UMTRA GJVP COMMINGLED WASTE PROJECT INVESTIGATION: A CASE HISTORY

Robert D. Sanders, Kenneth E. Karp, and James E. Bennett
UNC Geotech
P.O. Box 14000
Grand Junction, Colorado

ABSTRACT

During the course of performing work under the Uranium Mill Tailings Remedial Action program, UNC Geotech discovered that, because of past business-related operations, certain properties included in the Grand Junction Vicinity Property Project had the potential for containing commingled waste. As a result, UNC Geotech initiated a new project, the Commingled Waste Investigation Project, to further characterize those properties determined to have a possibility of containing commingled waste.

INTRODUCTION

In 1978, the U.S. Congress enacted Public Law 95-604, the Uranium Mill Tailings Radiation Control Act (1). The act authorized the U.S. Department of Energy (DOE) to perform remedial action as required under the Uranium Mill Tailings Remedial Action (UMTRA) program. Under this program, uranium mill tailings taken from the Climax millsite in Grand Junction, Colorado, are to be removed from vicinity properties in the Grand Junction area. These properties contain uranium mill tailings, which were used mainly as construction materials.

UNC Geotech (UNC), prime contractor for the DOE Grand Junction, Colorado, Projects Office, is responsible for conducting the Grand Junction Vicinity Properties (GJVP) project of the DOE Uranium Mill Tailings Remedial Action (UMTRA) program. The UNC Commingled Waste Investigation Project (CWIP) was established to determine if commingled waste exists at any GJVP properties prior to the start of remedial action. Commingled waste is defined as a mixture or combination of uranium mill tailings and hazardous waste (2). The hazardous waste is present on the properties due to past business practices, and its deposition is unrelated to the presence of the uranium mill tailings.

BACKGROUND

Since the beginning of the UMTRA GJVP project, UNC has performed remedial action for the removal of uranium mill tailings on over 3,000 individual properties. These include properties ranging in size from private residences to complex commercial facilities. As UNC began to perform remedial action on complex commercial facilities (such as junk yards, drum refurbishing facilities, metal plating operations, etc.), it became evident that there was potential for the discovery of commingled waste. An options study was performed in early 1989 on the most feasible method for handling commingled waste. The results of the options study showed that there is a possibility of discovering over 160,000 tons (145,150 metric tons) of commingled waste in the Grand Junction area (3).

COMMINGLED WASTE INVESTIGATION PROJECT

The CWIP project was developed to verify if the 160,000-ton estimate in the options study was accurate (3). The project was implemented to determine the presence or absence of commingled waste on 74 individual vicinity properties. The specific tasks associated with the CWIP were developed from the flow chart shown in Fig. 1; the process is outlined below.

Hazardous Waste Sampling Vans

Two full-size vans were equipped with sampling and monitoring equipment needed to perform a hazardous-waste-site characterization as per the Environmental Protection Agency (EPA) guidelines (4). These vans give UNC the capability to fully characterize a vicinity property or to respond to any emergencies, such as the discovery of discolored soils during the remedial action phase of the GJVP.

CWIP Work Flow Process

Detailed work plans containing site history, sampling guidance, chemical analysis, data validation, final reporting, quality assurance, and health and safety are prepared for each of the suspect properties. These plans are developed using current EPA Resource Conservation and Recovery Act (RCRA) or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidelines (4).

The CWIP sampling team, consisting of three members, is given a readiness review by the CWIP project manager prior to sampling as per the work plan.

To determine the presence of volatile organic compounds or to locate buried landfills, selected sites are first screened using soil-gas and surface-flux measurements (5). Sample locations are then selected for more detailed follow-up soil sampling based on initial screening results, personal interviews, aerial photographs, and historical data. If the contamination is expected to be at a depth greater than 4 feet (1.22 meters), a drill rig equipped with a hollow-stem auger and spilt-spoon sampler is used to obtain the soil samples for confirming the presence of commingled waste.

