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REPORT OF THE MONITORING TEAM OF THE INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH

ON THE

INDEPENDENT AUDIT OF LOS ALAMOS NATIONAL LABORATORY FOR COMPLIANCE WITH THE CLEAN AIR ACT, 40 CFR 61, SUBPART H IN 2001

TO

CONCERNED CITIZENS FOR NUCLEAR SAFETY

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December 18, 2002

Reissued with a minor clarification on page 19

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I. PRINCIPAL MONITORING FINDINGS REGARDING THE ITAT THIRD AUDIT

This is the final report of the Institute for Energy and Environmental Research (IEER) on the monitoring of the third audit of the Los Alamos National Laboratory's compliance with the radionuclide emission standards of the Clean Air Act that was conducted by an independent technical audit team (ITAT) led by Dr. John E. Till. The ITAT filed its final report in October 2002 as part of the Settlement Agreement and Consent Decree that resolved a lawsuit filed by Concerned Citizens for Nuclear Safety (CCNS) against the U.S. Department of Energy (DOE).[a] The third independent audit of Los Alamos National Laboratory assessed the compliance with the Clean Air Act, 40 CFR 61, Subpart H for the year 2001. IEER monitored the audit for completeness, quality, and thoroughness on behalf of CCNS, as provided for in the Consent Decree.

The audit concluded that Los Alamos National Laboratory was in compliance with the 10 mrem/year dose limit required by 40 CFR 61, Subpart H for the year 2001 (referred to below as Subpart H for brevity). The audit also found LANL to be compliance with all other requirements of Subpart H of 40 CFR 61 and related Appendixes. Further, the audit team did not find any substantive technical deficiencies in LANL compliance program. It did make some recommendations for "continued improvement" (p.1) without finding that any of the areas in which these improvements were desirable constituted a substantive technical deficiency or a violation of Subpart H.

IEER is in general agreement with only one of these overall conclusions of the ITAT. Despite the uncertainties and the technical deficiencies, as well as the essential lack of compliance in one area, IEER is in agreement with the ITAT regarding the 10 mrem/year dose limit compliance. This is because the maximum estimated dose is so much below 10 mrem per year (in part due to the fact that the main source of emissions, the Los Alamos Neutron Science Center (LANSCE), is not in full operation) that it is highly unlikely that the dose limit of 10 mrem per year was exceeded.

In monitoring the audit and reviewing the final report, IEER has concluded that the ITAT should have called out four substantive technical deficiencies:

(1) a lack of quality assurance of the data on radionuclide usage supplied by the facilities to the Meteorology and Air Quality Group (MAQ),
(2) the problem of detecting radiologically elevated concentrations of plutonium-238 in samples in some cases,

[a] Risk Assessment Corporation, *Independent Technical Audit of Los Alamos National Laboratory for Compliance with the Clean Air Act, 40 CFR 61, Subpart H in 2001*, Final Report, DOJ File Number: 90-5-1749A, RAC Report No. 6-DOJ-LANLAudit-2002-FINAL, Neeses, South Carolina, October 2002.

(3) the need to provide continuous monitoring of airborne emissions from TA-54 waste characterization activities, and
(4) the significant uncertainties in the coverage of AIRNET stations with respect to Los Alamos North Mesa residences that justify an additional sampling station that has not been installed.

In relation to the first of these substantive technical deficiencies, IEER has also concluded that the ITAT should have found LANL to be in substantive breach of its compliance obligations under the Subpart H and related requirements under the Clean Air Act. As a result IEER finds that the main findings of the ITAT that LANL is in compliance with Subpart H and that the compliance program of LANL has no substantive technical deficiencies to be in error.

IEER's conclusions regarding the substantive breach of Subpart H are based on the monitoring of the audit, which included review of the data, review of the regulations, and review of the specific examples of a lack of quality assurance in user supplied data that came up in the course of the audit. As regards these examples, IEER detailed them to the ITAT in the course of its monitoring. (The IEER memoranda, as reprinted in the ITAT Final Report, are appended to this report.) In these memoranda, IEER also specifically recommended to the ITAT that it investigate the issue of quality assurance in regard to user supplied data in more detail with specific reference to compliance.

In reviewing the ITAT's findings and analysis as well as the conduct of the audit itself, IEER has concluded that the ITAT's failure to find a substantive technical deficiency in this area arose partly from a near-exclusive focus of the ITAT's audit on the work of the MAQ, rather than on the performance of LANL as a whole, in complying with Subpart H. The problem in this case does not lie in the work of the MAQ, but in the failure of LANL as a whole to require users to adopt a quality assurance program to ensure the integrity of the data supplied to MAQ. In effect, the ITAT Final Report implicitly deals with the compliance issue as if it is MAQ rather than LANL that must be in compliance. This implicit narrowing of the focus is incorrect, since Subpart H does not apply to MAQ but to LANL as a whole. IEER therefore finds that the ITAT's third audit was not as complete as it should have been, even given the limitations of the resources available for the audit.

We found that the ITAT's evaluation of the 1989 EPA Guidance Document cited in Appendix D of 40 CFR 61 was inadequate. Further, the ITAT Final Report did not present a careful evaluation of:

- the lack of adequate technical expertise in the MAQ for assessing the accuracy and quality of the data supplied by the facilities;
- the implications for quality assurance of the exemption that the EPA granted to the DOE from periodic confirmatory measurements of emissions from minor sources.

The ITAT did not evaluate at all the internal DOE quality assurance (QA) requirements that contractors are obliged to follow to protect health and the environment. Further, despite the prominence of quality assurance issues during the third audit, and despite the fact that they were part of the original lawsuit filed by CCNS, the ITAT did not interview any LANL quality assurance personnel outside the MAQ, past or present, during the third audit.

In view of these omissions, IEER finds that the ITAT third audit was not thorough, even within the limitations of the resources available to it.

Finally, in view of our conclusion of LANL's substantive breach in compliance with Subpart H, as well as the other substantive technical deficiencies itemized above and discussed in more detail below, IEER has concluded that that ITAT should have called for a fourth audit in order to ensure that LANL comes into full compliance. The Consent Decree requires the auditor to make a judgment about whether a fourth audit is needed based on whether there are substantive deficiencies in the program. Since IEER finds that the audit was in error in not finding such deficiencies (because the audit was neither complete nor thorough), we find that the ITAT also erred in terminating the audit process at the third audit.

II. QUALITY OF USAGE SURVEY DATA USED IN EMISSION ESTIMATES

Usage data are part of an estimation process that serves as a substitute for periodic confirmatory measurements of unmonitored sources, which measurements are required under 40 CFR 61 Subpart H. IEER has reviewed Subpart H as well as related regulations and guidance from the EPA regarding quality assurance (QA) as it applies to usage data. We have also reviewed the June 1996 Federal Facilities Compliance Agreement (FFCA) between DOE and the Environmental Protection Agency (EPA) in this regard.

The issue of quality assurance in regard to compliance has a long history at LANL. CCNS raised it in the lawsuit it filed against DOE that resulted in the Consent Decree. Years before that, in early 1992, the Tiger Team report raised QA issues in regard to LANL's air quality compliance. In 1991, the DOE scientist responsible for evaluating LANL's clean air program, Frank L. Sprague, noted in regard to dose estimation that "the model and its output is valid; it is the input data that is questionable." (DOE Albuquerque Operations Office, August 7, 1991.)

1. QA requirements specific to Subpart H and related regulations and guidance

Subpart H 40 CFR 61.93 requires the continuous monitoring of the emissions from certain sources. For other sources deemed to have emissions so small that they would contribute only less than 0.1 mrem per year, the regulation exempts the facility from continuous monitoring, but requires that it make "periodic confirmatory measurements" in order to ensure that the emissions remain below the threshold that would trigger continuous monitoring. The FFCA provides a waiver of the requirement for periodic confirmatory measurements in part because they were deemed to be too onerous. This waiver in the FFCA is not compatible with a strict interpretation of the requirement of Subpart H for periodic confirmatory measurements. However, IEER has viewed this part of the FFCA as a practical expedient whose compatibility with compliance depended essentially on the thoroughness of the entire process by which the estimates of emissions and doses were being made. Without QA of user supplied data the substitute calculation cannot be regarded as thorough or reliable. Moreover, the FFCA has lapsed.[b] So far as we can determine, there appears to be no explicit exemption from periodic confirmatory measurements for unmonitored sources in Subpart H at the present time.

During the first two audits, the ITAT found a number of serious technical problems (including a lack of compliance in the first audit) relating to the gathering and analysis of usage data. The most basic problems arose from a lack of clear understanding within MAQ (then called ESH-17) about the difference between stocks of radionuclides on hand at the using facility at the time the audit was done and the estimated annual throughput, or usage, properly called. Given this

[b] Carl E. Edlund, Director, Mulitmedia Planning and Permitting Division, U.S. EPA, Region 6. Letter to David Gurule, Area Manager, Los Alamos Area Office, U.S. DOE, December 17, 1999. Frank Marcinowski, Director of the Radiation Protection Division of the EPA Office of Radiation and Indoor Air confirmed on 17 December 2002 that there is no new agreement with the federal government that has replaced the lapsed FFCA. Personal telephone communications with Arjun Makhijani, 17 December 2002.

fundamental problem, the attention in the first audit was properly focused on MAQ and on creating an understanding in that group of what was required to acquire and analyze a scientifically sound set of data. The main problem at that point was for the MAQ to ask for and get usage data as such, and to separate that from any data relating to stocks of radionuclides that the users might supply. Communicating a consistent set of requirements to the users in this regard was, at that point, the main and overriding quality problem in the data that MAQ was using to make dose estimates from unmonitored sources.

