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From: Dave McCoy [mailto:dave@radfreenm.org]
Sent: Friday, December 05, 2008 1:25 PM
To: Bearzi, James, NMENV
Subject: Review of 2008 Soil Gas Report

December 5, 2008
New Mexico Environment Department
James Bearzi, Chief
Hazardous Waste Bureau

Dear Mr. Bearzi,

Please see the attached review of Citizen Action and Registered Geologist Robert Gilkeson for the 2008 Soil Gas Report. This major document was prematurely approved by NMED without submission for public review and comment as required by the May 2005 Final Order of Secretary Ron Curry. We are requesting that the document be submitted for public comment and review. The approval of the document represents acceptance by NMED of a report in which the data does not support the conclusions of the report.

Sincerely,

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December 5, 2008
Mr. James Bearzi, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

RE: - 1. NMED November 20, 2006 Notice of Disapproval: Mixed Waste Landfill Corrective Measures Implementation Work Plan, November 2005, And Requirements For Soil-Vapor Sampling and Analysis Plan Sandia National Laboratories (the November 20, 2006 NOD)

- 2. NMED September 26, 2008 Approval: *INVESTIGATION REPORT ON THE SOIL-VAPOR VOLATILE ORGANIC COMPOUNDS, TRITIUM, AND RADON SAMPLING AT THE MIXED WASTE LANDFILL, AUGUST 2008* - (the Soil Vapor Report).

- 3. NMED October 10, 2008 Notice of Disapproval: *MIXED WASTE LANDFILL CORRECTIVE MEASURES IMPLEMENTATION PLAN, NOVEMBER 2005 SANDIA NATIONAL LABORATORIES, NM5890110518 SNL-05-025* - (the October 10, 2008 NOD).

Dear Mr. Bearzi,

Regarding the above actions by the Hazardous Waste Bureau (HWB) of the New Mexico Environment Department (NMED), the Interested Parties (Citizen Action and Registered Geologist Robert H. Gilkeson) are requesting

- 1). a notice period for public comment and review of the "*INVESTIGATION REPORT ON THE SOIL-VAPOR VOLATILE ORGANIC COMPOUNDS, TRITIUM, AND RADON SAMPLING AT THE MIXED WASTE LANDFILL, AUGUST 2008*" - (the 2008 Soil Vapor Report),
- 2). a public hearing on the 2008 Soil Vapor Report, and
- 3). answers to the questions in this letter.

Major Finding No. 1. The sampling locations in the 2008 Soil Vapor Report were at too few locations to meet the requirements in the NMED November 20, 2006 NOD that are pasted below:

- From page 8 in the November 20, 2006 NOD:

  - "**<u>General Comments and Requirements for Soil-Gas Sampling</u>**
  As the Permittees are aware, most site characterization data for the MWL (other than groundwater data) dates before the mid 1990's. <u>Because the rupturing of containers and the leaking of their contents could have occurred since the mid 1990's, the NMED requires more current soil-gas data to help resolve this issue</u> [emphasis supplied]. The Permittees shall therefore collect and analyze active soil-gas samples taken at depths of 10 and 30 feet at a minimum of three locations within the landfill where previous sampling has detected the highest soil-gas concentrations in the past. The soil-gas samples shall be analyzed for volatile organic compounds, tritium, and radon."

- From page 7 in the November 20, 2006 NOD:

  - Comment no. 19 on the MWL Fate and Transport Model. "Propose some additional monitoring to be conducted at locations within the landfill where contaminants were detected at their highest levels during the RFi."

However, the data presented in the 2008 Soil Vapor Report are proof that

- 1). samples were collected at too few locations to identify the rupturing of containers and the leaking of their contents that could have occurred since the mid 1990's,
- 2). the data presented in the Soil Vapor Report show the need to collect soil-gas samples at many locations across the MWL dump and at depths much greater than 50 feet below ground surface (bgs) in order to determine the nature and extent of contamination with tritium, VOCs, and methane, and
- 3). the Soil Vapor Report did not include samples collected at important locations within the MWL dump where contaminants were detected at their highest levels during the mid-1990's Resource Conservation Recovery Act (RCRA) Facility Investigation (RFI).

The failure of the Soil Vapor Report to include samples collected at locations within the landfill where contaminants were detected at their highest levels during the mid-1990's RFI was described below in the October 10, 2008 NOD:

  - "In NOD Comment 19, NMED asked that the Permittees propose additional monitoring points at locations (surface and subsurface) within the landfill where contaminants were detected at their highest levels during the RCRA Facility Investigation of the MWL. No additional sampling was proposed by the Permittees, ..."

The October 10, 2008 NOD was issued <u>after</u> the NMED approved the 2008 Soil Vapor Report on September 26, 2008, and the failure of DOE/SNL to collect samples within the MWL dump where samples were detected at their highest levels during the RFI was reason alone that it was a mistake on September 26, 2008 for the NMED HWB to approve the DOE/SNL *Investigation Report On The Soil-Vapor Volatile Organic Compounds, Tritium, And Radon Sampling At The Mixed Waste Landfill* (the 2008 Soil Vapor Report).

The failure of the 2008 Soil Vapor Report to include subsurface samples from the locations in the Classified Area of the MWL dump where the large inventory of tritium wastes are buried in unlined pits is illustrated by Figures 1, 2, 3 and 4. Figure 1 is a map of the MWL dump. Figure 2 shows the six locations (DP1 to DP6) where subsurface samples were collected for tritium and soil-vapor VOCs. However, Figures 3 and 4 show that none of the six sampling locations were close to the unlined pits in the Classified Area of the MWL dump where the large inventory of tritium wastes are buried.

The fact that a very large inventory of the tritium wastes were buried in Pit 33 in the Classified Area was described in Finding no. 62 in the April 20, 2005 NMED Hearing Officers Report for the MWL dump. Finding no. 62 is pasted below:

  - "62. Sandia's 1992 and 1993 surface samples indicated that the highest tritium activities were at Pit 33, where records show that almost half of the curies of tritium disposed of at the landfill were placed."

Figure 4 shows that the highest tritium contamination of surface soils at the MWL dump is at the location of Pit 33 in the Classified Area. Figure 3 shows that much of the inventory of tritium waste were buried in Pit 33 and other unlined pits in the Classified Area of the MWL dump. Comparison of Figure 2 to Figure 3 shows the great distance that all of the 6 DP probe holes were located away from Pit 33 and the other unlined pits where the inventory of tritium wastes were disposed of.

Question no. 1. Why did NMED approve of the 2008 Soil Vapor Report given the failure of DOE/SNL to collect samples near the unlined pits in the Classified Area where the large inventory of tritium wastes were known to be buried?

The November 20, 2006 NMED NOD described the purpose of the 2008 Soil Vapor Report as follows:

- "Because the rupturing of containers and the leaking of their contents could have occurred since the mid 1990's, the NMED requires more current soil-gas data to help resolve this issue."

Figures 12 and 13 are pictures of barrels of waste disposed of into Trenches E and F at the MWL dump. However, Figure 2 shows that the 2006 Soil Vapor Report collected no data for tritium or VOCs at locations close to the two trenches. Figure 2 shows that DP2 was the only probe hole located in the southern part of the MWL dump and DP2 is located close to the western side of Trench G.

Question no. 2. Why did NMED approve the 2008 Soil Vapor Report given the failure of the report to investigate "the rupturing of containers and leaking of their contents" for Trenches E and F in the MWL dump?

Major Finding No. 2. NMED did not provide the required public comment on the 2008 Soil Vapor Report. The Interested Parties do not agree with the conclusions drawn by the Soil Vapor Report nor the approval of the Soil Vapor Report by the New Mexico Environment Department (NMED) that has occurred without the required written notice to the public.

The NMED did not provide the public with an opportunity to comment on the Soil Vapor Report as required by the NMED Final Order issued on May 26, 2005. The pertinent excerpts from the Final Order are pasted below:

- "3. NMED and Sandia shall provide a convenient method for the public to review Sandia's Corrective Measures Implementation Plan, Corrective Measures Implementation Report, progress reports, long-term monitoring and maintenance plan, and any other major documents developed by NMED or Sandia for the MWL ("the documents"), including but not limited to, posting the documents on a publicly-accessible website" (p. 4 in the Final Order).
- "4. NMED and Sandia shall provide a method and schedule that allows interested members of the public to review and comment on the documents, and NMED shall review, consider and respond to these public comments prior to approving any of these documents (with the exception of any documents, such as progress reports, that NMED does not approve in the normal course of permit review and oversight)" (p. 4 in the Final Order).

Question no. 3. The Soil Vapor Report is a "major document" because it will be used to validate the CMIP soil cover and the fate and transport model. Why didn't NMED comply with the requirement in the Final Order that NMED shall provide a method and schedule that allows interested members of the public to review and comment on the Soil Vapor Report, and NMED shall review, consider and respond to these public comments prior to approving the Soil Vapor Report?

