UMTRA PROJECT WATER SAMPLING AND ANALYSIS PLAN

**CANONSBURG AND BURRELL,
PENNSYLVANIA**

March 1994

LIBRARY
MAY 12 1994
OSTI

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

INTENDED FOR PUBLIC RELEASE

This report has been reproduced from the best available copy. Available in paper copy and microfiche.

Number of pages in this report: 40

DOE and DOE contractors can obtain copies of this report from:

**Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831
(615) 576-8401**

This report is publicly available from:

**National Technical Information Service
Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650**

UMTRA PROJECT WATER SAMPLING AND ANALYSIS PLAN
CANONSBURG AND BURRELL, PENNSYLVANIA

March 1994

Prepared for
U.S. Department of Energy
UMTRA Project Office
Albuquerque, New Mexico

Prepared by
Jacobs Engineering Group Inc.
Albuquerque, New Mexico

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

EXECUTIVE SUMMARY

Surface remedial action was completed at the Canonsburg and Burrell UMTRA Project sites in southwestern Pennsylvania in 1985 and 1987, respectively. Results of 1993 water sampling indicate ground water flow conditions and ground water quality at both sites have remained relatively consistent with time. Uranium concentrations in ground water continue to exceed the maximum concentration limit (MCL) at the Canonsburg site; no MCLs are exceeded in ground water at the Burrell site. Surface water quality shows no evidence of impact from the sites.

The following water sampling activities are planned for calendar year 1994:

- Sampling at both the Canonsburg (8 monitor wells) and Burrell (10 monitor wells) sites for annual postclosure compliance monitoring.
- Sampling eight new monitor wells installed in October 1993 at the Canonsburg site.
- Sampling surface water locations at the Canonsburg (Chartiers Creek) and Burrell (Conemaugh River) sites.

The monitor well locations provide a representative distribution of sampling points to characterize ground water quality and ground water flow conditions in the vicinity of the disposal cells. Annual water sampling normally is conducted in late summer or early fall. The list of analytes has been modified with time to reflect constituents that are related to uranium processing activities and the parameters needed for geochemical evaluation.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
EXECUTIVE SUMMARY	ES-1
1.0 INTRODUCTION	1-1
1.1 Purpose	1-1
1.2 Site location	1-1
1.3 Site history	1-1
1.4 Site status	1-5
1.5 Sampling plan	1-5
2.0 CANONSBURG PROCESSING/DISPOSAL SITE (CAN-01)	2-1
2.1 Site conceptual model	2-1
2.1.1 Physiographic setting	2-1
2.1.2 Geology	2-1
2.1.3 Hydrology	2-1
2.1.4 Water quality	2-7
2.2 Data collection objectives	2-10
2.2.1 Regulatory requirements	2-10
2.2.2 Compliance monitoring	2-10
2.3 Water sampling plan	2-10
2.3.1 Sampling locations	2-10
2.3.2 Constituent selection	2-11
2.3.3 Sampling frequency	2-11
2.3.4 Data interpretation	2-11
2.3.5 Anomalous data evaluation	2-12
3.0 BURRELL DISPOSAL SITE (CAN-03)	3-1
3.1 Site conceptual model	3-1
3.1.1 Physiographic setting	3-1
3.1.2 Geology	3-1
3.1.3 Hydrology	3-1
3.1.4 Water quality	3-1
3.2 Data collection objectives	3-7
3.2.1 Regulatory requirements	3-7
3.2.2 Compliance monitoring	3-7
3.3 Water sampling plan	3-9
3.3.1 Sampling locations	3-9
3.3.2 Constituent selection	3-9
3.3.3 Sampling frequency	3-9
3.3.4 Data interpretation	3-10
3.3.5 Anomalous data evaluation	3-10
4.0 LIST OF CONTRIBUTORS	4-1
5.0 REFERENCES	5-1

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1.1 Location of the Canonsburg and Burrell sites, Pennsylvania	1-2
1.2 Canonsburg processing/disposal site, Pennsylvania	1-3
1.3 Burrell disposal site, Pennsylvania	1-4
2.1 Location of monitor wells and surface water sampling points at the Canonsburg site, Pennsylvania	2-2
2.2 Hydrogeologic cross section at the Canonsburg site, Pennsylvania	2-4
2.3 Potentiometric surface map for the unconsolidated materials at the Canonsburg site, Pennsylvania	2-5
2.4 Potentiometric surface map for the shallow bedrock at the Canonsburg site, Pennsylvania	2-6
2.5 Uranium distribution in the shallow ground water at the Canonsburg site, Pennsylvania	2-9
3.1 Location of monitor wells and surface water sampling points at the Burrell site, Pennsylvania	3-2
3.2 Hydrogeologic cross section at the Burrell site, Pennsylvania	3-4
3.3 Potentiometric surface map for the unconsolidated materials at the Burrell site, Pennsylvania	3-5
3.4 Potentiometric surface map for the shallow bedrock at the Burrell site, Pennsylvania	3-6

