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Mr. Tom Clark
Regional Project Officer
Environmental Protection Agency
1201 Elm Street
Dallas, TX 75270

March 28, 1986

Reference: EPA Contract No. 68-01-7038; Work Assignment R06-01-05, Preliminary Assessment Report, Kirtland Air Force Base, Kirland Air Force Base, New Mexico

Dear Mr. Clark:

Enclosed please find the Preliminary Assessment Report for Kirtland Air Force Base. This report was prepared based on information obtained from files at U.S. EPA Region 6 and the New Mexico State Department of Health and Environment. Information available at the time of this review included Part A and B applications, EPA and New Mexico State inspection reports for the facility, and various pieces of correspondence. A response to EPA's request for information concerning Solid Waste Management Units was not available at the time this report was prepared.

We recommend that the facility be directed to conduct a remedial investigation to define the extent of releases from selected solid waste management units. We also recommend that EPA conduct a site investigation to gather additional information concerning other SWMU's.

If you have any further questions, please call Mr. John Blasco at 415/892-0821.

Sincerely,

Kay H. Breeden
by JB

Kay H. Breeden
Technical Director

MAR 31 1986
HAZARDOUS WASTE PROGRAMS BRANCH

cc: D. Beasley
J. Grieve
A. Schaffer
J. Blasco

KAFB1003

PRELIMINARY ASSESSMENT REPORT

KIRTLAND AIR FORCE BASE
KIRTLAND AIR FORCE BASE, NEW MEXICO
FNM9570024423

Prepared for

U.S. Environmental Protection Agency, Region VI
1201 Elm Street
Dallas, Texas 75270

Contract No. 68-01-7038
Work Assignment No. R06-01-05

Prepared by

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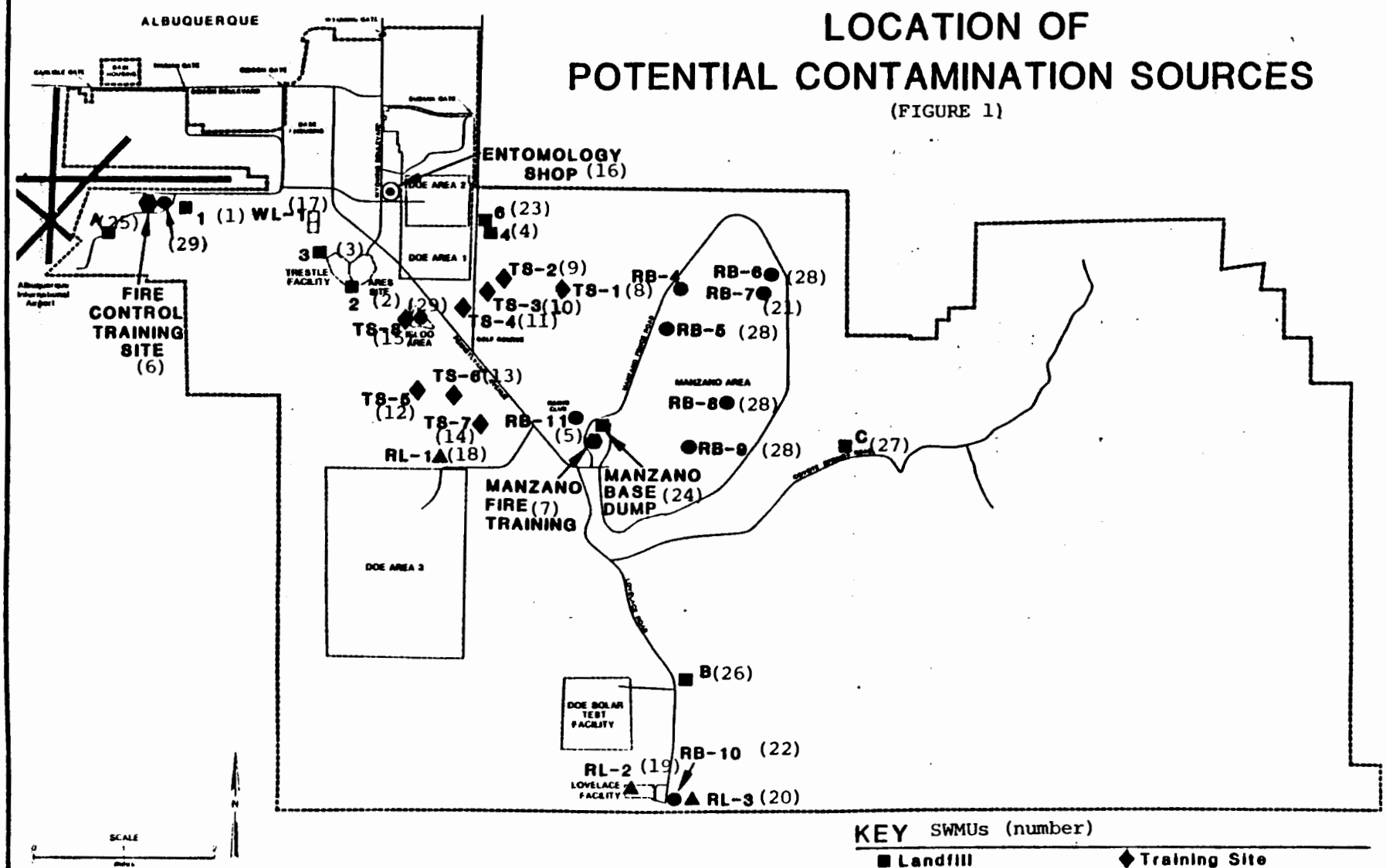
March 27, 1986

KIRTLAND AFB

LOCATION OF POTENTIAL CONTAMINATION SOURCES

(FIGURE 1)



SOURCE: KIRTLAND AFB DOCUMENTS

FIGURE 1

ES ENGINEERING-SCIENCE

Partial List of Pesticides and Herbicides Used at Kirtland Air Force Base

Aluminum phosphide - fumigant
Bromacil - herbicide
Carbaryl (Sevin) - insecticide
Chlordane - insecticide
Chlorpyrifos (Dursban) - insecticide
Diazinon - insecticide
Dichlorvos (DDVP) - insecticide
Malathion - insecticide
Paraquat - herbicide
Pentachlorophenol (PCP) - wood preservative
Propoxur (Baygon) - insecticide
Thiram - fungicide
Strychnine/strychnine sulfate - rodenticide
Zinc phosphide
2-4-D - herbicide

Source: Kirtland AFB Documents

Continued from page 2.

ATTACHMENT 2

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 9 5 7 0 0 2 4 4 2 3 — 1	W DUP — 2 DUP

I. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (If a code is not entered in D(1))
1	F 0 0 1	4,000	P	S 0 2				
2	F 0 0 2	50,625	P	S 0 1				
3	F 0 0 3	10,125	P	S 0 1				
4	F 0 0 4	1,000	P	S 0 1				
5	F 0 0 5	2,000	P	S 0 1				
6	F 0 0 7	800	P	S 0 1				
7	F 0 0 8	50	P	S 0 1				
8	F 0 0 9	1,000	P	S 0 1				
9	D 0 0 1	75,000	P	T 0 1	T 0 4			separated in fuel separator and sold for reprocessing
10	D 0 0 3	400	P	S 0 1				
11	D 0 0 2	1,600	P	T 0 1				
	P 0 0 1	0.5	P	S 0 1				
13	P 0 0 8	0.5	P	S 0 1				
14	P 0 1 3	10	P	S 0 1				
15	P 0 1 5	0.5	P	S 0 1				
16	P 0 1 9	1	P	S 0 1				
17	P 0 2 2	4	P	S 0 1				
18	P 0 2 9		P	S 0 1				included in above
19	P 0 3 0		P	S 0 1				indlucded in above
20	P 0 3 5	1	P	S 0 1				
21	P 0 5 5	2	P	S 0 1				
22	P 0 5 6		P	S 0 1				included in above
23	P 0 9 0	30	P	S 0 1				
24	P 0 9 8		P	S 0 1				included in above
25	P 0 9 9		P	S 0 1				included in above
26	P 1 0 4		P	S 0 1				included in above

EPA Form 3510-3 (6-80)

CONTINUE ON REVERSE

(enter "A", "B", "C", etc. behind the "3" to identify photocopied pages)

Atch 1

Continued from page 2.
NOTE: Photocopy this page before completing if you more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 9 5 7 0 0 2 4 4 2 3 — 1	W DUP — 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	P105	2	P	S01	
2	P106	10	P	S01	
3	P120	0.5	P	S01	
4	U001	5	P	S01	
5	U002	10	P	S01	
6	U008	4	P	S01	
7	U009	1	P	S01	
8	U013	4	P	S01	
9	U019	3	P	S01	
10	U021	.1	P	S01	
11	U022	.2	P	S01	
12	U029	0	P	S01	
13	U031	5	P	S01	
14	U032		P	S01	included in above
15	U036	45	P	S01	
16	U037	0.1	P	S01	
17	U043	1	P	S01	
18	U044	5	P	S01	
19	U045	0	P	S01	
20	U052		P	S01	included in above
21	U056	5	P	S01	
22	U057	2	P	S01	
23	U075	0	P	S01	
24	U076	1	P	S01	
25	U077		P	S01	included in above
	U080	0	P	S01	

EPA Form 3510-3 (6-80)

CONTINUE ON REVERSE

(enter "A", "B", "C", etc. behind the "3" to identify photocopied pages)

A1-6-11

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1): W N M 9 5 7 0 0 2 4 4 2 3 — T/A: — C: 1

FOR OFFICIAL USE ONLY: W DUP — T/A: — C: 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U092	1	P	S01	
2	U093	.1	P	S01	
3	U108	0	P	S01	
4	U112	4	P	S01	
5	U117	16	P	S01	
6	U122	10	P	S01	
7	U134	10	P	S01	
8	U140	1	P	S01	
9	U151	8	P	S01	
10	U154		P	S01	included in above
11	U159		P	S01	included in above
12	U160		P	S01	included in above
13	U161		P	S01	included in above
14	U162	1	P	S01	
15	U165		P	S01	included in above
16	U167	0.1	P	S01	
17	U169	1	P	S01	
18	U182		P	S01	included in above
19	U188		P	S01	included in above
20	U202	2	P	S01	
21	U205	2	P	S01	
22	U210		P	S01	included in above
23	U211	50	P	S01	
24	U213	2	P	S01	
25	U216	1	P	S01	
	U220		P	S01	included in above

EPA Form 3510-3 (6-80)

CONTINUE ON REVERSE

Atch-1

(enter "A", "B", "C", etc. behind the "3" to identify photocopied pages)

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 9 5 7 0 0 2 4 4 2 3 T/A C 1	W DUP T/A C 2 DUP

V. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (If a code is not entered in D(1))
1	U 2 2 2	2	P	S 0 1	
2	U 2 2 3		P	S 0 1	included in above
3	U 2 2 6		P	S 0 1	included in above
4	U 2 2 7		P	S 0 1	included in above
5	U 2 2 8		P	S 0 1	included in above
6	U 2 2 0		P	S 0 1	included in above
7	U 2 3 9		P	S 0 1	included in above
8	U 0 1 2	7	P	S 0 1	
9	U 2 2 5	3	P	S 0 1	
10	D 0 0 0	2	P	S 0 1	
11	D 0 0 4	2	P	S 0 1	
12	D 0 0 7	1	P	S 0 1	
13	D 0 0 8	1	P	S 0 1	
14	D 0 1 0	1	P	S 0 1	
15	P 0 3 1	5	P	S 0 1	
16	P 0 7 6	5	P	S 0 1	
17	P 0 9 6	1	P	S 0 1	
18	U 0 0 4	5	P	S 0 1	
19	U 0 3 2	6	P	S 0 1	
20	U 1 3 5	1	P	S 0 1	
21					
22					
23					
24					
25					
26					

PRELIMINARY ASSESSMENT REPORT

KIRTLAND AIR FORCE BASE
KIRTLAND AIR FORCE BASE, NEW MEXICO
FNM9570024423

Prepared for

U.S. Environmental Protection Agency, Region VI
1201 Elm Street
Dallas, Texas 75270

Contract No. 68-01-7038
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Prepared by

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March 27, 1986

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March 27, 1986

INTRODUCTION

This report represents a preliminary assessment of Kirtland Air Force Base (AFB) located adjacent to Albuquerque, New Mexico. U.S. EPA's Draft RCRA Preliminary Assessment/Site Investigation Guidance document (August 1985) was used in preparing this report. Information regarding hazardous waste management activities was taken from two inspection reports, one by the State of New Mexico Department of Health and Environment, Environmental Improvement Division (EID) and the other by EPA, the Phase I and draft Phase II (Stage 1) Installation Restoration Program (IRP) reports; and Parts A and B of the facility's RCRA Permit Application including revisions (see References 1 through 7). A site visit, as described within EPA's guidance document was not conducted as part of the preparation of this report. No response from Kirtland AFB was available for review relative to EPA's request for information on Solid Waste Management Units.

FACILITY DESCRIPTION

Kirtland Air Force Base (AFB) is located in central New Mexico, southeast of and adjacent to the City of Albuquerque next to Albuquerque International Airport. The base includes lands and facilities owned and operated by the U.S. Air Force and by the U.S. Department of Energy (DOE). Some 120 to 130 various tenants are located on Kirtland AFB. The largest tenant organization is the Air Force Weapons Lab, a research and development organization responsible for nuclear weapons effects research (3). The

primary activities at the base are research and development and the training of pararescue medics (2, page 1-3). Kirtland AFB is classified as a waste generator and as a treatment, storage, and disposal (TSD) facility. Wastes generated by Kirtland AFB's tenants utilize the facilities of the base; the wastes generated by Sandia National Laboratories (SNL) within the three areas of DOE ownership are regulated under a separate RCRA permit. The SNL facilities are owned and operated separately from those of Kirtland AFB and are not included in this assessment.

Twenty-nine Solid Waste Management Units (SWMUs) have been identified on the approximately 72-square-mile facility (Figure 1) and are discussed in detail in this report. This list of SWMUs may not be complete, given the limited information available for this review and the diversity, complexity, and number of past and current activities that could result in the generation and disposal of hazardous wastes. The following is a list of known SWMUs:

1. Landfill 1
2. Landfill 2
3. Landfill 3
4. Landfill 4
5. Radioactive Burial Site 11
6. Fire Training Control Area
7. Manzano Fire Training Area

8 through 15. Radioactive Training Facilities

16. Entomological Shop

17. Wastewater Treatment Lagoons

18, 19, and 20. Radioactive Waste Lagoons

21 and 22. Radioactive Burial Sites 7 and 10

23 through 27. Landfill 6, Manzano Dump, and Landfills A, B, and C

28. Radioactive Liquid Holding Tanks

29. Defense Property Disposal Office (DPDO) Storage Facilities (RCRA-regulated)

Kirtland AFB has generated various quantities of hazardous and non-hazardous wastes since 1941 when the construction of the base was initiated. No written records were found regarding the types and quantities of wastes generated or the nature of the disposal activities prior to 1960 (2, page 1-3). Wastes and hazardous materials which have been disposed of on-site include the following:

1. Low-level radioactive wastes consisting mainly of animal carcasses, excreta, contaminated solid wastes, and Brazilian thorium hydroxide sludge (1, pages 4-41 and 4-16)

2. Hazardous and toxic chemicals including acids, mercury, cyanides, silver (1, page 4-41), pesticides (listed in Attachment 1), and solvents (which solvents were used historically is not known, but currently used solvents are listed in Attachment 2)

3. General refuse.

At Kirtland AFB the DPDO has been delegated the responsibility for the disposal of hazardous materials and wastes (3, page B-1). The DPDO will not treat, incinerate, or in any way dispose of any hazardous wastes (3, page B-1). General refuse is reportedly disposed of at an on-site landfill, and Brazilian thorium hydroxide sludge is released in certain specified areas as

part of training exercises. Hazardous wastes currently generated as part of various research programs include more than 100 different types of materials (5, page 3).

A variety of halogenated and nonhalogenated solvents account for about one-fourth of the estimated 110,000 pounds of hazardous materials handled annually by the DPDO (5, page 3). Some of this material is recycled (e.g., 75,000 pounds of JP-4 fuel collected in a fuel separator) while the rest is handled as waste and disposed of off-site at a state- or EPA-approved hazardous waste disposal facility (3, page B-1).

SITE CONDITIONS

Floodplain and Surface Water

The mean annual rainfall in the Albuquerque area is 8.4 inches, about half of which occurs during the summer months as brief but locally heavy thunderstorms (2, page 2). Two main natural drainage channels cross the Kirtland AFB. The Tijeras Arroyo drains a large area of about 150 square miles bounded on the south by the Sandia Mountains and on the north by the Manzano Mountains. The Arroyo del Coyote drains an area of about 30 square miles on the west face of the Manzano Mountains. These drainage channels are generally dry (2, page 2) except during periods of rainfall. The Rio Grande, the nearest waterway which is not ephemeral, is located about 4 miles from the base (3, page G-2.G.1).

Information on the 100- and 500-year flood boundaries of both the Tijeras Arroyo and the Arroyo del Coyote was available (2, page 2-19). This

information shows that of the seven SWMUs (SWMUs 1 through 7) investigated during Stage 1 of the Phase II Installation Restoration Program (IRP), only Landfill 2 lies within the 100-year floodplain of one of these channels. The other six SWMUs in this group are outside the floodplain. Information regarding the location of the other 22 SWMUs relative to the 100-year floodplain was not available for review.

The principal beneficial use of the ephemeral surface waters appears to be ground-water recharge.

Geology and Soils

The geology of the site is complex and varied. The eastern portion of Kirtland AFB is mountainous, with elevations up to 7900 feet. These mountainous areas are in part composed of Precambrian crystalline rocks. The western portion of the base, where most of the SWMUs are located, is within the Albuquerque-Belen Basin. The geologic features of this basin include travertine and unconsolidated and semiconsolidated pediment deposits; and aeolian, lacustrine, and stream channel deposits (2, pages 2-3 and 2-4). In general, the surficial geologic units included: recent deposits (i.e., mixtures of sandy silt, silty sand with minor amounts of clay and gravel), Ordiz gravel (i.e., alluvial pediment sand and gravel deposit), and Santa Fe Formation (i.e., mixture of sand, silt, clay, gravel, cobbles, and boulders) (2, pages 2-5 through 2-9).

The site is traversed by several faults which generally are oriented in a north-south or northeast-southwest direction. The locations of some of

the faults are not known precisely. Only a few faults within the entire Albuquerque-Belen basin show evidence of surface rupturing within the last 10,000 years (3, App. I).

Surface soils at Kirtland AFB consist predominantly of well-drained gravelly sands containing varying amounts of silts and clays (1, page 3-5). Detailed mapping of the base by the USDA Soil Conservation Service has identified six different surface soil associations (1, page 3-5). Information on the variability of soil depths was not available for this assessment.

Ground Water

Over half of the Kirtland AFB site overlies the Santa Fe Formation aquifer. Depth to the water table varies from 54 to 588 feet (2, page 2-27) but is generally 400 to 500 feet (2, page D-3). The more developed western portion of the base, where most of the SWMUs are located, overlies this aquifer. This aquifer is the principal drinking water supply for Kirtland AFB and the City of Albuquerque.

Kirtland AFB operates 12 wells for drinking water production. In addition to these active wells, there are about five abandoned or unused wells (1, page 3-29). Why these wells are no longer in use was not stated in the information available for review. Wells are generally completed in the upper 500 feet of the saturated zone, and transmissivity values ranged from 7,500 to 678,000 gal/day/ft among one group of four wells (2, page 2-29).

The direction of ground-water flow in the Santa Fe Formation aquifer under the northwestern portion of Kirtland AFB is currently northward or northwestward toward a localized cone of depression created by the pumping of private, City of Albuquerque, and Kirtland AFB wells. The direction of flow in the southeastern portion of the base appears to be generally eastward.

Winds

A wind rose prepared from meteorological data collected at Albuquerque International Airport shows that winds most frequently blow from the south to southeast and from the north to northwest (3, page K-3). The mean wind speed is 8 knots (1, page 2-1).

Land Use

The Kirtland AFB is bounded on the north and west by developed areas of the City of Albuquerque, including the airport. The southern boundary of the base borders an Indian reservation which consists of open desert, and to the east lies a sparsely populated mountainous area and national forest (1, page 2-1). While the base contains more than 700 buildings, no information was available for this review on the number of people living and working in various areas of the base, nor the number of residents in the nearby neighborhoods.

RELEASE PATHWAYS, TARGET POPULATIONS, AND ENVIRONMENTS

Ground Water

Although the depth to ground water is generally several hundred feet, one of the most significant release pathways for contaminant migration is ground-water transport. Most of the SWMUs are located upgradient of the drinking water wells used by Kirtland AFB. The base's drinking water wells are in turn generally located upgradient of the city's drinking water wells.

Any contaminants that reach the water table in the northwestern portion of the base would flow northerly or northwesterly, depending on where the water table is intercepted (2, page 2-21). Because ground-water gradients in this area have been induced by pumping, a historical release of contaminants may have migrated westerly, the historical regional ground water flow direction. Any contaminants that reach the water table in the relatively undeveloped southwestern portion of the base would flow westerly.

Three Kirtland AFB wells in the northwestern portion of the site had detectable concentrations of tetrachloroethylene (<600 μg/l) in 1981 (2, page 2-32). This contamination most likely resulted from releases at the base. In addition, two City of Albuquerque wells were shut down in 1979 due to the presence of organic contaminants (2, page 2-33). The types of organic contaminants found in these wells were not indicated. While there is no evidence that Kirtland AFB is the source of contamination of the city's wells, the 1979 incident demonstrates the vulnerabilty of this aquifer to releases of organic solvents. A monitoring program for all of

Kirtland AFB's drinking water wells and for all City of Albuquerque well fields would provide essential information on the status of contamination of the Santa Fe Formation aquifer in these areas.