Major Finding No. 3. The data presented in the Soil Vapor Report do not support the NMED finding on page 1 of the September 26, 2008 NMED approval letter for the Soil Vapor Report that is pasted below:

> - ***"The New Mexico Environment Department (NMED) has reviewed the subject report and finds the levels and distribution of tritium, radon and volatile organic compound (VOC) vapors are consistent with earlier data used to develop the conceptual model for the MWL. As demonstrated in the risk assessment that is included in the MWL Corrective Measures Study Report, similar levels detected in the past for these constituents were found not to pose unacceptable risk to human health and the environment based on an industrial land-use scenario".***

In fact, the earlier mid-1990's RCRA Facility Investigation data (RFI data) and also the new 2008 sampling data collected for the 2008 Soil Vapor Report were too sparse in locations across and in depth below the MWL dump to develop the required conceptual model for the nature and extent of tritium and VOC contamination in the vadose zone below the MWL dump. Furthermore, the documents in the NMED Administrative Record are proof that there was never a reliable network of monitoring wells at the MWL dump, and because of this fact, the risk assessment in the MWL Corrective Measures Study Report is without basis and must be retracted.

In addition, the levels of tritium contamination measured in the 2008 sampling data are markedly higher than the earlier data used to develop the conceptual model for the MWL dump. This is a serious problem which the 2008 Soil Vapor Report avoids by making the mistake to claim that the high levels are because the 2008 samples were collected inside the MWL dump and the 1995 RFI data were collected from the perimeter of the dump. The pertinent excerpt from the 2008 Soil Vapor Report is pasted below:

> - "Because none of the 2008 tritium samples were collected from the same locations that were sampled in 1995, a direct comparison of the 1995 and 2008 tritium concentrations was not possible. However, in general, tritium concentrations in the majority of the 2008 samples are higher than those in the 1995 samples. The highest tritium concentrations were 7.80E+06 picocuries per liter (pCi/L) in 1995 and 3.95E+07 pCi/L in 2008." (p. i)
>
> - "All of the 1995 tritium samples were collected from boreholes around the perimeter of the MWL, whereas 20 out of 24 of the 2008 samples were collected from the [DP sampling locations in the] interior of the MWL. The overall higher tritium concentrations found in the 2008 samples were expected because most of these samples were collected in close proximity to waste pits and trenches in the landfill." (p. i)

There is much misinformation in the above statement as described below:

First, it was a mistake in the 2008 Soil Vapor Report to describe the 2008 samples as collected in close proximity to the waste trenches and pits. Comparison of Figure 2 to Figures 3 and 4 shows that none of the six 2008 DP sample locations were in close proximity to the pits where the large inventory of tritium waste were known to be buried.

Second, it was a mistake to describe the 1995 tritium samples as collected from boreholes around the perimeter of the MWL dump because the 1995 boreholes were drilled at an angle to collect samples for tritium from locations interior to the MWL dump and below the waste trenches and pits. Figure 7 shows the locations interior to the MWL dump where samples were collected from the set of 13 angle boreholes.

Third, it was possible to locate some of the 2008 probe holes close to the 1995 angle boreholes and the decision not to do this was a mistake. Nevertheless, a comparison of Figures 2 and 7 show the close location of DP3 to angle borehole BH-11. In addition, the comparison of the two figures shows that the higher tritium concentrations would be expected at the angle borehole because it was located further to the interior of the MWL dump and DP3 was a vertical probe hole located along the perimeter. However, the table below shows the markedly higher tritium levels measured at DP3 compared to the levels measured in angle borehole BH-11.

- Borehole	10-ft Samples	30-ft Samples	50-ft Samples
- BH-11 (1995)	7,000 pCi/L	1,230 pCi/L	1,060 pCi/L
- DP3 (2008)	189,000 pCi/L	8,210 pCi/L	5,150 pCi/L
- Factor higher in 2008 compared to 1995 ---------	27 times	6.7 times	4.9 times

Figure 2 shows that DP1 is the closest probe hole to the north of the unlined pits in the Classified Area of the MWL dump where the large inventory of tritium waste were known to be buried. DP1 is located a lateral distance greater than 60 feet from Pit 33. The high levels of tritium contamination measured in the sediments samples collected from DP1 are below:

- Borehole	10-ft Samples	30-ft Samples	50-ft Samples
- DP1 (2008)	75,400 pCi/L	1,270,000 pCi/L	not sampled
- DP5 (2008)	39,500,000 pCi/L	6,820,000 pCi/L	319,000 pCi/L

Unfortunately, samples were not collected from deeper than 30 feet below ground surface at DP1. There is a need for knowledge of tritium contamination at greater depths in the vadose zone at DP1 because the contamination measured at 30 feet is 17 times higher that the contamination measured at 10 feet.

DP5 is the probe hole where the highest tritium contamination was measured in the 2008 sampling program. The measured contamination is posted in the table above. DP5 is located in the Unclassified Area a distance greater than 150 feet from Pit 33.

The 2008 study collected no data from the known tritium Hot Spots. The Soil Vapor Report makes the claim that the highest level of tritium in the vadose zone is at the location of probe hole DP5 and the report used the tritium concentration measured at DP5 to calculate risk. The pertinent excerpt from the Soil Gas Report is pasted below:

"A risk assessment evaluation was performed based on the maximum tritium concentration detected in the 2008 samples [collected at probe hole DP5]. . . The risk assessment calculations show that the tritium concentrations at the MWL pose no threat to human health or the environment." (p. i).

However, Figures 2, 3 and 4 show that probe hole DP5 is located a lateral distance of greater than 150 feet away from the large inventory of tritium waste (>1500 Curies) buried in unlined pits in the Classified Area of the MWL dump. The 2008 Soil Vapor Report made a mistake to use the level of tritium measured in DP5 for the risk assessment calculations to show that the tritium concentrations at the MWL dump pose no threat to human health or the environment.

Question no. 4. Does NMED recognize that it was a mistake for the 2008 Soil Vapor Report to use the tritium value measured in probe hole DP5 for the conclusion that the tritium concentrations at the MWL dump pose no threat to human health or the environment?

The short half-life of 12.3 years for tritium is another reason that the markedly higher levels measured in 2008 compared to 1995 are evidence of a large release of tritium and possibly other contaminants from the unlined pits and trenches in the MWL dump. For example, as described below in this letter, the 2008 sampling data are evidence of a release of VOCs from the unlined pits in the southern region of the Classified Area.

Question no. 5. Does NMED recognize that the sparse sampling data collected in the 2008 sampling program show a large increase in the tritium contamination in the vadose zone below the MWL dump as compared to the earlier RFI data?

Question no. 6. Does NMED recognize that the nature and extent of tritium contamination in the vadose zone below the MWL dump is not known at this time and additional characterization of this contamination is necessary from information collected from deep probe holes, core holes and multiple-port vadose zone monitoring wells at locations inside the Unclassified Area and the Classified Area in the MWL dump?

The calibration of the DOE/SNL Fate and Transport Model for the MWL dump requires accurate knowledge of the nature and extent of tritium contamination in the vadose zone below the dump.

Question no. 7. Does NMED recognize that 2008 Soil Vapor Report shows that the existing data on tritium contamination does not provide for accurate calibration of the DOE/SNL MWL Dump Fate and Transport Model?

Question no. 8. Does NMED recognize that the dirt cover must not be installed over the MWL dump until there is accurate knowledge of the nature and extent of the tritium (and also VOC) contamination below the MWL dump?

Major Finding No. 4. The sparse data presented in the 2008 Soil Vapor Report do not support the isopleth maps for tritium contamination that are presented in the report. The 2008 Soil Vapor Report presents isopleth maps for the nature and extent of tritium contamination to a depth of 50 feet below the 2.6 acre dump. The isopleth maps

for tritium contamination at 10 feet bgs and 50 feet bgs are in Figures 5 and 6. However, tritium contamination was only measured at six locations at depths of 10 and 30 feet below ground surface (bgs) and at only three locations at a depth of 50 feet bgs. In addition, all of the data used to construct the isopleth maps were at locations far away from the unlined pits in the Classified Area where the historical records show practically all of the tritium waste to be disposed of.

It is a serious mistake that the isopleth maps present the highest tritium contamination to be present in the vadose zone in the northwestern Unclassified Area of the MWL dump. The major mistake in using data that were too sparse and missing from important locations for the construction of the tritium concentration isopleth maps is reason for NMED to retract the approval of the 2008 Soil Vapor Report and for the NMED to order DOE/SNL to collect the necessary data that will provide for accurate isopleth maps.

Question no. 9. Does NMED recognize that the data collected in the 2008 sampling program were not sufficient for the construction of the tritium contamination isopleth maps in the 2008 Soil Vapor Report because the data were too sparse and missing from important locations where the large inventory of tritium wastes were buried?

Major Finding No. 5. The sampling data in the 2008 Soil Vapor Report were collected at too few locations across the MWL dump and at too shallow a depth to support the conclusions presented in the report for the VOC contamination. The 2008 Soil Vapor Report makes conclusions about the nature and extent of VOC contamination that are not supported by the sparse data on VOCs that were only collected at six locations across the MWL dump in the 2008 sampling program. The locations of the six DP probe holes are displayed on Figure 2. VOC soil gas samples were collected to depths of 30 feet below ground surface (bgs) at the six DP locations. Soil gas samples at the depth of 50 feet bgs were only collected at DP1, DP4 and DP6.

The sampling data in the 2008 Soil Vapor Report are too sparse to support the following conclusions on page ii in the report:

- "(t)he 1994 and 2008 overall [VOC] concentrations have declined substantially at the MWL since 1994."
- "Because the findings of this investigation are consistent with the conceptual model of the MWL, the cover should be constructed."

This conclusion in the 2008 Soil Vapor Report to install the dirt cover is not credible because of the sparse data for VOCs below the MWL dump in both the 2008 sampling program and in the earlier 1994 RFI Facility Investigation and the large increase in tritium contamination in the 2008 samples.

