MWL

ENTERED

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Sent: Thursday, January 31, 2008 3:57 PM
To: Kieling, John, NMENV
Subject: Citizen Action Comments SNL LTMMP
Attachments: LTMMP CA Comments Jan 31 07.doc

January 31, 2008
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Dear Mr. Kieling, here are comments for the SNL Long-Term Monitoring and Maintenance Plan. Several other individuals and CARD join with Citizen Action.
Please acknowledge receipt of the comments. Thank you.

Sincerely,

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Before the New Mexico Environment Department

January 31, 2008
Citizen Action Comments Re: Sandia National Laboratories (SNL), New Mexico Long-Term Monitoring and Maintenance Plan (LTMMP) for the Mixed Waste Landfill (MWL) (September 2007)

1. By letter of November 26, 2007 Citizen Action asked for denial of the LTMMP, extension of the comment period and request for public hearing for the LTMMP. That letter is incorporated in its entirety herein by reference and includes the requests and comments. The undersigned groups and individuals join Citizen Action in the 11/26/07 requests and comments as well as for the comments contained in these 1/31/08 Comments.
2. The LTMMP is being presented out of sequence with the requirements of the Resource Conservation and Recovery Act (RCRA), the NMED Final Order (2005) and the Corrective Measures Implementation Plan. A requirement to develop the LTMMP was presented in the NMED Final Order on the MWL (Curry May 2005) and the Class 3 Permit Modification (NMED August 2005). (See, September 2007 LTMMP p. 1-2). The LTMMP is required to be submitted within 180 days *after* the NMED approval of the CMI Report. The CMI Report cannot issue until after the Corrective Measures Implementation Plan is approved. The CMI Plan cannot issue until after the soil cover construction is complete. The soil cover construction cannot be completed until after the Notice of Disapproval for the soil cover due to inadequate soil gas monitoring is no longer in place. The issuance of the Sandia LTMMP prior to the completion of the soil cover also requires a public hearing as a modification of the Module IV of HSWA Permit.
3. Basically, the LTMMP is "accelerated," presented out of sequence and is an incomplete document not ready for presentation. The LTMMP lacks any defined well monitoring program and "lacks important details of the proposed wells." (LTMMP, p.1-2). The public has had no opportunity to review and comment on ongoing NMED modifications to the well monitoring network at the MWL.
4. The accelerated basis was a modification of the requirements set forth for the timing of provision of long term monitoring plan after the construction of the soil cover provided for in the Corrective Measures Implementation Plan and the May 2005 Final Order of the Secretary of the NMED. Thus, changes in terms and conditions of Module IV of the HSWA permit were made between SNL and NMED without opportunity for public comment. 63 FR 56721 requires public involvement of notification of all persons on the facility mailing list for a Class 2 modification. There

is non-compliance with RCRA (40 CFR 270.41, 124.5, 124.10) and the New Mexico Open Meetings Act (NMSA 1978, Sections 10-15-1 to 10-15-4) requirements.

5. Extension for the comment period is requested until the proper sequence for presentation of the LTMMP exists and the public has had opportunity for review and comment on the modifications to the MWL well monitoring network and soil gas monitoring.
6. A full evidentiary public hearing is requested for the LTMMP.
7. These comments regarding the LTMMP are also for submission in their entirety for comments to the Administrative Record for the RCRA Part B Draft Permit for SNL.
8. SNL is currently seeking a Resource Conservation and Recovery Act permit for the SNL facility and is including the MWL unit as a part of the Draft Permit in Section 6.7 as Corrective Measures for the MWL. The MWL cannot properly be included within a RCRA Part B permit because the MWL was never on the Part A RCRA application for SNL. (See, 40 CFR 270.1(b).) In fact, the MWL was never on a Part B application either. The Hearing Officer's Conclusion of Law No. O for the MWL[1] concluded that the MWL site *was never included in the Part B permit for the SNL facility*. Instead, SNL sought and obtained a "corrective action module" for the MWL *from the EPA,* the so-called "Module IV," on the theory that the MWL was *not* subject to Part B permitting requirements.
9. There is no regulatory authority under RCRA for the SNL RCRA Draft Permit to now include the MWL as a part of the RCRA Draft Permit. Neither does the LTMMP qualify for inclusion in the RCRA Draft Permit. The MWL was in operation in December 1988 after the September 1988 EPA declaration in the Federal Register that Mixed Waste Landfills would have to comply with Part A and Part B permitting requirements once their State was authorized to regulate mixed waste. The MWL received both mixed waste and hazardous waste during the period July 26, 1982 to December 1988 making it a "regulated unit" under 40 CFR 270.1 and 40 CFR 264.90. On or about July 25, 1990, New Mexico received its authority to regulate mixed waste. SNL never submitted a RCRA Part A application or a Part B application for the MWL within the 12 month time period required at the latest by July 25, 1991.
10. Under the provisions of RCRA, the MWL lost or lacked interim status for operation. Owners of land disposal units were required to submit a Part B permit application within one year after the state's radioactive mixed waste authorization or lose interim status. NMED gained status mixed waste authorization on July, 25, 1990. The MWL did not submit a Part B application within one year of that date and lost interim status. The MWL was required to immediately close by either clean closure, submitting a post-closure plan, or a document in lieu thereof because it did not maintain interim status and lost interim status if it had it at all. None of this was accomplished and the MWL remains an illegally operating unit[2] to the present time without a closure plan,

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[1] Request for Class 3 Permit Modification for Corrective Measures for the Mixed Waste Landfill, Hearing Officer's Proposed Findings of Fact, Conclusions of Law at O. " The landfill is not regulated as a permitted facility under 40 CFR 264 because Sandia never applied for or was issued a Part B permit for the landfill. The landfill is not regulated as an interim facility under 40 CFR Part 265 because Sandia did not include the landfill in its Part A application for the facility."

[2] The LTMMP, p.i describes the MWL as an "inactive landfill." In fact the MWL is an unlined dump with no provisions for leachate detection or leachate collection.

post-closure plan and in non-compliance with the provisions of 40 CFR 264 Subpart F. The MWL is still required to close under the provisions of 40 CFR 270.1.

11. The MWL requires closure, a post-closure plan and a post-closure permit or an enforceable document "in lieu thereof." A post-closure plan must be provided for the MWL because it is not clean closed. (40 CFR 264.118, 265.118(e)(1) and (2)). No closure by removal or decontamination has been demonstrated for the MWL.
12. SNL cannot substitute the Consent Order or the LTMMP in place of a post-closure permit because neither is an enforceable document "in lieu of" a post-closure permit nor has the LTMMP been noticed for public hearing as such.
13. The Class 3 Permit Modification of Module IV does not constitute a permit. Module IV itself was not a RCRA permit, but is an order for special conditions for corrective action.[3]
14. The MWL continues to store and treat mixed waste in situ because the MWL was never closed pursuant to state or federal law (See, 40 CFR 260.10 definitions for "active life" and "closed portion"). All active facilities must have a RCRA permit for their lifetime, which the MWL does not have.
15. 40 CFR 270.1 (c) requires that owners and operators of landfills that received waste after July 26, 1982 must have post-closure permits, unless they demonstrate closure by removal or decontamination or obtain an enforceable document in lieu of a post-closure permit. The MWL received hazardous and mixed hazardous wastes after July 26, 1982 and is thus a "regulated unit." The MWL has no closure plan as required for regulated units that received hazardous waste after July 26, 1982. "Enforceable documents have not been issued in lieu of a post closure care permit for the MWL. Thus, there are no records of this type." (May 25, 2007 NMED Public Information Request response, p.2, #9.a). NMED has obtained no authorization from EPA to issue an enforceable document for the MWL. (May 25, 2007 NMED Public Information Request response). SNL/DOE is required to apply for a post-closure permit because it has not obtained enforceable documents in lieu of a post-closure permit. SNL/DOE has not applied for a post closure care permit. The LTMMP does not satisfy the requirements for a post-closure plan.
16. The SNL also never certified closure for the MWL although it discontinued receiving burial wastes at the MWL in 1988. The MWL continued receiving above ground wastes until in or about 1993.
17. Under the provisions of 40 CFR 270.1(c) where an unpermitted regulated unit, such as the MWL is closing with wastes in place, SNL must obtain either a post-closure permit or an enforceable document in lieu thereof. SNL cannot simply now include the MWL in the RCRA permit without a post-closure permit or an enforceable document in lieu thereof. Neither the LTMMP, Consent Order nor the RCRA Draft Permit present themselves as enforceable documents in lieu of a post-closure permit.
18. 40 CFR 264.90 (2) states in pertinent part that "A ... landfill that receives hazardous waste after July 26, 1982 (hereinafter referred to as a "regulated unit") must comply

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[3] (See, LTMMP, p. 8-6, U.S. Environmental Protection Agency (EPA), August 1993. "Module IV. Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) to RCRA for Sandia National Laboratories/New Mexico, EPA I.D. Number NM 5890880518," U.S. Environmental Protection Agency, Region VI, Dallas, Texas. August 26, 1993.)

with the requirements of Sections 264.91 through 264.100 ***in lieu of*** **section 264.101** for purposes of detecting, characterizing and responding to releases to the uppermost aquifer..." (Emphasis added). The LTMMP must include these specific requirements for the MWL.

19. The Draft Permit 6.7 states that "A long-term monitoring and maintenance plan, which includes all necessary physical and institutional controls to be implemented in the future, shall be submitted by the Permittees to the Department no later than 180 days ***after*** the Department's approval of the CMI Report." The CMI Report has not been submitted to the Department." (Emphasis supplied). Therefore the LTMMP is an untimely, premature submission for review.
20. With respect to permitted facilities, RCRA section 3004(u) provides that any permit issued to a facility after November 8, 1984 "shall require . . . corrective action for all releases of hazardous waste or constituents from any solid waste management unit at a treatment, storage, or disposal facility seeking a permit under this subchapter, regardless of the time at which waste was placed in such unit." 42 U.S.C. § 6924(u).
21. 63 FR 56710, 56715 states that "Section 270.1 (c) ... requires owners and operators closing unpermitted regulated units with waste in place either to (1) obtain a post-closure permit, or (2) comply with the alternative post-closure requirements of §270.1(c)(7)." Section 270.1(c) also provides that "Facilities that close with waste in place, without obtaining a permit, and then use non-permit mechanisms in lieu of a permit to address post-closure responsibilities, will have to meet three important requirements: (1) the more extensive groundwater monitoring required under Part 264, as they apply to regulated units..."
22. The LTMMP must insert language under regulatory requirements that a RCRA compliant groundwater monitoring network is required at the MWL to meet the requirements of 40 CFR 264 Subpart F (40 CFR 264.90-.100) and G. (See 63 FR 56710 et seq.). The Draft Permit and the LTMMP need language that recognize that the MWL is a "regulated unit" under RCRA because of the disposal of hazardous wastes after July 26, 1982, and therefore, the MWL "must comply with the requirements of §§264.91 through 264.100 in lieu of §264.101 for purposes of detecting, characterizing and responding to releases to the uppermost aquifer" (§264.90).
23. The Corrective Action Program requires the owner or operator required to establish a corrective action program to insure that regulated units are in compliance with the ground-water protection standard under 264.92. (40 CFR 264.100)
24. 40 CFR 264.90 (2) provides that "All solid waste management units must comply with the requirements in 264.101. A surface impoundment, waste pile, and land treatment unit or landfill that receives hazardous wastes after July 26,1982 (hereinafter referred to as a "regulated unit") must comply with the requirements of sections 264.91 through 264.100 in lieu of 264.101 for the purposes of detecting, characterizing and responding to releases to the uppermost aquifer."
25. **The Secretary's Final Order (2005) must be modified before allowing the current submission of the Sandia National Laboratories' (SNL) Mixed Waste Landfill (MWL or dump) September 2007 Long Term Monitoring and Maintenance Plan (LTMMP).** NMED should **deny** the out of sequence, early submission of the LTMMP. A permit modification must first be obtained by Sandia

because the submission sequence is out of order. (Consent Order, section III.J.1 Procedures for Modifying any Provision of the Consent Order; III.M.1 "All workplans and schedules ...become enforceable requirements of this Consent Order..."; III.W.5. Preservation of Procedural Rights – "including but not limited to, opportunities for public participation, including public notice and comment, administrative hearings, and judicial appeals..."). The public is entitled to a public hearing on the modification of the sequence for submission of the LTMMP. NMED should enforce the Consent Order at this time.

26. Module IV was issued in 1993 by the EPA after the settlement of a lawsuit between EPA and SNL/DOE. The modifications made to Module IV as a result of the settlement were never noticed to the public for opportunity to review and comment or have a public hearing.
27. For the MWL, under the Consent Order's Section IV.D., (p. 43) it states that in 2001, NMED directed Sandia to conduct a Corrective Measures Study (CMS) meeting the requirements set forth in Sections N, O, P, Q and S of Module IV of the Respondent's RCRA permit. Section R, which contained the requirements for collecting hydrogeologic and other environmental conditions at the MWL, was omitted from the Consent Order requirements for the CMS. Thus, issues regarding the well monitoring network that would be required by a post-closure plan or an alternative plan in lieu thereof, were omitted from the CMS requirements. The requirements for the CMS, which then extended into the Corrective Measures Implementation Plan (CMI Plan) and ultimately to the selection of the soil cover remedy, did not formally embrace discussion of the 264.91-.100 requirements for a groundwater monitoring network that could satisfy requirements for a post-closure plan. NMED could argue that the groundwater requirements were supposedly addressed in the RCRA Facility Investigation, but the point is, there was no direct carry through for purposes of public notice to claim that the CMI Plan met requirements of a post-closure permit.
28. LTMMP D-5 asserts that the Consent Order "transferred regulatory authority for groundwater sampling at the MWL from the HSWA module to the Consent Order." No citation to the Consent Order is provided to support this statement. Consent Order Section VIII Groundwater Monitoring Wells and Section IX Groundwater Sampling say nothing about a transfer of authority. Consent Order Section III.W.3.b states that "where controls are identified for a SWMU, only those controls (e.g., institutional controls, engineered barriers, long-term monitoring and operation and maintenance) are enforceable under the Permit." No explanation is given for how the Consent Order contained the authority to transfer authority from the HSWA Module IV to the Consent Order. Section 6.0 of the Draft Permit also seems to be contrary to the assertion of transfer of authority because it says corrective action is to be conducted solely under the Consent Order except "5) For the purpose of complying with the requirements of this Permit for the Mixed Waste Landfill (MWL)."
29. Because the MWL received hazardous waste after July 26, 1982, the requirements of 264.91 through 264.100 must be complied with in lieu of 264.101. The language requiring compliance with 264.91 through 264.100 must be inserted into the LTMMP and the Draft Permit. 40 CFR 264.90 (a)(1) requires the owner/operator must satisfy the requirements of (a)(2) for "all wastes contained in solid waste management units

at the facility, regardless of the time at which waste was placed in such units. All solid waste management units must comply with the requirements in 264.101."