LIST OF TABLES

<u>Table</u>	<u>Page</u>
2.1 Monitor well information for the Canonsburg site, Pennsylvania	2-3
2.2 Summary of background ground water quality at the Canonsburg site, Pennsylvania	2-8
3.1 Monitor well information for the Burrell site, Pennsylvania	3-3
3.2 Summary of background ground water quality at the Burrell site, Pennsylvania	3-8

LIST OF ACRONYMS AND ABBREVIATIONS

<u>Acronym</u>	<u>Definition</u>
cm ² /s	square centimeters per second
DOE	U.S. Department of Energy
DQO	data quality objectives
EPA	U.S. Environmental Protection Agency
ft	feet
km	kilometers
LTSP	long-term surveillance plan
m	meter
MCL	maximum concentration limit
mi	miles
MSL	mean sea level
QA	quality assurance
QAIP	quality assurance implementation plan
QC	quality control
RRM	residual radioactive material
SOP	standard operating procedure
UMTRA	Uranium Mill Tailings Remedial Action
WSAP	water sampling and analysis plan

1.0 INTRODUCTION

1.1 PURPOSE

This water sampling and analysis plan (WSAP) provides the regulatory and technical basis for ground water and surface water sampling at the Canonsburg (CAN-01) and Burrell (CAN-03) sites in southwestern Pennsylvania. It identifies and justifies the sampling locations, analytical parameters, and sampling frequencies. The ground water and surface water data are used for compliance monitoring, site characterization, and risk assessment.

Ground water and surface water monitoring activities are based on the U.S. Environmental Protection Agency (EPA) regulations in 40 CFR Part 192 (1993) and the proposed EPA standards of 1987 (52 FR 36000 [1987]), Uranium Mill Tailings Remedial Action (UMTRA) Project standard operating procedures (SOP) (JEG, n.d.), the *Technical Approach Document* (DOE, 1989), the *Guidance for Implementing the UMTRA Project Long-term Surveillance Program* (LTSP) (DOE, 1992), and the most effective technical approach for the site.

This WSAP summarizes the results of water sampling activities for calendar year 1993 and the plan for water sampling activities for calendar year 1994.

1.2 SITE LOCATION

The Canonsburg processing/disposal site is near the southwestern corner of the Borough of Canonsburg, Washington County, Pennsylvania, approximately 20 miles (mi) (32 kilometers [km]) southwest of downtown Pittsburgh (Figure 1.1). The site is bounded on the north and west by Chartiers Creek, on the east by Strabane Avenue, and on the south by the Conrail railroad tracks (Figure 1.2). The site is in a mixed residential/commercial area. The designated disposal site is fenced and is not accessible to the public. Area C southeast of the designated site, across Strabane Avenue, is outside the fenced area and is being evaluated for potential release for other uses.

The Burrell vicinity property site is an inactive landfill located 1 mi (1.6 km) east of the Borough of Blairsville, Indiana County, Pennsylvania, approximately 40 mi (64 km) east of downtown Pittsburgh (Figure 1.1). The southern property line is located along the county line between Indiana County and Westmoreland County near the center of the Conemaugh River. The north side of the property lies along the right-of-way of the Conrail railroad (Figure 1.3). The site is in a mixed residential/commercial area. The designated disposal site is fenced and is not accessible to the public.

1.3 SITE HISTORY

Standard Chemical Company owned the Canonsburg facilities from 1909 to 1922. Standard Chemical initially produced vanadium at the site and later

FIGURE 1.1
LOCATION OF THE CANONSBURG AND BURRELL SITES, PENNSYLVANIA

FIGURE 1.2
CANONSBURG PROCESSING/DISPOSAL SITE, PENNSYLVANIA

FIGURE 1.3
BURRELL DISPOSAL SITE, PENNSYLVANIA

produced radium from Colorado Plateau carnotite ore. Vitro Rare Metals Company purchased the Canonsburg property in 1922. From 1922 to 1930, radium and uranium salts were extracted from on-site residues. From 1930 to 1942, radium and uranium were extracted from carnotite ore. The facility recovered uranium from various ores, concentrates, and other materials from 1942 to 1957. Operations at the site essentially shut down in 1957.

The Burrell vicinity property site was owned and operated by the Pennsylvania Railroad as a landfill for railroad debris. After the closure of the Canonsburg site in 1957, approximately 54,000 cubic yards (41,000 cubic meters) of radioactive debris were moved from the Canonsburg site to the Burrell site.

1.4 SITE STATUS

Surface remediation at the Canonsburg site began in October 1983 and was completed in December 1985; it consisted of stabilizing contaminated materials in an on-site disposal cell. Because the design and construction of the Canonsburg disposal cell were based on the EPA standards remanded in part on September 3, 1985, the EPA has tentatively concluded that modifying the existing disposal cell to meet the existing proposed standards of September 24, 1987 (52 FR 36000 [1987]), Subpart A, is not warranted. The proposed ground water protection standards of September 24, 1987 (52 FR 36000 [1987]), are applicable for compliance under Subpart B.

