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SUBJECT: Supplement Comments on Soil Gas Sampling and Analysis Program for the Mixed Waste Landfill submitted by Sandia National Laboratories

Dear John:

On May 1, 2007 New Mexico Environmental Department (NMED) Hazardous Waste Bureau (HWB) conducted a Public Technical Discussion Meeting regarding a Soil Gas Sampling and Analysis Program (SAP) proposed for Mixed Waste Landfill (MWL) at Sandia National Laboratories (SNL). At that meeting, NMED HWB Bureau Chief James Bearzi summarized the current status of the clean-up plan for the MWL and requested comments and recommendation regarding the SAP resulting from the meeting be submitted in writing to NMED by close of business May 15, 2007.

He noted that the Notice of Disapproval issued by NMED in November 2006 for the MWL Corrective Measure Implementation Plan (CMIP) included a requirement for submittal of a Soil Gas Sampling and Analysis Plan. He noted that NMED's determination regarding the SAP is on hold pending completion of the comment period and additional review by NMED. Pending a determination regarding the SAP and the numerous other requirements in the Notice of Disapproval, NMED asserted that the Notice of Disapproval remains in place.

Mr. Bearzi stated that the NMED is seeking information regarding whether the SAP is reasonable and necessary to either confirm previous characterization programs or conduct a current site characterization program and the impact of the subgrade cover NMED allowed to be constructed on the MWL prior to issuance of the Notice of Disapproval or submittal of the SAP under consideration. These comments address those concerns in addition to other matters addressed at the May 1, 2007 meeting.

RECOMMENDATIONS

I. Recommendation: NMED should require a comprehensive soil gas sampling and analysis plan to provide document the extent of soil gas release from the MWL landfill to provide:

1) Comparison to previous sampling programs;
2) Basis for evaluation of soil gas conditions used in the "Fate and Transport Model" for the MWL;
3) Characterization of full scope and extent of soil gas occurrence at the MWL; and
4) Baseline for long-term monitoring program.

Reasons:

1) Comparison to previous sampling programs – Previous soil gas sampling program are all more than a decade old. The previous programs included full site arrays of sampling sites in and around the perimeter of the MWL. These programs showed elevated values for soil gas at

and beyond the perimeter of the MWL and at the maximum depth sampled. No effort has been made to identify the full extent of soil gas migration at the MWL since the mid-1990s.

2) Basis for evaluation of soil gas conditions used in the Fate and Transport Model (FTM) for the MWL – The FTM relied on soil gas dispersion data that is out of date and not comprehensive. No sampling programs have been conducted to verify the VOC dispersion predictions provided by the FTM. A current, comprehensive soil gas database is needed to determine if the predictions in the model reflect real world conditions.

   The goal of the FTM should be to accurately predict dispersion of contaminants at the MWL. The FTM submitted by SNL presents a set of calculations do not reflect current soil gas conditions at the MWL because:

   a) data used in the FTM is more than a decade old;
   b) previous VOC sampling failed to identify the full depth of VOC migration at the time it was conducted; and
   c) the FTM does not account for preferential pathways for soil gas migration through or around the MWL.

   NMED should require a comprehensive soil gas SAP at the MWL to provide real world data for both:

   a) calibration – use of real world conditions to insure the accuracy of parameters used in a model – and
   b) verification – use of real world data to determine if the model's predictions accurately reflect real world conditions –

   of the FTM.

3) Characterization of full scope and extent of soil gas occurrence at the MWL – The SAP submitted by SNL merely assesses soil gas conditions at locations and depths where high VOC and other soil gas measures were found in more than a decade ago. It does not provide a database to determine the current distribution of VOCs.

   A comprehensive soil gas sampling plan is needed to supersede the proposed SAP due to its failure to:

   a) Assess soil gas condition at and beyond the margin of the MWL where soil gas releases have previously been detected. Soil gas including VOCs and other soil gas were detected at and beyond the margins of the proposed SAP as shown in "A Preliminary Human Health Risk Assessment for the Mixed Waste Landfill, Sandia National Laboratories, Albuquerque, NM," (Johnson et al, 1995) at p. 63 and 64 – Figures 14 and 15. Johnson et al 1995 is posted on the NMED HWB web site at http://www.nmenv.state.nm.us/hwb/SNL/MWL/Preliminary_Human_Health_Risk_Assess_MWL_by_Johnson(1-1995).pdf.