30. The language of the LTMMP should include the Consent Order requirements.

31. The April 29, 2004 Consent Order is not an enforceable document in lieu of a post-closure permit.
32. The LTMMP states (1.3): "Although the Consent order (NMED April 2004) governs the remedy selection process for the MWL, it does not contain any requirements related to long-term monitoring, other than requirements for monitoring well replacement." ... "The Class 3 Permit Modification provides the framework for the LTMMP..." This is incorrect inasmuch as it pretends to be the only framework applicable to long-term monitoring requirements. As per 63 FR 56710 et seq., the well monitoring requirements of 40 CFR 264 Subpart F (40 CFR 264.90-.100) are also applicable to the LTMMP whether the MWL is being closed under corrective action or under a post-closure permit and should be reflected in the legal and regulatory requirements in the LTMMP at section 1.3.
33. The LANL *TA-54 Evaluation and Network Recommendations, Revision 1*, p. 6, para 2, recognizes that the RCRA requirements of 40 CFR 264.90-.99 (Subpart F) for groundwater monitoring include detection monitoring (264.98) and compliance monitoring (264.99) to either permitted or regulated units that received waste after July 26, 1982. Like TA-54, the MWL is a regulated unit that received waste after July 26, 1982 and the LTMMP and the SNL Draft Hazardous Waste Permit need to state and apply the 40 CFR 264.90-.100 (Subpart F) requirements to the MWL *including vadose zone monitoring requirements*. Similarly to MDA H, the requirements of 40 CFR 264.91- .100 are applicable to the MWL. The provisions of 40 CFR 264.91- .100 must be provided within the LTMMP in sections 1.0 through 1.3 as being specifically applicable to the MWL.
34. Section 3.5.3 of the LTMMP should include the drilling methodology to be used for replacement wells. It should state specifically that no bentonite clay or organic drilling or foams shall be allowed to invade the screened interval. Only Air Rotary Reverse Circulation under reamer should be used for advancing drill casing. Air Rotary Casing Hammer should not be used within 50 ft above the predicted depth to the water table. Then that casing needs to be parked and telescoped down to a smaller casing size and advanced only with air and without a mist for drilling into the water table. This is to obtain accurate water samples without contamination to characterize the existence of contamination at the water table. When the saturated zone is reached, drilling should halt and water should be produced from the borehole until it cleans up and is suitable for sampling as determined by turbidity. That water shall be sampled for the full analytical suite including VOCs, Semi-VOCs and tritium and RCRA trace metal suite. Tritium shall be analyzed at the low detection limits of the University of Miami as is done for LANL. This is the design for wells R35 A and R35 B at LANL. Drilling shall proceed with a careful watch on geologic formations, and water production. When encountering strata with good production of water, the drilling shall stop and sampling shall take place as above described before continuing drilling.
35. LTMMP D-5, 1.3 Scope, fails to identify any RCRA competent monitoring wells designated for long-term monitoring of "groundwater," as defined in the Consent

Order (III.B). Provision should be made for inclusion of wells to monitor groundwater as defined by the Consent Order.

36. LTMMP D-5, 1.3 Scope, fails to identify any RCRA competent monitoring wells at the MWL that are located at the Point of Compliance as defined by 40 CFR 264.95.
37. SNL/DOE is changing the point of compliance for the MWL from the horizontal limit of where the wastes were placed during operation of the MWL to the toe of the landfill cover. LTMMP D-9, 10 claims that the location of MWL-MW7, MWL-MW 8 and MWL-MW9 serve as Point of Compliance wells "at the downgradient toe of the landfill cover." In fact, the point of compliance is the former boundary of the waste management unit for the MWL. (40 CFR 264.95 (b)).
38. 40 CFR 270.42 Appendix I, C.4 provides that a change in point of compliance constitutes a class 2 modification of the permit. **The public is entitled to a notice and public hearing for a class 2 modification to the permit. This has not been provided and is another reason why the submission of the LTMMP is not appropriate at this time.**
39. LTMMP D-9 fails to identify which wells are down-gradient or cross-gradient and what is the direction of ground water flow. LTMMP D-9 claims the four oldest wells "provided excellent quality data over the years." The statement is false. The March 1993 Mixed Waste Landfill Phase 2 RCRA Facility Investigation Work Plan, states, (p. 2-31, para 2.2.5.2) (AR005409):

    "Although regional potentiometric maps indicate that the hydraulic gradient at the MWL is toward the west and northwest (Figure 2-16), current water level data for the four MWL monitor wells suggest that the hydraulic gradient is toward the **southwest**, approximately 40 degrees counterclockwise to the regional gradient. It has not been determined whether this indicates actual conditions beneath the MWL , or whether one of the monitor wells (MWL-MW3) has a poor hydrologic connection to the aquifer as a result of improper well completion or the presence of fine-grained materials near the zone of completion. If the hydrologic connection is poor, water levels in the well would not reflect the true potentiometric surface beneath the MWL. An additional well (MWL-ML4) recently completed beneath trench D of the MWL will help to resolve this uncertainty in the hydraulic gradient." (Emphasis supplied).

40. **The LTMMP must include a plan for monitoring wells to be located in the ARG strata at the point of compliance immediately along the western and southern side of the MWL dump. In 2007 NMED and DOE/SNL recognized some of the deficiencies in the existing network of monitoring wells at the MWL dump.** The fact that NMED now recognizes the requirement of RCRA to locate monitoring wells immediately along the western side of the MWL dump is shown by the instruction for the installation of two new monitoring wells in an order issued by NMED to DOE/SNL in a letter sent on 10-30-07:

    "The new wells need to be placed as close to the old landfill boundary as possible to ensure the detection of any contaminants in the groundwater. Thus, NMED approves the work plan with the following conditions.

- Both new wells shall be positioned as close as possible to the former west fence that originally surrounded the Mixed Waste Landfill. NMED is aware that, once installed, the new wells will fall within the footprint of the new cover."

Figure 5 (DOE/SNL *Long-Term Monitoring and Maintenance Plan*) shows the locations proposed by DOE/SNL for the network of monitoring wells to be installed for long-term monitoring of the performance of the MWL dump after installation of the dirt cover. Figure 5 is from the DOE/SNL *Long-Term Monitoring and Maintenance Plan* (LTMMP) that was released by NMED for public comment on October 31, 2007. However, the LTMMP does not inform the public of the order by NMED on October 30, 2007 to install monitoring wells MWL-MW7 and -MW8 at locations that are different from the locations displayed on the figure in the LTMMP (i.e., Figure 3 in this letter).

In addition, the LTMMP that was released for public comment does not inform the reader that NMED has taken action to order DOE/SNL to plug and abandon wells MWL-BW1, -MW1, and -MW3 and install new monitoring wells MWL-BW2, -MW7, and -MW8. NMED is not waiting for public participation as required by RCRA in these decisions. Instead, the LTMMP "blindsides" the public because NMED and DOE/SNL are making many decision on the long-term monitoring well network at the MWL dump without opportunity for review and comment by the public.

Figure 5 shows the proposal of DOE/SNL to install three new monitoring wells to the west of the MWL dump at locations within 70-ft of the western fence line whereas Figure 1 shows that during the 17 year period of collecting water quality data, only well MWL-MW3 was at a location this close to the western fence line of the dump.

The LTMMP still fails to meet the requirements of RCRA for the necessary network of monitoring wells because the flow of groundwater at the water table is to the southwest and the LTMMP does not install any monitoring wells along the southern side of the MWL dump. However, the LTMMP does identify the need to use low-flow purging and sampling techniques for the production of water samples from monitoring wells installed across the water table in the fine-grained sediments.

Furthermore, the LTMMP does not inform the public that NMED issued letters in 2007 that ordered DOE/SNL to 1). avoid the use of drilling methods that would invade the screened intervals of monitoring wells with any organic drilling additives or bentonite clay drilling muds, and 2). only use PVC screens in the new monitoring wells.

41. LTMMP D-9 falsely claims that MWL-BW1 is a background well. BW1 never was a background/upgradient well as defined by RCRA because it is cross-gradient to the flow of groundwater. No RCRA qualified background water data has been provided at any time for the MWL.
42. MWL-BW1 also did not monitor "groundwater" under either the definition provided in the Consent Order (2004) or under the definition of the "uppermost aquifer" provided for by 40 CFR 264 Subpart F. No data from MWL-BW1 has met the requirements for background water sampling requirements also because the well was at all times cross-gradient to the MWL.

43. The fact that hazardous wastes were disposed of in the MWL after July 26, 1982 established that the waste dump must be managed as a "regulated unit", and therefore, the MWL must meet the requirements of RCRA 40 CFR §§ 264.90 to 264.101 (referred to by RCRA as RCRA § 264 Subpart F) for monitoring the release of wastes to the groundwater.
44. The current NMED scheme is to close the disposal site as a solid waste management unit (SWMU) and deny that the RCRA requirements include 40 CFR §264.90-.100 of Subpart F. NMED's position is legally incorrect because hazardous wastes were disposed of in the MWL after July 26, 1982, and in fact the waste disposal activities continued until December of 1988. 40 CFR § 264.90.(a)(2) provides as follows:

A surface impoundment, waste pile, and land treatment unit or landfill that receives hazardous waste after July 26, 1982 (hereinafter referred to as a "regulated unit") must comply with the requirements of §§264.91 through 264.100 in lieu of §264.101 for purposes of detecting, characterizing and responding to releases to the uppermost aquifer [Emphasis supplied].

The substantial deficiencies in the current detection monitoring program and the historic deficiencies of the monitoring wells at the MWL to meet the requirements of RCRA § 264 Subpart F for monitoring the groundwater beneath the MWL are described below. A study of the available information establishes that the network of monitoring wells have not produced scientifically sound or legally defensible data under RCRA about the presence or absence of hazardous contaminants or radioactive contaminants in the groundwater beneath the MWL.

The data collected from the monitoring wells over the past 15 years are inadequate to support a decision to leave the hazardous and radioactive wastes at the MWL over the drinking water supplies. There is routine detection of the cancer-causing contaminants TCE, DCE and cis-1,2-dichloroethane in numerous other wells at Sandia National Laboratories and at Kirtland Air Force Base. These carcinogenic solvents, known as volatile organic chemicals (VOCs), are consistently showing up in monitoring wells for Sandia and KAFB such as in the Tijeras Arroyo, numerous wells at the Technical Area 5 and the Chemical Waste Landfill. There is no reason to believe that these same wastes that are in the MWL will not also reach groundwater. No appropriate monitoring network is currently in place at the MWL for the detection of these contaminants.

The deficiencies include:

1) The failure to have a detection monitoring program for indicator parameters including tritium, PCE, and other constituents in the unsaturated strata beneath the MWL. Presently, there is no detection monitoring of indicator parameters in the unsaturated strata (vadose zone). The DOE scheme to permanently leave the buried waste at the MWL does not include monitoring the unsaturated zone beneath the buried waste. The proposal is deficient because of the sparse monitoring and also because the method of installation of the borehole will not include sealing the annular space between the casing for the

monitoring port and the borehole wall. The open annulus will allow cross-contamination of the soil air that is sampled. In addition, the long-term monitoring scheme does not propose to monitor for indicator parameters in the unsaturated strata. **The RCRA violation is 40 CFR § 264.98(a)(2)**;

2) The failure to install monitoring wells in the productive aquifer strata (the "uppermost aquifer" in RCRA terminology); the strata that are important for monitoring and the strata that form the fast pathways for the travel of contaminated groundwater away from the MWL to drinking water wells. Presently, there is only one monitoring well installed in the "uppermost aquifer". This is well MWL-MW6 located at a distance of 500 feet to the west of the MWL. **The RCRA violations are 40 CFR §§ 264.95, 264.97(a)(2), 264.97(a)(3) and 264.98(b)**;
3) The failure to install wells in the uppermost aquifer at the "point of compliance" – RCRA terminology for the hydraulically downgradient limit of the MWL (i.e., the western boundary of the disposal site). Presently, there are no monitoring wells installed in the uppermost aquifer at the point of compliance. **The RCRA violations are 40 CFR §§ 264.95, 264.97(a)(2), and 264.98(b)**.
4) SNL used the mud-rotary drilling method that invaded the screened intervals with bentonite clay muds that have properties to mask the detection of contamination and to lower the permeability of the screened intervals. Two of the monitoring wells (MW1, MW3) and the background water quality well (BW1) were drilled with the mud rotary method. **The RCRA violations are 40 CFR §§ 264.95, 264.97(a)(3), 264.97(a)(4), and 264.98(a)(4), 264.98(b), 264.98(c), 264.98(d), and 264.98(e)**;
5) There is failure to meet the mandatory requirement of RCRA for monitoring background groundwater quality at locations that are hydraulically upgradient of the MWL. There are no background water quality wells installed at locations that are hydraulically upgradient of the MWL. **The RCRA violations are 40 CFR §§ 264.97(a)(1) and 264.98(a)(4)**;
6) The failure to implement a sampling methodology that collects representative water samples. Instead, the sampling methodology is to purge the wells to dryness and collect water samples up to seven days later of the water that refills the wells. This sampling methodology strips volatile contaminants from the water and also changes the water chemistry through the introduction of air. The RCRA violations are 40 CFR §§ 264.97(a)(1), 264.97(a)(2), 264.97(a)(3), 264.97(d)(1) 264.97(e), 264.98(a)(3), 264.98(a)(4), 264.98(b), 264.98(c), 264.98(d), and 264.98(f);
7) The failure to have a detection monitoring program that is reliable for the mandatory RCRA requirement to monitor for indicator parameters in the groundwater beneath the MWL, and at the point of compliance. The RCRA violations are 40 CFR §§ 264.98(a), 264.98(a)(3), and 264.98(a)(4);
8) The failure to have a detection monitoring program to produce water quality data that meet the protocols for statistical tests to assess the presence or absence of hazardous constituents and indicator parameters in the groundwater beneath the MWL and at the point of compliance. The RCRA

violations are 40 CFR §§ 264.97(g), 264.97(h), 264.97(i), 264.98(c), 264.98(d), 264.98(f), 264.98(f)(1), 264.98(f)(2), 264.98(g), 264.98(g)(1), 264.98(g)(2), 264.98(g)(3), 264.98(g)(4), 264.98(i);

9) The failure to have accurate knowledge of the ground-water flow rate and direction in the uppermost aquifer. The RCRA violation is 40 CFR § 264.98(e).