Surface remediation at the Burrell site consisted of stabilizing contaminated materials in an on-site disposal cell. Remediation began in 1986 and was completed in 1987. The Burrell site is considered a vicinity property site. Although not regulated like designated disposal sites, the strategy for compliance with ground water protection standards is similar to the strategy for the Canonsburg site.

The Canonsburg and Burrell sites will retain poststabilization, prelicensing status until the U.S. Nuclear Regulatory Commission licenses them for long-term surveillance and maintenance under the provisions of 10 CFR Part 40 (1993). When the general license becomes effective, the responsibility for conducting the long-term surveillance program for the disposal sites will transfer from the U.S. Department of Energy (DOE) UMTRA Project Office to the DOE Grand Junction Projects Office.

1.5 SAMPLING PLAN

The current water sampling plan for the Canonsburg and Burrell processing/disposal sites is to collect water samples from selected DOE monitor wells and surface water locations. The monitor well locations provide a representative distribution of sampling points to characterize ground water quality and flow conditions in the vicinity of the sites. Water sampling is performed annually in late summer or early fall. The list of analytes has been

modified with time and currently reflects hazardous constituents related to uranium processing activities and parameters needed for geochemical evaluation.

The annual water quality sampling round for 1993 was completed at both sites in July 1993. Additional sampling for site characterization and risk assessment was performed during October and November 1993 at the Canonsburg site.

The next regularly scheduled water quality sampling round is scheduled for August and September 1994 and will include 16 monitor wells at the Canonsburg site and 10 monitor wells at the Burrell site. Surface water locations also will be sampled at both sites.

2.0 CANONSBURG PROCESSING/DISPOSAL SITE (CAN-01)

2.1 SITE CONCEPTUAL MODEL

The site conceptual model is based on available hydrogeologic information, site reconnaissance, and data from monitor wells installed in the unconsolidated materials (400 series) and shallow bedrock (500 series) (Figure 2.1 and Table 2.1). The site conceptual model is summarized below.

2.1.1 Physiographic setting

The Canonsburg site is in southwestern Pennsylvania. The geological setting consists of subparallel folds with northeast axis orientation. The topography of the Canonsburg site, originally a low-lying flood plain, has been altered by landfilling and earth-moving activities.

2.1.2 Geology

The Canonsburg processing/disposal site is located on a sequence of unconsolidated materials overlying the bedrock (Figure 2.2). The unconsolidated materials generally consist of up to 30 feet (ft) (9 meters [m]) of soil (sandy loam to silty clay loam), clay, alluvium, and fill material (cinders mixed with soil, stones/cobbles, and building rubble). The bedrock consists of interbedded gray and black carbonaceous shales and sandy shales, with several thin coal seams and limey shales of the Pennsylvanian Casselman Formation. Shale near the bedrock surface is broken and weathered to thin brittle plates. The bedrock surface generally dips northeast (less than 1 degree). Fracturing was observed in core samples in the upper 5 to 20 ft (1.5 to 6.1 m) of bedrock beneath the site.

2.1.3 Hydrology

Ground water occurs in the unconsolidated materials under unconfined (water table) conditions and in the underlying bedrock under semiconfined conditions (Figure 2.2). Depth to ground water in the unconsolidated materials ranges from 3 to 14 ft (0.9 to 4.3 m) beneath the land surface. Water levels have varied slightly over time but the configuration of the potentiometric surface has remained generally the same (Figures 2.3 and 2.4). Hydraulic interconnection appears to exist between the two lithologic units with a generally downward vertical gradient from the unconsolidated materials to the bedrock. Recharge to the ground water systems is from precipitation infiltration and from ground water flow beneath the site from the south. The dominant boundary condition for flow in the shallow water table and bedrock ground water systems is Chartiers Creek. This creek surrounds the site on the west, north, and east and is the discharge zone for the water table and bedrock ground water systems. Transmissivity based on aquifer pumping tests (DOE, 1983) ranges from 1.3 to 3.8 square centimeters per second (cm^2/s) in the unconsolidated materials and

