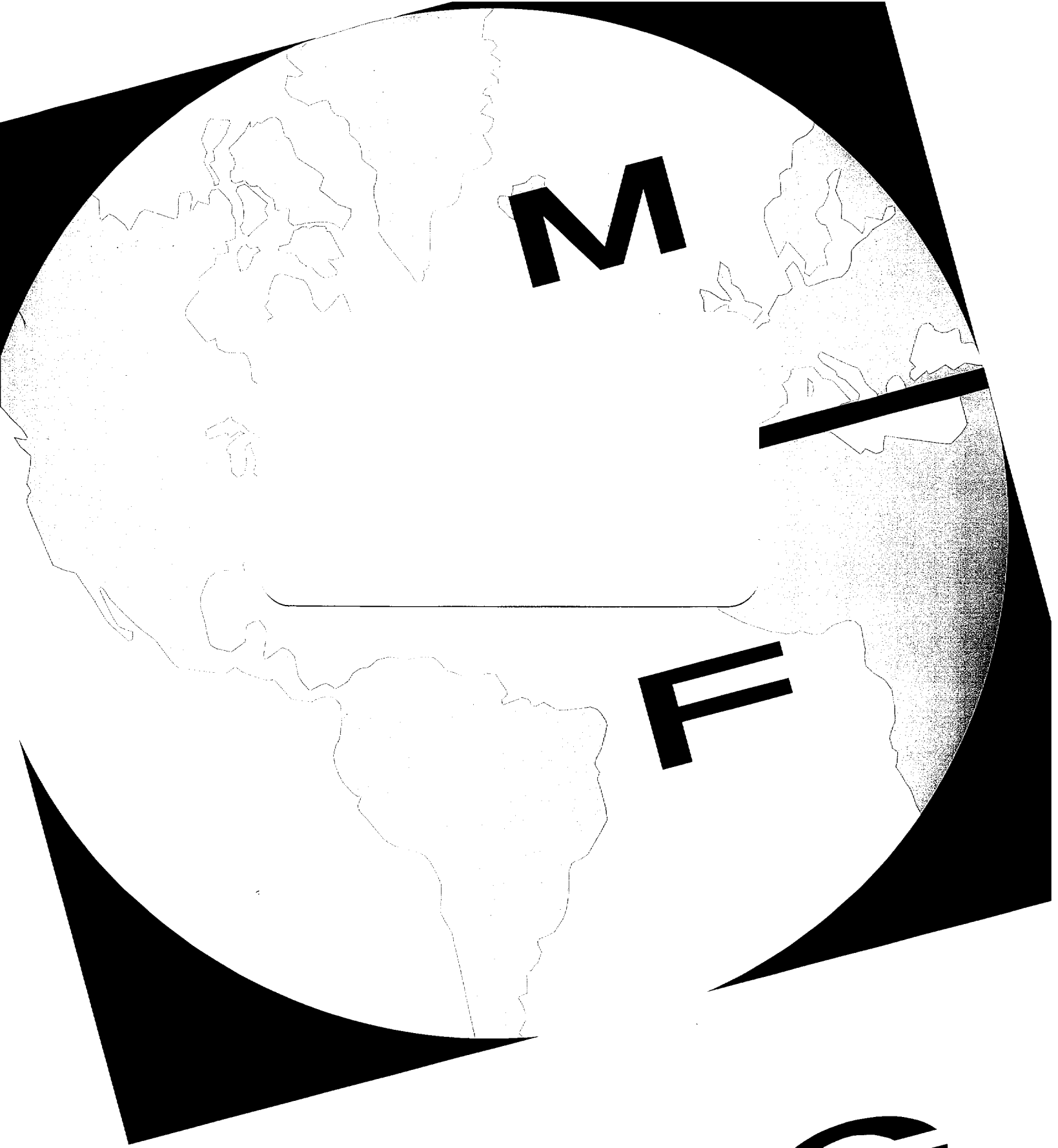

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SUPPLEMENTAL CHARACTERIZATION MONITORING PLAN FOR GROUNDWATER, SURFACE WATER, AND SEDIMENT

MOLYCORP, INC.
WASHINGTON, PENNSYLVANIA

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Prepared for:

RADIOLOGICAL SERVICES, INC.
P.O. Box 911
New London, CT 06320

Prepared by:

MFG, INC.
800 Vinial Street
Building A
Pittsburgh, PA 15212
(412) 321-2278
Fax: (412) 321-2283

MFG Project No. 120090

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1.0 INTRODUCTION

On August 8, 2000 the United States Nuclear Regulatory Commission (NRC) issued Amendment No. 5 to Material License SMB-1393, authorizing remediation of the Molycorp, Inc. (Molycorp) Washington, Pennsylvania facility. Condition 15A requires Molycorp to submit a supplemental characterization monitoring plan for groundwater, surface water, and sediment prior to excavating radiological contamination. Specifically, condition 15A requires the following:

- Condition 15A.1 requires Molycorp to perform radiological characterization of the bedrock unit near the western boundary of the site prior to and after excavation to provide evidence that contamination is not migrating from the site in the bedrock unit.

- Condition 15A.2 requires Molycorp to update groundwater, surface water, and sediment monitoring data from previously sampled locations prior to and after excavation sufficient to establish radiological trends for thorium and uranium and their significant daughter products and to provide assurance that post-excavation contamination levels are within acceptable limits.

- Condition 15A.3 requires Molycorp to provide information on the planned extent of excavation below the water table and control measures (e.g. engineering controls, waste water management plans, and contamination controls) that will be used to limit the migration of both radiological and, if present, non-radiological contaminants.

The purpose of this monitoring plan is to establish the scope of monitoring and data collection protocols for satisfying the requirements in condition 15A.1 and 15A.2 of License Amendment No. 5.

2.0 SITE ENVIRONMENTAL CONDITIONS

This section provides a summary of the environmental conditions at the facility within and bordering the area where radiological remediation activities are planned. Specifically, it summarizes the geology, hydrogeology, groundwater, surface water, and sediment radiological characterization data for the facility within Chartiers Creek and its floodplain.

The summary is based on information from several site reports including the *Site Characterization Report for License Termination of the Molycorp Washington, PA Facility* (Foster Wheeler, 1995), *Final Design Report, Temporary Thorium Storage Structure* (ICF Kaiser, 1996), *Washington Facility Environmental Report* (ICF Kaiser, 1997), and additional groundwater sampling that was conducted in 2001. The information summarized in this section is used to establish the scope of the field sampling and analysis plan presented in Section 3.

2.1 Site Geology

The site geology is based on more than 400 boreholes drilled in the Chartiers Creek floodplain to depths between approximately 4 and 36 feet below ground surface (ft-bgs). Appendix A provides geologic cross-sections through the facility. As illustrated on the cross-sections, unconsolidated deposits are present from the land surface to depths between approximately 15 and 22 ft-bgs. The uppermost deposit is fill material comprised of slag, spent refractory bricks, and mixed natural sediments. The fill material generally varies between 2 and 12 feet thick and is consistently present throughout the facility area.

Some of the slag in the on-site fill material contains radiological contaminants. Thorium-232 (Th-232) is the primary radiological contaminant of interest. The thoriated slag at the facility is in a glass-like form, which does not degrade or breakdown due to weathering. As a result, the radiological contaminants are essentially bound within the glass-like slag and not readily leached by infiltrating precipitation or groundwater flow.

Beneath the fill is 5 to 16 feet of clay alluvium characterized as containing a mixture of poorly sorted clay, silt, sand, and gravel. Below this unit, is a mixed alluvium zone comprised of clayey to silty sand with gravel, which averages about 2 feet thick. This mixed alluvium zone

was characterized by Foster Wheeler in the Site Characterization Report (SCR) as the "sand and gravel unit".

Bedrock is present below the unconsolidated overburden at depths ranging from 15 to 22 ft-bgs. The uppermost bedrock surface beneath the lowland area is claystone of the Pennsylvanian/Permian Age Waynesburg Formation.

2.2 Site Hydrogeology

Groundwater is present at the facility in the unconsolidated deposits and bedrock. Groundwater occurs at a depth of approximately 4 ft-bgs in the floodplain area. The water table is primarily within the fill material, but at some locations it falls below the base of the fill and into the underlying clay alluvium.

Hydraulic conductivity measured for the fill based on two constant-rate pumping tests is 13 to 27 feet per day (ft/day) with an average of 20 ft/day. Hydraulic conductivities for the fill based on slug tests were an order of magnitude or more lower than the pumping test, with hydraulic conductivities ranging from 0.45 to 2.8 ft/day with an average of 1.25 ft/day. The groundwater elevation contour map for the fill shows groundwater flows to the west toward Chartiers Creek at an average gradient of 0.03 ft/ft (Appendix A). Based on an assumed effective porosity of 20 percent, the lateral groundwater flow velocity ranges from about 70 to 1,100 feet per year (ft/year). The large variation in velocities may reflect the heterogeneity of the fill or different hydraulic conductivity testing methods.

There is no hydraulic conductivity data available for the clay alluvium that underlies the fill, but the permeability of this unit is expected to be an order of magnitude or more lower than the fill materials owing to its high clay content and poor sorting. This unit does not provide a significant pathway for horizontal groundwater flow and acts to impede downward vertical flow of groundwater.

Beneath the clay alluvium is a highly variable mixed alluvium zone comprised of silt, silty sand, sand, and in places sandy gravel (characterized by Foster Wheeler in the SCR as the "sand and gravel unit"). The reported hydraulic conductivity of the mixed alluvium averages 0.57

ft/day for (range is 0.059 to 2.15 ft/day). In some areas a thin (about 1 foot thick or less) weathered bedrock layer is present beneath the mixed alluvium. This zone is in direct contact with and exhibits hydraulic conductivity values similar to the mixed alluvium.

The groundwater elevation contour map for the mixed alluvium shows groundwater flows to the west toward Chartiers Creek at an average gradient of 0.03 ft/ft (Appendix A). Based on an assumed effective porosity of 20 percent, the lateral groundwater flow velocity ranges from about 3 ft/year to 120 ft/year.

Groundwater elevations in mixed alluvium are typically about 3 feet lower than fill groundwater elevations. The clay alluvium separating these units is about 10 feet thick indicating a vertical gradient across the unit of about 0.3 ft/ft. This large head difference suggests that the clay acts to restrict vertical flow between the fill and mixed alluvium zones. However, M-18, which is screened in the mixed alluvium below clay, responded to pumping in the fill zone. This suggests the clay zone is discontinuous or breached and only locally confining. The saturated thickness of the unconsolidated deposits is typically less than 15 feet; therefore, it cannot sustain supplies of water to practically serve as an aquifer.