10) Well MWL-MW5. Mistakes made during the construction of well MW5 allowed a large amount of annular sealant material of bentonite grout to enter the well. The large amount of this grout contaminant entering the well can be seen in the Mixed Waste Landfill Well MWL-MW5 Final Well Summary, p.9-11. Bailers put into the bottom of the screen came out filled with grout. Subsequent bailers put into the bottom of the screen also came out filled with grout and/or muddy water. The well development log for MWL-MW5 shows the final turbidity level at 48.9 NTUs when the well development was terminated. This level is more than 40 NTUs above the permissible limit of 5 NTUs under the RCRA Draft Technical Enforcement Guidance Document cited for performance in the April 29, 2004 Consent Order between SNL and NMED. The RCRA requirement and the standard industry practice are that monitoring wells are to be originally developed that meet the appropriate turbidity for representative water samples of not greater than 5 NTUs. The original development of MW5 was stopped before the grout contamination was removed. The intended purposes for well MW5 was to provide hydraulic conductivity of the uppermost aquifer, and to serve as a downgradient monitoring well for the MWL. Neither purpose has not been met because the screen is mistakenly installed across both the fine-grained sediments and in the Ancestral Rio Grande strata, and the screen is contaminated with the bentonite grout. The well should be replaced. Indeed, the Consent Order requires that wells that have failed for their purpose be replaced.

11) The effect of the grout contamination to plug the aquifer strata and lower the measured value of hydraulic conductivity is evidenced by the data in Table 3-3, Summary of Hydraulic Conductivity Data for MWL Wells in Sandia Report SAND2002-4098. The hydraulic conductivity for well MW5 is shown as 0.682 ft/day compared to the markedly higher values of 1.73 ft/day measured in the lower screen of well MW4, and of 5.05 ft/day measured in well MW6. Well MW6 is the only well at the MWL with a screen installed only in the Ancestral Rio Grande strata.

12) Table 3-3 in the Sandia report identifies the permeability values for the lower screen in well MW4 and the screen in MW5 as being a composite value for both the fine-grained strata and the Ancestral Rio Grande strata because the screens are installed in both strata type. Thus neither MW4 nor MW5 are capable of producing an accurate hydraulic conductivity value for either the fine-grained strata or the Ancestral Rio Grande strata.

13) Mistakes in the installation of well MWL-MW4. Well MW4 is a multiple-screen well with two well screens. The well was installed at an angle beneath Trench D to investigate contamination by the 271,000 gallons of reactor coolant water that was dumped into the unlined trench. The upper screen is

installed in the fine-grained sediments deep below the water table and the lower screen is installed across the contact of the fine-grained sediments with the ARG strata. The well was installed to investigate contamination at the water table but fails to meet this purpose because the top of the upper screen was installed too deep below the water table.

There is the ubiquitous presence of nitrate at high levels in the water samples collected from the water table below the MWL dump, but the water produced from the upper screen in well MW4 is low in nitrate. The water samples produced from monitoring well MW-6 show that water in the ARG strata are also low in nitrate.

The water level measured in the upper screen in well MW4 is much deeper than the water levels measured in the wells that are installed across the water table. In fact, the deep water levels measured in the upper screen in well MW4 is nearly identical to the level measured in the deeper ARG strata at well MW6. The anomalously deep water level measured in the upper screen in well MW4 is evidence of leakage between the upper and lower screen.

The water level information, the quick refilling of the upper screen in well MW4 after it is pumped dry, and the low levels of nitrate are all evidence that there is leakage between the upper and lower screens in well MW4. At a minimum this leakage has been present since 2001 to the present. The placement of the upper screen at too great a distance below the water table and the ongoing leakage have prevented well MW4 from producing reliable and representative water samples for knowledge that releases from the MWL dump are contaminating the groundwater. There is an immediate need to plug and abandon well MW4 and replace the well with a new well installed to investigate groundwater contamination at the water table beneath Trench D.

14) However, Table 3-4 in the same Sandia report (SAND2002-4098) and the text of the report misrepresent the hydraulic conductivity values measured in the MWL wells MWL-MW4 Lower and MWL-MW5 as being representative of the Ancestral Rio Grande strata. This information is false because the two screens are also installed in the fine-grained sediments and the measured hydraulic conductivity is accordingly a composite value that is much lower than the hydraulic conductivity of the Ancestral Rio Grande strata. Only the bottom 10% of the screens in wells MW4 and MW5 are in the Ancestral Rio Grande strata. In addition, the bottom of the screen in well MW5 is the very part of the screened interval that was plugged by the grout!
15) Thus neither well MW4 nor MW5 are capable of producing an accurate hydraulic conductivity value for the Ancestral Rio Grande strata. This practice is violative of 40 CFR 264.98 (e) which requires that the owner or operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually. Table 3-4 misrepresents the permeability values of wells MW4 and MW5 as being representative of the Ancestral Rio Grande strata.

16) The average hydraulic conductivity value determined from the three wells MW4, MW5, and MW6 was then used in Sandia report SAND2002-4098 to calculate a flow velocity for groundwater in the Ancestral Rio Grande strata which underestimates the flow velocity for the uppermost aquifer to be 18.5 ft/year. The flow velocity for the uppermost aquifer at the MWL is unknown and misrepresented. The Sandia report thus makes false material representations for calculation and reporting of a slow groundwater flow rate at the MWL.
17) The LTMMP has provided no competent potentiometric surface map because of the above cited defects.

45. The drilling record on file at the New Mexico Environment Department for Sandia Mixed Waste Landfill (MWL) monitoring well MW5 is proof that the Air Rotary Casing Hammer (ARCH) drilling record is unacceptable for installing any of the new network of monitoring wells at the Sandia MWL dump.

From the New Mexico Environment Department records for monitoring wells at the Sandia Mixed Waste Landfill - MW5 Well File Shears # 199913

Summary drilling record for Sandia Mixed Waste Landfill (MWL) well MW5:

Driller's TD:	550ft
Formation at TD:	Santa Fe Group
Depth to water while drilling:	No indication (drilled while pumping water)
Depth to water on geophysical log:	496ft
[TD = total depth of borehole]	

Drilling record for well MW5 on Oct. 31, 2000:

"At 355 ft the [drill] bit was sticking badly and some water had to be pumped down the hole while drilling. Clay was drilled 355-60 ft. From 360 ft drilling continued while pumping water. Sample returns from this point consisted of a stream of mud coming thru the hopper."

Drilling record for well MW5 on Nov. 1, 2000:

"Resumed drilling while pumping water. Sample returns began coming up as gooey slugs. Backpressure in the returns hose to the hopper built up and blew the hose off, spewing mud in a focused column. Hose had to be clamped and reclamped."

The drilling record on file at the New Mexico Environment Department (NMED) for Sandia MWL well MW5 is evidence that the Air Rotary Casing Hammer (ARCH) drilling method had similar performance as a mud rotary drill to invade the permeable zones of the alluvial sediments with the highest saturated hydraulic conductivity (Ksat) with natural clay drilling muds that have properties to lower the Ksat of the sediments and to mask the detection of contamination.

The drilling record for well MW5 shows that the use of water for drilling the borehole prevented the ARCH method from identifying the water table in the fine-grained sediments during the drilling of the borehole. In addition, the borehole geophysics also failed to identify the water table because the depth to water on the geophysical log of 496 ft is approximately 25 ft below the water table.

On June 19, 2007 the NMED issued a Notice of Disapproval (NOD) for the DOE/SNL proposed plan for replacement of monitoring wells BW1 and MW1 at the Sandia MWL dump. The pertinent pats of the NOD are pasted below.

4. Page 5, Section 5.2.1 - The Permittees shall log the geology of the borehole during drilling, given that MWL-BW2 is to be located a substantial distance from the well it will replace. Modify the plan to state that the geology of the borehole will be logged during drilling.

5. Page 5, Section 5.2.1 - The Permittees shall log the depth of the first encounter with regional groundwater and any perched groundwater, during drilling. Modify the plan to stated that the depth of regional groundwater and the depth of any perched groundwater will be logged during drilling.

46. The NMED letter dated July 2, 2007 prohibits use of the mud rotary method for installing the replacement monitoring wells at the Sandia MWL dump as follows in pertinent part:

RE: REPLACEMENT OF MIXED WASTE LANDFILL GROUNDWATER MONITORING WELLS MWL-MW1 AND MWL-MW3 SANDIA NATIONAL LABORATORIES, EPA ID NM5890110518

"The mud rotary drilling method shall not be used to install the wells. Each well shall be installed to monitor groundwater at the water table." (p.2)

The drilling record of Sandia MWL dump monitoring well MW5 is proof that the ARCH method is unacceptable for drilling any of the boreholes for the network of new monitoring wells at the Sandia MWL dump because the use of water with the ARCH drilling method will be a type of mud-rotary drilling and will

1). prevent logging the geology during drilling,
2). prevent detection of perched zones of saturation,
3). prevent detection of the water table,
4). prevent collection of *in situ* groundwater at the water table for investigation of contamination from releases from the MWL dump, and
5). invade the screened interval with clays that will lower the Ksat of the screened

interval and mask the detection of contaminants in the groundwater samples produced from the new network of monitoring wells.

The ARCH drilling method is unacceptable for installing any monitoring wells at the Sandia MWL dump. The two drilling methods that are acceptable are

1). air-rotary reverse circulation underreamer casing advance using telescoped drill casings, and

2). the sonic drilling method that was used for installation of the Sandia MWL dump monitoring well MW4.

47. The LTMMP has no transmittal letter included with the LTMMP. The LTMMP is a Resource Conservation and Recovery Act (RCRA) document and requires a transmittal letter signed under penalty of perjury by SNL.
48. NMED currently has a Notice of Deficiency against the soil cover and must, but has not yet responded to citizen comments regarding soil gas testing. The issues must be resolved prior to submission of the LTMMP.
49. DOE SNL submitted an incomplete LTMMP on an "accelerated basis" which DOE claimed was ordered by the NMED. SNL admits that the LTMMP is incomplete. NMED states that no "accelerated" request for the report was made by them. The LTMMP thus presents false information to the public, if NMED is correct. The LTMMP should be denied by NMED because it provides misleading or false statements.
50. NMED has issued the LTMMP report for review and comment by the public even though the NMED has made changes to well monitoring requirements at the MWL that are different from what is in the incomplete LTMMP.
51. The orders for well monitoring replacements at the dump are major documents for which the public has not been given an opportunity for review and comment by the NMED. The locations for monitoring wells indicated by the LTMMP (App. D-7 Fig.D-1.3-1) are not shown in the positions currently ordered by the NMED. The Order by NMED was sent out before the NMED issued the LTMMP for public review and comment.
52. NMED has failed to inform the public that there are substantive changes ordered for the well monitoring network that are not in the LTMMP. The public is not being provided accurate information upon which to make its comments.
53. Public comment for the LTMMP requires access to all TechLaw reports. The LTMMP should not be sent out for public comment until the public has the TechLaw reports. NMED Attorney Tannis Fox has stated that the 2006 TechLaw report forms the foundation for the Fate and Transport Model. The TechLaw reports are crucially related to the long-term monitoring for the dump.
54. NMED is refusing to present the TechLaw reports about the Fate and Transport Model for contaminants at the dump. The report may show a lack of reliable data about 1) the existing monitoring network and 2) the Fate and Transport Model.
55. The New Mexico Attorney General's Office has twice stated that the TechLaw report is a public record subject to release. NMED filed a lawsuit against Citizen Action to prevent the TechLaw reports from becoming public. Despite the NM Attorney

General's determinations that the TechLaw reports are public records, the NMED has sued Citizen Action to prevent public access to the TechLaw report(s) that may be critical to the computer model used for the Mixed Waste dump. NMED must face public scrutiny of the computer model used to justify the dirt cover for the dump.

