*** Concerned Citizens for Nuclear Safety * Robert H. Gilkeson, Registered Geologist * Citizen Action New Mexico * Loretto Community * Honor Our Pueblo Existence * Embudo Valley Environmental Monitoring Group * Tewa Women United * Amigos Bravos * Partnership for Earth Spirituality * Tewa Environmental Watch Alliance * Nuclear Watch New Mexico ***

By email to: "Bearzi, James, NMENV" <james.bearzi@state.nm.us>

James Bearzi, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Re: Preliminary Public Comments about Corrective Measures Evaluation Report for Material Disposal Area G, Consolidated Unit 54-13(b)-99, at Technical Area 54, Revision 2, at Los Alamos National Laboratory
LA-UR-10-7868, November 2010, EP 2010-0507

Dear Mr. Bearzi:

The undersigned representatives of non-governmental organizations provide the following preliminary comments to the above-referenced Revision 2 of the Corrective Measures Evaluation Report for Material Disposal Area G at Technical Area 54 at Los Alamos National Laboratory (2010 LANL MDA G CME-2). These comments include Figures 1 through 8 which are enclosed at the end of the comments..

Please consider the positions taken in these comments as separate, distinct and unrelated to any Concerned Citizens for Nuclear Safety may advance in the course of litigation on the LANL hazardous waste permit that is currently under appeal in the New Mexico Court of Appeals and the United States District Court.

We provide these preliminary comments without having reviewed the French, S., et al., October 2008 "Performance Assessment and Composite Analysis for Los Alamos National Laboratory Material Disposal, Area G, Revision 4," LA-UR-08-06764 (PACA). Despite several requests over the past several years, we have not received any of the revision documents to the 1998 PACA from DOE/LANL. We are concerned that according to the CME Report, the PACA for Area G

> will establish the technical requirements for closure needed to meet the performance objectives for radiological protection of the public from radionuclides disposed of at the site. These technical requirements will be incorporated into the design of the final remedy during the corrective measures implementation phase of the project. 2010 LANL MDA G CME-2, p. v.

It is unclear how the Department of Energy (DOE) PACA requirements will be coordinated with the NMED requirements under the Compliance Order on Consent and the newly issued Hazardous Waste Facility Permit (HWFP), issued pursuant to the New Mexico Hazardous Waste Act. We anticipate that without proper coordination millions – perhaps billions - of taxpayer funding will be wasted as a result of the lack of proper coordination between the facility and the regulator, all of which should be subject to public review.

Further,

> Pursuant to these regulations [Atomic Energy Act of 1954 (AEA), as amended, 10 CFR Parts 830 through 835], DOE is required to review and approve all activities and work related to radionuclides, including activities and work under the Consent Order. 2010 LANL MDA G CME-2, p. 2

It is unclear how the reviews, approvals and oversight will be done in an efficient and cost-effective manner. In addition, the Resource Conservation and Recovery Act (RCRA) requires enhanced public participation. As discussed during the hearing on the HWFP, "it is EPA's policy to encourage public involvement early and often in the permitting process, in its remediation programs, as well as in other Agency actions." Further, "in most cases, the Agency anticipates, this [public involvement] will be very early in the process, prior to remedy selection – certainly before any Agency-prescribed remedies occur. 63 Fed. Reg. 56710, 76720.

<u>Lack of Community Relations Plan as Required by Compliance Order on Consent</u>. We note that one avenue for such communication would be implementation of the Community Relations Plan (CRP) as required by the Compliance Order on Consent Section VII.E.4. It states: "The Respondents [DOE/LANL/LANS] shall involve the public in all corrective measures selections and implementations in accordance with the most recent version of the LANL ER Public Involvement Plan." We have not seen any evidence that the CRP has been engaged in this process.

In addition, the hazardous waste permit for the Waste Isolation Pilot Plant (WIPP) and LANL both went into the effect on December 30, 2010. Both permits require a CRP. Many of us have received a draft WIPP Community Relations Plan (CRP). The comment period ends on March 21, 2011. We have not received a word from LANL. In fact, at a recent public meeting of the Community Radiation Monitoring Group, we passed around the WIPP draft CRP and asked when LANL would be holding the meetings required under the hazardous waste permit. We were told that it would be necessary for us to request such a meeting. We don't believe this was the intent of the Compliance Order on Consent nor the new HWFP requirements.

Moreover, Section 10.5.4 "Community Relations Activities" of the 2010 LANL MDA G CME-2 states:

> "A community-relations program will be developed in accordance with Section VII.E.4 [of the Compliance Order on Consent] to keep Northern New Mexico stakeholders and other interested parties involved in project activities and progress." 2010 LANL MDA G CME-2, p. 85

But we haven't seen it. Shouldn't the CRP have been submitted to NMED and be ready for implementation in order to meet EPA policy that "[public involvement] will be very early in the process, prior to remedy selection?"

And NMED has not enforced this requirement to the detriment of "stakeholders and other interested parties" in Northern New Mexico and those living downstream and downwind of LANL. Given the potential remediation price tag of $32 billion for Area G, it is time for NMED to enforce these requirements.

As demonstrated over the years, there are many people who are interested in the MDA G remediation process. Successful examples include the Los Alamos Study Group "Canpaign" and public participation in the recent hazardous waste permit hearing at locations in Santa Fe, Ohkay Owingeh Pueblo, Pojoaque, Los Alamos, and Albuquerque.

Many sampling, monitoring, and inventory reports, as well as work plans about Area G have been prepared and submitted by LANL to NMED for review and approval. Without persistent investigation and follow through, it is difficult for the public to be informed about the processes that have lead to the release of the 2010 LANL MDA G CME-2. This example runs counter to the EPA public participation goals:

> "EPA is committed to involving the public in the development and implementation of the solid waste, hazardous waste, and UST environmental decision-making. One of the Agency's central goals is to provide equal access to information and an equal opportunity to participate. EPA regards public participation as an important activity that empowers communities to become involved in local RCRA-related activities. …

> "EPA views public outreach as an essential element of public participation. Public outreach educates people about hazardous waste issues and the RCRA decision-making process. Public outreach also creates informal opportunities for public input and dialogue. To expand public participation, the Agency actively engages in extensive public outreach activities." RCRA Orientation Manual, EPA Solid Waste and Emergency Response, EPA530-R-98-004, May 1998, pp. VII-1 - 2; RCRA §7004(b).

Environmental Justice, which refers "to the fair distribution of environmental risks across socioeconomic and racial groups." Id., p. VII-9. Further,

> "EPA is committed to equal protection in the implementation and enforcement of the nation's environmental laws. EPA believes that environmental justice issues should be addressed on a local level and on a site-specific basis. EPA encourages permitting agencies and facilities to use all reasonable means to ensure that all segments of the population have an equal opportunity to participate in the permitting process and have equal access to information in the process." Id.

NMED and LANL have not met the basic requirements for public participation and environmental justice with respect to decision-making about clean-up, closure and post-closure care for MDA G. It is time for all parties to come into compliance with the public participation and environmental justice requirements of the Compliance Order on Consent and the HWFP.

The Compliance Order on Consent is Not an "Enforceable Document" to be Used in Lieu of Closure and Postclosure Requirements. 40 CFR §270.1(c)(7).

LANL states: "The Consent Order is the sole enforceable instrument for corrective action relating to the Laboratory except as provided in Section III.W.1." 2010 LANL MDA G CME-2, p. 2. We agree that the Compliance Order on Consent is an enforceable document for Corrective Action only. The Consent Order at III.W.6 states that the Consent Order is to be the only enforcement instrument for corrective action. There is no mention of the Consent Order to serve for closure and post-closure. The Consent Order at Section III.W.1 (2) specifically excludes its use for the purpose to meet "the closure and post-closure care requirements of 20.4.1.500 NMAC (incorporating 40 C.F.R. Part 264, Subpart G), as they apply to operating units at the Facility…"

Additionally, the Compliance Order on Consent is not an "enforceable document" in lieu of closure and post-closure requirements because the New Mexico Environment Department did not notify the public as required by 40 CFR § 270.1(c)(7) and 40 CFR §

265.121(b). Obtaining an enforceable document under 40 CFR § 270.1(c)(7) requires compliance with 40 CFR § 265.121(b) for public notice and comment. The 2005 Compliance Order on Consent was not noticed to the public as an enforceable document that was being issued in lieu of the Closure and Post Closure requirements.

In fact, the NMED Response to Commenter 13 (AR 16251), who raised the issue of requiring closure and post closure in the Permit stated:

> **"Response:** The Consent Order does not address closure or post-closure requirements for operating units at LANL, nor does the Order address the continued disposal of wastes at Area G. Section III.W.1 of the Consent Order specifically provides that the closure and post-closure care requirements for operating units at LANL, under section 20.4.1.500 NMAC, will be addressed in the hazardous waste facility permit and not in the Consent Order. … The closure plans for MDA's G, H and L will be incorporated in the draft permit. The public will have the opportunity for a hearing when the draft permit is released for public review. The Department is working on the permit, but it is not certain when the draft permit will be issued."