The sparse soil gas data collected in the 1994 RFI Facility Investigation. The 2008 Soil Vapor Report describes the importance to collect soil-gas data at locations inside the MWL dump. Nevertheless, Figures 8 and 9 show that the 1994 RFI Facility Investigation only collected soil gas samples at eight (8) locations inside the MWL dump and the 8 sampling locations were all in the northern part of the Unclassified Area. No soil gas samples were collected inside the Classified Area or inside the southern part of the Unclassified Area. In addition, for the 1994 RFI, the soil gas samples were only collected at depths of 10 and 30 feet bgs. It was a major mistake that the 1994 RFI did

not collect soil gas samples for VOC contamination to a depth of hundreds of feet below the MWL dump because of the general and large increase in VOC contamination that occurred from 10 feet to 30 feet bgs. The increase is displayed in Table 1.

Table 1. Total VOCs and PCE values measured in the eight probe holes located inside the northwestern part of the MWL dump for the 1994 RFI Investigation.

1994	Total VOCs (ppmV[A])			PCE (ppmV)		
DP[B] no.	10 ft bgs	30 ft bgs	Increase	10 ft bgs	30 ft bgs	Increase
- 5	0.340	1.130	3.3 times	0.240	0.520	2.2 times
- 6	0.410	1.690	4.1 times	0.240	0.720	3 times
- 7	0.810	3.710	4.6 times	0.310	1.100	4.5 times
- 8	0.630	3.210	5.1 times	0.200	0.790	3.9 times
- 9	2.460	4.630	1.9 times	0.380	0.690	1.8 times
- 10	30.700	27.700	~0 change	1.700	2.500	1.5 times
- 11	8.020	9.500	1.2 times	5.200	5.900	1.1 times
- 12	1.990	3.010	1.5 times	1.700	1.600	~ 0 change

[A]ppmV = parts per million volume [B]DP means direct push probe hole

The large increase in measured VOC contamination from 10 ft to 30 ft bgs at the sparse number of sampling locations inside the MWL dump was an important reason for the mid-1990's RCRA Facility investigation to collect VOC soil-gas data at many locations across the MWL dump and to depths of greater than 200 feet bgs. However, this necessary sampling program was never done at any time including the 2008 study.

The important need to characterize VOC contamination in the vadose zone to depths greater than 200 feet below the MWL dump is illustrated by the VOC plume that is present below the SNL Chemical Waste Landfill (CWL). Figure 10 is a cross-section view of the Total VOC Contamination in the plume below the SNL CWL. The figure shows that the highest VOC concentrations are present at a depth of approximately 200 feet below the CWL and that much lower values are present at a shallow depth.

Figure 10 also shows that the total VOC concentrations at a shallow depth below the SNL CWL are comparable to the total VOC concentrations that were measured in most of the 8 probe holes in Table 1 for the MWL dump.

Figure 10 also shows the importance to locate multiple-port vadose zone monitoring wells at locations inside the MWL dump in order to detect and monitor the vapor phase contamination. This is because Figure 10 shows that monitoring wells D-3 and MW-2A that are located along the perimeter of the SNL CWL do not provide resolution of the plume.

Figure 10 shows the mistake in the plans of DOE/SNL to locate the multiple-port vadose zone monitoring wells (e.g., the three FLUTe[B] wells in Figure 11) at distances greater than 50 feet away from the boundary of the MWL dump. The great decline in PCE concentrations that occur with distance away from the MWL dump is also illustrated by the data in Figures 8 and 9. The very large decline in concentrations with lateral

distance away from the western boundary of the MWL dump that is displayed in Figures 8 and 9 and the poor resolution in Figure 10 of the plume below the SNL CWL for monitoring wells located along the perimeter of the CWL are all important information that shows the important need to locate multiple-port vadose zone monitoring wells inside the MWL dump and close to the unlined pits and trenches. If there is resistance to locating the monitoring wells inside the MWL dump, then the necessary multiple-port monitoring wells can be installed in angle boreholes that are located outside the planned boundary of the dirt cover.

Question no. 10. Does NMED recognize that the body of knowledge shows that the proposed locations of the three FLUTe[B] wells outside the boundary of the dirt cover will prevent the wells from the detection of VOCs and tritium that are released from the unlined pits and trenches in the MWL dump?

Question no. 11. Does NMED recognize the need to locate multiple-port vadose zone monitoring wells inside the MWL dump or in angle boreholes drilled under the unlined pits and trenches from locations outside the planned perimeter of the dirt cover?

Major Finding No. 5. The statements about the VOC and tritium contamination in the 2008 Soil Vapor Report that are incorrect to the data. Three examples of statements in the 2008 Soil Vapor Report that are incorrect to the data in the report are presented in this section. The first example is the following statement on page 7-2 in the report:

- "In addition, CFC-12, PCE, TCE, and total VOC concentrations in the 50-foot samples collected in 2008 are less than those in the 30-foot samples, which indicates that soil-vapor VOC concentrations decrease with depth."

In fact, the 50-foot samples were collected at only three locations in the sparse set of samples that were collected at only eight locations in 2008. In addition, for the location of DP3 in the southern part of the Classified Area of the MWL dump, all of the VOC constituents show an increase in concentrations in the 30-foot and in the 50-foot samples as compared to the concentrations in the 10-ft samples. The data from DP3 are presented below in Table 2. For DP3, the data in Table 2 show large increases with depth to 50-feet for total VOCs and methane.

The data in Table 2 indicate that soil-vapor VOC concentrations increase with depth at the location of DP3 and the VOC concentrations at depths greater than 50-feet are not known but must be investigated with a new sampling program that measures VOC concentrations through the total thickness of the vadose zone and at the water table. Figures 1 and 2 show that probe hole DP3 is located approximately 25 feet west of pit SP-1 where disposal of hazardous wastes began in 1959 and the Chemical Waste Landfill at SNL did not open until 1962.

The location of a monitoring well installed across the water table at a location near DP3 is necessary because of 1). the large amount of hazardous wastes disposed of into pit SP-1 (known as the "Acid Pit"), 2). the increasing concentrations of VOCs measured in soil gas samples collected from DP3, and 3). the southwest direction of groundwater travel at the water table below the MWL dump.

Question no. 12. Does NMED recognize the need to locate a multiple-port vadose zone monitoring well with ports to a depth greater than 400-feet below ground surface at the location of DP3?

Question no. 13. Does NMED recognize the need to install a monitoring well across the water table at a location immediately south of the Classified Area of the MWL dump to monitor contamination below the unlined pits including the "Acid Pit" which is located in the southeast corner of the Classified Area?

Table 2. Concentrations of VOCs measured in soil gas samples collected from the 2008 DP probe holes.

	ppbV				
- DP3	CFC-12	PCE	TCE	total VOC	methane
- 10-ft	55	53	39	658	ND (1,900)
- 30-ft	100	100	110	904	220,000
- 50-ft	110	120	140	1,330	5,400,000
- DP4					
- 10-ft	70	120	34	446	ND (1,900)
- 30-ft	110	190	100	893	4,600
- DP6					
- 10-ft	31 [30]	1.2 [190]	4.2 [42]	111 [373]	ND (1,900)
- 30-ft	53 [53]	310 [300]	110 [110]	670 [654]	ND (1,900)

ppbV = parts per billion on a volume basis
ND (1,9000 = not detected at the listed method detection limit
[30] = value in brackets is for duplicate sample

Table 2 presents the VOC concentrations measured at the locations of probe holes DP4 and DP6 where samples were only collected to a maximum depth of 30-feet. However, for both DP4 and DP6, there are marked increases in the VOC concentrations measured at 30-feet compared to the values measured at 10-ft below ground surface.

Overall, the data in Table 2 show that it was a mistake for the 2008 Soil Vapor Report to make the statement that the data "indicates that soil-vapor VOC concentrations decrease with depth." In fact, the sparse data show that VOC concentrations increase with depth at 50% of the sampling locations and the nature and extent of VOC (and Tritium) contamination below the MWL dump is not known but must be investigated before the soil cover is installed over the dump.

Question no. 14. Does NMED recognize that the increasing trends in VOC contamination measured in soil gas samples collected from 50% of the probe holes in the 2008 Soil Vapor Report requires additional investigation of the nature and extent of VOC contamination in the vadose zone and in the groundwater below the MWL dump?

The second example of statements in the 2008 Soil Vapor Report that are incorrect to the data is the statement on page 6-3 about trigger levels:

- "The maximum concentrations of PCE and TCE in the 1994 samples were less than the respective [long-term monitoring and maintenance plan] LTMMP triggers, and total VOCs exceeded the trigger."

The mistake in the above statement is that it does not acknowledge that the 1994 samples were collected only at eight locations inside the MWL dump and only at depths of 10-feet and 30-feet below ground surface. Table 1 presents the large increase in measured concentrations for total VOCs and PCE that were measured in the 30-ft samples compared to the values measured in the 10-ft samples. It is possible that contamination levels increased at greater depth below the MWL to concentrations that exceeded the trigger levels for PCE, TCE and total VOCs. For example, Figure 10 shows that the measured levels of total VOCs were below the trigger level (e.g., 25 parts per million on a volume basis) at depths to greater than 100 feet below ground surface but increased to levels greater than 2-4 times the trigger level at a depth of ~ 200 feet below ground surface. The same increase in VOC contamination may be present in the vadose zone below the MWL dump but the contamination has never been studied.

