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Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico

Volume 1
Chapters 1 through 11

U.S. Department of Energy

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Table 4–10 Estimated Average Annual Concentrations of Radionuclides in Base Flows in Pueblo and Mortandad Canyons Compared with the Biota Concentration Guides

Radionuclide	BCGs (picocuries per liter)	Lower Pueblo Canyon (at NM 502)		Mortandad Canyon below TA-50 Radioactive Liquid Waste Treatment Facility Outfall	
		Estimated 2005 Time-Weighted Annual Average (picocuries per liter)	Ratio to BCG	Estimated 2005 Time-Weighted Annual Average (picocuries per liter)	Ratio to BCG
Americium-241	400	0.4	0.001	5.1	0.013
Cesium-137	20,000	Not detected	0.0	20	0.001
Tritium	300,000,000	Not detected	0.0	237	0.0000008
Plutonium-238	200	Not detected	0.0	2.1	0.0105
Plutonium-239 and Plutonium-240	200	11	0.055	2.9	0.0145
Strontium-90	300	0.4	0.0013	3.4	0.0011
Uranium-234	200	1.7	0.0085	2.0	0.01
Uranium-235 and Uranium-236	200	0.1	0.0005	1.1	0.0055
Uranium-238	200	1.6	0.008	1.9	0.0095
Sum of Ratios			0.07	–	0.07

BCG = Biota Concentration Guide, TA = technical area.
Source: LANL 2006h.

4.3.1.2 Industrial Effluents

Liquid effluents from LANL's industrial and sanitary outfalls are permitted under the NPDES Industrial Point Source Outfall Program (called NPDES-permitted outfalls). The NPDES permit requires routine monitoring of discharges and reporting of sampling results. The permit specifies the parameters to be measured and the sampling frequency (EPA 2007b).

Notable changes since the *1999 SWEIS* include a reduction in the number of permitted outfalls and the total effluent flow from outfalls, changes to LANL treatment facilities at the Radioactive Liquid Waste Treatment Facility at TA-50 and the High-Explosives Wastewater Treatment Facility at TA-16, and water conservation projects that recycle treated effluent to cooling towers from the TA-46 Sanitary Wastewater Systems Plant (formerly known as the Sanitary Wastewater Systems Consolidation Plant).

LANL has 21 outfalls currently permitted under the industrial permit program. **Table 4–11** shows the number of outfalls and the type of effluent that is discharged through the outfalls.

The 21 NPDES-permitted outfalls at LANL discharge into five local canyons in the LANL region, with the amount of discharge varying from year to year. Figure 4–13 shows the location of the NPDES-permitted industrial outfalls. In 2005, approximately 198 million gallons (749 million liters) of effluent were discharged from all permitted outfalls. This represents a reduction in the number of outfalls, the number of watersheds receiving flow, and the total amount of effluent discharged since publication of the *1999 SWEIS*. Thirty-five outfalls were removed from service as a result of efforts to reroute and consolidate flows and eliminate outfalls; one outfall was reinstated to serve the Laboratory Data Communication Center (TA-3-1498) cooling towers (DOE 1999a, LANL 2005f). The annual flow from permitted outfalls and discharges by watershed is shown in **Table 4–12**.

Table 4–11 National Pollutant Discharge Elimination System Industrial Point Source Outfalls

Number of Outfalls	*Type of Discharge*
1	Power Plant Discharge
1	Boiler Blowdown Discharge
15	Treated Cooling Water Discharge
2	High Explosive Wastewater Treatment
1	Radioactive Liquid Waste Treatment
1	Sanitary Wastewater Treatment
Total 21	

Source: EPA 2007b.

Table 4–12 National Pollutant Discharge Elimination Systems Permitted Outfalls and Discharges by Watershed

Canyon	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Cañada del Buey [a]							
Number of permitted outfalls	3	1	1	1	1	1	1
Discharge (million gallons per year)	2.6	0	0	0	0	0	0
Guaje [b]							
Number of permitted outfalls	6	0	0	0	0	0	0
Discharge (million gallons per year)	1.7	0	0	0	0	0	0
Los Alamos							
Number of permitted outfalls	7	5	5	5	5	5	5
Discharge (million gallons per year)	45.2	37.4	19.34	36.79	34.52	29.57	53.58
Mortandad							
Number of permitted outfalls	6	5	5	5	5	5	5
Discharge (million gallons per year)	39.3	31.6	4.21	31.4	33.12	15.9	16.84
Pajarito [c]							
Number of permitted outfalls	2	0	0	0	0	0	0
Discharge (million gallons per year)	0	0	0	0	0	0	0
Pueblo							
Number of permitted outfalls	1	0	0	0	0	0	0
Discharge (million gallons per year)	0.9	0	0	0	0	0	0
Sandia							
Number of permitted outfalls	6	4	4	5	5	5	5
Discharge (million gallons per year)	213.2	180.2	100.38	108.58	140.41	116.43	127.54
Water [d]							
Number of permitted outfalls	5	5	5	5	5	5	5
Discharge (million gallons per year) (Includes discharge to Cañon de Valle, a tributary)	14.3	16.2	0.102	1.41	1.77	0.62	0.50
Totals							
Number of permitted outfalls	36	20	20	21	21	21	21
Discharge (million gallons per year)	317.2	265.4	124.04	178.18	209.82	162.52	198.46

[a] Includes Outfall 13S from the Sanitary Wastewater Systems Plant, which is permitted to discharge to Cañada del Buey or Sandia Canyon. The discharge is currently piped to TA-3 and ultimately discharged to Sandia Canyon via Outfall 001.
[b] Includes 04A-176 discharge to Rendija Canyon, a tributary to Guaje Canyon.
[c] Includes 06A-106 discharge to Threemile Canyon, a tributary to Pajarito Canyon.
[d] Includes 05A-055 discharge to Cañon de Valle, a tributary to Water Canyon.
Note: To convert gallons to liters, multiply by 3.7853.
Sources: LANL 2003h, 2004f, 2005f, 2006g.

Five canyons (Pueblo, Cañada del Buey, Guaje, Chaquehui, and Ancho Canyons) that previously received LANL discharges are no longer receiving any industrial effluent. Pajarito Canyon has not received any effluent since 1998. Water Canyon and its tributary, Cañon de Valle, Sandia Canyon, Mortandad Canyon, and Los Alamos Canyon continue to receive LANL effluent discharges. Cañada del Buey is permitted to receive effluent from the TA-46 Sanitary Wastewater Systems Plant, but that effluent has been routed to Sandia Canyon since the plant opened (LANL 2005f). Total effluent discharges to the canyons from LANL decreased by about 37 percent over the past 6 years.

It should be noted that the method used to measure and report flow rates at NPDES-permitted outfalls has significantly changed since the *1999 SWEIS*. Historically, instantaneous flow was measured and extrapolated over a 24-hour day, 7-day week period. Flow meters, used since 2001 in many (but not all) outfalls and measuring stations, provide more accurate flow measurements. At those outfalls without meters, the flow is still calculated according to the previous method. Without comparable values, trend analysis of yearly flows is difficult.

The distribution of total industrial effluent contributed by the various facilities (Key and non-Key Facilities) has also changed since the *1999 SWEIS*. Annual effluents generated and discharged are listed by facility in **Table 4–13**. Total effluent discharges from all facilities in 2005 were 63 percent of the total discharges in 1999. In 2005, Key Facilities discharged about 63 million gallons (240 million liters) of effluent, representing 32 percent of the total annual flow; and non-Key Facilities discharged about 135 million gallons (511 million liters) of effluent, or 68 percent of the annual flow. Flows from Key and non-Key Facilities have fluctuated, but generally decreased since 1999. The apparent increase in effluent from the Tritium Facility is due to increased effluent discharges from the TA-21 Steam Plant (LANL 2006g).

Quality of Effluent from NPDES-Permitted Outfalls

LANL personnel collect weekly, monthly and quarterly samples to analyze effluents for compliance with NPDES permit levels. The *1999 SWEIS* reported that LANL had "chronic problems meeting NPDES industrial/sanitary permit conditions" (DOE 1999a). This condition has improved significantly. Since 2000, LANL has maintained an average compliance rate with permit conditions of 99.75 percent. The current compliance rate is summarized in **Table 4–14**. Permit exceedance trends are shown in **Figure 4–14**. The number of samples exceeding permit limits in Table 4–14 may differ from the number of exceedances shown in Figure 4–14 because one sample may exceed two limits. Each of these samples were counted as two exceedances until October 2004, when the method of reporting exceedances was changed so a single sample could only represent one exceedance of permit limits (LANL 2006a). In the event that a permit level is exceeded, DOE reports the condition to the EPA and takes corrective action to address the noncompliance. Details of all exceedance events are provided in the Environmental Surveillance Reports for the respective years (LANL 1999b, 2000e, 2001f, 2002d, 2004a, 2004d, 2005h, 2006h). Generally, exceedances of permit standards in the 5 years since 2000 were of excess total residual chlorine.

Table 4–13 National Pollutant Discharge Elimination Systems Permitted Outfalls and Discharges by Facility

Facility	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Plutonium Complex							
Number of permitted outfalls	1	1	1	1	1	1	1
Discharge (million gallons per year)	8.6	6.5	0.41	2.82	3.02	2.72	2.40
Tritium Facility [a]							
Number of permitted outfalls	2	2	2	2	2	2	2
Discharge (million gallons per year)	9.0	8.6	0.39	13.4	19.03	22.09	32.98
CMR Building							
Number of permitted outfalls	1	1	1	1	1	1	1
Discharge (million gallons per year)	4.5	2.3	0.02	0.76	2.16	1.19	0.92
Sigma Complex							
Number of permitted outfalls	2	2	2	2	2	2	2
Discharge (million gallons per year)	5.77	3.9	0.06	2.00	7.62	1.97	3.80
High Explosives Processing Facility							
Number of permitted outfalls	3	3	3	3	3	3	3
Discharge (million gallons per year)	0.2	0.1	0.04	0.03	0.02	0.037	0.029
High Explosives Testing Facility							
Number of permitted outfalls	3	2	2	2	2	2	2
Discharge (million gallons per year)	14.3	16.1	9.00 [b]	1.38	1.75	0.58	0.47
LANSCE							
Number of permitted outfalls	4	4	4	4	4	4	4
Discharge (million gallons per year)	37.2	30.5	20.45	24.04	16.46	8.12	21.00
Biosciences Facilities (previously called Health Research Laboratory)							
Number of permitted outfalls	1	0	0	0	0	0	0
Discharge (million gallons per year)	0	0	0	0	0	0	0
Radiochemistry Facility							
Number of permitted outfalls	1	0	0	0	0	0	0
Discharge (million gallons per year)	0	0	0	0	0	0	0
Radioactive Liquid Waste Treatment Facility	1	1	1	1	1	1	1
Number of permitted outfalls	5.3	4.9	3.6	2.92	2.97	2.14	1.83
Discharge (million gallons per year)							
Number of permitted outfalls	0	0	0	0	0	0	0
Discharge (million gallons per year)	0	0	0	0	0	0	0
Applies to each of the following facilities: - Pajarito Site - Machine Shops - MSL - Waste Management - TFF - Operations							
Sub-Total Key Facilities							
Number of permitted outfalls	19	16	16	16	16	16	16
Discharge (million gallons per year)	85.0	72.5	24.99	47.17	53.03	38.85	63.43
Non-Key Facilities							
Number of permitted outfalls	17	4	4	5	5	5	5
Discharge (million gallons per year)	232	192.5	99.01	130.83	156.79	123.67	135.03
Totals							
Number of permitted outfalls	36	20	20	21	21	21	21
Discharge (million gallons per year)	317	265	124	178	209.8	162.52	198.46

CMR = Chemistry and Metallurgy Research, LANSCE = Los Alamos Neutron Science Center, MSL = Materials Science Laboratory, TFF = Target Fabrication Facility.

[a] The TA-21 Steam Plant Outfall is included in the Tritium Facility outfall totals and is usually 90 percent or more of the total flow attributed to this Key Facility, although it serves other facilities within that technical area.

[b] Value was incorrectly reported in the LANL 2003h Table 3.2-4 as .006638. The correct value is 9.0, per LANL 2004c.

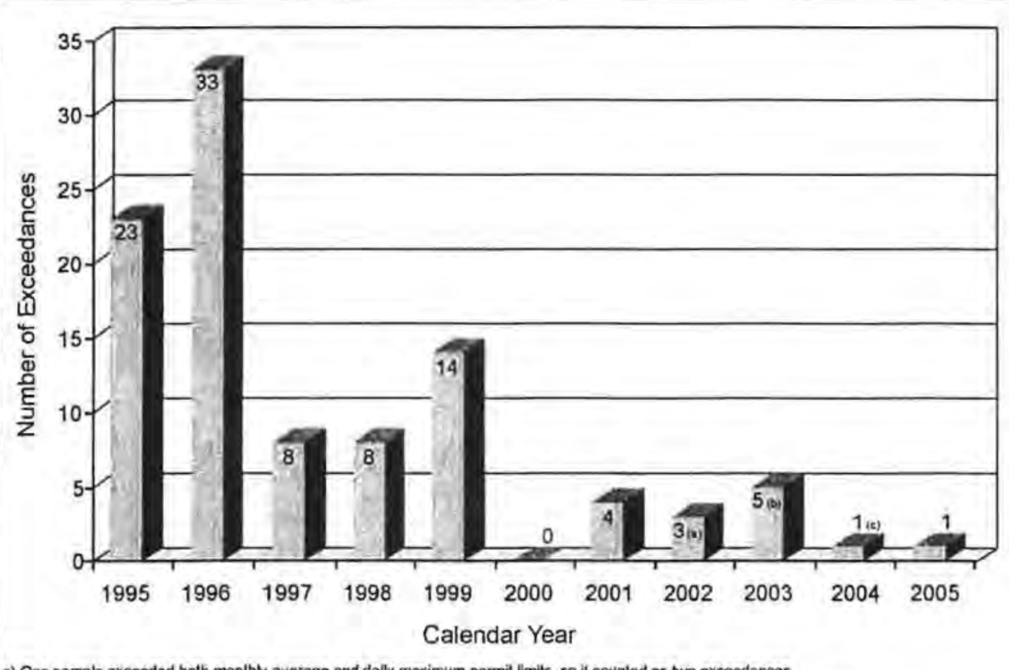
Note: To convert gallons to liters, multiply by 3.785.