DOE, LANL and NMED should stop misleading, misinforming and misrepresenting the purposes of the Consent Order and the requirements for public participation.

The testimony of NMED James Bearzi at the LANL RCRA Part B Permit hearing states that "Corrective action and closure are both independently required by statute and regulations." … "And, the explicit exclusion of closure and post-closure from section III.W.1 of the Consent Order makes it doubly clear that those processes are governed by the Permit." NMED Ex 3, p. 66.

<u>Elimination of Treatment Technologies without Justification</u>. We object to the elimination of treatment technologies without justification. LANL has stated that alternative treatment technologies, such as in Section 6.2.2.1 "Biological Treatment Technologies," were "not retained" without providing any cites to any documentation, including the scientific literature. 2010 LANL MDA G CME-2, p. 33. NMED should require that any revision to the CME take a second look at biological treatment technologies provide references to the documents reviewed.

<u>Disclaimer</u>. We copied and used the CME, Revision 2 in preparing these comments. In compliance with the requirements stated on the backside of the title page, we restate:

> Los Alamos National Laboratory, operated by Los Alamos National Security, LLC, for the U.S. Department of Energy under Contract No. DE-AC52-06NA25396, has prepared this document pursuant to the Compliance Order on Consent, signed March 1, 2005. The Compliance

Order on Consent contains requirements for the investigation and cleanup, including corrective action, of contamination at Los Alamos National Laboratory. The U.S. government has rights to use, reproduce, and distribute this document. The public may copy and use this document without charge, provided that this notice and any statement of authorship are reproduced on all copies.

"The investigation report addendum (LANL 2007, 096110) [approved by NMED (NMED 2007, 096716)] concluded that the hazardous constituents in the subsurface of MDA G pose no potential unacceptable present-day risk or dose to human health or the environment." 2010 LANL MDA G CME-2, p. 10.

VOC	Groundwater Screening Level (ug/L)	Source of Groundwater Screening Level	Tier I Pore-Gas Concentrations (ug/L)
1,1,1-trichloroethane (TCA)	60	NM WQCC	42,300
trichloroethene (TCE)	5	EPA MCL	2,000
1,1-dichlorethene (DCE)	5	NM WQCC	5,500
tetrachloroethene (PCE)	5	EPA MCL	3,600

Adopted from Table C-2.1-1 "Henry's Law Constants, Groundwater SLs, and the Laboratory-Recommended Tier I and Tier II Vapor-Phase Screening Concentrations for MDA G," p. C-19.

The data contradicts the LANL statement. We are concerned with such statements and approvals by NMED for a number of reasons including the findings of elevated levels of volatile organic compounds (VOCs) and tritium found in pore-gas monitoring. The VOCs that passed the Tier II method analyses include:

See Figures C-3.1-1 and C-3.1-2 to see the three plumes of concern. -*See* Figure C-3.1-5, which is Figure 4 in these preliminary comments showing the overlapping plumes. We note that the TCE plumes contain levels at over 30 times background (423,000 ug/m3). *See* Figure C-3.1-2. And the plume analyses are based on fourth quarter FY2009 data only. This is "statistically significant" evidence of releases from MDA G. RCRA regulations require NMED to order LANL to conduct compliance monitoring under 40 CFR §264.98. *See:* "EPA Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action for Facilities Subject to Corrective Action Under Subtitle C of the Resource Conservation and Recovery Act," April 2004. EPA530-R-04-030.

MOST OF MDA G HAS NOT BEEN MONITORED FOR CONTAMINATION TO GROUNDWATER

Section 1. The monitoring well network at MDA G is not adequate to evaluate and select the necessary remedy to protect the large groundwater resource below MDA G. The network of monitoring wells in the vicinity of MDA G is displayed on Figure 2. The 2010 LANL MDA G CME-2 on page E-15 describes the network of monitoring wells installed at MDA G as follows:

> The regional monitoring-well network downgradient of MDA G is a redundant system that is designed to provide reliable detection of potential contaminants reaching the regional aquifer in an area of considerable hydrogeologic complexity.

In fact, the monitoring-well network has no redundancy and is grossly inadequate because a review of all factors shows that monitoring well R-57 is the only well that may detect groundwater contamination from the large inventory of commingled hazardous and radioactive wastes buried in the unlined trenches and shafts at the 63-acre MDA G. However, an analysis of groundwater flow below MDA G for this report shows that monitoring well R-57 is at a location that will only detect groundwater contamination from the southeast area of MDA G, a small part of the 63-acre site. The groundwater flow below MDA G is displayed on Figure 1.B. The factors that lead to the conclusion that well R-57 is the only reliable monitoring well at MDA G are described below.

Continued from page E-15 in the LANL CME-2:

> The wells are located both near the facility boundary and at more distal locations along the dominant regional flow direction as well as along potential local flow directions to the northeast.

It was a mistake to use <u>the dominant regional groundwater flow direction</u> for decisions on the location of monitoring wells at MDA G. The local direction of groundwater flow below MDA G and hydraulically downgradient from MDA G are the factors that are important for the location of monitoring wells. Figure 1.A is the contour map in the 2010 LANL MDA G CME-2 for the direction of the local groundwater flow at the water table below and downgradient from MDA G. Figure 1.B is a map prepared for these preliminary public comments that displays the directions of groundwater flow at the water table below MDA G. The map shows that wells R-57 and R-41 are the only hydraulically downgradient monitoring wells at locations along the flow path for groundwater from below MDA G at the water table for the regional aquifer. However, Figure 1.B shows that monitoring well R-57 is at a location with potential to only detect groundwater contamination from the southeastern part of MDA G.

In addition, the pumping tests performed in the two-screen monitoring well R-41 determined that the upper screen is installed in a dry zone and the lower screen is installed in a stagnant zone. The installation of screen 1 in a dry zone and screen 2 in a stagnant zone is because of mistakes in drilling the borehole for the very expensive well. The upper screen is useless and screen 2 is also useless and not reliable to:
1) detect groundwater contamination from MDA G or
2) provide reliable knowledge of the elevation of the water table downgradient of MDA G.
The 2010 LANL MDA G CME-2 on page E-15 describes the unreliable water quality data and the unreliable water table elevation data provided by monitoring well R-41 as follows:

> At R-41, the relatively low water level and the lack of cross-well pumping responses lead to uncertainties related to
> (1) the groundwater flow direction in the regional aquifer near R-41, and
> (2) the hydraulic connection of the saturated zone tapped by R-41 with the rest of the aquifer.

Nevertheless, Figure 1.A. shows that the unreliable water table elevation data measured in well R-41 were used to construct the water table contour map in Figure E-2.3-1 in the LANL MDA G CME-2. In addition, Page D-2 in Appendix D in the 2010 LANL MDA G CME-2 describes the water quality data from the two screen well R-41 as follows:

- R-41 screen 1. This screen has been dry since installation..

- R-41 screen 2 meets geochemical-monitoring objectives unconditionally. This screen is capable of providing representative data for all MDA G COPCs [contaminants of potential concern].

The contradictory information presented in the 2010 LANL MDA G CME about well R-41 violates RCRA requirements to provide full and accurate information. 40 CFR 270.41-43. On the one hand, Appendix E describes screen 2 as installed in a stagnant zone and accordingly well R-41 does not produce reliable and representative water samples for the detection of groundwater contamination. On the other hand, Appendix D describes the groundwater samples collected from well R-41 as reliable for detection of all MDA G COPCs. In addition, the erroneous water level elevations measured in the stagnant zone at well R-41 were used in the local groundwater contour map in Figure E-2.3-1 in Appendix E (Figure 1.A in these preliminary public comments). *The use of data from well R-41that is known to be defective in the 2010 LANL MDA G CME-2 violates RCRA requirements to provide full and accurate information*. 40 CFR 270.41-43. .

Continued from page E-15 in the LANL CME-2:

> The monitoring wells located downgradient of MDA G (R-41, R-57, R-49, and R-39) are screened in sections of the regional aquifer that appear to be the best locations for monitoring potential contaminants.

This statement is incorrect for well R-41 because as stated above the LANL MDA G CME-2 describes the well as installed in a stagnant zone. The local groundwater contour map in Figures 1.A and 1.B is the local groundwater contour map in Figure E-2.3-1 in the 2010 LANL MDA G CME-2. The red and black flow lines on Figure 1.B are from a groundwater flow direction analysis that was performed for these preliminary public comments. The flow analysis was performed with the scientific principle that the direction of groundwater flow is perpendicular to the contour lines and toward contour lines with lower elevation (i.e., “water flows downhill”-down the hydraulic gradient). The set of red flow lines on Figure 1.B provide important knowledge on the direction of groundwater travel below MDA G and downgradient of MDA G.