FIGURE 2.1
LOCATION OF MONITOR WELLS AND SURFACE WATER SAMPLING POINTS
AT THE CANONSBURG SITE, PENNSYLVANIA

TABLE 2.1 MONITOR WELL INFORMATION FOR THE CANONSBURG SITE,
PENNSYLVANIA
SITE: CAN01 CANONSBURG
REPORT DATE: 01/18/94

LOCATION ID	NORTH COORDINATE (FT)	EAST COORDINATE (FT)	GROUND ELEVATION (FT MSL)	BOREHOLE DEPTH (FT)	BOREHOLE DIAMETER (INCHES)	CASING ELEVATION (FT MSL)	CASING DEPTH (FT)	CASING DIAMETER (INCHES)	SCREEN BEGINNING DEPTH (FT)	SCREEN LENGTH (FT)	FLOW CODE	FORMATION OF COMPLETION
0401	-	-	-	12.50	6.000	960.6	12.30	4.000	7.50	4.7	U	AL
0405	-	-	-	-	-	963.2	-	-	-	-	N	AL
0406	-	-	-	-	-	940.5	-	-	-	-	N	AL
0407	-	-	-	-	-	945.4	-	-	-	-	N	AL
0408	-	-	-	-	-	945.9	-	-	-	-	N	AL
0409	-	-	-	-	-	985.4	-	-	-	-	N	AL
0410	-	-	-	17.00	6.000	969.3	16.00	4.000	11.40	4.6	U	AL
0412	-	-	-	20.10	10.000	948.5	21.30	4.000	14.30	5.0	O	AL
0413	-	-	-	12.20	10.000	939.5	13.00	4.000	7.00	5.0	O	AL
0414	-	-	-	15.55	10.000	941.8	15.45	4.000	4.45	10.0	C	AL
0502	-	-	-	-	-	945.4	-	-	-	-	N	AL
0503	-	-	-	-	-	-	-	-	-	-	N	AL
0504	-	-	-	26.50	4.500	968.5	26.90	2.000	19.90	5.0	U	AL
0505	-	-	-	95.00	6.000	940.5	37.40	2.000	25.40	10.0	O	LS
0506	-	-	-	90.00	6.000	959.7	27.95	2.000	20.95	5.0	O	SH

FORMATION OF COMPLETION CODE:

AL - ALLUVIUM
LS - LIMESTONE
SH - SHALE

FLOW RELATIONSHIP CODE:

U - UPGRADIENT
N - UNKNOWN
O - ON-SITE
C - CROSS GRADIENT

DATA FILE: M:\DART\CAN01\MWI10001.DAT

FIELDS DISPLAYED WITH A DASH INDICATE DATA UNAVAILABLE

E

W

REDRAWN FROM DOE, 1983

FIGURE 2.2
HYDROGEOLOGIC CROSS SECTION AT THE
CANONSBURG SITE, PENNSYLVANIA

FIGURE 2.3
POTENTIOMETRIC SURFACE MAP FOR THE UNCONSOLIDATED MATERIALS
AT THE CANONSBURG SITE, PENNSYLVANIA

FIGURE 2.4
POTENTIOMETRIC SURFACE MAP FOR THE SHALLOW BEDROCK
AT THE CANONSBURG SITE, PENNSYLVANIA

0.3 to 3.9 cm²/s in the shallow bedrock. Although ground water is present in both units, neither functions as a viable aquifer; ground water from the unconsolidated materials and shallow bedrock is not used for drinking or other purposes.

2.1.4 Water quality

Water quality sampling has been conducted at the Canonsburg site since 1986. The following constituents were analyzed during the screening monitoring to determine background and baseline ground water quality in the unconsolidated materials and the underlying bedrock: aluminum, ammonium, antimony, arsenic, barium, beryllium, boron, bromine, cadmium, calcium, chloride, chromium, cobalt, copper, cyanide, fluoride, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, nitrate, pH, phosphate, potassium, selenium, silica, silver, sodium, strontium, sulfate, sulfur, thallium, tin, total alkalinity, total dissolved solids, total kjeldahl nitrogen, total organic carbon, uranium, vanadium, and zinc. The following radionuclides were analyzed: gross alpha/beta, lead-210, polonium-210, radium-226 and -228, and thorium-230. This list was modified during subsequent sampling events to focus on the following hazardous constituents related to uranium processing activities: ammonium, calcium, chloride, cyanide, gross alpha, iron, lead, magnesium, manganese, molybdenum, nitrate, potassium, radium-226 and -228, selenium, sodium, sulfate, total dissolved solids, uranium, and vanadium.

Background ground water quality at the Canonsburg site is determined by analyzing samples from monitor wells 410 and 504 upgradient (south) of the site (Figure 2.1). Background ground water quality does not exceed the EPA maximum concentration limits (MCL) (Table 2.2).

The source of contamination at the Canonsburg site was the residual radioactive material (RRM) generated by extracting, concentrating, and processing radioactive materials from ore from the early 1900s until 1957. The site also was used to store radioactive materials under a U.S. Atomic Energy Commission contract until 1967.

Geochemical and statistical analysis has characterized ground water quality beneath and downgradient from the site. Uranium concentrations in monitor wells 412, 413, and 506 exceed the MCL of 0.044 milligrams per liter (Table 2.2 and Figure 2.5). Uranium is considered the key indicator of site-related contaminant migration in ground water beneath the site. Uranium is mobile in ground water because of the neutral pH conditions and an apparent abundance of bicarbonate that acts as a complexing agent.