Source: LANL 2003h, 2004c, 2004f, 2005f, 2006g.

Table 4–14 Effluent Quality Monitoring and Compliance with Permit Limits for National Pollutant Discharge Elimination Systems-Permitted Outfalls

	1999	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Industrial Outfalls							
Number of permitted outfalls (as of end of calendar year)	19	20	20	20	20	21	21
Number of samples collected	1,248	1,121	1,085	1,084	958	1,283	949
Number of samples exceeding permit limits	14 [a]	0	4	2 [b]	3 [c]	1 [d]	1
Yearly compliance rate (percent)	98.88	100	99.63	99.82	99.69	99.92	99.89
Sanitary Outfalls							
Number of permitted outfalls (as of end of calendar year)	1	1	1	1	1	1	1
Number of samples collected	175	200	134	129	132	145	126
Number of samples exceeding permit limits	0	0	0	0	0	0	0
Compliance rate (percent)	100	100	100	100	100	100	100

[a] Number of samples differs from Environmental Surveillance Report for 1999 because two samples exceeding permit limits were taken from the Guaje Well, which had been transferred to Los Alamos County ownership in 1998 (LANL 2006a).
[b] One sample exceeded both monthly average and daily maximum permit limits, so it counted as two exceedances.
[c] Two samples exceeded both monthly average and daily maximum permit limits, so they each counted as two exceedances.
[d] One sample exceeded both monthly average and daily maximum permit limits, but is counted as one exceedance under the new reporting method.
Sources: LANL 1999b, 2000e, 2001f, 2002d, 2004a, 2004d, 2005h, 2006a, 2006h.



a) One sample exceeded both monthly average and daily maximum permit limits, so it counted as two exceedances.
b) Two samples exceeded both monthly average and daily maximum permit limits, so they each counted as two exceedances.
c) One sample exceeded both monthly average and daily maximum permit limits, but is counted as one exceedance under the new reporting method.
Sources: LANL 1996b, 1997c, 1999b, 2000e, 2001f, 2002e, 2004a, 2004d, 2005h, 2006a, 2006h

Figure 4–14 National Pollutant Discharge Elimination Systems Permit Exceedance Trend

Wastewater Treatment Facility Outfalls

LANL has three wastewater treatment facilities permitted to discharge treated effluent. The sanitary outfall shown in Table 4–14 refers to the TA-46 Sanitary Wastewater System Plant. The other two wastewater treatment facilities are the TA-50 Radioactive Liquid Waste Treatment Facility and the TA-16 High Explosives Wastewater Treatment Facility. Information on the operations of treatment facilities is presented in Section 4.9. Details on the improvements made to the treatment processes at the various wastewater treatment facilities may be found in the *SWEIS Yearbooks* (LANL 2002e, 2003h, 2004f, 2005f, 2006g).

The volume of treated effluent discharged from the TA-50 Radioactive Liquid Waste Treatment Facility has steadily decreased since the *1999 SWEIS*. In 2005, the Radioactive Liquid Waste Treatment Facility discharged 1.83 million gallons (6.9 million liters) compared to the 5.3 million gallons (20 million liters) discharged in 1999. Annual effluent discharges are shown in Table 4–13.

Effluent quality from the Radioactive Liquid Waste Treatment Facility has improved since the *1999 SWEIS*. At that time, the Radioactive Liquid Waste Treatment Facility effluent did not meet water quality discharge standards, resulting in a letter of noncompliance issued by NMED to LANL (LANL 2004c). New treatment processes have been installed since then to improve effluent quality. With these improvements, calendar year 2005 marked the sixth consecutive year that the Radioactive Liquid Waste Treatment Facility effluent had no violations of the NPDES permit limits or exceedances of the DOE Derived Concentration Guides for radioactive liquid wastes (Del Signore and Watkins 2005, LANL 2006a).

During this same 6-year period, the Radioactive Liquid Waste Treatment Facility has also met voluntary NMED groundwater standards for nitrates, fluoride, and total dissolved solids. Similarly, perchlorate concentrations in Radioactive Liquid Waste Treatment Facility effluent has been below the detection limit since March 2002, when perchlorate treatment equipment was installed. In addition, Radioactive Liquid Waste Treatment Facility tritium discharges have been less than one percent of the DOE Derived Concentration Guide since March 2001. Tritium-contaminated effluent that exceeds this voluntary standard of 20,000 picocuries per liter, which is the EPA drinking water standard, is now treated via evaporation at the TA-53 Radioactive Liquid Waste Treatment Plant (LANL 2004d). **Table 4–15** summarizes the water quality in the Radioactive Liquid Waste Treatment Facility effluent for 2005 for certain contaminants.

Since 1999, construction of TA-16 High Explosives Wastewater Treatment Facility has been completed and full operation has begun to comply with Federal Facility Compliance Act Agreement AO Docket No. VI-94-1210. With the operation of this new facility, 19 NPDES-permitted outfalls that previously received contamination from high explosives discharges have been eliminated. Three high explosives processing outfalls remain in use and the effluent discharged through these outfalls was reduced to 0.029 million gallons (0.11 million liters) per year in 2005. Yearly effluent discharged is shown in Table 4–13, High Explosives Processing Facility. The High Explosives Wastewater Treatment Facility is discussed further in Section 4.9 (LANL 2004d, 2005f, 2006g).

Table 4–15 Selected Water Quality Data for Radioactive Liquid Waste Treatment Facility Effluent in 2005

Contaminant	*Average Effluent Concentration in 2005*	*Standard Concentration Limit*	*Water Quality Standard*
Sum of 39 radionuclide ratios, including tritium	Less than 0.18	1.0 Sum of Ratios	DOE Derived Concentration Guideline
Nitrogen as nitrate	3.7 milligrams per liter	10 milligrams per liter	NMED Groundwater Standard for Human Health
Fluoride	0.24 milligrams per liter	1.6 milligrams per liter	NMED Groundwater Standard for Human Health
Total dissolved solids	182 milligrams per liter	1,000 milligrams per liter	NMED Groundwater Standard for Domestic Water Supply
Perchlorate	Not detected	(a)	No current standard
Tritium	3,200 picocuries per liter	2,000,000 picocuries per liter	DOE Derived Concentration Guideline
		20,000 picocuries per liter	EPA Primary Drinking Water Standard

NMED = New Mexico Environment Department, EPA = U.S. Environmental Protection Agency.
[a] The EPA has proposed a drinking water standard for perchlorate of 4 micrograms per liter, but it has not been issued yet.
Sources: LANL 2005h, 2006a, 2006h; Del Signore and Watkins 2005.

Treated liquid effluent from the TA-46 Sanitary Wastewater Systems Plant is currently pumped to storage tanks at TA-3 for reuse or is discharged to Sandia Canyon through an NPDES-permitted outfall.

The *1999 SWEIS* reported that the Los Alamos County Bayo Wastewater Treatment Facility discharges into Pueblo Canyon where that effluent could mobilize sediment contaminants from former LANL operations in Acid Canyon downstream. This facility is not owned or operated by LANL, but it may have an impact on contaminant transport in surface water and groundwater contamination (LANL 2005h).

4.3.1.3 Stormwater Runoff

During New Mexico's summer rainy season, there can be a large volume of stormwater runoff flowing over LANL facilities and construction sites picking up pollutants. The most common pollutants transported in stormwater flows are radionuclides, polychlorinated biphenyls, and metals (LANL 2005h). At the time of publication of the *1999 SWEIS*, conventional programs were in place at LANL to manage and control stormwater runoff from its industrial activities and construction projects. Since then, LANL has improved its monitoring of stormwater runoff. The program improvements are the result of changes in the EPA NPDES stormwater permitting program, increased regulatory attention on stormwater flows from solid waste management units, and ongoing programmatic changes that improve monitoring activities and implement best management practices for stormwater pollution prevention.

Stormwater runoff at LANL was managed under a Multi-Sector General Permit for industrial activities and a General Permit for construction projects in 1999. The Multi-Sector General Permit covered stormwater runoff from 25 onsite industrial activities, which included all solid waste management units as one of those industrial activities. Until March 2003, the Construction General Permit requirements addressed the management of stormwater runoff from various explosives wastewater treated and effluent discharged to NPDES-permitted outfalls. In 2005, the High Explosives Wastewater Treatment Facility discharged about 30,000 gallons (114,000 liters) to an outfall, compared to the *1999 SWEIS* projection of 170,000 gallons (644,000 liters) (LANL 2006g).

4.9.1.4 Industrial Effluent

Industrial effluent is discharged to a number of NPDES-permitted outfalls across LANL. Currently, LANL discharges wastewater to a total of 21 outfalls, down from the 55 outfalls identified in the *1999 SWEIS*. An effort to reduce the number of outfalls was initiated in 1997, with significant reductions realized in 1997 and 1998. Most of these reductions resulted from changes at the High-Explosives Processing Key Facility and High Explosives Testing Key Facility, with the redirection of some flows to the sewage plant at TA-46, and the routing of high explosives-contaminated flows through the High Explosives Wastewater Treatment Facility (LANL 2003h).

Discharges to outfalls are regulated under an NPDES permit, effective February 1, 2001. At most outfalls, actual flows are recorded by flow meters; at the remaining outfalls, flow is estimated based on instantaneous flows measured during field visits. With the exception of discharges during 1999, total discharges for the period of 1998 through 2005 from LANL outfalls have fallen within *1999 SWEIS* projections (LANL 2003h, 2004f, 2005f, 2006g).

4.9.2 Solid Waste

Sanitary solid waste is excess material that is not radioactive or hazardous and can be disposed of in a solid waste landfill. Solid waste generated at LANL is disposed of at the Los Alamos County Landfill, located within LANL boundaries, but operated by Los Alamos County. Solid waste includes paper, cardboard, plastic, glass, office supplies and furniture, food waste, brush, and construction and demolition debris. Through an aggressive waste minimization and recycling program, the amount of solid waste at LANL requiring disposal has been greatly reduced. In 2004, 6,380 tons (5,789 metric tons) of solid waste were generated at LANL, of which 4,240 tons (3,847 metric tons) was recycled (LANL 2004l). The per capita generation of routine solid waste (food, paper, plastic) at LANL has decreased by about 58 percent over the 10-year period from 1993 through 2003 (LANL 2004f). Nonroutine solid waste is generated by construction and demolition projects, and also includes waste generated by Cerro Grande Rehabilitation Project cleanup activities. Recycling of sanitary waste currently stands at 60 percent compared to 1993, when LANL recycled only about 10 percent of the sanitary waste. In 2005, the total amount of recycled sanitary waste reached 4,417 tons (4,007 metric tons), an increase from 2004 (LANL 2006g).

The *1999 SWEIS* projected that the Los Alamos County Landfill would not reach capacity until 2014, however, in accordance with direction from NMED, the County plans on closing the landfill (LAC 2006c). The landfill is expected to operate until fall 2008, when a new transfer station, operated by the County, will be used to sort and ship LANL sanitary wastes to a solid waste landfill outside the county (DOE 2005a).

water contamination more than the No Action Alternative because additional potential contamination sources at MDAs and PRSs would be avoided or eliminated.

Technical Area Impacts

DD&D of buildings at TA-21 would eliminate both the Tritium Science and Fabrication Facility and the Steam Plant, which both discharge industrial effluent into Los Alamos Canyon. As these are the only TA-21 outfalls, discharges from this TA would be eliminated in the Expanded Operations Alternative. The impact on surface water quantity in Los Alamos Canyon would be minor, as these effluents are less than 40 percent of the discharges into that canyon. Removal of these sources would have little to no impact on surface water quality, because the majority of the effluent comes from boiler blowdown and cooling water, which does not contain many contaminants.

Key Facilities Impacts

Under the Expanded Operations Alternative, impacts to surface water quality would be the same as described under the No Action Alternative, except as described below. Construction of a new Radioactive Liquid Waste Treatment Facility, two bridges, other building construction, and demolition of the existing annexes would have little or no adverse impact on surface water quality due to installation of stormwater management and erosion and sediment controls based on compliance with site-specific Stormwater Pollution Prevention Plans and LANL's construction specifications.

Radioactive Liquid Waste Treatment Facility

Proposed increased discharges from the Radioactive Liquid Waste Treatment Facility outfall resulting from increased activity at facilities that generate radioactive liquid waste (see Table 5–5) would result in about a 25 percent higher effluent discharge rate into Mortandad Canyon from that facility, compared to the No Action Alternative. This increase would have a negligible effect on Mortandad Canyon, as the Radioactive Liquid Waste Treatment Facility effluent currently accounts for about 9 percent of LANL's discharges into that canyon. This percentage of overall flow contribution would only increase to 11 percent at the higher discharge rate. Contaminant transport through sediment mobilization could be enhanced due to the increased outfall discharge rate. Cooling water discharges are the only other LANL effluents introduced into Mortandad Canyon.

Operation of a new Radioactive Liquid Waste Treatment Facility would have a beneficial impact on surface water quality because the improved low-level radioactive waste and transuranic waste processes would reduce the contaminant concentrations in the effluent discharged into Mortandad Canyon to levels that could meet potentially more stringent future water quality standards. An auxiliary action, which could be applied to any of the options for the new Radioactive Liquid Waste Treatment Facility, is to construct evaporation tanks and eliminate discharges into Mortandad Canyon. If the facility thus becomes a zero discharge facility, surface water quality would be positively affected. Elimination of effluent flows into the canyon at the Radioactive Liquid Waste Treatment Facility outfall would minimize the potential for contaminated sediments to become mobilized in streams, resulting in a beneficial impact to downstream surface water quality. There would be a minor reduction in surface water quantity in Mortandad Canyon if the Radioactive Liquid Waste Treatment Facility outfall were eliminated. Floodplain size would not be affected by this project.