Question no. 15. Does NMED recognize that the nature and extent of VOC contamination in the vadose zone below the MWL dump is not known and the contamination may exceed the trigger levels in the LTMMP as indicated by the VOC plume below the SNL Chemical Waste Landfill?

The third example of statements in the 2008 Soil Vapor Report that are incorrect to the data is the statement on page i about the tritium contamination:

- "All of the 1995 tritium samples were collected from boreholes around the perimeter of the MWL, whereas 20 out of 24 of the 2008 samples were collected from the [DP sampling locations in the] interior of the MWL. The overall higher tritium concentrations found in the 2008 samples were expected because most of these samples were collected in close proximity to waste pits and trenches in the landfill." (p. i)

The mistake in this statement was described earlier on page 4 of this letter. In fact, the 1995 samples were collected from boreholes drilled at an angle to collect samples from under the unlined pits and trenches in the MWL dump.

The fourth example of statements in the 2008 Soil Vapor Report that are incorrect to the data for tritium contamination is the statement on page i about the risk assessment:

- "A risk assessment evaluation was performed based on the maximum tritium concentration detected in the 2008 samples [collected at probe hole DP5]. . . The risk assessment calculations show that the tritium concentrations at the MWL pose no threat to human health or the environment." (p. i).

In fact, as described on page 6 of this letter, the risk assessment was not credible because all of the tritium samples collected in the 2008 sampling

program were at locations far away from the unlined pits in the Classified Area where the large inventory of tritium wastes were known to be buried.

Major Finding No. 6. The incorrect statement in the 2008 Soil Vapor Report about the disposal of liquid wastes in the MWL dump. The pertinent excerpt is on page 1-1 of the 2008 Soil Vapor Report:

- "With the exception of a one-time disposal of coolant water to Trench D, disposal of free liquids at other disposal pits and trenches was not allowed at the MWL. Liquids such as acids, bases, and solvents were solidified with commercially available agents before containerization and disposal."

The above statement is incorrect and in contradiction with Finding No. 34 in the April 25, 2005 Hearing Officer's Report for the MWL dump. Finding No. 34 is pasted below:

> "Prior to 1975, liquid radioactive wastes were disposed in the landfill without solidification or other treatment. In 1975, up to 5,000 gallons of potable water were used to extinguish a fire in Trench B; however, the exact quantity of water is unknown." (NMED Administrative Record No. 000819).

Question no. 16. Why does NMED allow DOE/SNL to make statements in reports like the 2008 Soil Vapor Report that are not factual and not accurate to the NMED Administrative Record?

Major Finding No. 6. Nickel and chromium are contaminants of concern for the waste disposed of in the MWL dump according to the findings from the mid-1990's RCRA Facility Investigation. In the October 10, 2008 NMED Notice of Disapproval for the DOE/SNL Corrective Measures Implementation Plan, NMED requested DOE/SNL to provide additional monitoring at locations where contaminants were detected at their highest levels during the 1990's RCRA Facility Investigation. The pertinent excerpt from the NMED NOD is pasted below:

> "In NOD Comment 19 [in the November 20, 2006 NMED NOD] , NMED asked that the Permittees propose additional monitoring points at locations (surface and subsurface) within the landfill where contaminants were detected at their highest levels during the RCRA Facility Investigation of the MWL. No additional sampling was proposed by the Permittees, chiefly on the basis that intrusive monitoring techniques could possibly compromise cover integrity. However, NMED believes that additional monitoring points can be located within the landfill, and that such monitoring can be conducted without necessarily driving heavy vehicles over the landfill surface. The Permittees shall propose additional monitoring points at locations within the landfill where radon, tritium, and VOCs were detected at their highest levels during the RCRA Facility Investigation. These monitoring locations should consider air, surface soil, and subsurface soil as media to be monitored." (page 4 in the NMED October 10, 2008 NOD).

The NMED is correct to identify the need for additional monitoring points within the landfill at locations within the landfill where contaminants were detected at their highest levels during the RCRA Facility Investigation (RFI) of the MWL dump. This need must also address the failure of the RFI to characterize the nature and extent of contamination

in the vadose zone below the MWL dump and in the groundwater because of the history of waste disposal in the MWL dump. The contamination of groundwater because of the disposal of RCRA hazardous liquid wastes including chromium into Trench D in the Unclassified Area and RCRA hazardous VOC wastes into the Acid Pit in the Classified Area of the MWL has never been investigated. In addition, the nature and extent of the nickel plume identified in all of the water samples produced from monitoring well MW1 has not been characterized. Table 3 lists the nickel contamination measured in water samples produced from the four MWL dump monitoring wells with stainless steel screens installed across the water table. The locations of the four monitoring wells are on Figure 1.

Table 3. Total and Dissolved Nickel Measured in the Water Samples Produced From Monitoring Well MWL-MW1, -MW-3, -BW1 and - MW2 at the Sandia Mixed Waste Landfill. The four wells have stainless steel screens.

Date	- Well MW1 Nickel (ug/L) T / D	- Well MW3 Nickel (ug/L) T / D	- Well BW1 Nickel (ug/L) T / D	- Well MW2 Nickel (ug/L) T / D
09 - 90	46 / 43	ND[a]<40/ND< 40	ND<40/ND<40	ND<40/ND<40
01 - 91	NA[b] / NA	NA / NA	NA / NA	NA / NA
04 - 91	NA / NA	NA / NA	NA / NA	NA / NA
10 - 91	NA / NA	NA / NA	NA / NA	NA / NA
07 - 92	150 / 63	66 / 43	ND<40/ND<40	ND<40 / ND<40
01 - 93	78 / NA	26 (j)[c] / NA	ND < 40 / NA	ND < 40 / NA
04 - 93	97 / 94	37 (j) / 33 (j)	7.5 / 16	14 (j) / 13 (j)
11 - 93	95 / NA	ND < 40 / NA	ND < 40 / NA	ND < 40 / NA
05 - 94	110 / NA	ND <40 / NA	NA / NA	ND < 40 / NA
10 - 94	130 / NA	ND < 40 / NA	9.8 (j) / NA	ND < 40 / NA
04 - 95	120 / NA	NA / NA	9.3 (j) / NA	7.5 (j) / NA
10 - 95	107 / NA	7.99 (j) / NA	1.96 (j) / NA	NA / NA
04 - 96	145 / NA	3.67 (j) / NA	ND < 0.81 / NA	3.42 (j) / NA
04 - 97	NA / NA	NA / NA	NA / NA	NA / NA
10 - 97	NA / NA	NA / NA	NA / NA	NA / NA
04 - 98	398 / 538	36.2 / 28.5	2.9 (j) / NA	5 (j) / 4
11 - 98	490 / 467	18 / 18.3	7.19 / 9.47	4.49 / 3.42
04 - 99	266 / 313	31 / 31.3	12.8 / 14.3	5.31 / 4.37
04 - 00	279 / 281	25.1 / NA	16.5 / NA	124 / NA
04 - 01	252 / NA	14.1 / NA	191 / NA	88.2 / NA
04 - 02	265 / NA	96.1 / NA	13.6 / NA	89.7 / NA
04 - 03	374 / NA	NA / 69.4	26.6 / NA	52 / NA
04 - 04	401 / NA	56 / NA	33.2 / NA	10.5 / NA
04 - 05	424 / 405	17.3 / 11.5	35.5 / NA	10.5 / NA
04 - 06	477 / NA	157 / NA	NA / NA	6. 76 / NA
04 - 07	436 / 284	84.8 / 120	NA / NA	7.34 / 5.41

T = Concentration of total nickel measured in an unfiltered water sample
D = Concentration of dissolved nickel measured in a filtered water sample
ug/L = micrograms per liter or parts per billion
ND[a] = nickel was not detected at the listed minimum detection level
NA[b] = nickel was not analyzed in samples collected on this date
(j)[c] = the listed value is an estimated value

- **The NMED approved background concentration for total and dissolved nickel in groundwater is 28 ug/L.**
- **The NMED proposed trigger for total and dissolved nickel in groundwater is 50 ug/L.**

The nickel plume is growing in size and for the past few years has been detected in the water samples produced from both monitoring wells MW1 and MW3. Table 3 lists the nickel contamination measured in water samples produced from the four MWL dump monitoring wells with stainless steel screens installed across the water table. The locations of the four monitoring wells are on Figure 1.

The high levels of dissolved nickel were measured in wells MW1 and MW3 that are located close to the buried waste and low levels of dissolved nickel were measured in wells BW1 and MW2 that are located distant from the MWL dump. The 10/10/08 NOD identifies nickel as a contaminant of concern for wastes disposed of in the MWL dump and sets the trigger level for nickel contamination in groundwater at 50 ug/L. Table 1 shows that the dissolved nickel contamination measured in water samples produced from well MW1 consistently exceeded the proposed NMED trigger level of 50 ug/L beginning in 1992 up to the most recent water samples collected in 2007. In addition, Table 1 shows that the dissolved nickel contamination measured in water samples produced from well MW1 has consistently exceeded the WQCC standard of 200 ug/L for the past ten years.

The NMED has made a mistake to assign the nickel contamination in well MW1 as only from corrosion of the stainless steel screen. The high nickel concentrations measured in well MW1 and now also in well MW3 compared to the low values measured in wells BW1 and MW2 are statistically significant evidence of contamination under RCRA. The nature and extent of this contamination must be characterized by installing a new monitoring well across the water table near the location of well MW1. The new well should have a PVC screen and casing, and water samples should be collected with low-flow pumping methods. NMED has made a mistake to order DOE/SNL to plug and abandon well MW1 without requiring the installation of a new monitoring well to investigate the nickel plume.