During the second audit, when most of the problems at MAQ in this regard had been sorted out, the ITAT did focus on the issue of the role of users in providing usage data and made a recommendation in this regard. The ITAT made a recommendation that the users should be involved intimately in the process and suggested that a LANL-wide system be looked into as part of the collection of usage data. LANL rejected this suggestion. The ITAT's draft third audit report noted the following in this regard:

> Our suggestion from the second audit to implement a LANL-wide database system for compiling radionuclide usage at the facility level was investigated by MAQ. The response from facility personnel indicated a desire for MAQ personnel to continue to maintain responsibility for data collection and data entry; therefore, implementing such a system was not pursued. (p. 21)

While the preferences of facility personnel should, of course, be considered before a decision is made regarding how MAQ obtains its data, the LANL decision not to implement the ITAT suggestion after the second audit took the program off-track in regard to quality of user supplied data. One result of the decision was that the key role of the facility personnel in assuring the integrity of the data that is supplied is not part of the compliance process. However, given that facility personnel are the ones with the knowledge of the usage processes, they have obligations that are unavoidable if there is to be compliance with the letter and spirit of 40 CFR 61, Subpart H.

One principal problem with the current system is that the expertise regarding usage estimation lies with the users. The third audit process showed that MAQ does not possess the technical expertise to understand all the essential details of the processes in order to set up a proper estimation process for usage and emissions in the absence of periodic confirmatory measurements. Indeed, in IEER's view, it would be unreasonable to expect MAQ to have such expertise, since there are literally hundreds of users of radionuclides at LANL carrying out a large variety of operations and experiments. Only the full and engaged involvement of the personnel who are actually responsible for designing and carrying out these multifarious activities can be relied on to make valid estimates of usage. Yet, the attitude of at least some of the users, revealed both by the lack of desire to be involved in the data collection process and the casualness of the manner in which the data are reported and changed, indicates a lack of the kind of involvement needed to assure the scientific integrity of the result. Indeed, the risk of such an outcome is precisely the scientific basis for instituting a quality assurance program. That is one

reason why IEER has concluded that the ITAT should have called out the lack of a quality assurance process at the users' end for user supplied data as a substantive technical deficiency.

The ITAT report notes that "because LANL relies on emission and dose calculations based on usage data as a very integral part of their compliance program, establishing an effective mechanism to assure the quality of facility-level data when they are initially provided to MAQ is of high importance." (p. 23) The ITAT then argues as follows (on p. 23):

> There are regulatory requirements specified by 40 CFR 61, part 61.95 for record keeping which state that it must be '…sufficient to allow an independent auditor to verify the accuracy of the determination made concerning the facility's compliance with the standard.' Similar requirements are noted by EPA (1989) with regard to maintaining sufficient documentation '…for the EPA to judge the validity of the input used in the calculations.' While we did not believe this record-keeping requirement was met during the year evaluated by the first audit (1996), we considered the program evaluated during this third audit (2001) satisfactory with regard to this regulatory requirement and believed the documentation maintained by MAQ was sufficient to allow us to assess the accuracy and validity of the emission calculations and determine compliance with the standard. The same conclusion of compliance with the record-keeping requirements was also made during the second audit (1999).
>
> Our evaluation and assessment of the MAQ quality assurance program as it relates to usage data for this third audit has been consistent with the approach we have taken for the first two audits. In general, as with the first two audits, we believe that the procedures MAQ has adopted for assuring the quality of these data meet the underlying purpose of quality assurance in that they help minimize the occurrence of significant errors.

We find this argument to be misleading and incorrect. The documentation maintained by MAQ is not the issue at hand. It is the quality of the data that is reported by the facilities that is at issue. The MAQ does not have the technical expertise to judge the validity of the data supplied to it. The MAQ does not review raw data or experiment logbooks or other sources of basic data that would be expected to go into the preparation of scientifically sound usage estimates. The QA procedures at MAQ generally consist of checks of calculations supplied to it and of asking for verification of suspect data in some cases. This is fundamentally insufficient to the required goal of adequate record keeping cited above by the ITAT. Adequacy of record keeping requires the maintenance and verification of records at the users' end so that the raw data can be checked by the regulatory agency. The first sentence of the next paragraph reveals much of the problem with this part of the audit. The ITAT evaluated the "MAQ quality assurance program," but it failed to evaluate the LANL QA program as a whole as it pertains to Subpart H. All of LANL must be in compliance with Subpart H, not MAQ alone. Moreover, the MAQ quality assurance

program is fundamentally insufficient to ensure the quality of the facility supplied data since the MAQ does not review the raw data, logbooks and the like. IEER therefore does not agree with ITAT's conclusion even as regards the adequacy of the MAQ's QA program, especially in light of the absence of a QA program at the facilities.

IEER also does not agree with the ITAT's view that the procedures outlined in 40 CFR 61, Subpart H do not explicitly define the method to be used for estimating potential emissions from point sources that do not require continuous monitoring. 40 CFR 61.93(b)(4)(i) requires "periodic confirmatory measurements" for unmonitored sources to ensure that emissions from these sources remain below the level required for continuous monitoring. In the FFCA, the EPA allowed LANL to substitute dose estimates based on usage surveys to the exclusion of periodic confirmatory measurements. The scientific integrity and validity of this permission depends in large measure on the quality of the data supplied by the users. The lack of quality assurance in facility supplied user data undermines the premise of the compliance program in regard to calculations based on radionuclide usage. LANL is not doing these measurements. One crucial part of IEER's point regarding the unmonitored sources is based on the fact Subpart H is explicit in its requirements for periodic confirmatory measurements. Moreover, as noted above, the FFCA has been terminated by the parties.

Appendix D of 40 CFR 61 has implicit QA requirements for user supplied data. While Appendix D of 40 CFR 61 does not itself make explicit reference to quality of data, it does refer to an EPA guidance document for compliance as it applies to NRC-regulated and other non-DOE facilities and suggests that the procedures in it be used (reference 1 in Appendix D).[c] This EPA document contains the following statements regarding data that are to be used in calculations:

> Again, *your report must include enough information for the EPA to judge the validity of the input used in the calculations*.
>
> Not all the parameters listed below are needed for any given facility. You do not have to report any that you do not use.
>
> 12. The physical form and quantity of each radionuclide emitted from each stack, vent, or other release point and the *method(s) by which these quantities were determined.*
>
> …
>
> 16. The values used for *all other user-supplied input parameters* (e.g., meteorological data) and the source of these data.[d]

[c] U.S. Environmental Protection Agency, Office of Radiation and Indoor Air. "A Guide for Determining Compliance with the Clean Air Act Standards for Radionuclide Emissions from NRC-Licensed and Non-DOE Federal Facilities," EPA 520/1-89-002, Washington, D.C., January 1989, p.4-3.

[d] Ibid., italics added.

Even a limited review of the usage data and the manner in which it was acquired during the third audit revealed that MAQ does not have all the necessary expertise to evaluate the processes at the using facilities and therefore the quality of the user-supplied data. The recommendation of the EPA guidance in Appendix D therefore cannot be systematically fulfilled in the absence of QA at the users' end.

Further, the fact that the FFCA has exempted LANL from the requirement under Subpart H that it make periodic confirmatory measurements of unmonitored sources itself places a requirement upon LANL to ensure that the quality of the input data into the process of estimation of doses is equivalent to that which would have been obtained by those periodic confirmatory measurements. Without the assurance of input data quality, the FFCA exemption is itself invalid, since it then comes into conflict with the requirement of periodic confirmatory measurements.

Finally, since the FFCA has expired and the federal government has not replaced this with another agreement, LANL would appear to be employing usage data in place of periodic confirmatory measurements without any explicit legal basis. The ITAT should have investigated this issue because it was raised during the course of the audit; it did not do so.

In sum, the ITAT seems to have evaluated the compliance of the MAQ, rather than LANL. Its failure to audit the relevant parts of LANL contributed to its erroneous conclusion that LANL was in compliance. IEER has concluded that the ITAT should have found LANL in substantive breach of its Subpart H compliance obligations in regard to dose estimation for unmonitored sources.

2. General DOE QA requirements

Besides the specific requirements of Subpart H, LANL is also subject to the general QA requirements of the DOE. DOE Orders 5700.6C, 414.1 and 414.1A relate to quality assurance. The last mentioned is the most recent order, issued on September 29, 1999; it was reviewed two years later. [e] One of the goals of this order is to institute a DOE-wide QA program that requires "[l]ine organizations to minimize environmental, health and safety risks and impacts while maximizing reliability and performance." (Para 1 c.) Elements of the DOE are exempt from its requirements only if there is an explicit overriding QA order from the EPA or other government agencies (paragraph 3d(1)).

Section 4 of DOE Order 414.1A sets forth the specifics of DOE QA program requirements. Among other things, it requires the development of procedures to "detect and *prevent* quality problems." (Italics added). The LANL program for estimation of radionuclide usage, and hence of doses based on this data, completely fails the test of prevention of quality problems, since there is neither a QA program nor any institutionalized check on the quality of data supplied by

[e] U.S. Department of Energy Order 414.1A, Subject Quality Assurance, Approved 9-19-99, Review date 9-29-01.

the facilities themselves. The MAQ has a procedure for checking some of the data, and has corrected mistakes in this way. But the quality of most of the usage data from sources deemed to have very low emissions (Tier IV sources[f]) remains unverified by MAQ. MAQ is also not in a position to prevent data quality problems from occurring even in other cases, since it does not possess the necessary technical expertise to evaluate the data, nor can it be expected to have the expertise.

Some of the instances of the way in which facilities have reported and corrected usage data can best be described as exhibiting a cavalier disregard for quality assurance. In one case, data were phoned to MAQ without reference to any document that they had been logged in. Then something jogged the employee's memory, and he checked a label and then left a message on a phone machine at MAQ with a new number for the facility usage. MAQ accepted this new number, as it had the first one, without further inquiry.