Shallow ground water in the unconsolidated materials and bedrock is a potential contaminant migration pathway. Hydraulic interconnection occurs with surface water in Chartiers Creek, but no evidence exists of site-related contamination in the surface water. Ground water contamination related to processing activities at the site (elevated concentrations of uranium) has been detected in monitor

**Table 2.2 Summary of background ground water quality at the Canonsburg site,
Pennsylvania**

Constituent	MCL	Unconsolidated materials (MW 410)	Shallow bedrock (MW 504)
Ammonium		<0.1	<0.1
Calcium		39.4	179.0
Chloride		50.4	162.0
Iron		8.15	3.00
Lead	0.05	<0.003	<0.003
Magnesium		14.7	21.3
Manganese		2.82	1.07
Molybdenum	0.10	<0.01	<0.01
Net gross alpha	15.00	1.26	1.81
Nitrate	44	<1	<1
Potassium		1.0	1.3
Radium (-226 and -228)	5.00	0.00	1.20
Selenium	0.01	<0.005	<0.005
Sodium		38.0	38.0
Sulfate		128.0	166.0
Uranium	0.044	<0.001	0.008
Vanadium		<0.01	<0.01
Total dissolved solids		340.0	820.0
pH		5.50	6.72

Note:

Concentrations in milligrams per liter; activities in picocuries per liter.
Results from July 1993 sampling period.
Background monitor wells are MW 410 and MW 504.

FIGURE 2.5
URANIUM DISTRIBUTION IN THE SHALLOW GROUND WATER
AT THE CANONSBURG SITE, PENNSYLVANIA

wells in the unconsolidated materials and in the bedrock. No receptors are in the vicinity of the site, because shallow ground water is not used for drinking water or other purposes. Water used by the public in this area comes mainly from surface-water reservoirs on tributaries to Chartiers Creek.

Water quality in Chartiers Creek in the vicinity of the site is affected by acid mine drainage and industrial and municipal discharges. Results of water quality sampling indicate no impact from site activities on surface water quality.

2.2 DATA COLLECTION OBJECTIVES

Data collection objectives identify the reasons for collecting data, which include regulatory requirements, compliance monitoring, site characterization, risk assessment, and other considerations.

Data quality objectives (DQO) define the manner in which samples are collected, handled, and analyzed. DQOs define analytical support levels; follow standard procedures for water sampling, preservation, transport, and various other field procedures; ensure procedures follow quality assurance (QA) and quality control (QC) protocols; and provide analytical data validation. DQOs to be followed during data collection and evaluation activities are stated in the WSAP guidance document (DOE, 1993), the quality assurance implementation plan (QAIP) now being developed, and applicable SOPs (JEG, n.d.).

2.2.1 Regulatory requirements

The regulatory requirements for ground water and surface water sampling at the Canonsburg site are specified in 40 CFR Part 192 (1993).

2.2.2 Compliance monitoring

Ground water is sampled annually for compliance monitoring purposes at the Canonsburg site in accordance with the LTSP (DOE, 1988a).

2.3 WATER SAMPLING PLAN

2.3.1 Sampling locations

Eight monitor wells will be sampled to assess postclosure ground water conditions at the Canonsburg site: five wells completed in the unconsolidated materials (monitor wells 406, 410, 412, 413, and 414) and three wells completed in the underlying shallow bedrock of the Pennsylvanian Casselman Formation (monitor wells 504, 505, and 506) (Figure 2.1 and Table 2.1). Monitor wells 410 and 504 are used to evaluate background and the remaining wells are used to evaluate crossgradient and downgradient ground water quality. Eight new monitor wells were installed in October 1993 to further evaluate ground water conditions at the site (422, 423, 424, 425, 507, 508, 509, and 510). These wells will be sampled again in 1994. Surface water

samples from Chartiers Creek are collected at locations upstream (station 601) and downstream (station 602) from the disposal site (Figure 2.1).

2.3.2 Constituent selection

The ground water monitoring program includes collecting and analyzing ground water samples from the monitor wells listed in Section 2.3.1. Ground water samples initially were evaluated for hazardous constituents generally expected to be in or derived from the RRM related to the uranium processing activities. Constituents analyzed during the screening monitoring to determine background and baseline ground water quality included those listed in Section 2.1.4. The list of constituents has been modified during subsequent sampling events to reflect hazardous constituents related to uranium processing activities at this site. Based on existing ground water quality data, the current list includes the constituents listed in Section 2.1.4. Water samples from monitor wells are normally filtered at the site before shipment to the laboratory for analysis. Determination of compliance with ground water regulations and protection of human health and the environment are based on assessment of trends in ground water quality data in relation to background levels and site-specific conditions.

Surface water in Chartiers Creek upstream and downstream from the site is sampled according to the same schedule and specifications used for ground water sampling and analysis.

2.3.3 Sampling frequency

Ground water and surface water have been monitored at the Canonsburg site since 1986. Following the definition of background and baseline ground water conditions at the site, monitor wells were sampled twice a year for 5 years (through 1992 at Canonsburg) and currently are sampled annually. The sampling is conducted annually in late summer or early fall when low-flow conditions in Chartiers Creek facilitate evaluation of water quality and potential ground water/surface water interactions. This sampling frequency permits evaluation of trends in ground water flow conditions and quality. It also provides additional information and continuity to the database that could be useful during the project's ground water remediation phase.

