Department of Energy
Field Office, Albuquerque
Kirtland Area Office
P.O. Box 5400
Albuquerque, New Mexico 87115

AUG 30 1996

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. David Neleigh, Section Chief
New Mexico Federal Facilities Section
Multimedia Planning and Permitting Division
U.S. Environmental Protection Agency, Region 6
1445 Ross Avenue, Mail Stop 6PD-N
Dallas, Texas 75202-2733

Dear Mr. Neleigh:

Enclosed are two copies of the Report of the Mixed Waste Landfill Phase 2 RCRA Facility Investigation for Sandia National Laboratories, New Mexico (SNL/NM), EPA ID Number NM5890110518. This satisfies the requirements of Module IV of the DOE/SNL RCRA permit.

Upon your review please contact Mark Jackson at (505) 845-6288 to arrange a meeting to resolve any potential open issues.

Sincerely,

Brenda J. Harmeson

for Michael J. Zamorski
Acting Area Manager

Enclosures

Certification Statement for Approval and Final Release of Documents

To be used when a SNL Office and KAO must approve release

Document title and author: Report of the Mixed Waste Landfill Phase 2 RCRA Facility Investigation, SNL, Albuquerque, NM

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather, evaluate, and prepare the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Joan Woodard — 8-28-96

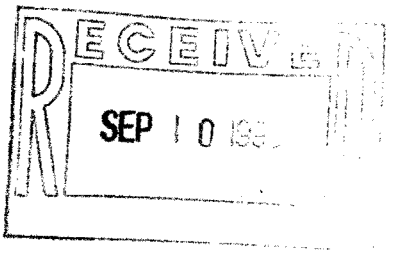
Joan B. Woodard
Vice President
Energy and Environment Division, 6000
Sandia National Laboratories
Albuquerque, New Mexico
Co-Operator

Date

Brenda J. Harmeson — 8-30-96

Michael J. Zamorski
Acting Area Manager
Kirtland Area Office
U.S. Department of Energy
Albuquerque Operations Office
Owner and Co-Operator

Date



Sandia National Laboratories

REPORT OF THE MIXED WASTE LANDFILL PHASE 2 RCRA FACILITY INVESTIGATION SANDIA NATIONAL LABORATORIES ALBUQUERQUE, NEW MEXICO

September 1996

Environmental Restoration Project

United States Department of Energy
Albuquerque Operations Office

REPORT OF THE MIXED WASTE LANDFILL PHASE 2 RCRA FACILITY INVESTIGATION SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NEW MEXICO

September 1996

Sandia National Laboratories
Department 7585: Environmental Restoration
for Landfills and Test Areas
Albuquerque, New Mexico 87185
for the United States Department of Energy
under contract DE-AC04-94AL85000

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ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
BH	borehole
BTEX	benzene, toluene, ethylbenzene, xylene
CLP	Contract Laboratory Program
C_n	Critical Number
CEC	cation exchange capacity
COC	contaminant of concern
CWL	Chemical Waste Landfill
DAC	Derived Air Concentration
DOE	U.S. Department of Energy
EDE	effective dose equivalent
EIFC	emission isolation flux chamber
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FID	flame ionization detector
FOP	field operating procedure
GC/MS	gas chromatography/mass spectrometry
Ge	germanium
GM	Geiger Müeller
GR	gamma ray
HEAST	Health Effects Assessment Summary Tables
HI	hazard index
HSWA	Hazardous and Solid Waste Amendments
ICP	Inductively Coupled Plasma
IP	Instantaneous Profile
IRIS	Integrated Risk Information System
IT	International Technology Corporation
KAFB	Kirtland Air Force Base
KUMSC	Kirtland Underground Munitions Storage Complex
LLOQ	lower limit of quantitation
MCL	maximum concentration limit
MDA	Minimum detectable activity
MODFLOW	USGS Modular Three-Dimensional Groundwater Flow Model
MWL	Mixed Waste Landfill
NESHAP	National Emission Standards for Hazardous Air Pollutants
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity units
OU	operable unit
PID	photoionization detector
PIP	Project Implementation Plan
PM_{10}	Particulate Monitor (10 micron)
PQL	practical quantitation limit
Précis	Probabilistic Risk Evaluation and Characterization Investigation System
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RETC	Retention Curve Code
RFD	reference dose
RFI	RCRA Facility Investigation
RME	Reasonable Maximum Exposure

ACRONYMS AND ABBREVIATIONS (Continued)

RPD	relative percent difference
SNL,NM	Sandia National Laboratories, New Mexico
SVOC	semi-volatile organic compound
SWHC	Site-Wide Hydrogeologic Characterization
SWMU	Solid Waste Management Unit
TA	technical area
TAL	target analyte list
TCE	trichloroethylene
ULOQ	upper limit of quantitation
USAF	U.S. Air Force
USGS	U.S. Geological Survey
UTL	upper tolerance limit
VOC	volatile organic compound
WRS	Wilcoxan Rank Sum
bgs	below ground surface
°C	degrees Celsius
Ci	curie
cm	centimeter
E_H	Redox Potential
famsl	feet above mean sea level
fbgs	feet below ground surface
ft	foot
g	gram
gal	gallon
in.	inch
K_{sat}	saturated hydraulic conductivity
m	meter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mi	mile
mm	millimeter
mmho/cm	micromhos per centimeter
mph	miles per hour
mrem/yr	millirem per year
mS/m	milliSiemens per meter
mV	millivolt
ng/m^2/hr	nanograms per square meter per hour
ng/m^2/min	nanograms per square meter per minute
pCi/g	picocuries per gram
pCi/L	Picocuries per liter
pCi/m^2/hr	picocuries per square meter per hour
ppbv	parts per billion by volume
ppmv	parts per million by volume
ppt	parts per thousand
s	second
µCi/m^3	microcuries per cubic meter
µg/kg	microgram per kilogram
µg/L	microgram per liter
yr	year