      A full sampling program – a grid of sampling at regular spacing and multiple depths including samples that document the full depth and aerial extent of soil gas dispersion – is needed to determine the extent of soil gas migration in addition to determination of the location of maximum VOC concentrations.

   b) Assess the full depth of soil gas dispersion at the MWL – The VOC sampling conducted in the 1990s failed to identify the full depth and extent of VOC migration at that time. This limitation in the previous soil gas data results from SNL's failure to collect and analyze sample at increasing depths below the 30-foot level where VOCs were found to occur across the landfill.

      As a result of the failure to systematically sample beneath the 30-foot depth at which significantly elevated levels of VOCs were detected, the 1990s soil gas sampling does not provide a full characterization of the extent of soil gas migration from the

MWL. The proposed SAP merely resamples previous locations and does not provide for characterization of the extent of soil gas dispersion at the MWL;

c) Account for the potential migration of soil gas via preferential pathways – By limiting its program the resampling locations where high soil gas values were previously detected, the proposed SAP fails account the influence of preferential pathways or "paths of least resistance" for soil gas migration.

The influence of preferential flow paths, rather than simple up-or-down migration of soil gas is discussed in Johnson et al, 1995 at p. 10 which states

> "[t]he location of detected VOC flux may not correspond spatially to the subsurface location of contamination because vapor escaping the subsurface follows the path of least resistance which may not be directly vertical. Also although the flux measurements indicate the presence of VOCs it is difficult to draw any correlation between their values and the level of contamination present in the soil."

Resampling at the proposed locations will merely provide information about conditions at those locations, not about the larger questions of the distribution of VOCs and other soil gas releases from the MWL. The NMED should require a soil gas SAP that establishes the current soil gas distribution pattern at the MWL, not merely identify current VOC values at locations that were elevated during sampling in the 1990s. The proposed sampling program does not provide for collection of a data base to determine whether values at proposed sampling locations are high or low relative to the current distribution of soil gas values at the site.

d) Account for potential release due to damage to waste containers associated with the installation of the subgrade cover at the MWL prior to issuance of NMED's Notice of Disapproval for the MWL Corrective Measure Implementation Plan – SNL ended its long-term efforts to protect the MWL landfill pits and trenches from damage to waste containers from physical stresses such as compaction due to heavy equipment operations site when it installed a subgrade cover at the MWL.

Subgrade cover installation included the placement of 2 – 40 inches of soil and compaction of that soil to a 90% maximum dry density by rolling heavy equipment over the subgrade cover and the loose, uncompacted soil fill over the MWL disposal sites. This compaction activity results in a potential for damage to existing waste containers and release of constituents of concern, including VOCs and other soil gases, that had been effectively restricted until the containers that held them were damaged due to compaction by heavy equipment.

A full-scale soil gas SAP is necessary to determine the pattern of soil gas dispersion that may have occurred as a result of subgrade cover installation across the whole MWL site because releases from containers damaged by compaction are not restricted to locations where releases were detected in the 1990s.

4) Baseline for long-term monitoring program – SNL has not conducted regular, periodic monitoring of soil gas conditions at the MWL. SNL has chosen to rely on sampling programs conducted more than a decade ago for characterization of soil gas conditions at the site in the Fate and Transport Model (FTM) it has had prepared to predict future soil gas dispersion. This failure results in SNL, NMED and the public being unable to either identify the progress of soil gas migration at the site since the 1990s or discern the effect of construction activity such as installation of the subgrade cover on soil gas dispersion at the site.

This lack of regular soil gas monitoring can be addressed by installation of a soil gas SAP that reflect soil gas migration conditions at the MWL as whole and can serve as part of a long-term monitoring program at the MWL.

The proposed SAP should be modified to provide a full characterization of soil gas conditions at and around the MWL and a full sampling program be conducted at least semi-annually to define the pattern of soil gas migration at the site. Semi-annual monitoring of soil gas conditions at and below MWL were recommended as far back as 1995. Johnson et al, 1995, p. 13 states,

> "It should be noted that if liquid containerized wastes are present in the MWL, potential transport mechanisms may not yet have occurred. Migration could occur at some time in the future when corrosion causes the containers of liquid to be breached. Information on waste disposed in the MWL is incomplete. Because the possibility of increased migration exists if liquid containerized wastes are present, limited term monitoring at the landfill will likely be needed (e.g. semi-annual measurement of flux rates)."

Such a site-wide monitoring program should be required by NMED as a modification to the currently proposed SAP and periodic, no less than semi-annually - quarterly samples may be appropriate to require to reflect variable site conditions – sampling initiated to allow changes in VOC dispersion to be monitored.