The black flow lines on Figure 1.B represent the regions away from MDA G that are away from the flow of groundwater from MDA G. The combination of red and black flow lines show that the distant wells R-23 and R-55 are not at appropriate locations for the detection of groundwater contamination from MDA G.

Contamination from MDA G may travel laterally a considerable distance in the vadose zone during downward travel to the regional zone of saturation. For this reason, it is important to install monitoring wells on all sides of MDA G at locations close to the waste facility boundary. The potential but unknown lateral travel of groundwater in the vadose zone is the only basis for the locations of wells R-49 and R-38 south of MDA G because the two wells are not at appropriate locations for the northeast flow of groundwater below and away from MDA G.

<u>The groundwater flow analysis in Figure 1.B along with a study of the location of burial of highly mobile solvent wastes and highly mobile tritium wastes in MDA G shows the importance for the installation of monitoring wells along the north side of MDA G</u>. Figure 2 shows that no monitoring wells are installed north of MDA G. The “Hot Spots” for solvent wastes on the north side of MDA G are displayed on Figure 4 and the “Hot Spots” for tritium wastes are displayed on Figure 5.

Section 2. There are two zones of saturation in the regional aquifer below MDA G that require reliable networks of monitoring wells for decisions on corrective measures to protect public health and the environment. The information presented in the 2010 LANL CME R-2 shows that reliable networks of monitoring wells are not installed in either zone.

- The upper zone that requires a reliable network of monitoring wells is the water table of the regional aquifer. The rocks and sediments at the water table are generally poorly productive of groundwater and this zone is not recognized under RCRA as an aquifer. Nevertheless, a reliable network of monitoring wells is required at the water table below MDA G for early detection of groundwater contamination.

- The deeper zone that requires a reliable network of monitoring wells is the highly productive aquifer that is present generally at a depth of less than 100 feet below the water table. The monitoring wells displayed on Figure 2 that have screens installed in productive strata in the deeper zone include the two screen wells R-56, R-49 and R-57.

Well R-49. The elevation of the water table measured in screen 1 is 23.5 feet higher than the water level measured in screen 2 and along with information from the pumping tests in the two screens is evidence of a layer with low permeability between the two screens. Screen 2 is installed in a highly productive layer of coarse-grained sedimentary deposits. The top of screen 2 is located a distance of 96 feet below the water table elevation in screen 1.

Well R-56. The elevation of the water table measured in screen 1 is 4 feet higher than the water level measured in screen 2 and along with information from the pumping tests in the two screens is evidence of a layer with low permeability between the two screens. Screen 2 is installed in a productive layer of sedimentary deposits. The top of screen 2 is located a distance of 119.5 feet below the water table elevation in screen 1.

Well R-57. The elevation of the water table measured in screen 1 is 8.3 feet higher than the water level measured in screen 2 and along with information from the pumping tests in the two screens is evidence of a layer of low permeability between the two screens. Screen 2 is installed in a highly productive layer of sands and gravels that is more than 100 feet thick. The top of screen 2 is located a distance of 82 feet below the water table elevation in screen 1.

The deeper screens in wells R-49, R-56 and R-57 are installed in a layer capable of producing large supplies of groundwater that is recognized by RCRA as the "uppermost aquifer." RCRA requires a reliable network of monitoring wells installed in the "uppermost aquifer" below MDA G but the information in the 2010 LANL CME R-2 shows that the required network of monitoring wells is not installed at MDA G. It is very important to determine the thickness and continuous presence of the layer of low permeability above the productive aquifer zone below MDA G but the information presented in the 2010 LANL CME R-2 shows that the required knowledge does not exist.

Indeed, an important deficiency in the 2010 LANL MDA G CME R-2 is that the report does not recognize the RCRA requirement for knowledge of the "uppermost aquifer" below MDA G and the measures required to protect the valuable groundwater resource. The information from wells R-49 and R-57 shows that there is a large groundwater resource at a depth of less than 100 feet below the water table below MDA G. The necessary knowledge to protect the valuable resource from contamination from MDA G is not provided in the 2010 LANL MDA G CME-2. The lack of knowledge for protection of the large groundwater resource below MDA G is an important reason for NMED to order LANL to perform the required studies and revise the MDA G CME Report.

Section 3. The background water quality data provided in the 2010 LANL MDA G CME report, Revision 2 is unacceptable. The background water quality data used in the 2010 LANL MDA G CME Report are from the LANL Groundwater Background Investigation Report-Revision 4 (GBIR-4) and not from a hydraulically upgradient monitoring well. Section 11.10.6 in the LANL Permit requires background water quality to be from monitoring wells that are located hydraulically upgradient of MDA G as follows:

> **11.10.6 Determination of Background**
> Background concentrations for groundwater shall be collected from upgradient wells (p. 151).

The LANL GBIR-4 does not meet the requirement in the LANL Permit that background concentrations for groundwater shall be collected from upgradient monitoring wells. The water quality data in the GBIR-4 are from Los Alamos County drinking water supply wells with screens commonly 1000 feet long at locations that generally are several miles distant from MDA G and from springs that are downgradient of MDA G. In addition, the water quality data in the GBIR-4 are from some of the LANL monitoring wells.

The EPA Kerr Research Laboratory issued reports on February 16, 2006 and March 30, 2009 that described the reasons the springs and supply wells were not acceptable for background water quality data for the LANL waste disposal sites including MDA G. The pertinent excerpt from the March 2009 EPA report follows:

> **Uncertain Background Conditions.** The data used to characterize "background" conditions is sparse, derived mainly from sources representing mixtures of water that are significantly different from the samples obtained from the hydrogeologic characterization wells [that are now the LANL monitoring wells].
>
> As noted many times in the GBIR, water chemistry is determined by the lithologies of aquifer materials through which the water migrates and the

> residence time. Data from springs near the Rio Grande and the long-screened production wells does not necessarily represent the flowpaths monitored by the individual short-screened characterization wells. The GBIR recognizes this limitation. However, it indicates that the appropriate data (*i.e.*, data from similarly screened wells immediately upgradient of the regulated units) may never be available (p. 3).

LANL monitoring well R-56 was installed as a background water quality well for MDA G. The LANL Well Completion Report for well R-56 (LA-UR-10-7289) describes the two-screen monitoring well R-56 as installed for the purpose to provide background concentrations for groundwater from a location that is hydraulically upgradient of MDA G as follows:

> The primary purpose of R-56 is to monitor regional groundwater east of MDA L and to provide baseline data for groundwater flowing eastward toward MDA G (p.1).

The location of well R-56 is displayed on Figures 1.A. and 2. The 2010 LANL MDA G CME-2 does not present any water quality data from the background water quality monitoring well R-56 because the groundwater sampling system was not installed in the two screen well R-56 as of December 15, 2010 and the LANL MDA G CME-2 was issued to NMED on November 30, 2010.

An additional important issue is the 1400 foot lateral distance of well R-56 west from the western boundary of MDA G and that the pumping tests in well R-56 identified a lateral boundary to groundwater flow at an unknown location and unknown distance away from well R-56. The pertinent excerpt from Appendix C in the LANL Well R-56 Completion Report (LA-UR-10-7289) follows:

> Analysis of the screen 2 pumping tests suggested a near-well hydraulic conductivity of 99 gpd/ft2 or 13.3 ft/d. Away from the well, the data showed a boundary effect with a corresponding hydraulic conductivity of 53 gpd/ft2 or 7.1 ft/d, approximately half the early-time value. <u>This may have been an indication of an actual lateral reduction in conductivity of that amount, or may have signaled the presence of an aquifer boundary such as a fault or pinch out, or, as discussed previously, possibly a submerged expanse of tight basalt near the screen zone. The computed 2:1 ratio in conductivity is symptomatic of a linear boundary (truncation of the aquifer)</u> [Emphasis supplied] (p. C-15).

A similar reduction in the hydraulic conductivity was observed for the pumping tests in screen 1 in well R-56. The pumping tests indicate that well R-56 does not provide representative background water quality for MDA G. There is a need for the installation of a new monitoring well at an appropriate location ~ 200 feet west of the western boundary of MDA G. *The failure to use water quality data from reliable background monitoring wells at an appropriate location hydraulically upgradient of MDA G is an important reason for the NMED to require the retraction of the LANL MDA G CME-2.*

Section 4. The knowledge of the geology below MDA G is inadequate for decisions on corrective measures to protect the public health and the environment. Moreover, a monitoring well is necessary close to the western boundary of MDA G to provide knowledge of the thickness and physical properties of the geologic formations in the vadose zone and in the upper 200 feet of the regional zone of saturation below MDA G. The MDA G CME Report (LA-UR-08-5781) issued in September 2008 contained a west to east cross-section across MDA G that showed the great uncertainty and data gaps in the geology in the vadose zone and in the regional zone of saturation below MDA G. The cross-section is in Figure 8. The cross section shows that there is insufficient knowledge of the geologic formations in the vadose zone and in the regional zone of saturation below the 63-acre MDA G for the selection of the necessary long-term remedy that will protect public health and the environment.