After the ITAT released its Final Report on October 22, 2002, IEER interviewed Mr. Chris Mechels, a retired laboratory employee (Software Quality Assurance Manager, LANL Yucca Mountain Project, Retired 1994) who is familiar with LANL QA requirements and who raised questions about QA during the public meeting at which the ITAT released its third audit report.[g] Specifically, he raised some questions as to whether and when the ITAT had consulted LANL personnel outside MAQ regarding QA procedures and requirements. We also interviewed a former lab employee, Mr. William J. Parras, at the suggestion of Mr. Mechels. Mr. Mechels was also the one who pointed us to the general laboratory QA requirements. Mr. Mechels was an interested member of the public who had raised similar questions during a public meeting at the first or second audit. Yet the ITAT neither followed up with him nor reviewed the DOE QA program requirements, of which he has considerable knowledge, particularly as they concern LANL.

Besides the problem of quality of data that is routinely maintained and reported by the facilities to MAQ, the lack of an independent QA program that is thoroughly implemented for all data also raises the possibility of cover-ups of embarrassing incidents. This possibility is raised by the charges that Bill Parras made when IEER interviewed him:

> Bill Parras: …This is an example – you asked me for an example. We had a fire in a glovebox in TA-55 processing area – I want to say 1993, I don't remember the exact year….That's a reportable occurrence. Now, here's the interesting thing about it. The TA-55 Operations Center (which is the central focal point for controlling all plant operation activity especially emergency response requirements) didn't know there was a fire going on

[f] Tier IV are "[a]ny source that does NOT have the potential to contribute greater than 0.001 mrem/yr to any member of the public according to the last usage survey." Los Alamos National Laboratory, Environment, Safety, and Health Division, *Quality Assurance Project Plan for the Rad-NESHAP Compliance Project*, ESH-17-RN, R2, 10-9-2001. p. 20.

[g] IEER interview with Chris Mechels, October 23, 2002.

in the critical plant processing area. Personnel manning the TA-55 Operations Center couldn't have called anybody to respond to it. I was told by somebody who walked out of the plant and walked down the hall, and knew that I was responsible for occurrence reporting, that there was a fire in a glovebox located in the plant processing area. I said, doesn't the Operations Center know that? He said, no, they don't have the slightest idea. So I called the center and said, don't you know there's a fire in a glovebox, someone just told me. They came out of the plant – because my office was not in the plant, it was in a cold office area – they said, no, we don't have any idea. So somebody from that operations office went back to see what was going on at the plant processing area of TA-55. What had happened was somebody had pulled the fire alarm out of the glovebox when the fire had started, because he knew that would alert the Operations Center. So he had actually pulled that out while the fire was going on. It turned out it was some rags that had caught on fire while they were doing some soldering in the glovebox. They didn't have any special nuclear material [SNM] in the glovebox. So it wasn't related to SNM catching on fire.

I immediately went to [XXX] and said, we have a serious situation here. It was okay to put the fire out but disassembling – unplugging the fire alarm or without first notifying the Operations Center was an obvious reportable incident. They are never supposed to do that, particularly if they haven't let the Operations Center know about it. Operations Center needs to know when anything that is done in that processing plant, because if any alarm is disconnected then they have to send somebody there to be on guard in case there is a reportable emergency. That was sort of standing operating procedure. Make sure it wasn't a fire that was going to burn the building down. Because it's kind of hard to see what's going on in the plant from where the Operations Center is.

…

The Operations Center didn't know whether there was any SNM back in processing plant area where the fire occurred. They could have had some and they wouldn't have known it. I go to [XXX] who says, let me look into this myself. So he goes back there and it's a friend of his that was involved in the incident.

Bernd Franke (IEER): How long after the incident – couple [of] hours?

Bill Parras: Probably at least an hour or two hours later. And then I got to him within 15 minutes after I'd talked to the Operations Center. He said let me go back and check into this. He went back there and came back and informed me that this wasn't an incident that he wanted reported. I

said, how can you do that? This is something that sort of showing us that we don't have some good procedures in place. And I said, even if the fire was put out, was a trivial matter, it was serious enough to alarm somebody who came out of there and told us there was a fire, and somebody unplugged the alarm system, pulled it out of the glovebox, without the Operations Center knowing about it. He insisted that that was not going to be reported. He stated to me that he needed somebody else for this job. So I was immediately reassigned and this all happened with a week of when he took over as division leader. He did assign me to a very trivial job of developing a records management office.

…

Bill Parras: In terms of replacing me, he brought in [YYY] to do exactly what the division leader wanted which was in line with what they had been told to do lab-wide, and that is, you are going to be careful about what you report out to DOE because that is going to bring back some negative review of what the lab is doing with its safety program, in general.

Bernd Franke: What other dangers, curtail funding?

Bill Parras: No, DOE could shut you down. At TA-55 if you have something that is real serious, there are certain things that DOE can then say, shut TA-55 down until we see whether or not appropriate procedures are in place and done right. And we did have a couple of occurrences like that. We had an airborne contamination, one that literally DOE Headquarters shut the plant down for at least several weeks to make sure that everything was safe before they brought it back up.

Bernd Franke: Before or after this change?

Bill Parras: Prior.[h]

These are serious allegations, because this kind of process for not reporting incidents that may cause problems for the LANL's operations may also directly lead to fabrication of data required for environmental analysis and reporting. IEER has not independently investigated the allegations made by Mr. Parras. For that reason, IEER has omitted all names of parties not present at the interviews from the quoted text. We did ask Mr. Parras one-and-a-half months after the interview to review the draft of the transcript and a draft of this report and consider very carefully the statements quoted here. He has reaffirmed them and they are quoted here.

[h] Interview with William J. Parras, October 25, 2002.

Further, the issue of QA and lab whistleblowers was raised in a vigorous way by CCNS during the very first audit. But apart from one interview with one whistleblower, Joe Gutierrez, during the first audit, the ITAT did not systematically follow up this issue. The ITAT did not conduct interviews with whistleblowers during the third audit even when very specific issues regarding QA came up during that time.

The allegations made by Mr. Parras are not part of IEER's findings. But they have raised our level of concern regarding the integrity of environmental, health and safety data at LANL. If the allegations made by Mr. Parras are verified, and if the problems have not been systematically corrected, the problem of non-compliance may be even more complex and broad than indicated here. However, an investigation of these problems is beyond the scope of IEER's monitoring work. We find that it was the responsibility of the ITAT to investigate them, but it did not.

3. Conclusion regarding QA of usage data

IEER finds that LANL has not met the minimal conditions for assuring the integrity of the usage data that would make the process of dose estimation allowed by the FFCA for minor point sources equivalent to the process mandated by Subpart H of making periodic confirmatory measurements. LANL is in violation of requirements for quality assurance that are clearly implicit in Subpart H, in Appendix D and in the EPA guidance document to which it refers, as well as to internal DOE QA requirements. The ITAT should therefore have found that LANL is in substantive breach of its compliance obligations in this regard. The ITAT should also have recommended that the EPA revoke the substitute procedure and require periodic confirmatory measurements for all unmonitored sources. We believe that LANL has not earned the prerogative of using a less onerous substitute process because it has failed to institute a process of quality assurance for user data and because facility personnel have refused to participate in setting up a LANL-wide database that might have addressed this problem. Finally, the FFCA has lapsed. This re-enforces the primacy of periodic confirmatory measurements for sources that are not continuously monitored. The ITAT should have recommended the institution of periodic confirmatory measurements as the main basis for compliance assessments for these sources.

III. EVALUATION OF TA-54 WASTE CHARACTERIZATION DOSE CALCULATIONS

IEER finds that the ITAT's approach to the issue of monitoring emissions from TA-54 mobile waste characterization efforts is not adequate. The dose calculated by LANL from this potential source is a mere 20% smaller than the dose that would require monitoring. The ITAT recommends "additional demonstration to show that the calculation done to determine monitoring requirements for the proposed TA-54 operations is valid so that it can be more thoroughly defended. Ideally, the operations would be monitored for a period of one year or more, during which the highest-wattage drums could be processed, to clearly demonstrate low emissions." (p. 37)

Given the uncertainties in the assumptions, (e.g., the source term is likely to be non-uniform over the year because re-suspended material is associated with high-wind speed situations), IEER finds the ITAT's recommendation to be insufficient. IEER's conclusion is that the ITAT should have judged the LANL plan to be substantively deficient and recommended that the proposed TA-54 operations be continuously monitored. Doses above the monitoring limit may otherwise go unmonitored.

IV. STACK SAMPLING – PLUTONIUM-238 PARTICLE EMISSIONS

IEER expressed a concern in the second and third audits that releases of large particles of Pu-238, which has a high specific activity, could be a source of confusion that could affect response to increased emissions from a LANL facility. The ITAT's response to our concerns did not address the central issue that IEER raised. The ITAT Final Report simply evaded the issues raised by its own calculations in the draft report, giving rise to the problems with the calculations cited in the IEER comments. It remains true that at the reported level of estimated doses from CMR Stack 28 and 10 micron AMAD particles (the example originally used by the ITAT), the procedure used by LANL would not be sufficient to detect the level of doses being estimated. For an estimated dose of 1.1×10^{-3} mrem due to Pu-238, a small fraction of one particle would be collected on the air monitoring filters cumulatively over the entire year, if the particle size were 10 microns. Only about 0.07 particle would be collected annually on the half-filters that are being analyzed. (In practice, this means it would take about 14 identical systems for 1 particle of 10 microns to be collected cumulatively on the half-filters of all of them put together over one year.) Hence, the sampling rate of 2 cubic feet per minute, while adequate for doses of 1 millirem or more, fails to provide meaningful results at doses of less than $\sim 10^{-2}$ mrem (less than one particle per year on an annual collection of half-filters), assuming a particle size of 10 microns. System performance at a dose of 10^{-2} mrem from a single radionuclide is important from a compliance point of view. 40 CFR 61.93 (b)(4)(i) requires measurement of all radionuclides that contribute 10 percent of the dose for any release point, and monitoring of all release points that produce a 0.1 mrem dose or larger. It should be noted that the system acceptability improves as the particle size decreases, since the number of particles for a given dose increases rapidly as particle size decreases. However, the system remains marginal even for a particle size of 5 microns.