II. Recommendation: NMED should require SNL to characterize the condition of waste containers at the MWL using non-intrusive geophysical methods to determine the distribution of container types and forms and the condition of those containers.

Reasons:

SNL has provided no information regarding the physical state of the containers for waste at the MWL. As the inventory of waste and waste containers at the MWL remains incomplete (as noted in Johnson 1995, p. 13), releases of VOCs and other soil gases were detected more than a decade ago, and significant physical stress has been applied to the surface above pits and trenches at the MWL, SNL should be required to conduct non-intrustive investigations to identify the form and condition of waste containers at the MWL landfill.

III. Recommendation: NMED should require SNL to provide a summary of relevant technical literature related to the likelihood of damage from physical compaction – such as that resulting from heavy equipment use to attain the 90% compact criteria applicable to the MWL subgrade – to waste containers at shallow waste burial sites similar to conditions at the MWL.

Reasons:

At the May 1, 2007 meeting, as SNL representative that no impact of compact such as that conducted during the subgrade installation at the MWL could be identified more than two feet below the surface. No technical basis was provided to support this assertion.

As the condition of containers is critical to the containment of soil gas such as VOCs and other constituents of concern at the MWL, it is appropriate for SNL to identify the extent to which has impacted shallow burial sites with aged, structurally-weak containers such as the plastic bags, wooden boxes, and corrosion-weaken containers at the MWL are likely to have deteriorated and allow contaminant release.

IV. Recommendation: NMED should revise its permit modification for the MWL to require the submittal, review and approval of a long-term monitoring and maintenance plan for the MWL.

Reasons:

SNL continues to make statements regarding attributes of future long-term monitoring programs in its MWL submittal to NMED, including the SAP, though such a plan has not been submitted for NMED review or public comment. SNL has allowed inappropriately long gaps between sampling

program for VOCs, a constituent of concerns that was shown to have been released from the MWL more than a decade ago but not subject to a regularly instituted monitoring program.

To reduce or eliminate future references to "yet-to-be-submitted" future long-term monitoring programs and focus regulatory proceedings on formally reviewed and approved plan, SNL should be required to submitted a long-term monitoring and maintenance program prior to rather than after, approval and completion of a Corrective Measure Implementation Plan or other remedy to current and potential releases from the MWL.

V. Recommendation: NMED should require SAP to be revise to provide for radon sampling at the soil surface rather than at "respirable" height above surface.

Reasons:

The SAP is a "soil gas" sampling program, not an ingestion assessment program. It is necessary to sample radon at the soil surface to determine soil gas emanation for radon or other constituents of concern. Sampling at "respirable" height will not provide documentation of the emanation rate of radon from soil. Therefore radon and other constituents of concern should be sampled at the soil surface and at specified depths below the surface, rather than at elevations above the soil surface that might reflect the height of a person who could ingest the radon.

VI. Recommendation: Prior to considering approval of SNL's March 13, 2007 request to conduct precautionary erosion control measures at the MWL, NMED should require:

1) detailed technical documentation related to the actual construction activities conducted during subgrade installation,
2) detailed technical documentation of the "Temporary Diversion and Control of Water during Construction" measures installed in conformance with Section 01563 of the engineering specifications that are applicable to all portions of Section 02200 of the engineering specifications for Earthwork including subgrade cover installation, as identified in the yet-to-be-approved Corrective Measures Implementation Plan;
3) visual documentation of the current condition of the surface of MWL landfill and surrounding watershed, and
4) visual documentation of erosion at or near the MWL that may have occurred during peak precipitation events in December 2006 – January 2007 period following subgrade installation.

Reasons:

SNL's request for precautionary erosion control measures does not provide adequate documentation to support the request. The request fails to identify the specific "Temporary Diversion and Control of Water during Construction" measures installed at the MWL sites prior to earthwork such as subgrade installation and why they are not adequate for "control of water" at the MWL site. Such measures are required by the CMIP specifications Section 02200. The "Temporary Diversion and Control of Water" specifications – Section 01563 should have been sufficient to address control of water concerns such as erosion. The SNL request fails to identify proposed engineering specifications related to design and functional capacity of the "swales" mentioned in the request letter. The SNL request fails to identify the condition of the subgrade by visual or narrative means. The SNL request fails to identify control of water measures and erosional effects of the peak precipitation events that occurred in December 2006 and January 2007 shortly after completion of the subgrade installation.

Thank you for the opportunity address this important matter. Please contact me if you have any questions concerns these comments and recommendations.

Sincerely,

<signed>
Paul Robinson
Research Director