56. The *Probabilistic Fate and Transport Modeling of the Mixed Waste Landfill* (Ho et al. January 2007) is a major document that has not been presented to the public for review and comment. The TechLaw reports may contradict the Sandia Report 2007-0170 *Probabilistic Performance-Assessment Modeling of the Mixed Waste Landfill (MWL) at Sandia National Laboratories (Sandia)* (2d Edition) (January 2007) and should be provided on that basis to the public.
57. The Report states (p.69): "[A] robust monitoring system is planned for the vadose zone at the Mixed Waste Landfill (MWL) to serve as an early warning system for protecting groundwater." Sandia also asserts that "Additional details regarding the frequency and extent of long-term monitoring activities will be included in the MWL Long Term Monitoring and Maintenance Plan." http://www.nmenv.state.nm.us/hwb/SNL/MWL/MWL_Prob_Model_NOD_revision.pdf Sandia is required by DOE Orders to provide well monitoring of the vadose zone, but currently has provided no plans for vadose zone monitoring. Sandia also has not performed vadose zone monitoring beneath the MWL. Sandia must provide a Long Term Monitoring and Maintenance Plan that provides for vadose zone monitoring and that accounts for the NMED orders to provide well replacement.
58. Projections of contaminant transport models may all be highly skewed for dump contaminants such as uranium, PCE or tritium reaching the groundwater because of the corroded well screens, inappropriate well locations, and the use of drilling fluids and bentonite clay that adsorb contaminants.
59. The well monitoring system at the Mixed Waste Landfill is currently required to replace three monitoring wells. It would seem appropriate that Sandia be also required to present its plans for installation of the three wells and the plans for vadose zone monitoring system prior to proceeding with construction of the dirt cover.
60. Sandia has indicated in response to NMED plans to suggest new monitoring well locations that new well monitoring locations would damage the soil cover. Thus, it would additionally seem appropriate for Sandia to also install the new wells ordered by NMED as well as the vadose zone monitoring system at the MWL prior to proceeding with additional cover construction.
61. The projections of the Probabilistic Performance-Assessment Modeling of the MWL at SNL (2d Edition) may not account for the lack of appropriate well monitoring that has existed for some time at the MWL. Baseline characterization of the MWL may be flawed and the data inappropriate for use in Fate and Transport Models. Incorrect data has been furnished by well screens due to:
    - **a)** Improper locations in relation to the flow of ground water (known since 1990 Julie Wanslow Memorandum);
    - **b)** Corroded stainless steel well screens (chromium and nickel) that have existed since 1992. (2002 Annual Ground Water Monitoring Report);
    - **c)** Improper well development by the use of drilling muds and fluids (Benito Garcia, 1994) that prevented detection of contaminants and left wells with high turbidity levels (Drilling logs);

d) Use of purge to dry sampling methods that could destroy up to 70% of VOCs;
e) Wells with water levels that were too low to accurately sample.
f) Well screens that were placed across both the Alluvial Fan and the Ancient Rio Grande strata.
g) MW5 Well screen contaminated with bentonite clay.

Earlier Reports by EPA, DOE and NMED recognized that monitoring wells were not at the correct locations.

- DOE/SNL knew in May 1991 from the DOE Tiger Team Assessment of SNL ((p. 3-59) that

"The number and placement of wells at the mixed waste landfill is not sufficient to characterize the effect of the mixed waste landfill on groundwater."

- In June 1991, the DOE Technical Review: Compliance Activities Workplan for the Mixed Waste Landfill, Sandia National Laboratory (Kenneth Rea, Environmental Restoration Technical Support Office) stated under Comments:

"19/1/1 It is stated that 'three additional wells were installed, two downgradient and one upgradient...' It would be appropriate to mention here that data from these wells indicated that this network has in fact only one downgradient well and no wells that are definitely upgradient.". (Emphasis supplied).

- The SNL Annual Ground-Water Monitoring Report (March 1992 for Calendar Year 1991) states:

p.7- "The ground-water surface elevation data were evaluated to determine whether the monitoring well network meets the requirements of being comprised of at least one upgradient and three downgradient wells, as specified in 40 CFR 265-93 (f). This requirement cannot be demonstrated at this time" [emphasis supplied].

- The SNL March 1993 Mixed Waste Landfill Phase 2 RCRA Facility Investigation Work Plan, states, (p. 2-31, para 2.2.5.2) (AR005409):

"Although regional potentiometric maps indicate that the hydraulic gradient at the MWL is toward the west and northwest (Figure 2-16), current water level data for the four MWL monitor wells suggest that the hydraulic gradient is toward the **southwest**, approximately 40 degrees counterclockwise to the regional gradient" [emphasis supplied].

- EPA Comment 11 contained in The Final Mixed Waste Landfill RFI Work Plan Summary Report (September 6, 1994) stated,

"Based on the southwest gradient flow of groundwater, the MWL monitoring wells are located crossgradient instead of downgradient from

the MWL; therefore, contaminants emanating from the MWL may not be detected in the monitoring wells."

- September 14, 1998, 1:12 Santa Fe MWL (AR 010980-82) handwritten notes of Will [Moats] and Benito [Garcia] discussing an NOD and closure standards (AR 010981):

"Will- Detection system is inadequate.

"Benito- Why? Write that in there

"Will- they only have 1 well down gradient..."

These above statements were a matter of public record and also were provided to EPA Region 6 by Citizen Action.

These above statements address the monitoring well network through year 1998 that consisted of wells BW1, MW1, MW2, MW3 and MW4.

62. **The LTMMP does not comply with the 2004 Consent Order for monitoring *groundwater* beneath the dump.** No monitoring wells are installed beneath the dump in the groundwater as defined by the Consent Order. The Consent Order defines groundwater as follows: "Groundwater means interstitial water which occurs in saturated earth material and which is capable of entering a well in sufficient amounts to be utilized as a water supply." (Consent Order p.66, IX.A. **Sampling**). However, the LTMMP does not install any monitoring wells in the saturated formation which produces a sufficient amount of groundwater to be utilized as a water supply. Instead, all the wells in the LTMMP are in the poorly productive, fine-grained sediments that do not produce water in the quantity as required by the Consent Order for monitoring.
63. Thermal ionization mass spectrometry (TIMS) analysis must be performed for groundwater samples to identify the isotopic signature for uranium. Uranium wastes in the dump will have a unique isotopic study. Preliminary study by Baskaran indicated uranium with isotopic proportions unlike those of natural uranium has reached the dump. Baskaran, M. *Mixed Waste Landfill Review*, Department of Geology, Wayne State University, Detroit, MI 48202, July 5, 2000.
64. The Corrective Measures Study admits that its risk assessment "does not consider risk posed by organic, inorganic, radiological constituents present in the MWL inventory that have not been released into the environment." (CMS, p. I-11). The requirements of 40 CFR 264.111
65. The NMED is not paying attention to the warning of experts such as the National Academies of Science. The NAS warned against the "hollow promise" of the combination of computer models and cheap dirt covers for long term protection of people and the environment. The National Academies of Science describes the Department of Energy's stewardship as "providing unacceptable risks to people and the environment." The report states:

- "Stewardship (covering waste with dirt and institutional controls) of waste sites will be difficult if not impossible to achieve.
- "At many sites hazardous wastes will remain posing risks to people and the environment for hundreds or even thousands of years.
- "No plan developed today is likely to remain protective for the duration of the hazards."

66. NMED requested DOE/SNL to identify locations for monitoring wells inside the dump where high levels of tritium and PCE were discovered in the RCRA Facility Investigation. The LTMMP does not address the concerns for monitoring the high levels of contamination within and beneath the dump. This monitoring is important to protect public health and the environment and to validate the Fate and Transport Model for now and into the future.
67. For legacy waste dump (Area H) at the Los Alamos National Laboratory (LANL), NMED has found the type of Evapo-transpiration cover planned for use at the Sandia Mixed Waste dump is not reliable for "preventing the intrusion of deep-rooting plants and burrowing animals." Furthermore, Hakonson, a noted LANL scientist, (*Review of SNL/NM Evapotranspiration Cap Closure Plans for the MWL*, 2/15/02, http://www.radfreenm.org/pages/hakonson_full.htm) stated that "[T]he post closure monitoring plan should provide for measurements on all possible migration pathways including movement through the vadose zone, surface contamination and biological transport." Hakonson states the need for collection of vegetation and animals at the MWL dump, including monitoring the honeybee-honey pathway for tritium. Climate change will cause plants and animals to send their root systems or burrows more deeply. Hakonson states (p.54): **"[I]t appears to me that SNL/NM has done little or nothing of substance on evaluating the surface pathway, developing a quality post-closure monitoring plan, or establishing decision criteria for possible future actions at the MWL."** (Emphasis in the original). The LTMMP (3-29) states, "Samples of soil from on-site animal burrows and ant hills showed elevated concentrations of cesium-137 above established background levels, suggesting that burrowing animals and ants may have the potential to transport contaminants to the ground surface. Plant material ...growing over trench B showed detectable activities of cobalt-60 and cesium-137." Sandia is now backing out of the representation to the NMED Notice of Disapproval for the soil cover that it would monitor soil from ant nest and animal burrows for gross alpha and beta contamination.
68. Vadose zone monitoring is not provided for beneath the dump. Neutron Measurement Gauges (NMG) are proposed. The monitoring frequency is insufficient beginning quarterly for 2 years, semi-anually for years 3 and 4 and annually thereafter. Even quarterly measurements are too sparse. Hakonson states (p.52) "Measurements must be keyed to the drainage cycle in order to 'catch' any possible percolation event at critical measurement locations in the soil profile. ... The water front from a percolation event could have already passed the measuring point in the time intervals between measurements. The point is this; NMG does not measure moisture flux."
69. **There is the failure by NMED to consider and implement the numerous scientific expert reports such as the 2003 WERC report calling for: "immediate and**

continuous active soil vapor extraction monitoring technology for regular, periodic sampling of the vadose zone; concerns for site operational history and inventory of wastes including Volatile Organic Compounds (VOCs)." The 2003 WERC Executive Summary review of the Corrective Measures Study stated: "[N]o monitoring currently exists in the vadose zone under the MWL. It is recommended that vadose zone monitoring be implemented as soon as possible to assess and monitor the region between the MWL and aquifer. Obviously, vadose zone monitoring is essential to establish the appropriate trigger levels. Such monitoring and assessment may affect the remedy selection process and/or risk assessment in both the short term and/or long term." To date no vadose zone monitoring has begun.

70. In the Notice of Disapproval (11/2006) for the soil cover, NMED acknowledges that contamination ruptured containers at the dump may have released contaminants to the vadose zone. In Response to Comments (p.19), "The NMED agrees that soil gas in the vadose zone should be monitored for tritium, radon and VOCs." In Response to Citizen Comments for the CMI Plan, NMED stated that it "has the authority under State law to require the installation of vapor monitoring wells at the MWL." However, the NMED has not required vadose zone monitoring to detect release of contaminants beneath the dump.
71. In the LTMMP measurement of the soil gas profile is too distant outside the boundaries of the dump to measure any releases of soil gas from the dump for early detection of contaminants from the dump. The soil gas data in the RCRA Facility Investigations show the requirement for measuring profiles of soil gas immediately below the buried waste. The wells for monitoring soil gas must be located inside the boundaries of the dump. No monitoring is provided for at the bottom of the pits and trenches as would be present in an engineered landfill with leak detection equipment. It is necessary then to provide such detection beneath the trenches with adequate monitoring for early detection.
72. Because of the inadequacy of dirt covers to prevent release of contamination along multiple pathways, NMED requires complete encapsulation of the shafts at LANL's Area H for wastes buried in unlined shafts. Accordingly, at a minimum, NMED should require encapsulation of the individual pits and trenches at the MWL. By analogy to the NMED decision for Area H, if encapsulation is not possible for the MWL dump, then excavation of the wastes in the MWL dump is required. Comparative cost studies between complete encapsulation and excavation for the effectiveness for long-term protection from dump contaminants should be made. DOE has the technology for excavation of the MWL dump as demonstrated by the excavation of three similar dump sites at Sandia and excavation of similar legacy mixed waste dump sites at LANL.
73. The surface pathway is still not adequately studied for the LTMMP. (Hakonson).
74. **Surface Soil Sampling required by the RCRA Facility Investigation Workplan was not performed for nuclear weapons radionuclides, RCRA heavy metals and other RCRA constituents, including PCBs.** All of these contaminants are present in the MWL. The storm water run-off pathways for these contaminants were not characterized. Surface Soil sampling across the Mixed Waste Landfill was only evaluated for tritium for which significant levels of contamination were present. That

suggests that other contaminants may also be present across the surface of the MWL, but have not been characterized.

75. **Transuranic Waste (TRU)**—the SWIMS database indicates that about 50 cu ft of TRU waste containing 1.2 mCi of total activity was disposed of at the MWL. Memoranda And Waste Management Site Plans from the early 1970s indicate that the amount of TRU waste could be as high as 600 cu ft. The major contaminants included in this waste category are Pu-238 and Pu-239. (A Preliminary Human Health Risk Assessment for the Mixed Waste Landfill, Sandia National Laboratories, 1995, p. 12) http://www.nmenv.state.nm.us/hwb/SNL/MWL/Preliminary_Human_Health_Risk_Assess_MWL_by_Johnson(1-1995).pdf
76. Pu-238 and Pu-239 in the surface pathways are unknown. With a half-life of 87.7 years for Pu-238 and 24,100 years for Pu-239, both of these contaminants should be of concern along the surface soil pathway.
77. **No characterization was done with the surface soil samples for plutonium as required in the Work Plan at the Mixed Waste Landfill during the RCRA Facility Investigations (RFI) Phase 1 and Phase 2.** The Phase 1 *Work Plan for an Expanded Site Assessment at the Mixed Waste Landfill* (July 1989) by Ecology and Environment, Inc., (Table 3-2, p. 3-11) stated 197surface soil samples were to be collected for Tritium, Gross Beta, Gamma Spectrometry, Isotopic-Uranium, and Strontium 90 if gross beta and the gamma isotopic scan indicate its presence.[4]
78. Isotopic thermal ionization mass spectrometry should be performed for uranium nuclides. The number of samples collected did not meet the 1989 Work Plan requirements. The Phase 1 Report (p.3-24) states:

> "A total of 164 surface soil samples including duplicates and blanks were collected at the MWL. The workplan specified the collection of 182 samples. Samples could not be collected where surface obstacles prevented access (i.e., above ground storage casks, disposal pits and associated concrete, steel, or wood caps, unyielding ground), *or near areas of excessively high radiation marked areas (previously roped off by SNL)*. Originally, all of the samples were to be analyzed for tritium, gross beta activity, gamma emitters (gamma spectroscopy), isotopic uranium, and isotopic plutonium. Ten Percent of the samples (randomly selected) were analyzed to determine if the radiological parameters could be determined. The remainder of the samples were list [lost?] by the laboratory.[5] The actual analyses were for tritium, gross beta activity, gross alpha activity, gamma emitters, and isotopic uranium." (Emphasis added).