The 2010 LANL MDA G CME-2 does not include any west-to-east cross-sections for MDA G although the west to east distance from the western boundary to the eastern boundary of MDA G is greater than 3400 feet. Instead, the cross-sections in the MDA G CME-2 are from north-to-south at locations west and east of MDA G.

Examples of the lack of knowledge for the subsurface geology below MDA G are illustrated by the discussion of the subsurface geology in Appendix E in the 2010 LANL MDA G CME R-2. The unacceptable poor knowledge of the Puye Formation below MDA G is illustrated from the description on page E-6 as follows:

> **Puye Formation (Tpf, Tpt, and Tpl)**. The fanglomerate deposits are a heterogeneous assemblage of clast- to matrix-supported conglomerates with associated gravels and lithic sandstones. Clasts in the coarsest deposits consist of subangular to subrounded cobbles and boulders of lava and tuff in a poorly sorted matrix of ash, silts, and sands. Debris flow deposits are common throughout the unit. Primary and reworked ash- and pumice-fall deposits of dacitic to rhyolitic composition are interbedded with the conglomerates and gravels. At TA-54, the fanglomerate facies thins eastward; it is >263–ft- (>80 m) thick at well R-52 and is absent on the east side of MDA G [Emphasis supplied].

Well R-52 is located a lateral distance of 1.25 miles (6600 feet) northwest of the western side of MDA G. The above discussion does not provide useful information on the nature and thickness of the highly complex Puye Formation below MDA G. Accurate knowledge of the thickness and physical properties of the Puye Formation below MDA G is required for wise decisions on corrective measures, but does not exist.

Another example of the poor knowledge of the geology below MDA G is illustrated by the discussion of the Otowi volcanic tuff on page E-3 in Appendix E.

> Otowi ash-flow tuffs thin eastward against a paleotopographic high formed by Cerros del Rio volcanics near White Rock. These tuffs are continuous under TA-54, but unit thicknesses decrease eastward, ranging between 250 ft (76 m) near MDAs H and J to 45 ft (14 m) on the east side of MDA G.

MDAs H and J are located 7000 feet northwest of the western side of MDA G. The above discussion does not provide useful information on the variation in thickness and properties of the Otowi tuff below MDA G.

The insufficient knowledge of the geology in the vadose zone and in the upper 200 feet of the regional zone of saturation below MDA G is an important reason for the NMED to require the retraction of the 2010 LANL MDA G CME-2.

Figure 8 shows that the installation of a background water quality monitoring well at a location approximately 200 feet west of MDA G will provide important information on the subsurface geology that will reduce the great uncertainty that exists at the present time. In addition, the installation of monitoring wells is necessary at locations west, north, south and east of MDA G to provide accurate knowledge of the hydrogeology in the vadose zone and in the upper 200 feet of the regional aquifer below MDA G. It is appropriate and necessary to drill some of the boreholes for the new monitoring wells at an angle to acquire knowledge on geology and potential groundwater contamination below MDA G.

The installation of angled monitoring wells is important at locations below and/or downgradient of the "hot spots" for tritium contamination and solvent contamination at several locations across MDA G. The locations of the "hot spots" are displayed on Figure 4 for solvents and on Figure 5 for tritium.

Networks of monitoring wells are required:
1) at the water table and
2) in the highly productive "uppermost aquifer" that is known to be present below MDA G and in the region away from MDA G from the information provided by monitoring wells R-49, R-56 and R-57.
It is important to drill the boreholes for the monitoring wells to a sufficient depth to determine the thickness of the productive aquifer below MDA G.

A large number of monitoring wells is required at MDA G because of:
1) the 63-acre size of the waste disposal facility where a large inventory of commingled hazardous and radioactive wastes are buried in unlined pits and trenches and
2) the complex geology below MDA G that controls the pathways for travel of contaminated groundwater.
The RCRA guidance on the spacing of monitoring wells at waste disposal facilities that are not "clean-closed" is displayed on Figure 3. The RCRA guidance is a lateral spacing of monitoring wells approximately every 50 feet with the wells located close to the hydraulically downgradient boundary of the waste disposal facility.

RCRA requires networks of monitoring wells located in the two zones of saturation on the north and east side of MDA G.

At the present time, there are no monitoring wells installed along the north side of MDA G over a west to east distance of approximately 3400 feet and only one reliable monitoring well (well R-57) installed along the east side of MDA G over a north to south distance of approximately 1400 feet. *The inadequacy of the monitoring well networks in the 2010 LANL MDA G CME R-2 violates RCRA requirements to provide full and accurate information from a reliable network of monitoring wells*. 40 CFR §§ 264.91-100.

Section 5. The potential presence of vertical volcanic vents deep into the regional aquifer below MDA G is a special concern that requires careful investigation. Figure 7 is a cross-section that displays the deep vertical volcanic vent that is located approximately 700 feet east of MDA G. The cross-section is from Figure E-1.1-4 in the 2010 LANL MDA G CME-2. The 2010 CME report describes the volcanic vent as a potential conduit for transport of contamination from MDA G to great depths in the regional aquifer.

The potential presence of many volcanic vents below MDA G is described as follows on page E-5 in Appendix E of the 2010 LANL MDA G CME-2:

> The presence of volcanic vents in the vicinity of TA-54 is inferred from the presence of thick cinder and phreatomagmatic deposits that commonly accumulate near their source vents. Cinder deposits more than 50-ft- (16 m) thick occur in wells R-20, R-21, R-22, R-34, R-39, R-41, R-49, R-53, R-54, R-55, and R-56.

Figure 2 shows that MDA G is surrounded by the above list of R-wells. Accordingly, volcanic vents may be present at many locations below MDA G with more volcanic vents located in the eastern region of MDA G as described below on page E-5 in Appendix E:

> These cinder deposits range in composition from basalt to dacite, indicating that there are multiple vents in the vicinity. Thick (>25 ft [>7.6 m]) basaltic phreatomagmatic deposits occur in wells R-38, R-41, R-49, R-55, and R-57, suggesting maar volcanoes are located near the east end of MDA G. Additionally, structure contours for the top of the Cerros del Rio volcanics shows that a broad north-trending paleotopographic high area also occurs near the east end of MDA G (Figure E-1.1-7). This paleotopographic high likely represents a volcanic constructional highland formed by coalesced volcanic vents.

The presence of deep vertical volcanic vents below MDA G that may serve as a conduit for groundwater contamination deep into the regional aquifer requires a careful investigation for the presence of the vents below MDA G. The volcanic vents require a careful study of the thickness and properties of the layer of low permeability that is present above the uppermost aquifer and between the two screens in the three monitoring wells R-49, R-56 and R-57. Unfortunately, the thickness and properties of the low permeability layer at the three wells was not determined during the drilling of the boreholes for the wells. A careful investigation of the continuous presence, thickness and properties of the low permeability layer below MDA G is of paramount importance as part of the study of volcanic vents below MDA G.

We recommend that NMED require LANL to retract the flawed 2010 LANL MDA G CME-2 (signed by George J. Rael, Michael J. Graham and Jarrett Rice). NMED should fine DOE and LANL for non-compliance with the requirements of the Compliance Order on Consent and HWFP.

Please contact us with any questions or concerns.

Sincerely,

Joni Arends, Executive Director
Concerned Citizens for Nuclear Safety
Santa Fe, NM 87501
jarends@nuclearactive.org

Robert H. Gilkeson, Registered Geologist
Los Alamos, NM 87544
rhgilkeson@aol.com

Dave McCoy
Citizen Action New Mexico
Albuquerque, NM 87196
dave@radfreenm.org

Penelope McMullen, SL
Loretto Community
Santa Fe, NM 87501
pmsl@cybermesa.com

Marian Naranjo, Director
Honor Our Pueblo Existence
Espanola, NM 87532
Mariann2@windstream.net

S. Kotowski, Lead Organizer
Embudo Valley Environmental Monitoring Group
PO Box 291
Dixon, NM 87527
serit@cybermesa.com

Beata and Luis Peña
Environmental Justice
Tewa Women United
Santa Cruz, NM 87567
beata_tsosie@yahoo.com

Brian Shields, Executive Director
Amigos Bravos
Taos, NM 87571
bshields@amigosbravos.org

Joan Brown
Marlene Perrotte
Partnership for Earth Spirituality
Albuquerque, NM 87107
joankansas@swcp.com
MarleneP@swcp.com

Kathy Wanpovi Sanchez
Tewa Women United
Santa Cruz, NM 87567
tewawu@msn.com

J. Gilbert Sanchez
Tewa Environmental Watch Alliance
Rt. 5, Box 442B
Santa Fe, NM 87506
tewacowboy@hotmail.com

Scott Kovac, Operations and Research Director
Nuclear Watch New Mexico
Santa Fe, NM 87505
scott@nukewatch.org

cc: Senator Jeff Bingaman
Senator Tom Udall
Representative Ben Lujan
Representative Martin Heinrich
Representative Steve Pearce
Rich Mayer, EPA Region 6

Figures 1 through 8

Figure 1.A. The local contour map for the direction of groundwater flow at the water table of the regional zone of saturation below and in the vicinity of LANL MDA G. Source: Figure E-2.3-1 in 2010 LANL MDA G CME-2.