Assuming 2,800 picocuries per 10 micron particle, for a dose of 1.1×10^{-3} mrem, the number of particles collected in the air sample would be 4 orders of magnitude less, that is, about 0.14 particles per year. Therefore the measurements are in fact likely to be erratic and inaccurate (still using the above assumptions). The sampling rate of 2 ft^3 per min is not adequate to measure the level of releases corresponding to a 1×10^{-3} mrem per year dose from Pu-238 to within an order of magnitude of accuracy under the stated assumptions for large particles. The issue is not the number of particles for a 10 mrem dose, but the number of particles for the level of emissions and doses that are claimed to be measured and estimated accurately. At the level reported by LANL, emissions estimates for Pu-238 are likely not accurate for large particles even if the whole filter were being analyzed, let alone just half the filter. The system is of dubious value even for 5 micron particles.

It may be, as the ITAT has concluded that emission of particles of this size is unlikely. However, it also remains true that at the reported level of emissions, the LANL system would not be able to detect the emission of these particles. If only the second factor were to be considered, LANL would be violation of the requirements of Subpart H. But given that the exhaust air has HEPA filters, we have not found that LANL is in violation of the monitoring requirements in this area. Still, we have concluded that the ITAT should have found this as a substantive technical

deficiency. Moreover, we are dismayed that the minimal action that could be taken to improve the accuracy of the reported dose estimate – the analysis of both halves of the filter – was not recommended by the ITAT as a routine requirement for those areas where Pu-238 emissions are possible.

V. NON-POINT SOURCE MONITORING EVALUATION

1. Plutonium-238 and the AIRNET System

The ITAT's review of the issue of measuring of plutonium-238 particles in the AIRNET system is not in conformity with prevailing U.S. regulations. So far as we can determine, the ITAT has used the lowest dose conversion factor from ICRP 72 in making these dose calculations (though that is not explicitly stated in the ITAT Final Report). The prevailing EPA regulations do not use ICRP 72 but use EPA Regulatory Guide 11. Further, the ITAT has not explored the statistical aspects of the situation fully in regard to potential doses to the public from Pu-238 particles. Further the ITAT scenario does not correspond to the single-particle-over-two weeks scenario that we had asked it to explore. We present the details of our calculations and reasoning below.

In the MAQ-AIRNET system, the largest allowable Minimum Detectable Limit (MDL) for any radionuclide is set to be equivalent to a dose of 0.1 mrem/year. A pure Pu-238 oxide particle with 1 μm aerodynamic diameter (AMAD) has an activity of 2.8 pCi; a particle with 3.4 μm AMAD has an activity of about 100 pCi. With this information we can assess the dose that would arise if there were just one particle deposited on the filter every two weeks.[i] We present our calculations here because our analysis shows that the ITAT appears to have misinterpreted the nature of the problem and hence arrived at an incorrect conclusion.

The scenario we postulate, which we asked the ITAT to review, is that of a single particle deposited in one two-week period on the filter of an AIRNET station. A single pure Pu-238 particle of 1 μm AMAD, if breathed in by someone, would produce a dose of 1.1 mrem.[j] If the

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[i] The ITAT analyzed a case of one particle deposited every week, which would double the estimated doses to people given here since it doubles the concentration of plutonium-238 in the ambient air. The ITAT used a Class S particle assumption. This may be appropriate for plutonium oxide but not for all possible forms of plutonium that might be emitted at LANL. The ITAT obtained a weekly dose of 0.0234 millirem using dose conversion factor. Class F and Class M dose conversion factors would have yielded considerably higher doses -- 0.16 and 0.067 mrem respectively. While Class F and perhaps Class M are not appropriate for plutonium oxide, they are appropriate for other forms of plutonium. We have used conservative dose conversion factors for dose estimation since our choice of plutonium oxide for the calculations is a convenience rather than a technical judgment. The ITAT has published the radioactivity estimates for plutonium oxide particles, and so we used this chemical form as an example in order to have as close a correspondence in parameter choice to the ITAT for the purposes of comparison. Higher dose conversion factors cannot be excluded without more consideration of the matter than the ITAT gave it. Pure Pu particles may also have higher or lower densities than the case of Pu oxide particles considered here.

[j] We have used a dose conversion factor of $1.06*10^{-4}$ Sv/Bq for Class W material from Federal Guidance Report No.11, (United States. Environmental Protection Agency, Office of Radiation Programs. *Limiting Values of Radionuclide Intake And Air Concentration and Dose Conversion Factors For Inhalation, Submersion, and Ingestion.* EPA-520/1-88-020, Washington, DC, September 1988), which is the prevailing regulatory document. A somewhat lower dose is obtained if one assumes a Class Y particle, but the overall conclusions remain the same, since the ratio of dose conversion factors of Class Y to Class W in the EPA Reg. Guide 11, cited above, is about

particle were 3.4 μm AMAD, the dose would be 39 mrem. Using the same assumptions as the ITAT for breathing rate, the AIRNET station draws in air at about seven times the breathing rate of an adult. In such a situation, there is a 13 percent probability that a person would breathe in at least a particle in the two-week period. Another way of looking at this situation is that if five people were to breathe in the ambient air being sampled, there would be a 50 percent probability (approximately) that at least one of them would breathe in at least one particle in the two-week period.[k]

Yet another way to view this situation is that the expected value of dose over a two-week period would be about 0.155 mrem. Further, it would take only a handful of people exposed to ambient air such that there is one particle of plutonium-238 deposited on the filter in two weeks for at least one of them to get a dose of at least 1.1 millirem in the case of a 1 μm AMAD particle and 39 millirem in the case of a 3.4 μm particle with 50 percent probability. The former is greatly in excess of the 0.1 mrem dose corresponding to the target MDL; the latter is greatly in excess of the Subpart H legal limit. In case several people are exposed, the target MDL may be exceeded even if the postulated event occurred only in one two-week period in several years, with the frequency (or rarity) depending on the particle size distribution and the size of the exposed population. The ITAT did not provide any analysis regarding the issue of multiple people being exposed to the ambient air sampled by the AIRNET station during the two-week period postulated in the scenario.

IEER disagrees with the ITAT statement that "[t]he IEER concern about a single particle of ^{238}Pu being missed and resulting in a significant dose seems to be unfounded" (p. 57). The ITAT has failed to properly consider the various statistical aspects of the situation and also used the smallest number for dose conversion factor from ICRP 72. While the assumption of insoluble plutonium is reasonable for plutonium oxide, the ITAT should have used the dose conversion factor from the prevailing EPA regulations to which LANL must conform. Had it done that it would have found that the target MDL would not be met in the postulated scenario, contrary to its finding. Finally, the ITAT did not consider the situation when multiple people might be exposed to the polluted air. We therefore find that the ITAT conclusion that IEER's concerns are unfounded is in error. We reiterate that the current LANL practice of analyzing only half of the filter paper by alpha spectrometry increases the likelihood of a significant dose being undetected if the particle were to remain on the half-filter composite that is not subjected to alpha

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0.735. The expected value of dose in this case is 0.11 mrem, which is still above the limit corresponding to the target MDL.

[k] We use a Poisson probability distribution, and assume that one Pu-238 particle in oxide form is taken in, on average, in two weeks by an AIRNET station. This yields a mean waiting time for a person to breathe in a single particle, μ = (air intake rate of the AIRNET station)/(air intake rate of a person) = 163/23, which is about 7 periods of time (of two weeks each). The probability that a person exposed to this air would breathe in at least one particle in a two-week period is given by the cumulative probability, $P = 1\text{-}e^{(-1/\mu)} = 0.13$, or 13 percent. For an exposed population of N people, the probability that at least one person breathes in at least one particle in the two-week period is given by $P = 1 - e^{(-N/\mu)}$. For $\mu = 7$ and $P = 0.5$, N works out to 4.9, which is rounded up to 5 people.

spectroscopy, especially in the case of small particles.[1] The ITAT should revise its dismissal of our concerns and issue a recommendation that both halves of the filter be analyzed.

The problem constitutes a substantive technical deficiency of the AIRNET system and the ITAT should revise its Final Report and identify it as such. The assertion that the postulated situation is unlikely to arise does not resolve the issue. The estimated doses are high enough, especially if more than one person is exposed to the air, that a quantitative probabilistic analysis of the problem, including an analysis of the possible Pu-238 particle size distribution is needed. Such an analysis, including particle size distribution analysis, is necessary if LANL's claim of an MDL corresponding to an annual average dose of 0.1 mrem is to be scientifically credible. The ITAT should have recommended that it be done.

2. Sampler Siting Analysis

The ITAT has recommended that LANL "reevaluate the sampler siting with respect to the North Mesa residences and the MDA-U diffuse source…." (p. 62) However, the ITAT did not cite the problem of the lack of such an evaluation or the failure to install an AIRNET station corresponding to a "TA-21 East" source, which in the absence of such an evaluation should be a substantive technical deficiency. The procedure that was adopted by LANL for sampler siting north of the Laboratory was based on an annual average source term from a diffuse source whereas it is clearly established that a diffuse sources of resuspended material has a markedly different time-release function. The LANL procedure does not account for that fact and hence is a substantive technical deficiency. The ITAT should have cited it as such. IEER also has concluded that until such a time as it can be definitively shown that such a station is not needed, that the ITAT should have recommended that additional AIRNET station be installed at the eastern edge of North Mesa residences at this time.

[1] The problem is especially relevant for small particles because LANL does a gross alpha scan on the whole filter as a preliminary screening technique that would be more likely to pick up larger particles.