Surface Water

The ephemeral drainages which cross Kirtland AFB provide sources of water for ground-water recharge. The principal area of recharge of the Santa Fe Formation aquifer along the Tijeras Arroyo is reported to be within 1 to 1.5 miles of the mouth of Tijeras Canyon (2, page 2-27). This places at least eight units (SWMUs 4, 5, 7, 8, 9, 23, and 24) directly over areas of recharge.

Infiltration of surface waters readily occurs at Kirtland AFB even outside the reported principal recharge area. It was observed that rainfall runoff had infiltrated a drainage crossing Landfill 1 before reaching Tijeras Arroyo (2, page 1-5). While such infiltrations may not be the principal means of recharge of the Santa Fe Formation aquifer, they provide potential migratory routes to this aquifer.

Another principal source of recharge to the Santa Fe Formation aquifer is infiltration from the Rio Grande Channel (2, page 2-27). Therefore, if any surface waters containing hazardous wastes were to flow from Kirtland AFB to the Rio Grande, the aquifer could be contaminated by this surface-water route.

Air Emissions

Winds frequently blow toward the northwest; this creates a pathway for particulates emitted at Kirtland AFB to reach workers in the most developed northwestern portion of Kirtland AFB and residents in the adjoining City of Albuquerque.

Subsurface Gas

Subsurface gas could be generated at some of the SWMUs but, given the apparent permeability of the cover materials and the remoteness of these landfill areas, it is unlikely that such releases would pose a hazard.

UNIT CONDITIONS, CONCLUSIONS, AND RECOMMENDATIONS

SWMU 1 - Landfill 1

Unit Conditions

This 53-acre landfill (Figure 1) was used from 1965 until 1975 for the disposal of what has been described as general refuse, although there are no written records on the nature and quantities of material disposed of, and landfill operations personnel who were interviewed did not recall the nature of the materials buried (2, page 1-9). Photograghs taken in 1971 reportedly show that the waste material included numerous 55-gallon drums, building debris, and tree stumps (2, page 1-5). The drums could have contained organic solvents or other hazardous wastes.

The landfill is divided into two sections, east and west, separated by a modified natural channel which joins Tijeras Arroyo 1 mile to the south.

Soil moisture values detected by one of the lysimeters installed in this area indicate that this channel contributes higher-than-normal line recharge in close proximity to the landfill (2, page 4-8). Refuse and fill material is not present beneath the channel. The thickness of the landfill material is variable from less than 10 feet to a maximum of 30 feet. Whether the landfill had a liner was not discussed in the information reviewed. The landfill is located on the northern rim of Tijeras Arroyo about 800 feet south of one of the runways at Albuquerque International Airport. The landfill straddles an east-west trending geologic contact separating the Santa Fe Formation from recent alluvium (2).

The nearest drinking water well is Kirtland AFB Production Well 2 located about 150 feet northeast of the northeast corner of the landfill. No sampling results from this well for synthetic organic compounds were available for this review. A monitoring well designated DM-01 was constructed about 200 feet north and downgradient of the landfill. The top of the water table is at a depth of about 420 feet at Well DM-01, and the well is screened over approximately the uppermost 45 feet of the aquifer. Sampling results from DM-01 detected 0.02 mg/l of organic chloride (2, page 4-3). It is reported that Kirtland AFB production well water was circulated through Well DM-01 to remove cuttings and drilling mud prior to development and that a small amount of this water entered the formation (2, page 4-5). It is assumed that production well water means potable water from one of Kirtland's wells.

Soil samples taken at 62- and 49-foot depths as part of the installation of lysimeters did not detect the presence of halogens (TOX - Total Organic Halogens) constituents or pesticides, but oil and grease was detected below the limits of quantification in one of these samples (2, page 4-4). The haloscan results are questionable because the soil samples were transferred and stored in Mason jars, from which volatile compounds could be lost to the head space, and because the samples were frozen and stored for two months before being analyzed.

The site is described as closed (1, page 4-44). The surface of most of the landfill's gentle slopes is characterized as well covered and graded, but the southern bank had exposed debris in 1981 (1, page 4-48) and the steeper slopes in the south-central area contained exposed debris in 1983-84 (2, page K-2). Other than the presence of the drainage channel between the two sections of the landfill, no information was available regarding run-on or run-off controls.

The landfill appears to be located at least 1/4 mile from any buildings (3, Drawing 9). No information was available regarding the possible presence of subsurface utilities within the landfill or the number of people working or living in adjoining areas.

Conclusions Regarding Potential for Releases

Air. Since the landfill is mostly well covered, there is little potential for particulate releases of wastes. The potential for an existing release of volatiles is small given the age of the landfill and the probability that most of the material disposed of was not volatile.

Ground Water. Based in part on the apparent detection of organic chloride in Well DM-01, it is apparent that releases to ground water may have occurred and may continue to occur.

Other circumstances which bear on the possibility of a release are the probable absence of a liner, the observed infiltration of rainfall runoff into the drainage channel dividing the landfill, and the possible presence of organic solvents and other hazardous wastes in the landfill.

If there has been a release from the landfill, the thickness of the vadose zone should provide some protection of the aquifer. The stratigraphy of DM-01 consists of various layers of unconsolidated materials ranging from sandy clays and silts to clayey and silty sands.

Surface Water. The likelihood of release to surface waters is remote because 1) the site is not located within the 100-year floodplain of Tijeras Arroyo, 2) the site is generally well covered, and 3) surface-water runoff is ephemeral.

Subsurface Gas. Putrescible wastes which could generate gas may be present in the landfill. Given the large areal extent of the landfill relative to its depth, it is unlikely that methane gas is present in volumes of concern in this relatively remote location.

Recommendations

1. Obtain any additional information on subsequent sampling of Wells DM-01 and Kirtland AFB Production Well 2 for synthetic organic compounds. If sufficient samples have not been taken and analyzed to verify the presence of and to identify the compounds contributing to the organic chloride concentrations previously found in Well DM-01, such sampling should be performed as part of a remedial investigation.

2. If synthetic organic contaminants are verified to be present in Well DM-01, the facility should be directed to conduct a remedial investigation to evaluate the extent of ground-water contamination.

3. Obtain any sampling results from the two lysimeters which were installed under the landfill during Stage 1 of the Phase II IRP.

4. Obtain information from Kirtland AFB in order to verify the integrity and adequacy of the cover and characterization of the wastes disposed of in the landfill. The wastes should be characterized by drilling at least three soil borings within the landfill to a depth of at least 50 feet, sampling every 5 feet from the ground surface, and analyzing the samples for hazardous constituents (i.e., VOC and BNA analyses).

5. Obtain information from Kirtland AFB regarding their monitoring and maintenance program for the cover and the run-on and run-off control measures at the unit. Review this information to determine its adequacy to prevent the infiltration of rainfall runoff, including the elimination of any areas of ponding.

SWMU 2 - Landfill 2

Unit Conditions

This 32-acre landfill (see Figure 2) is bounded on the south for about 4500 feet by the active channel of Tijeras Arroyo, and about 80 percent of the landfill is located within the 100-year floodplain of this channel (2, page 2-19). The landfill was operated from 1943 to 1965. There are no written records regarding the nature and quantities of materials disposed of at the landfill. Reportedly, general refuse was disposed there, but a truck driver for a subcontractor to the Atomic Energy Commission has stated that he delivered a large quantity of solvents and plastic wastes from an off-site facility to this landfill for disposal in unlined trenches (2, page 1-13).

The northernmost portion of the landfill was exhumed and relocated in the early 1970s to provide room for a facility named TRESTLE. The material exhumed was disposed of at Landfill 3.

The depth of disposed material and fill is generally 20 feet, and the maximum fill depth is about 30 feet. While the Santa Fe Formation occurs in the northernmost portion of the landfill, its relationship to fill materials has not been determined. Available information indicates that the landfill is unlined.

The nearest monitoring well, DM-02, is located about 125 feet northeast of the northeast border of the landfill; the static water level in this well during February 1984 was 378 feet below ground surface, and the uppermost 50 feet of the water table is screened by this well (2, page 4-3). Due to the northwest direction of ground water in this area, a contaminant plume may not be detected by this well. Sampling of this well detected the presence of 0.010 mg/l of organic chloride and 0.004 mg/l of organic bromide. The nearest drinking water well is Kirtland AFB Production Well 8 located about 2100 feet northeast of the eastern edge of the landfill. No sampling results for synthetic organic compounds were available for Well 8.

Two lysimeters were installed in slant boreholes at the northern and northeastern edges of the landfill to try to detect the possible migration of contaminants from the landfill into the vadose zone. Sampling was unsuccessful at the time that the Stage 1/Phase II IRP draft report was prepared. Soil sampling at the depth at which the lysimeters were placed showed nondetectable concentrations of oil and grease, haloscan (TOX)

compounds, and pesticides. The significance of the haloscan results is in doubt because of the sample handling procedures previously discussed in the evaluation of Landfill 1.

The site is described as closed (1, page 4-44). While the landfill is reportedly generally well covered, landfill debris is exposed along the Tijeras Arroyo channel and the cover is not uniformly graded (2, page 1-14). The cover soil has been described as poorly compacted, fine grained, and silty. In the northernmost portion of the landfill, the cover has been altered by grading and dredging to prevent ponding and to improve surface drainage (2, page 1-15). This has resulted in surface depressions which support anomalously dense vegetation. Information on whether these grading and dredging activities affected the integrity of the cover and on the location used for disposal of the dredged material was not available for this review. Drainage from the ARES and TRESTLE facilities (undescribed) flows directly onto the landfill (2, page 2-15), and Tijeras Arroyo is eroding the landfill on the southern boundary. Evidence of this is the reported presence of landfill material, consisting largely of inert material with some pieces of "melted" material, exposed along this channel (2, page 1-14). No other information on run-on or run-off controls was available for this assessment.

Two pipelines cross the landfill: one carries sewage and the other contains treated sewage effluent for use on the golf course (2, page 1-13). The latter has a history of failures resulting in the release of effluent into the landfill (2, page 1-14). Although the site is described as

adjacent to the ARES and TRESTLE facilities, no information on what these facilities are or the number of people working there was available for this review. Other than these facilities, no other buildings apparently are located within 1/4 mile of the landfill (3, Drawing 9).

Conclusions Regarding Potential for Releases

Air. Since the landfill is mostly well covered, there is little potential for particulate release of wastes. Litter is reportedly widespread, but this is presumably not currently originating from the landfill. Given the age of the landfill, the potential for a release of volatiles is low.

Ground Water. Based on the detection of organic chloride and bromide, and considering other site factors, releases to ground water may have occurred.

Other factors which increase the possibility of a release include the following:

1. Surface water flows onto the landfill and, in at least the northernmost portion, has ponded and has infiltrated into the landfill.

2. Large volumes of solvents, some of which could be quite mobile, reportedly were disposed of in this landfill.

3. The landfill is unlined.

Surface Water. The likelihood of releases of contaminants from the landfill to surface waters is fairly substantial because it adjoins the active channel of the Tijeras Arroyo and landfill material is exposed along this channel.