Figure 1.B. The northeast direction of groundwater flow at the water table below MDA G determined from a flow analysis of the contour map in Figure 1.A.   Source: Figure E-2.3-1 in 2010 LANL MDA G CME-2.

Figure 2. Monitoring Wells (R-wells) in the vicinity of Area G / MDA G at the Los Alamos National Laboratory. Source: Figure 2.3-3 in 2010 LANL MDA G CME-2.

Figure 3. Two examples of the design for groundwater monitoring well networks in the Federal Resource Conservation and Recovery Act (RCRA) guidance document for hazardous and mixed waste disposal sites where buried wastes are not excavated.

Figure 4. Locations for solvent contamination “Hot Spots” at MDA G. Source: Figure C-3.1-5 in 2010 LANL MDA G CME-2.

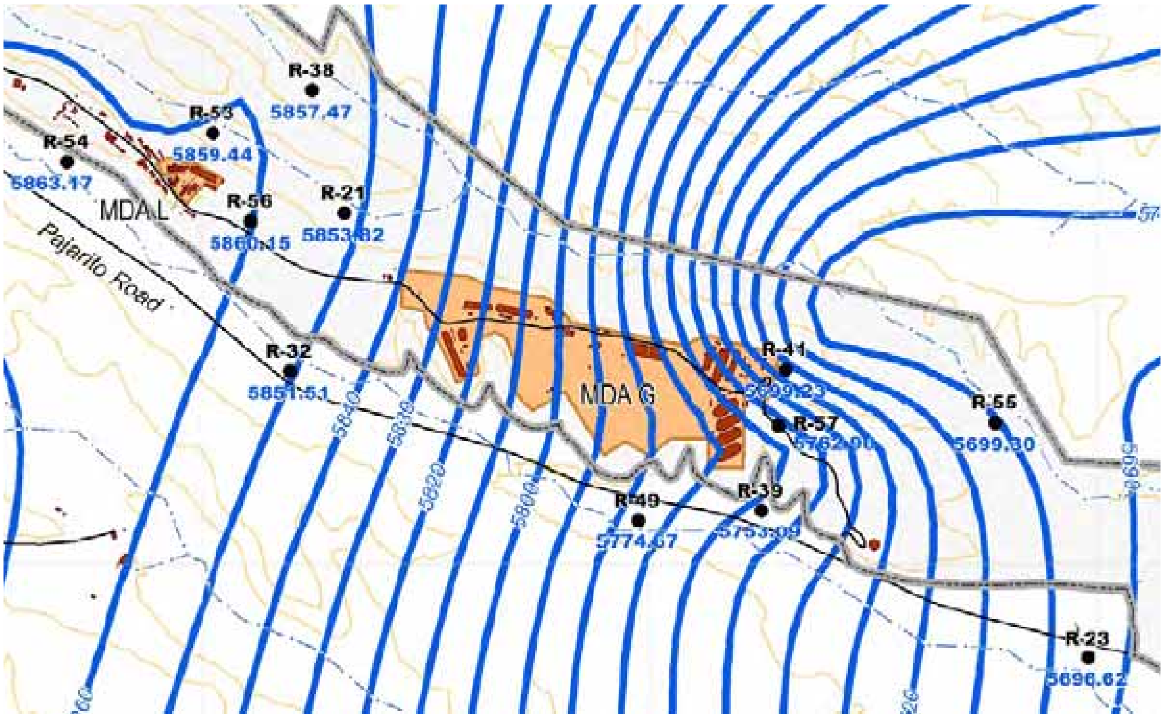
Figure 5. Locations for tritium contamination “Hot Spots” at MDA G. Source: Figure B-2.0-4 in 2010 LANL MDA G CME-2.

Figure 6. Hydrogeologic conceptual site model for MDA G. Source: Figure 4.0-1 in 2010 LANL MDA G CME-2.

Figure 7. North-South Cross-Section Near East End of MDA G. The cross-section shows a vertical volcanic vent that is a potential pathway for transport of contamination from MDA G deep into the regional aquifer. An unknown number of these volcanic pathways may be present below MDA G. Source: Figure E-1.1-4 in 2010 LANL MDA G CME-2.

Figure 8. West to East Cross- section for Canada del Buey that shows the great uncertainty in the geology below MDA G. Source: Figure 4.2-2 in 2008 LANL MDA G CME Report (LA-UR-08-5781
September 2008)

Figure 1.A. The local contour map for the direction of groundwater flow at the water table of the regional zone of saturation below and in the vicinity of LANL MDA G. Source: Figure E-2.3-1 in 2010 LANL MDA G CME-2.



l-5850 l-5800 l-5750 l-5700

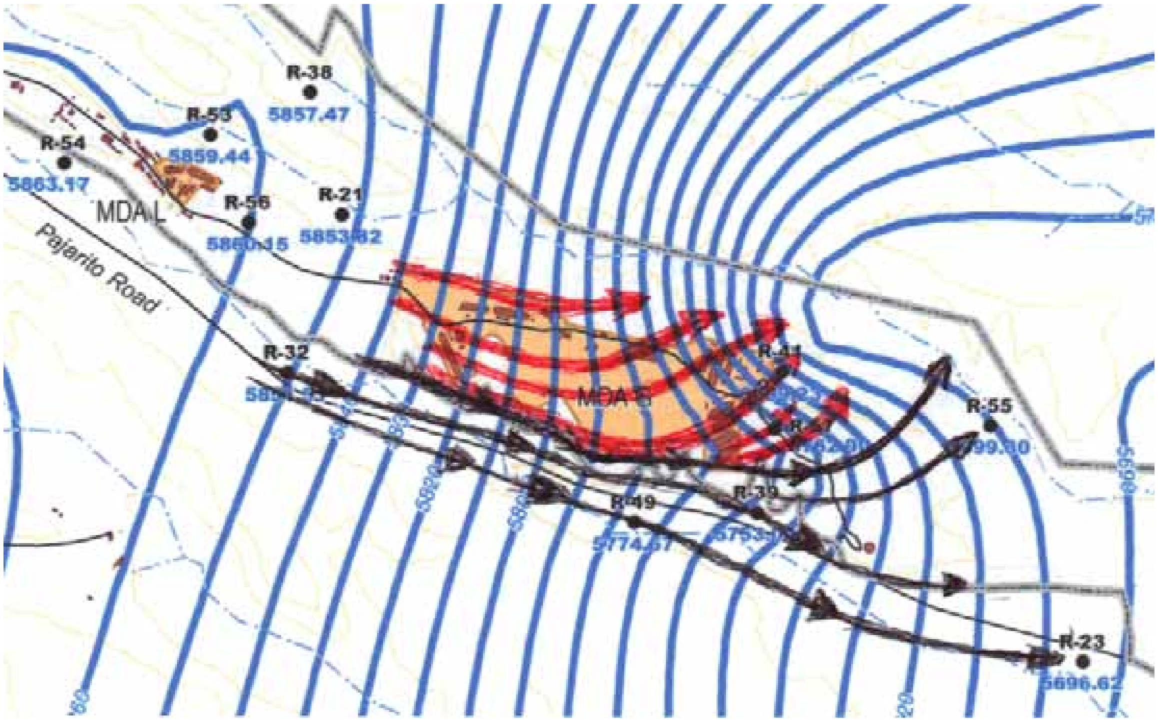
The above numbers are the elevation of the water table in feet above mean sea level

Lateral Scale 0----------1----------2----------3000 feet

NOTE: North is up on the map. Water table elevations were measured over the period July – September 2010.

NOTE: An anlysis of the direction of groundwater flow below and in the vicinity of MDA G for the above contour map is presented below in Figure 1.B.

Figure 1.B. The northeast direction of groundwater flow at the water table below MDA G determined from a flow analysis of the contour map in Figure 1.A. Source: Figure E-2.3-1 in 2010 LANL MDA G CME-2.



l-5850 l-5800 l-5750 l-5700

The above numbers are the elevation of the water table in feet above mean sea level

-Lateral Scale 0----------1----------2----------3000 feet

The red flow lines illustrate the northeast direction of groundwater flow below MDA G and hydraulically downgradient from MDA G.