VI. COMPLEX TERRAIN MODELING COMPARISONS

The ITAT provided additional calculations comparing complex terrain model with the model used by LANL (EPA-approved CAP-88) and concludes that the latter one would still provide a conservative estimate of dispersion at relevant distances. This, however, is only correct if the assumption of continuous releases is valid. Thus, the assumption that CAP-88 provides a conservative estimate of dispersion under all the circumstances relevant to dose estimation at LANL is not correct. Considerable further investigation, using specific source characteristics, both for point and diffuse sources, is needed to arrive at a definitive conclusion.

The calculations presented by the ITAT are based on annual average χ/Q values. LANL is not required by Subpart H to use this assumption; for the LANSCE facility, doses are calculated based on monthly averages. Many stationary sources and all diffuse sources are highly non-uniform. Particle releases from stationary sources often occur over short periods of time. Emissions from diffuse sources due to resuspension are associated with high-wind speed situations (see IEER memo of September 16, 2002). It is possible that the χ/Q values of such releases are significantly larger than the annual average one and that resulting doses are larger than if the same release is assumed to be equally distributed over the year. The comparison of annual average χ/Q values does not address this concern.

The ITAT Final Report shows that the doses based on an assumption of short-term releases could be far higher than annual average doses. The fact that in the example chosen the dose is still far below the regulatory maximum is not relevant to the choice of the model. Until a complete and definitive comparison of the complex terrain model under the prevailing conditions of episodic releases can be done for the entire LANL site to sufficient degree of accuracy to show that the CAP-88 approach is uniformly conservative, the use of CAP-88 will continue to be a substantive technical deficiency and should be regarded as such. The IEER commends the ITAT for having carried out the sample calculations using CALPUFF and for responding in detail to IEER's comments. However, the facts remain that LANL is located on complex terrain and has episodic emissions and there is still no demonstrated conservative procedure for modeling the site's emissions even though the ITAT has declared an end to the required audit process. The ITAT's ending of the audit process at the third audit was therefore inappropriate.

VII. ISSUES PERIPHERAL TO THE SCOPE OF THE AUDIT

1. The Neighborhood Environmental Watch Network

During this audit, IEER again raised concerns (Final Report, Appendix B) about the quality of the Neighborhood Environmental Watch Network (NEWNET) data and the usefulness of the NEWNET web site. The ITAT recommends that LANL continue to take steps to ensure the quality of web-posted data, resolve any apparent calibration problems, and investigate the most appropriate method for developing a representative characterization of background. IEER agrees with this recommendation. IEER further stresses that the presentation of the data on the NEWNET web site should contain a description of the limits of the system detailing under which conditions the system is able to monitor routine or accidental emissions from the LANL site and which are not detectable by the NEWNET system. The NEWNET web site should also contain continuously updated reports on the steps taken to improve the quality assurance and quality control (QA/QC).

2. Uncertainties in Dose Calculations

The ITAT has not addressed the issue of uncertainties in CAP-88 dose calculations although it had been raised during this and past audits. We still consider this issue peripheral to the scope of the audit because estimates of uncertainty are not required by the regulation. The calculations made by LANL using CAP-88 do not include estimates of uncertainty because the EPA has not deemed it necessary; however, in theory, the model does appear to compensate for not explicitly addressing uncertainty by producing results that are biased high in those cases where the assumption of continuous releases is valid. However, as discussed above, this is not true in all cases.

VIII. ITAT MODEL FOR FUTURE STAKEHOLDER INVOLVEMENT

IEER has provided its comments on the stakeholder involvement to the ITAT in reviewing the draft report. The current context is not suitable for a voluntary compliance model recommended by the ITAT, though there might be a time in the future when it might be more appropriate.

A part of the reason for our conclusion is the fact that throughout the audit process, up to and including the third audit, LANL and DOE have never acknowledged that they were in violation of Subpart H, despite the finding of non-compliance by the audit tem and the concurrence in that finding by the IEER monitors of the audit. Further, the failure of the third audit to cite the substantive technical deficiencies in the program as well as the lack of thoroughness and completeness of the third audit, which was conducted under the Consent Decree, lead IEER to the conclusion that the basis for a truly independent voluntary compliance program does not now exist. IEER will therefore not go beyond what it has already stated in public as part of the comments on the draft third audit report at this time regarding the process. These comments were published by the ITAT. IEER may make further comments on a proposed process if a fourth audit is conducted under the Consent Decree, depending on the outcome of that process.

APPENDIX A: SELECTED IEER'S MEMOS AS REPRINTED IN THE ITAT'S FINAL REPORT

To: Joni Arends
From: Arjun Makhijani
Subject: Some issues for the ITAT review regarding unmonitored sources during the third CAA audit.
Date: 11 July 2002.

A number of issues have come up in the course of review of the documents regarding estimation of doses from unmonitored sources. This will provide a formal record of the issues that IEER believes that the ITAT should review, though Justin Mohler has notes on most (all?) of these items already.

I. Quality assurance relating to input data

The most important item that has arisen, in my view, is the issue of the quality of the data provided to MAQ by the users of radionuclides. It is the responsibility of the user to provide accurate data. MAQ does not do quality assurance on this data and, it seems, does not regard this as part of its mandate. This is a reasonable point of view. Yet, it is crucial that the data that MAQ gets are QA-ed.

My understanding is that MAQ does not at present make sure that the data provided by users have gone through a QA process that can, if necessary, be verified. MAQ does not require the maintenance of QA records for this data and does not maintain any records, formal or informal, of any QA to which the data might have been subjected by the user.

Some specific items that came up during the review of the files indicate that QA procedures may be lacking at the users' end at least in some cases.

1. The plutonium usage data at 21-257. The data that MAQ got from the user were felt to be too high by MAQ and were sent back for a check. The numbers that came back were different and lower.
2. In the case of TA 48-1, Room 430, ES-67, MAQ requested documentation and got back slightly different (and lower) estimates for Pu usage.
3. At TA 48-1, Room 430, Stack ES-67, plutonium in liquid form is heated. The usage is estimated at 1.5 percent of the amount processed because it is estimated that 98.5% of the Pu is recovered. MAQ does not have a record of the details of how this estimate of recovery was made or of the QA procedures for it.

These examples indicate that QA procedures may be lacking for some or all of the user supplied data. Of course, input data that have not been subject to QA would vitiate the validity of all the subsequent calculations, however carefully the calculations are done and QA-ed. **IEER recommends that the ITAT should inquire into the QA procedures for the input data at the user's end as a very high priority. If the ITAT finds that there is not a user data QA process as a matter of normal practice, the ITAT should evaluate the implications of such a deficiency for the compliance status of LANL with respect to Subpart H.**

II. Other issues

1. Have there been any DU fires or U fires in the places where DU or other U metal is being processed? This is not a question that the MAQ section asks. The ITAT should examine whether fires have occurred and how such issues should be handled. Areas where this may be important are U metal machining and foundry operations (e.g. TA-3 102, ES-25 and TA-3-66, ES-4).
2. The criterion for the emissions reduction factor is whether or not the DU is heated using an external heat source. However, DU is also heated during machining. The ITAT should consider whether the criterion for selection of an emissions reduction factor should depend on external heating or on whether the DU (or other U) actually becomes hot either by heating or through machining or other mechanical processing. In the latter case, using the example of TA 3-102, the emissions factor for machining should be 10^{-3} rather than 10^{-6}.
3. Is the DU inventory at LANL from virgin or recycled U? If the latter, are there specs for the DU as to trace contaminants? The ITAT should review this issue and examine whether any change is needed in MAQ assessment.
4. The liquid emission reduction factor (unheated) is 10^{-3}. Does this take into account mechanical agitation and the increase in emissions due to mechanical suspension of fine particles? Example 21-257.
5. The ITAT should review the procedures by which the MAQ assures itself that usage of inventories that have not been used for some time (and therefore not reported to MAQ) is reported if and when they do come into use. The thresholds of material accounting in the buildings and rooms for radionuclides should be assessed as part of this review.
6. TA 48-1 Room 430, ES-67 has a liquid DU source that is heated sealed. MAQ assumes that no emissions are occurring. The ITAT should review the reasonableness of this assumption by inquiring into the nature of the sealing that is employed.
7. In some, but not all, cases Pu-239 specific activity is assumed to be that for pure Pu-239. This means that total Pu may be somewhat underestimated in these cases since Pu-240 is being ignored. The ITAT should examine the issue of the Pu-240 content of the Pu-239 and the criteria for using mixed isotopic specific activity or single isotope specific activity.
8. The total radionuclide content of the waste drums that are examined and characterized in TA-54-36 is reported to a high degree of accuracy and small amounts of individual radionuclides. The ITAT should examine the quality of this data in relation to the characterization procedures that are being used. The ITAT should also examine whether the data have been subjected to QA procedures.

cc: John Till (at Joni Arends request)

From: Bernd Franke, IFEU (for IEER)
To: Arjun Makhijani (IEER) Joni Arends (CCNS), John Till and Helen Grogan (ITAT)
Date: July 3, 2002
Re: Estimating the gamma dose at East Gate using NEWNET data

This memo summarizes my review of the procedure selected by Mike McNaughton in his January 2002 summary of how he estimated the gamma dose at East Gate using NEWNET data. McNaughton assumed that background doses at East Gate from measurements in time periods that the beam was off for a day or more. The total dose estimated by McNaughton for November 2001 was estimated to be 0.11+0.03 mrem whereas the CAP88 dose was 0.22 mrem. (I have not yet seen the CAP88 input and output data so I could not verify the result of the model calculation).

I present a somewhat different approach for the month of November 2001. Upon inspection of the gamma dose rate over time (Figure 1), a gradual shift is evident which may likely be due to instrument calibration.

If that is the case, the absolute background gamma dose rate it is difficult to determine. I therefore calculated the monthly average gamma dose rate for all observations (15-minute averages) as a function of the wind direction. It is likely that short lived gamma emitting radionuclides from LANSCE operations would be transported to the East Gate when the wind direction is between 90 and 270 degrees. Inversely, at wind directions of less than 90 degrees and more than 270 degrees, a contribution from LANSCE is unlikely to result in increased gamma dose rates at the East Gate. Hence the data from those observations can be assumed to represent background.