Subsurface Gas. The landfill could contain putrescible wastes which could generate gas. Since the areal extent of the landfill is great relative to its depth, and since the cover is poorly compacted, it is unlikely that methane will be present in concentrations of concern.

Recommendations

1. Obtain additional information on subsequent sampling of Well DM-02 and Kirtland AFB Production Well 8 for synthetic organic compounds. If sufficient samples have not been taken and analyzed to verify the presence of and to identify the compounds contributing to the organic chloride and bromide detected, such sampling should be performed as part of a remedial investigation.

2. If synthetic organic contaminants are verified in Well DM-02, the facility should be directed to conduct a remedial investigation.

3. Obtain any sampling results from the two lysimeters which were installed at the landfill during Stage 1 of the Phase II IRP.

4. Obtain information from Kirtland AFB verifying the integrity and adequacy of the cover. Information should be obtain that characterizes the wastes disposed in the landfill, including a determination of the nature of the "melted" material found along the southern boundary of the landfill. The waste should be characterized by drilling at least three soil borings within the landfill to a depth of at least 30 feet, sampling every 5 feet from the ground surface, and analyzing the samples for hazardous constituents (i.e., VOC and BNA analyses).

5. Obtain information from Kirtland AFB regarding their monitoring and maintenance program for the landfill cover and available run-on and run-off control measures at the site. This information should be reviewed to determine its adequacy to prevent infiltration of rainfall runoff, including the elimination of ponding areas. In addition, the information should be reviewed to assure that surface drainage from the TRESTLE and ARES facilities is directed away from the landfill and that adequate erosion control measures (i.e., riprap) exist along the southern edge of the landfill where it is adjacent to the active channel of Tijeras Arroyo.

SWMU 3 - Landfill Number 3

Unit Conditions

This 7-acre site is located about 0.4 mile northwest of Landfill 2 (Figure 1) and is reported to have been created to dispose of debris exhumed in the early 1970s from the northernmost section of Landfill 2. The material reportedly was exhumed in order to provide a site for the TRESTLE facility. The landfill largely contains burned aircraft parts, although this is not confirmed by written records (2, page 2-19). Since the landfill was operated until 1977, it is unlikely that only material exhumed from Landfill 2 was disposed of at this site.

Landfill 3 straddles the geologic contact between the Santa Fe Formation underlying the northern portion of the landfill and alluvium underlying the southern portion of the landfill. Although Tijeras Arroyo is located about 400 feet south of Landfill 3, the site is reportedly above the projected 100-year floodplain boundary for this channel (2, page 2-19). Disposed material and fill are found to a maximum depth of 30 feet, but more typically to a depth of about 20 feet. No monitoring wells are located near this landfill, and the closest drinking water well is Kirtland AFB Production Well 4 located about 2400 feet to the north, in the downgradient direction for ground-water movement.

A lysimeter was installed in a slant borehole at the southern edge of the landfill in an unsuccessful attempt at extracting a vadose zone water sample. A soil sample taken at the same depth as the lysimeter did not detect oil and grease, haloscan (TOX) compounds, or pesticides (2, page

4-4). Reservations regarding the sampling procedures used to contain and store this soil sample were stated previously in this assessment (see page 11).

The landfill was described as closed and well covered in 1981 (1, page 4-44). More recently, it was noted that this cover had begun to erode at the "south-central" area (2, App. K). No drainages cross or discharge to the landfill. No other information regarding run-on and run-off controls was available for this review.

The closest developed areas to the landfill appear to be two sewage treatment lagoons about 1/4 mile to the north. No information was available for this review regarding the number of persons working at these lagoons or other nearby facilities. Information on the possible presence of subsurface utilities passing near or through the site was also lacking.

Conclusions Regarding Potential for Releases

Air. Since the landfill is well covered, the potential for particulate release is remote, provided the cover is maintained. The potential for a release of volatiles is low because the material is old and any VOC constituents most likely volatilized during its exhumation and reburial.

Ground Water. The potential for migration of contaminants from the landfill to ground water is difficult to assess. If it is accepted that the disposed material was largely burned airplane parts, the likelihood is low. Nonetheless, the landfill is probably unlined and it is possible that other types of materials may have been disposed of at the site, since it continued in operation until 1977.

Surface Water. Since the site is well drained and well covered, there is little potential for release of wastes to the predominantly ephemeral surface waters on the base.

Subsurface Gas. Since the landfill wastes apparently consist mostly of burned aircraft parts, it is unlikely that any subsurface gas would be generated at the site. Even in the unlikely event that some subsurface gas did develop, its release would not be of concern at this relatively remote site.

Recommendations

1. Obtain any sampling results from the lysimeter which was installed at the edge of the landfill during Stage 1 of the Phase II IRP.

2. Obtain information from Kirtland AFB verifying the integrity and adequacy of the cover and characterizing the wastes disposed of in the landfill. The wastes should be characterized by drilling at least three soil borings within the landfill to a depth of at least 30 feet, sampling every 5 feet from the ground surface, and analyzing the samples for hazardous constituents (i.e., VOC and BNA analyses).

   Kirtland should install at least one ground-water monitoring well adjacent to the downgradient side of the unit. Soil samples should be collected from the monitoring well borehole at least every 10 feet from the bottom of the landfill to the water table. The first three to four samples should be analyzed for hazardous constituents using at least chromatography/mass specrtoscopy (GC/MS) and base/neutral acid extraction (BNA) analyses. The additional soil samples should be properly preserved for future analyses pending the results of the initial soil analyses. A ground-water sample should be collected and analyzed for hazardous constituents using GC/MS and BNA techniques.

3. If hazardous wastes are found, a remedial investigation should be required.

4. Obtain information from Kirtland AFB regarding their monitoring and maintenance program for the landfill cover and available run-on and run-off control measures at the unit. This information should be reviewed to determine its adequacy to prevent infiltration of rainfall runoff, including the elimination of ponding areas.

SWMU 4 - Landfill 4

Unit Conditions

This 25-acre landfill (Figure 1) is bounded on the north by an active landfill, designated Landfill 6, and is located approximately 1200 feet to the east of Tijeras Arroyo. This landfill was operated jointly by Kirtland AFB and the City of Albuquerque from 1964 to 1969, reportedly for the disposal of general refuse (2, page 1-19). No written records exist to confirm the types or quantities of disposed materials. Wastes categorized as "hard fill" were disposed of in the northeastern part of the landfill, and other types of wastes were disposed of in the remainder of the landfill. The types of wastes that constitute the "hard fill" were not stated.

Landfill 4 is located beyond the 100-year floodplain of Tijeras Arroyo. The landfill reportedly lies over or at the western margins of a recharge area for the Santa Fe Formation aquifer (2, page 2-27). Because of this location, it is possible that any hazardous wastes released through the bottom of the landfill could reach the aquifer.

The landfill largely overlies the Santa Fe Formation. Fill occurs up to a maximum depth of 40 feet.

The nearest well is Kirtland AFB Production Well 11, located about 3000 feet northwest of the landfill. No analyses for synthetic organic coumpounds from this well was available for review. One lysimeter was installed in a slant borehole at the western edge of the landfill, but no samples are known to have been collected. A soil sample was collected at the depth of the lysimeter emplacement, and analysis of this sample did not detect oil and grease, total organic halogens, or pesticides (2, page 4-4). Concerns regarding the procedures used to contain and store the sample for haloscan analyses have been addressed previously in this review (see page 11).

The landfill was reported to be closed and well covered (1, page 4-44). Nonetheless, some surface depressions occur which allow rainfall to accumulate, causing channeling and erosion of the western face (1, page 1-23). An unnamed drainage to the east of the landfill directs surface-water flow away from the site, and no surface drainages cross the site. No other information regarding surface run-on or run-off controls was available for this review.

No buildings appear to be located within 1/4 mile of the landfill (3, Drawing 9). No information was available for this review regarding the number of people who work or reside in the vicinity of this landfill. Similarly, no information was available regarding the possible presence of subsurface utility lines which might cross the landfill.

Conclusions Regarding Potential for Releases

Air. Since the landfill is generally well covered, the potential for particulate release is remote, provided the cover is maintained. The potential for a release of volatiles appears to be low because there has been a substantial period of time for such contaminants, if present, to have already volatilized.

Ground Water. Because the site is located in a ground-water recharge area, the landfill is unlined, and the nature of the disposed wastes has not been confirmed, a release of hazardous wastes to ground water is possible.

Surface Water. The likelihood of a release to surface waters is remote because the site is not located within the 100-year floodplain of Tijeras Arroyo, the site is generally well covered, no drainages cross the landfill, and the only surface waters are ephemeral.

Subsurface Gas. Putrescible wastes could be present in the landfill which could generate gas. In view of the site's relatively remote location, it is unlikely that methane gas is present in amounts of concern.

Recommendations

1. Obtain any sampling results from the one lysimeter which was installed during Stage 1 of the Phase II IRP

2. Obtain information from Kirtland AFB verifying the integrity and adequacy of the landfill cover and characterizing the wastes disposed of in the landfill. The wastes should be characterized by drilling at least three soil borings within the landfill to a depth of at least 40 feet, sampling every 5 feet from the ground surface, and analyzing the samples for hazardous constituents (i.e., VOC and BNA analyses).

3. Kirtland AFB should install at least one monitoring well adjacent to the downgradient side of the unit. Soil samples should be collected from the monitoring well borehole at least every 10 feet from the bottom of the landfill to the water table. The first three to four samples should be analyzed for hazardous constituents using at least GC/MS and BNA analyses techniques. The remaining soil samples should be properly preserved for future analyses pending the results of the initial soil analyses. A ground-water sample should be collected and analyzed for hazardous constituents using GM/MS and BNA analyses techniques. If hazardous wastes are found in the soil and/or ground water, a remedial investigation should be required.

4. Obtain information from Kirtland AFB regarding their monitoring and maintenance program for the landfill cover and available run-on and run-off measures at the unit. This information should be reviewed to determine its adequacy to prevent infiltration of rainfall runoff, including the elimination of ponding areas.

SWMU 5 - Radioactive Burial Site 11

Unit Conditions

This 2.5-acre site (Figure 1) is located within the riding club area about 1400 feet northeast of Arroyo del Coyote and west of the Manzano Area (formerly, Manzano Base). The site was used between 1961 and 1970 for the disposal of radioactive animal carcasses and excreta and small amounts of hazardous and toxic chemicals, including acids, mercury, cynanides, and silver (1, pages 4-41 and 4- 42). Most of the radioactive material resulted from induced activity and is in the form of short-lived elements. The wastes were buried in at least nine trenches (2, page 1-23). Three of these trench scars were investigated using seismic refraction, and the maximum trench depth was found to be 24 feet.

The site lies entirely on the Santa Fe Formation, which shows considerable horizontal variability in this area (2, page 4-7). The Sandia

fault is located near the site, but its exact location could not be determined (2, page 2-27). The site lies atop or at the western margin of the ground-water recharge area for the Santa Fe Formation aquifer (2, page 4-9). No information was available for this review regarding the location of the site in relation to the 100-year floodplain of Arroyo del Coyote.