The uppermost bedrock beneath the facility is a gray claystone of the Waynesburg Formation. The Waynseburg Formation is reported as a poor water-producing unit due to the paucity and small size of fractures. The mean reported yield is generally 10 gallons per minute or less. Permeability testing of the Waynesburg Formation beneath the hill area on the southwestern portion of Molycorp's property confirmed the poor capacity of this unit.

2.3 Groundwater Quality

Three rounds of groundwater samples were collected in 1994 to characterize radiological groundwater quality at the site. Thirty-five (35) groundwater samples were collected during 1994-Round 1 (6/28/94 through 7/12/94), 34 samples during 1994-Round 2 (7/26/94 through 8/03/94) and seven samples during 1994-Round 3 (8/9/94). Appendix B provides the 1994-groundwater radiological data. A summary of the 1994 data including the radionuclides tested, detection limit, frequency of detection, and minimum and maximum detected concentration is provided on Table 2-1.

As indicated on Table 2-1, radiological constituents were detected infrequently and at low concentrations. The only detections above Maximum Contaminant Levels (MCLs) were in monitoring wells MW-21 and MW-26 during 1994-Round 2. Ra-228 was detected slightly above the MCL of 5 pCi/L in MW-21 (5.32±2.20 pCi/L) and MW-26 (5.16±3.55 pCi/L). MW-21 screens the clay alluvium and MW-26 screens fill material. Ra-228 was not detected in either of these wells during 1994-Round 1. Radiological constituents were not detected at concentrations of concern in any of the mixed alluvium wells.

Bedrock monitoring well BR-1 was sampled during 1994-Rounds 1 and 2. Radionuclides were not detected in the samples collected from this well.

In 2001, two additional rounds of samples were collected from bedrock. Samples were collected from BR-1 and newly installed monitoring well BR-2. The samples were laboratory analyzed for gross-alpha and gross-beta. The results for the 2001 sampling are provided in Appendix B.

In 2001-Round 1 (5/25/01), the results for BR-1 show gross-alpha as not detected and gross-beta detected at a concentration of 21 pCi/L. The results for BR-2 show gross-alpha detected in 2001-Round 1 at a concentration of 30 pCi/L and gross-beta as not detected. The gross-alpha value for BR-2 exceeded the MCL of 15 pCi/L gross-alpha, however, the samples collected during 2001-Round 1 were not filtered prior to analysis.

BR-1 and BR-2 were re-sampled on July 18, 2001 (2001-Round 2). The samples were field filtered and laboratory analyzed for gross-alpha and gross-beta. Gross-alpha and gross-beta were not detected in the filtered samples. The results for BR-1 and BR-2 show bedrock is not impacted by site radiologicals and that bedrock is not a pathway of concern for migration of contaminants.

2.4 Chartiers Creek

Surface water samples were collected concurrently with groundwater samples in 1994 from the Chartiers Creek and analyzed for radionuclides. Round 1 surface water sampling (7/28/94) coincided with Round 2 of groundwater sampling. Round 2 of surface water sampling (8/9/94)

coincided with Round 3 groundwater sampling. Stream sediments were collected on 8/3/94 through 8/5/94 and analyzed for thorium-232.

2.4.1 Surface Water Quality

Two of four surface water samples collected from Chartiers Creek during each sampling Round were analyzed for radiological constituents. Surface water samples from the southern upstream end of the site (CR1) and the northern downstream end (CR4) were analyzed for the same list of radionuclides as groundwater. Two at intermediate stations (CR2 and CR3) were analyzed for target analyte list metals but radiological data are presented in the Foster Wheeler 1995 Site Characterization Report. The Chartiers Creek sample locations are shown in Appendix A, Figure 5-23 and the analytical results are summarized in Table 2-2.

Only Ra-228 was detected in surface water samples CR1 and CR4. The detection of Ra-228 is not believed to be site related because upstream concentrations of this parameter were higher than downstream concentrations in both Rounds. During Round 1, the only detection was 5.61 pCi/L of total Ra-228 in CR-1, located upstream of the site. Radium-228 was not detected in CR4, the Round 1 downstream sample.

In Round 2, Ra-228 was detected in the filtered sample from CR1 at a concentration of 5.70 pCi/L and CR4 at 2.9 pCi/L.

2.4.2 Sediment Quality

Stream bottom sediment samples were collected from Chartiers Creek on August 3 to 5, 1994 at four points each, spaced 10 feet, on transects across the stream width at the seven stream locations shown in Appendix A, Figure 5-23. Samples were collected from the top six inches of sediment. Across the stream width at each given stream location, the samples were labeled A from the east bank, D from the west bank, B from below the Creek near the east side, and C from below water near the west side. The sample results are summarized in Table 2-3.

The samples were laboratory analyzed for Th-232. The results, presented in Appendix B, show Th-232 concentrations varying from 0.23 to 0.89 pCi/g. Upstream concentrations were

higher or equal to those downstream, indicating no adverse affects to Chartiers Creek sediment from the site.

3.0 FIELD SAMPLING AND ANALYSIS PLAN

3.1 Groundwater

3.1.2 Monitoring Plan Objectives and Sampling Strategy

The objective of the monitoring plan is to provide for collecting the data necessary to satisfy conditions 15A.1 and 15A.2 of License Amendment No. 5. Condition 15A.1 requires Molycorp to perform radiological characterization of the bedrock unit near the western boundary of the site prior to and after excavation to provide evidence that contamination is not migrating from the site in the bedrock unit. Condition 15A-1 has already been partially fulfilled via the 2001groundwater sampling events. Specifically, sampling of well BR-2 provides pre-excavation radiological characterization of groundwater in bedrock near the western boundary of the site. All that remains to fulfill 15A.1 is post-excavation sampling of bedrock groundwater; therefore, this plan provides for post-excavation sampling of monitoring well BR-2.

Condition 15A.2 requires pre- and post-excavation groundwater, surface water, and sediment samples to establish radiological trends for thorium, uranium, and their significant daughter products to provide assurance that post-excavation contamination levels are within acceptable limits. The scope of the groundwater monitoring in this plan includes pre- and post-excavation sampling of site groundwater monitoring wells screened in the unconsolidated deposits. Specifically, wells screening the fill zone and alluvium were selected to provide the data required to fulfill 15A.2. The fill zone is selected for monitoring because (1) it is the first zone where a release from the thoriated slag to groundwater would be detected and (2) it exhibits the highest permeability and will provide for monitoring of the zone most capable of lateral groundwater transport. The alluvium zone is selected for monitoring because it will provide for detection of radiological contaminants if they were to migrate vertically downward from the fill zone.

Seventeen monitoring wells will be used to monitor the effect of remediation activities on groundwater quality. The scope of the sampling includes monitoring wells screened in both bedrock and the unconsolidated deposits. Table 3-1 provides a list of the wells to be monitored,

the analyses to be performed, frequency of sampling, and rationale. The well locations are provided on Figure 3-1.

Two monitoring wells (BR-1 and BR-2) will be sampled pre- and post-remediation to provide evidence that contamination is not migrating from the site in the bedrock unit. The sample will be field filtered, preserved, and laboratory analyzed for Ra-226, Ra-228, Th-228, Th-230, Th-232, U-234, U-235, and U-238 by the methods listed in Table 3-2.

Fifteen monitoring wells screened in the unconsolidated deposits at the site will be sampled pre- and post-excavation to provide the data required to establish radiological trends for thorium and uranium and their significant daughter products, and to provide assurance that post-excavation contamination levels are within acceptable limits. The unconsolidated deposit monitoring wells include five shallow monitoring wells screening the fill zone (M-2, MW-25, MW-26, MW-27, and UG-4), eight deep monitoring wells screening the alluvium (M-8, M-10, M-13, MW-18, M-20, MW-28, MW-29, and MW-31), and two monitoring wells screening both the fill and alluvium zones (M-4 and MW-24). These wells were selected to provide for monitoring of radiological parameters in groundwater upgradient, within, and downgradient of the areas planned for remediation. The groundwater samples will be collected from the unconsolidated zone monitoring wells twice (semi-annually) prior to excavation of the radiological fill materials to establish pre-remediation concentrations and trends. Following completion of all excavation activities, groundwater samples will be collected twice (semi-annually) from the same ten wells (or suitable replacement wells if abandoned prior to excavation) to assess the effect of the remediation activities on groundwater quality. The samples will be field filtered, preserved, and laboratory analyzed for radiological parameters Ra-226, Ra-228, Th-228, Th-230, Th-232, U-234, U-235, and U-238 by the methods listed in Table 3-2.

3.1.2 Groundwater Sample Collection Procedure

A clean submersible pump and/or bailer will be used for purging groundwater from the monitoring wells and retrieving the samples. Initially, the depth to groundwater and the total depth of each well will be measured and used in conjunction with the well casing radius to calculate the volume of standing water in each well.

Each well will be pumped or bailed until `between three and five well volumes are removed. To assure that the water samples are representative of the water-yielding zone, field measurements of groundwater temperature, pH, and specific conductance will be made following removal of each well volume. The sample will be collected only when consecutive readings of temperature, pH and specific conductance stabilize to within ±10%, or after five well volumes have been removed. If the yield of the well is low such that it can be bailed or pumped dry, then the recharged groundwater in the well will be considered representative regardless of the number of casing volumes of groundwater removed because all the standing water in the well will have been replaced by recharge from the water-yielding zone. If a well is purged dry, the well will be sampled whenever sufficient volume is present to recover a sample.

When purging is completed, a groundwater sample will be collected immediately for submittal to a laboratory for analysis. The groundwater sample will be field-filtered through a 0.45 μm filter. If a submersible pump is used to collect the sample, the sample will be pumped through a disposable in-line 0.45 μm filter and directly into the appropriate sample. If a bailer is used, the sample will initially be poured into a clean laboratory supplied sample container. A peristaltic pump will then be used to pump the sample through a disposable in-line 0.45 μm filter and into a second container.

Non-dedicated groundwater sampling equipment including the submersible pump and peristaltic pump will be decontaminated after use at a well to avoid sample cross-contamination. Equipment will be decontaminated by washing in an Alconox detergent solution, rinsing with a potable water rinse, and rinsing with de-ionized water. Dedicated equipment such as pump discharge tubing and filters will be used only once and then discarded.

Field quality assurance/quality control (QA/QC) samples will be collected during each round of monitoring. One equipment blank and one duplicate sample will be collected per round of sampling.