The red and black flow lines show that monitoring wells R-32, R-49, R-39, R-55 and R-23 are not at appropriate locations to detect contamination in groundwater flowing from below MDA G.

The red flow lines show the importance to install reliable monitoring wells along the north and east side of MDA G at locations to investigate groundwater contamination from the solvent and tritium “Hot Spots” that are displayed on Figures 4 and 5. At the present time there are no monitoring wells installed north of MDA G.

The available information shows that well R-41 located at the northeast corner of MDA G is installed in a stagnant zone and not reliable to detect groundwater contamination or accurately measure the elevation of the water table. The defective well R-41 requires replacement.

The red and black flow lines and other information show that well R-57 is the only monitoring well in the network of eight monitoring wells in the 2010 LANL MDA G CME-2 that is reliable to detect groundwater contamination from MDA G. However, the red flow lines show that well R-57 is at a location where the groundwater is only expected to be contaminated from the wastes buried in the southeastern area of MDA G.

Figure 2. Monitoring Wells (R-wells) in the vicinity of Area G/MDA G at the Los Alamos National Laboratory. Source: Figure 2.3-3 in 2010 LANL MDA G CME-2.

Lateral Scale 0----------1----------2----------3000 feet

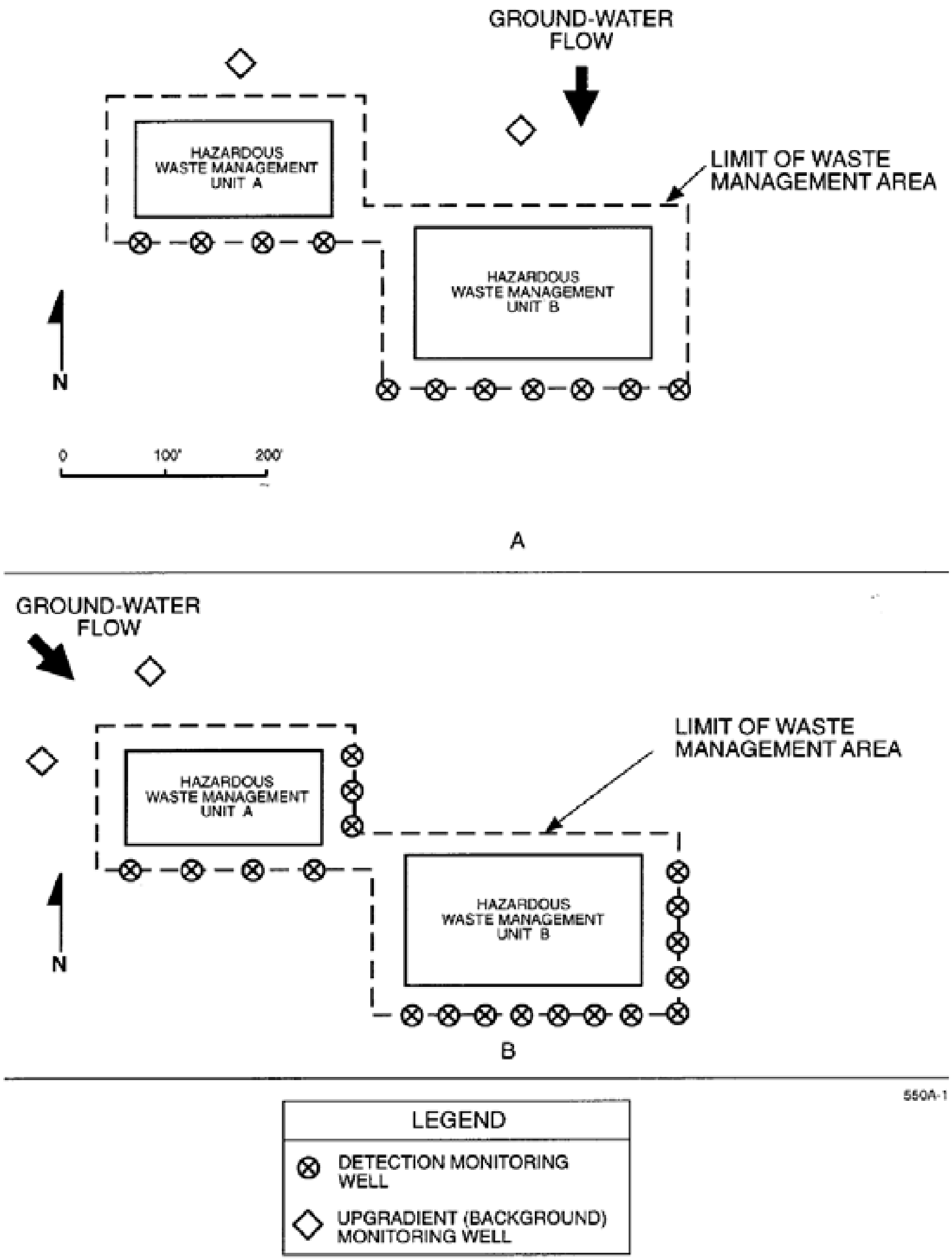
The groundwater flow analysis in Figure 1.B. shows the requirement in RCRA for monitoring wells to be installed along the northern and eastern side of MDA G because of the northeastern direction of groundwater flow at the water table at the top of the regional zone of saturation. The above figure shows that there are no monitoring wells installed north of MDA G at this time.

Note the wide spacing of monitoring wells along the eastern side of MDA G in Figure 2 of greater than 600 feet between wells R-39 and R-57 and greater than 400 feet between wells R-57 and R-41. For comparison, Figure 3 shows the recommended spacing of monitoring wells in RCRA guidance for waste disposal facilities where waste is left in place below a dirt cover is approximately 50 feet.

An additional reason monitoring wells are required along the northern side of MDA G is the four "Hot Spots" for subsurface solvent contamination that are located on the northern side of MDA G. The solvent hot spots are displayed on Figure 4. The hydrogeologic conceptual site model for MDA G in Figure 6 shows that LANL recognizes the potential for the solvent contamination at MDA G to travel down below Canada del Buey north of MDA G and contaminate the groundwater. Nevertheless, no monitoring wells were installed north of MDA G at any time including for the evaluation of corrective measures.

Monitoring wells in the regional zone of saturation are also required at appropriate locations north and east of MDA G to characterize and monitor groundwater contamination from the tritium "Hot Spots" that are displayed on Figure 5 and also for accurate knowledge of all of the large number of COPCs for the large volume of wastes buried in the 63-acre Area G/MDA G.

Figure 3. Two examples of the design for groundwater monitoring well networks in the Federal Resource Conservation and Recovery Act (RCRA) guidance document for hazardous and mixed waste disposal sites where buried wastes are not excavated.



Source: Figure 9 *in* U.S. EPA, *RCRA Groundwater Monitoring: Draft Technical Guidance*, EPA/530-R-93-001, Nov. 1992.

Figure 4. Locations for solvent contamination "Hot Spots" at MDA G. The black "hot spots" are the solvent 111-TCE. The blue "hot spots" are the solvent TCE. Source: Figure C-3.1-5 in 2010 LANL MDA G CME-2.