No monitoring wells are located near this site and the closest well is Kirtland AFB's "abandoned" Production Well 9 (2, Plate II) located about 2000 feet east-southeast of the site. No information was available for this review on the reasons for abandoning the well nor what is precisely meant by abandoned. The depth to ground water at the site is believed to be at least 500 feet. Installation of one lysimeter in a slant borehole at the edge of the site did not result in extraction of a vadose zone water sample. A soil sample taken at the same depth as the lysimeter (about 41 feet below ground surface) did not detect oil and grease, haloscan (TOX) compounds, pesticides, or silver or mercury. The significance of the haloscan results is in doubt because of the sample handling concerns previously discussed on page 11. The drill cuttings obtained from drilling of the lysimeter borehone and an exploratory borehole did not show gamma ray emissions above background levels (2, page 4-9).

Information on site closure indicates that the site is inactive and that it is well covered with up to 8 feet of earthen, well compacted fill (2, App. K and page 1-23). Two of the trenches also have an asphalt cover. The site is flat and not crossed by any surface drainage (2, page 1-23). No

other information was available for this review regarding surface run-on and run-off controls.

The site is located in Kirtland AFB's riding club area, and one of the burial pits is located beneath a one-stall stable. Information regarding the number of people using the riding club or using nearby facilities was not available for this review. Similarly, no information was available regarding the possible presence of subsurface utility lines running through the site.

Conclusions Regarding Potential for Releases

Air. Since the site is generally well covered, there is little potential for the release of particulate wastes. The potential for a release of volatiles appears to be low since there has been sufficient time for these types of contaminants, if present, to have already volatilized.

Ground Water. Since some of the hazardous wastes disposed of were liquid and, because the bottoms may have been unlined, it is possible that a release to ground water has occurred or will occur. The 500 feet of vadose zone may not be relied upon to contain a release. Since this site is located in an area of ground-water recharge, any release would have potentially serious consequences.

Surface Water. The likelihood of release to surface water is remote since the site is relatively flat, and generally well covered, no drainage channels are present in the immediate vicinity, and surface-water runoff is ephemeral.

Subsurface Gas. While putrescible wastes were disposed of at the site, the amounts were relatively small and the period of time since disposal should have been sufficient to preclude any ongoing release of subsurface gas.

Recommendations

1. Obtain any sampling results from the lysimeter which was installed during Stage 1 of the Phase II IRP.

2. Obtain information from Kirtland that characterizes the nature of the wastes disposed, verifies the integrity and adequacy of the cover, and identifies that the unit is properly fences and posted with signs. The wastes should be characterized by drilling at least three soil borings within the unit to a depth of at least 30 feet, sampling every 5 feet from the ground surface, and analyzing the samples for hazardous constituents (i.e., VOC, BNA, alpha, beta, and gamma radioactivity analyses).

3. Kirtland AFB should install at least one monitoring well adjacent to the downgradient side of the unit. Soil samples should be collected from the monitoring well borehole at least every 10 feet from the bottom of the landfill to the water table. The first three to four samples should be analyzed for hazardous constituents using at least GM/MS and BNA analysis techniques. The remaining soil samples should be properly preserved for future analyses pending the results of the initial soil analyses. A ground-water sample should be collected and analyzed for hazardous constituents using GC/MS and BNA analyses techniques. If hazardous wastes are identified in the soil and/or ground water, a remedial investigation should be required.

4. Obtain information from Kirtland AFB regarding their monitoring and maintenance program for the units cover and available run-on and run-off control measures at the unit. This information should be reviewed to determine its adequacy to prevent infiltration of rainfall runoff, including the elimination of ponding areas.

SWMU 6 - Fire Training Control Area

Unit Conditions

The 0.7-acre Fire Training Control Area (FTCA) is located near the western edge of Kirtland AFB about 600 feet southwest of the FAA control tower. The site is defined as a graded circular area with a 200-foot radius. The FTCA is used to train Kirtland AFB personnel in fire control methods. At the center of the site is an approximately 65-foot-diameter concrete pad with a steel mockup of an aircraft. Jet fuel is applied to the aircraft mockup from a nearby tank, ignited, and extinguished using a fire retardant foam. Residual liquids are allowed to evaporate (2, page 1-27).

Former activities at the site included the same types of exercises as described above, undertaken at the same location but over uncovered soil. In the past, small quantities of waste solvents and oils were used to provide flammable material. In addition, flammable materials of unknown and varied composition were placed in an unlined "rectangular pit" and an unlined "circular pit" to provide training for structural fires (2, page 1-33). It has also been reported that these pits were used for the indiscriminate disposal of one to two 55-gallon drums per month of waste solvents and oils from base facilities (1, page 4-21).

The jet fuel used in these exercises is stored in a tank located southeast of the graded area (2, page 1-27). No information was available for this review regarding the design and construction of this tank or whether its contents can be considered a waste.

The concrete pad has a drainage system which extends from its eastern side to an open storm drain 300 feet away. Two storm drains to the east of the FTCA serve one of the runways and other developed areas to the north. Some "petroliferous residue" was observed at the point of discharge of one of these storm drains, which drains toward a ponding area (2, page 1-33).

No monitoring wells are near the site. The nearest well appears to be Kirtland AFB Production Well 14, at a distance of about 0.9 mile to the north-northeast. Soil samples from nine borings underneath and in the vicinity of the concrete pad detected the presence of oil and grease at concentrations up to 6500 mg/kg extending to the bottom of one boring (20 feet). Halogenated organics were also detected in some soil borings at concentrations up to 4.9 mg/kg organic chloride (2, page 4-2). A boring drilled 250 feet north of the pad to obtain background information showed the presence of 3.6 mg/kg organic chloride and 0.06 mg/kg organic iodide at 10 feet below ground surface (2, page 4-2).

The site is not closed, although some portions of it are no longer used. The two pits on the site have been filled with soil. No information was available for this review regarding the nature of the fill used to cover these pits, nor on the integrity of the cover. Detailed information regarding run-on/run-off controls was also not available for this review.

The nearest building to the site appears to be the FAA control tower. No information was available regarding the numbers of people using the FTCA or surrounding areas. Similarly, no information was available regarding the possible presence of subsurface utility lines passing through the site.

Conclusions Regarding Potential for Releases

Air. During firefighting training exercises, some particulates and volatile compounds will be released. However, given the infrequency of these events, the amounts should no pose a concern.

Ground Water. Current practices at the site should significantly limit the risk of ground-water contamination. Past practices have resulted in the release of contaminants to the soil system and their migration to a depth of at least 20 feet. It is unlikely that the oil and grease would be sufficiently mobile under the concrete pad to pose much risk of reaching the ground water. The halogenated chlorides found in the soil are much more of a concern. Since these compounds have been detected in the soil, it is possible that they could reach the water table located at a depth of approximately 400 feet (2, page 1-27). There is no way to determine from the information available for this review whether the halogenated organics found in the soil originated solely from the FTCA or whether multiple sources and means of release account for the presence of these contaminants in the background boring.

Surface Water. There is a strong possibility that contaminants from the concrete pad could migrate through the storm drain system and flow to the ponding area. No information was available regarding the beneficial uses of the ponding area and of the ultimate drainage point beyond the ponding area.

Subsurface Gas. Based on past and current activities at the FTCA, there is no potential for generation of subsurface gas at the unit.

Recommendations

1. Obtain information on the nature of the drain at the concrete pad and the height of any berm surrounding the pad, and on the possible spillage, splashing, or spraying of materials off the concrete pad during training exercises.

2. Obtain a description of the chemical constituents and properties of the fire suppressant foam used at the site.

3. Conduct a site investigation a) to evaluate whether contaminants are migrating from the concrete pad, b) to characterize the contaminants disposed of in the pits, c) to determine whether contaminants present in the soil have reached the water table by installing one monitoring well and taking appropriate soil and ground-water samples, d) to determine the possible beneficial uses of the ponding area and the potential for soil/ground-water contamination, and e) to locate the source of the oily material observed in the storm drain.

   At least two soil borings should be installed within the circular pit and the rectangular pit. Soil samples should be collected at 5-foot intervals from the ground surface to at least 50 feet. These samples should be analyzed for hazardous constituents (i.e., VOC and BNA analyses). At least one ground-water monitoring well should be installed adjacent to the pits. Soil samples should be collected at least every 10 feet from the surface of the ground to the water table. A ground-water sample should also be collected. The first three to four soil samples and the ground-water sample should be analyzed for hazardous constituents using GC/MS and BNA analyses techniques.

4. Obtain all available information on the design, operation, and monitoring of the pit areas as part of the site investigation.

SWMU 7 - Manzano Fire Training Area

Unit Conditions

This unit is located within the former Manzano Base, near the western boundary of what is now designated the Manzano Area (Figure 1). Little information was available for this review regarding the history of use of this former fire training area. The Phase I IRP report speculates that

training procedures consisted of applying fuel to the uncovered ground within a diked area, igniting the fuel, and applying water (1, page 4-22). It is also reported that no waste chemicals are known to have been used (1, page 5-4), but adequate documentation does not exist to support any definitive conclusions about what was disposed and ignited. A small area comprising approximately 400 square feet of surface soil was observed to be contaminated at this site in 1981 (1, page 4-22).

No monitoring well installations, soil borings, or other sampling efforts have been made at this site. Abandoned Kirtland AFB Production Well 9, the closest well to this site, is located about 1/4 mile to the west in an approximately downgradient direction. The site is located in the area thought to provide ground-water recharge to the Santa Fe Formation aquifer.

No information was available for this review regarding the closure of this inactive site. Since surface contamination was observed, the site is obviously not well covered. Similarly, no information was available regarding surface run-on/run-off control measures.

No information was available regarding the number of buildings and people working or residing in the area, nor regarding the possible presence of subsurface utility lines at the site.

Conclusions Regarding Potential for Releases

Air. The potential for release of either particulates or volatiles from this site is very low considering the site's age, small size, and presumed operations.

Ground Water. A release to ground water may have occurred or may occur at this site; little is known about the nature of the materials deposited on the uncovered ground and the location of the site in an area of ground-water recharge.

Surface Water. The potential for release to surface waters appears to be low, given the age of the material and the absence of surface waters in the area.

Subsurface Gas. Subsurface gas would not be expected to be generated as a result of past activities at this site.

Recommendations

1. Conduct a site investigation to characterize the wastes disposed, to collect and analyze surface soil samples and samples from shallow borings in the area of contaminated soil, and to evaluate what closure activities have been completed and what additional measures are necessary. Three to five surface soil samples should be collected in the area where fuel was known to have been placed on the ground. In addition, three to five soil borings should be drilled with soil samples collected every 5 feet from the ground surface to at least 50 feet. All samples should be analyzed for hazardous constituents using at least GC/MS and BNA analyses.