Pajarito Site

Under the Expanded Operations Alternative, unneeded structures at TA-18 would be removed, thereby removing potential contamination sources from an area where they could be flooded. Parts of TA-18 lie within the 100-year floodplain for Pajarito Canyon. For example, the building that houses the Solution High-Energy Burst Assembly (SHEBA) is partially within the floodplain boundary. Although the possibility of floodwater mobilizing contaminants from the buildings is remote, complete removal of potential contaminant sources would protect surface water quality.

5.3.2 Groundwater Resources

Alternatives evaluated in the SWEIS have the potential to impact the quality of groundwater and the quantity of water available in aquifers. Groundwater quality can be affected by radionuclides and chemicals in liquid and solid waste that infiltrate into the ground. The quantity of groundwater available can be affected by changes in recharge rates and water supply well withdrawal rates. This section addresses potential impacts to groundwater from liquid effluent releases to the canyons and from solid radioactive waste disposal on the mesa tops. In addition, the effects of changes in recharge rates and water supply well withdrawal rates on water levels in the aquifer are discussed.

Impacts to the regional aquifer in the LANL area are generally measured over many years, primarily due to the long time necessary for contaminants to flow through the rock into the regional groundwater and the relatively small volume of water transported through the vadose zone in this arid climate. For the *1999 SWEIS*, significant adverse impacts to the regional aquifer were defined as changes to groundwater that alter the contaminant levels in concentrations above the drinking water standards in a way that can affect human health and safety. This could occur if any of the activities under consideration in the three SWEIS alternatives increase the flow rate of contaminants entering the deep groundwater.

Impacts to the alluvial groundwater are likely to occur more rapidly and could be affected either beneficially or adversely by changes to outfall flows from LANL. Some of the surface water carrying contaminants enters the alluvial groundwater system through canyon bottoms. Although surface-to-subsurface infiltration is fairly rapid in the canyons, any contaminants carried by the surface water are diluted by the large volume of water already stored in the ground; conversely, uncontaminated surface water infiltrating into already contaminated groundwater would cause its dilution over time.

Impacts to the alluvial aquifer may be considered significant if the concentrations of contaminants are altered in relation to the New Mexico and U.S. Environmental Protection Agency (EPA) groundwater standards for irrigation and other non-drinking-water uses. An adverse impact to the alluvial aquifer would be significant if, as a result of any of the activities proposed in the alternatives, contaminant levels increase so that the perched groundwater no

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Appendices A through H

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NNSA
National Nuclear Security Administration

Los Alamos Site Office

the hot cell plutonium-238 spill with no confinement is estimated to have the highest risks. For this accident, the annual risks are estimated to be 0.0021 LCFs (1 chance in 480) for the offsite population, 1.3×10^{-5} increased risk (1 chance in 77,000) of LCFs for the MEI, and 8.6×10^{-5} increased risk (1 chance in 12,000) of an LCF for a noninvolved worker located at a distance of 330 feet (100 meters) from the accident.

Table G–23 Radiological Accident Offsite Population and Worker Risks – Radiological Sciences Institute

Accident	*Onsite Worker (LCFs)*	*Offsite Population (LCFs)*	
	Noninvolved Worker at 330 Feet (100 meters) [a]	*MEI* [a]	*Population to 50 Miles (80 kilometers)* [b, c]
Hot cell fire involving plutonium-238 in general purpose heat source modules	3.9×10^{-6}	3.8×10^{-7}	0.00017
Seismic-induced building collapse and fire involving plutonium-238 in general purpose heat source modules [d]	4.4×10^{-6}	8.5×10^{-7}	0.00019
Seismic-induced building collapse with no fire involving plutonium-238 in general purpose heat source modules [d]	4.9×10^{-5}	2.8×10^{-6}	0.00067
Spill of plutonium-238 residue from 0.5-gallon (2-liter) bottles outside of hot cell	2.7×10^{-6}	4.0×10^{-7}	6.5×10^{-5}
Hot cell plutonium-238 spill with no confinement	8.6×10^{-5}	1.3×10^{-5}	0.0021
Main vault fire	$< 7.9 \times 10^{-8}$	$< 7.7 \times 10^{-9}$	$< 3.4 \times 10^{-6}$

LCF = latent cancer fatality, MEI = maximally exposed individual.

[a] Increased risk of an LCF to an individual per year.

[b] Increased number of LCFs for the offsite population per year.

[c] Offsite population size is approximately 300,000 persons located within a 50-mile (80-kilometer) radius.

[c] An updated probabilistic seismic hazard analysis has been completed for LANL (LANL 2007), which results in higher peak horizontal ground acceleration values for the same annual probability of exceedance. In the seismic accident analyses for the Radiological Sciences Institute, the radioactive source term was conservatively based on the assumption that all structures, systems, and components failed, therefore, the updated probabilistic seismic hazard analysis is not expected to change the accident consequences or risks.

Seismic accidents considered for the proposed Radiological Sciences Institute are estimated to have a probability of release of 0.1 (the same as at the Chemistry and Metallurgy Research Building); the Radiological Sciences Institute would be designed to withstand the evaluation-basis earthquake. In comparing a seismic accident scenario that includes a fire with one that does not include a fire, both located within the Radiological Sciences Institute, the former has higher potential for causing offsite population and MEI impacts, while the latter has higher individual worker impacts. This is because the buoyant effects of a fire loft the radioactive plume over the onsite workers, while the greater releases associated with this scenario would impact the general population farther downwind. In contrast, the absence of a fire and its buoyant effects has a greater impact on close-in individuals like the noninvolved worker at 330 feet (100 meters) and the nearby worker population.

G.4 Radioactive Liquid Waste Treatment Facility Upgrade Impact Assessment

This section provides an assessment of environmental impacts for the proposed Radioactive Liquid Waste Treatment Facility Upgrade. Section G.4.1 provides background information on the proposed project. Section G.4.2 provides a description of the proposed options for the Radioactive Liquid Waste Treatment Facility Upgrade. Section G.4.3 presents environmental consequences of the No Action Option and project options for the Radioactive Liquid Waste Treatment Facility Upgrade. The main volume of this SWEIS contains information about the general environmental setting of LANL and environmental impacts associated with continued operations of the site.

G.4.1 Introduction

The Radioactive Liquid Waste Treatment Facility treats radioactive liquid wastes generated at other LANL facilities and houses analytical laboratories supporting waste treatment operations. The principal capabilities and activities conducted at the Radioactive Liquid Waste Treatment Facility include: (1) waste characterization and packaging, including identification and quantification of constituents of concern in waste streams and packaging and labeling waste according to U.S. Department of Transportation regulations; (2) waste transportation including inspection and cross-checking for acceptance; (3) liquid and solid chemical materials and radioactive waste storage; (4) waste pretreatment; (5) radiological liquid waste treatment using a number of treatment processes, including ultrafiltration and reverse osmosis; and (6) secondary waste treatment.

The original Radioactive Liquid Waste Treatment Facility (Building 50-1) as shown in **Figure G–4** was constructed in 1963. Between 1963 and 1986, three annexes were attached to the north, south, and east sides of the original building. With the addition of these annexes, the current facility has a total floor area of approximately 42,300 square feet (3,900 square meters). The North Annex has a footprint of about 5,000 square feet (450 square meters); the East Annex has a footprint of about 7,000 square feet (630 square meters); and the South Annex has a footprint of about 7,500 (700 square meters).

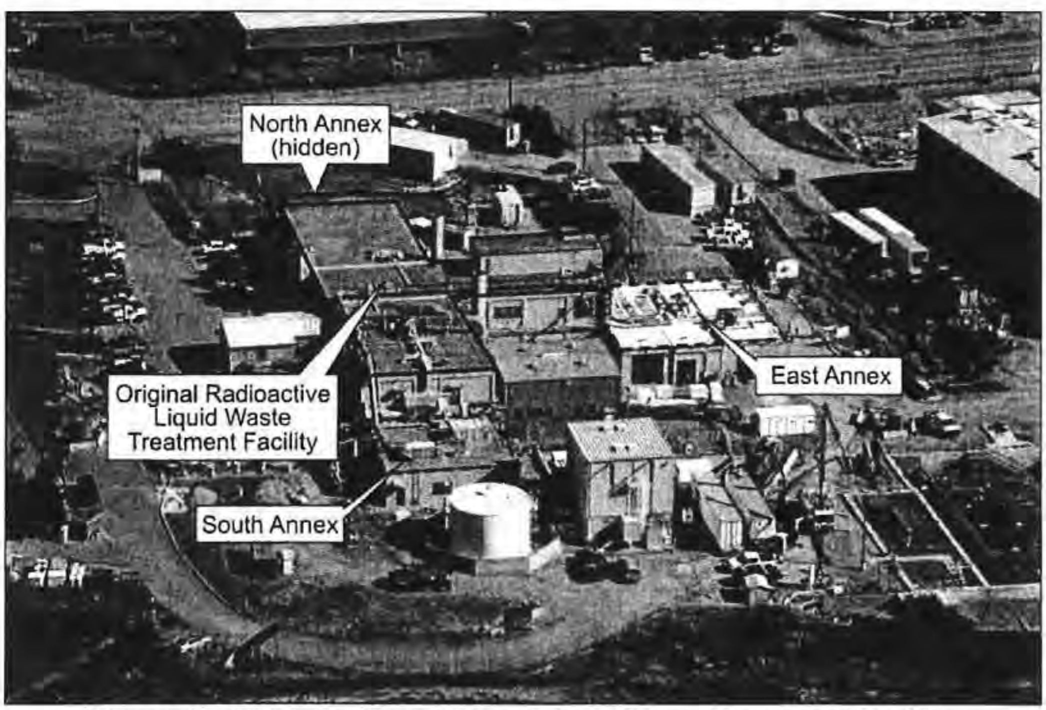

Figure G–4 Existing Radioactive Liquid Waste Treatment Facility

The Radioactive Liquid Waste Treatment Facility is the only facility available at LANL to treat a broad range of transuranic liquid wastes and low-level radioactive liquid waste. However, the ability of this facility to operate reliably is becoming increasingly uncertain. The original building is over 40 years old and has exceeded its design life. Similarly, the clarifiers, rotary vacuum filter, and heating, ventilation, and air conditioning systems, installed in 1963, are also over 40 years old. The infrastructure and treatment equipment require increasing maintenance attention to keep them operational, and replacement parts are increasingly difficult to acquire; replacement components for some older systems are no longer commercially produced. Corrosion of pipes and tanks has resulted in leaks. Radioactive Liquid Waste Treatment Facility materials and components are failing with increased frequency, and key systems could potentially fail within the next 5 to 10 years.

The current Radioactive Liquid Waste Treatment Facility treats all liquid radioactive waste generated at LANL except for that generated at TA-53 and occasionally that from TA-21. A system of pipes collects radioactive wastewater from various facilities, such as the Plutonium Facility at TA-55 and the Chemistry and Metallurgy Research Facility at TA-3, and transfers the wastewater to influent tanks at the Radioactive Liquid Waste Treatment Facility. In a few cases, trucks bring radioactive wastewater from other facilities to the Radioactive Liquid Waste Treatment Facility.

The influent waste stream contains two types of radioactive components: (1) tritiated water, and (2) radioactive solids that are either dissolved or suspended in the liquid. The existing and the proposed Radioactive Liquid Waste Treatment Facility treatment processes are designed to treat the dissolved or suspended solids, but are not able to extract tritiated water. Tritiated wastewater is discharged via a permitted outfall if it meets discharge criteria or is trucked to TA-53's evaporation ponds if it exceeds discharge criteria. Tritiated wastewater has not been trucked to the TA-53 evaporation ponds since 2003.

Although the treatment processes cannot remove tritiated water, they do extract suspended and dissolved radioactive solids from the liquid waste and concentrate the solids by removing additional liquid. The treated liquid is either returned to the low-level radioactive waste influent tank or released to a permitted outfall in Mortandad Canyon. Solid radioactive waste is placed in 55-gallon (208-liter) drums. Drums of solids that meet the waste acceptance criterion regarding liquid content are trucked to TA-54 for storage or disposal. Concentrated liquids resulting from the evaporator portion of the treatment process are sent by truck to a permitted commercial treatment facility in Tennessee for drying, a trip of about 1,400 miles (2,700 kilometers). Typically, about six shipments are made each year. The treatment facility returns the dried solids to TA-54. Drums of solidified transuranic waste from liquid treatment are stored at TA-54 pending preparation for shipment to WIPP near Carlsbad, New Mexico; low-level radioactive waste is disposed of in TA-54.

Future preparation of transuranic waste for shipment is expected to occur in a new TRU (Transuranic) Waste Facility in TA-54 (Appendix H, Section H.3.2.2.2). Some of the functions needed for preparation of transuranic waste from the Radioactive Liquid Waste Treatment Facility may be optionally duplicated in a separate structure co-located with the Radioactive Liquid Waste Treatment Facility. The environmental analysis conducted for the TRU Waste Facility bounds this possibility.

Because many treatment processes work best with water that contains certain ranges of minerals and chemicals and with certain quantities of water, design of the new facility would consider historical usage and future mission requirements. The lower-bound waste volumes assume the generators of radioactive wastewater implement various waste minimization and pollution prevention projects. Calculations of the upper-bound waste volumes assume these waste minimization and pollution prevention projects do not occur and changes in LANL's mission (in particular an increase in pit production up to 80 pits per year) would result in generation of more radioactive wastewater. **Table G–24** shows the quantities of wastewater that the new facilities would be designed to process annually. Upper-bound quantities would be about twice as large.

Table G–24 Design Basis Influent Volumes – Radioactive Liquid Waste Treatment Facility Upgrade

Influent	*Lower Bound (gallons per year)*
Low-level radioactive waste	2,507,000
Acidic transuranic waste	3,700
Caustic transuranic waste	2,600

Note: To convert gallons to liters, multiply by 3.7854.

G.4.2 Options Considered

For the Radioactive Liquid Waste Treatment Facility Upgrade, one No Action Option (see Section G.4.2.1) and three action options (see Sections G.4.2.2, G.4.2.3, and G.4.2.4) are proposed to address facility needs. Additionally, two auxiliary actions to reduce or eliminate the discharge are also proposed (see Section G.4.2.5). The auxiliary actions (evaporation tanks or mechanical evaporation) may be incorporated as part of the No Action Option or any of the three action options. Section G.4.2.6 presents options considered, but dismissed.