Question no. 17. Why hasn't NMED required DOE/SNL to characterize the nature and extent of the nickel plume in the groundwater at the water table below the MWL dump?

The mistakes and deficiencies in the 2008 Soil Vapor Report and its findings are a matter of significant public interest. A Soil Gas Technical Hearing was held on this matter on May 1, 2007 and comments on the technical hearing were submitted by Citizen Action and Gilkeson. Nevertheless, the tritium and soil gas sampling activities at the MWL dump in 2008 were not responsive to the comments provided to NMED by Citizen Action and Gilkeson.

Please provide answers to the 17 questions as soon as practicable.

Sincerely,

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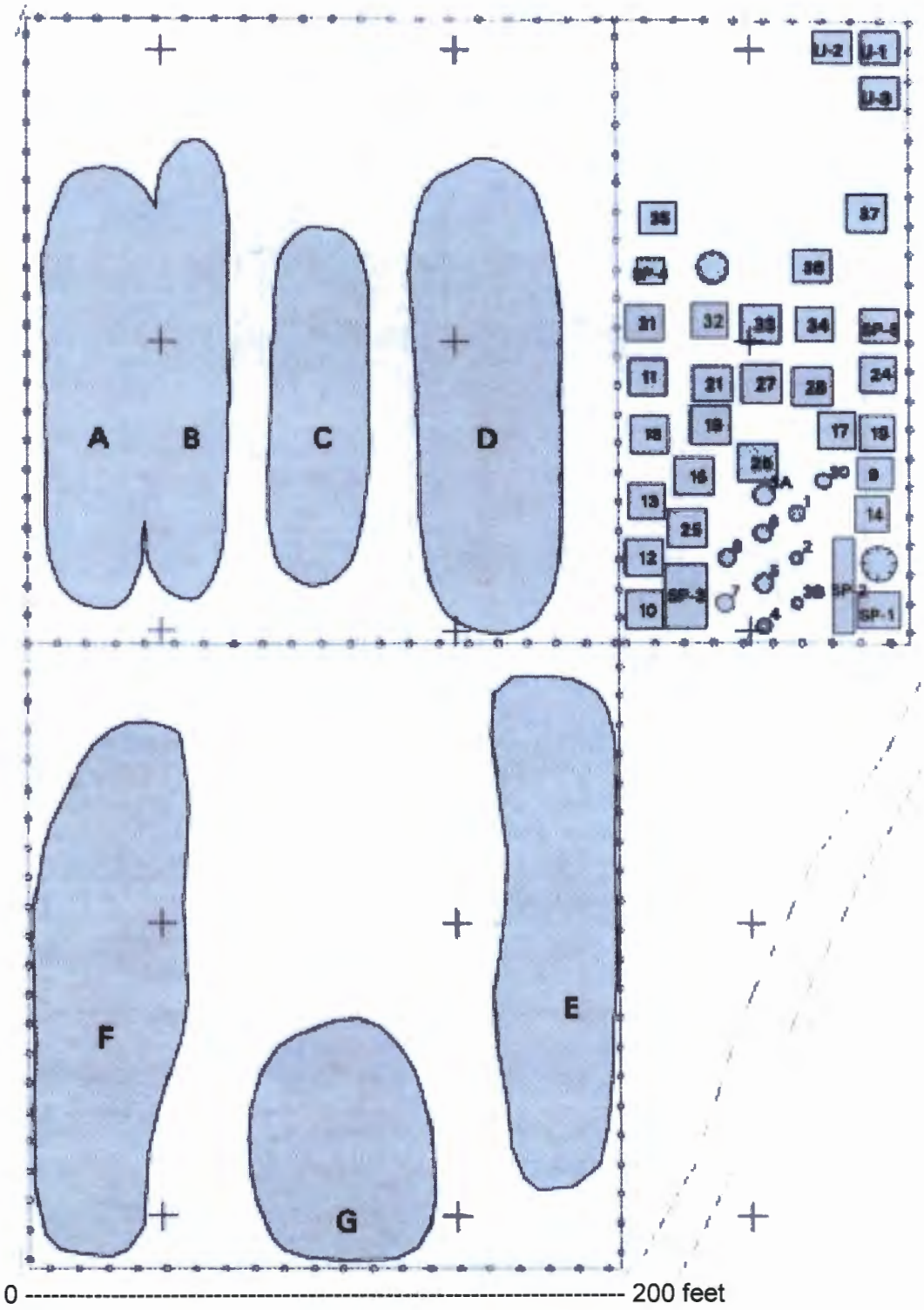
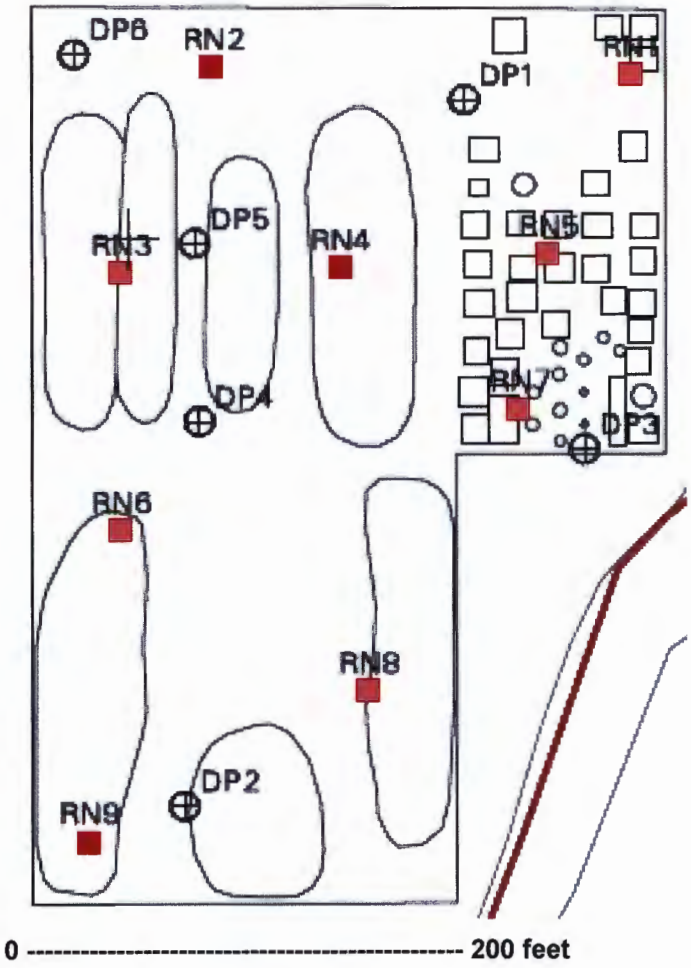
Figure 1. Map of unlined disposal trenches and pits at the Sandia MWL dump
Unclassified Area - Trenches A to G
Classified Area - Pits 1 to 37, U-1 to U-3, SP-1 to SP-4



Source: Figure 2 in 2001 WERC Report *"Mixed Waste Landfill Peer Review"*

Figure 2. 2008 Radon, Tritium and Soil-Vapor VOC Locations at the Sandia Mixed Waste Landfill Dump.



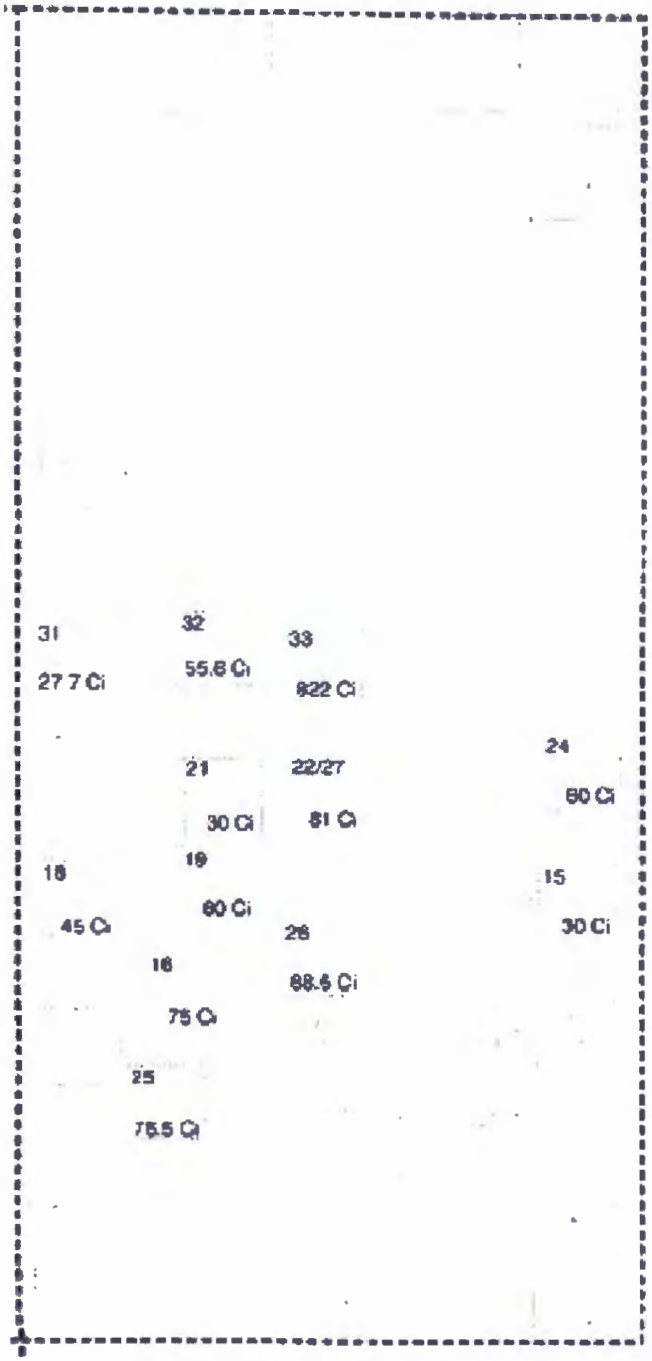
- DP1 to DP6 Six locations where subsurface samples were collected for tritium and soil-vapor VOCs.
- DP2, DP3, DP5 Three locations where tritium and VOC analyses were on samples collected at depths of 10, 30 and 50 feet.
- DP1, DP4, DP6 Three locations where tritium and VOC analyses were on samples collected at depths of 10 and 30 feet.