2. During the site investigation, determine whether abandoned Kirtland AFB Production Well 9 can be sampled and, if so, collect at least two sets of samples within a period of several weeks and analyze the samples for hazardous constituents using GC/MS and BNA analyses. A ground-water monitoring well should also be installed in the area where fuel was placed on the ground surface. Soil samples should be collected at least every 10 feet. Ground-water samples, over a period of several weeks, should be collected. The first three to five soil samples and the ground-water samples should be analyzed for hazardous constituents using GC/MS and BNA analyses. The remaining soil samples should be properly preserved for future analyses.

SWMUs 8 through 15 - Radioactive Training Facilities

Unit Conditions

Eight nuclear accident training sites are scattered over approximately 2 square miles in the northwestern portion of Kirtland AFB (Figure 1). The sites have been operated by the Interservice Nuclear Weapons School. Between 1963 and 1971, about 15,270 pounds of Brazilian thorium hydroxide sludge has spread over these sites to dry and then raked into the topsoil (1, page 4-16). The sludge emits alpha radiation and is used to provide training on radiation monitoring and decontamination procedures. Since 55 to 70 percent of the thorium is lost each year, new sludge is added at least annually (1, page 4-19). The loss is believed to result from the infiltration of the thorium into the top layer of soil (1, page 4-19). The contaminated areas at each site vary in size from 1000 to 15,000 square feet.

Each training area is fenced, posted with signs, and patrolled by the Kirtland AFB security police (1, page 4-16).

These training facilities were still in operation in 1981, and no information was available for this review regarding the facilities' current status or closure plans. Similarly no information was available regarding surface run-on/run-off control measures. Radiological surveys of nearby drainage channels have not detected radioactive material which may have moved with runoff from the site and been deposited. Translocation of radioactive material outside fenced areas has occurred at several locations, and these areas have been decontaminated by removing the top foot of soil and placing it inside the boundaries of the training areas (1, page 4-19).

No information was available for this review regarding the number of buildings and people who might be working or residing in nearby areas. Similarly, no information was available regarding the possible presence of subsurface utility lines within the training areas.

Conclusions Regarding Potential for Releases

Air. Routine monitoring of air during training has not detected significant fugitive emissions of health significance (1, page 4-19). It is possible that some of the thorium may be released from the site during dry and windy conditions. Radiological surveys apparently indicate that the amounts being lost are insignificant.

Ground Water. It is likely that the thorium is relatively immobile in soil, and thus the potential for releases to ground water is low.

Surface Water. It is possible that thorium could be translocated by surface-water runoff during rainfall events. Any thorium that is carried off the sites can be easily detected and removed.

Subsurface Gas. Subsurface gas is not generated at the training sites because of the nature of the operation of the facilities.

Recommendations

Since thorium is not regulated under 40 CFR Part 261 no further action is required.

SWMU 16 - Entomological Shop

Unit Conditions

The entomological shop was located (until at least 1981) in Building 20687, which is west of the DOE Area I in the northwestern portion

of the base (Figure 1). No current information was available for this review regarding the current location or activities at the site. The shop provided year-round weed and pest control using a variety of chemicals. A list of pesticides used in 1981 is contained in Attachment 1. After use, the large truck-mounted sprayer is rinsed out and the washwater disposed of on the ground either at the spray site(s) or in an area next to the shop. It was reported in 1981 that the hand-held sprayers were rinsed out in a sink at the shop and, after the rinsing, approximately 10 gpd of washwater drained to a gravel-filled trench where it infiltrated into the ground (1, page 4-15).

No information was available for this review regarding the current status of the site nor whether plans for closure have been prepared, if it is still operating as was reported in 1981. Similarly, no information was available regarding surface run-on/run-off controls.

The entomological shop is or was located near a densely developed portion of Kirtland AFB, but no information regarding the numbers of buildings and people working or residing in the area was available for this review. Information concerning the possible presence of subsurface utility lines at the site was similarly unavailable.

Conclusions Regarding Potential for Releases

Air. There is some potential for releases to air of chemicals from the washwater. The amounts are likely to be insignificant compared to the amounts released during application.

Ground Water. The gravel drain and the area near the shop routinely used to wash out the truck-mounted sprayer could provide a pathway for pesticides to reach the ground water. The small amounts of rinse-water disposed at random job sites would be less likely to result in ground-water contamination.

Surface Water. The opportunities for releases to surface waters are limited because surface waters are generally ephemeral at the base, and spraying generally would not be conducted during periods of rainfall or impending rainfall.

Subsurface Gas. Because of the nature of the operation and the wastes handled, subsurface gas would not be generated at the rinsewater disposal sites.

Recommendations

1. Obtain information on current pesticide washwater disposal practices.

2. Conduct a site investigation to evaluate the extent of soil contamination and whether ground water has been affected, to assess pesticide management practices with a view toward minimizing the amounts of rinsewaters generated, and to evaluate appropriate rinsewater treatment and/or disposal alternatives. At least three soil borings should be drilled within the area of the gravel-filled trench. Soil samples should be collected at intervals of 5 feet from the ground surface to a depth of at least 50 feet. At least one ground-water monitoring well should be installed in the area of the trench. Soil samples should be collected at least every 10 feet from the ground surface to the water table. Ground-water samples should be collected over several weeks. All samples should be analyzed for hazardous constituents including VOCs, BNAs, pesticides, and metals.

SWMU 17 - Wastewater Treatment Lagoons

Unit Conditions

A portion of the sanitary wastewater generated at Kirtland AFB is treated at the City of Albuquerque's treatment facilities (1, page 4-32), and a portion is treated on site in lagoons (1, page 5-5). According to the Phase I IRP report, sanitary wastes including some shop and laboratory wastes collected in the northeast portion of the base are biologically treated in two lagoons, and the effluent is disposed of on the base golf course (1, page 4-53). No information was available for this report regarding the characteristics of the untreated wastewater or the flow volumes. The lagoons appear to be located about 1600 feet north of Landfill 3 and are described as covering about 16 acres and averaging 4 feet in depth (4, page 2). Reportedly, the lagoons have concrete sides and unlined bottoms. Of two pipelines associated with the lagoons, one is used to transport raw wastewater and the other is used to transport the treated effluent to the golf course for disposal (2, page 1-13). The effluent line is reported to have a history of failures resulting in releases of treated wastewater to Landfill 2 (2).

A figure in the Stage 1/Phase II IRP draft report (2, App. I) also shows four sewage treatment lagoons in an area east of the riding club about 1000 feet east-northeast of Radioactive Burial Site 11. This area is within an identified recharge area for the Santa Fe Formation aquifer. No information was available for this review regarding the area served by these

ponds, the characteristics of the wastewater, the flow rates, or the ultimate method of disposal.

The wastewater lagoons have not been closed, and no information was available for this review regarding the features provided to prevent surface run-on to the lagoons or spillage from the lagoons.

There appear to be very few buildings within 1/4 mile of the two lagoons located in the northern portion of the base (3, Drawing 9). Insufficient information was available to locate any buildings near the lagoons east of the riding club. Similarly, no information was available regarding the number of people working or residing near these facilities, nor the possible presence of subsurface utility lines at the sites.

Conclusions Regarding Potential for Releases

Air. Depending on the nature of the laboratory and shop wastes disposed of in the sewage treatment lagoons, it is possible that some loss of volatile contaminants would occur. However, it is unlikely that the amounts released would be of significant concern.

Ground Water. The lagoons could serve as localized recharge areas, especially those located east of the riding club. If only biologically degradable wastes are disposed of in the lagoons, no problems should be associated with recharge from these lagoons. Possible exceptions include nitrates,which could potentially contribute to degradation of the aquifer.

Surface Water. It is not possible to evaluate the potential for release of water from the ponds since no information was available on the design characteristics or operational procedures used to prevent overtopping.

Since surface waters are generally ephemeral at the base, any potential impacts on surface waters are likely to be small.

Subsurface Gas. The opportunity for the generation and release of subsurface gas is remote. Some gas may be generated in the bottom of the ponds, but this would be released into the pond and not the subsurface.

Recommendations

Request additional information on the locations of sewage treatment ponds, the areas they service, flow rates, characteristics of the treated and untreated wastewater (with emphasis on the nature and amounts of any hazardous or toxic constituents), design of the ponds, operational procedures to prevent overflows, history of overflows, effluent disposal locations and practices, and monitoring records. This information should be reviewed to verify the conclusions reported above.

SWMUs 18, 19, and 20 - Radioactive Waste Lagoons

Unit Conditions

Three surface impoundments (Figure 1) were being used in 1981 for the disposal of low-level liquid radioactive wastes (1, page viii). Radioactive Lagoon 1 (RL-1 or SWMU 18) is located north of DOE Area 3, and Radioactive Lagoons 2 and 3 (RL-2 and RL-3; SWMUs 19 and 20) are located near the southern border of Kirtland AFB near the Lovelace Inhalation Toxicology Research Institute (ITRI).

Little information about RL-1 was available for this assessment. While the Phase I IRP report states that this site is closed, it does not describe its current condition, manner of operation, nor whether any liquid wastes were still at the unlined site. The report does state that samples taken in 1971 from the ponds and from sampling wells showed radioactivity within permissible limits (1, page 4-56)

The site designated RL-2 consists of both lined and unlined sewage treatment lagoons and is located at the ITRI complex. In 1981, four of the six lagoons were being used both for the disposal of small amounts of low-level radioactive wastes and for the treatment of sanitary wastes (1, page 4-6). The lagoons cover approximately 10 acres and treat all the sanitary wastes generated at the facility. In addition to the radioactive wastes, other liquid chemical wastes are disposed of in the lagoons. RL-2 is fenced and marked with radiation warning signs.

The lagoons act as evaporation ponds and thus have no effluent discharge. Reportedly, two lysimeters installed in the vicinity of the lagoons had not detected percolation of water from the lagoons in 1981 (1, page 4-56). The concentrations of radionuclides in 1981 were below permissible radioactivity limits for unrestricted discharge as effluent (1, page 4-56).

Intermediate-level liquid radioactive wastes generated at ITRI are stored in two lined ponds (designated RL-3) southeast of the main complex (1, page 4-56). Each pond is about 5 feet deep and 20 feet on each side. The lining of each pond consists of three layers of polyethylene sheets laminated with nylon cord. The ponds are surrounded by a curbed concrete pad and fencing and are marked with radiation warning signs. Wastes are transported to the ponds in 5-gallon containers. Each pond receives waste during a period when the other pond is allowed to evaporate. There is no discharge from the ponds, and the liners and solids residue are periodically removed and disposed off site.

Since the RL-2 and RL-3 facilities are not part of Kirtland's RCRA permit (5, page 2), their use may have been discontinued since the 1981 Phase I IRP.

In 1981, RL-1 was described as closed and RL-2 and 3 as open. No information was available for this review regarding the closure methods used at RL-1. No information is provided about run-on/run-off control features for any of the pond sites except RL-3, which has some sort of berm.

RL-2 is located on the grounds of the ITRI facility, and RL-3 is located several hundred feet from this complex. ITRI comprises three main buildings; however, no information was available regarding the number of persons working at this facility or in nearby facilities. Similarly, no information was available regarding the possible presence of subsurface utility lines at any of the three sites. Information on the number of buildings and people working or residing near RL-1 was also unavailable.