Upon collection, the groundwater and associated QA/QC samples will be appropriately preserved, labeled, logged onto a chain of custody (COC) form and shipped by overnight courier

to the analytical laboratory. All field activities will be recorded in a bound, weatherproof field logbook.

3.2 Surface Water and Sediment

3.2.1 Objectives and Sampling Strategy

The scope of the surface water and sediment monitoring includes collecting the data necessary to satisfy condition 15A.2 of License Amendment No. 5. Condition 15A.2 requires pre- and post-excavation surface water and sediment samples to establish radiological trends for thorium, uranium, and their significant daughter products to provide assurance that post-excavation contamination levels are within acceptable limits.

Four surface water samples will be collected, including one from an upstream location and one from a downstream location. Sediment samples will be collected from seven locations or transects within the creek. Along each transect, three aliquots will be collected along the normal width of the stream, and will be composited into one sample for laboratory analyses. Sample locations are illustrated on Figure 3-2.

3.2.2 Surface Water and Sediment Sample Collection Procedures

Surface water samples will be collected directly into the appropriate sample containers by dipping the mouth of the container into the stream and filling. Sampling personnel will be positioned downstream of the sample location to avoid having the samples affected by disturbed bottom sediments.

Sediment samples will be collected from the stream bed to a depth of 0 – 6 inches using a stainless steel spoon or trowel. The sediment will be homogenized and the samples will be collected into the appropriate sample containers.

Both surface water and sediment samples will be sent to a laboratory for selected radioisotope analyses. Surface water will be field filtered, preserved, and laboratory analyzed for radiological parameters Ra-226, Ra-228, Th-228, Th-230, Th-232, U-234, U-235, and U-238 by

the methods listed in Table 3-2. The sediment samples will be analyzed for the same parameters as surface water, methods listed in Table 3-3.

Field quality assurance/quality control (QA/QC) samples will be collected. One duplicate sample will be collected for each matrix and one equipment blank for sediments.

Upon collection, the surface water, sediment, and associated QA/QC samples will be appropriately preserved, labeled, logged onto a chain of custody (COC) form and shipped by overnight courier to the analytical laboratory. All field activities will be recorded in a bound, weatherproof field logbook.

4.0 REPORTING

4.1 Pre-Excavation

Groundwater, surface water, and sediment data collected pre-excavation will be summarized in a letter report to NRC prior to initiating excavation work.

4.2 Post-Excavation

The post-excavation samples of groundwater, surface water, and sediment will be compiled and a report, comparing the pre- and post-remediation samples, will be submitted to NRC.

TABLES

Table 2-1

Summary of 1994 Groundwater Radiological Data

Round 1 Summary (6/28/94 through 7/12/94)

Radionuclide	Detection Limit pCi/L	Frequency of Detection	Minimum Detected Concentration pCi/L	Maximum Detected Concentration pCi/L
Radium-226	0.5	2/35	0.92±0.27	2.23±1.88
Radium-228	2	5/35	2.11±1.89	4.92±3.01
Thorium-228	0.5	0/35	ND	ND
Thorium-230	0.5	2/35	0.75±0.22	0.93±-0.23
Thorium-232	0.5	0/35	ND	ND
Uranium-234	0.5	16/35	0.52±0.15	3.41±-0.47
Uranium-235	0.5	0/35	ND	ND
Uranium-238	0.5	13/35	0.52±0.14	2.6±0.39

No detections in Round 1 exceeded MCLs

Round 2 Summary (7/26/94 through 8/03/94)

Radionuclide	Detection Limit pCi/L	Frequency of Detection	Minimum Detected Concentration PCi/L	Maximum Detected Concentration pCi/L
Radium-226	0.5	2/34	0.52±0.16	0.91±0.22
Radium-228	2	10/34	2.25±2.28	5.32±-2.20
Thorium-228	0.5	2/33	1.04±0.5	1.36±0.78
Thorium-230	0.5	2/33	1.47±0.39	2.97±0.97
Thorium-232	0.5	2/33	0.74±04	1.38±0.39
Uranium-234	0.5	14/34	0.55±-0.2	3.58±0.49
Uranium-235	0.5	0/34	ND	ND
Uranium-238	0.5	11/34	0.68±0.16	2.48±0.39

Two detections of Ra-228 slightly exceeded the 5 pCi/L MCL for Ra-226/Ra-228 in MW-21 and MW-26. In Round 1, Ra-226 and Ra-228 were not detected in either well.

Round 3 Summary (8/9/94)

Radionuclide	Detection Limit pCi/L	Frequency of Detection	Minimum Detected Concentration pCi/L	Maximum Detected Concentration pCi/L
Radium-226	0.5	1/7	0.52±0.19	0.52±0.19
Radium-228	2	3/7	2.06±2.37	4.52±2.48
Thorium-228	0.5	1/7	0.54±0.59	0.54±0.59
Thorium-230	0.5	0/7	ND	ND
Thorium-232	0.5	0/7	ND	ND
Uranium-234	0.5	3/7	0.74±0.18	1.75±0.29
Uranium-235	0.5	0/7	ND	ND
Uranium-238	0.5	2/7	1.24±0.26	1.3±0.25

No detections in Round 3 exceeded MCLs

Table 2-2

Results of 1994 Surface Water Sampling Event

	Well ID	CR1F(Dissolved)	CR1 Total	CR1F(Dissolved)	CR4F(Dissolved)	CR4 Total	CF4F (Dissolved)
	Sampling Date	7/28/94	7/28/94	8/9/94	7/28/94	7/28/94	8/9/94
Radionuclide	Detection Limit (pCi/L)						
Ra-226	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ra-228	2	< 2	5.61 ±6.67	5.70 ±2.72	< 2	< 2	2.9 ±1.76
Th-228	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Th-230	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Th-232	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
U-234	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
U-235	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
U-238	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

Data from Foster Wheeler 1995 Site Characterization Report

Table 2-3

Results of 1994 Sediment Sampling Event

Sediment ID#	Th-232 (pCi/g)
SS1A	0.34 ±0.9
SS1B	0.34 ±0.11
SS1C	0.29 ±0.09
SS1D	0.51 ±0.12
SS2A	0.31 ±0.09
SS2B	0.37 ±0.10
SS2C	0.29 ±0.09
SS2D	0.49 ±0.11
SS3A	0.35 ±0.09
SS3B	0.25 ±0.07
SS3C	0.37 ±0.10
SS3D	0.34 ±0.09
SS4A	0.35 ±0.08
SS4B	0.23 ±0.06
SS4C	0.33 ±0.08
SS4D	0.33 ±0.08
SS5A	0.45 ±0.11
SS5B	0.33 ±0.08
SS5C	0.35 ±0.09
SS5D	0.28 ±0.08
SS6A	0.36 ±0.08
SS6B	0.22 ±0.06
SS6C	0.26 ±0.68
SS6D	0.36 ±0.10
SS7A	0.86 ±0.18
SS7B	0.35 ±0.09
SS7C	0.33 ±0.08
SS7D	0.43 ±0.10

Data from Foster Wheeler 1995 Site Characterization Report

Table 3-1

Groundwater Monitoring Plan Summary

Well Number	Zone Monitored	Pre-Remediation Sampling	Post-Remediation Sampling	Parameter List	Rationale
BR-2	Bedrock	None	1 Round	A	Monitor Bedrock West of Site
M-2	Fill Material	2 Semi-annual	2 Semi-annual	B	Monitor Downgradient of Central Portion of Excavation Area
MW-25	Fill Material	2 Semi-annual	2 Semi-annual	B	Monitor Downgradient of Northern Portion of Excavation Area
MW-26	Fill Material	2 Semi-annual	2 Semi-annual	B	Monitor Within South-Central Portion of Excavation Area
MW-27	Fill Material	2 Semi-annual	2 Semi-annual	B	Monitor Southern Edge of Excavation Area
UG-4	Fill Material	2 Semi-annual	2 Semi-annual	B	Provide Background Concentration For Fill Material
M-10	Alluvium	2 Semi-annual	2 Semi-annual	B	Monitor Downgradient of Central Portion of Excavation Area
M-18	Alluvium	2 Semi-annual	2 Semi-annual	B	Monitor Within North-Central Portion of Excavation Area
MW-21	Alluvium	2 Semi-annual	2 Semi-annual	B	Monitor Downgradient of North-Central Portion of Excavation Area
M-29	Alluvium	2 Semi-annual	2 Semi-annual	B	Monitor Downgradient of South-Central Portion of Excavation Area
MW-31	Alluvium	2 Semi-annual	2 Semi-annual	B	Provide Background Concentration For Alluvium

Notes:

Parameter List A = gross-alpha and gross-beta
Parameter List B = parameters Ra-226, Ra-228, Th-228, Th-230, Th-234, U-235, and U-238

Table 3-2

Groundwater and Surface Water Sample Preservation and Analytical Methods Summary

Analysis	Container	Preservation	Analytical Method	MDA pCi/L
Radium-226	Two 1 Liter Plastic	HNO_3 (pH<2)	903.0/904.0	
Radium-228				1
Thorium-228	Two 1 Liter Plastic	HNO_3 (pH<2)	NAS-NS-3004	1
Thorium-230				
Thorium-232				
Uranium-234	Two 1 Liter Plastic	HNO_3 (pH<2)	NAS-NS-30-50A	1
Uranium-235				
Uranium-238				