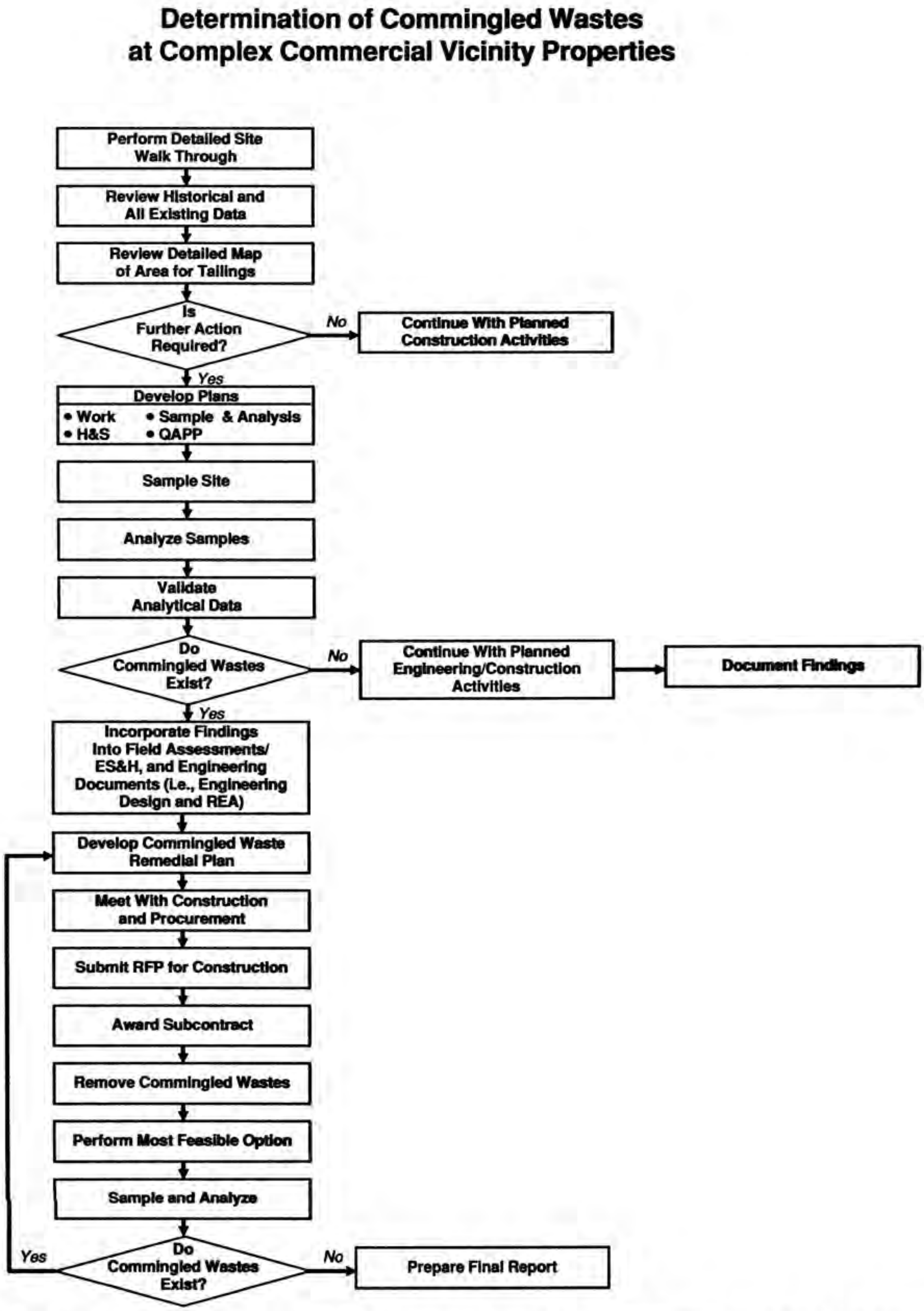

Fig. 1. CWIP Work Flow Process: Determination of Commercial Wastes at Suspect Grand Junction Vicinity Properties.

Sampling at depths less than 4 feet is accomplished using stainless-steel hand augers, scoops, and shovels. When soil sampling is completed, the samples are sent to an analytical laboratory for analysis. These samples are typically analyzed for the compounds found on the CERCLA hazardous substance list (6). The results of the chemical analysis are validated using EPA guidelines (7) upon receipt to assure that the data is valid.

Finally, a report is prepared showing any areas of the vicinity property where commingled waste exists. This information is factored into the Remedial Engineering Assessment, and special precautions are taken to assure that the commingled waste is remediated appropriately.

To date, commingled waste ranging from heavy metals--such as arsenic and lead--to volatile organic compounds (VOCs)--such as carbon tetrachloride--has been discovered on seven vicinity properties. These sites currently are not scheduled for remedial action; a policy decision on what to do with the commingled wastes has not yet been made.

The remainder of this paper details a specific use of the CWIP work process as it applies to one of the vicinity properties that has been investigated.

