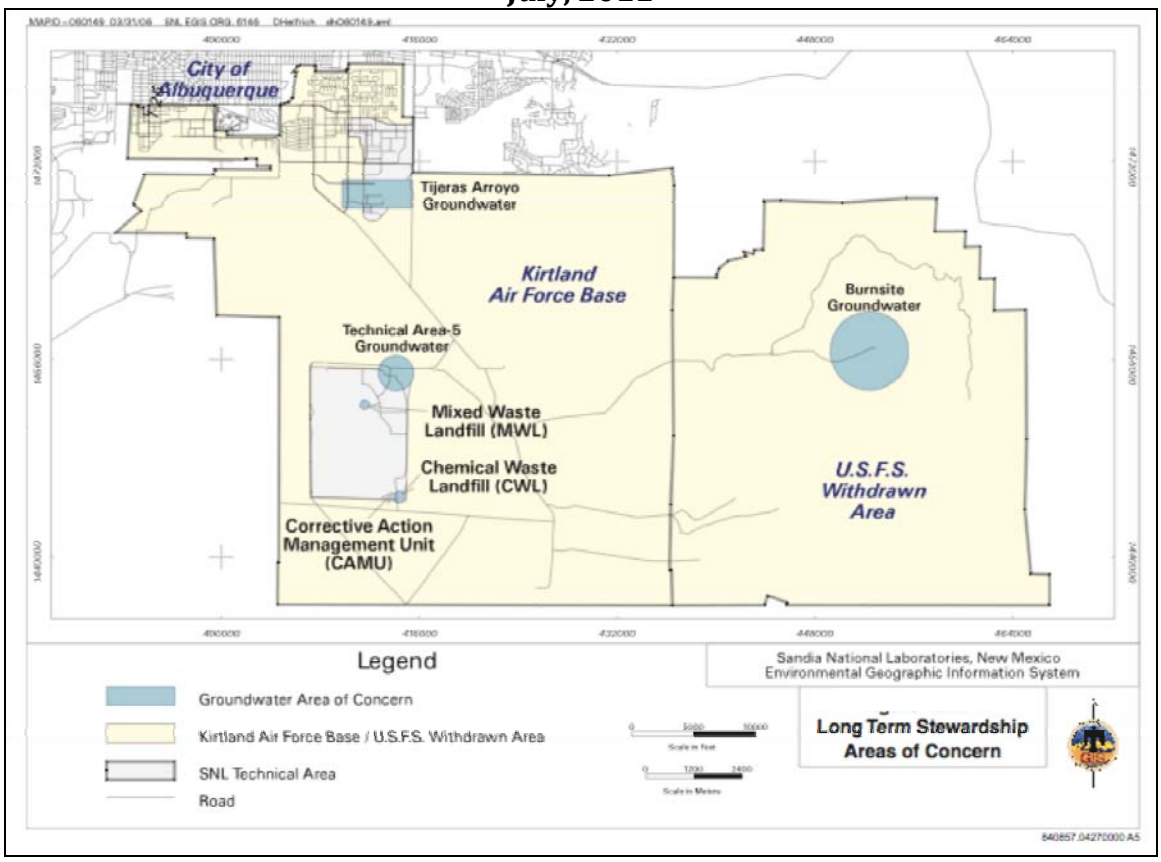
# Fact Sheet Concerning
# Groundwater Contamination and Remediation Options at the Technical Area Five (TA-V) and the Tijeras Arroyo Groundwater (TAG) Environmental Remediation Sites at Sandia National Laboratories, New Mexico
## -- July, 2011 --




**Long-Term Stewardship Areas of Concern at Sandia National Laboratories showing Location of Tijeras Arroyo Groundwater (TAG) and Technical Area 5 (TA-V) Groundwater Remediation Sites**

This Fact Sheet summarizes a report on the status of two groundwater contamination sites at Sandia National Laboratories ("SNL") in New Mexico south of the City of Albuquerque in Bernalillo County: Technical Area Five ("TA-V") and the Tijeras Arroyo Groundwater ("TAG") site.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***Overview***

Sandia National Laboratories is located with the boundaries of Kirtland Air Force Base ("KAFB"). SNL and KAFB are located in a portion of Bernalillo County that has not been incorporated into the city limits of the City of Albuquerque. The City of Albuquerque borders SNL and KAFB on the north and west.