Table 3-3

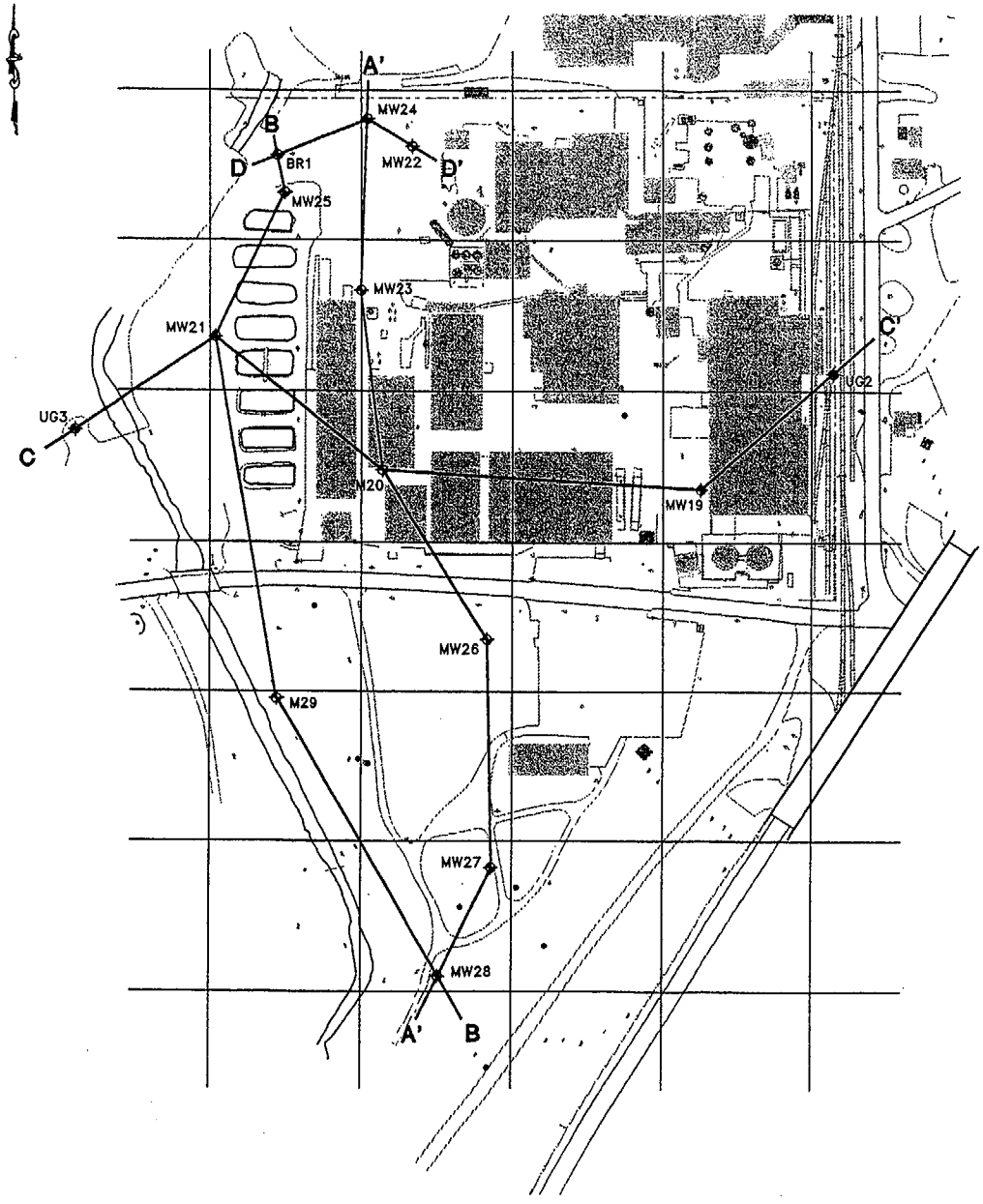
Sediment Sample Preservation and Analytical Methods Summary

Analysis	Container	Analytical Method	MDA pCi/L
Radium-226	500 gm	903.0/904.0 or HASL 300 *	1
Radium-228			
Thorium-228	10 gm	NAS-NS-3004	1
Thorium-230			
Thorium-232			
Uranium-234	10 gm	NAS-NS-30-50A	1
Uranium-235			
Uranium-238			

* Method depends upon amount of water within sediment sample; HASL 300 for solid or EPA 903.0/904.0 for water.

APPENDIX A

Geologic Cross-Sections and Groundwater Elevation Maps



LEGEND:

A —◇— A' CROSS SECTION LINE

MONITORING WELL

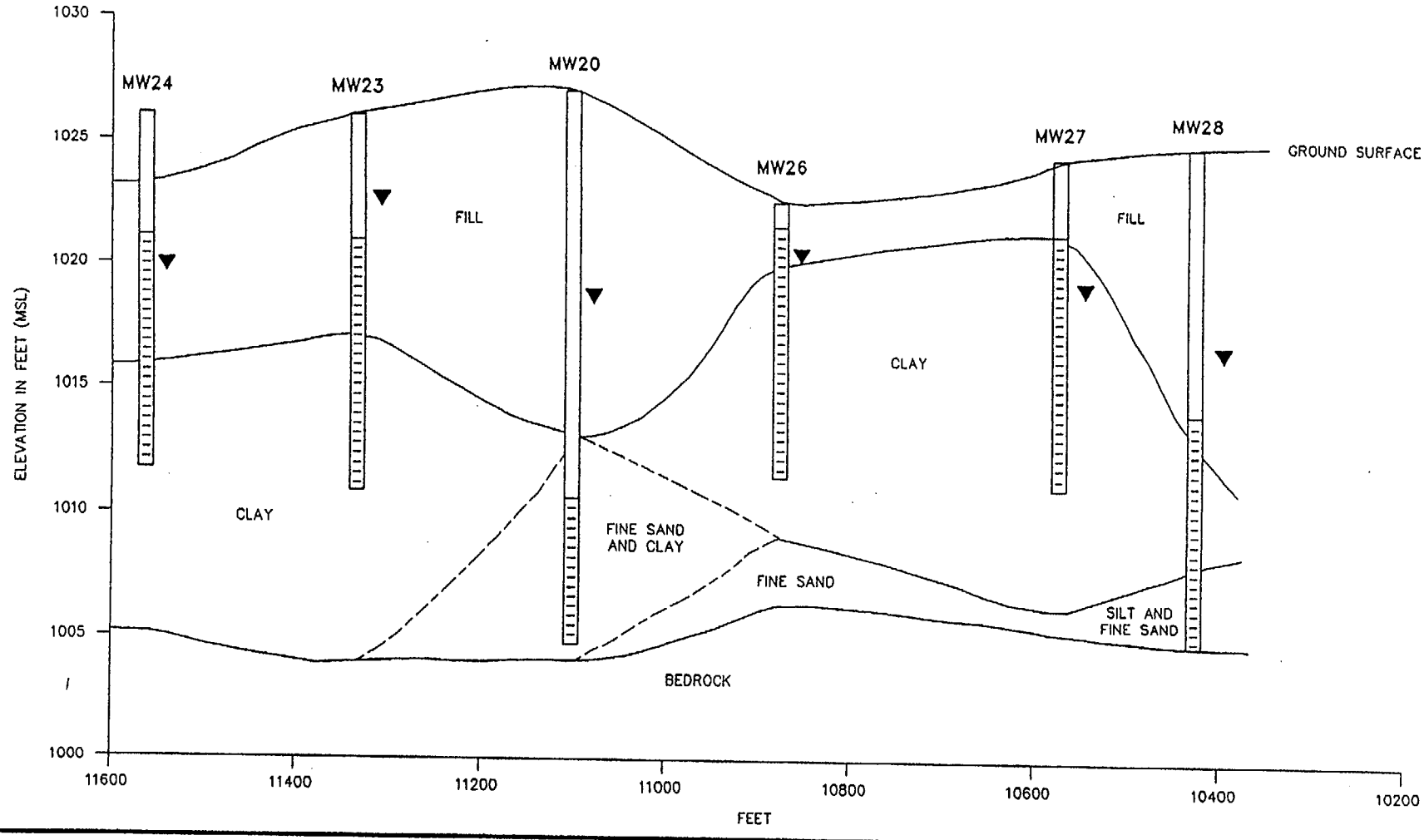
MOLYCORP, INC.

FIGURE 4-12

GEOLOGIC CROSS SECTION LOCATIONS

FOSTER WHEELER ENVIRONMENTAL CORPORATION

MOL5



▼ APPROXIMATE WATER LEVEL 8/16/94

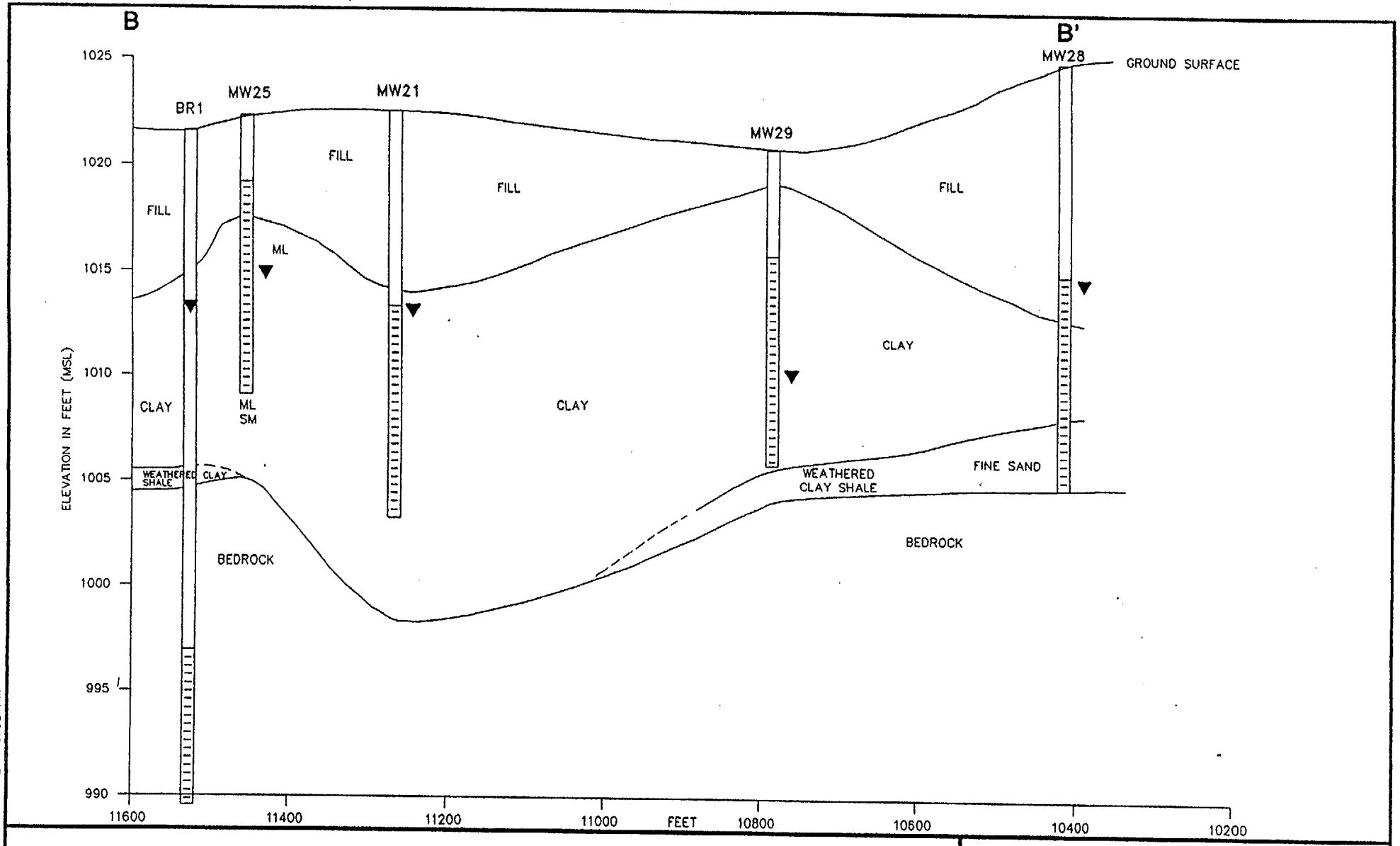
MOLYCORP, INC.
300 CALDWELL AVENUE
WASHINGTON, PA

FIGURE 4-13

CROSS-SECTION A-A'