The result of the analysis is as follows:

Wind direction >90 and <270 degrees
Total number of 15-minute observations: 1.679
Average dose rate: 17.04 µR/hr

Wind direction <90 or >270 degrees
Total number of 15-minute observations: 1.200
Average dose rate: 16.49 µR/hr

The cumulative integrated dose wind direction >90 and <270 degrees is calculated to be 0.23 mR above background, which compares well with the CAP88 result of 0.22 mrem reported by McNaughton.

In addition, I would like to direct attention to the gamma dose rates as a function of the wind direction in the month December 2001 (Figure 4) compared to the data for October 2001 (Figure 2) and November 2001 (Figure 3). The increases in gamma dose rates at wind directions <90 and >270 degrees in the month of December 2001 are difficult to explain and may indicate electronic

noise at this station. That comes as a surprise because the station East Gate (new) was equipped with new data loggers that are supposed to have rectified the noise issue.

I suggest that ITAT continues the review of NEWNET data quality and the methodology to use NEWNET data to validate the results of CAP88 calculations.

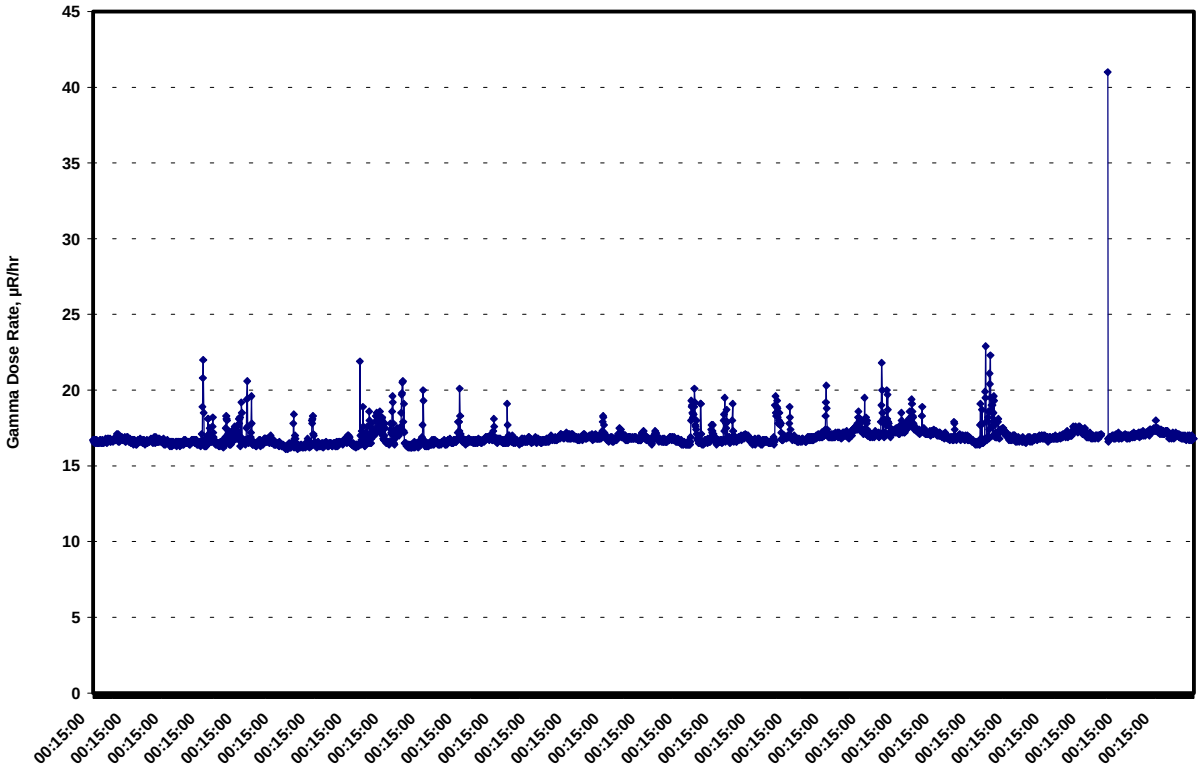

Figure 1 November 2001 gamma dose rate at the NEWNET East Gate (new) station
Note: the 41 µR/hr value on 11/28 was considered to be erroneous

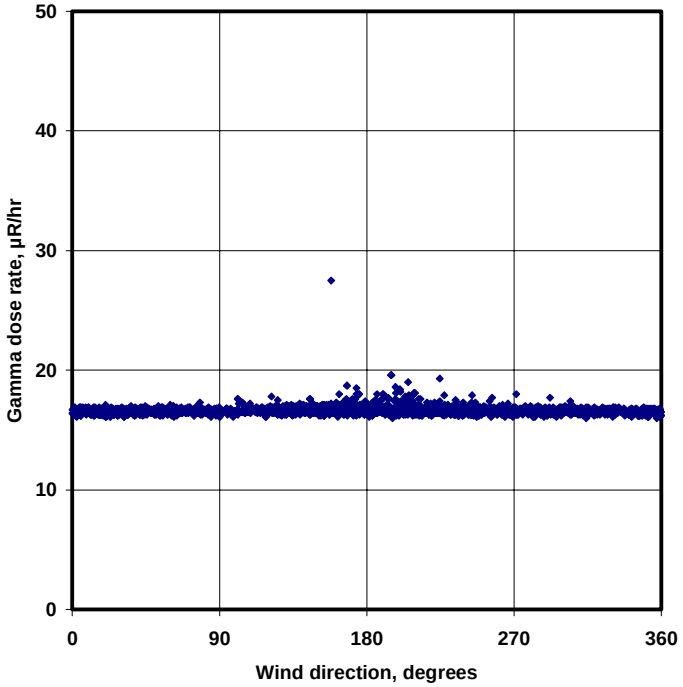

Figure 2 October 2001 gamma dose rate at the NEWNET East Gate (new) station as a function of wind direction in degrees

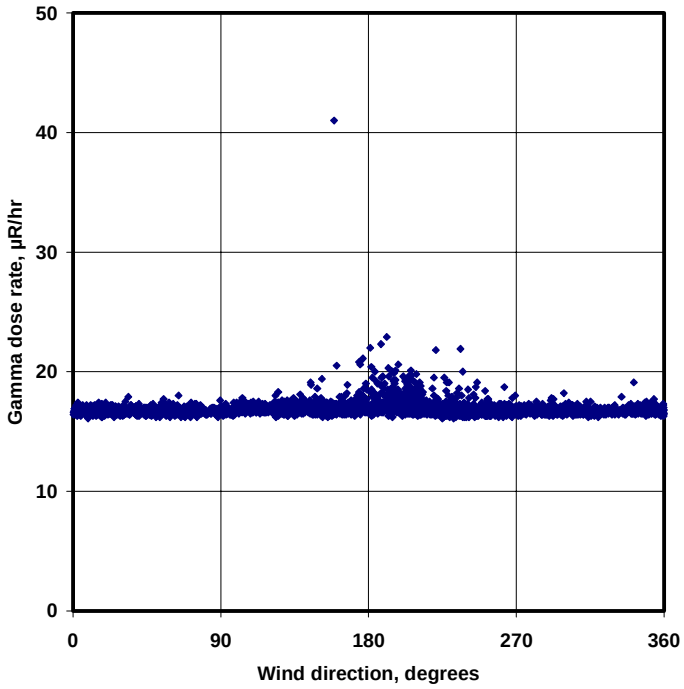

Figure 3 November 2001 gamma dose rate at the NEWNET East Gate (new) station as a function of wind direction in degrees

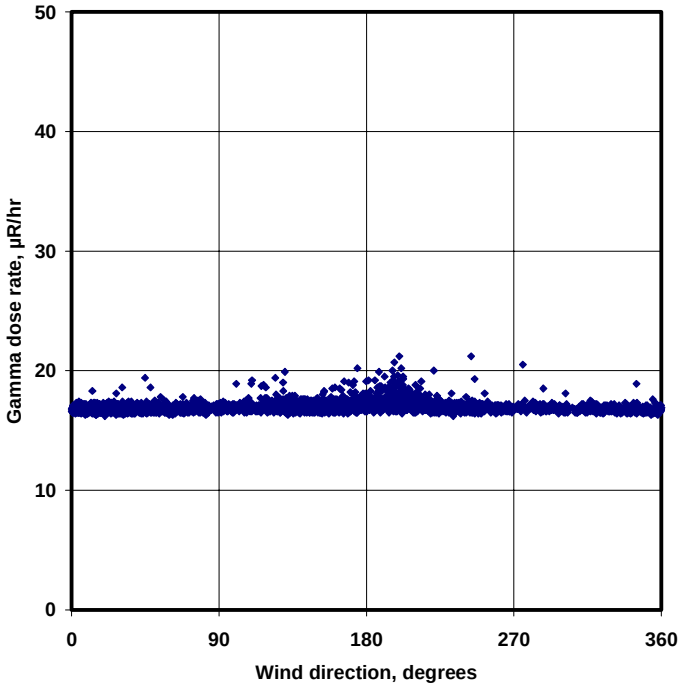

Figure 4 December 2001 gamma dose rate at the NEWNET East Gate (new) station as a function of wind direction in degrees

To: Joni Arends
From: Arjun Makhijani
Subject: Some quality assurance issues regarding input data for unmonitored sources dose estimation
Date: September 1, 2002

This memorandum follows up on one aspect of my July 11, 2002 memorandum regarding unmonitored sources: quality assurance relating to input data. Justin Mohler is aware of the facts mentioned here. This memorandum provides IEER's view of the issues that need to be addressed by the ITAT in this regard.

