

**Mid-Valley Data Gap Investigation
2nd Round
Final Delineation
Outline of Additional Work**

Overview:

In order to complete the RDX and TCE plume delineation that was conducted under the scope of the Mid-Valley Data Gap Investigation Work Plan (Shaw, 2003) several more groundwater sampling points are required. The primary data gaps remaining are as follows:

- Cross and down-gradient extent of main RDX and main TCE plumes in bedrock/overburden near fault & buried valley termini near the southern portion of Area F,
- Depth (within bedrock) delineation of main RDX and main TCE plumes at hotspots (161MW-1 and 17MW-5),
- Apparent bedrock fracture flow of RDX plume at bedrock ridge between 17MW-5 and the Mt. Hope Fault,
- Nature of contamination near spring feeding Robinson Run (Near Former Building 1038), and
- Whether contaminant migration down along the Mt. Hope Fault from eastern portions of Area L or beyond is occurring.

It is also desirable to resample previous streambed piezometer locations to re-assess the plumes' impact on nearby surface water features.

The work to be completed in order to investigate these remaining data gaps and conduct the final delineation of the Mid-Valley Areas of Concern will include the following:

- Installation of seven monitoring wells (including survey of well locations and elevations),
- Installation of four streambed piezometers,
- Development of new wells and piezometers,
- Single well permeability tests for the seven new wells,
- Synoptic round of water level measurements taken from most wells in and around the Mid-Valley Investigation Area,
- Sampling of the seven new wells, four piezometers, and ten existing wells.

All additional work listed above will be completed in accordance with the Picatinny Arsenal Facility-Wide Health and Safety Plan (Shaw, 2003), Picatinny Arsenal Facility-Wide Quality Assurance Project Plan (ICFKE, 1998) and Facility-Wide Field Sampling Plan (ICFKE, 1998).

Monitoring Well Installation:

Seven groundwater monitoring wells will be installed in the vicinity of Area L in order to investigate the remaining data gaps as outline above. All well installation and construction will be conducted in accordance with SOP F.1, Monitoring Well Installation and Development, located in Appendix A, Section F of the Facility-Wide Field Sampling Plan (FSP) (ICFKE, 1998). The techniques used for the installation and development of groundwater monitoring wells are described in Sections 3.10.1 and 3.10.2 of the Facility-Wide FSP.

The locations for the seven monitoring wells are depicted in red on **Figure 1**. The rationale for installation as well as the anticipated depths to bedrock and depths of installation associated with each monitoring well are summarized in the following Table:

**TABLE 1
SUMMARY OF NEW WELLS TO BE INSTALLED**

WELL ID	Geologic Depth	Rationale	Anticipated Screened Interval	Depth To Bedrock
125MW-2A	Top of Bedrock	Determine Cross/Down Gradient Extent of Both Plumes in Overburden near Fault Terminus and Buried Valley Terminus	ca. 50'-60' bgs	~60
125MW-2B	Bedrock	Determine Cross/Down Gradient Extent of Both Plumes in Bedrock near Fault Terminus and Buried Valley Terminus	ca. 90'-100' bgs	~60
161MW-1C	Deep Bedrock	Vertical Delineation of TCE at Hotspot	ca. 160'-175' bgs	88'
17MW-5B	Deep Bedrock	Vertical Delineation of RDX at Hotspot	ca. 80'-90' bgs	13'
B1090MW-2	Bedrock	Investigate Lateral Data Gap for TCE and RDX Plumes. Also, Investigate apparent Bedrock Fracture flow of RDX plume between Hotspot and Fault.	>20' bgs	Unknown
B1038MW-4	Bedrock	Determine Concentration of TCE in Bedrock (if any) near Overburden/Bedrock groundwater interface.	ca. 90'-100' bgs	50'
35MW-5C	Bedrock	Investigate Upgradient Extent of Plume along Mount Hope Fault	>50' bgs	Unknown

Streambed Piezometer Installation:

Four streambed Piezometers will be installed to re-assess the plumes' impact on Green Pond Brook and Robinson Run and evaluate the quality of the groundwater entering the streams. One piezometer (PZ-1 as depicted in **Figure 1**) will be installed within the spring that serves as the headwaters of Robinson

Run. Three piezometers (PZ-9, PZ-11, and PZ-15 as depicted in **Figure 1**) will be installed into the substrate of Green Pond Brook.