On the contrary, however, The RFI Phase 1 Report at Table 5-6 (p. 5-11) shows that gamma emitters were not analyzed. In addition, the analytic results for gamma emitters are not presented anywhere in the Phase 1 or Phase 2 Reports.

This statement is an indication that high levels of surface soil contamination were present and were not characterized for plutonium and many other contaminants, especially given the fact that only ten samples were analyzed. The ten samples, moreover, did not analyze

[4] See the attached .jpg file.

[5] This sentence makes no sense unless the word "list" is changed to "lost." The writing is sloppy at critical junctures that could indicate deliberate miscommunication.

for nuclear weapons related contaminants other than tritium, Ra-226, U-234, and U-238 (Table 5-6, p. 5-11).

None of the later sampling in the RFI Phase 2 looked for plutonium or other radionuclides, with the exception of tritium.[6] Plutonium was detected in the surface soils from a limited study of the closure of an Interim Status Storage Unit. (Also, see below). The gamma isotopic scan was not performed as required by the RCRA Phase 1 Workplan. The Phase 1 Report (p.3-25 and Table 3-4) showed that the Workplan activity for Surface Soil Sampling was for -- "182 Samples to be collected for analyses for Tritium, Gross Beta, Gamma Spectrometry, Isotopic-Uranium , and Isotopic Plutonium. 100% Analysis of samples." The Completed work was -- "164 samples collected for Analyses for Tritium, Gross Alpha/Beta activity, Gamma Spectrometry, and Isotopic Uranium. Iso-Plutonium only if elevated gamma readings noted. Only 10% analyzed in 1989. Remainder to be analyzed in Phase II."

The remaining 90% of the samples were supposed to be analyzed in Phase 2. Apparently the laboratory lost the samples. (See fn 1). In the Phase 2 (p. 4-29) surface soil sampling, however, there is indication only that surface soil samples were collected for tritium. The remaining analysis of Phase 1sampling was apparently not accomplished.

The failure to accomplish the RCRA Work Plan for Phase 1 and 2 gives no confidence that soil surface contamination from plutonium or other radionuclides does not exist because only 10 samples were actually analyzed and for a limited analytical suite.

79. **Failure to conduct adequate surface soil sampling precluded risk analysis for both the surface runoff pathway and for airborne emissions inhalation pathway.** The *Preliminary Human Health Risk Assessment for the Mixed Waste Landfill, Sandia National Laboratories, Albuquerque, New Mexico* (January 1995) was based on the limited and insufficient data from the RFI phase 1 and 2 surface soil sampling. "**No surface soil sampling was performed during the RCRA Facility Investigations Phase 1 and Phase 2 for RCRA heavy metals.**" (P.9). (Emphasis supplied).
(http://www.nmenv.state.nm.us/hwb/SNL/MWL/Preliminary_Human_Health_Risk_Assess_MWL_by_Johnson(1-1995).pdf)

The 1995 Risk Assessment states further: "In addition, the lack of surface soil data precludes modeling the potential airborne emissions from the site. The potential pathways of concern for the future resident include inhalation and absorption of tritium, external radiation, and ingestion of groundwater. Inhalation of radioactive air particulates was not assessed for the same reason as for the worker scenario. Incidental ingestion of soil, and ingestion of contaminated food also were not assessed *because surface soil data have not been collected.*" (Emphasis supplied).

[6] The number of samples stated in the Phase 1 Work Plan (1989) differs from the number stated in the Phase 1 Report.

The RFI Phase 2 Report (p.7-6) states "Surface soil sampling for radionuclides showed all values to be below the 95th percentile or UTL background level, with the exception of tritium." However, the only data presented in the Phase 1 and 2 reports is from 10 samples that did not adequately characterize for radionuclides other than tritium.

80. Citizen Action believes that the areas outside the now constructed subgrade and boundaries of the MWL along the drainage pathways from the MWL should be examined for radionuclides and other contaminants for compliance with terrestrial monitoring requirements under RCRA and the Clean Water Act.
81. **The surface soil flow path away from the MWL was not appropriately examined for contaminant dispersal as required also by the Sandia Environmental Monitoring and Surveillance Plan** (PG470247) (p.13).

    "**Stormwater -** Stormwater flowing over the ground surface has the potential to pick up and transport contaminants. Accordingly, this is considered in the design of terrestrial sampling, stormwater and groundwater sampling plans considering the watershed approach."

The terrestrial Sampling Locations shown in PG470247 indicate that only the four corners of the MWL were sampled and not the storm water run-off pathways away from the dump as identified by the topographic map. (See, RFI Phase 2 Report, p.1-4 Topographic Map of the MWL.) The terrestrial sampling on flow paths away from the dump is not adequately covered. At the four locations where soil was sampled, the analytical results are that soils are elevated in tritium. The actual activity levels are not listed. No samples were taken away from the dump along the storm water flow paths. No testing was done for RCRA contaminants or PCBs.

There was additionally surface soil contamination by low levels of plutonium detected in surface soil at the MWL at the location of the now closed Interim Status Storage Unit. (April 16, 2007, Letter to Citizen Action from New Mexico Environment Department.) Plutonium along the storm run-off pathway was not monitored. Additionally as stated above, the RFI Workplan requirements for 100% of the 164 out of 182 required samples analyzed only 10 samples for tritium and not plutonium.

82. **Given the failure to collect data at the MWL for the surface soil contamination along the run-off pathway from the MWL, the Preliminary Risk Assessment could not analyze the risk to human health from plutonium and other radionuclides, RCRA metals, PCB's and other RCRA chemical contaminants.**
83. The regulatory criteria for the Mixed Waste dump are misstated by the LTMMP (D-1). The dump is subject to the closure requirements and post-closure requirements of 40 CFR 264 Subpart F and G for well monitoring networks. (See 63 Federal Register 56710 et seq.). The MWL has never had a well monitoring network that complied with the minimum requirements for at least one upgradient and three down-gradient monitoring wells for detection or a network that met requirements for long term monitoring.
84. The monitoring network of wells installed by 1990-- MWL-BW1, MWL-MW1, MWL-MW2 and MWL-MW3 -- never provided reliable or representative water samples. DOE/SNL knew in May 1991 from the Tiger Team Assessment of SNL ((p.

3-59) that "The number and placement of wells at the mixed waste landfill is not sufficient to characterize the effect of the mixed waste landfill on groundwater."

EPA Region 6 issued a September 22, 1994 Notice of Deficiency for the MWL RFI Work Plan. The EPA NOD reiterates the concern about the inadequate design of the MWL monitoring network (p.17):

> "HSWA Permit Section R.3.b.1) requires the facility to describe the hydrogeologic conditions at the facility. Paragraph 2, on page 2-44, states that the monitoring wells were sampled six times between September 1990 and January 1992 and semiannually, thereafter. Paragraph 3, on page 2-44, concludes that based on the analytical results of these sampling events, there is no evidence of contamination in the groundwater beneath the MWL. The Work Plan does not provide sufficient information to support this conclusion. In fact, as described below, the location of the monitoring wells and the depth of the screened intervals may not be adequate to detect releases of hazardous constituents to groundwater." (Emphasis supplied).
>
> "[T]he existing monitoring well network was designed in anticipation of a local hydraulic gradient toward the northwest; however, based on water level data, the observed hydraulic gradient is reportedly toward the southwest. Further, information provided on page 2-41 indicates that dense non-aqueous phase liquids, (DNAPLs) were deposited in the MWL. No information was provided in the Work Plan concerning the depth to the bottom of the aquifer into which the wells were completed or the depth to the well screen in relationship to the aquifer thickness." Emphasis supplied).

NMED's Moats et al.(March 1993) stated several concerns for the MWL-MW4: "The detection monitoring system that currently exists at the MWL is inadequate because the direction and gradient of ground-water flow can not be determined with reasonable certainty."

85. The above concerns for the well monitoring network have never been corrected at the MWL. Data that was not from a competent well monitoring network has been knowingly furnished and accepted and the soil cover remedy is not supported by that data. The LTMMP continues providing false and misrepresentative information to the public about the well monitoring network.
86. The *Evaluation of the Representativeness and Reliability of Groundwater Monitoring Well Data, Mixed Waste Landfill,Sandia National Laboratories,("Evaluation")* New Mexico Environment Department/Hazardous Waste Bureau By: William P. Moats, David L. Mayerson1, and Brian L. Salem (November 2006) has not been scientifically peer reviewed nor set for public review and comment prior to its use as a major document for the CMI Plan. The document provides no scientific basis that well monitoring data from the dump is correct.

The public has been grossly misinformed by the Moat's *Evaluation* that the monitoring wells at the MWL are reliable for water quality as they may be impacted by drilling mud, grout, and organic drilling additives and corrosion of well screens. Both the

National Academy of Sciences (NAS) (Plans and Practices for Groundwater Protection at the Los Alamos National Laboratory) and the EPA Kerr Research Laboratory (Ford and Acree, February 10 and 16, 2006) have rejected the scheme of the Moat's *Evaluation.* The Moat's *Evaluation* used the LANL Well Screen Analysis as a model, which was discredited in all aspects by NAS and EPA Kerr Research Laboratory.

The LTMMP should not be put out for review by the public until the same public review process has been provided for the Moat's *Evaluation* prior to the LTMMP presentation to the public. NMED claims that it "welcomes the review by EPA" in a July 17, 2007 letter, but has not requested the review from EPA. The 7/07 letter states "Citizen Action is correct that the report did not address certain topics, such as hydraulic conditions, the flow of groundwater, whether wells have gone dry, the tightness of sediments, or the capabilities of sampling pumps." For example, NMED 11/06 Responses to Public Comments used the Moat's *Evaluation* extensively to address public comments regarding groundwater monitoring wells. Comment I (p.35) addresses the need to replace monitoring wells that meet RCRA regulatory requirements. The Moat's *Evaluation* is cited regarding formation water, but fails to address whether the wells are RCRA compliant in the first instance! The hydraulic conditions, flow of groundwater, dry wells, and tightness of sediments are all included in RCRA well monitoring requirements and the Moat's *Evaluation* was thus used improperly to address the Comment.

Citizen Action and the public need the EPA review of the Moats *Evaluation* to properly review the LTMMP.

87. **The failure to identify the two groundwater flow systems beneath the MWL dump.** Figure 3 is a cross-section that shows the two distinct groundwater flow systems in the hydrogeologic setting beneath the MWL dump. The upper flow system is at the water table in the fine-grained alluvial fan sediments. The direction of flow at the water table is to the southwest. The monitoring wells that are installed across the water table in the alluvial fan sediments are wells MWL-BW1, -MW1, -MW2, and -MW3.

The deeper flow system is in the Ancestral Rio Grande (ARG) strata that are beneath the layer of fine-grained sediments. Figure 3 shows that the only monitoring well with a screen installed only in the ARG strata is well MW6. The direction of groundwater flow in the ARG strata below the MWL dump is poorly known but the available data indicate flow is to the west or possibly northwest. The ARG strata are the sole source aquifer for the region of Albuquerque. The ARG strata produce large flows of groundwater to water supply wells but the fine-grained alluvial sediments that form the layer above the ARG strata are not capable to produce groundwater in sufficient amounts to be utilized as a water supply.

RCRA (40 CFR 264.98(a)(2) requires the installation of monitoring wells across the water table in the fine-grained sediments for early detection of contamination "beneath the waste management areas" and also in the deeper productive ARG strata that are the fast pathway for horizontal travel of contaminated groundwater to the supply wells. The

monitoring wells installed at the MWL dump have failed over all time to meet the requirements of RCRA for monitoring contamination in either flow system. The only monitoring well with a screen installed only in the ARG strata is well MWL-MW6.

88. Under Module IV (Section H), Sandia is under a duty to inform the NMED about the discovery regarding nickel contamination and chromium contamination at the MWL within 15 days in writing. NMED is under a duty to act upon the new information about nickel contamination and "shall initiate a modification to the Permit according to Module IV.B.3." (Module IV, Section M.3)). Since NMED is informed about the chromium and nickel contamination NMED must require compliance monitoring under 40 CFR 264 Subpart F as provided for in 40 CFR 264.90-.100. The compliance monitoring requirements should be placed in the LTMMP.
89. The water samples produced from wells MWL-MW1 and MWL-MW3 in April 2006 exceeded the EPA MCL for chromium as they have on occasion from 1992. Water samples in April 2007 for well MW1 exceeded the EPA MCL for chromium by a factor of four. Now, NMED is ordering the wells with high measures of chromium contamination to be plugged and abandoned with the two new wells to be located a point distant to the present location. Monitoring well MW1 that is now on the northern boundary of the MWL is being moved a distance greater than 500 feet to the southwest corner of the MWL. The replacement well for MW3 is being moved 100 feet to a southwest location.
90. The speculation by NMED and DOE/SNL that the chromium and nickel contamination is from only the corrosion of the well screens is not proven. Even if the measured contamination was from the well screens, then the wells containing corrosion at the MWL were inadequate as monitoring wells.
91. In September 30, 1992, the NMED Response to Public Comments on DOE/SNL Proposed Closure Plan for the Chemical Waste Landfill (CWL), Comment #10, the NMED states,

    "Any monitoring well that has chromium contamination is inadequate to monitor the Chemical Waste Landfill. The chromium is assumed to originate in the Chemical Waste Landfill unless it is demonstrated that another source caused the chromium contamination." (Emphasis supplied).