CASE HISTORY

Property Description

The vicinity property is located in southwestern Grand Junction, Colorado, on the northern bank of the Colorado River as shown on the map in Figure 2. The property is included in the UMTRA Grand Junction Vicinity Properties Project and has an approximate size of 46 acres.

Soils in the area of the site were classified by Knobel and others (8) as Billings silty clay, Billings silty-clay loam, Green River very fine sandy loam, and riverwash. The soils are typical of those found in the Grand Valley adjacent to the Colorado River. The alluvial material contains groundwater as an unconfined aquifer and overlies Mancos Shale. Nearby islands in the Colorado River are mapped as riverwash.

An automobile wrecking company involved with the salvaging and selling of junked automotive parts and materials occupies the site. The Denver and Rio Grande Railroad borders on the east, and farther to the northwest there is an open area recently used for dumping construction material. An abandoned gravelpit located in the southern portion of the property was used in the 1960's as a landfill site where uranium mill tailings were interbedded with trash.

Site Investigation

The objective of the site characterization at this vicinity property is to (1) locate the approximate boundaries of the buried landfill suspected of containing commingled waste, (2) screen the landfill for evidence of commingled waste, and (3) confirm the extent and nature of contamination using sampling.

Soil-Gas and Surface-Flux Measurements

Soil-gas sampling techniques were pioneered in the 1920's for petroleum exploration. Only in the last 10 years have these methods received much attention for use in hazardous-waste-site investigations. The premise underlying the use of soil-gas analyses to characterize contamination at a hazardous waste site is as follows: when organic compounds with high vapor pressures and low solubilities contaminate groundwater or soil, they volatilize and migrate to the ground surface by molecular diffusion. The areal extent of the landfill can be approximately determined by measuring the concentration of the VOCs in the soil. Soil-gas techniques were specifically used on this vicinity property to optimize drilling locations and to reduce the number of soil samples submitted for VOC analysis.

Surface contamination was screened by monitoring the VOC-concentration build- up inside a 3.1-liter accumulator can (5), which is shown in Fig. 3. Measurements were performed by carefully pressing the open end of the can into the soil so as not to disturb the near surface soil-gas concentrations any more than necessary. Soil was then packed around the can's edge to a height of 2 cm to help seal in the organic vapors, which begin to increase at the time the accumulator comes in contact with contaminated soil. A stopwatch was used to measure the elapsed time from when the canister came in contact with the soil to when the VOC concentration was measured. Concentrations were measured using a total organic vapor analyzer. The rate of change in concentration is related to the VOC vapor flux at the soil surface.

Over 250 surface-flux measurements were performed on a 50-foot-grid spacing across the site. Areas having abnormally high flux values were found to coincide mostly with the boundary of the landfill, as determined later by the borehole sampling results (Fig. 2). The boundary between the compacted landfill soil and the unconsolidated river material may provide a conduit for migration of organic vapor.

Organic contamination in the subsurface was screened using standard soil-gas sampling techniques. Soil-gas samples were obtained by a mechanical system mounted in the rear of a cargo van (Fig. 4) and designed specifically to insert a small diameter probe through unconsolidated material. The probe consists of a hollow stainless steel pipe. One end of the pipe is fitted with an expendable drive point to ensure that the probe does not become plugged with soil during installation, and the other end is attached to a hydraulic ram. The pipe is pressed into the soil to the desired depth and