FOSTER WHEELER ENVIRONMENTAL CORPORATION

CAD FILE NAME: MOLY-AA.DWG
PLOT SCALE: (FIT)
DATE: 01/17/95
TIME: 5:35 PM



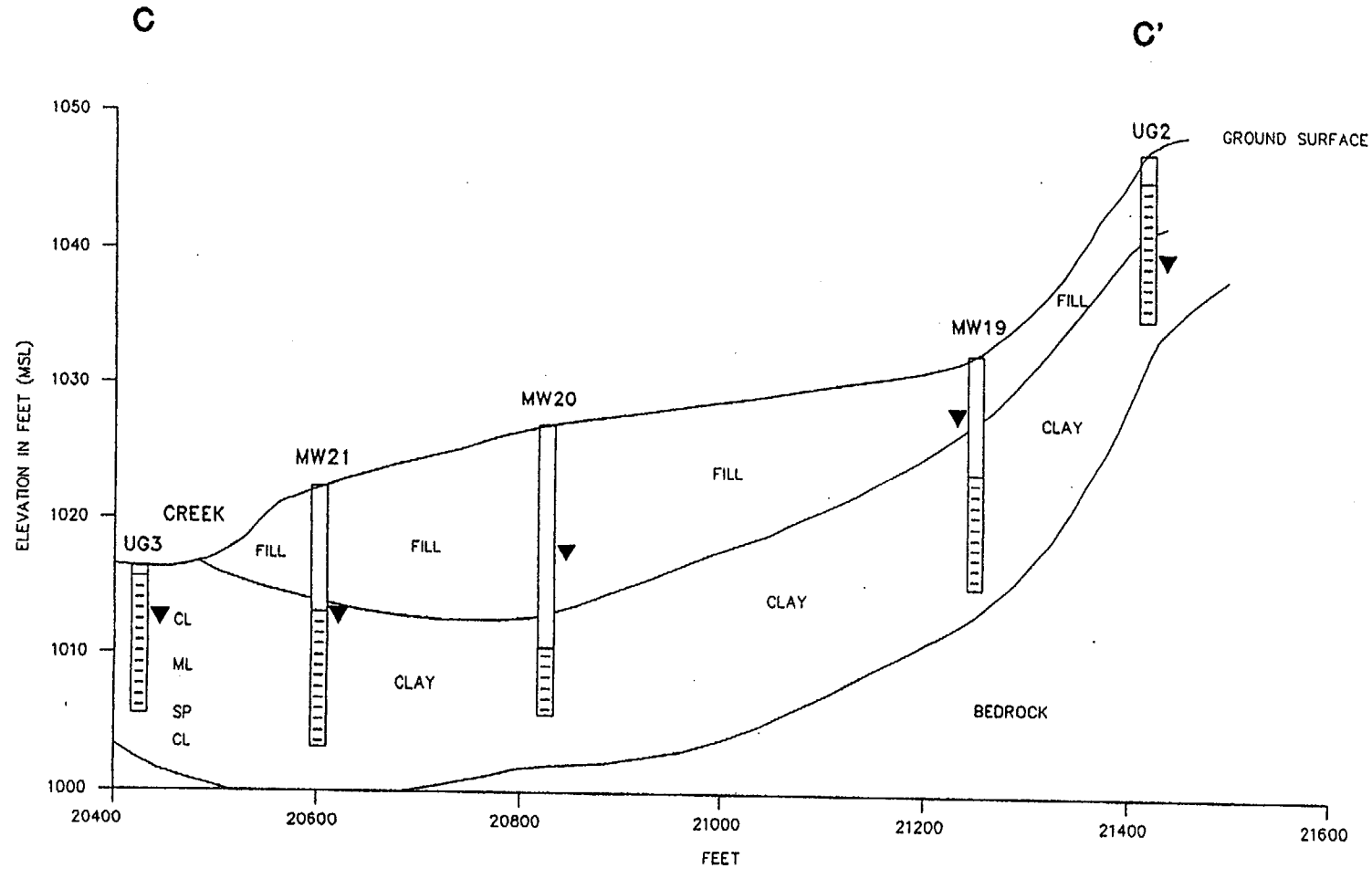
▼ APPROXIMATE WATER LEVEL 8/16/94

MOLYCORP, INC.
300 CALDWELL AVENUE
WASHINGTON, PA

FIGURE 4-14
CROSS-SECTION B-B'

FOSTER WHEELER ENVIRONMENTAL CORPORATION

CAD FILE NAME: MOLY-BB.DWG
PLOT SCALE: (FIT)
DATE: 01/17/95
TIME: 5:38 PM



▼ APPROXIMATE WATER LEVEL 8/16/94

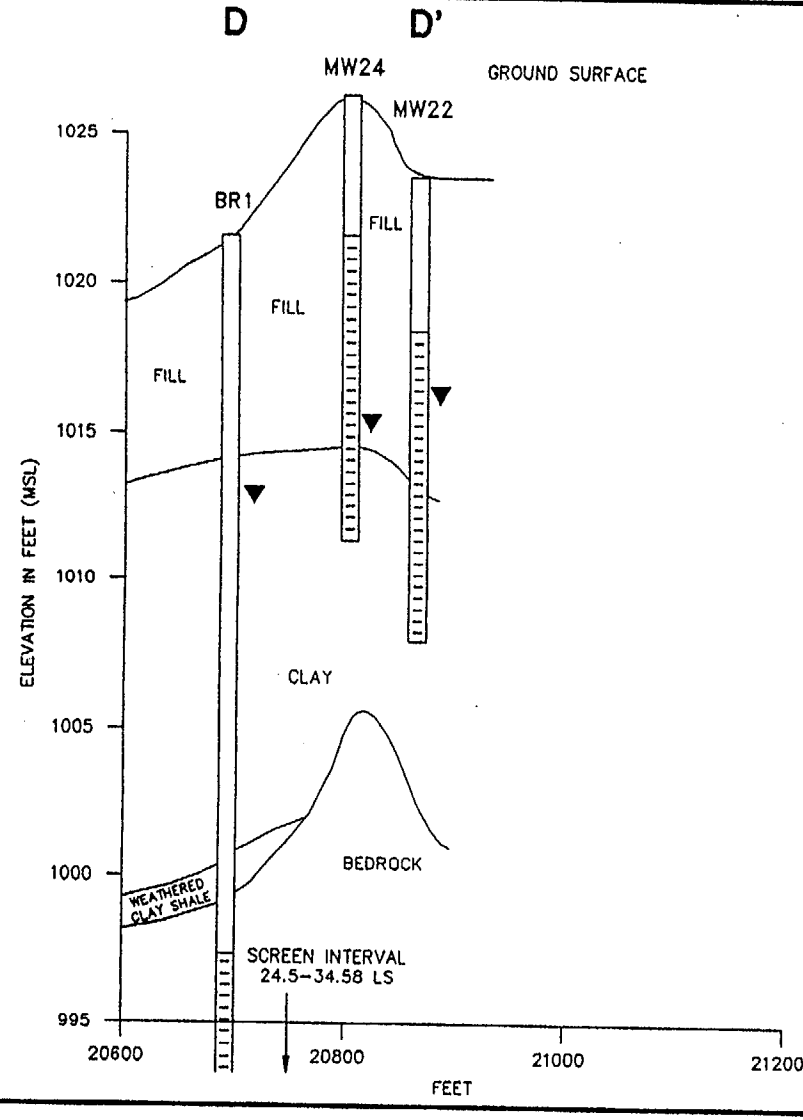
MOLYCORP, INC.
300 CALDWELL AVENUE
WASHINGTON, PA

FIGURE 4-15

CROSS-SECTION C-C'