All piezometers will be installed by hand and constructed of 1-inch PVC pipe. Because samples will be collected from the groundwater prior to mixing with Green Pond Brook, floor samples will provide a more accurate representation of the quality of the groundwater than surface water samples collected at these locations. Installation will follow the SOP developed for hydropunch sampling (SOP F.4, Hydropunch Groundwater Sampling, located in Appendix A, Section F of the Facility-Wide FSP) with modifications due to the fact that these piezometers will be installed by hand through the stream sediments. The top of screen for the piezometers will be installed to a minimum depth of 12 inches below the solid streambed below the stream channel to ensure that the samples collected are representative of shallow groundwater.

Monitoring Well/Piezometer Development:

After installation each well will be developed to remove fine-grained sediments from the filter pack to ensure that groundwater samples from the wells will be representative of natural groundwater conditions. All wells will be developed in accordance with SOP F.1, Monitoring Well Installation and Development, located in Appendix A, Section F of the Facility-Wide FSP. The techniques used for the development of the groundwater monitoring wells are also described in Section 3.10.3 of the Facility-Wide FSP.

Single Well Permeability Testing:

Single well permeability tests (slug tests) will be conducted on each of the new wells to be installed. Both rising and falling head tests will be conducted per well and averaged for consistency. The results of these tests will provide information on the aquifer characteristics at each location, which, in conjunction with the chemical analytical data, will be used to determine contaminant migration rates. The technical approach for conducting the slug tests is described in Section 3.10.9, Aquifer Testing, of the Facility-Wide FSP and in SOP F.7, Aquifer Testing (Slug Tests), located in Appendix A, Section F of the Facility-Wide FSP.

Synoptic Round of Water Level Measurements:

Synoptic water level measurements will be collected from the seven new wells to be installed as well as from the 125 wells that were included in the round of synoptic water level collection conducted as part of the Data Gap investigation in November 2003. All wells to be included in this synoptic water level round are tabulated in **Table 2**.

Water levels for wells in which the water level exceeds the top of the inner casing will be measured using a temporary riser extension in order to calculate groundwater elevation at that location and estimate vertical groundwater gradients, if possible.

TABLE 2
WELLS TO BE INCLUDED IN SYNOPTIC

AREA	WELL ID	Aquifer
F	176D	Bedrock
F	176DB	Bedrock
G	185MW-1B	Bedrock
H	100MW-1	Bedrock
H	131MW-2	Bedrock
H	131MW-3	Bedrock
H	151MW-1	Bedrock
H	151MW-2	Bedrock
L	114MW-1B	Bedrock
L	125MW-1B	Bedrock
L	161MW-1B	Bedrock
L	168MW-1	Bedrock
L	168MW-2	Bedrock
L	168MW-3	Bedrock
L	168MW-4	Bedrock
L	171MW-1	Bedrock
L	171MW-2	Bedrock
L	171MW-3	Bedrock
L	171MW-4	Bedrock
L	17MW-3	Bedrock
L	17MW-5	Bedrock
L	6MW-4D	Bedrock
L	DM17-1	Bedrock
L	DM17-2	Bedrock
L	DM17-3	Bedrock
L	DM6-1	Bedrock
L	DM6-2	Bedrock
L	DM6-3	Bedrock
F	104MW-4	LSC
F	104MW-6B	LSC
F	176S	LSC
F	61MW-1B	LSC
F	MWF-1B	LSC
F	MWF-2B	LSC
F	MWF-3B	LSC
F	MWF-4B	LSC
G	52MW-4B	LSC
G	MW101-3B	LSC
G	MWG-1B	LSC
G	MWG-2B	LSC
H	MWG-3B	LSC
L	138MW-5B	LSC
L	35MW-5B	LSC
F	104MW-1	Unconfined
F	104MW-2	Unconfined
F	104MW-3	Unconfined
F	104MW-6A	Unconfined
F	138MW-3	Unconfined
F	138MW-4	Unconfined
F	138MW-6	Unconfined
F	139MW-1	Unconfined
F	142MW-1	Unconfined
F	61MW-1A	Unconfined
F	B462MW-1	Unconfined
F	FB303MW-1	Unconfined
F	MW106-1	Unconfined
F	MW138-1	Unconfined