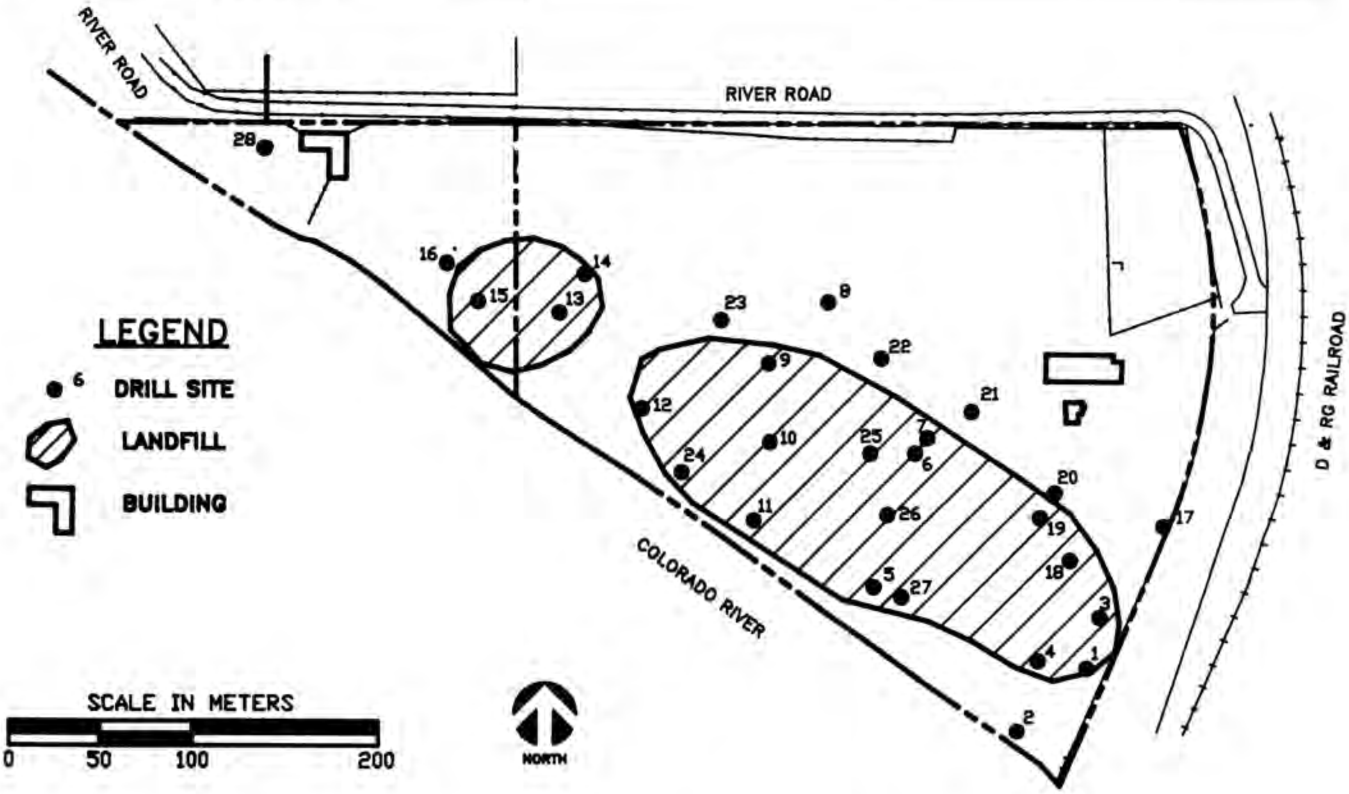

Fig. 2. Vicinity Property Sample Location Map, Southwestern Grand Junction, Colorado.

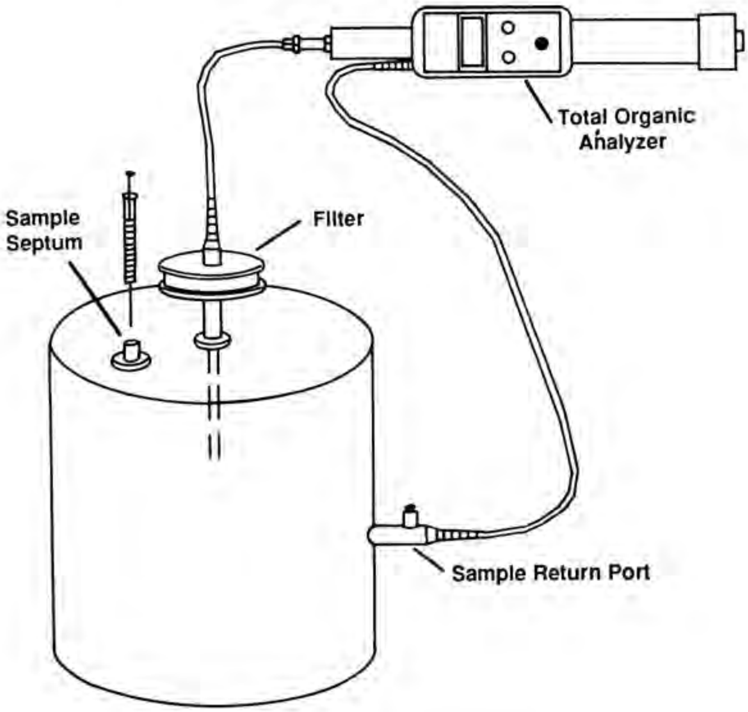

Fig. 3. 3.1-Liter Accumulator Device.

Fig. 4. Hydraulically-Powered Soil-Gas Sampling System Mounted in the Rear of a Cargo Van.

then pulled up 3 inches (7.6 cm) to allow the drive point to fall off and create a small cavity from which to draw a sample.