Water supply wells for the City and surrounding County are operated by the Albuquerque Bernalillo County Water Utility Authority ("ABCWUA") are found within a quarter mile of the northern boundary of SNL. These water supply wells, and water supply wells used by SNL and KAFB, draw water from the regional aquifer beneath the Middle Rio Grande Valley where the City of Albuquerque, SNL and KAFB are located.

The TA-V and TAG site are located in the watershed of Tijeras Arroyo and overlie the Middle Rio Grande Regional Aquifer. Tijeras Arroyo slopes east-to-west as it crosses SNL and KAFB between the Sandia Mountains to the east and the South Valley and Rio Grande to the west. Between the TA-V and TAG sites, Tijeras Arroyo is joined by its largest tributary, Arroyo del Coyote just west of the golf course on Kirtland Base, Tijeras Arroyo Golf Course.

The water table in the Rio Grande regional aquifer located beneath the TA-V and TAG sites has been affected by withdrawals from the aquifer for drinking water uses in the City of Albuquerque and on KAFB. The regional aquifer water table had dropped by 80 – 100 feet during the 1960 – 2002 period. The continuing withdrawals of groundwater for drinking water use continue to influence the regional and perched aquifer water tables at TA-V and TAG.

**Summary of Groundwater Contamination at TAG and TA-V Environmental Restoration Sites**

| Characteristic | Tijeras Arroyo Groundwater (TAG) Site | Technical Area V (TA-V) Site |
|---|---|---|
| Nitrate groundwater contamination (EPA MCL = 10 mg/L) | Up to 30 ppm | Up to 25 ppm |
| TCE groundwater contamination (EPA MCL=5 μg/L=5 ppb) | Up to 10 ppb | Up to 25 ppb |
| PCE groundwater contamination (EPA MCL=5 μg/L=5 ppb) | None detected | Up to 8 ppb |
| Other groundwater contaminants | Chlorinated volatile organic compounds (less than 5 ppb) | cis-1,2-DCE 4.5 μg/L; well below EPA MCL of 70 μg/L |
| Probable source of contamination | Solid-waste management units | Liquid-waste disposal system |
| Depth to groundwater (ft. below ground surface) | 450-475 (regional aquifer) 250-375 (perched aquifer) | +/- 500 |

Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.

Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

ppm = parts per millions = milligrams/liter; ppb = parts per billion = micrograms/liter = μg/l

At TA-V, Tricholoroethene (TCE), Tetrachloroethene (PCE) and Nitrate exceeding allowable maximum contaminant levels (MCLs) have been identified in monitoring wells sampling groundwater beneath the site since 1993 in the deep alluvial aquifer that supplies drinking water to the Albuquerque area. Sources of the TA-V

contamination identified by SNL include liquid waste disposal systems that discharged at least 50 million gallons of wastewater between the early 1960s and 1992.

At TAG, TCE contamination in the regional aquifer was first identified by SNL in 1994. TCE exceeding the applicable Maximum Contaminant Level ("MCL") has been detected in two wells sampling a perched ground water system connected to the regional aquifer; including exceedences of the applicable MCLs for TCE in all samples from one of the wells. Nitrate exceeding the applicable MCL has been detected in four of the TAG monitoring wells, reaching 3 times the MCL in August 2009 samples.

**Summary of Health Effects and their Maximum Contaminant Levels (MCL) in Drinking Water Established by the US Environmental Protection Agency for SNL Contaminants**

| Contaminant | Maximum Contaminant Level Goal (MCLG) [1] – mg/l (parts per million) | Maximum Contaminant Level (MCL)[1] – mg/l (parts per million) | Health Effects from Long-term Exposure to Contaminants above MCL (unless specified as short-term) | Sources of Contaminant in Drinking Water |
|---|---|---|---|---|
| Tricholorethylene (TCE) | zero | 0.005 | Liver problems; increased risk of cancer | Discharges from metal degreasing site and other factories |
| Tetrachloroethylene (PCE) | zero | 0.005 | Liver problems; increased risk of cancer | Discharges from factories and dry cleaners |
| Nitrate | 10 | 10 | Infants below age of six months who drink water containing nitrate in excess of MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-bay syndrome. | Runoff from fertilizer use; leaking from septic tanks, sewage; erosion of natural features |

***What is the Current Status of TA-V and TAG Remediation Projects?***

SNL is required by the regulations being implemented at the TA-V and TAG site to submit and attain approval from NMED-HWB for a Corrective Measure Evaluation Report s("CMERs") prior to selection and implementation of a remedy to the contamination at the sites.