Conversion Factors For Selected SI (Metric) Units

Multiply U.S. Customary Unit	By	To Obtain SI (Metric) Unit
Inches (in.)	2.54	Centimeters (cm)
Feet (ft)	0.304	Meters (m)
Miles (mi)	1.6	Kilometers (km)
Square feet (ft^2)	0.093	Square meters (m^2)
Acres	0.4	Hectares (ha)
Cubic feet (ft^3)	0.028	Cubic Meters (m^3)
Gallons (G)	3.8	Liters (L)
Ounces (oz)	28.6	Grams (g)
Pounds (lbs)	0.45	Kilograms (kg)
Parts per billion (ppb)	1	Micrograms per kilogram (µg/kg)
Parts per million (ppm)	1	Milligrams per kilogram (mg/kg)
Fahrenheit (°F)	-32 x 5/9	Celsius (°C)

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EXECUTIVE SUMMARY

The Mixed Waste Landfill is located approximately 5 miles southeast of Albuquerque International Airport and 4 miles south of Sandia National Laboratories Technical Area 1. The landfill is a fenced, 2.6 acre compound in the north-central portion of Technical Area 3. Mean elevation is 5381 ft.

The Mixed Waste Landfill was established in 1959 as a disposal area for low-level radioactive and mixed waste that was generated at Sandia National Laboratories research facilities. The landfill was opened originally as the "Area 3 Low-Level Radioactive Dump" when the low-level radioactive dump in Technical Area 2 was closed in March 1959. The Area 3 dump accepted low-level radioactive waste and minor amounts of mixed waste from March 1959 through December 1988. Approximately 100,000 ft^3 of low-level radioactive waste containing approximately 6300 curies of activity were disposed of at the landfill.

The Mixed Waste Landfill consists of two distinct disposal areas: the classified area, occupying 0.6 acres, and the unclassified area, occupying 2.0 acres. Low-level radioactive and mixed waste has been disposed of in both areas. Classified wastes have been buried in a series of vertical, cylindrical pits in the classified area. These wastes included materials which, by shape or content, contained information important to national security. Unclassified wastes have been buried in shallow, parallel trenches in the unclassified area. These wastes included materials which were of little or no security concern.

A Phase 1 RCRA Facility Investigation was conducted in 1989 and 1990 to determine if a release of RCRA contaminants had occurred at the Mixed Waste Landfill and to begin characterizing the nature and extent of any such release. The Phase 1 investigation indicated that tritium was the contaminant of primary concern. No organic contaminants were identified. A Phase 2 RCRA Facility Investigation was initiated in 1992 to thoroughly determine contaminant source, define the nature and extent of contamination, identify potential contaminant transport pathways, evaluate potential risks posed by the levels of contamination identified, and recommend remedial action, if warranted, for the landfill.

The Phase 2 RCRA Facility Investigation incorporated the Streamlining Approach, combining Data Quality Objectives and the Observational Approach. Non-intrusive field activities were conducted first to facilitate the efficiency and cost-effectiveness of intrusive field activities. Data collected during the Phase 2 RCRA Facility Investigation were evaluated using EPA-approved methods. Initially, a constituent population was statistically compared to natural background. Any constituent failing the statistical comparison was further analyzed for spatial distribution. Constituents that failed the statistical comparison to background and showed a strong spatial correlation were identified as potential contaminants of concern.

After a constituent was identified as a potential contaminant of concern, the sample population was compared to RCRA proposed Subpart S action levels and studied in a transport and risk assessment. Reasonable Maximum Exposure was used to assess risk. The basic risk assessment methodology defined by EPA was modified to include a quantitative uncertainty analysis technique.

The Phase 2 RCRA Facility Investigation was completed in 1995. The Phase 2 RCRA Facility Investigation consisted of reconnaissance radiological surveys, air monitoring, passive and active soil gas surveys, non-intrusive geophysical surveys, soil sampling for background metals and radionuclides, surface soil sampling, borehole drilling and sampling, vadose zone tests, aquifer tests, and risk assessment. The Phase 2 RCRA Facility Investigation confirmed the findings of the Phase 1 RCRA Facility Investigation; tritium is the contaminant of primary concern.

Tritium levels range from 1100 pCi/g in surface soils to 20,600 pCi/g in subsurface soils in the classified area of the landfill. The highest tritium levels are found within 30 ft of the surface in soils adjacent to and directly below classified area disposal pits. Below 30 ft bgs, tritium levels fall off rapidly to a few pCi/g of soil.

Tritium also occurs as a diffuse air emission from the landfill. A total of 0.294 Ci/yr is released from the landfill surface. The maximum radiological dose to an off-site receptor is 1.1×10^{-5} mrem/yr due to internal exposure to tritium. The maximum radiological dose to an on-site receptor due to combined soil and vapor ingestion is 0.29 mrem/yr.

A detailed risk assessment was conducted for the MWL and the results indicate that the MWL will not significantly affect human health or the environment under an industrial land-use scenario. MWL contaminants present little risk to groundwater or as air emissions to potential receptors. Tritium activities at the MWL will decrease steadily with time due to its relatively short half-life of 12.3 years. Tritium activity at the landfill will decrease to approximately 10% of its original activity within 3 half-lives. The risk to human health and the environment due to natural radiological sources is much greater than risk posed by the MWL.

Based on Phase 2 RCRA Facility Investigation data and risk assessment, the MWL is recommended for No Further Action with continued groundwater monitoring for tritium to 1999.