Analysis of the soil-gas was performed by attaching a sample line from the probe to an organic vapor analyzer. Results were normalized to a known isobutylene calibration standard and reported as isobutylene equivalents. In general, those areas having relatively high soil-gas concentrations were found to correspond with the center of the landfill (Fig. 2). The compacted soil over the landfill had a relatively low diffusivity, which may have reduced the surface-flux and increased the soil-gas concentrations.

Confirmation Sampling

Commingled-waste sample locations for the vicinity property were chosen at areas where high VOC anomalies had been mapped during the soil-gas and surface-flux surveys. Twenty-eight sample locations were drilled as shown in Fig. 2. Each location was sampled using a Mobile B-80 auger drill and split-spoon sampler to a depth of at least 2.5 meters. Ten 2-foot (0.61- meter) sections of core were taken from each sample location. After a lithological log was prepared, the sample was composited into the required amount of material for chemical analysis. EPA protocols for sample preservation and chain of custody were used (4); and each composite sample was placed into a cooler and transported to the laboratory for EP-toxicity metals analysis, volatile organic chemical analysis, and semi-volatile organic chemical analysis. Each borehole was then logged using a PRS-1 Rascal gamma- ray detector to determine levels of radioactivity and the extent of uranium mill tailings on the property.

RESULTS

The location and extent of the suspected landfill were determined during the sampling process. The landfill material from the split-spoon samplers seemed to indicate that it was mostly composed of household trash rather than the expected industrial waste; however, soil-gas results indicated that there may be some industrial waste also.

The chemical analysis of the samples show that pockets of uranium mill tailings and elevated levels of hazardous waste exist on the property; Table I shows a summary of this data. Chemical contamination found during the investigation of the junkyard is consistent with what was expected; that is, lead from old car batteries and bis(2-ethylhexyl) phthalate (which is the material responsible for the interior smell of new cars and which is also used as a plasticizer).

Further investigation to delineate the lateral and vertical extent of each location where elevated levels of hazardous waste mixed with uranium mill tailings were discovered

TABLE I
Summary of Analytical Results for the Samples Associated with the Vicinity Property

Sample Location	Sample Depth (m)	Chemical	Concentration (ug/kg)
4	0 - 4.25	DDT	170
7	0 - 0.75	Lead	48,000
9	0 - 4.25	Bis(2-ethylhexyl) phthalate	56,000
11	0 - 3.65	Bis(2-ethylhexyl) phthalate	52,000
14	0 - 3.65	Bis(2-ethylhexyl) phthalate	56,000
19	0 - 3.05	Acetone	1,200
27	0.6 - 3.05	Bis(2-Ethylhexyl) phthalate	16,000

has not been completed. Upon completion of the final characterization, a remedial action plan for removal of any commingled waste will be developed and implemented.

CONCLUSION

The CWIP work flow process has been shown to be an effective method of characterizing the extent and location of potential commingled waste on this vicinity property and 15 other UMTRA properties to date. In addition, the development of the commingled waste sampling teams has given UNC the capability and expertise to perform extensive waste-characterization studies at locations outside of the Grand Junction vicinity.

ACKNOWLEDGMENTS

This work was supported by the U.S. Department of Energy, Assistant Secretary for Nuclear Energy under DOE Contract No. DE-AC07-86ID12584.

REFERENCES

1. U.S. Code of Federal Regulations, Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," (July 1988).
2. U.S. Code of Federal Regulations, Part 261, "Identification and Listing of Hazardous Waste," (July 1988).
3. R.D. SANDERS and J.A. BENNETT, "An Option Study for the Management of Commingled Waste from the UMTRA Program," WM-M-89-1, UNC Geotech (March 1989).
4. U.S. Environmental Protection Agency, "Draft RCRA Preliminary Assessment and Site Investigation Guide."
5. K.E. KARP, "FY-1988 Annual Report on Volatile Organic Compounds Vapor Surface-Flux Measurements," WM-M-88-2, UNC Geotech (September 1988).
6. U.S. Code of Federal Regulations, Part 302, "Designation, Reportable Quantities, and Notification," (July 1988).
7. U.S. Environmental Protection Agency, "Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses," (1988).
8. E.W. KNOBLE, R.K. DANSDILL, and M.L. RICHARDSON, "Soil Survey of the Grand Junction Area, Colorado," U.S. Department of Agriculture Series, 1940, No. 19 (November 1955).