AREA	WELL ID	Aquifer
F	MW138-2	Unconfined
F	MW430B	Unconfined
F	MWF-1A	Unconfined
F	MWF-2A	Unconfined
F	MWF-3A	Unconfined
F	MWF-4A	Unconfined
G	101MW-6	Unconfined
G	185MW-1A	Unconfined
G	52MW-4A	Unconfined
G	GMW-4	Unconfined
G	GMW-5	Unconfined
G	MW-1	Unconfined
G	MW101-1	Unconfined
G	MW101-3A	Unconfined
G	MW-2	Unconfined
G	MW-3	Unconfined
G	MW-4	Unconfined
G	MW52-2	Unconfined
G	MWG-1A	Unconfined
G	MWG-2A	Unconfined
H	100MW-3	Unconfined
H	128MW-1	Unconfined
H	128MW-2	Unconfined
H	128MW-3	Unconfined
H	128MW-4	Unconfined
H	131MW-1	Unconfined
H	132MW-2	Unconfined
H	55MW-1	Unconfined
H	55MW-2	Unconfined
H	55MW-3	Unconfined
H	62MW-1	Unconfined
H	62MW-2	Unconfined
H	64MW-1	Unconfined
H	64MW-2	Unconfined
H	MWG-3A	Unconfined
I	108MW-1	Unconfined
I	108MW-2	Unconfined
I	108MW-4	Unconfined
I	109MW-2	Unconfined
I	137MW-1	Unconfined
I	137MW-2	Unconfined
I	90MW-1	Unconfined
I	90MW-2	Unconfined
L	114MW-1A	Unconfined
L	125MW-1A	Unconfined
L	161MW-1	Unconfined
L	161MW-2	Unconfined
L	161MW-3	Unconfined
L	161MW-4A	Unconfined
L	161MW-4B	Unconfined
L	162MW-1	Unconfined
L	17MW-1	Unconfined
L	17MW-2	Unconfined
L	17MW-4	Unconfined
L	18MW-2	Unconfined
L	35MW-1	Unconfined
L	35MW-2	Unconfined

AREA	WELL ID	Aquifer
L	35MW-3	Unconfined
L	35MW-4	Unconfined
L	35MW-5A	Unconfined
L	6MW-4	Unconfined
L	6MW-5	Unconfined
L	B1038MW-1	Unconfined
L	B1038MW-2	Unconfined
L	B1038MW-3	Unconfined
L	B1090MW-1	Unconfined
L	LMW-1	Unconfined
L	MW-5	Unconfined

New Wells

AREA	WELL ID	Aquifer
L	125MW-2A	Unconfined
L	125MW-2B	Bedrock
L	B1038MW-4	Bedrock
L	35MW-5C	Bedrock
L	17MW-5B	Bedrock
L	161MW-1C	Bedrock
L	B1090MW-2	Bedrock

Groundwater Sampling:

Groundwater samples will be collected from seven newly installed wells, as well as seven existing wells installed in 2003 as part of the Data Gap Investigation. Three other wells located in the Mid-Valley Region corresponding to RDX and TCE 'hot-spots' will also be sampled. Groundwater samples will be collected from 10 existing wells in the Mid-Valley Region in order to provide reference data to compare with data collected during previous investigations.

Groundwater samples will also be collected from the four streambed piezometers as outlined above.