By the same rationale, monitoring wells BW1, MW1, MW2, and MW3 were inadequate from 1992 to monitor the MWL.

92. More recently, in 2007, the NMED ordered replacement of wells at LANL where high levels of chromium were measured. DOE/LANL claimed that the chromium levels were due to well screen corrosion. However, NMED stated that was speculation and ordered new wells to be installed near the locations where high levels of chromium were measured. NMED should likewise order new wells to be installed near the present location of MWL-MW1 and MWL-MW3.
93. A July 2, 2007 NMED letter informed Sandia that the direction of groundwater flow is to the southwest. Thus, downgradient monitoring wells are required along the western and southern boundaries of the MWL, and including along the southern boundary of the classified area. Groundwater contamination has never been examined for the large inventory of hazardous and mixed waste buried in the acid waste pit, located in the southeastern portion of the classified area of the MWL.

94. The NMED is not only excluding the public from commenting on the replacement of wells MW1 and MW3 that are part of the long-term monitoring network plan, but NMED is allowing the chromium contamination to remain unexamined, contrary to the requirements of RCRA for Compliance Monitoring under 40 CFR 264.99.
95. The background monitoring well is being moved to the east of the MWL at a location that is upgradient of only the southernmost portion of the MWL unclassified area. The well does not measure background water quality further to the northern area of the dump where the largest inventory of wastes are buried in both the classified area and the northern quadrant of the unclassified area. NMED is thus excluding public review and comment for the location of the upgradient background water monitoring well.
96. Taken together, the replacement of the three wells represents a significant portion of the future long-term well monitoring network without implementing the public review process prior to the presentation of the LTMMP.
97. **The corrosion of stainless steel well screens has masked the detection of groundwater contamination below the MWL dump for longer than the past ten years.** Monitoring wells MWL-BW1, -MW1, -MW2 and -MW3 have stainless steel screens. For more than the past ten years, corrosion of the screens was claimed as responsible for the measurement of high levels of nickel and chromium in the water samples produced from the wells. However, as shown in Table 1, the levels of nickel contamination in MW1 are an order of magnitude higher than the nickel levels in BW1. Both well screens are stainless steel and corroded. The markedly higher levels of nickel measured in MW1 exceed the level that can be assigned to corrosion and represent direct evidence of a release from the dump. In fact, on July 2, 2007 DOE/SNL sent a letter to notify NMED that chromium levels measured in water samples produced from wells MWL-MW1 and -MW3 for the April 2007 sampling event exceeded the EPA MCL for chromium. In the letter, DOE/SNL made the unsubstantiated claim that corrosion of the stainless steel well screens was responsible for the high concentrations.

Over the years, NMED made the mistake to accept the unsubstantiated claim by DOE/SNL that corrosion of the stainless steel screens was the only source for the high levels of chromium and nickel. There is a record of disposal of a large volume of chromium liquid wastes in the MWL dump. There is also a record of the release of nickel wastes to the geologic formations below the dump. The buried wastes in the dump may be responsible for the high levels of nickel and chromium contamination measured in the groundwater below the dump.

In 1974, EPA set the drinking water standard for nickel at 100 ug/L. However, EPA remanded the drinking water standard for nickel on February 9, 1995 and has not set a new standard. The New Mexico groundwater quality standard for nickel is 200 ug/L. The 2004 World Health Organization Guideline Value is that drinking water shall not contain nickel at concentrations greater than 20 ug/L. The nickel values of greater than 400 ug/L that are consistently measured in the groundwater produced from well MW1 are far above the water quality standard of the state of New Mexico of 200 ug/L.

NMED has a history of arbitrary and inconsistent practice at the Los Alamos National Laboratory (LANL) and Sandia. When LANL made a claim to NMED that the high levels of chromium and nickel measured in two screened intervals of a LANL monitoring well were because of corrosion, NMED immediately responded with an order in a letter dated April 5, 2007 to install new wells stating that

> "The required actions stem from speculation by the Permittees that nickel and chromium detections represent leaching of stainless steel well casing in screens #1 and #2" [emphasis added].

It is well known in the technical literature including the RCRA guidance documents that corrosion causes stainless steel screens to be encrusted with corrosion products that have properties to prevent the detection of many contaminants of concern for releases from the MWL dump. From the pertinent section of *RCRA Ground-Water Monitoring: Draft Technical Guidance, November 1992*:

> "Monitoring well casing and screen materials should not chemically alter ground-water samples, especially with respect to the analytes of concern, as a result of their sorbing, desorbing, or leaching analytes. For example, if a metal such as chromium is an analyte of interest, the well casing or screen should not increase or decrease the amount of chromium in the ground water. Any material leaching from the casing or screen should not be an analyte of interest, or interfere in the analysis of an analyte of interest" (p.6-16 to 6-18).

> "The presence of corrosion products represents a high potential for the alteration of ground-water sample chemical quality. The surfaces where corrosion occurs also present potential sites for a variety of chemical reactions and adsorption. These surface interactions can cause significant changes in dissolved metal or organic compounds in ground-water samples" (p. 6-30).

> "Disadvantages of stainless steel well casing and screen materials:
> · May corrode under some geochemical and microbiological conditions;
> · May sorb cations and anions;
> · May contribute metal ions (iron, chromium, nickel, manganese) to groundwater samples;
> · High weight per unit length; and
> · Type 304 and Type 316 stainless steel are unsuitable for use when monitoring for inorganic constituents" (p. 6-32). (Emphasis supplied).

[Note: The well screens at the MWL dump are Type 304 stainless steel. Many of the contaminants of concern at the MWL dump are inorganic constituents. In 2007, NMED has ordered for the replacement monitoring wells at the MWL dump to be installed only with screens made of nonmetallic PVC.]

It was a mistake for NMED to order DOE/SNL to plug and abandon wells MW1 and MW3 without first collecting water samples for special analytical techniques that would possibly identify if there was a release from the MWL dump. For example, water

samples should be analyzed for low-levels of tritium and with chromium isotopic analyses to identify if the wastes in the dump were a contributor to the chromium contamination measured in groundwater. NMED should order DOE/SNL to collect water samples from the two wells for these analyses if the wells have not already been plugged and abandoned.

In addition, NMED should have ordered DOE/SNL to replace the wells with wells that have PVC screens when the anomalously high levels of nickel and chromium were first known to be present. High levels of chromium were first measured in well MW1 in 1997 and in MW3 in 2001.

Table 1 presents the nickel concentrations measured in wells MW1, BW1, and MW2. There is a history of measurement of anomalously high levels of nickel in water samples from well MW1 beginning with the first water sample collected in 1990 with total and dissolved levels of 46 and 43 ug/L, respectively. For comparison, the NMED approved background for total and dissolved nickel in groundwater is 28 ug/L.

Over the years, the waters produced from well MW1 show exceptionally high levels of nickel with levels above 400 ug/L since 2004. The high levels of dissolved nickel measured in well MW1 are anomalously high for the levels expected from corrosion of stainless steel well screens. Recent research has established that corrosion produces the highest levels of nickel in the early years of onset of corrosion, and in later years the dissolved nickel levels show a large decline. The decline is because of the exceptional properties of the corrosion products encrusted on the well screens to lower the concentration of nickel in water samples produced from the corroded screens. The corrosion products have an iron oxide mineralogy with strong properties for adsorption of many trace metals including nickel and chromium. Table 1 shows that this phenomenon of increase in nickel levels to a plateau followed by a great decline in measured values is recorded for the history of nickel values measured in the water samples produced from wells BW1 and MW2.

SNL must establish a compliance monitoring program meeting the requirements of 40 CFR §264.99 in the LTMMP.

RCRA identifies the high levels of nickel contamination measured in the water samples produced from monitoring well MWL-MW1 as "Statistically Significant Evidence of Contamination." The discussion of "statistically significant evidence of contamination" is in **40 CFR 40 CFR §264.98 Detection Monitoring Program** with the following pertinent parts:

> "(2) The owner or operator must determine whether there is statistically significant evidence of contamination at each monitoring well as the compliance point within a reasonable period of time after completion of sampling. The Regional Administrator will specify in the facility permit what period of time is reasonable, after considering the complexity of the statistical test and the availability of laboratory facilities to perform the analysis of ground-water samples."

"(g) If the owner or operator determines pursuant to paragraph (f) of this section that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he or she must:

(1) Notify the Regional Administrator of this finding in writing within seven days. The notification must indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination;"

"(4) Within 90 days, submit to the Regional Administrator an application for a permit modification to establish a compliance monitoring program meeting the requirements of §264.99. The application must include the following information:

(i) An identification of the concentration of any appendix IX constituent detected in the ground water at each monitoring well at the compliance point;

(ii) Any proposed changes to the ground-water monitoring system at the facility necessary to meet the requirements of §264.99;"

DOE/SNL did not inform NMED that the high levels of nickel measured in monitoring well MWL-MW1 represent "statistically significant evidence of contamination" and that DOE/SNL was required to establish a compliance monitoring program meeting the requirements of 40 CFR §264.99. The monitoring wells installed at the MWL dump never met the compliance monitoring program requirements of §264.99. A minimum requirement was to replace monitoring well MWL-MW1 with a well that had a nonmetallic PVC screen to make a determination of the source of the nickel contamination that was consistently and continuously measured to the present time at high levels in the water samples produced from the well.

Table 1. Total and Dissolved Zinc Measured in the Water Samples Produced From Monitoring Well MWL-MW1, -BW1 and - MW2 at the Sandia Mixed Waste Landfill.

- All three wells have stainless steel screens that have become corroded.

Date	- Well MW1 Nickel (ug/L) Total / Dissolved	- Well BW1 Nickel (ug/L) Total / Dissolved	- Well MW2 Nickel (ug/L) Total / Dissolved
09 - 90	46 / 43	ND[a] < 40 / ND < 40	ND < 40 / ND < 40
01 - 91	NA[b] / NA	NA / NA	NA / NA
04 - 91	NA / NA	NA / NA	NA / NA
10 - 91	NA / NA	NA / NA	NA / NA
07 - 92	150 / 63	ND < 40 / ND < 40	ND < 40 / ND < 40
01 - 93	78 / NA	ND < 40 / NA	ND < 40 / NA
04 - 93	97 / 94	7.5 / 16	14 (j)[c] / 13 (j)
11 - 93	95 / NA	ND < 40 / NA	ND < 40 / NA
05 - 94	110 / NA	NA / NA	ND < 40 / NA
10 - 94	130 / NA	ND < 40 / NA	ND < 40 / NA
04 - 95	120 / NA	NA / NA	7.5 (j) / NA
10 - 95	107 / NA	1.96 (j) / NA	NA / NA
04 - 96	145 / NA	ND < 0.81 / NA	3.42 (j) / NA
04 - 97	NA / NA	NA / NA	NA / NA
10 - 97	NA / NA	NA / NA	NA / NA
04 - 98	398 / 538	2.9 (j) / NA	5 (j) / 4
11 - 98	490 / 467	7.19 / 9.47	4.49 / 3.42
04 - 99	266 / 313	12.8 / 14.3	5.31 / 4.37
04 - 00	279 / 281	16.5 / NA	124 / NA
04 - 01	252 / NA	191 / NA	88.2 / NA
04 - 02	265 / NA	13.6 / NA	89.7 / NA
04 - 03	374 / NA	26.6 / NA	52 / NA
04 - 04	401 / NA	33.2 / NA	10.5 / NA
04 - 05	424 / 405	35.5 / NA	8.0 / 7.1
04 - 06	477 / NA	----------	6.8 / NA

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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 for total and dissolved nickel in groundwater is 28 ug/L.

- The groundwater quality standard of the New Mexico Water Quality Bureau for nickel is 200 ug/L.

- In 1974, EPA set the drinking water standard for nickel at 100 ug/L. EPA remanded the drinking water standard for nickel on February 9, 1995 and has not set a new standard.

- The 2004 World Health Organization Guideline Value is that drinking water shall not contain nickel at concentrations greater than 20 ug/L.

98. The LTMMP must require DOE/SNL to locate monitoring wells "within the landfill where contaminants were detected at their highest levels during the RFI." The MWL Dump monitoring wells are not at critical locations for knowledge of groundwater contamination from the highly mobile contamination in the buried wastes. The sampling investigations performed in the 1980's and early 1990's identified discrete regions inside the MWL dump where large quantities of tritium and solvent wastes including PCE were buried. There are no monitoring wells at appropriate locations to identify if these wastes have contaminated the groundwater. This is an important issue because the fate and transport model uses the highly mobile tritium and PCE as "indicator parameters" that the groundwater below the MWL dump is not contaminated. The assertion in the EPA Region 6 (12/13/07) letter of "no contamination" is disingenuous and not proven because there are no monitoring wells at the locations where this groundwater contamination would be expected to be present.

The NMED Notice of Disapproval (NOD) issued on November 24, 2006 ordered DOE/SNL to install monitoring wells inside the MWL dump where high levels of contaminants were discovered in the earlier RCRA facility investigations (RFI). The order from NMED Comment No. 19 and the response from DOE/SNL is as follows in pertinent part from the DOE/SNL response on January 15, 2007:

> **Comment 19 in the NMED Order: Propose some additional monitoring to be conducted at locations within the landfill where contaminants were detected at their highest levels during the RFI.**
> **DOE/SNL Response to Comment 19:** Additional monitoring at locations within the landfill using intrusive techniques is not recommended, and could compromise the integrity of the cover.

The refusal of DOE/SNL to install monitoring wells inside the MWL dump to investigate groundwater contamination by tritium and solvents including PCE is unacceptable. The existing monitoring well MWL-MW4 is installed through the cover. In addition, NMED issued an letter on October 30, 2007 that ordered DOE/SNL to install monitoring wells through the cover:

- Both new wells shall be positioned as close as possible to the former west fence that originally surrounded the Mixed Waste Landfill.
  NMED is aware that, once installed, the new wells will fall within the footprint of the new cover.