- Tritium analyses were on sediment samples.
- VOC analyses were on soil gas samples.

Source: From Figure 4-1 in DOE/SNL *Investigation Report On The Soil-Vapor Volatile Organic Compounds, Tritium and Radon Sampling At The Mixed Waste Landfill* August 2008 DOE Sandia Site Office

Figure 3. Inventory of Tritium Buried in Unlined Pits in the Classified Area of the Sandia MWL Dump.

- For Example - 822 Curies of Tritium were buried in Pit 33



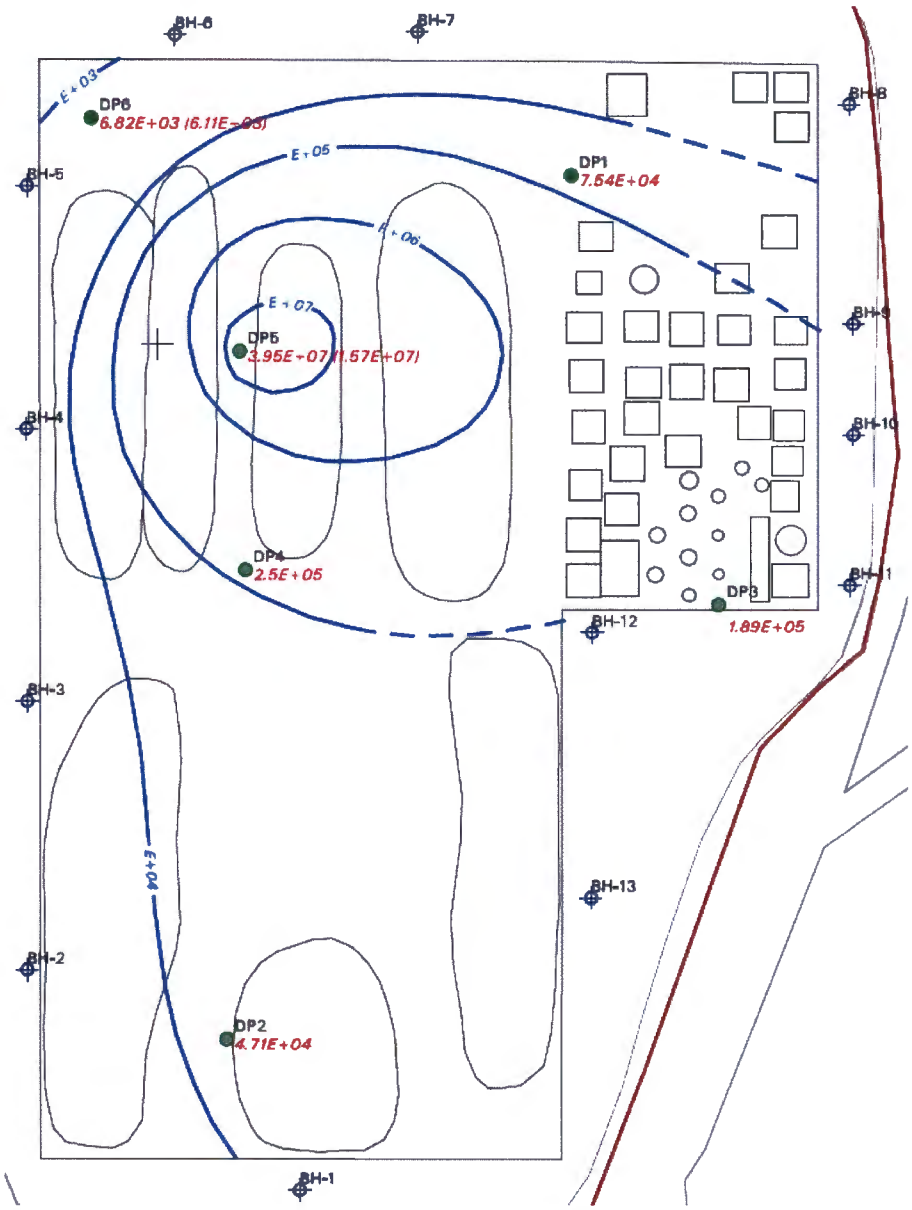
Source: Figure 9 in 2001 WERC Report *"Mixed Waste Landfill Peer Review"*

Figure 4. Tritium in Surface Soils at the Sandia MWL Dump (1993 RFI data).

------- 1 to 1000 ------- Tritium isopleths (picocuries / gram)

Source: Sandia MWL Corrective Measures Study Final Report May 2003

Figure 5. 2008 Tritium Sediment Sample Concentration Isopleths (pCi/L) at the 10-foot depth at the DOE/SNL MWL Dump

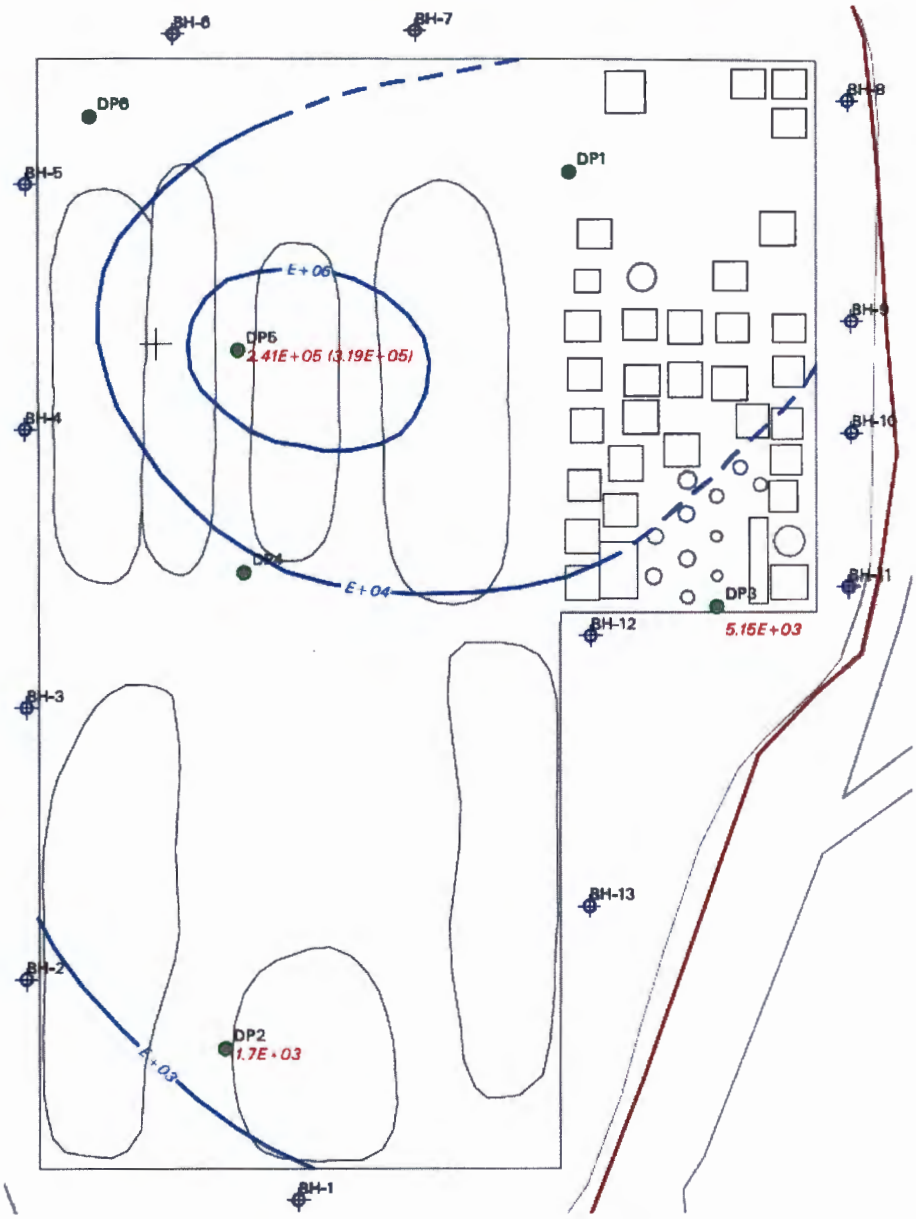


0 ---------- 200 feet

- DP1 to DP6 - Six 2008 Vertical Probe Holes where Tritium (Pci/L) was measured on sediment samples collected at a depth of 10 feet.
- BH-1 to BH-13 - Thirteen Angle Coreholes where triitum was measured on sediment samples collected from below pits and trenches in the MWL dump.