G.4.2.1 No Action Option

Under the No Action Option, the Radioactive Liquid Waste Treatment Facility would continue to process transuranic and low-level radioactive wastewater in the existing building. No new construction would occur. The annexes to the original Radioactive Liquid Waste Treatment Facility, which do not meet seismic and wind-loading standards, would not be removed. No existing contaminated materials would be removed. Existing processes would continue to treat liquid transuranic waste and liquid low-level radioactive wastes separately. Treatment processes would result in generation of transuranic sludge, low-level radioactive waste sludge, solid low-level radioactive waste, secondary liquid low-level radioactive wastes (evaporator bottoms), and treated effluent. The transuranic sludge would be solidified (cemented), then transported to TA-54 for storage, characterization, and shipment to WIPP for disposal. The low-level radioactive waste sludge would be dewatered, packaged, and shipped to TA-54 for disposal. Solid low-level radioactive wastes would be packaged and shipped to TA-54 for disposal. Secondary liquid low-level radioactive wastes would be transported by truck to an offsite treatment plant where it would be dried, and the resultant solids would be returned to LANL for disposal at TA-54 as solid low-level radioactive wastes, if it meets waste acceptance criteria. Optionally, effluent from the existing facility could be evaporated as discussed in Section G.4.2.5. The existing treatment processes for transuranic waste are shown in **Figure G–5**.

Under the No Action Option, LANL staff would continue to perform routine repairs, safety improvements, and replacement-in-kind of equipment on an as-needed basis. LANL would continue to meet current discharge standards, but may not be able to meet future discharge standards if they become more stringent and the auxiliary actions are not implemented. The existing Radioactive Liquid Waste Treatment Facility would continue to process radioactive liquid wastes until key systems irreparably fail or until the facility can no longer meet discharge standards. System failure or failure to meet discharge standards is estimated to occur sometime within the next 10 years. Therefore, this No Action Option does not meet NNSA's purpose and need to maintain treatment capability at LANL for 50 years.

G.4.2.2 Option 1: Single Liquid Waste Treatment Building Option – Proposed Project

Under the proposed project, NNSA would construct new low-level radioactive waste and transuranic liquid waste treatment facilities to achieve greater reliability, redundancy, and flexibility. A new waste treatment building would have a footprint of about 10,800 square feet (1,000 square meters). The building would consist of a partially below-grade basement, a main floor, and a mezzanine for a total area of 20,700 square feet (1,923 square meters), and would be accompanied by a new central utilities building. NNSA would also modify low-level radioactive and transuranic waste processes to become more effective and better able to incorporate future technology. Portions of the existing Radioactive Liquid Waste Treatment Facility, as described below, would be demolished. The existing facility would not be renovated but would continue to be used for offices and chemical analyses. New equipment would be purchased; some existing equipment may be used to supplement the new equipment and to provide redundancy. Additionally, either one of the auxiliary actions (evaporation tanks or mechanical evaporation) described in Section G.4.2.5 may be added to this option.

The proposed location of the single new low-level radioactive waste and transuranic facility is west of the existing Radioactive Liquid Waste Treatment Facility in an existing parking area (see **Figure G–6**). The building would be sited near the point where transuranic waste lines enter TA-50 to minimize the distance this wastewater must flow to reach the treatment facility. NNSA would conduct DD&D of the East Annex. The existing transuranic storage tank vault (TA-50-66) and the transformer on the north side of the existing Radioactive Liquid Waste Treatment Facility would also be demolished. Some wastewater collection pipes and utilities in the immediate vicinity of the Radioactive Liquid Waste Treatment Facility may be rerouted. Some remediation of contaminated soils would be required.

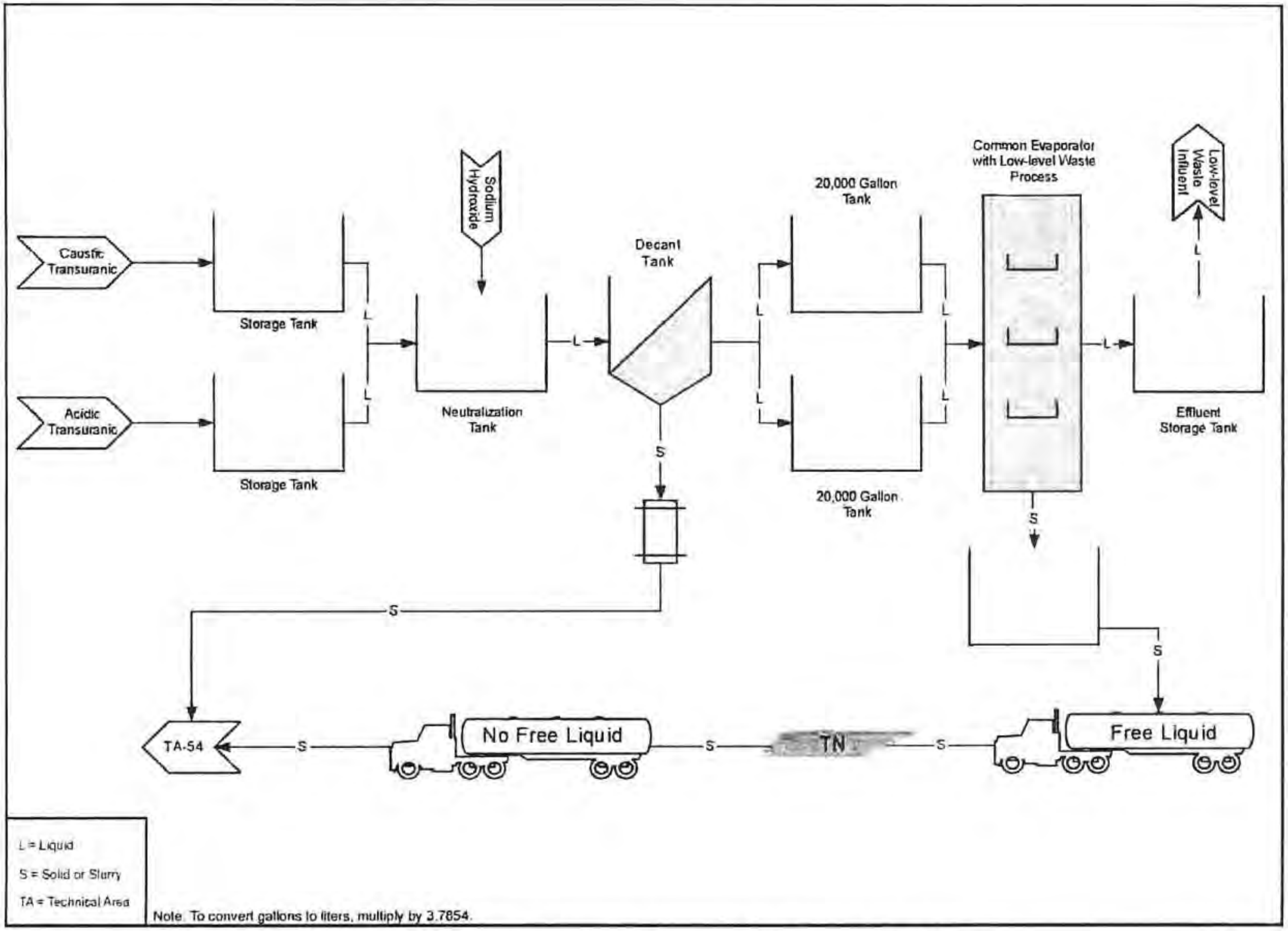

Figure G–5 Existing Treatment Processes for Transuranic Waste

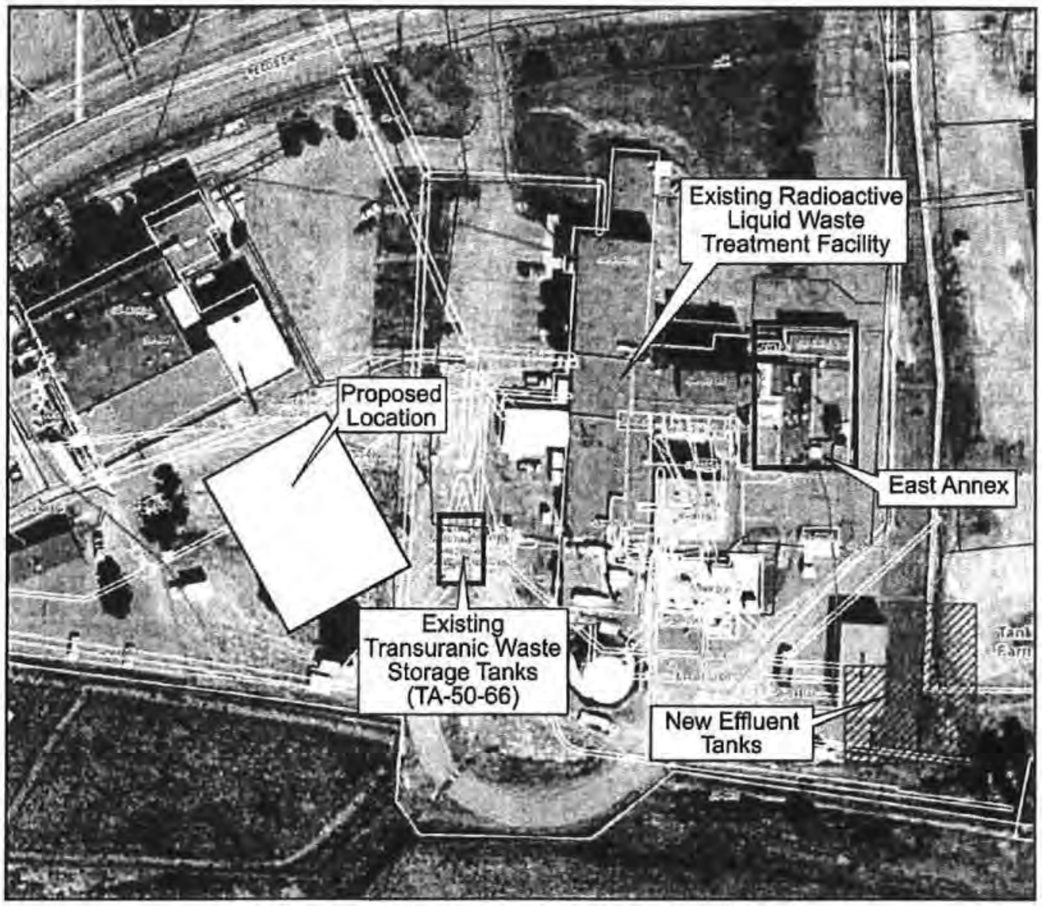

Figure G–6 Proposed Project Location

The proposed low-level radioactive waste treatment process consists of removing suspended and dissolved solids from the liquid waste stream, concentrating the solid waste stream by removing additional liquid, packaging the resulting solid radioactive waste, and ultimately releasing the remaining liquids to a permitted outfall or to evaporative processes. **Figure G–7** shows the proposed low-level radioactive waste treatment process. This process would receive waste via pipeline from the low-level radioactive waste influent tanks and distillate from the transuranic waste treatment process. Some industrial wastewater that cannot be treated by other LANL wastewater treatment systems may also be treated (LANL 2005e). In a typical year, the system could receive approximately 2.5 million gallons (9.5 million liters) of liquid low-level radioactive waste, although the upper bound influent volume may be up to 5 million gallons (20 million liters). The proposed transuranic waste treatment process is shown in **Figure G–8**. The transuranic influent tanks can store approximately 25,000 gallons (96,000 liters) per year of transuranic acid wastewater and 9,000 gallons (34,000 liters) per year of transuranic caustic wastewater. Redundant tanks would handle overflows and drainage.