***TA-V*** - NMED's Hazardous Waste Bureau issued a Conditional Approval for the SNL GI Work Plan in May 2010 to the address deficiencies in the CMER. The revised GI Work Plan for which NMED issued conditional approval includes:
- "Use a licensed well driller and approved materials to install four groundwater monitoring wells
- Use a licensed well driller and approved materials to install three soil vapor monitoring wells;
- Upon completion of the well-installation field activities, submit a report describing the field activities to the NMED;
- Conduct geophysical logging using induction, neutron, and gamma logging techniques of the groundwater monitoring wells through the casing;
- Sample the newly installed groundwater and soil-vapor monitoring wells for eight consecutive quarters;
- Prepare an Investigation Report (revised Current Conceptual Model) and submit to the NMED; and
- Reevaluate the corrective measures and submit a revised CME Report to the NMED."

In November 2010, SNL submitted geophysical logs for all 16 monitoring wells and slug test data for the four new monitoring

wells as required in NMED's May 2010 "Conditional Approval." A slug test measures the effects of instantaneous injection or extraction of water into an aquifer to induce stress such as changes in the water level over time as the aquifer returns to equilibrium.

Major milestones in SNL's February 2011 GWI Work Plan as approved by NMED, include:

- February 2012 - completion of eight consecutive quarterly samples for the groundwater and soil vapor monitoring wells;
- May 2013 - submittal of a revised Corrective Measure Evaluation Report;
- May 2014 – NMED approval, disapproval or approval with conditions of revised CMER and make approved CMER available for Public Review;
- December 2014 – NMED selects recommended final remedy; and
- December 2015 – NMED convenes hearing on and selects of final remedy.

***TAG*** – NMED-HWB staff have indicated that they have begun review of the August 2005 CMER filed by SNL for the TAG site following the Agency's February 2010 acceptance in of SNL responses to two Notices of Disapproval previously issued for the GIR. The GIR was submitted to NMED-HWB by SNL in November 2005. The two Notices of Disapproval were provided to SNL on August 1, 2008 and August 12, 2009.

The SNL response to the first NOD in February 2009 was the focus of the second NOD issued in August 2009. The SNL's January 19, 2010 Response to the second NOD provided the basis for NMED's February 22, 2010 approval of the TAG GIR. In that letter notifying SNL of the NMED approval of the January 19, 2010 SNL response to second TAG NOD, NMED notified SNL of its intent to begin review of August 2005 TAG CMER.

NMED has not required SNL to provide a revised version of the GIR incorporating the information provided to the NMED in the SNL Response to the two NODs.
Therefore members of public seeking to review the TAG GIR must compile a complete GIR on their own, incorporating part of the November 2005 original GIR, and the two SNL Responses to the NODs.

An extensive body of material has been generated regarding the TAG sites between the August 2005 version of the TAG CMER and the February 2010 start of NMED review of that document. NMED-HWB's February 2010 GIR approval letter does not address the need for, or opportunity to prepare, a consolidated update the August 2005 CMER including all post-2005 groundwater information or remedial technology developments.

***What Funding Does SNL have for Environmental Management Projects?***

Funding for Environmental Management projects at SNL for the next few years is anticipated to be approximately $5,878,000. DOE's Office of Environmental Management reports that SNL projects have received the following funding:

"FY 2010 Enacted Appropriation was $2,864,000, the FY 2011 Operating Plan is $3,014,000, and the FY 2012 Congressional Request is $0. This total funding of $5,878,000, permits the Sandia site to address remaining work scope required under the 2004 regulatory driven Compliance Order on Consent issued by the New Mexico Environment Department.