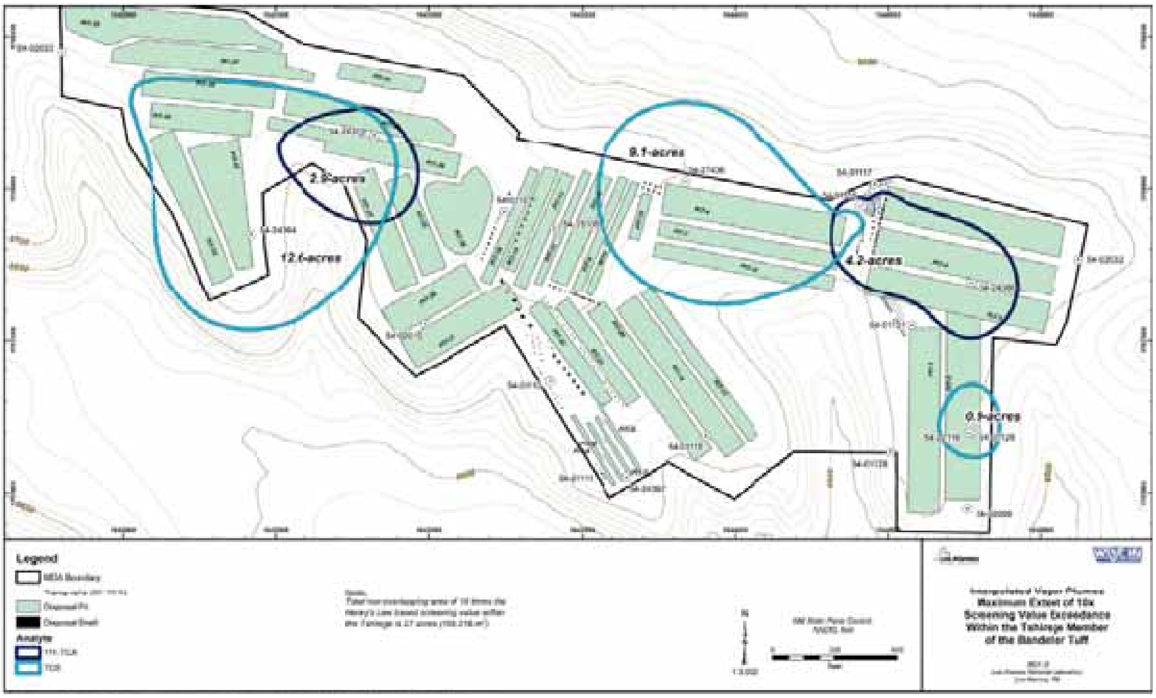


Figure 5. Locations for tritium contamination “Hot Spots” at MDA G. Tritium “Hot Spots” 2 and 3 are at the locations of solvent “Hot Spots.” See Figure 4. Source: Figure B-2.0-4 in 2010 LANL MDA G CME-2.

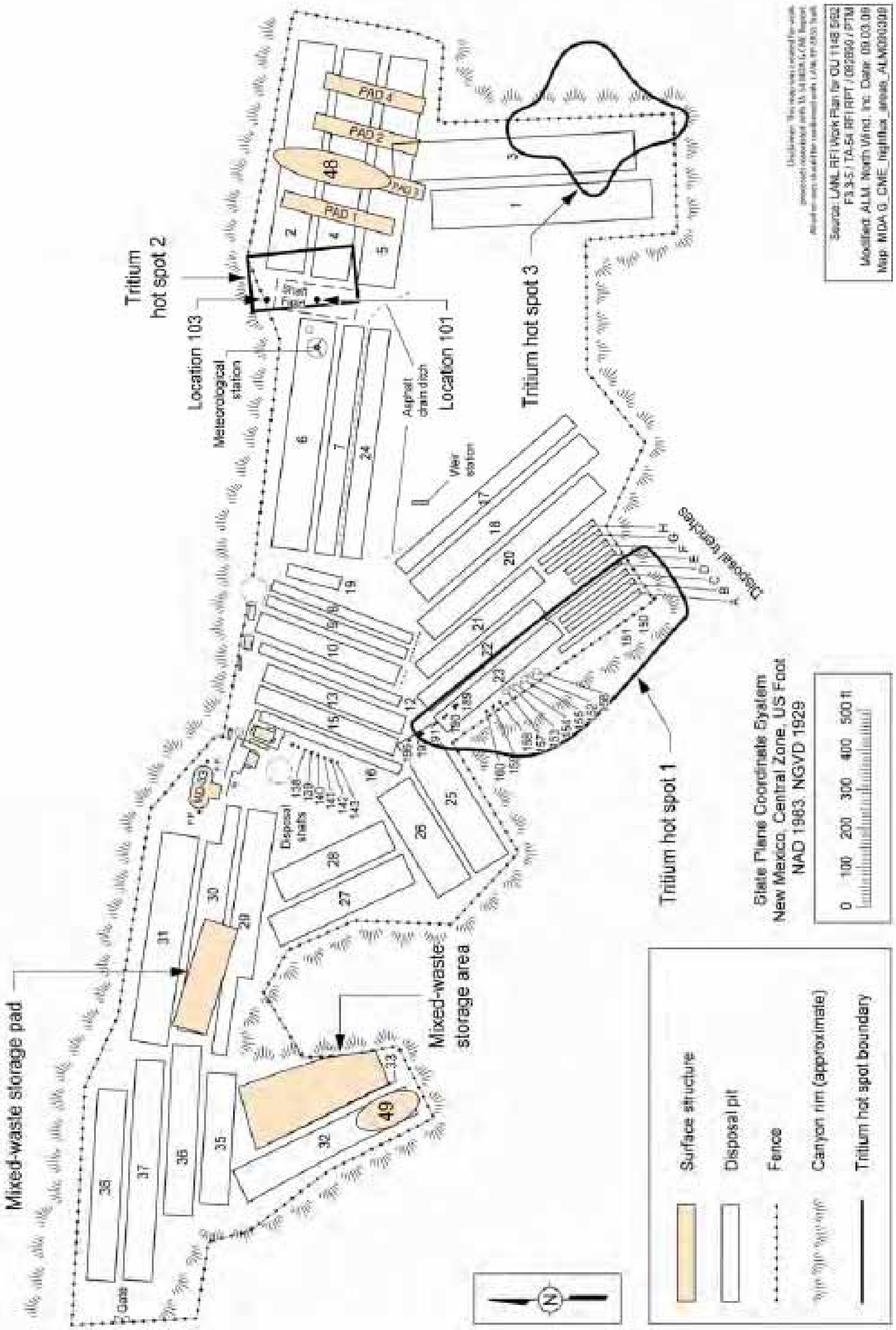


Figure 6. Hydrogeologic conceptual site model for MDA G. The conceptual site model is that MDA G contaminants are traveling down in the vadose zone below Canada del Buey north of MDA G. The potential groundwater contamination below Candada de Buey from the travel of contamination in the vadose zone and from the northeastern direction of groundwater flow has not been investigated. Source: Figure 4.0-1 in 2010 LANL MDA G CME-2.