It is essential to install monitoring wells at locations inside the MWL dump where large quantities of the highly mobile tritium and solvent wastes are known to be buried. The monitoring wells should be a design for measuring contamination in the soil gas throughout the thick vadose zone and also measuring contamination in water samples collected at the water table. If EPA Region 6 is opposed to installation of monitoring wells at locations inside the MWL dump, then an alternative is to install angle wells drilled at locations outside the dump. A disadvantage is that the angle wells will not provide the required knowledge of contamination in the vadose zone immediately

beneath the locations where large quantities of tritium and solvent wastes are buried in unlined pits and trenches.

99. There is an essential need to monitor the release of contaminants to the vadose zone for early detection and remediation of the release. However, the DOE/SNL LTMMP does not propose to monitor the vadose zone beneath the unlined pits and trenches. Instead, DOE/SNL propose to monitor the vadose zone at only three locations that are located too distant from the unlined pits and trenches for the detection of releases that may contaminate the groundwater below the MWL dump. The proposed locations for the three vadose zone wells outside the perimeter of the dirt cover are displayed on Figure 5.

The distance from any of the proposed wells to where large amounts of tritium wastes are known to be buried is greater than 150 feet. The three wells are a similar distance from where the sparse RFI data indicated solvent wastes were buried.

Indeed, the groundwater at the water table below the MWL dump may already be contaminated with tritium and solvents including PCE, but this contamination has not been detected because of the deficiencies in the existing network of monitoring wells and will not be investigated by the monitoring scheme in the DOE/SNL LTMMP.

100. **Mistake in the location of well MW6. Well MWL-MW6 does not meet the point of compliance requirements of 40 CFR §264.95 because of the 500-ft distance of MW6 away from the western side of the MWL.** Figure 3 shows that the only monitoring well with a screen installed only in the ARG strata is well MWL-MW6. NMED instructed DOE/SNL to install well MWL-MW6 in the ARG strata at the distant location 500 feet west of the western boundary of the MWL dump. However, this location does not meet the compliance requirements of 40 CFR §264.95 as stated in pertinent part:

"The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units."

The "hydraulically downgradient limit of the waste management area" is immediately along the western and southern side of the MWL dump. In §264.95 the "uppermost aquifer" is referring to the productive ARG strata monitored only by well MW6 and not to the fine-grained alluvial sediments that are poorly productive of groundwater. RCRA 40 CFR §264.98 requires a detection monitoring program at the MWL dump that meets the following requirement:

§264.98(e). The owner or operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.

101. **Mistakes in the installation of well MWL-MW5.** Figure 2 shows that well MW5 is at a location too distant (175 ft) from the western boundary of the MWL dump to meet the point of compliance requirements of RCRA. Figure 3 shows that the screen in well MW5 is installed too deep below the water table to detect contamination at the water table. In addition, Figure 3 shows that an important mistake in the installation of well MW5 is that *the well screen is installed across the*

contact of the alluvial fan sediments with the deeper ARG strata. The well produces a mixture of water from both geologic formations and is not reliable for the detection of contamination in either formation.

The NMED SNL Consent Order (section VIII.A.6) requires wells to be installed in only one zone of saturation in terms of aquifer properties as follows:

> "In constructing a well or piezometer, Respondents shall ensure that the well or piezometer will not serve as a conduit for contaminants to migrate between different zones of saturation."

An October 30, 2001 position paper of the NMED Hazardous Waste Bureau provides additional caution on cross-cutting screens as follows:

> *"Wells with screened intervals connecting intervals of different head and/or hydraulic conductivity may act as conduits for vertical flow within the screened interval."*

The information on Figure 3 shows that the screen in well MW5 is connecting intervals of different head and hydraulic conductivity.

Furthermore, the record of well construction shows that bentonite clay/cement grout was mistakenly poured inside the well and that the well development activities were not successful to clean the grout from the screened interval. The clay and the cement have strong properties to mask the detection of contamination in the water samples produced from the well.

Monitoring well MW5 has never produced reliable and representative water samples for the detection of groundwater contamination from releases from the MWL dump. There is an immediate need to plug and abandon well MW5 and install two new monitoring wells east of well MW5 immediately at the western boundary of the MWL dump. One of the new wells should be screened across the water table. The second well should be screened only in the ARG strata.

102. DOE/SNL has never installed the network of monitoring wells at the MWL dump to meet the requirement of 40 CFR §264.98(e). DOE/SNL does not have accurate knowledge of the ground-water flow rate and direction in the uppermost aquifer i.e., the ARG strata because only one monitoring well MW6 exists in the uppermost aquifer. The averaging of different wells in different strata further misrepresents the flow properties at the MWL. Similarly, DOE/SNL does not have accurate knowledge of the direction or rate of flow at the water table in the fine-grained alluvial sediments.

103. Well purging, as indicated in the NMED position paper on low flow pumping (2001), is not appropriate for the proposed 30 ft well screen lengths SNL plans to use at the dump. The LTMMP must be modified to limit low-flow water production from the upper 10 ft. of saturation in the well screen.

104. The Sandia plans for air monitoring at the dump ignores the fact that NMED has not furnished responses to the public regarding their comments at the soil gas hearings. All of Citizen Action's Comments for soil gas provided to the NMED are incorporated herein by reference.
105. Air monitoring should include monitoring for tritium gas.
106. Monitoring for tritium needs to be at state of the art detection limits for both air and water. Current detection limits at SNL are far above those used at Los Alamos National Laboratory (LANL) and do not provide for early detection of contamination in groundwater beneath the dump.
107. The LTMMP should provide information as to whether nesting areas for the burrowing owl were identified and investigated for activity prior to laying down the subgrade portion of the dirt cover. Poor quality of surface sampling has been present in the past. (p.8 Hakonson).
108. The LTMMP presents false information by stating that (p.2-9): "Disposal of free liquids was not allowed at the MWL." The Corrective Measures Study, p.18 admits that in 1967 271,000 gallons of reactor coolant water were dumped in Trench D. In fact, the prohibition against free liquid disposal was not put into effect until 1975, fifteen years after the landfill opened. (ER Program/Site Health and Safety Plan, 1992 (FOIA 115, 116)).
109. For proper public review of the LTMMP, DOE/SNL must answer the following questions from a Freedom of Information Act request sent in November 2006 that are necessary for evaluating the LTMMP:
    a) Provide any document that gives the basis for the decision that only groundwater quantity and not groundwater quality required detailed analysis for the **Supplemental Analysis to the SWEIS ("SA")** prepared by Sandia National Laboratories New Mexico ("SNL/NM").
    b) Provide all documents that present or discuss issues of groundwater quality or future threats to groundwater quality at SNL and/or existing or potential contamination for the groundwater or vadose zone.
    c) Provide documents showing all known groundwater contamination at SNL including all known contaminants and contaminants exceeding regulatory limits for both RCRA and the U.S. Environmental Protection Agency's ("EPA") Maximum Contaminant Levels ("MCL"). (SA, p. 3-8, para 3.5.1).
    d) Provide documents showing all known vadose and groundwater contamination at SNL by radionuclides.
    e) Provide documents that describe the long term strategy to be able to collect representative water samples under RCRA from groundwater monitoring wells given the declining water level elevations. (SA, p.4-1, para 4.1).
    f) Provide documents that show the factual basis for the "thought" that chromium exists in wells due to corrosion in well screens. Provide documents that demonstrate or speculate that the chromium is from contaminants from wastes disposed of in the Mixed Waste Landfill or from other locations at SNL. (SA, p. 3-8, para 3.5.1).
    g) Provide all geologic or other documents, including maps and attachments, that show any potential for the movement of hazardous and/or radioactive wastes within the boundaries of SNL, and including specifically within Tech Area-III as

a result of movement along fault lines or due to earthquake activity. Provide the report, *Geologic Investigation: An update of Subsurface Geology on Kirtland Air Force Base, New Mexico.* (**Supplemental Analysis to the SWEIS** prepared by Sandia National Laboratories New Mexico, p. 3-7). Include maps and attachments, that show any fault zones within the boundaries of SNL, including specifically fault zones within Tech Area-III.

h) Provide documents that show studies or measurements for radiation or hazardous waste levels in plants and animals within the SNL/KAFB boundaries and offsite migration.

i) **Supplemental Analysis to the SWEIS ("SA")** prepared by Sandia National Laboratories New Mexico ("SNL/NM"), p. 2-25, states "Expenditures have ranged from five to twelve times the SWEIS estimate over the 1999-2004 time period. Provide the documents that provides the factual basis for the nature of "expenditures" for this statement.

j) Provide documents that show the types and amounts of potential chemical emissions for each facility at SNL. (SA, p. 3-17, para 3.8.1).

k) Provide documents showing any State of New Mexico or EPA air permit for the Thermal Treatment Facility. (SA, p. 2-43).

l) Provide documents showing the types of solvents burned at the Thermal Treatment Facility.

m) Provide documents that describe the "existing SNL/NM program" for decontamination, decommissioning and demolition of the MDL under the MESA project. (SA, p. 2-45).

n) Provide documents that describe whether the "existing SNL/NM program" for decontamination, decommissioning and demolition of the MDL under the MESA project is a RCRA regulated activity.

o) Identify all facilities using High Particulate Efficiency Filters (HEPA) and for each facility using HEPA filters provide the RCRA waste codes for any hazardous wastes contained in the HEPA filters.

p) Provide documents showing disposal of HEPA filters for the question above.

q) Provide documents that show the total inventory of radionuclides at SNL.

r) Provide documents providing the factual data for the conformity analysis performed for SNL.

s) Provide USEPA air permit for hazardous air pollutants.

t) Provide documents showing the types and quantities of radiological air emissions for each facility at SNL.

u) Provide the documents for any independent analyses that have been performed for radiological air emissions at SNL.

v) Provide documents showing the methods used for monitoring the chemical and radiological air emissions for each facility at SNL.

w) Provide documents which show the programs in place at SNL for monitoring and controlling hazardous air pollutants for each facility at SNL.

x) Provide documents that analyze for any disproportionate adverse health or environmental effects on minority or low income populations within the ROI (Region of Interest) 15 mile radius about the SNL Steam Plant. (SA, p. 3-38, para 3.15 and SA, p. 4-8, para 4.2.8).

y) Provide documents showing the potential environmental releases/effects for a terrorist attack on facilities at SNL.
z) Provide documentation as to whether SNL constitutes a "major source" as defined by 40 CFR 63.2.
aa) Provide documents that show the facilities for which SNL is required to comply with the Maximum Achievable Control Technology (MACT) requirements of 40 CFR 63.
bb) Provide the location for all process vents at SNL including but not limited to, process vents for the processes of distillation, fractionation, thin-film evaporation process, solvent extraction process, steam stripping process and gas stripping process. A process vent means an open-ended pipe, stack, or duct through which a gas stream containing hazardous air pollutants (HAP) is continuously or intermittently discharged to the atmosphere by any of the processes listed in 40 CFR 63.680(c)(2)(i) through (c)(2)(vi).
cc) Provide documents that demonstrate compliance for SNL with 40 CFR 63.683 (b) that provides general standards for control of air emissions, removal or destruction of hazardous air pollutants (HAP), and concentration limits for treatment.
dd) Provide documents that demonstrate compliance for SNL with 40 CFR 63.683 (c) that provides for controls for air emissions from process vents.
ee) Provide documents that demonstrate compliance for SNL with 40 CFR 63.683 (d) that provides for controlling equipment leaks by implementing leak detection and control measures specified in section 63.691.
ff) Provide documents that demonstrate compliance for SNL with 40 CFR 63.684 that provides standards for off-site material treatment to remove or destroy HAP at specified performance levels for different types of treatment processes.
gg) Provide documents that identify the use of any incineration or thermal destruction devices at SNL.
hh) Provide documents that demonstrate compliance for SNL with 40 CFR 63.685 that provides standards for control of air emissions from tanks.
ii) Provide documents that demonstrate compliance for SNL with 40 CFR 63.689 that provides standards for transfer systems.
jj) Provide documents that demonstrate compliance for SNL with 40 CFR 63.690 that provides standards for process vents.
kk) Provide documents that demonstrate compliance for SNL with 40 CFR 63.691 that provides standards for equipment leaks.
ll) Provide documents that demonstrate compliance for SNL with 40 CFR 63.694 that covers testing methods and procedures for measurement of VOHAP concentration at point of delivery and point-of-treatment.
mm) Provide documents used for the **Supplemental Analysis to the SWEIS ("SA")** prepared by Sandia National Laboratories New Mexico ("SNL/NM") that show types and sources of radioactive and hazardous waste generation at SNL. Provide documents that show the basis for the determination of quantities released whether by monitoring or process knowledge. (SA, Table 2.2.1.).

nn) For all hazardous waste generated, provide all documentation giving the RCRA hazardous waste codes for these wastes from each facility and whether the hazardous wastes are treated as RCRA hazardous wastes or not. (**SA,** Table 2.2.1.)

oo) For all radioactive and hazardous waste generated, (SA Table 2.2.1), provide documents which show how the waste is to be disposed of, location of disposal or whether there are environmental releases to air, water, or land.

pp) The **Supplemental Analysis to the SWEIS ("SA")** prepared by Sandia National Laboratories New Mexico ("SNL/NM") uses the term "other hazardous waste." Provide documents that identify the specific wastes that SNL identifies as "other hazardous wastes." Provide documents showing the RCRA waste codes which may exist for any waste type identified as "other hazardous wastes."

qq) Provide documents that show the location and method of disposal at SNL for all wastes that are reported as hazardous waste, but that are not considered as RCRA-regulated wastes. SA, p.2-29.

rr) Provide all documents that characterize RCRA wastes, and/or wastes described as "hazardous but not RCRA-regulated," from all reactor operations at SNL.

ss) Provide all documents that provide the basis for the determination that beryllium contaminated wastes produced as a result of accelerator operations are not RCRA-regulated hazardous wastes. (SA, p.2-34).