My understanding is that MAQ does not at present make sure that the data provided by users have gone through a QA process. MAQ does not require the maintenance of QA records for this data and does not maintain any records, formal or informal, of any QA to which the data might have been subjected by the user.

I had mentioned some items that point to the lack of user data QA in my July 11, 2002 memorandum. A further example came up during the August 22, 2002 visit to LANL at TA-35-213 Room F-11 and the associated discussion held with Sue Terp of MAQ. The tritium content of tiles was first reported as 400 mCi from memory over the phone by Bob Reiswig who works in Room F-11. He then looked up the shipping manifest from Princeton, having had a hunch that he might have made a mistake. He found that the figure in the manifest was 40 mCi. Mr. Reiswig then made a new phone call to notify MAQ of the change and reportedly left a message on the answering machine explaining the error and providing the new figure. This new figure of 40 mCi was also accepted as correct by MAQ.

Scientific aspects of quality assurance

IEER strongly recommends that ITAT should examine the scientific and compliance aspects of the lack of a systematic quality assurance component for the input data for unmonitored sources. As regards the scientific aspect of the matter, the lack of a procedure at the user's end for ensuring that the data provided to MAQ are correct, is troubling. The MAQ staff do check the calculations when they are provided by the user and often ask for them, but there is no set process for determining the accuracy of the data that go into the calculations. The deficiency is compounded in those cases where there is a lack of systematic facility review of the actual changes in the inventories of the radionuclides in the possession of users. In sum, the ITAT needs to assess the scientific adequacy or lack thereof of the process by which the input data are generated for unmonitored source dose estimations. How can the validity of the results be assured if the quality of the input data is not systematically assured?

Legal aspects of quality assurance

IEER also strongly recommends that the ITAT also examine carefully the compliance aspect of this situation, as recommended in my July 11, 2002 memo. Let me elaborate here. Subpart H explicitly requires quality assurance for all stack measurements as well as all environmental

measurements. It also requires "periodic confirmatory measurements" to be made for those sources of emissions considered too low for continuous stack sampling (40 CFR §61.93(b)(4)(i)). These periodic confirmatory measurements are subject to the same rigorous quality assurance requirements as the continuously sampled stacks.

The EPA has allowed LANL to employ emissions estimates based on user surveys and dispersion modeling as a *substitute* for periodic confirmatory measurements. In other words, LANL makes no periodic confirmatory measurements to ensure that emissions from unmonitored sources are low, but relies entirely upon the user-supplied information as the basis for dose estimation and compliance assessment for unmonitored sources. Therefore ensuring that quality of the input data is of paramount importance.

The ITAT should carefully evaluate the whether a quality assurance requirement for user supplied data is implicit in Subpart H as it is being implemented by LANL – that is without confirmatory measurements. The ITAT should then evaluate whether LANL is in compliance with Subpart H in this regard.

To: John Till and the Independent Technical Audit Team
From: Joni Arends, CCNS Waste Programs Director
Date: September 16, 2002
Re: RRES-MAQ Quality Assurance Program

In reviewing the RRES-MAQ Quality Assurance Program, CCNS requests that the Independent Technical Audit Team review and comment on the following items:

1. CCNS appreciates the addition of the vertical edit line on the side of the page indicating revisions, but requests that RRES-MAQ use this style consistently. ESH-17-102, R3 (used edit line), but RRES-MAQ-102, R4 (did not use edit line); ESH-17-109, R7; ESH-17-124, R4 (p. 15 for shipping radioactive material - quick change to document DOT compliance); RRES-MAQ-22, R6 (quick change for division/group designator).

RAC Response: We suspect that the inclusion of the vertical edit line in the pdf version of these procedure documents is unintentional. These appear to be Microsoft Word editing marks where the edits were not accepted, and the artifacts of these editing marks were carried over into the pdf file when it was created from the Word file. We would instead encourage MAQ to continue to include the table at the front of each procedure document that indicates changes since the last version of the procedure was written.

2. The "Note" referring to "Actions specified within this procedure, unless preceded with 'should' or 'may,' are to be considered mandatory guidance (i.e., 'shall')" is often deleted in the revision process. ESH-17-114, R1 (p. 3), ESH-17-114, R2 (p. 3); ESH-17-109, R6 (p. 3), ESH-17-109, R7 (p. 3). CCNS believes that the Note should be included in all procedures as a reminder of which procedures are mandatory and which are optional.

RAC Response: We agree that this is a helpful statement and encourage MAQ to include it in all of their procedures.

From: Bernd Franke, IFEU (for IEER)
To: Arjun Makhijani (IEER), Joni Arends (CCNS), John Till and Helen Grogan (ITAT)
Date: September 16, 2002
Re: Environmental monitoring issues

It is the purpose of this memorandum to discuss three issues regarding the environmental monitoring at LANL: (1) the adequacy of the periodic review for station siting especially with regard to the North Mesa residences, (2) the reliability of alpha spectroscopy for Pu-238, and (3) the accuracy of TLDs compared to electret ionisation chambers (EICs).

AIRNET station siting

The siting of AIRNET stations is subject to periodic review as specified in procedure MAQ-238. The periodic review requires a constant update pf information about diffuse emission sources. Based on the procedures, NSR data for TA-21 and elsewhere does not require installation of additional AIRNET stations. In his September 11, 2002 E-mail entitled "Airnet siting & TA-21 potential releases TSPA", David Fuehne presents results of CAP88 calculations. He concludes that even for a source located in the Eastern section of TA-21, the LA Airport Terminal station can serve "as an indicator of rad concentrations for North Mesa residences, since the concentrations are so close to one another". Consequently, an additional AIRNET station is not required.

The underlying calculation assumes a steady-state release and is modelled with a simplified flat-terrain model. Both assumptions are not valid in this case. The use of a complex terrain model may lead to a different conclusion for a "TA-21 East" source. In addition, the releases from a diffuse source are most likely to occur during high wind speeds (>10 mph) when material can be readily suspended into air. High wind speed situations are more likely during wind blowing from the South/Southeast (see Figure 1).

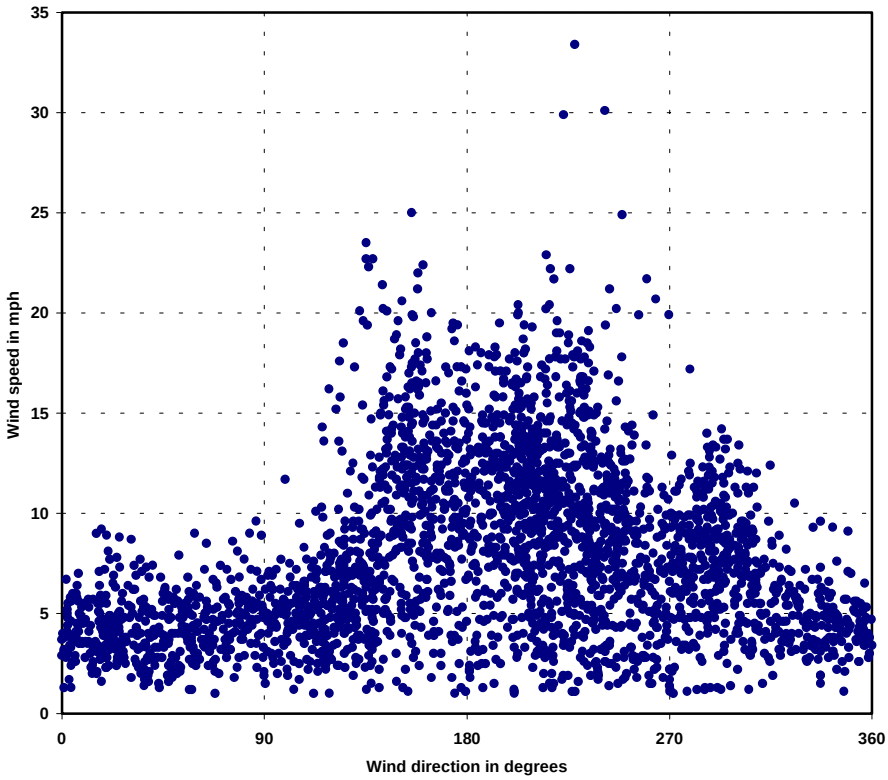

Figure 1 Wind speed as a function of wind direction at East Gate NEWNET station, August 2002

With regard to diffuse sources at TA-21-East, the wind speed/direction pattern suggests that the greatest impact to residents from such a source is likely at the North Mesa residences.

In my opinion, this fact requires a re-evaluation of the AIRNET siting procedure for diffuse sources. Whereas one may argue that the release pattern for stationary sources may be randomly distributed over the year, the time-release function for diffuse source is clearly non-randomly correlated with high wind speed situations. Given this, CAP88 is certainly not a suitable tool for determining whether the potential dose to the MEI at a receptor location exceeds 0.1 mrem/year[1].

In my opinion, the procedure MAQ-238 which allows that "CAP88 or previously derived conservative LANL dose factors" can be used for the dose assessment needs to be corrected.

It is likely very difficult to determine the time-release function of the source term for diffuse sources with reasonable accuracy. Given that and the uncertainties in NSR process and the time it takes to install AIRNET stations, it appears more appropriate to take a cautious approach and install an additional AIRNET station at the Eastern edge of North Mesa residences at this time.

[1] If the projected dose is in excess of 0.1 mrem/year, a new AIRNET station will have to be installed provided that there is no other AIRNET station within the half-sector or 100 m, whichever is larger.

Alpha spectrometry for Pu-238

Owing to its high specific activity, the proper identification of Pu-238 in ambient air samples may pose a problem. In the MAQ-AIRNET, the maximum MDL for Pu-238, equivalent to 0.1 mrem/year annual dose, is reported to be 0.14 pCi per half filter composite. The target MDL for Pu-238 is indicated to be 0.05 pCi per half filter composite.