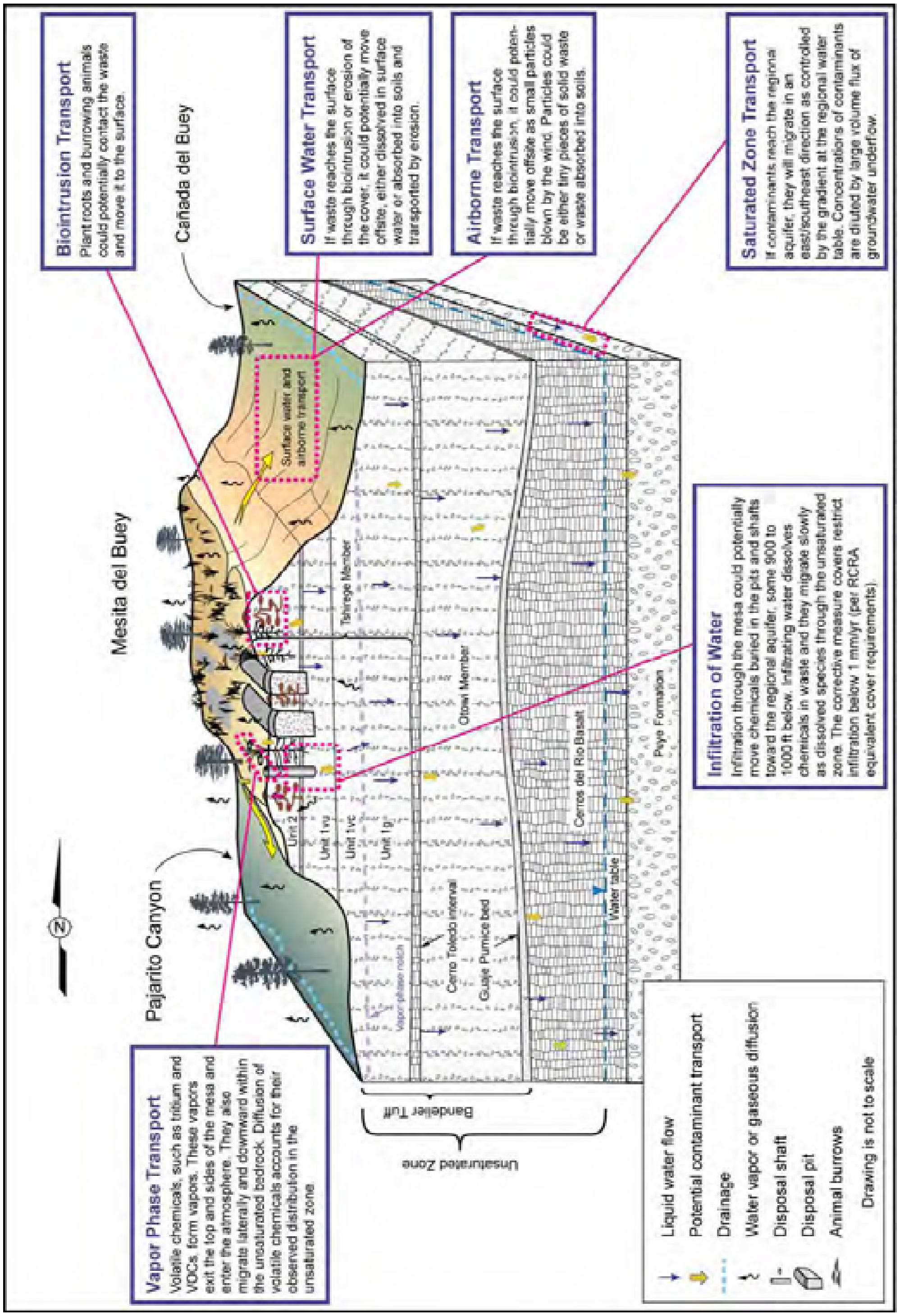
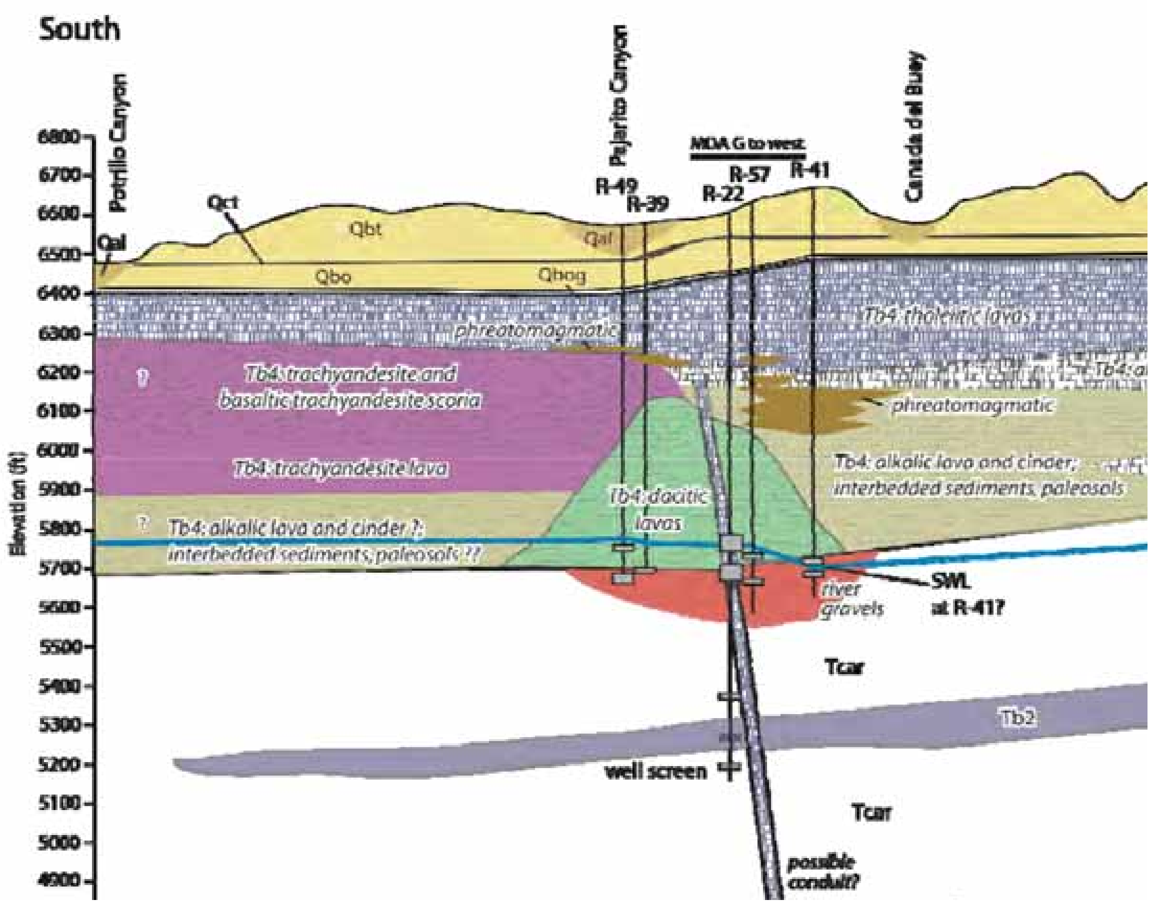


Figure 7. North-South Cross-Section Near East End of MDA G. The cross-section shows a vertical volcanic vent that is a potential pathway for transport of contamination from MDA G deep into the regional aquifer. An unknown number of these volcanic pathways may be present below MDA G. The nature and extent of the volcanic pathways below MDA G was not investigated for the 2010 LANL MDA G CME-2.

Source: Figure E-1.1-4 in 2010 LANL MDA G CME-2.

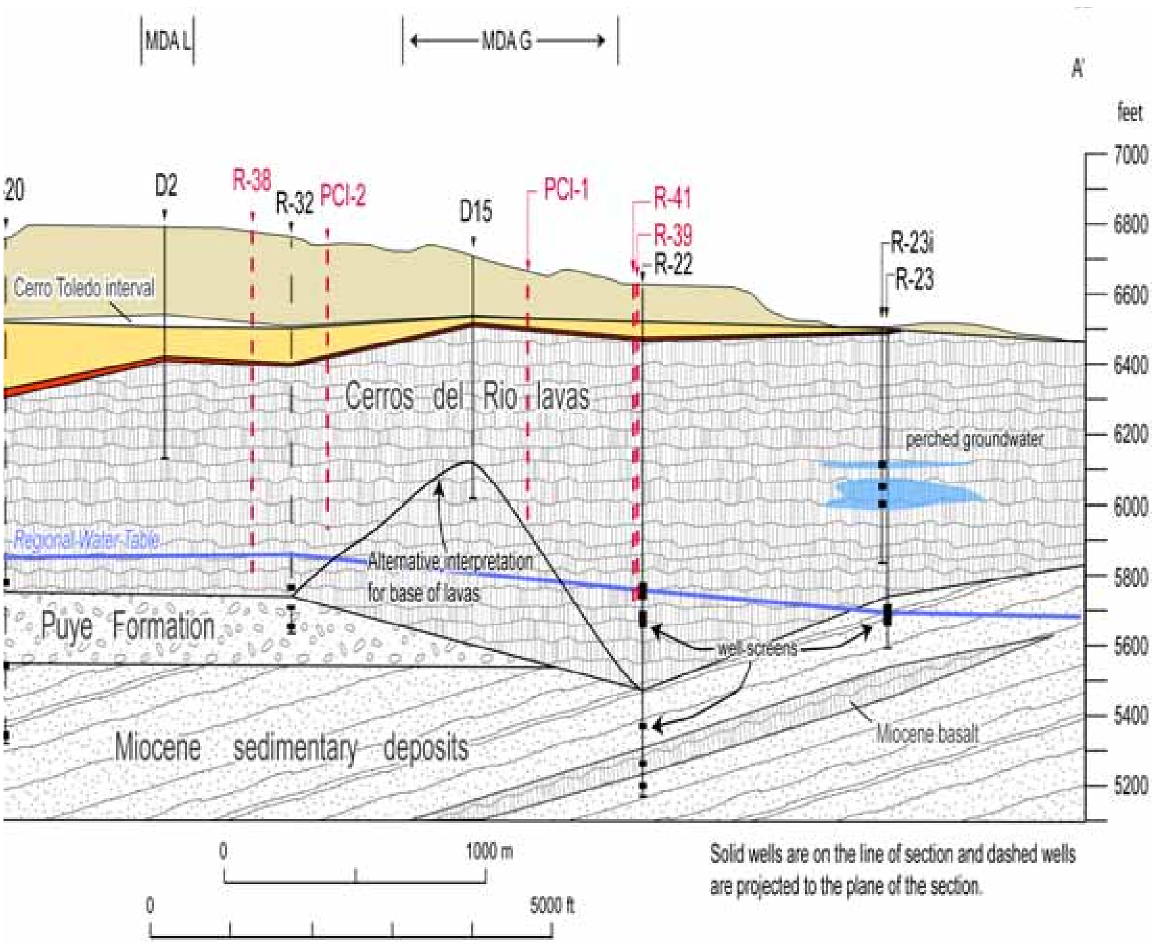
South **North**



Lateral Scale 0------------1-------------2-------------3000 feet

Figure 8. West to East Cross- section for Canada del Buey that shows the great uncertainty in the geology below MDA G. The uncertainty illustrated on the cross-section is in the thickness of the basalt and the Puye sediments.

Source: Figure 4.2-2 in 2008 LANL MDA G CME Report (LA-UR-08-5781 September 2008)



There is additional great uncertainty in the geology below MDAG concerning the physical properties of the rocks and sediments that control travel of contamination.

An important example of the great uncertainty in the geology below MDA G is the lack of knowledge on the number and locations of volcanic vents below MDA G. The vertical volcanic vent located immediately east of MDA G is displayed on Figure 7.