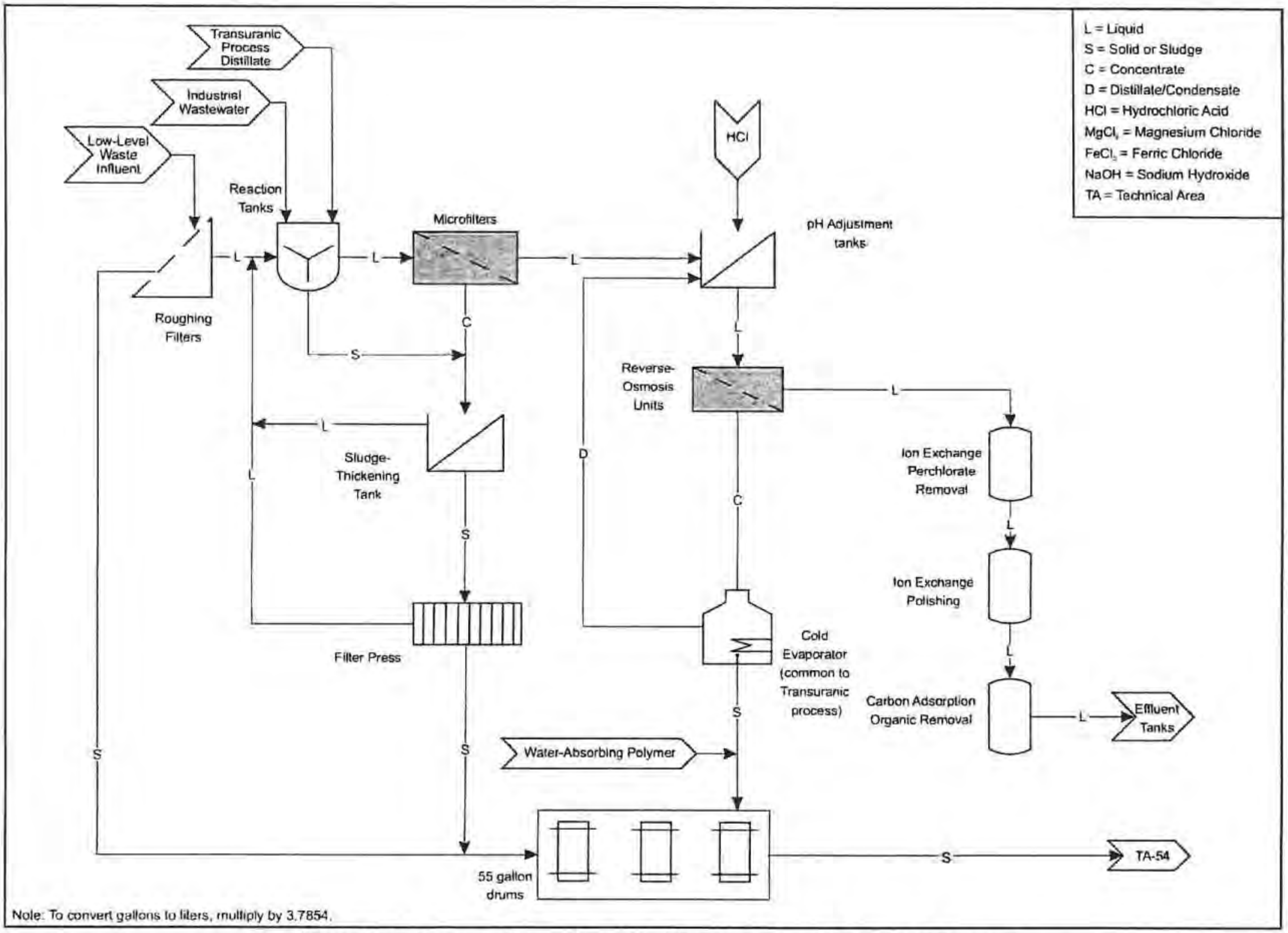

Figure G–7 Proposed Low-Level Radioactive Waste Treatment Process

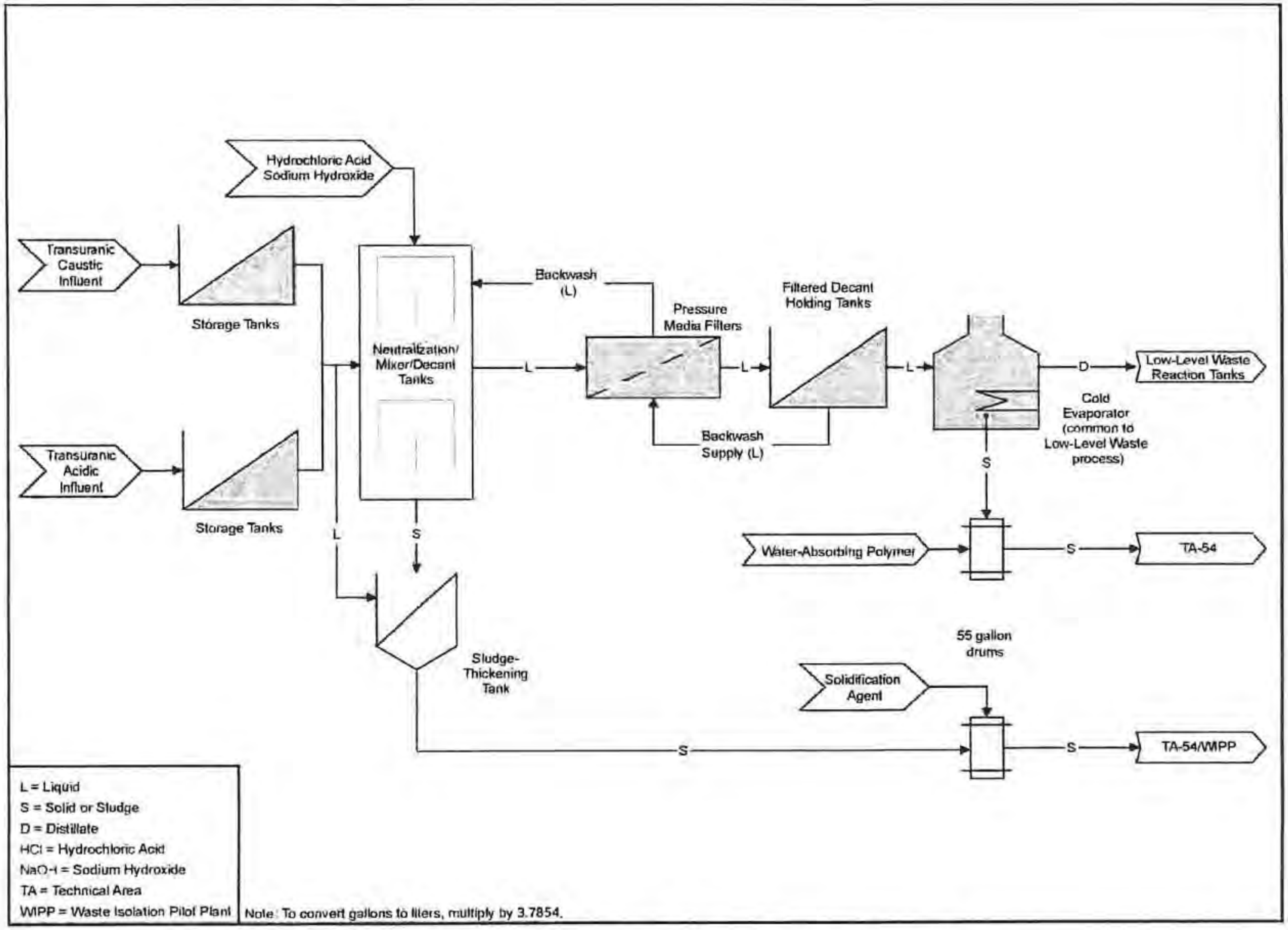

Figure G–8 Proposed Transuranic Waste Treatment Process

G.4.2.3 Option 2: Two Liquid Waste Treatment Buildings Option

This option would involve construction and operation of two new treatment facilities: one for low-level radioactive waste and one for transuranic waste (see **Figure G–9**). A central utilities building would also be constructed. The new low-level radioactive waste facility would have a footprint between 25,000 and 35,000 square feet (2,323 to 3,150 square meters) and would be located on the north side of the Radioactive Liquid Waste Treatment Facility. The transuranic waste facility would be located close to the point where transuranic waste lines enter TA-50, southwest of the existing Radioactive Liquid Waste Treatment Facility, to minimize the distance this wastewater must flow to reach the treatment facility. The transuranic waste facility would require approximately 15,000 square feet (1,350 square meters) of floor space. Like the low-level radioactive waste facility, it would contain processing areas, mechanical rooms, a control room, and access control areas. Additionally, either one of the auxiliary actions (evaporation tanks or mechanical evaporation) described in Section G.4.2.5 may be added to this option.

Locating the new low-level radioactive waste facility north of the existing Radioactive Liquid Waste Treatment Facility would necessitate demolition of the North Annex, in addition to the East Annex, as well as a transformer located on the north side of the existing facility. The existing transuranic waste storage tank vault (TA-50-66) would be demolished. Some remediation of contaminated soils would be required. The new facilities would use the same treatment process as that described for the proposed project. All other aspects of this option are the same as those of the proposed project (Option 1).

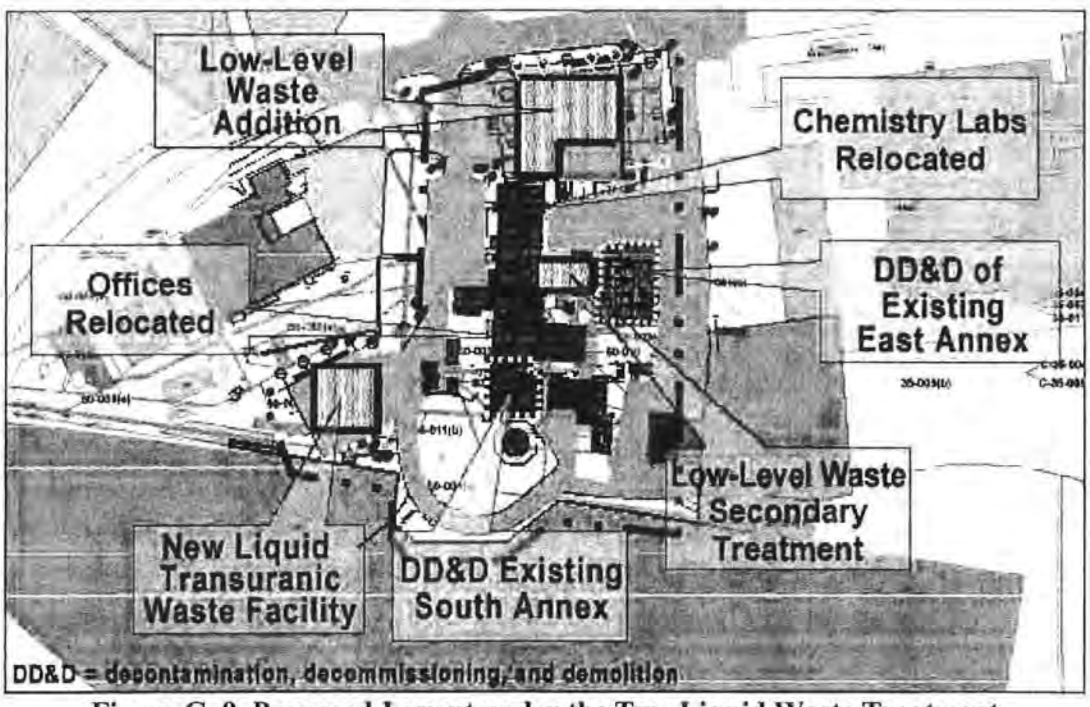

Figure G–9 Proposed Layout under the Two Liquid Waste Treatment Buildings Option

As a variation on this option, treatment functions to be housed in two facilities may be housed in multiple facilities in addition to the central utilities building. For example, separate structures may be constructed for portions of the transuranic waste treatment train rather than being consolidated into one structure.

G.4.2.4 Option 3: Two Liquid Waste Treatment Buildings and Renovation Option

Under Option 3, new buildings would be constructed to house the low-level radioactive waste and transuranic waste treatment processes, as in Option 2. As for Option 2, two new treatment buildings are envisioned, in addition to a central utilities building, although separate functions of the liquid waste treatment trains may be optionally housed in separate structures. In addition, the existing Radioactive Liquid Waste Treatment Facility would be renovated and reused for offices, chemistry laboratories, and drying of various solid residues (secondary waste) from the low-level radioactive waste treatment system.

Upon completion of the new facilities, the low-level radioactive waste and transuranic waste processes would be established in the new facilities and renovation of the existing facility would begin. When renovation is completed, equipment needed to dry the solid residues would be installed and operated in the renovated facility. In the interim, solid wastes would continue to be shipped off site for dewatering. The wastewater streams would be treated in the same way as under the proposed project (Option 1), and the treated effluent would similarly be discharged into Mortandad Canyon, reused, or evaporated. One of the auxiliary actions (evaporation tanks or mechanical evaporation) described in Section G.4.2.5 may be added to this option.

This Two Liquid Waste Treatment Buildings and Renovation Option (Option 3) would entail major structural and infrastructure changes to the existing Radioactive Liquid Waste Treatment Facility. Existing external walls would be removed and replaced with seismically appropriate materials and construction as required to meet LANL engineering standards for Hazard Category 2 facilities. Electrical and plumbing systems that do not meet current building codes would be replaced. Piping that does not conform to spill control requirements would also be replaced. The North, South, and East Annexes would be demolished, as they do not meet seismic requirements; failure of these structures could have a detrimental effect on existing and new construction. Under this option, the process of characterizing, demolishing, and removing contaminated materials would be the same as that under the proposed project (Option 1).

G.4.2.5 Auxiliary Actions

For the Radioactive Liquid Waste Treatment Facility Upgrade, two auxiliary actions are proposed to reduce or eliminate this discharge. The auxiliary actions could be applied to the No Action Option or any of the action options.

The first auxiliary action consists of constructing evaporation tanks and allowing the wastewater to evaporate using passive solar energy. The tanks would consist of up to three individual tanks constructed of lined, self-supporting concrete structures having walls approximately 4 feet high. Each tank would be open on top and have a surface area for evaporation of about an acre, with a total surface tank area of about 3 acres (1.2 hectares). The tanks would be surrounded by a security fence slatted with inserts to provide a wind screen. Except for periodic cleaning to eliminate the buildup of dissolved solids in the water, the tanks would be managed to always retain a minimum level of water. During cleaning, salt (and blown-in dirt) on the floor and sidewalls of the tanks would be flushed to a sump for solids removal, and the filtrate from solids removal returned to the evaporation tanks. The evaporation tanks could be constructed at a site in TA-52, located about a mile east of the Radioactive Liquid Waste Treatment Facility. A pipeline would be constructed to transport effluent from the Radioactive Liquid Waste Treatment Facility to the evaporation tanks.

The second auxiliary action option consists of the use of mechanical evaporation. Evaporative equipment would be purchased and installed at or near the proposed low-level radioactive waste treatment building.

G.4.2.6 Options Considered but Dismissed

Two additional action options were considered but dismissed from further evaluation. The first of these would be to construct the new radioactive liquid waste treatment facilities in another location. This site option was dismissed because the collection system, which is already in place to deliver wastewater to the current Radioactive Liquid Waste Treatment Facility, would need to be rebuilt in new locations. Constructing a new collection system has the potential for negative impacts on a number of resources without a benefit over the options being considered. The existing facility is in reasonable proximity to the source of most of the transuranic wastewater. Any other location would entail additional collection infrastructure and a longer distance over which wastewater would be transferred. In addition, the current facility has an existing NPDES permit to discharge at its current location.

The second option considered but dismissed from further evaluation would be to renovate the existing Radioactive Liquid Waste Treatment Facility to house the new transuranic waste and low-level radioactive waste treatment processes. This option is not feasible, as the capability to treat radioactive liquid wastewater must be maintained so that LANL missions are not impacted. Engineering and process reviews have determined that it is not feasible to install additional treatment equipment in the existing facility while the current treatment process is operating due to lack of space. The existing treatment processes must be maintained with no more than 10 days of downtime to ensure that mission-critical activities in facilities that generate liquid radioactive waste can be maintained. The time required to renovate the existing facility would far exceed 10 days.

G.4.3 Affected Environment and Environmental Consequences

This section presents an analysis of environmental consequences for each of the four options presented in Section G.4.2. Affected environment descriptions are also included where information is available that is specific to the project site and has not been included in Chapter 4 of this SWEIS. Detailed information about the LANL environment is presented in the main volume of this SWEIS. The auxiliary actions (see Section G.4.2.5) are not evaluated separately, but are largely evaluated as part of each of the action options (Options 1, 2, and 3). These auxiliary action evaluations would be also applicable to the No Action Option.