2.3.4 Data interpretation

Water sampling data collected during 1994 will be analyzed and evaluated according to prescribed UMTRA Project procedures and compared with the existing database. Trend analyses will be performed to detect any variations in ground water flow conditions and ground water quality. Variations will be evaluated and modifications to the sampling plan will be noted, justified, and implemented, as appropriate.

2.3.5 Anomalous data evaluation

If water sampling results are beyond the range of expected values, the suspect data will be evaluated to determine the cause. If the deviation cannot be related to an error in sample collection analysis or to processes reasonably expected to occur in the hydrogeologic environment, the location will be resampled during the next scheduled sampling round. Resampling will be conducted sooner if there is an urgent need related to potential impact to human health and the environment. Detailed procedures for evaluation of anomalous data are included in the WSAP guidance document (DOE, 1993).

3.0 BURRELL DISPOSAL SITE (CAN-03)

3.1 SITE CONCEPTUAL MODEL

The site conceptual model is based on available hydrogeologic information, site reconnaissance, and data from monitor wells installed in the unconsolidated materials (400 series) and shallow bedrock (500 series) (Figure 3.1 and Table 3.1). The site conceptual model is summarized below.

3.1.1 Physiographic setting

The Burrell site is in southwestern Pennsylvania. The geological setting consists of subparallel folds with northeast axis orientation. Landfilling and railroad operations have altered the site topography.

3.1.2 Geology

The Burrell disposal site is located on a sequence of unconsolidated materials overlying the bedrock (Figures 3.1 and 3.2). These materials generally consist of up to 50 ft (15 m) of landfill debris, soil, clay, alluvium, and colluvium. The bedrock consists of alternating layers of shale, limestone, sandstone, siltstone, coal, and claystone of the Pennsylvanian Casselman Formation.

3.1.3 Hydrology

Ground water occurs in the unconsolidated materials under unconfined (water table) conditions and in the underlying bedrock under confined conditions (Figure 3.2). Depth to ground water in the unconsolidated materials is more than 30 ft (9 m) beneath the land surface. Water levels have varied slightly over time, but the configuration of the potentiometric surface has remained generally the same (Figures 3.3 and 3.4). No hydraulic interconnection is apparent between the unconsolidated materials and the underlying saturated portion of the bedrock because of a 30- to 40-ft (9- to 12-m)-thick claystone and shale aquitard between the two units. Recharge to the ground water systems is from precipitation infiltration and from ground water flow beneath the site from the north. In the unconsolidated materials, ground water flows predominantly to the southwest toward the Conemaugh River. The river is the discharge zone for the water table ground water system. Ground water in the bedrock flows predominantly to the south. Although ground water is present in both units, neither functions as a viable aquifer; ground water from the unconsolidated materials and shallow bedrock is not used for drinking or other purposes.

3.1.4 Water quality

Water quality sampling has been conducted at the Burrell site since 1987. Constituents analyzed during the screening monitoring to determine background

LEGEND

- 421 ● MONITOR WELL SCREENED IN UNCONSOLIDATED MATERIALS
- 521 ■ MONITOR WELL SCREENED IN SHALLOW BEDROCK
- 622 ▲ SURFACE WATER SAMPLING LOCATION
- ← DIRECTION OF STREAM FLOW
- N — S CROSS SECTION

FIGURE 3.1
LOCATION OF MONITOR WELLS AND SURFACE SAMPLING POINTS
AT THE BURRELL SITE, PENNSYLVANIA

TABLE 3.1 MONITOR WELL INFORMATION FOR THE BURRELL SITE,
PENNSYLVANIA
SITE: CAN03 BURRELL VICINITY PROPERTY
REPORT DATE: 01/18/94

LOCATION ID	NORTH COORDINATE (FT)	EAST COORDINATE (FT)	GROUND ELEVATION (FT MSL)	BOREHOLE DEPTH (FT)	BOREHOLE DIAMETER (INCHES)	CASING ELEVATION (FT MSL)	CASING DEPTH (FT)	CASING DIAMETER (INCHES)	SCREEN BEGINNING DEPTH (FT)	SCREEN LENGTH (FT)	FLOW CODE	FORMATION OF COMPLETION
0420	-	-	-	57.50	8.000	-	60.40	2.000	35.40	20.0	U	AL
0421	-	-	-	55.00	10.000	-	56.90	2.000	31.90	20.0	U	AL
0422	-	-	-	55.00	10.000	-	57.00	2.000	37.00	15.0	C	AL
0423	-	-	-	52.70	8.000	-	54.70	2.000	34.70	15.0	D	AL
0424	-	-	-	44.00	10.000	-	47.20	2.000	34.20	10.0	D	AL
0520	-	-	-	158.00	8.000	-	159.80	2.000	103.80	55.0	U	CS
0521	-	-	-	157.00	8.000	-	159.00	2.000	100.80	58.2	U	CS
0522	-	-	-	154.70	8.000	-	156.70	2.000	103.50	53.2	C	CS
0523	-	-	-	154.00	8.000	-	156.00	2.000	107.50	48.5	D	CS
0524	-	-	-	150.00	8.000	-	152.20	2.000	103.70	48.5	D	CS