Conclusions Regarding Potential for Releases

Air. Particulates could be released when the RL-3 ponds are allowed to dry out. The amount of wastes released is likely to be small. Some volatile wastes are likely to be released from RL-2. There is insufficient information regarding RL-1 to make an evaluation.

Ground Water. The release of wastes to unlined RL-1 and to the unlined lagoons at RL-2 poses a risk of migration to the ground water. The lysimeters at RL-2 give some qualitative indication that this type of release may not have occurred.

Surface Water. The potential for a release to surface waters is low given the small volumes of mostly ephemeral surface waters present at the site and the minimal likelihood of a surface release from one of the facilities.

Subsurface Gas. Based on the nature and operation of these facilities, there is no potential for generation of subsurface gas.

Recommendations

Radioactive constituents are not regulated by 40 CFR Part 261. However, other uncharacterized chemical wastes were reported to have been disposed of in the ponds; therefore, the following recommendations are made.

1. Obtain current information on the use of ponds RL-2 and RL-3 and, if they are still in use determine why they are not included in Kirtland AFB's RCRA permit.

2. Obtain information regarding the manner of operation of RL-1 and current site conditions, including methods of closure (if any).

3. Obtain design and operating information on all three ponds, a description of overflow features, information on the placement and sampling results of any lysimeters, wells, or air monitoring near the ponds and a characterization of all wastes disposed of in the ponds. Three to five samples should be collected from the wastes contained in the ponds and analyzed for hazardous constituents including at least VOCs and BNAs.

4. Based on the information collected, conduct a site investigation to determine whether wastes from RL-1 and RL-2 were released to the ground. If such releases have occurred, determine the lateral and vertical extent. At least three to five soil borings should be installed adjacent to the ponds. Soil samples should be collected at intervals of 5 feet from the ground surfce to a depth of at least 30 feet. The samples should be analyzed for hazardous constituents including VOCs and BNAs.

SWMUs 21 and 22 - Radioactive Burial Sites 7 and 10

Unit Conditions

Low-level solid radioactive wastes have been disposed at SWMU 21 (RB-7), located in the northeast section of the Manzano Area, and SWMU 22 (RB-10), located by ITRI near the southern border of Kirtland AFB (Figure 1).

Wastes were disposed of in trenches at RB-7 from before 1959 until 1963. The wastes included contaminated clothing, gloves, dust and tuballoy swipes (1, page 4-41). No information was available for this assessment regarding the current cover or whether the trenches were lined or unlined. The site is fenced and marked with radiation warning signs. In 1980, radiation was reportedly within background levels along the perimeter and downslope of the site (1, page 4-41).

Research activities at ITRI have generated dead animals contaminated with low-level radioactivity. These carcasses were disposed of at RB-10 from the late 1970s until at least 1981 (1, page 4-41). No information was available for this assessment regarding the current cover or whether the disposal trenches are lined or unlined.

In 1981, RB-7 was described as inactive and covered with earth, and RB-10 was reportedly still active (1, page 4-46). No information was available for this review regarding surface run-on/run-off control measures for either site.

The available information on the buildings and people present at the ITRI facility near RB-10 was discussed previously. The number of buildings and people near RB-7 was not available for this review. Similarly,

information regarding the possible presence of subsurface utility lines at both sites was unavailable.

Conclusions Regarding Potential for Releases

Air. The potential for a release of particulates to air is low, provided adequate covers are maintained over the sites.

Ground Water. The potential for a release to ground water is probably low, provided the sites have intact, low-permeability covers.

Surface Water. The potential for a release to surface waters is low, considering the small volumes of generally ephemeral surface water at the site and the likelihood that any migration and deposition by surface waters would be easily identified during radiation surveys.

Subsurface Gas. Subsurface gas would likely be generated at RB-10, but not at RB-7. It is unlikely that any subsurface gas released would be of sufficient quantities to cause concerns at these disposal sites.

Recommendations

Radioactive wastes are not regulated under 40 CFR Part 261; therefore, no further action is required.

SWMUs 23 through 27 - Landfill 6, Manzano Dump and Landfills A, B, and C

Unit Conditions

Landfills A, B, C and the Manzano Dump landfills are relatively small inactive landfills, generally less than 5 acres in extent, which were used for the disposal of what has been characterized as general refuse (1, pages 4-44 and 4-45). Landfill 6 is an active landfill used for the disposal of nonhazardous wastes generated at Kirtland AFB. Landfills B and C and the

Manzano Dump are located in the central part of the base; Landfill 6 is located near the northern border of the base adjacent to Landfill 4, and Landfill A is located in the northwest section of the base near the western border (Figure 1).

Landfill 6 covered an area of approximately 24 acres in 1981 (1, page 4-44). The site overlies the Santa Fe Formation and is located in the recharge area for the Santa Fe Formation aquifer. Kirtland AFB Production Well 11 is about 1/2 mile northeast of the site. No information was available for this review regarding whether the landfill is lined, the type and adequacy of the cover, and the methods of operation; thus, it is not known whether hazardous wastes are disposed at Landfill 6.

The other landfills were operated as surface landfills with open burning. The Manzano Dump and possibly Landfills B and C lie within the recharge area for the Santa Fe Formation aquifer. Abandoned Kirtland AFB Production Well 9 is located about 1/4 mile west of the Manzano Dump. Landfill B is located about 1/8 mile from domestic monitoring wells 29055 and 29056 (1, page 3-29). Landfills A and C lie roughly 1 mile from production wells. No sampling results for synthetic organic contaminants were available for any of these wells for this assessment.

In 1981, Landfills A, B, and C and the Manzano Dump were described as abandoned (1, page 4-45) with only the Manzano Dump having been covered. Information regarding the nature of the cover material and its depth and slope was not available for this review. Similarly, no information was

available regarding surface run-on/run-off control features for any of the landfills. Landfill 6 was still active in 1984.

Information regarding the number of buildings and people working or residing in the vicinity of these landfills was generally not available for this review. Landfill 6 appears to be at least 1/4 mile from any buildings (3, Drawing 9). No information regarding the possible presence of subsurface utilities was available for this assessment.

Conclusions Regarding Potential for Releases

Air. Particulate releases from the uncovered landfills are possible, but the consequences are likely to be insignificant considering the reported nature of the materials disposed and the past burning of the disposed wastes.

Ground Water. The potential for a release to ground water is difficult to assess. Nonetheless, since many of these landfills are located in an area of ground-water recharge and several of the sites are uncovered, there is a possibility of a release reaching ground water.

Surface Water. The potential for movement of wastes to surface waters is generally low, but probably greater at those landfills without covers.

Subsurface Gas. The potential for subsurface gas generation is low at all of these units except Landfill 6. Subsurface gas at this landfill should not be of concern because of its relatively remote location.

Recommendations

1. Obtain current information on the adequacy of the covers at each landfill, characterization of the nature of the wastes disposed, and information on whether there has been a release of contaminants from any of the landfills to subsurface soils and ground water. Ground-water samples should be collected from domestic Monitoring

Well 29055 and 29056 and Production Wells 9 and 11 and analyzed for hazardous constituents (i.e., VOCs and BNAs). The wastes disposed at these landfills should be characterized by drilling at least three soil borings within the landfills to a depth of at least 50 feet. Soil samples should be collected at 5-foot intervals from the ground surface and analyzed for hazardous constituents including VOCs and BNAs.

2. If review of the above information indicates that a cover is needed for Landfills A, B, and C, require emplacement of a low-permeability cover of adequate thickness and slope for good drainage.

3. Obtain information on the lining, if any, and operating practices for Landfill 6.

SWMU 28 - Radioactive Liquid Holding Tanks

Unit Conditions

Within the Manzano Area of Kirtland AFB (Figure 1) are five emergency radioactive liquid holding tanks, designated RB-4, 5, 6, 8 and 9 (1, page 4-59). These underground tanks comprise two 10,000-gallon tanks and three 1000-gallon tanks. Each tank site is fenced and marked with radiation warning signs. These facilities were not used from 1963 until at least 1981 (1, page 4-59). No information was available for this review concerning the tanks' construction, whether any tank integrity tests have been conducted, whether these tanks have been closed, nor the locations of the tanks in relation to the number of buildings and people in nearby areas. Similarly, no information was available regarding the possible presence of subsurface utility lines in close proximity to the tanks.

Conclusions Regarding Potential Releases

Air. Releases to air from these facilities are unlikely, given the infrequent use of the tanks.

Ground Water. Releases from these tanks are possible if their integrity has been breached. Given the very infrequent use of these tanks, the potential for a past release to have occurred is low.

Surface Water. Releases to surface waters are unlikely, given the infrequent use of the tanks and the ephemeral nature of surface waters at the base.

Subsurface Gas. Subsurface gases would not result from the operation of these facilities.

Recommendations

Radioactive wastes are not regulated under 40 CFR Part 261; therefore, no further action is required.

SWMU 29 - DPDO's RCRA Storage Facilities

Unit Conditions

The Defense Property Disposal Office (DPDO) receives and temporarily stores containerized hazardous wastes generated by approximately 120 tenants at Kirtland AFB and other DOD-supported activities (3, page B-2). A partial listing of tenants, based on available information (1), is contained in Attachment 4. Some of the wastes received may be from off-site generators (6, unnumbered page). All wastes received must be in nonleaking DOT-approved containers in good condition (3, page I-2). Two storage facilities are used: Building 615, a 400-square foot former ammunition locker, and Building 28009 (Figure 1), also a former ammunition storage bunker (4, page 2). Building 615 is divided into six compartments with brick walls separating each unit. Incompatible wastes were reportedly separated into

the various units in a satisfactory manner, according to a 1983 EPA compliance monitoring inspection (7, page 4). Deficiencies in separating wastes have been reported at Building 28009, where "corrosives" were being stored above "poisons" and PCBs were stored in this crowded building (6, unnumbered page).

The existing storage buildings are described as free of any cracks or gaps and capable of containing at least 10 percent of the volume of liquid wastes that might be stored in them (3, page H-6). Building 28009 also has a special bermed area which is used to store capacitors and transformers containing PCBs.

Most of the hazardous waste handled by DPDO is sold for reprocessing or reuse; the rest is disposed off site at appropriate facilities. Much of the waste material listed on the November 1983 revised RCRA Part A application is only potential RCRA hazardous wastes. Whether it becomes a waste per se depends on whether it is disposed of or recycled.

In 1983, Kirtland AFB management was considering constructing a new storage facility (7, Attachment 4). These plans had not yet been implemented as of 1985 (3, page B-2). The facility would include a 4000-square-foot building which would be designed to conform to EPA performance criteria.

The site is an active storage site. A closure plan is contained in the revised Part B application (3, page M-1). Run-on and run-off are prevented by storing the wastes in fully enclosed buildings (3, page H-1).

Building 615 is located near several other buildings (3, Drawing 1). The number of people using these adjoining facilities was not available for this review. Building 28009 is located at least 1/4 mile from any buildings other than similar bunker-type structures.