According to the information on page 55 of the first audit report by the ITAT, the specific activity a particle with 1 µm aerodynamic diameter that consists of pure Pu-238 oxide particles is 2.8 pCi. If such particles would be released from a diffuse source (e.g. from waste materials), the presence of one such particle on a half filter composite would indicate a dose of 2 mrem/year. If said particle were to remain on the half filter composite that is not subjected to alpha spectroscopy, the resulting dose estimate would be 0 mrem/year.

The potential bias would be greater if a larger particle size is assumed. While it may be argued that the activity may be detected because the detection limit for alpha activity of a single filter is 0.5 pCi. However, it is not evident from the procedures in place (MAQ-AIRNET, ESH-17-201, R3) that analysis of the entire filter be performed.

TLD versus EIC

A one-year comparison study[2] of three methods for measuring environmental radiation comparing thermoluminiscent dosimeters (TLDs), pressurized ionisation chambers (PICs), and electret ionisation chambers (EICs) on and around the INEEL site found that exposure rates calculated with EISs correlate much better with PIC data those calculated using TLD data. PICs provide the most accurate measure of environmental dose rates. TLDs were found show a lower response than the PICs. This means that use of uncorrected TLD data underestimates external gamma dose rates. The study authors summarize that “Preliminary results suggests that EICs seem to be an appropriate replacement for TLDs”.

In my opinion, use of EICs should be considered for LANL as well if the preliminary results of the INEEL study are confirmed.

I suggest that the ITAT review the above described three issues.

[2] Moser K D, Walker D W, Paulus L R, Gesell T F. One-Year Comparison study of Three Methods for Measuring Environmental Radiation. Unpublished manuscript Idaho State University/INEEL Oversight Program.

From: Bernd Franke, IFEU (for IEER)
To: Arjun Makhijani (IEER) Joni Arends (CCNS), John Till and Helen Grogan (ITAT)
Date: September 5, 2002
Re: Stack monitoring QA program

The new stack monitoring system for the CMR building has to comply with the quality assurance provisions of Subpart H, specifically those described in 40CFR61, Appendix B, Method 114, section 4. It is the purpose of this memorandum to suggest that the ITAT should carefully evaluate the whether the quality assurance requirements are met in their entirety for the new system.

Both the "old" and "new" sample systems were in operation in 2001. The "CMR comparison writeup" by David Fuehne of July 5, 2002 indicates a statistical difference between the radionuclide results for the annual source term. There was a statistical difference in 30 out of 54 comparisons of composite results. It appears to me that the observed difference allows is an important piece of information for the determination of the "precision, accuracy and completeness" of the emission measurement data (Method 114, section 4.4). I suggest that ITAT review whether the quantitative results should become part of the documentation of the accuracy of the stack sampling system.

In addition, I would like to focus on another issue that is not limited to the monitoring of radioactive air emissions from the CMR building and is relevant for other facilities as well. Given the accident involving Pu-238 that has occurred on March 16, 2000, the issue of potential bias in particle collection and analysis of composite filters[3] deserves a revisit. I note that section 5.5.6 "Responding to increased releases" on page 84 of the Quality Assurance Project Plan for the Rad-NESHAP Compliance Project (ESH-17-RN, R2) specifies*: "If increased emissions from LANSCE have the potential to impact the Laboratory's compliance with the 10-mrem/yr standard, the responsible facility representatives will be informed within 24 hours of identification by the Rad-NESHAP Project Leader. Notifications will be made to a sufficiently high level of management to ensure that the conditions that result in the release are corrected, if possible."* In my review of LANL's Rad-NESHAP documentation, I was unable to find a quantitative evaluation of whether the above QA provision is met when accounting for the potential bias in stack sampling and analysis of composite filters if large particles of Pu-238 are the major contributor to dose. I suggest that the ITAT inquire whether such documentation exists.

I suggest that the ITAT review these issues in their evaluation of whether the QA provisions in 40CFR61 Subpart H for stack monitoring were met at LANL for the year 2001.

[3] Independent Audit of Los Alamos National Laboratory for Compliance with the Clean Air Act, 40 CFR61, Subpart H, 1998, pages 52-56

APPENDIX B: OTHER DOCUMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

December 17, 1999

Mr. David Gurule
Area Manager
Los Alamos Area Office
Albuquerque Operations Office
U.S. Department of Energy
Los Alamos, NM 87544

Re: The Federal Facilities Compliance Agreement, Signed June 13, 1996, Regarding Noncompliance with Monitoring Testing and Reporting Requirements.

Dear Mr. Gurule:

Thank you for your letter dated November 23, 1999. You certified that the Department of Energy has fulfilled all requirements and activities of the Federal Facilities Compliance Agreement (Agreement). We reviewed the material and activities and have determined that the Agreement has been met. This letter is to terminate the Agreement.

Should you have any questions, please contact George P. Brozowski, Regional Health Physicist at (214) 665-8541.

Sincerely yours,

for Carl E. Edlund, P.E.
Director
Multimedia Planning and
Permitting Division

Received 8-8-91

United States Government

Department of Energy

memorandum

Albuquerque Operations Office

DATE: AUG 7 1991

REPLY TO ATTN OF: EPD:FHS

SUBJECT: Informal National Emission Standards for Hazardous Air Pollutants Evaluation of the Los Alamos National Laboratory

TO: MEMORANDUM TO FILE
THRU: C. L. Soden, Supervisor, EPD, AL

Commencing April 9, 1991, John R. McDowell (Advanced Sciences, Inc.) and I spent two weeks conducting an evaluation of the Los Alamos National Laboratory's (LANL) state of compliance with the requirements of 40 CFR 61, Subpart H — National Emission Standards for Emissions of Radionuclides Other Than Radon From U.S. Department of Energy Facilities. This report discusses the findings of this evaluation.

1. Emission Monitoring and Test Procedures: There are currently approximately 87 stacks that are continuously monitored for radioactive emissions. Although these stacks are continuously monitored, for the most part, the methods used are not in compliance with Reference Methods 1 and 2 of Appendix A to 40 CFR 60.

Isokinetic sampling is achieved by regulating the sample flow rate to 2 cfm and providing a sampling tube with a diameter that will effect a velocity equal to that of the stack velocity. These flow rates (2 cfm) are set using a field calibration instrument and method that does not take into account temperature or barometric pressure. Because of the variations in stack flow, temperature, and barometric pressure, the extent of variance from isokinetic sampling has to be determined.

The flow rates of most of the stacks is measured annually by Johnson Controls using procedures similar to Reference Method 2. This annual measurement is utilized to determine emissions by assuming the flow rate is constant throughout the year.

A site inventory which would verify that the currently monitored emission points are all that exist at LANL has not been completed. Nor has a screening of the current stacks been completed to determine which stacks need to be continously monitored according to the Regulation. HSE-8 has developed a screening procedure based on Appendix D of 40 CFR 61 and results to date suggest that about 20 - 30 of the currently identified stacks will have to be continuously monitored. Still the

inventory will have to be completed to determine which isotopes and in what form it will be necessary to monitor for, and if any new stacks must be added to the existing list.

Overall, the emission monitoring and test procedures utilized at LANL, with the exception of the LAMPF (which has an acceptable stack monitoring program), are not in compliance with the Regulation. The information currently derived from the program is questionable; thus making the values produced by the dose modeling questionable.

2. Ambient Monitoring: In general, the ambient monitoring program at LANL is of high quality. The program is well managed, well documented, and includes an active Quality Assurance (QA) plan. The program consists of the following:

35 Air Sampling Stations
40 TLD Stations (12 Downwind of LAMPF)
Appropriate numbers of Soil, Vegetation, and Sediment sampling stations
Appropriate numbers of produce, fish, honey, bee, and meat sampling stations
Approximately 70 ground and surface water sampling areas

Because this program is well managed and well documented, it may well be possible for a competent auditor to verify that LANL is in compliance with the Regulations 10 mrem off-site EDE.

3. Meteorological Monitoring: The Meteorlogical Monitoring program is an excellent program. It consists of five (5) active towers, a receiving station that can accept and present the raw data in a usable form, and a myriad of support equipment. The program has adequate operating procedures and an acceptable QA program. The program is audited twice yearly: an external audit in the summer, and an internal audit in the winter. The data provided by this program gives the dose modelers acceptable necessary meteorological data.

4. Dose Modeling: LANL utilizes a version of CAP-88 with site specific modifications, which is approved by the U.S. Environmental Protection Agency (EPA). HSE-8, the section which runs and maintains the model, has well established operational and QA procedures. The model and its output is valid; it is the input data that is questionable.

5. Quality Assurance: In general, the QA program at LANL is in its infancy, and would not meet the requirements of 40 CFR 61, Method 114. The only possible exceptions may be HSE-8 and HPAL activities. HSE-1 has written some QA procedures and they are in the review process. The QA plan at Johnson Controls is generic and does not meet the specifics of the Regulation. A Laboratory wide effort is needed in the QA area.

6. Data Handling and Analysis: The data related to NESHAP compliance is handled by many entities within LANL which makes validation extremely tenuous. There are no chain-of-custody procedures for any of the data presented to HSE-8 for inclusion in the dose model. There were numerous comments that the data base contained many errors and duplication of data. A centralized system for collection and reporting of data is needed.

7. Compliance and Reporting: Because of the excellent ambient monitoring program, it is credible to state that LANL does meet the Regulatory requirement of off-site EDE of <10 mrem per year. However, proof of that depends on the records of the ambient montioring program.

   Records for new construction or modifications are centralized at HSE-8, and as such, are readily available for inspection or for filing reports upon request from the EPA.

8. Conclusion: It is credible to state that LANL does meet the <10 mrem EDE per year off-site criteria, but they do not fully meet the total requirements set forth in 10 CFR 61, Subpart H.

Frank H. Sprague

Frank H. Sprague
Environmental Scientist
Environmental Protection Division

cc:
M. Harrison, LAAO
K. Hargis, LANL
D. Nochumson, LANL

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