Proposed sites for the new transuranic and low-level radioactive waste buildings are within the developed area of TA-50, adjacent to the existing Radioactive Liquid Waste Treatment Facility. The area has been designated as an industrial area focused on Nuclear Materials Research and Development in *LANL's Comprehensive Site Plan*. Mortandad Canyon, which lies north of the proposed project, is largely undeveloped.

An initial assessment of the potential impacts of the proposed project identified resource areas for which there would be no or only negligible environmental impacts. Consequently, for the following resource areas, a determination was made that no further analysis was necessary.

- *Noise* – Would be managed with standard worker protective measures; no impact on the public due to location.
- *Socioeconomics and Infrastructure* – No new employment is expected. Construction and DD&D workers would be drawn from the pool of construction workers employed on various projects at LANL. Only infrastructure impacts are included in the impacts discussion.
- *Environmental Justice* – The proposed project is mainly confined to already-developed areas of TA-50, with no disproportionate human health impacts to low-income or minority populations expected.
- *Facility Accidents* – Potential facility accidents associated with this proposed project are addressed as part of the No Action Alternative of this SWEIS.

Resource areas examined in this analysis include: land resources, geology and soils, water resources, air quality, ecological resources, human health, cultural resources, site infrastructure, waste management, and transportation.

G.4.3.1 No Action Option

No changes in air emissions or biological resources are expected under the No Action Option. Although the Radioactive Liquid Waste Treatment Facility is currently able to meet existing discharge standards, the facility may not meet more stringent discharge standards in the future. Implementation of the auxiliary action options would greatly reduce or eliminate liquid effluent discharges and therefore beneficially effect water quality. Construction impacts from particulate or radioactive emissions would not occur. There would be no effects on land resources, cultural resources, human health, transportation, traffic, or infrastructure under the No Action Option.

Between 1998 and 2004, the Radioactive Liquid Waste Treatment Facility received a range of about 2.2 million to 5.9 million gallons (8.4 million to 22.3 million liters) of low-level radioactive waste influent per year (LANL 2005e). During that same period, solid low-level radioactive waste volumes ranged from 173 to 510 cubic yards (132 to 390 cubic meters) per year (LANL 2003b, 2004d, 2006a).

During 2005, the facility treated and discharged about 1.8 million gallons (6.8 million liters) of effluent to a permitted outfall. Also during 2005, 339 cubic yards (259 cubic meters) of solid low-level radioactive waste, very small quantities of mixed low-level radioactive waste, and

15.9 pounds (7.2 kilograms) of chemical waste were generated. About 75 cubic yards (57.5 cubic meters) of the low-level radioactive waste was construction soil and debris from installing influent storage tanks for the Cerro Grande Rehabilitation Project (LANL 2006f).

Under the No Action Option, low-level radioactive waste volumes are expected to be similar to the past few years of Radioactive Liquid Waste Treatment Facility operation, when more-efficient treatment equipment was brought online and radioactive solids were more effectively removed than in previous years. Because the treatment process would not be improved under the No Action Option, the amount of solid low-level radioactive waste to be generated would be largely a product of the influent volume and contamination concentrations. The average influent volume for 2003–2004 was 2.7 million gallons (10.3 million liters), while average low-level radioactive waste generation was 488 cubic yards (373 cubic meters) (LANL 2003b, 2004d, 2006a). Influent and waste generation levels were smaller than those averages in 2005 (LANL 2006f). If all pollution prevention measures and mission changes are implemented as scheduled, low-level radioactive waste influent volumes are expected to decrease slightly from current levels by about the year 2014 (LANL 2005e). Solid low-level radioactive waste volumes are expected to decrease slightly as well.

Similarly, because the treatment process would not be improved under the No Action Option, transuranic waste quantities would be a function of the influent volume and influent contamination concentrations. For the years 1998-2002, the Radioactive Liquid Waste Treatment Facility received on average 1,412 gallons (5,346 liters) of caustic transuranic and 8,792 gallons (33,276 liters) of acid transuranic influent per year. In that same period, the Radioactive Liquid Waste Treatment Facility produced approximately about 6.5 to 7.8 cubic yards (5 to 6 cubic meters) of solid transuranic and mixed transuranic waste annually. Under the No Action Option, the transuranic waste influent would approximately double if mission changes and pollution prevention measures are implemented. The amount of transuranic solid waste generated by treatment of the influent is likely to increase in a similar way.

Construction and operation of the evaporation tanks would have the same impacts as those detailed for Options 1, 2, and 3 in Section G.4.3.2.

G.4.3.2 Option 1: Single Liquid Waste Treatment Building Option – Proposed Project

Land Resources—Land Use

Land in TA-50 where the new building would be constructed is in the immediate vicinity of the Radioactive Liquid Waste Treatment Facility, a highly developed area with a land use designation of Waste Management (see Section 4.1 for a land use map and description). If evaporation tanks were constructed, the pipeline to them would be routed east through TA-63 and TA-52 in areas with current land use designations of Physical and Technical Support, Experimental Science, and Reserve. The proposed location of the evaporation tanks near the border of TA-52 and TA-5 is designated Reserve (LANL 2003b).

Construction Impacts—Construction of the new liquid waste management building would occur in a developed area and result in no changes to current or future land use designations. If the option to construct evaporation tanks is implemented, the land use designation for the tank areas and along a portion of the pipeline would likely change from Reserve to Waste Management. The tanks themselves could occupy approximately 3 acres (1.2 hectares), but a somewhat larger area (up to 4 acres [1.6 hectares]) would undergo a change in land use designation. Removing this land from the Reserve designation was not previously accounted for in land use plans (LANL 2004d).

Land Resources—Visual Resources

As noted previously in the land use discussion, the area in which the treatment buildings would be constructed is a highly developed area. This area currently has an industrial look, with a mix of buildings of different design. The area proposed for construction of the tanks is currently undeveloped and wooded.

Construction Impacts—There would be temporary local visual impacts associated with construction of the new treatment building, and during excavation from the use of construction equipment. The current natural setting in the area of the evaporation tanks, and a portion of the pipeline, would be disrupted by removal of vegetation, establishment of a construction staging area, and construction activities. Construction would entail excavation of soils to construct the tanks and pipeline, and possibly the temporary establishment of a soil pile. Excess soils would be removed and used or stockpiled elsewhere.

Operations Impacts—The new treatment building would not result in a change to the overall visual character of the area within TA-50. The facility would be a maximum of two stories and constructed in accordance with site guidelines, which establish acceptable color schemes for building exteriors. Establishment of evaporation tanks would result in a permanent change to the visual environment in the area near the border of TA-52 and TA-5. Although this change would result in a noticeable break in the forest cover when seen from higher elevations to the west of LANL, due to their low profile and the presence of nearby forest vegetation, the tanks would not likely be visible from the east. Additionally, the tanks would be surrounded by a fence that would be colored to blend with the surrounding environment. Following regrowth of vegetation, the area disturbed for pipeline construction would not be noticeable.

DD&D Impacts—Removal of the East Annex and TA-50-66 would result in temporary local visual impacts in the form of construction equipment and the presence of partially demolished buildings. Long-term effects would be a slightly improved local visual environment, once the annex and TA-50-66 are removed.

Geology and Soils

The existing Radioactive Liquid Waste Treatment Facility is categorized as a potential release site; other potential release sites representing possible historic spills, polychlorinated biphenyls, or leakage of radioactive wastewater are present in the vicinity of the proposed construction at TA-50. A large radioactive waste material disposal area (MDA), designated MDA C, is immediately south of the existing Radioactive Liquid Waste Treatment Facility. NNSA is implementing environmental investigation and remediation measures for MDA C and other potential release sites at TA-50 in accordance with DOE requirements and the Consent Order.

TA-50 is approximately 0.8 miles (1.25 kilometers) east of the nearest mapped fault, a subsidiary of the Rendija Canyon Fault (see Section 4.2 of this SWEIS). However, previous study indicates that the level of seismic risk is low and is manageable through facility design. Any new facilities would be designed in accordance with current DOE seismic standards and applicable building codes.

Because building construction would occur within areas already disturbed by previous facility construction, there would be no impact on native soils. Construction of the new facilities would require removal of facility soils as well as new excavation of shallow bedrock in some areas. As a result, construction activities would generate excess soil and excavated bedrock that may be suitable for use as backfill. Uncontaminated backfill would be stockpiled at an approved material management area at LANL for future use. Best management practices would be implemented to prevent erosion and migration of disturbed materials from the site caused by stormwater, other water discharges, or wind.

Construction Impacts—Approximately 36,000 cubic yards (28,000 cubic meters) of soil and rock would be disturbed during building excavation. If construction of the evaporation tanks and associated pipeline also occurs, an additional 69,000 cubic yards (53,000 cubic meters) of excavation work would be required. Nevertheless, the proposed project would initiate removal of contaminated areas adjacent to the Radioactive Liquid Waste Treatment Facility and would have a positive effect. The East Annex and TA-50-66 would also be demolished, and remediation of associated potential release sites would be initiated.

Operations Impacts—There would be minimal operations impacts on geology and soils. Evaporation of liquid effluent would eliminate addition of contaminants to soil and sediment below the existing permitted outfall. As noted above, construction activities may remove contaminated media, resulting in a reduced potential for contamination spread from past releases.

DD&D Impacts—Contaminated material would be removed from the areas affected by demolition and construction, and would be managed according to waste type and LANL procedures.

Water Resources

The Radioactive Liquid Waste Treatment Facility currently releases treated effluent to Mortandad Canyon at a permitted outfall. Other industrial outfalls and stormwater also discharge into Mortandad Canyon, both upstream and downstream from the Radioactive Liquid Waste Treatment Facility. Mortandad Canyon crosses lands belonging to the Pueblo of San Ildefonso before discharging into the Rio Grande. Existing contaminants are known to be present in Mortandad Canyon. A permeable reactive membrane barrier designed to trap contaminants and to prevent their movement downstream toward the Pueblo of San Ildefonso is located downstream from TA-50.

Construction Impacts—Construction could result in movement of contaminated and uncontaminated materials. The effects of construction would be mitigated by implementation of a stormwater pollution prevention plan to contain sediments and prevent erosion.

Operations Impacts—The overall effect of implementing the proposed project is expected to be positive. This option would ensure that both current and projected future discharge requirements could be met. During operations, effluent water quality is expected to improve due to improved processing and potentially more-stringent discharge requirements. If discharges are eliminated or greatly decreased through recycling or evaporation, movement of contaminants in groundwater and surface water in Mortandad Canyon is expected to decrease. If liquid discharge is not reduced or completely eliminated by recycling or evaporation, the permeable reactive membrane barrier is expected to mitigate the downstream movement of contaminants. The potential for spills of contaminated water would be greatly reduced by replacing single-walled piping with double-walled pipes and by use of secondary containment structures.

DD&D Impacts—Demolition could result in mobilization of particulates that could be entrained in offsite sediments. However, erosion control measures specified in a stormwater pollution prevention plan would be implemented. Movement of contaminated or uncontaminated materials is, therefore, expected to be negligible.

Air Quality

The Radioactive Liquid Waste Treatment Facility contributes less than 1 microcurie of radioactive emissions to LANL's total radioactive emissions. Likewise, Radioactive Liquid Waste Treatment Facility emissions of criteria air pollutants (nitrogen oxides, sulfur oxides, particulate matter, carbon monoxide, and volatile organic compounds) and other hazardous air pollutants are small relative to LANL's overall emissions.

Construction Impacts—Construction and demolition would result in temporary increases in particulate emissions.

Operations Impacts—Sufficient information to assess emissions and doses from a new treatment building is not yet available. The effect of the proposed project on air quality is expected to be minimal. During operations, radioactive air emissions are expected to be within an order of magnitude of current air emissions. Because current radioactive air emissions are very low, radioactive emissions from the processes to be implemented under any of the new construction options would likely not be major contributors to the total LANL radioactive emissions. Stack monitoring requirements would be adjusted as necessary based on the final design. New combustion equipment installed as part of any of the new construction options would be low-nitrogen-oxide emitters compared to existing equipment. Radiological and nonradiological emissions associated with solar evaporation of effluent are expected to be small, and dominated by evaporation of water containing tritium.

DD&D Impacts—Demolition of the East Annex and the transuranic waste influent storage tanks (TA-50-66) would likely produce radioactive or hazardous emissions. These emissions would be temporary, but released particulates could be dispersed to other areas. Because of the presence of contaminated soils and structural materials, there is potential to release radioactive or other hazardous constituents. Standard measures for controlling fugitive emissions would be employed.

Ecological Resources

The Radioactive Liquid Waste Treatment Facility is located within a highly developed industrial area of TA-50 and contains no important biological resources. However, the evaporation ponds would be located in an open field containing scattered trees. Mortandad Canyon contains breeding and foraging habitat for the Mexican spotted owl. The industrial area where the Radioactive Liquid Waste Treatment Facility is located is within developed Mexican spotted owl core habitat and its developed buffer zone. The area where the evaporation tanks would be located is also within the buffer and cores zones of the Sandia and Mortandad Canyon Area of Environmental Interest (LANL 2000).

Construction Impacts – Construction of the new Radioactive Liquid Waste Treatment Facility would not disturb any natural habitat. The biological assessment prepared by DOE, however, determined that constructing the evaporation tanks and pipeline would remove about 5.4 acres (2.2 hectares) of undeveloped core and buffer habitat of the Mexican spotted owl (LANL 2006b). It was also determined that construction of the Radioactive Liquid Waste Treatment Facility would likely result in noise levels greater than 6 dB(A) above background levels in the core zone; however, these levels should attenuate to below this level within 0.25 miles (0.4 kilometers) of the construction site. The biological assessment concluded that with the application of reasonable and prudent alternatives the project may affect, but is not likely to adversely affect, the Mexican spotted owl. Reasonable and prudent alternatives would include not permitting work to start between March 1 and the completion of surveys aimed at determining if owls were present in order to avoid a sudden increase in noise levels during the breeding season (LANL 2006b). Additional reasonable and prudent alternatives would be similar to those addressed in Section G.3.3.2. The USFWS has concurred with this assessment (see Chapter 6, Section 6.5.2).