FOSTER WHEELER ENVIRONMENTAL CORPORATION

CAD FILE NAME: MOLY-CC.DWG
PLOT SCALE: (FIT)
DATE: 01/17/95
TIME: 5:40 PM



▼ APPROXIMATE WATER LEVEL 8/16/94

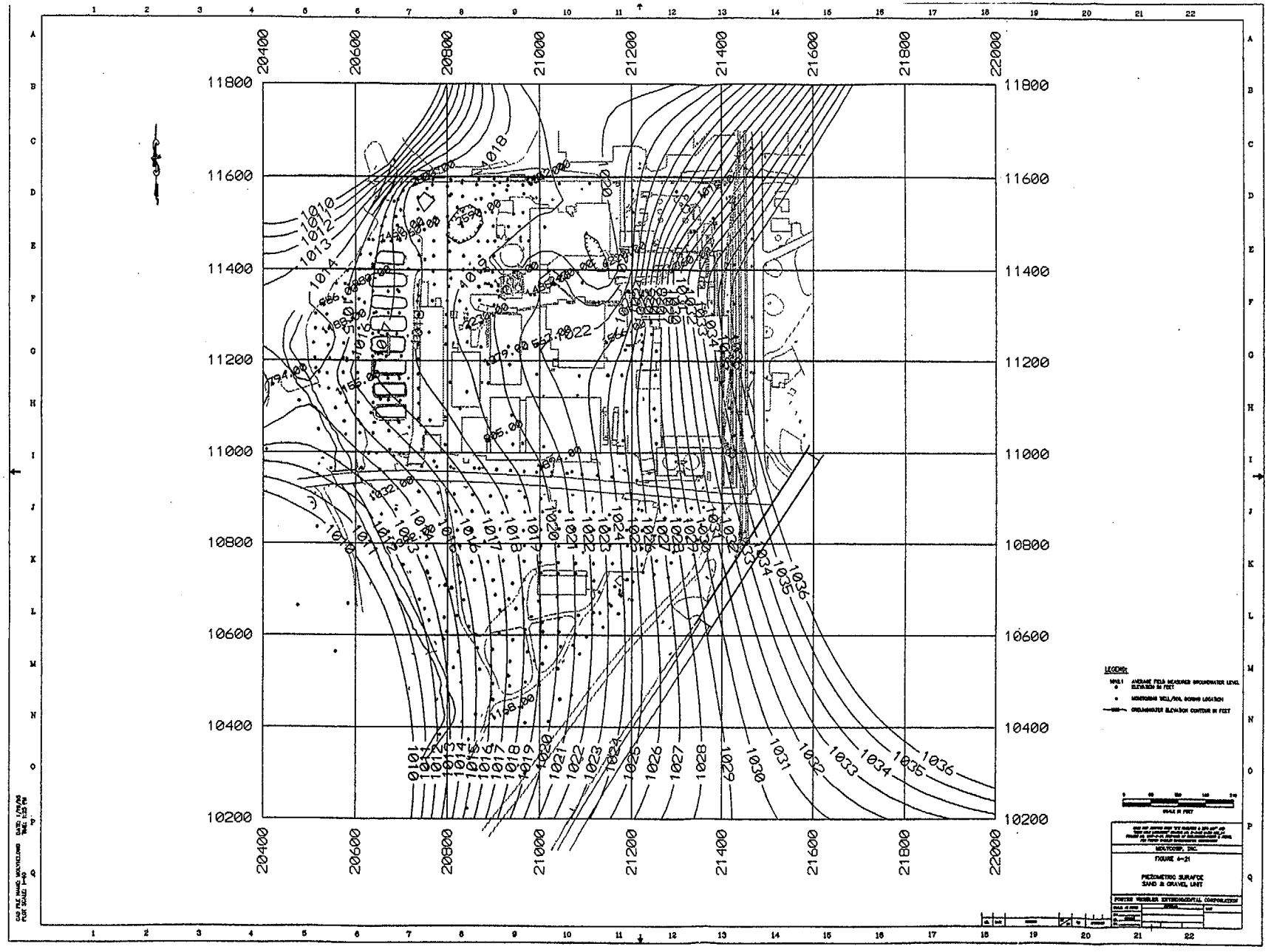
MOLYCORP, INC.
300 CALDWELL AVENUE
WASHINGTON, PA

FIGURE 4-16

CROSS-SECTION D-D'

FOSTER WHEELER ENVIRONMENTAL CORPORATION

CAD FILE NAME: MOLY-DD.DWG
PLOT SCALE: (FIT)
DATE: 01/17/95
TIME: 5:43 PM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10400
10200
1010
1011
1012
1013
1014
1015
1016
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1018
1019
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1021
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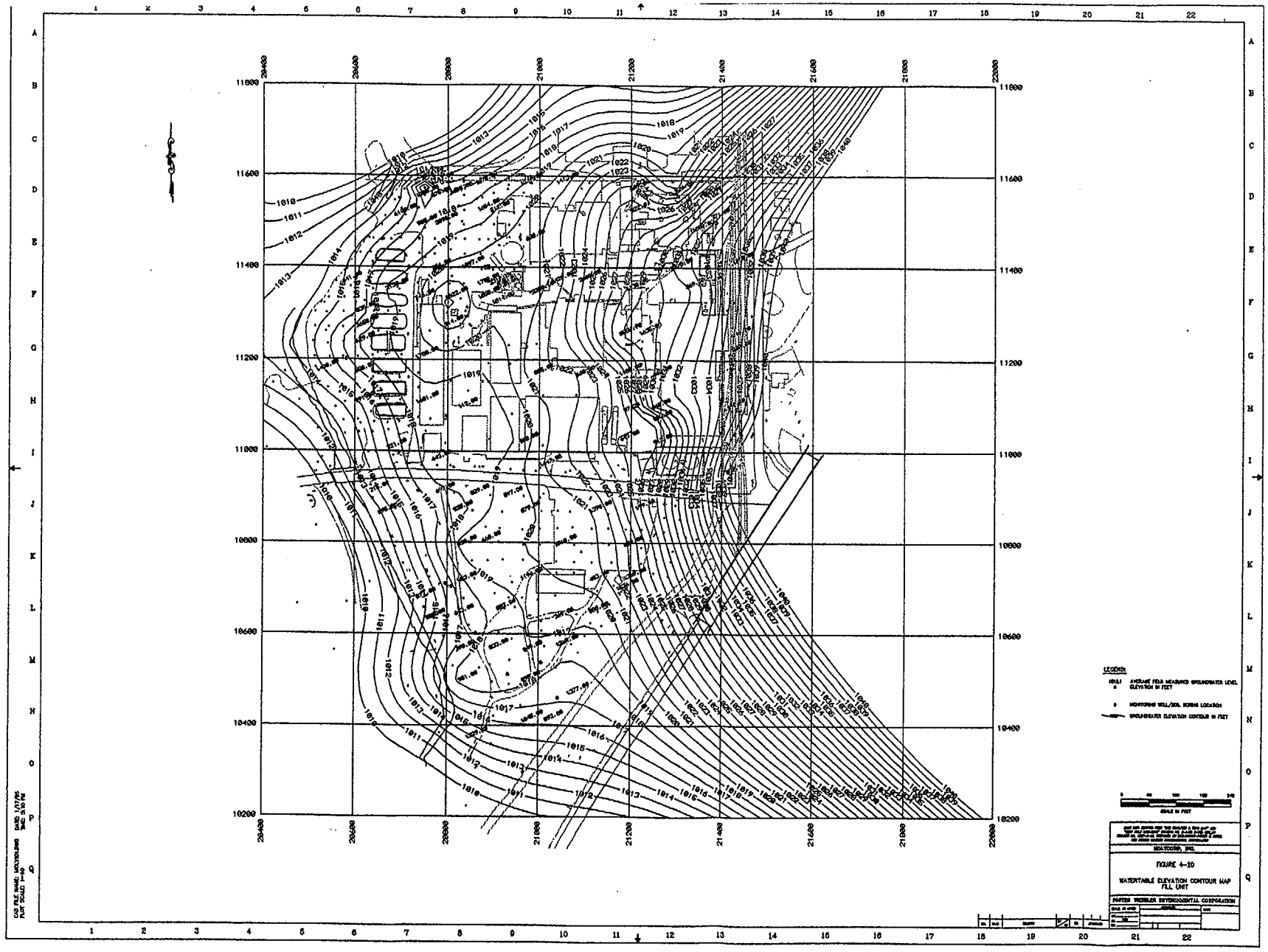
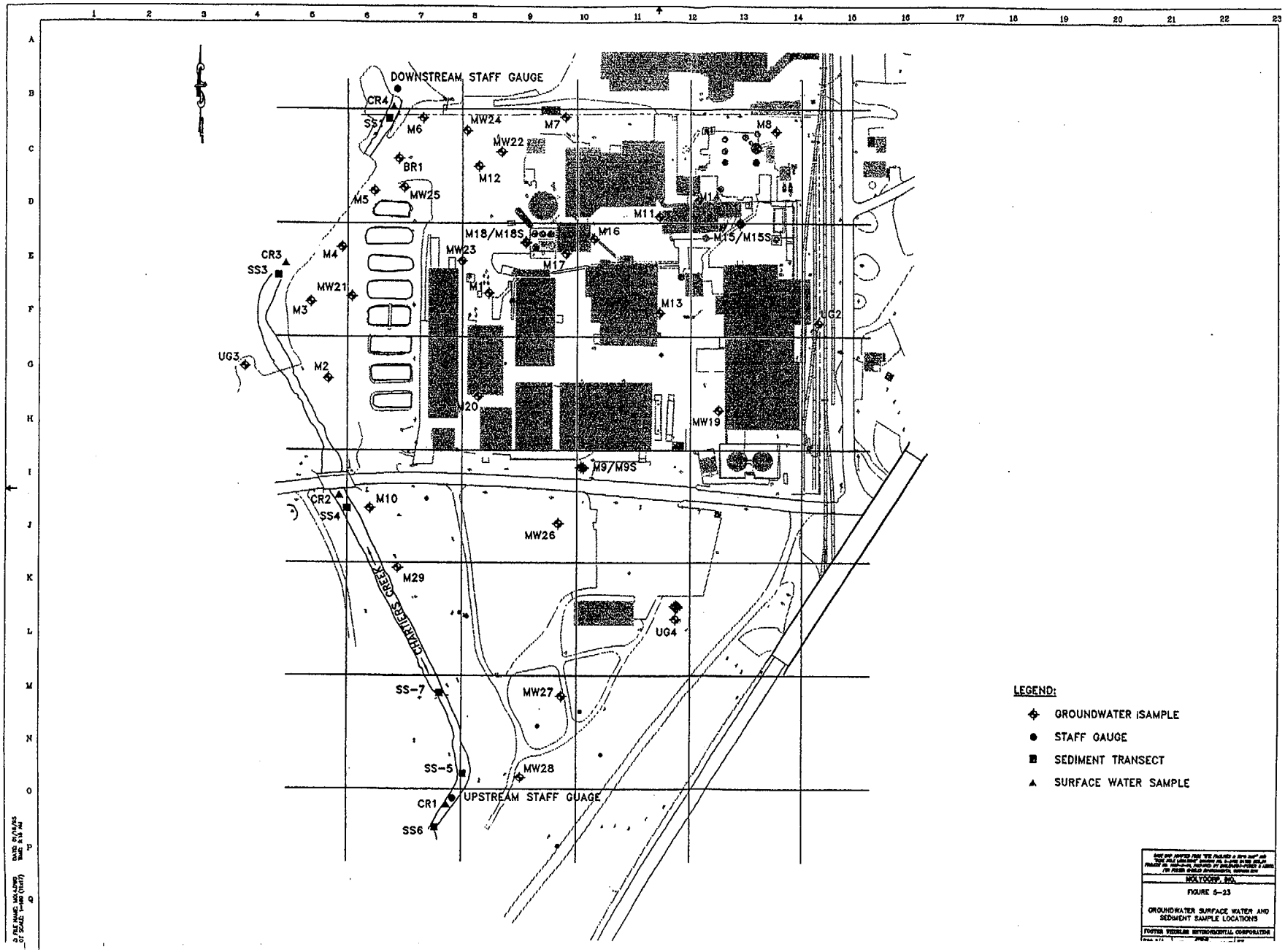
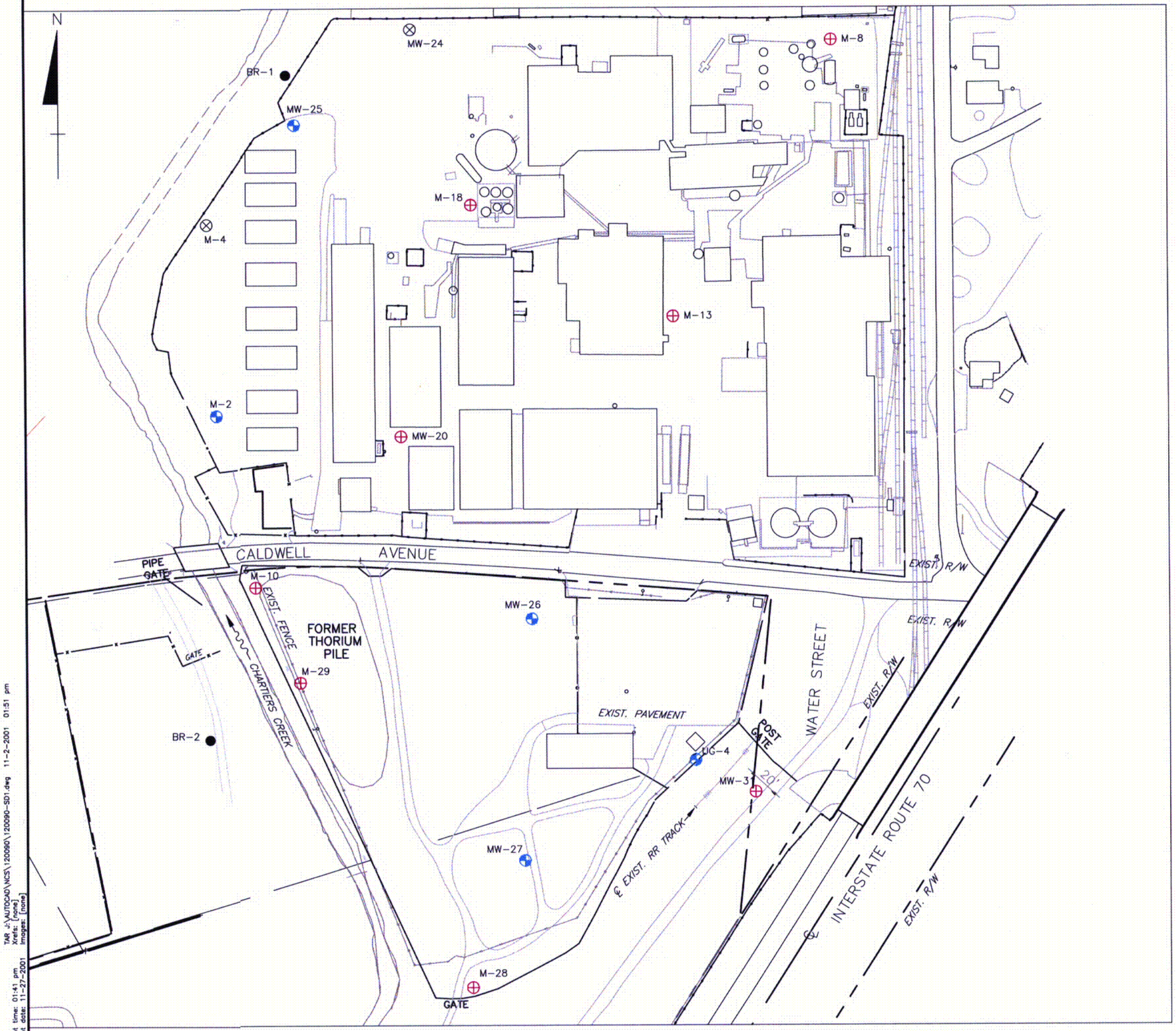
1035
1036
LEGEND:
AVERAGE FIELD MEASURED GROUNDWATER LEVEL ELEVATION IN FEET
MONITORING WELL/SOIL BORING LOCATION
GROUNDWATER ELEVATION CONTOUR IN FEET
SCALE IN FEET
MALCOLM PIRNIE, INC.
FIGURE 4-21
PIEZOMETRIC SURFACE
SAND & GRAVEL UNIT
PORTER WHEELER ENVIRONMENTAL CORPORATION