FORMATION OF COMPLETION CODE:
AL - ALLUVIUM
CS - CASTLEMAN FORMATION

FLOW RELATIONSHIP CODE:
U - UPGRADIENT
C - CROSS GRADIENT
D - DOWN GRADIENT

DATA FILE: M:\DART\CAN03\MWI10000.DAT

FIELDS DISPLAYED WITH A DASH INDICATE DATA UNAVAILABLE

FIGURE 3.2
HYDROGEOLOGIC CROSS SECTION AT THE
BURRELL SITE, PENNSYLVANIA

LEGEND

- 421 • MONITOR WELL SCREENED IN THE UNCONSOLIDATED MATERIALS
- 952.4 GROUND WATER ELEVATION FROM JULY 1993
- ← DIRECTION OF STREAM FLOW
- 945 — POTENTIOMETRIC CONTOURS

FIGURE 3.3
POTENTIOMETRIC SURFACE MAP FOR THE UNCONSOLIDATED MATERIALS
AT THE BURRELL SITE, PENNSYLVANIA

- LEGEND**
- 521 ■ MONITOR WELL SCREENED IN THE SHALLOW BEDROCK
 - 943.6 GROUND WATER ELEVATION FROM JULY 1993
 - ← DIRECTION OF STREAM FLOW
 - 945 — POTENTIOMETRIC CONTOURS

FIGURE 3.4
POTENTIOMETRIC SURFACE MAP FOR THE SHALLOW BEDROCK
AT THE BURRELL SITE, PENNSYLVANIA

and baseline ground water quality included those listed in Section 2.1.4. This list of constituents has been modified during subsequent sampling events to focus on hazardous constituents related to uranium processing activities (see Section 2.1.4).

Background ground water quality at the Burrell site is based on analysis of samples from monitor wells 420/421 and 520/521 upgradient (north) of the site; the analysis results show no MCL exceedances (Figure 3.1 and Table 3.2).

The source of contamination at the Burrell site was the RRM shipped from the Canonsburg site during the mid-1950s. Ground water quality beneath and downgradient from the disposal cell shows no MCL exceedances (Table 3.2).

Shallow ground water in the unconsolidated materials is a potential contaminant migration pathway. Hydraulic interconnection occurs with surface water in the Conemaugh River. However, the surface water shows no evidence of site-related contamination. No receptors occur in the site vicinity because shallow ground water is not used for drinking water or other purposes. The public water in the area predominantly comes from surface water reservoirs.

In the site vicinity, water quality in the Conemaugh River is affected by acid mine drainage and industrial and municipal discharge. However, sampling indicates no impact from site activities on surface water quality.

3.2 DATA COLLECTION OBJECTIVES

Data collection objectives identify the reasons for collecting data, which include regulatory requirements, compliance monitoring, site characterization, risk assessment, and other considerations.

DQOs define the way in which samples are collected, handled, and analyzed. DQOs define analytical support levels; follow standard procedures for water sampling, preservation, transport, and various other field procedures; ensure procedures follow QA and QC protocols; and provide analytical data validation. DQOs to be followed during data collection and evaluation activities are stated in the WSAP guidance document (DOE, 1993), the QAIP now being developed, and applicable SOPs (JEG, n.d.).

3.2.1 Regulatory requirements

The regulatory requirements for ground water and surface water sampling at the Burrell site are specified in 40 CFR Part 192 (1993).

3.2.2 Compliance monitoring

Ground water sampling is conducted annually for compliance monitoring at the Burrell site in accordance with the LTSP (DOE, 1988b).

Table 3.2 Summary of background ground water quality at the Burrell site, Pennsylvania

Constituent	MCL	Unconsolidated materials (MW 421)	Shallow bedrock (MW 521)
Ammonium		0.3	0.2
Calcium		242.0	3.7
Chloride		8.2	8.5
Iron		10.40	<0.03
Lead	0.05	<0.003	<0.003
Magnesium		51.7	0.8
Manganese		10.20	0.02
Molybdenum	0.10	<0.01	<0.01
Net gross alpha	15.00	5.36	3.76
Nitrate	44	<1	<1
Potassium		2.3	0.4
Radium (-226 and -228)	5.00	0.00	1.50
Selenium	0.01	<0.005	<0.005
Sodium		18.0	152.0
Sulfate		929.0	39.0
Uranium	0.044	<0.001	0.008
Vanadium		<0.01	<0.001
Total dissolved solids		1440.0	410.0
pH		4.08	8.47

Note:

Concentrations in milligrams per liter; activities in picocuries per liter.
Results from July 1993 sampling period.
Background monitor wells are MW 421 and MW 521.