110. Approval of replacements for wells, BW1, MW1, MW2, MW3. The wells should not be plugged and abandoned until an isotopic analysis has been performed on the dissolved chromium at those locations. The water samples should be also collected for dissolved chromium and total chromium at those locations. The chromium may be from waste in the dump rather than only the stainless steel well screens. Isotopic analysis of nickel should be conducted for MW1 if such analysis is warranted.

111. MW1, MW2 have remaining values for measurements of water level and are the only two wells on the northern side of the dump.

112. **The LTMMP must provide for the installation of well screens in pristine formations that are not disturbed with drilling fluids, even mud developed from the natural clays in the formation.** Invading the fine grained sediments with drilling muds should be prevented. The ARCH drilling method with the use of water that is planned for the new wells is no different from use of drilling muds. Great hydraulic force is generated to plug the permeable zones near the water table that are important for monitoring. The use of water will mix with clay cuttings producing a drilling mud that will invade the permeable zone that should remain free of plugging and coating the aquifer with a new chemistry in the zone that needs to be monitored.

Records for the Air-Rotary Casing Hammer drilling of wells MW5 and MW6 at the Sandia Mixed Waste Landfill.

- The records show that large amounts of water were used for drilling the deeper interval in the boreholes from above the water table to total depth. The water resulted in mixing of natural clays into the drilling fluid to have the same effect as mud-rotary drilling. The drilling muds invaded deep into the geologic formations that are important for monitoring. The muds reduced the saturated hydraulic conductivity of the screened interval and introduced a new mineralogy with strong properties to mask the detection of contaminants.

- Drilling record from well MWL-MW5

7	Oct. 31, 2000	Weather began to deteriorate: cold and windy. Resumed advancing 9 5/8". Encountered a clay-rich section at 310 ft. Drill bit was balling up. Advanced to 340 ft with very little hammering but the bit had to be worked up and down. Some caliche was recovered from the returns at 335 ft. Drilling was very slow to 355 ft (quartzite cobble bed at 344-47 ft). At 355 ft the bit was sticking badly and some water had to be pumped down the hole while drilling. Clay was drilled 355-60 ft. From 360 ft drilling continued while pumping water. Sample returns from this point consisted of a stream of mud coming thru the hopper. At 390 ft, at midday, the compressor went off line and Stewart Bros. had to send a mechanic from Grants to repair it. Drilling resumed at about 3:30 PM and 9 5/8" casing was advanced to 400 ft. Pulled drill string and recovered a 4-liter splitspoon rad sample (#3). Recovery was silty clay.
8	Nov. 1, 2000	Temperature in the low 30s. Ran in the hole with the drill string. Resumed drilling while pumping water. Sample returns began coming up as gooey slugs. Backpressure in the returns hose to the hopper built up and blew the hose off, spewing mud in a focused column. Hose had to be clamped and reclamped. Advanced 9 5/8" to 500 ft. Collected a 4-liter splitspoon rad sample (#4) of dense, brown, silty clay.

- Geologic log from well MWL-MW5

355'	Very fine sand with decreasing amounts of medium and coarse sand.
356-360'	*Silty clay balls*; one pea-size angular fragment of quartzite.
400'	**Splitspoon sample**. *Brown silty clay*.
500'	**Splitspoon sample**. *Brown silty clay* with some very light gray clay.
530'	Dried sample from drill returns. Poorly sorted, very fine to very coarse sand.
550'	**Splitspoon sample**. Very light brown, very fine sand, with some fine to medium sand & brown silty clay. Recovered one 1" fragment of quartzite that must have come from a small to medium cobble; unbroken side is well rounded.

- In well MW5, the 20-ft screen is installed from 496.5 to 516.5 ft bgs. The water table at well MW5 is ~ 468 ft below ground suface.

- Drilling record from well MWL-MW6

4	Sept. 10, 2000	Ran 9 5/8" drive casing to 300 ft. Resumed drilling @ 11:15 AM. Drilled to 435 ft.
5	Sept. 11, 2000	Drill bit was binding up. At 445 ft water had to be injected while drilling to prevent bit from binding up. Reached 550 ft (total depth) @ 12:40 PM. Pulled drill pipe out of the hole.

- Geologic log from well MWL-MW6

425-435'	Very fine to fine sand; color change to brown.
435-445'	Slightly pebbly, silty(?) very fine sand, with trace of fine pebbles.
445-465'	**Brown clay**, probably silty.
465-475'	Silty very fine sand; brown.
475-485'	As above.
485-495'	**Brown clay**, probably silty.

Depth	Lithology
495-505'	Poorly-sorted, very pebbly, very fine to coarse sand, or sandy fine gravel. Pebbles very fine to ½"; a few pebbles are rounded; one 1-3/8" pebble may be rounded basalt, **few rounded pea-size pebbles of basalt and what appears to be andesite.**.
505-515'	Slightly pebbly, very fine to fine sand; pebbles fine to 1/3"; largest is yellowish quartzite.
515-525'	As above.
525-535'	**Brown clay**, probably silty.
535-545'	Slightly pebbly very fine to fine sand, with few very fine to medium pebbles.
545-555'	As above. Some pebbles are rounded. **Some pebbles are basaltic, andesitic, and porphyritic volcanics.**

- In well MW6, the 20-ft screen is installed from 505.5 to 525.5 ft bgs. The water table at well MW6 is ~ 462 ft below ground suface.

The drilling records for wells MW5 and MW6 are proof that the Air-Rotary Casing Hammer (ARCH) drilling method does not meet the requirements in the NMED June 19, 2007 Notice of Disapproval (NOD) for the DOE/SNL workplan to install the new background monitoring well BW2. Specifically, the NMED NOD requires the use of a drilling method that provided for the identification of the "depth of the first encounter with regional groundwater and any perched groundwater, during drilling".

From page 2 of the June 19, 2007 NOD:

5. Page 5, Section 5.2.1 – The Permittees shall log the depth of the first encounter with regional groundwater and any perched groundwater, during drilling. Modify the plan to state that the depth of regional groundwater and the depth of any perched groundwater will be logged during drilling.

113. The LTMMP must provide that appropriate drilling method for the new monitoring wells at Sandia is the method used at LANL, i.e., Air Rotary Casing Advance with reverse circulation under-reamer casing advanced and using only air for drilling into the regional zone of saturation; or the sonic drilling method that was used for MW4.

The drilling record on file at the New Mexico Environment Department for Sandia Mixed Waste Landfill (MWL) monitoring well MW5 is proof that the Air Rotary Casing Hammer (ARCH) drilling record is unacceptable for installing any of the new network of monitoring wells at the Sandia MWL dump.

From the New Mexico Environment Department records for monitoring wells at the Sandia Mixed Waste Landfill - MW5 Well File Shears # 199913

Summary drilling record for Sandia Mixed Waste Landfill (MWL) well MW5:

Driller's TD:	550ft
Formation at TD:	Santa Fe Group
Depth to water while drilling:	No indication (drilled while pumping water)
Depth to water on geophysical log:	496ft
[TD = total depth of borehole]	

Drilling record for well MW5 on Oct. 31, 2000:

> "At 355 ft the [drill] bit was sticking badly and some water had to be pumped down the hole while drilling. Clay was drilled 355-60 ft. From 360 ft drilling continued while pumping water. Sample returns from this point consisted of a stream of mud coming thru the hopper."

Drilling record for well MW5 on Nov. 1, 2000:

> "Resumed drilling while pumping water. Sample returns began coming up as gooey slugs. Backpressure in the returns hose to the hopper built up and blew the hose off, spewing mud in a focused column. Hose had to be clamped and reclamped."

The drilling record on file at the New Mexico Environment Department (NMED) for Sandia MWL well MW5 is evidence that the Air Rotary Casing Hammer (ARCH) drilling method had similar performance as a mud rotary drill to invade the permeable zones of the alluvial sediments with the highest saturated hydraulic conductivity (Ksat) with natural clay drilling muds that have properties to lower the Ksat of the sediments and to mask the detection of contamination.

The drilling record for well MW5 shows that the use of water for drilling the borehole prevented the ARCH method from identifying the water table in the fine-grained

sediments during the drilling of the borehole. In addition, the borehole geophysics also failed to identify the water table because the depth to water on the geophysical log of 496 ft is approximately 25 ft below the water table.

On June 19, 2007 the NMED issued a Notice of Disapproval (NOD) for the DOE/SNL proposed plan for replacement of monitoring wells BW1 and MW1 at the Sandia MWL dump. The pertinent pats of the NOD are pasted below.

4. Page 5, Section 5.2.1 - The Permittees shall log the geology of the borehole during drilling, given that MWL-BW2 is to be located a substantial distance from the well it will replace. Modify the plan to state that the geology of the borehole will be logged during drilling.

5. Page 5, Section 5.2.1 - The Permittees shall log the depth of the first encounter with regional groundwater and any perched groundwater, during drilling. Modify the plan to stated that the depth of regional groundwater and the depth of any perched groundwater will be logged during drilling.

The NMED letter dated July 2, 2007 prohibits use of the mud rotary method for installing the replacement monitoring wells at the Sandia MWL dump as follows in pertinent part:

RE: REPLACEMENT OF MIXED WASTE LANDFILL GROUNDWATER MONITORING WELLS MWL-MW1 AND MWL-MW3 SANDIA NATIONAL LABORATORIES, EPA ID NM5890110518

"The mud rotary drilling method shall not be used to install the wells. Each well shall be installed to monitor groundwater at the water table." (p.2)

The drilling record of Sandia MWL dump monitoring well MW5 is proof that the ARCH method is unacceptable for drilling any of the boreholes for the network of new monitoring wells at the Sandia MWL dump because the use of water with the ARCH drilling method will be a type of mud-rotary drilling and will

1). prevent logging the geology during drilling,
2). prevent detection of perched zones of saturation,
3). prevent detection of the water table,
4). prevent collection of *in situ* groundwater at the water table for investigation of contamination from releases from the MWL dump, and
5). invade the screened interval with clays that will lower the Ksat of the screened interval and mask the detection of contaminants in the groundwater samples produced from the new network of monitoring wells.

The ARCH drilling method is unacceptable for installing any monitoring wells at the Sandia MWL dump. The two drilling methods that are acceptable are

1). air-rotary reverse circulation underreamer casing advance using telescoped drill casings, and

2). the sonic drilling method that was used for installation of the Sandia MWL dump monitoring well MW4.

114. The LTMMP does not consider the time frame for the pedogenic evolution of the soil cover to return to natural soil conditions.

115. The LTMMP does not consider the effect on releases from the MWL during the period that the soil cover is returning to natural soil conditions and once the natural conditions are achieved.

116. Vadose zone models for the MWL are not based on actual data about the characteristics of the vadose zone beneath the dump. Predictions of radionuclide transport through the vadose zone do not consider potentially fast pathways in the vadose zone that may exist beneath the MWL. Preferential flow may exist at the MWL to transport water and contaminants horizontally or vertically to the aquifer sooner than predicted. Preferential flow paths include macropore flow resulting from soil fissures, cracks and fractures. There may be funnel flow or perched flow.

117. No analysis has been performed for knowledge of surface ponding at the MWL and the effect that soil cover construction/compaction activities have had for fracturing the underlying surface of the dump where containers may have also been fractured. The knowledge is important both from the standpoint of contamination and for the knowledge of the condition of containers to be retrieved in the event of future excavation of the wastes.

118. High intensity, seasonal thunderstorms have not been taken into account for fractures in the shallow vadose zone.

119. Potential for funnel flow in connection with contrasting stratigraphic layers or lenses that are discontinuous beneath the dump, resulting in preferential flow paths, have not been considered.

120. No Adequate Soil Vapor Analysis has been performed for the MWL as has been done at other locations at SNL. For example, at SWMU 227 at the southeastern boundary of Tech Area II, Vapor Well VW-01 found total VOCs increasing from 15 ppb at 25 ft to 9000 ppb at 225 ft. (Figure 2.9.3-2 Total VOC Soil Vapor Concentrations in the TAG Study Area, December 2004-January 2005). At the MWL, the total VOCs were only measured to a depth of 30 ft. At one probe hole location inside the MWL at 10 ft the total VOCs were 30,700 ppb and at 30 ft there were 27,700 ppb. (Figure 4.5-29 Total VOCs in Soil Gas at 30 ft, Phase 2 RCRA Facility Invesigation). The great increase in values at the 225 ft depth for Vapor Well VW-01 indicate that very high values could be present below the MWL but there have never been measurements at depths greater than 30 ft. In contrast to other SWMUs at Sandia, there are no vapor wells at the MWL. The soil gas contamination data at the MWL are for one-time measurements taken in ~1994 from probe holes. NMED should order vapor wells through the entire thickness of the vadose zone at many locations within the MWL. The data from the Vapor Well VW-01 at SWMU 227

illustrate the need for investigating the nature and extent of the VOC contamination of the vadose zone beneath the MWL.

121. The data for Trichloroethene (TCE) concentrations for the MWL inside the northern half portion of the unclassified dump at 8 sparse locations indicates levels of TCE ranging as high as 570 parts per billion (ppb) or 570,000 micrograms per cu meter. The possibility that these high values extend beneath the MWL to contaminate groundwater must be investigated. There are no measurements taken for any VOCs inside the southern half of the unclassified area and the classified area of the MWL.

By comparison with MDA H at LANL, where there is only 2,600 micrograms per cu meter of TCE contamination in soil gas, NMED has ordered encapsulation of the wastes. Clearly, the high values for TCE in soil gas below the MWL, at a minimum, call for continuous monitoring beneath the dump at many locations to the uppermost aquifer. Since the TCE contamination measured in soil gas below the MWL dump is over 200 times greater than at LANL MDA H, more diffusely spread throughout the MWL dump, and computer models indicate TCE will reach the groundwater at the MWL dump, excavation of the MWL dump is indicated to protect the groundwater from contamination.

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