action surface samples were taken along the entire length of T-7. Two of the three locations exceeded RFCA WRW ALs for Pu. Remedial actions were performed at the two locations until ALs were met. However, there is still a large area of T-7's soil cover that may not have been characterized. T-7 sits between T-6 and T-8 and both of them required extensive soil cover remediation.

The Rocky Flats Cleanup Agreement (RFCA) Parties are confident that cover soils from 0 to 3 feet below grade have now been adequately characterized. The spacing of the three, biased surface soil samples in T-7 are approximately 45 feet, and based on actual soil samples, rather than high purity germanium detector scanning results. This spacing is more conservative than the spacing based on the statistical grid that indicated only one sample was necessary for 90 percent confidence. Because of the nature of the placement of the samples in a random oriented grid, better sampling density was achieved with biased sampling.

5. If the only data used to justify the request for NFAA designation of T-7 is limited to Reference 4, then I do not understand how the NFAA designation was made. According to Reference 4, T-7 is 115 feet long. The three boreholes were clustered within close distance to each other (15 to 20 foot area). Is there additional characterization data for the remaining 90 to 100 foot length of T-7? The regulatory agencies approved the NFAA designation without knowing the trench soil covers exceeded Pu ALs. A more detailed characterization of T-7 would have revealed this contamination.

No additional sampling data are available. However, Figure 2.1 of reference 4 is based on the Individual Hazardous Substance Site (IHSS) 111.4 coverage that was available at the time. Since that time, the trenches and boundaries of the associated IHSSs were changed to more accurately reflect field conditions. The attached map indicates the current IHSS boundaries and placement of samples. Three samples in the western portion of Figure 2.1 are now shown in IHSS 111.6b (Trench 9b). The new coverages are shown on Plate 1 of the

2003 Annual Update to the HRR. The actual locations of the three boreholes are better distributed than Figure 2.1 indicates and represent the center and western portions of T-7 effectively. Additionally, the east edge of T-7 is within 57 feet of the center borehole locations and, therefore, consistent with Industrial Area/Buffer Zone Sampling and Analysis Plan statistical protocols. The three samples were initially collected as shown in the attached figure and were followed by three surface soil samples. Confirmation sampling locations are also shown on the figure.

In 2003, as part of the modifications to RFCAs incorporating the revised soil action levels, the decision was made, with stakeholder input, to place emphasis on characterization and remediation of the original process waste lines (OPWLs) rather than on removing waste in Trench T-7. The plutonium associated with the buried T-7 wastes was considered to be very insoluble and relatively immobile and there was limited data at the time concerning contamination associated with OPWLs. As a result, further characterization of buried T-7 trench wastes was not considered.

- 6. If you compare T-7 characterization data in Reference 4 to other Site locations it appears to be less detailed. For example, the Present Landfill Trenches (A, B, and C) had a total of 26 boreholes drilled into the 3 trenches for characterization sampling. The boreholes also went 5 feet below the bottom of each trench. If additional characterization data does not exist for T-7, then perhaps T-7 has not been adequately characterized by the Site's own standards for characterization of known Pu-contaminated locations (statistical and biased sampling approach).**

The original samples collected at T-7 and IHSS 111.4 were collected before the IA and BZSAP statistical and biased approaches were approved. The placement of the three original boreholes within the trench was based on aerial photographs, geophysical surveys, and soil gas surveys.

- 7. Finally I have a question concerning a statement made in Reference 4, beginning at the bottom of page 22 as follows:
"Plutonium is present in the buried waste at a maximum concentration of 2.45 nCi/g, which is below the 3 nCi/g limit that triggers further evaluation and potential soil removal." What is the Site's measure of confidence that this statement is correct? Is it likely that the maximum concentration of Pu in T-7 is 2.45 nCi/g?**

In the response to Question 5, the IABZSAP statistical protocols indicate that the trench contents have been adequately characterized. Beyond that, it would be necessary to excavate and radiologically screen the contents on a continuous basis to ensure that the maximum concentration of Pu in the buried wastes of T-7 is 2.45 nanoCuries per gram (nCi/g). However, there are enough borehole data to indicate that most of the waste has a Pu concentration well under 2.45 nCi/g.

If you have any questions regarding our responses, or would like more information, please do not hesitate to contact us. Thank you.

Attachment 3. July 1, 2005 email of RFCLOG staff response to RFCA parties memorandum on T-7 issue

John,

I've been trying to call you this morning concerning the missing figure but the Mountain View inbound phone system must be goofed up. Thanks for sending the figure. The RFCA PCs and their staff responses have gone a long way towards answering my questions on the T-7 NFAA assignment. After I sent my T-7 NFAA memo to the RFCA PCs I was able to borrow the 1996 Draft East Trenches and Mound Site Characterization Report from RFPO and was able to see where the original T-7 boreholes were located. The actual borehole locations are not as closely clustered as they are in the NFAA figure. Based on the soil gas surveys, magnetic detector surveys, soil samples, and ground-penetrating radar results, T-7 is better characterized than the info presented in the NFAA, except for the 2 foot soil cover. Unfortunately when the original NFAA status for T-7 was granted it was not known that the soil cover exceeded Pu WRW ALs because adequate characterization of the soil cover did not exist. Although I didn't mention it in my memo, T-3 and T-4 were also granted NFAA at the same time as T-7 but didn't require as much soil cover remediation as T-6, T-7, and T-8. Hopefully the Site has adequately characterized the soil covers of the remaining East Trenches which have NFAA status. In order for the NFAA regulatory process to be effective, adequate characterization is paramount not just for the East Trenches but for the Site as a whole. My thanks to the RFCA PCs and their staff for a timely response to my T-7 NFAA memo.

Rik Getty