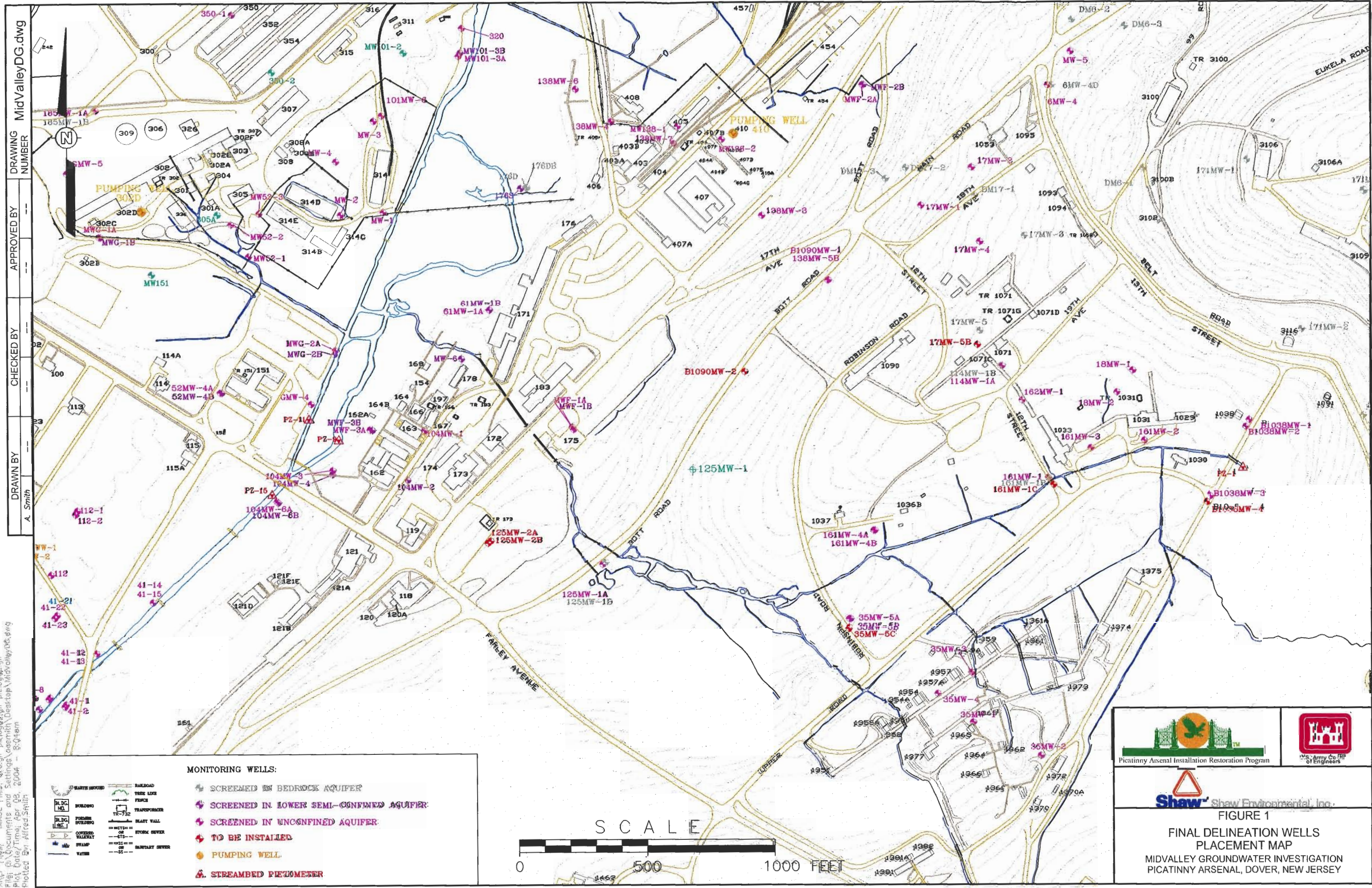
The Sampling and analysis program associated with the 21 groundwater samples is summarized in the following Table:

**TABLE 3
GROUNDWATER SAMPLING SUMMARY**

Bottle Requirements (Preservative)		3 40 ml VOAs (HCl)	2 1 Liter Amber (None)	
STL Table Number		2A	9A	
Well ID	Area	VOCs	Baseline	Explosives
17MW-5	L	x		x
161MW-1	L	x		x
B1038MW-1	L	x		
125MW-1A	L	x		x
125MW-1B	L	x		x
161MW-1B	L	x		x
162MW-1	L	x		x
171MW-4	L	x		
B1038MW-2	L	x		
B1038MW-3	L	x		x
35MW-5C	L	x		x
17MW-5B	L	x		x
125MW-2A	L	x		x
125MW-2B	L	x		x
161MW-1C	L	x		x
B1038MW-4	L	x		x
B1090MW-2	L	x		x
PZ-1	L	x		x
PZ-10	F	x		x
PZ-11	F	x		x
PZ-15	F	x		x

All groundwater samples to be collected from monitoring wells will be collected using low-flow purging and sampling techniques to minimize

disturbance to the water column above the pump intake as specified in SOP F.3, Low-Flow Groundwater Sampling, which can be found in Section F of Appendix A in the Facility-Wide FSP (ICFKE, 1998). This technique is also described in Section 3.10.5 of the FSP. It should also be noted that the purge water generated as a result of sampling activities will be dealt with in accordance with the Picatinny Arsenal FSP (ICFKE, 1998) as described in Section 3.25, Management of Investigation Derived Waste. Groundwater samples to be collected from streambed piezometers will be collected using a peristaltic pump after purging three well volumes.



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 CHECKED BY: [Signature]
 DRAWN BY: A. Smith

XREF Files: gwg.dwg, p1e1e02.dwg, p1e1e03.dwg, p1e1e04.dwg
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 Plot Date/Time: Apr 02, 2004 - 8:24am
 Plotted by: Alfred Smith

MONITORING WELLS:

	SCREENED IN BEDROCK AQUIFER
	SCREENED IN LOWER SEMI-CONFINED AQUIFER
	SCREENED IN UNCONFINED AQUIFER
	TO BE INSTALLED
	PUMPING WELL
	STREAMBED PIEZOMETER



FIGURE 1	
FINAL DELINEATION WELLS PLACEMENT MAP	
MIDVALLEY GROUNDWATER INVESTIGATION PICATINNY ARSENAL, DOVER, NEW JERSEY	