Source: Figure 6-3 in DOE/SNL 2008 Soil Vapor Report For MWL dump.

Figure 6. 2008 Tritium Sediment Sample Concentration Isopleths (pCi/L) at the 50-foot depth at the DOE/SNL MWL Dump



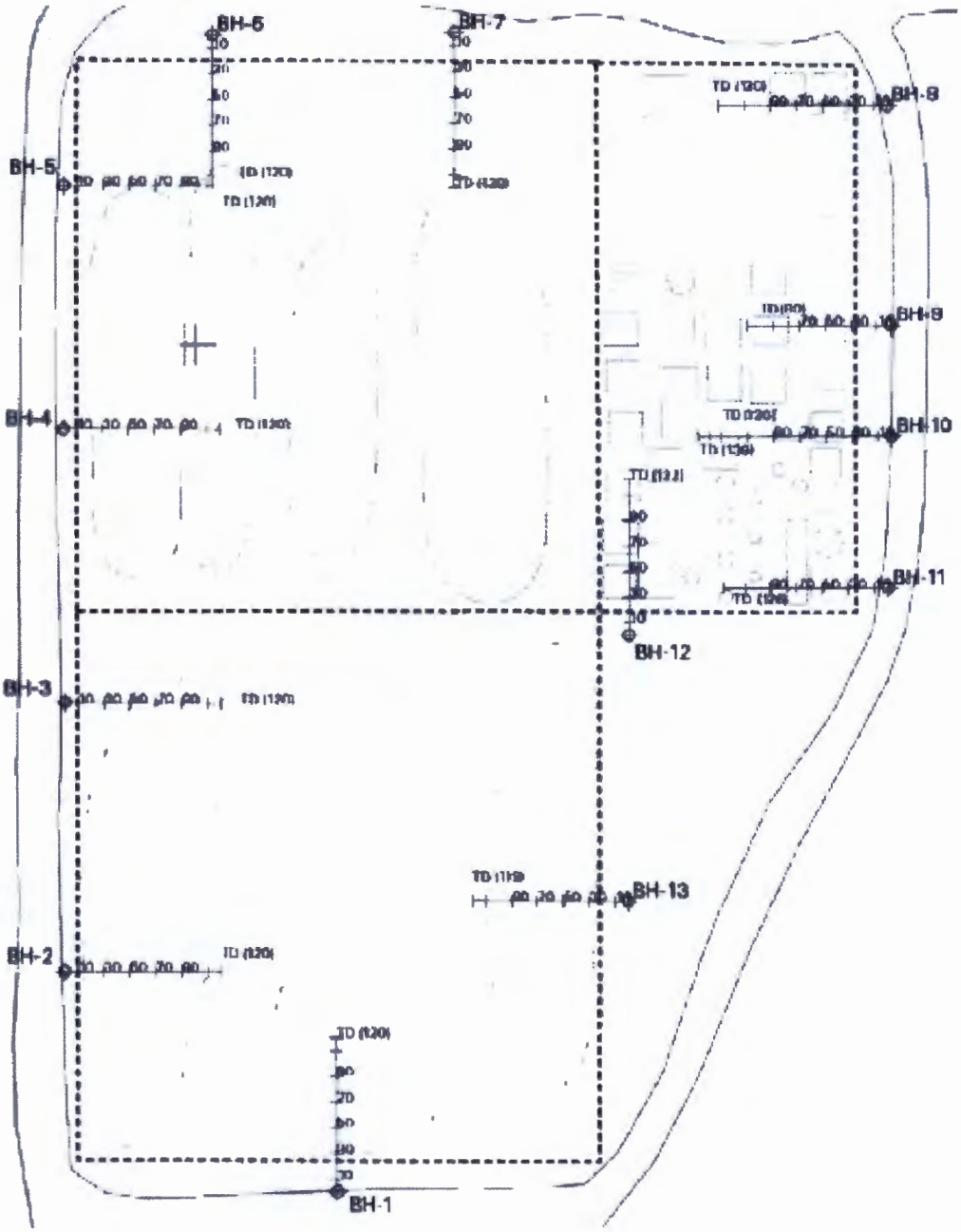
0 ---------- 200 feet

- DP2, DP3 and DP5 - Three 2008 Vertical Probe Holes where Tritium (Pci/L) was measured on sediment samples collected at a depth of 10 feet.

- BH-1 to BH-13 - Thirteen Angle Coreholes where triitum was measured on sediment samples collected from below pits and trenches in the MWL dump.

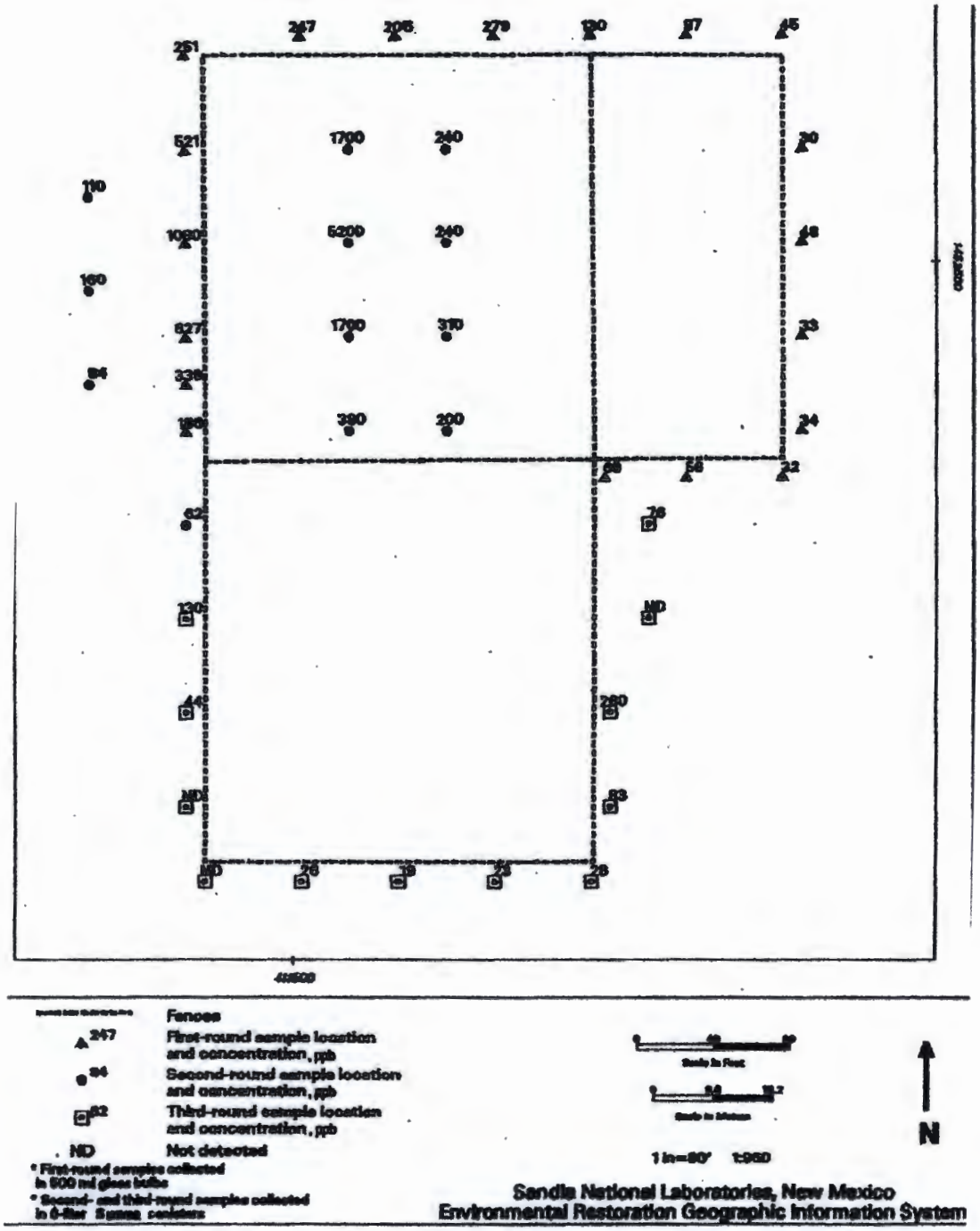
Source: Figure 6-5 in DOE/SNL 2008 Soil Vapor Report For MWL dump.

Figure 7. Map of the 1994 RFI Angle Boreholes Below the Sandia MWL Dump.