Conclusions Regarding Potential for Releases

Air. The potential for a release to air is remote, since this would require breakage or leaking of one of the containers. Information contained within the revised Part B Application (3) indicates that all wastes are in closed containers and are properly managed.

Ground Water. Releases to ground water are unlikely, given the containerized nature of the wastes stored and the secondary containment provided.

Suface Water. Releases to surface waters are highly improbable, other than in the case of an accident during shipment of the wastes to or from the DPDO facilities.

Subsurface Gas. Subsurface gases are not generated by these waste storage facilities.

Recommendations

No further action is required.

SUMMARY OF RECOMMENDATIONS

Recommendations for further investigation of SWMUs at Kirtland AFB, previously discussed in each unit section, are summarized below. Additional information which should be obtained before initiating a site investigation is listed at the end of this report.

RECOMMENDED INVESTIGATION ACTIVITIES

1. Landfill 1

   - Obtain well sampling results
   - Conduct well sampling, if necessary
   - Obtain lysimeter sampling results
   - Conduct remedial investigation, if ground-water well DM-01 is contaminated
   - Obtain information verifying adequacy of cover and characterizing wastes
   - Obtain information on cover monitoring and maintenance program and run-on and run-off control measures

2. Landfill 2

   - Obtain well sampling results
   - Conduct well sampling, if necessary
   - Obtain lysimeter sampling results
   - Conduct remedial investigation, if ground-water well DM-02 is contaminated
   - Obtain information verifying adequacy of cover, and characterizing wastes and "melted" material
   - Obtain information on cover monitoring and maintenance program and run-on and run-off control measures

3. Landfill 3

   - Obtain lysimeter sampling results
   - Obtain information verifying adequacy of cover, and characterizing wastes and install monitoring well for ground-water and soil sampling and analyses
   - Conduct remedial investigation if hazardous constituents identified in soil and ground water
   - Obtain information on cover monitoring and maintenance program and run-on and run-off control measures

4. Landfill 4

- Obtain lysimeter sampling results
- Obtain information verifying adequacy of cover and characterizing wastes, conduct remedial investigation, and install monitoring wells for soil and ground-water sampling and analyses, if necessary
- Obtain information on cover monitoring and maintenance program and run-on and run-off control measures
- Conduct remedial investigation, if hazardous constituents are identified in soil and/or ground water

5. Radioactive Burial Site 11

- Obtain lysimeter sampling results
- Obtain information verifying adequacy of cover and characterizing wastes and install monitoring well for soil and ground-water sampling and analyses
- Obtain information on cover monitoring and maintenance program and run-on and run-off control measures
- Conduct remedial investigation, if hazardous constituents are identified in soil and/or ground water

6. Fire Training Control Area

- Obtain information on berm and storm drain
- Obtain information on firefighting foam
- Conduct site investigation to characterize wastes disposed of at pits, install monitoring wells for soil and ground-water sampling and analyses, and determine source of oil
- Obtain design, operation, and monitoring data for the two pits

7. Manzano Fire Training Area

- Conduct site investigation to characterize materials disposed of; collect and analyze soil samples, and sample existing well, if possible, and install new sampling well
- Review well cover monitoring and maintenance

8 through 15. Radioactive Training Facilities

- No further action

16. Entomological Shop

- Obtain information on waste disposal
- Conduct site investigation to evaluate extent of soil contamination and determine if ground water has been contaminated

17. Wastewater Treatment Lagoon

- Obtain information on the characteristics of the raw wastewater and the effluent
- Obtain information on design, operation, monitoring, and disposal practices

18, 19, and 20. Radioactive Waste Lagoons

- Obtain current information on use
- Obtain closure information on RL-1
- Obtain design and operational information
- Conduct site investigation to assess potential of leakage from RL-1 and RL-2

21 and 22. Radioactive Burial Sites 7 and 10

- No further action required

23 through 27. Landfill 6, Manzano Dump and Landfills A, B, and C

- Obtain information verifying adequacy of cover, characterizing wastes, and monitoring of existing wells to determine if release has occurred
- Obtain information on cover monitoring and maintenance program and run-on and run-off control measures
- Obtain information verifying presence of lining at Landfill 6

28. Radioactive Liquid Holding Tanks

- No further action is required

29. DPDO's RCRA Storage Facilities

- No further action is required

Additional Site Investigation Recommendations

It is likely that additional SWMUs will be discovered at Kirtland AFB. Possible additional SWMUs include areas where jet fuel sludge was disposed of by land spreading (1, page 4-22) and the 11 or more facilities which, in 1981, used drain fields or storm drains to dispose of washwaters which might

contain hazardous wastes (1, pages 4-52 and 4-54). A thorough site inspection of the waste handling and disposal practices of the 120 or more tenants of Kirtland AFB needs to be conducted in order to identify any additional SWMUs. Any facilities which are currently improperly storing or disposing of hazardous wastes should be directed to eliminate these practices. To provide ongoing assurance of proper hazardous waste handling, an adequate program of monitoring and surveillance of these facilities needs to be conducted by Kirtland AFB. Such a program will help assure that all RCRA requirements are understood and are being complied with by the tenants.

Since PCE has been reported in some Kirtland AFB wells, and since organic chloride was found in the two monitoring wells installed during Stage 1 of the Phase II IRP, additional monitoring needs to be conducted at every Kirtland AFB well and every downgradient City of Albuquerque well field. If contaminant concentrations exceed recommended Maximum Contaminant Levels, appropriate measures will need to be taken to prevent contaminated water from reaching consumers. Such measures may include treatment, blending, or elimination of the source of contaminated water.

Priority for Action

The first priority should be to assure the safety of the Kirtland AFB drinking water supply by monitoring for appropriate contaminants, including GCMS and BNA analyses.

The second priority is to prevent any possible new releases of hazardous wastes by conducting the type of thorough site inspection discussed in the preceding section. This inspection should identify any new SWMUs.

The third priority is to obtain the existing information listed in Attachment 1. This information, along with information gathered during the site investigations of the tenants' operations, should help focus the SWMU site inspections and guide the sampling efforts outlined for these units.

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REQUIREMENTS FOR ADDITIONAL INFORMATION

The information described on the following page should be obtained from Kirtland AFB and evaluated as indicated previously in this report.

1. Provide any sampling results from the lysimeters installed at SWMUs 1, 2, 3, 4, and 5 and any monitoring results available since the Phase II IRP report for monitoring wells DM-01 and DM-02, for any Kirtland production wells, and for any abandoned or unused wells.

2. Describe the monitoring and maintenance programs, if any, for SWMUs 1, 2, 3, 4, 5, 18, 21, 22, 23, 24, 25, 26, and 27.

3. Describe improvements for surface run-on and run-off controls at SWMUs 1 and 2.

4. Provide information for SWMU 6 regarding the location and nature of the drain at the concrete pad; the height of any berm surrounding the pad; any spillage, splashing, or spraying of materials off the concrete pad during exercises; and the chemical composition and properties of the fire-suppressant foam used at the site.

5. Provide information for SWMUs 8 through 15 regarding whether the sites are still operating, the locations of each site relative to storm-water runoff and floodplains, and closure for any site no longer operating.

6. Describe the current pesticide washwater disposal practices for SWMU 16.

7. For SWMU 17, describe a) the locations of sewage treatment ponds, b) the areas they service, c) flow rates, d) characteristics of the treated and untreated wastewater with emphasis on the nature and amounts of any hazardous or toxic constituents, e) the design parameters of the ponds, f) operational procedures to prevent overflows, g) history of overflows, and h) effluent disposal locations and practices.

8. For SWMUs 18, 19, and 20, describe their design and operation and the placement and sampling results of any lysimeters, wells, or air samples taken near these ponds. Provide current information on the use of SWMUs 19 and 20 and, if they are still in use, explain why they are not included in Kirtland AFB's RCRA permit. Identify the manner of operation and closure of SWMU 18, including current conditions of the site, if known.

9. For SWMUs 21 and 22, identify the size of each disposal area and the status of closure, including any activities that have been taken for closure. Describe the radiation monitoring progam for these sites, including any current results.

10. Provide information on the covers of SWMUs 25, 26, and 27.

11. Identify the operating practices of SWMU 23 and provide information on its lining.

12. Provide information on the usage of SWMU 28 since 1981 and whether these facilities are still intended for use. Identify closure procedures used if the facilities are no longer in use.

13. Identify the status of the proposed new hazardous waste storage facilities of DPDO.

14. Identify areas where sludge from fuel tanks has been spread on the ground.

15. Identify any improvements in the disposal of potentially hazardous wastes to storm drains and drainage fields since the Phase I IRP.

16. Provide information that characterizes the wastes disposed of in SWMUs 1 through 5, and 23 through 27.

PARTIAL LISTING OF KIRTLAND AFB TENANTS (1)

- Air Force Contract Management Division (AFCMD)
- Air Force Weapons Laboratory (AFWF)
- Naval Weapons Evaluation Facility (NWEF)
- Department of Energy/Albuquerque Operations Office (ALO)
- Field Command, Defense Nuclear Agency (FCDNA)
- Air Force Test and Evaluation Center (AFTEC)
- 1550th Air Crew Training and Test Wing (1550 ATTW)
- 1960th Communications Squadron
- 3098th Aviation Depot Squadron (AFLC)
- Detachment 4, 1400 MAS (MAC)
- Defense Contract Administration Services Office/Albuquerque
- Air Force Inspection and Safety Center (Det 1), Nuclear Surety Directorate
- Detachment 23, 17th Weather Squadron (MAC)
- 2D Weather Squadron, Operating Location B
- 3416th Technical Training Squadron (ATC)
- Missile Electronic Warfare Airborne Group
- Office of Special Investigations (District 17)
- Management Engineering Team (Det 25) (AFSC)
- Nuclear Weapons Training Detachment
- Defense Property Disposal Office (DPDO)
- Defense Investigative Service, District 43 (AFO)
- Project Officer for Nuclear Munitions
- Air Force Logistics Nuclear Support Office (AFLC)
- U.S. Army Corps of Engineers/Albuquerque District, Plant Section
- Air Defense Command Liaison Office (ADC)
- Strategic Air Command Liaison Office (SAC)
- Civil Air Patrol Liaison Office (US AF)
- Tactical Air Command Liaison Office (TAC)
- Naval Liaison Office (JAWPS)

- New Mexico Air National Guard (Reserve)
- 156th Support Group (Army Reserve)
- 4153rd USAR School (Army Reserve)
- U.S. Army Transponder Unit (WSMR)
- Albuquerque Frequency Surveillance Unit (WASMR)
- Air Force Office of Security Police
- 6597th Student Squadron (Air Force Systems Command)
- Det 2, 4950th Test Wing (AFSC/ASD)
- 1369th Audiovisual Squadron, Det 1
- Army/Air Force Exchange Service
- Albuquerque Seismological Laboratory
- U.S. Customs, Air Support Unit
- Identification, Friend, Foe or Neutral, Joint Test Force (IFFN)
- Sandia National Laboratories
- Lovelace Biomedical and Environmental Institute