LEGEND
AVERAGE FEET MEASURED GROUNDWATER LEVEL ELEVATION IN FEET
MONITORING WELL/SOIL BORING LOCATION
GROUNDWATER ELEVATION CONTOUR IN FEET
SCALE IN FEET
MALCOLM, INC.
FIGURE 4-10
WATERTABLE ELEVATION CONTOUR MAP
FILL UNIT
PARSONS WHEELER ENVIRONMENTAL CORPORATION


DOWNSTREAM STAFF GAUGE
CR4
SS1
M6
MW24
M7
M8
MW22
BR1
M12
M5
MW25
M1
M11
M18/M18S
M16
M15/M15S
CR3
SS3
M4
MW23
M17
MW21
M3
M13
G2
UG3
M2
M20
MW19
M9/M9S
CR2
SS4
M10
MW26
M29
CHAMBERS CREEK
UG4
SS-7
MW27
SS-5
MW28
CR1
UPSTREAM STAFF GUAGE
SS6
LEGEND:
GROUNDWATER ISAMPLE
STAFF GAUGE
SEDIMENT TRANSECT
SURFACE WATER SAMPLE
HOLTCORP, INC.
FIGURE 5-23
GROUNDWATER SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS



LEGEND:

- ⊕ ALLUVIUM MONITORING WELL LOCATION
- ◒ FILL MONITORING WELL LOCATION
- ⊗ FILL AND ALLUVIUM MONITORING WELL LOCATION
- ● BEDROCK MONITORING WELL LOCATION

C01

SCALE

120 0 120 FEET

MFG

consulting scientists and engineers

800 Vinial Street, Building A,
Pittsburgh, Pennsylvania 15212
Phone (412) 321-2278
Fax (412) 321-2283

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BASEMAP PROVIDED BY ENGLEHARDT-POWERS SURVEYORS, WASHINGTON, PA, 8/28/01.

NO.	REVISIONS	BY	DATE
0	ISSUE FOR REVIEW	-	-

DESIGNED BY:	---
DRAWN BY:	TAR
CHECKED BY:	REC
APPROVED BY:	---
PCP/PC2:	MFG-750C
VIEW NAME:	
ORIGINATION DATE:	9/05/01
PLOT SCALE:	1:1
DATE:	JANUARY 2002

MOLYCORP, INC.

WASHINGTON, PA

FIGURE 3-1

LOCATION OF MONITORING WELLS INCLUDED IN GROUNDWATER MONITORING PLAN

DRAWING NO. 120090-SD1

REV.NO. 0

SHEET 1 OF 1

TAR J:\AUTOCAD\NCS\120090\120090-SD1.dwg 11-2-2001 01:51 pm
Xrefs: [none]
Images: [none]
Plot time: 01:41 pm
Plot date: 11-27-2001

LEGEND:

- ▲ PROPOSED SURFACE WATER SAMPLE LOCATION
- / PROPOSED SEDIMENT SAMPLE LOCATION

C02

SCALE

120 0 120 FEET

M F G

consulting scientists and engineers

800 Vinial Street, Building A,
Pittsburgh, Pennsylvania 15212
Phone (412) 321-2278
Fax (412) 321-2283

REFERENCE

BASEMAP PROVIDED BY ENGLEHARDT-POWERS SURVEYORS, WASHINGTON, PA, 8/28/01.

NO.	REVISIONS	BY	DATE
0	ISSUE FOR REVIEW	-	-

DESIGNED BY:	---
DRAWN BY:	MAW
CHECKED BY:	MEP
APPROVED BY:	MEP
PCP/PC2:	MFG-750C
VIEW NAME:	
ORIGINATION DATE:	9/05/01
PLOT SCALE:	1:1
DATE:	JANUARY 2002

MOLYCORP, INC.

WASHINGTON, PA

FIGURE 3-2

LOCATION OF SURFACE WATER AND SEDIMENT SAMPLES

DRAWING NO. 120090-SD2

REV.NO. 0

SHEET 1 OF 1

Plot time: 01:41 pm
Plot date: 11-27-2001
DWG: a:\AUTOCAD\WCS\120090\120090-SD1.dwg 11-2-2001 01:51 pm
Xrefs: (none)
Images: (none)

APPENDIX B

Historic Groundwater Radiological Data

MOLYCORP

RADIOLOGICAL RESULTS

Well ID# -->		M-1	M-1	M-2	M-2	M-2	M-3	M-3	M-3
Sampling Date		6/28/94	7/27/94	6/29/94	7/27/94	8/9/94	6/28/94	7/27/94	8/9/94
	Detection								
Radionuclide	Limit(pCi/L)								
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.52+/-0.16	0.52+/-0.19
Ra-228	2	<2	<2	<2	2.65+/-2.58	<2	<2	<2	3.61+/-3.08
Th-228	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-230	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-232	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-234	0.5	<0.5	<0.5	1.39+/-0.23	1.11+/-0.31	1.34+/-0.27	<0.5	<0.5	<0.5
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	<0.5	<0.5	1.57+/-0.25	1.27+/-0.33	1.24+/-0.26	<0.5	<0.5	<0.5

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

MOLYCORP

RADIOLOGICAL RESULTS

Well ID# -->		M-4	M-4	M-4	M-5	M-5	M-5D	M-5	M-6
Sampling Date		6/28/94	7/27/94	8/9/94	7/1/94	7/28/94	7/28/94	8/9/94	7/1/94
	Detection								
Radionuclide	Limit(pCi/L)								
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ra-228	2	<2	<2	<2	2.11+/-1.89	<2	<2	2.06+/-2.37	<2
Th-228	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-230	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-232	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-234	0.5	0.56+/-0.16	0.97+/-0.27	<0.5	<0.5	<0.5	<0.5	<0.5	1.72+/-0.31
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	<0.5	1.05+/-0.28	<0.5	<0.5	<0.5	<0.5	<0.5	1.55+/-0.29