The bald eagle Area of Environmental Interest is not located near the proposed project site. However, because the entire LANL site is considered potential bald eagle foraging area, there may be some habitat degradation associated with the project. Provided reasonable and prudent alternatives are implemented to protect adjacent foraging habitat from detrimental cumulative effects (see Section G.2.3.2), the DOE biological assessment concluded that construction of the Radioactive Liquid Waste Treatment Facility may affect, but is not likely to adversely affect, the bald eagle. Because the proposed project is not within or upstream of the southwestern willow flycatcher Area of Environmental Interest, the biological assessment determined that the project would not affect this species (LANL 2006b). The USFWS has concurred with the DOE biological assessment as it relates to the bald eagle and southeastern willow flycatcher (see Chapter 6, Section 6.5.2).

Operations and DD&D Impacts – No direct effects on sensitive species are expected from Radioactive Liquid Waste Treatment Facility Operations. However, a biological assessment prepared by DOE predicted that if water is evaporated and not discharged to Mortandad Canyon the reduction in flow would decrease the extent of perennial and intermittent stream reaches and associated wetland and riparian habitat. This could in turn reduce the abundance and diversity of prey species for the Mexican spotted owl. Thus, the biological assessment concluded that zero discharge may adversely affect the Mexican spotted owl (LANL 2006b). But after reviewing the assessment, the USFWS determined that the affects to the Mexican spotted owl would be insignificant and discountable, and would not result in adverse affects (see Chapter 6, Section 6.5.2).

DD&D effects are expected to be temporary and to have no direct impact on sensitive species.

Human Health

The Radioactive Liquid Waste Treatment Facility has very low radioactive emissions. These emissions do not have a distinguishable effect on the projected dose to the public. Current Radioactive Liquid Waste Treatment Facility operations are conducted with a commitment to maintaining radiological doses to workers at ALARA levels.

Construction Impacts—Construction would have potential for affecting only worker health. Based on an estimated 141,000 projected person-hours and accident rates for construction at DOE sites and for the general construction industry, 2 to 6 recordable injuries and no fatalities could be expected from construction of the new treatment buildings and associated structures. If the evaporation tanks and pipeline were built, an additional 420,000 person-hours would be required, with a possibility of 5 (DOE 2004) to 18 (BLS 2003) recordable injuries.

Operations Impacts—Emissions from operating the new treatment processes would remain very low, so there would be no distinguishable contribution to the dose to the public from all LANL activities. Emissions from effluent evaporation would be small and dominated by tritium, assuming operation of the evaporation tanks as described in Section G.4.2.5. The potential quantity of evaporated tritium would be minimal compared to the quantity of tritium emitted from other Key Facilities (for example, the Tritium Facility and the Plutonium Facility). The associated radiation dose would be small and enveloped by the impacts to the public discussed in Chapter 5, Section 5.6.1.

Worker health and safety at the facility would improve during operations under this option for two reasons: (1) the new buildings, equipment, and infrastructure would be more reliable and require less maintenance; and (2) because the buildings and process are being designed together (rather than retrofitting new equipment into an old building), when maintenance is needed, prolonged periods of time in zones with potential for radiation doses would be less than those in the current Radioactive Liquid Waste Treatment Facility. Maintenance of the evaporation tanks including periodic cleaning may cause occupational exposures to workers. However, radiation doses would be maintained to levels as low as reasonably achievable below DOE occupational dose limits in 10 CFR Part 835, and exposures to non-radioactive materials would be maintained well below established occupational exposure limits.

DD&D Impacts—Under this option, workers could be exposed to radiologically or chemically contaminated materials during demolition activities. Worker risks would be mitigated by use of personal protective equipment and pre-established safety procedures. Based on an estimated 56,000 person-hours and construction accident rates, 1 to 2 recordable injuries could be expected to occur from DD&D (DOE 2004, BLS 2003).

Cultural Resources

There are no archaeological remains within the developed area of TA-50. Archaeological sites in the vicinity of the proposed evaporation tanks and pipeline would be avoided. The existing Radioactive Liquid Waste Treatment Facility qualifies as a historic building. Any removal of process equipment or demolition of portions of the structure requires historic building documentation to mitigate any adverse effects.

Construction Impacts—Under Option 1, construction would not affect cultural resources. Changes in the Radioactive Liquid Waste Treatment Facility process area would require historic documentation before any equipment is removed from the building. Any mitigation plans would have to be implemented before or during project implementation.

The pipeline and tanks would be sited to avoid impacts on nearby archaeological sites to the extent practical. However, if the pipeline alignment or the tanks encroached on cultural sites, the sites would be fenced for avoidance or excavated.

Operations Impacts—Operations conducted under the proposed project would not affect historic buildings.

DD&D Impacts—Effects on historic buildings under this option are expected to be minimal. Removal of the East Annex is not likely to affect the original historic fabric of the Radioactive Liquid Waste Treatment Facility. Removal of both the East Annex and the transuranic waste influent storage vault (TA-50-66) would require historic documentation before the demolition process began.

Socioeconomics and Infrastructure

Major infrastructure (potable water, sewage, natural gas, and electricity) is available at TA-50. As necessary, utility infrastructure and capacity will be evaluated under a separate action to determine upgrade requirements due to demand from proposed new projects, including the Radioactive Liquid Waste Treatment Facility. Recently installed natural gas infrastructure would adequately accommodate the Radioactive Liquid Waste Treatment Facility. The radioactive liquid waste collection system, which pipes radioactive liquid waste to the Radioactive Liquid Waste Treatment Facility, requires improvements such as replacing manholes and installing monitoring equipment. Within the Radioactive Liquid Waste Treatment Facility, the piping is largely single-walled and has inadequate leak and spill protection. The electrical system within the existing facility does not meet current codes.

Construction—Utility infrastructure resources would be needed for Radioactive Liquid Waste Treatment Facility construction. Standard construction practice dictates that electric power needed to operate portable construction and supporting equipment be supplied by portable diesel-fired generators. Therefore, no electrical energy consumption would be directly associated with construction. A variety of heavy equipment, motor vehicles, and trucks would be used, requiring diesel fuel, gasoline, and propane for operation. Liquid fuels would be brought to the site as needed from offsite sources and, therefore, would not be limited resources. Water would be needed primarily to provide dust control, aid in soil compaction at the construction site, and possibly for equipment washdown. Water would not be required for concrete mixing, as readymix concrete is typically procured from offsite resources. Portable sanitary facilities would be provided to meet the workday sanitary needs of project personnel on the site. Water needed for construction would typically be trucked to the point of use, rather than provided by a temporary service connection. Construction is estimated to require 190,000 gallons (720,000 liters) of liquid fuels and 1.0 million gallons (3.8 million liters) of water.

If evaporation tanks and pipeline were constructed, an additional 850,000 gallons (3.2 million liters) of liquid fuels and 6.5 million gallons (25 million liters) of water would be required.

The existing LANL infrastructure would be capable of supporting requirements for new facility construction without exceeding site capacities, resulting in a negligible impact on site utility infrastructure.

Operations Impacts—Utility demands in TA-50 are expected to increase. Operations at both the new Chemistry and Metallurgy Research Building Replacement and the Radioactive Liquid Waste Treatment Facility would potentially require more natural gas and electric power over time. As stated previously, utility infrastructure needs are being separately evaluated. Nevertheless, the proposed project would be subject to an energy efficiency study as it reaches detailed design phases. The preliminary facility design limits energy use to some extent by the use of cold evaporators instead of more energy-consumptive driers or other evaporative equipment.

DD&D Impacts—Activities associated with DD&D of facilities to be replaced by the new facility would be staggered over an extended period of time. As a result, impacts of these activities on LANL's utility infrastructure are expected to be very minor on an annualized basis. Standard practice dictates that utility systems serving individual facilities are shut down as they are no longer needed. As DD&D activities progress, interior spaces, including associated equipment, piping, and wiring, would be removed prior to final demolition. Thus, existing utility infrastructure would be used to the extent possible and would then be supplemented or replaced by portable equipment and facilities as DD&D activities proceed, as previously discussed for construction activities. DD&D is estimated to require 1,700 gallons (6,500 liters) of liquid fuel and 52,000 gallons (197,000 liters) of water.

Waste Management

The existing Radioactive Liquid Waste Treatment Facility does not contain RCRA regulated treatment, storage, and disposal facilities. All RCRA-regulated waste is managed in less-than-90-day storage areas before being packaged and trucked to TA-54 for offsite treatment and disposal. In 2005, the Radioactive Liquid Waste Treatment Facility produced approximately 16 pounds (7.2 kilograms) (LANL 2006f) of chemical waste compared to about 4,850 pounds (2,200 kilograms) of chemical waste projected by the *1999 SWEIS* (DOE 1999a).

The Radioactive Liquid Waste Treatment Facility typically generated about 170 to 262 cubic yards (130 to 200 cubic meters) of solid low-level radioactive waste annually between 1998 and 2002 (LANL 2003b). In 2003, 510 cubic yards (390 cubic meters) of low-level radioactive waste were generated, in 2004, 464 cubic yards (355 cubic meters) were generated (LANL 2004d, 2005c), and in 2005, 339 cubic yards (259 cubic meters) were generated (LANL 2006f). Less than 4 percent of the low-level radioactive waste volume was mixed low-level radioactive waste (LANL 2003b, 2004d). Between 1998 and 2002, the Radioactive Liquid Waste Treatment Facility generated about 39 cubic yards (30 cubic meters) of transuranic or mixed transuranic solid waste, of which about one-third was mixed transuranic waste (LANL 2003b). Due to operational interruptions in 2003 and 2004, the Radioactive Liquid Waste Treatment Facility generated no transuranic waste and only 4 cubic yards (2.7 cubic meters) of mixed transuranic waste during those 2 years (LANL 2004d, 2005c). No transuranic or mixed transuranic waste was generated during 2005 (LANL 2006f).

Construction and DD&D Impacts – **Table G–25** lists the types and volumes of waste expected to be generated during construction and demolition of buildings under Option 1. Nearly 4,900 cubic yards (3,700 cubic meters) of low-level radioactive waste is projected to be soil and debris containing so little radioactive or hazardous material that it can be disposed in bulk using lift liners or similar disposal containers that are transported in reusable transport packages such as Intermodals. Packaged low-level radioactive waste would include small quantities of low-level radioactive waste from one-time transitioning from the existing Radioactive Liquid Waste Treatment Facility, and additional one-time waste from facility stand-down. This waste would include low-level radioactive waste sludges that would be drummed, solidified, and disposed of at TA-54 or any other authorized facility, as well as small quantities of used filters, membranes, and expendable supplies. A small amount of mixed low-level radioactive waste is expected to be generated from DD&D activities.

Table G–25 Construction and Decontamination, Decommissioning, and Demolition Waste Volumes – Single Waste Liquid Treatment Building Option

Waste Type	*Cubic Yards*
Low-level radioactive waste (bulk)	4,860
Low-level radioactive waste (packaged)	1,620
Mixed low-level radioactive waste	44
Transuranic waste (contact-handled)	94
Demolition debris [a]	820
Construction waste [b]	980
Hazardous waste with asbestos	200
Solid hazardous waste with organics	< 1
Solid hazardous waste with metals	< 1

[a] Includes solid sanitary wastes.
[b] Includes 427 tons (387 metric tons) of solid waste from constructing evaporation tanks with associated pipeline. Construction waste density is 2 cubic yards per ton.
Note: To convert cubic yards to cubic meters, multiply by 0.76456.

Contact-handled transuranic waste would include small quantities of transuranic sludge that would be drummed, solidified, and transferred to TA-54 for eventual disposal at WIPP. DD&D may also generate waste from roofing materials that may contain asbestos and would require disposal at a permitted offsite facility, as well as possibly small quantities (less than 1 cubic yard [0.8 cubic meter]) of other wastes containing organics or metals. Otherwise, all potentially recyclable materials from construction or DD&D would be characterized; if contaminated with radioactive materials or chemicals, they would be disposed of at an appropriate permitted facility (LANL 2005f).

Facility construction, transitioning, and DD&D are expected to also generate small quantities of liquids that would be processed and disposed of in accordance with LANL requirements. Construction liquids are expected to include wash water from concrete trucks (less than 100 gallons [380 liters]). Transitioning liquids are expected to include 2,640 gallons (10,000 liters) of clean water used for testing the new process that would be processed through the existing Radioactive Liquid Waste Treatment Facility treatment system. Rinsing and flushing of the piping at the existing Radioactive Liquid Waste Treatment Facility would be treated at the new or the existing facility. Any remaining treated effluent would be evaporated assuming the auxiliary action options discussed in Section G.4.2.5 are implemented; otherwise the effluent would be released to the outfall in Mortandad Canyon.

Operations Impacts—Operations would generate liquid effluent, transuranic waste, and low-level radioactive waste. The volumes of waste generated would be a function of the level of operations occurring at LANL; these volumes are presented in Chapter 5, Section 5.9 of this SWEIS.

Transportation

Pecos Drive, a secondary road that intersects Pajarito Road, provides access to TA-55, TA-50, and TA-35. Traffic is restricted to the LANL workforce and official visitors. Sufficient parking is available to accommodate the existing workforce on the site.

Construction Impacts—Construction would result in some local adverse transportation effects. Construction traffic would increase temporarily. Parking would be eliminated by construction of the new facility.

Operations Impacts—Implementation of this option would eliminate the need to ship radioactive waste to Tennessee, thus reducing the risks of waste transportation off site.

DD&D Impacts—As with construction, traffic on Pecos Road and employee parking would be disrupted during demolition. Demolition traffic would increase temporarily.

The generated construction and DD&D wastes would be transported to disposal sites, either at LANL TA-54 or an offsite location. Transportation has potential risks to workers and the public from incident-free transport, such as radiation exposure as the waste packages are transported long the routes and highways. Traffic accidents could result both in injuries or deaths from collisions and in an additional radiological dose to the public from radioactivity that may be released during the accident.