3.3 WATER SAMPLING PLAN

3.3.1 Sampling locations

Ten monitor wells will be sampled to assess postclosure ground water conditions at the Burrell site, consisting of five pairs of wells: five wells completed in the unconsolidated materials (monitor wells 420, 421, 422, 423, and 424), and the five wells completed in the underlying bedrock of the Pennsylvanian Casselman Formation (monitor wells 520, 521, 522, 523, and 524) (Figure 3.1 and Table 3.1). Monitor wells 420, 421, 520, and 521 are used to evaluate background and the remaining wells are used to evaluate crossgradient and downgradient ground water quality. Surface water samples from the Conemaugh River are collected at locations upstream (station 620) and downstream (station 622) from the disposal site (Figure 3.1).

3.3.2 Constituent selection

Ground water samples from the monitor wells listed in Section 3.3.1 initially were evaluated for hazardous constituents expected to be in or derived from the RRM related to the uranium processing activities. Constituents analyzed during the screening monitoring to determine background and baseline ground water quality include those listed in Section 2.1.4. The list of constituents has been modified during subsequent sampling events to focus on hazardous constituents related to uranium processing activities at this site. Based on existing ground water quality data, the current list of constituents analyzed includes those listed in Section 2.1.4. Water samples from monitor wells are normally filtered at the site before shipment to the laboratory for analysis. Determination of compliance with ground water regulations and protection of human health and the environment are based on comparing trends observed in ground water quality data to background levels and site-specific conditions.

Surface water sampling in the Conemaugh River upstream and downstream from the site follows the same schedule and specifications used for ground water sampling and analysis in that area.

3.3.3 Sampling frequency

Ground water and surface water have been monitored at the Burrell site since 1987. Following the definition of background and baseline ground water conditions at the site, monitor wells were sampled twice a year for 5 years (through 1993 at Burrell) and now are sampled annually. The annual sampling is conducted in late summer or early fall when low-flow conditions in the Conemaugh River facilitate evaluation of water quality and potential ground water/surface-water interactions. This sampling schedule permits evaluation of trends in ground water quality and flow conditions.

3.3.4 Data Interpretation

Water sampling data collected during 1994 will be analyzed and evaluated according to prescribed UMTRA Project procedures and compared with the existing database. Trend analyses will be performed to detect variations in ground water flow conditions and ground water quality. Variations will be evaluated and modifications to the sampling plan will be noted, justified, and implemented, as appropriate.

3.3.5 Anomalous data evaluation

If water sampling results are beyond the range of expected values, the suspect data will be evaluated to determine the cause. If the deviation cannot be related to an error in sample collection or analysis or to processes reasonably expected to occur in the hydrogeologic environment, the location will be resampled during the next scheduled sampling round. Resampling will be conducted sooner if there is an urgent need related to potential impact to human health and the environment. Detailed procedures for evaluation of anomalous data are included in the WSAP guidance document (DOE, 1993).

4.0 LIST OF CONTRIBUTORS

The following individuals contributed to the preparation of this report.

Name	Contribution
R. Heydenburg	Overall document responsibility; primary author
C. Slosberg	Text processing
J. Torline, K. Walston	Technical editing, document production, and coordination

5.0 REFERENCES

- DOE (U.S. Department of Energy), 1993. *Guidance Document for Preparing Water Sampling and Analysis Plans for UMTRA Sites*, DOE/AL/62350-70F, DOE UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.
- DOE (U.S. Department of Energy), 1992. *Guidance for Implementing the UMTRA Project Long-term Surveillance Program*, UMTRA-DOE/AL-350125.0000, Rev. 1, DOE UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.
- DOE (U.S. Department of Energy), 1989. *Technical Approach Document*, UMTRA-DOE/AL-050425.0002, DOE UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, p. 303.
- DOE (U.S. Department of Energy), 1988a. *Surveillance and Maintenance Plan, Canonsburg, Pennsylvania*, UMTRA-DOE/AL/350201.0000, in revision, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.
- DOE (U.S. Department of Energy), 1988b. *Vicinity Property Surveillance and Maintenance Plan, Burrell, Pennsylvania*, UMTRA-DOE/AL/350201.V200/800, revised 1992, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.
- DOE (U.S. Department of Energy), 1983. *Final Environmental Impact Statement: Remedial Actions at the Former Vitro Rare Metals Plant Site, Canonsburg, Pennsylvania*, DOE/EIS-0096-F, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.
- JEG (Jacobs Engineering Group Inc.), n.d. *Albuquerque Operations Manual*, standard operating procedures, prepared by Jacobs Engineering Group Inc., Albuquerque, New Mexico, for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

CODE OF FEDERAL REGULATIONS

- 10 CFR Part 40, "Domestic Licensing of Source Material," U.S. Nuclear Regulatory Commission (1993).
- 40 CFR Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," U.S. Environmental Protection Agency (1993).

FEDERAL REGISTER

- 52 FR 36000, "EPA Standards for Remedial Actions at Inactive Uranium Processing Sites; Proposed Rule," September 24, 1987.

DATE

FILMED

6 / 2 / 94

END