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

RAD.XLS

RADIOLOGICAL RESULTS

Well ID# -->		M-6	M-6	M-7	M-7	M-8	M-8	M-9	M-9
Sampling Date		7/28/94	8/9/94	6/30/94	8/1/94	6/29/94	7/26/94	6/30/94	7/26/94
	Detection								
Radionuclide	Limit(pCi/L)								
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ra-228	2	<2	<2	2.24+/-2.46	<2	<2	3.03+/-2.71	4.92+/-3.01	<2
Th-228	0.5	<0.5	0.54+/-0.59	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-230	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-232	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-234	0.5	0.78+/-0.27	0.74+/-0.18	3.19+/-0.43	2.09+/-0.46	0.58+/-0.15	0.71+/-0.17	1.83+/-0.29	0.87+/-0.2
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	<0.5	<0.5	2.58+/-0.37	1.46+/-0.37	<0.5	<0.5	1.61+/-0.27	0.86+/-0.2

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

RAD.XLS

MOLYCORP

RADIOLOGICAL RESULTS

Well ID# -->		M-9S	M-9S	M-10	M-10	M-10	M-11	M-11	M-12
Sampling Date		6/30/94	7/26/94	7/1/94	7/28/94	8/9/94	6/29/94	7/26/94	7/1/94
	Detection								
Radionuclide	Limit(pCi/L)								
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ra-228	2	<2	<2	<2	<2	<2	<2	<2	3.16+/-1.99
Th-228	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-230	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-232	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-234	0.5	<0.5	<0.5	1.57+/-0.26	1.45+/-0.32	1.75+/-0.29	3.41+/-0.47	3.58+/-0.49	3.13+/-0.40
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	<0.5	<0.5	1.63+/-0.27	1.3+/-0.3	1.38+/-0.25	2.6+/-0.39	2.48+/-0.39	2.6+/-0.37

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

RAD.XLS

MOLYCORP

RADIOLOGICAL RESULTS

Well ID# -->		M-12	M-13	M-13	M-14	M-14D	M-14	M-15	M-15S
Sampling Date		8/2/94	6/30/94	7/26/94	6/29/94	6/29/94	7/26/94	6/29/94	6/29/94
	Detection								
Radionuclide	Limit(pCi/L)								
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ra-228	2	2.25+/-2.28	4.85+/-2.59	<2	<2	<2	<2	<2	<2
Th-228	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-230	0.5	2.97+/-0.97	<0.5	<0.5	<0.5	0.75+/-0.22	<0.5	<0.5	0.93+/-0.23
Th-232	0.5	0.74+/-0.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-234	0.5	1.66+/-0.28	0.52+/-0.15	0.63+/-0.16	<0.5	<0.5	<0.5	<0.5	<0.5
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	1.36+/-0.25	<0.5	0.68+/-0.16	<0.5	<0.5	<0.5	<0.5	<0.5

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

RAD.XLS

MOLYCORP

RADIOLOGICAL RESULTS

Well ID# -->		M-15	M-15S	M-16	M-16	M-17	M-17	M-17D	M-18
Sampling Date		7/26/94	7/26/94	6/29/94	7/6/94	6/30/94	8/2/94	8/2/94	7/1/94
	Detection								
Radionuclide	Limit(pCi/L)								
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ra-228	2	<2	<2	<2	<2	<2	<2	<2	<2
Th-228	0.5	<0.5	1.36+/-0.78	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-230	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-232	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-234	0.5	<0.5	<0.5	<0.5	<0.5	0.92+/-0.19	<0.5	<0.5	1.16+/-0.23
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	<0.5	<0.5	<0.5	<0.5	0.82+/-0.18	<0.5	<0.5	0.87+/-0.20

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

RAD.XLS

MOLYCORP

RADIOLOGICAL RESULTS

Well ID# -->		M-18	M-18S	M-18S	MW19	MW19	MW20	MW20	MW21
Sampling Date		8/3/94	7/1/94	8/3/94	7/6/94	7/26/94	7/7/94	8/1/94	7/12/94
	Detection								
Radionuclide	Limit(pCi/L)								
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.92+/-0.27	0.91+/-0.22	<0.5
Ra-228	2	3.6+/-2.11	<2	4.14+/-2.88	<2	<2	<2	3.85+/-2.63	<2
Th-228	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-230	0.5	<0.5	<0.5	1.47+/-0.39	<0.5	<0.5	<0.5	<0.5	<0.5
Th-232	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-234	0.5	1.06+/-0.24	<0.5	<0.5	0.80+/-0.18	0.55+/-0.2	<0.5	<0.5	<0.5
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	0.83+/-0.21	<0.5	<0.5	0.52+/-0.14	<0.5	<0.5	<0.5	<0.5

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

RAD.XLS

MOLYCORP

RADIOLOGICAL RESULTS

Well ID# -->		MW21	MW22	MW22	MW23	MW23	MW24	MW24	MW25
Sampling Date		8/3/94	7/12/94	8/3/94	7/7/94	7/29/94	7/12/94	8/2/94	7/12/94
	Detection								
Radionuclide	Limit(pCi/L)								
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ra-228	2	5.32+/-2.20	<2	3.08+/-2.53	<2	<2	<2	<2	<2
Th-228	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-230	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-232	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-234	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.01+/-0.25
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.73+/-0.23

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

RAD.XLS

MOLYCORP

RADIOLOGICAL RESULTS

Well ID# -->		MW25	MW26	MW26	MW27	MW27	MW28	MW28	MW29
Sampling Date		7/28/94	7/8/94	7/29/94	7/6/94	7/29/94	7/6/94	7/29/94	7/8/94
	Detection								
Radionuclide	Limit(pCi/L)								
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ra-228	2	<2	<2	5.16+/-3.55	<2	<2	<2	<2	4.52+/-2.48
Th-228	0.5	1.04+/-0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-230	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-232	0.5	1.38+/-0.39	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-234	0.5	1.07+/-0.32	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	0.89+/-0.29	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

RAD.XLS

MOLYCORP

RADIOLOGICAL RESULTS

Well ID# -->		MW29	MW29	UG2	UG2	UG3	UG3	UGM4	UGM4D
Sampling Date		7/28/94	8/9/94	7/6/94	7/26/94	7/28/94	7/8/94	7/6/94	7/6/94
	Detection								
Radionuclide	Limit(pCi/L)								
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.23+/-1.88
Ra-228	2	<2	4.52+/-2.48	<2	<2	<2	<2	<2	<2
Th-228	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5
Th-230	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5
Th-232	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5
U-234	0.5	<0.5	<0.5	2.60+/-0.37	1.63+/-0.26	<0.5	0.62+/-0.15	<0.5	<0.5
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	<0.5	<0.5	2.30+/-0.34	1.41+/-0.24	<0.5	0.60+/-0.15	<0.5	<0.5

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

RAD.XLS

MOLYCORP

RADIOLOGICAL RESULTS

Well ID# -->		UG4	CR1F(Dissolved)	CR1 Total	CR1F(Dissolved)	CR4F(Dissolved)	CR4 Total
Sampling Date		7/29/94	7/28/94	7/28/94	8/9/94	7/28/94	7/28/94
	Detection						
Radionuclide	Limit(pCi/L)						
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ra-228	2	<2	<2	5.61+/-6.67	5.70+/-2.72	<2	<2
Th-228	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-230	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-232	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-234	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

RAD.XLS

MOLYCORP

RADIOLOGICAL RESULTS

Well ID# -->		CR4F(Dissolved)	BR1	BR1	FB062994	TB071294
Sampling Date		8/9/94	7/12/94	7/28/94	6/29/94	7/12/94
	Detection					
Radionuclide	Limit(pCi/L)					
Ra-226	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ra-228	2	2.9+/-1.76	<2	<2	2.91+/-3.45	<2
Th-228	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-230	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Th-232	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-234	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-235	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U-238	0.5	<0.5	<0.5	<0.5	<0.5	<0.5

FB - Field Blank, TB - Trip Blank, D- Duplicate, F-Dissolved sample, BR- Bedrock Well, CR - Creek Well, UG - Upgradient Well, < - Less than Detection Limit.

RAD.XLS

MFG ENVIRONMENTAL SCIENTISTS & ENGINEERS

Client Sample ID: BR-1

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F1E260134-010
Work Order: ED2KW
Matrix: WATER

Date Collected: 05/25/01 1210
Date Received: 05/26/01 0840

Parameter	Result	Qual	Total Uncert. (2 σ+/-	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC SW846 9310 MOD				pCi/L	9310 MOD			
Gross Alpha	12	U	12	19	06/01/01	06/04/01	1152147	
Gross Beta	21		11	17	06/01/01	06/04/01	1152147	

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC
U Result is less than the sample detection limit.

MFG ENVIRONMENTAL SCIENTISTS & ENGINEERS

Client Sample ID: BR-2

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F1E260134-011
Work Order: ED2K0
Matrix: WATER

Date Collected: 05/25/01 0825
Date Received: 05/26/01 0840

Parameter	Result	Qual	Total Uncert. (2 σ+/-	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC SW846 9310 MOD			pCi/L		9310 MOD			
Gross Alpha	30		12	14	06/01/01	06/04/01	1152147	
Gross Beta	8	U	10	17	06/01/01	06/04/01	1152147	

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.

Bold results are greater than the MDC

U Result is less than the sample detection limit.

MFG ENVIRONMENTAL SCIENTISTS & ENGINEERS

Client Sample ID: BR-1

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F1G190180-001
Work Order: EGLFA
Matrix: WATER

Date Collected: 07/18/01 1155
Date Received: 07/19/01 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC SW846 9310 MOD				pCi/L	9310 MOD			
Gross Alpha	-2.0	U	7.6	16	08/01/01	08/04/01	1213365	
Gross Beta	11.0	U	9.3	15	08/01/01	08/04/01	1213365	

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC

U Result is less than the sample detection limit.

MFG ENVIRONMENTAL SCIENTISTS & ENGINEERS

Client Sample ID: BR-2

Severn Trent Laboratories - Radiochemistry

Lab Sample ID: F1G190180-002
Work Order: EGLFE
Matrix: WATER

Date Collected: 07/18/01 1115
Date Received: 07/19/01 0900

Parameter	Result	Qual	Total Uncert. (2 σ+/-	MDC	Prep Date	Analysis Date	Batch #	Yld %
GROSS A/B BY GFPC SW846 9310 MOD				pCi/L	9310 MOD			
Gross Alpha	-3.8	U	6.5	14	08/01/01	08/04/01	1213365	
Gross Beta	6.0	U	7.9	13	08/01/01	08/04/01	1213365	

NOTE(S)

Data are incomplete without the case narrative.

MDC is determined by instrument performance only.
Bold results are greater than the MDC
U Result is less than the sample detection limit.

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CORPORATE HEADQUARTERS

4900 Pearl East Circle
Suite 300W
Boulder, Colorado 80301-6118
303/447-1823
303/447-1836/FAX
www.mfgenv.com