The effects of incident-free transportation of construction and DD&D wastes on the worker population and general public is presented in **Table G–26**. Effects are presented in terms of the collective dose in person-rem resulting in excess LCFs. Excess LCFs are the number of cancer fatalities that may be attributable to the proposed project, estimated to occur in the exposed population over the lifetimes of the individuals. If the number of LCFs is smaller than one, the subject population is not expected to incur any LCFs resulting from the actions being analyzed.

The risk for development of excess LCFs is highest for the workers under the offsite disposition option. This is because the dose is proportional to the duration of transport, which in turn is proportional to travel distance. As shown in Table G–26, disposal of low-level radioactive waste at the Nevada Test Site, which is located farthest from LANL, would lead to the highest dose and risk, although the dose and risk are low for all disposal options.

Table G–26 Incident-Free Transportation – for Single Liquid Waste Treatment Building Option Impacts

Disposal Option	*Low-Level Radioactive Waste Disposal Location* [a]	*Crew*		*Public*	
		Collective Dose (person-rem)	*Risk (LCF)*	*Collective Dose (person-rem)*	*Risk (LCF)*
Onsite disposal	LANL TA-54	0.26	0.000155	0.082	0.000049
Offsite disposition	Nevada Test Site	2.02	0.0012	0.59	0.00036
	Commercial facility	1.96	0.0012	0.58	0.00035

LCF = latent cancer fatality, TA = technical area.
[a] Transuranic wastes would be disposed of at WIPP.

Table G–27 presents the impacts of traffic and radiological accidents. This table provides population risks in terms of fatalities due to traffic accidents from both the collisions themselves and from excess LCFs from exposure to releases of radioactivity. The analyses assumed that all transuranic and nonradioactive wastes would be transported to offsite disposal facilities.

Table G–27 Transportation Accident Impacts – for Single Liquid Waste Treatment Building Option

Low-Level Radioactive Waste Disposal Location [a, b]	*Number of Shipments* [c]	*Distance Traveled (million kilometers)*	*Accident Risks*	
			Radiological (excess LCFs)	*Traffic (fatalities)*
LANL TA-54	462	0.057	3.6×10^{-10}	0.00089
Nevada Test Site	462	1.04	5.2×10^{-8}	0.0106
Commercial facility	462	0.94	3.9×10^{-9}	0.0095

LCF = latent cancer fatality, TA = technical area.
[a] All nonradiological wastes would be transported off site.
[b] Transuranic wastes would be disposed of at WIPP.
[c] Approximately 87.7 percent of shipments are radioactive wastes. Others include 10 percent industrial and sanitary wastes and about 2.4 percent asbestos and hazardous wastes.
Note: To convert kilometers to miles, multiply by 0.6214.

Because all estimated LCFs and traffic fatalities, as shown in Tables G–26 and G–27, are much less than 1.0, the analysis indicates that no excess fatal cancers would result from this activity, either from dose received from packaged waste on trucks or potentially received from traffic collisions and accidental release.

G.4.3.3 Option 2: Two Liquid Waste Treatment Buildings Option

The overall effect of implementing this option would be positive. Effects on land use, cultural resources, ecological resources, human health, and infrastructure are expected to be similar to those under the proposed project (Option 1). Resource area impacts that would differ from the proposed project are discussed in detail below.

Land Resources—Visual Resources

As noted previously in the land use discussion, the area in which the treatment buildings would be constructed is highly developed. This area currently has an industrial look, with a mix of buildings of different design. The area proposed for construction of the tanks is currently undeveloped and wooded.

Construction Impacts—There would be temporary local visual impacts associated with construction of the new treatment buildings and during excavation from the use of construction equipment. The current natural setting, in the area of the evaporation tanks and a portion of the pipeline, would be disrupted by removal of vegetation, establishment of a construction staging area, and construction activities. Construction would entail excavation of soils to construct the tanks and pipeline, and possibly the temporary establishment of a soil pile. Excess soils would be removed and used or stockpiled elsewhere.

Operations Impacts—The new treatment buildings would not result in a change to the overall visual character of the area within TA-50. Buildings would be a maximum of two stories and constructed in accordance with site guidelines, which establish acceptable color schemes for building exteriors. Establishment of evaporation tanks would result in a permanent change to the visual environment in the area near the border of TA-52 and TA-5. Impacts would be similar to those described for Option 1 (see Section G.4.3.2). Following regrowth of vegetation, the area disturbed for pipeline construction would not be noticeable.

DD&D Impacts—Removal of the North and East Annexes and TA-50-66 would result in temporary local visual impacts in the form of construction equipment and the presence of partially demolished buildings. Long-term effects would be a slightly improved local visual environment, once the annexes and TA-50-66 are gone.

Geology and Soils

Construction Impacts—About 80,000 cubic yards (61,000 cubic meters) of soil and rock would be disturbed during building construction; installation of the evaporation tanks and pipeline would disturb the same quantities of soil and rock as those given for Option 1.

This option would initiate removal of some potential release sites and would have a positive effect. This option would be likely to affect more potential release sites than would the proposed project because of its larger footprint.

DD&D Impacts—The major indirect impact on geologic and soil resources at DD&D locations would be associated with the need to excavate any contaminated soil and tuff from beneath and around facility foundations. Under this option, the North and East Annexes and TA-50-66 would be demolished and remediation of associated potential release sites would be required. Borrow material such as crushed tuff and soil would be required to fill the excavations to grade, but such resources would be available from onsite borrow areas (see Chapter 5, Section 5.2 of this SWEIS). Potentially affected contaminated areas would be surveyed to determine the extent and nature of any contamination. All excavated contaminated media would be characterized and managed according to waste type and all LANL procedures and regulatory requirements.

Water Resources

DD&D Impacts—Effects on water quality could be larger under this option because more demolition is proposed under this option. However, erosion control measures specified in a stormwater pollution prevention plan would be implemented to mitigate impacts of sediment movement by stormwater. Water quality effects would be similar to those under Option 1.

Air Quality

DD&D Impacts—Nonradioactive emissions would be slightly larger under this option because the amount of demolition is greater. Other air quality impacts would be similar to those under Option 1.

Ecological Resources

Possible impacts would be the same as those for Option 1.

Human Health

Construction Impacts—Option 2 would result in somewhat larger worker hours and risks than would Option 1. Based on 317,000 worker hours, 4 to 13 recordable injuries could occur during construction (DOE 2004, BLS 2003). If the evaporation tanks and pipeline were built, an additional 420,000 person-hours would be required, with a possibility of 5 (DOE 2004) to 18 (BLS 2003) recordable injuries.

DD&D Impacts—Under this option, workers could potentially be exposed to radiologically or chemically contaminated materials during demolition activities. Worker risks would be mitigated by use of personal protective equipment and pre-established safety procedures. Based on an estimated 59,800 worker hours and construction accident rates, one to three recordable injuries could occur from DD&D (DOE 2004, BLS 2003).

Operations Impacts—Impacts would be the same as those for Option 1.

Cultural Resources

Construction Impacts—Under this option, effects of construction on cultural resources would be the same as those for Option 1.

Operations Impacts—This option would result in minimal effects on historic buildings. The original portion of the Radioactive Liquid Waste Treatment Facility would remain, but would undergo internal changes such as process equipment removal. As required by mitigation plans, documentation would occur before any equipment is removed from the building. Mitigation plans would have to be implemented before or during project implementation.

DD&D Impacts—Removal of the North and East Annexes to the Radioactive Liquid Waste Treatment Facility and TA-50-66 under this option should not affect the original historic fabric of the building, but would require historic documentation before the demolition process began.

Socioeconomics and Infrastructure

Construction Impacts—Construction of the new buildings would require more infrastructure resources than Option 1. Construction is estimated to require 420,000 gallons (1.6 million liters) of liquid fuels and 2.3 million gallons (8.7 million liters) of water. If the evaporation tanks and pipeline were constructed, then similar impacts to those described in Option 1 would occur. The existing LANL infrastructure would be capable of supporting Option 2 without exceeding site capacities.

Operations Impacts—Electricity and natural gas requirements would be slightly more than Option 1 since additional new buildings would be operating. This would increase the use of utilities for lighting and heating as compared to Option 1.

DD&D Impacts—Activities associated with facilities to be replaced by the new facilities in Option 2 would be similar to those described in Option 1. However, the infrastructure needs for Option 2 would be somewhat higher than for Option 1 because one additional annex would be removed. DD&D is estimated to require quantities of liquid fuel and water similar to those in Option 1.

Waste Management

Waste types are expected to be similar to those under the proposed project. **Table G–28** provides the types and volumes of wastes generated during construction, transition, and demolition of buildings. Uncontaminated construction waste volumes would be larger than those under the proposed project because two or more new treatment facilities would be built. Transition and standdown wastes would be identical to those under the proposed project (Option 1). Volumes of demolition wastes would be greater than those under the proposed project because of the additional demolition of the North Annex. Operational waste is expected to be similar to that under the proposed project. Chemical and radioactive wastes generated through decontamination processes would be managed within the LANL waste management system. The low-level radioactive waste may be disposed of onsite or sent to an offsite facility, depending upon onsite capacities and waste acceptance priorities at TA-54 Area G. Solid wastes would be transferred to a permitted municipal landfill.

Operations Impacts—Operations would generate liquid effluent, transuranic waste, and low-level radioactive waste. The volumes of waste generated would be a function of the level of operations occurring at LANL; these volumes are presented in Chapter 5, Section 5.9, of this SWEIS.

Transportation

Pecos Drive, a secondary road that intersects Pajarito Road, provides access to TA-55, TA-50, and TA-35. Traffic is currently restricted to the LANL workforce and official visitors along Pecos Drive. Sufficient parking is available to accommodate the existing workforce in the area.

Construction Impacts—Traffic on Pecos Road and employee parking would be disrupted during construction. Pecos Road would be realigned slightly near the new low-level radioactive waste treatment buildings, but would not alter traffic flow over the long term. Traffic associated with construction would cause a temporary increase in local traffic.

Table G–28 Construction and Decontamination, Decommissioning, and Demolition Waste Volumes – Two Liquid Waste Treatment Buildings Option

DD&D Waste Type	*Cubic Yards*
Low-level radioactive waste (bulk)	5,250
Low-level radioactive waste (packaged)	1,750
Mixed low-level radioactive waste	44
Transuranic waste (contact-handled)	94
Demolition debris [a]	1,650
Construction waste [b]	1,110
Hazardous waste with asbestos	210
Solid hazardous waste with organics	< 1
Solid hazardous waste with metals	< 1

DD&D = decontamination, decommissioning, and demolition.
[a] Includes solid sanitary wastes.
[b] Includes 427 tons (387 metric tons) of solid waste from constructing evaporation tanks. Construction waste density is 2 cubic yards per ton (1.4 cubic meters per metric ton).
Note: To convert cubic yards to cubic meters, multiply by 0.76456.

Operations Impacts—Under this option, there would be no change in local traffic. Implementation of the proposed treatment technologies would eliminate the need to ship radioactive waste to and receive residues back from Tennessee, thus reducing the risks of offsite waste transportation.

The waste generated by construction and DD&D activities would have to be moved to a different location for disposal, mostly using over-the-road truck transportation. Effects of incident-free and accident conditions of transporting construction and DD&D wastes to disposal locations on or off site are presented in **Tables G–29** and **G–30**. All nonradiological and transuranic wastes would be transported to offsite facilities. The results in these two tables indicate that no traffic fatalities or excess LCFs are expected from transportation of generated wastes.

Table G–29 Incident-Free Transportation Impacts – Two Liquid Waste Treatment Buildings Option

		Crew		*Public*	
Disposal Option	*Low-Level Radioactive Waste Disposal Location* [a]	*Collective Dose (person-rem)*	*Risk (LCF)*	*Collective Dose (person-rem)*	*Risk (LCF)*
Onsite disposal	LANL TA-54	0.26	0.000156	0.082	0.000049
Offsite disposal	Nevada Test Site	2.16	0.0013	0.63	0.00038
	Commercial facility	2.10	0.00126	0.62	0.00037

LCF = latent cancer fatality, TA = technical area.
[a] Transuranic waste would be disposed of at WIPP.

Table G–30 Transportation Incident Impacts – Two Liquid Waste Treatment Building Option

Low-Level Radioactive Waste Disposal Location [a, b]	*Number of Shipments* [c]	*Distance Traveled (10^6 kilometers)*	*Accident Risks*	
			Radiological (excess LCFs)	*Traffic (fatalities)*
LANL [b]	540	0.076	3.6×10^{-10}	0.0011
Nevada Test Site	540	1.14	5.6×10^{-8}	0.0117
Commercial facility	540	1.03	4.2×10^{-9}	0.0105

LCF = latent cancer fatality.
[a] All nonradiological wastes would be transported offsite.
[b] Transuranic waste would be disposed of at WIPP.
[c] Approximately 81 percent of these are radioactive. Others include 17 percent industrial and sanitary waste and about 2 percent asbestos and hazardous waste.
Note: To convert kilometers to miles, multiply by 0.6214.

G.4.3.4 Option 3: Two Liquid Waste Treatment Buildings and Renovation Option

Under this option, the effects on ecological resources would be similar to those under the proposed project (Option 1). Resource area impacts that would differ from the proposed project are discussed in detail below.

Land Resources – Visual Resources

Activities in this option would be the same as those conducted in Option 2, with the additional renovation of a portion of the existing facilities. The renovated structure would have new external walls that would have color schemes that would match the new structures built as part of Option 2. Local visual impacts would therefore be similar to those described for Option 2.

Geology and Soils

About 95,000 cubic yards (73,000 cubic meters) of soil would be disturbed during building construction. Installation of the evaporation tanks and pipeline would disturb the same quantities of soil and rock as those given for Option 1.

This option would have a long-term positive effect by removing contaminated materials. More demolition would occur under this option than under Options 1 or 2, and a larger area of the associated potential release sites could be disturbed. More contaminated materials would be removed under this option. Contaminated material from demolition and construction would be managed according to waste type and LANL procedures. The long-term potential for spread of air- and waterborne contamination would be reduced.

Water Resources

Effects on water quality could be larger than those under Option 1 because more demolition is proposed under this option. However, implementing sediment and erosion control measures is expected to control possible consequences. Other water quality effects would be similar to those under Option 1.