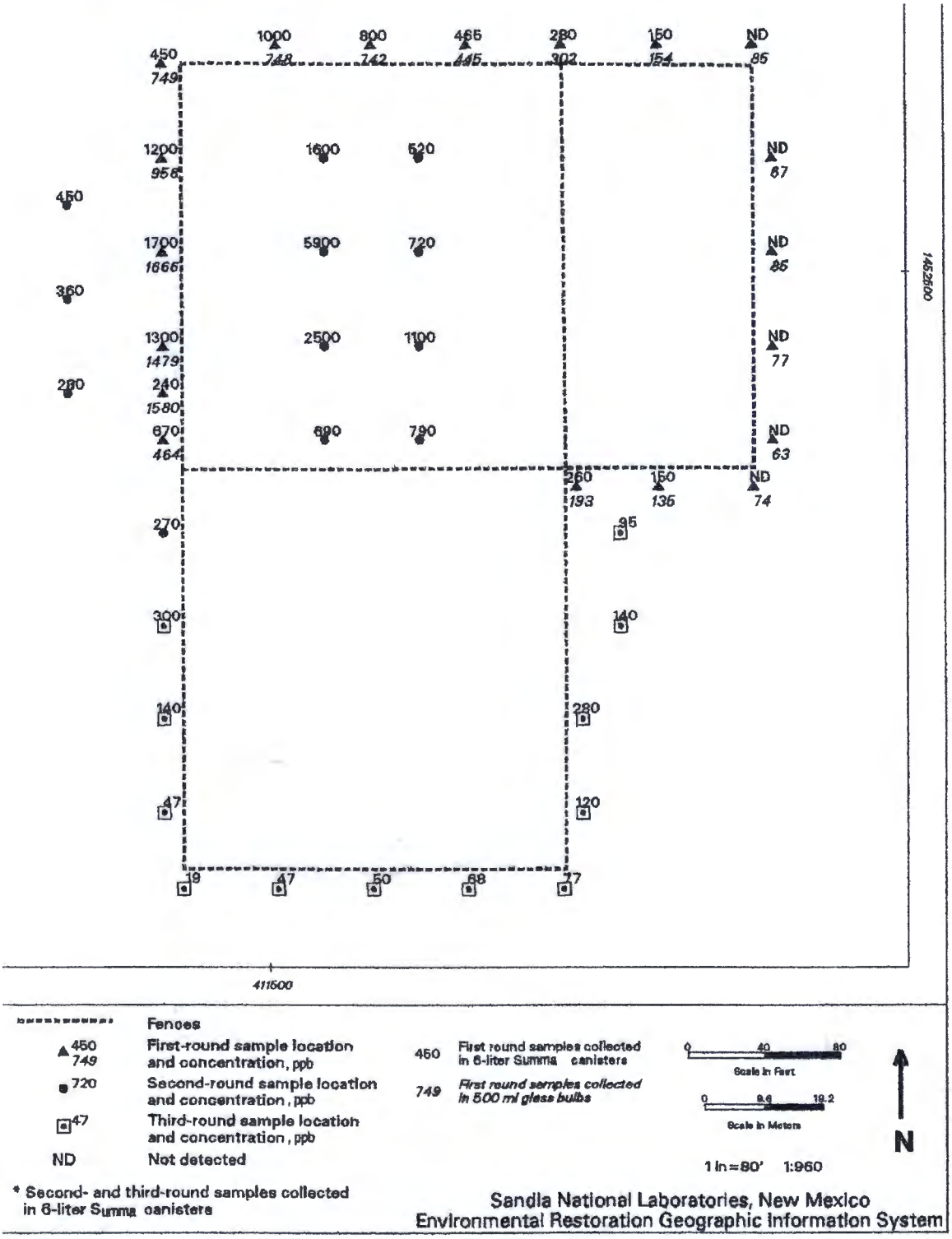
Source: Figure 10 in 2001 WERC Report *"Mixed Waste Landfill Peer Review"*

Figure 8. PCE in soil gas @ 10 feet below ground surface for measurements in probe holes at the Sandia MWL dump



Source: RCRA Phase 2 RFI Report, September, 1996

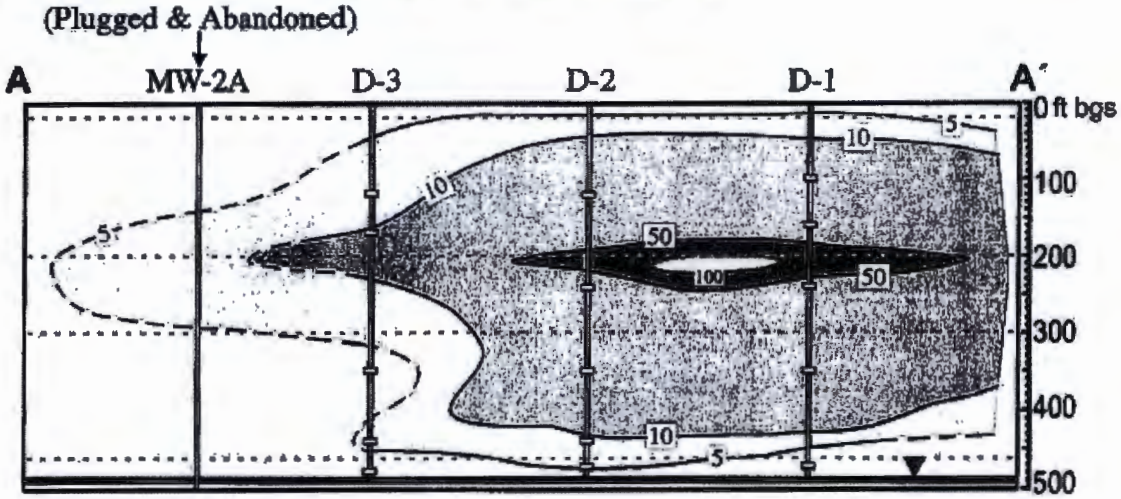
Figure 9. PCE in Soil Gas at 30 ft below ground surface at Sandia Mixed Waste Landfill.



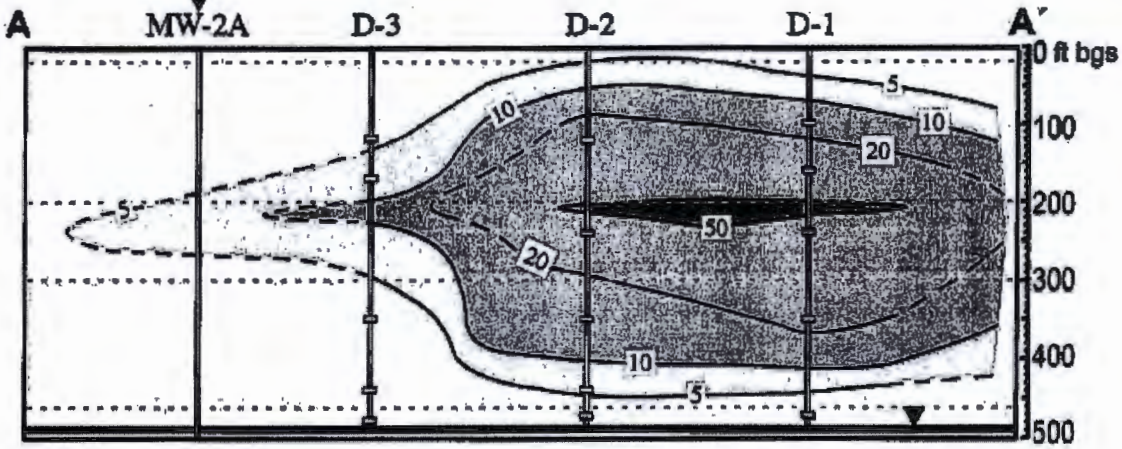
Source: RCRA Phase 2 RFI Report, September, 1996

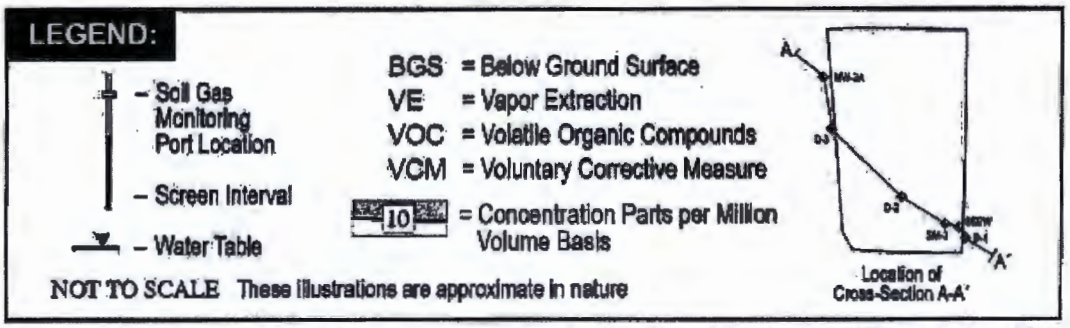
Figure 10. Soil Gas Plume Measured In Deep Vadose Zone Monitoring Wells For Long-Term Monitoring of the Sandia Chemical Waste Landfill.

Post-VE VCM Total VOC Concentration - September 2004



Post-VE VCM TCE Concentration - September 2004





Source: NMED Draft Post-Closure Care Permit For Sandia Chemical Waste Landfill

Figure 11. Proposed locations for the three long-term vadose zone monitoring wells (e.g., FLUTe[R] wells) at the Sandia MWL Dump.

- *MWL-VW-1 to VW-3* - The proposed locations for the three FLUTe[R] wells

Source: DOE/SNL Long-Term Monitoring and Maintenance Plan for the Mixed Waste Landfill, September 2007

Figure 12. Barrels of waste dumped into Trench E at the Sandia MWL Dump. Picture Date May 1980.

Source: Figure 5 in 2001 WERC Report *"Mixed Waste Landfill Peer Review"*

Figure 13. Barrels of waste dumped into Trench F at the Sandia MWL Dump. Picture Date1987.

Source: Figure 7 in 2001 WERC Report *"Mixed Waste Landfill Peer Review"*