"The work to be undertaken is:
• administrative activities at the Mixed Waste Landfill and Chemical Waste Landfill;
• characterization of three groundwater areas (i.e. Burn Site Ground Water, Technical Area V, Tijeras Arroyo Groundwater); and,
• characterization of five re-opened soil sites identified.
"Finally, FY 2011 estimated carryover of uncosted balances from the Sandia site indicates a balance of $1,345,000 into FY 2012 to complete the activities referenced above.

*Sources:*
*This fact sheet relies primarily on TA-V and TAG documents posted by New Mexico Environment Department – Hazardous Waste Bureau (HWB) at:*
- "ftp" site for TAG documents 2005 – 2011 ftp://ftp.nmenv.state.nm.us/hwbdocs/HWB/snl/TAG
- "ftp" site for TA-V documents 2005 – 2011 ftp://ftp.nmenv.state.nm.us/hwbdocs/HWB/snl/TA-V

### *What are the Potential Sources of Contamination at TAG?*

Three waste disposal sites previously operated by SNL have been identified as "high Concern" potential sources of contamination detected at TAG.
(SWMU = solid waste management unit)

**Wastewater Disposal History at SNL Locations of "High Concern" as Potential Sources of Release at TAG**

| Source | Contaminant of Concern | Period of Operation | Estimated Volume of Release in gallons | SWMU Number |
|---|---|---|---|---|
| TA-I Old Acid Waste Line Outfall | TCE, Nitrate | 1948-1974 | 1.3 billion | 46 (connected to SWMU 226) |
| TA-II Bldg. 901 Septic System | TCE, Nitrate | 1948 – 1992 | No estimate identified | 165 |
| TA-I Sanitary Sewer System | Nitrate | 1948 – Present (as of 2005) | No estimate identified | 187 |

Ten KAFB waste disposal sites have been identified as potential sources of the contamination detected at TAG.

**KAFB Sites of Potential Sources of TCE and Nitrate at TAG**

| **Potential Source** | **Contaminant of Concern and Level of Concern (L=Low; M=Medium; H=High)** | **Dates of Operations** | **Estimate Volume of release (gallons), acreage and/or volume of debris** |
|---|---|---|---|
| KAFB Landfill LF-02 | TCE (L);Nitrate(M) | 1945 - 1967 | Storm water (no estimate available); 50 acres of unlined landfill; estimated 1,000,000 cubic yards of waste |
| KAFB Landfill LF-08 | TCE(L); Nitrate(M) | 1960 -1989 | Storm water (no estimate provided); 30 acres of unlined landfill; estimated 600,000 cubic yards of waste |
| KAFB Landfill LF-44 | TCE(None); Nitrate(M) | 1979 - 1988 | Storm water (no estimate provided); 2 acres of unlined landfill; no debris volume estimate |
| KAFB Landfill LF-268 | TCE (None); Nitrate (M) | 1989 – Present (as of 2005) | Storm water (no estimated provided); 45 acres of landfill; no liner identified; no debris volume estimate |
| KAFB Sewage Lagoons | TCE(H); Nitrate(H) | 1966 - 1987 | Most of 7.3 billion gallons discharged at lagoons; unidentified volume of wastewater piped to golf course pond |
| KAFB Golf Course Main Pond | TCE(H); Nitrate(H) | 1966 - 1987 | Unknown volume of wastewater piped from KAFB sewage lagoons; After 1988, pond used to store well water |
| KAFB Sanitary Sewer Lines | TCE(L); Nitrate(M) | 1940s – Present (as of 2005) | No estimate of volume released |
| KAFB Septic Tank Systems | TCE(L); Nitrate(M) | 1940s – Present (as of 2005) | Estimated 30 systems across KAFB; No estimate of volume released |
| KAFB Manzano Base Blasting | TCE (None); Nitrate (Medium) | 1940s – Present (as of 2005) | Dynamite blasting of bunkers may have left explosive material that degrades to nitrate |

Five City of Albuquerque waste disposal sites have been identified as potential sources of contamination at TAG.

**City of Albuquerque (COA) Sites of Potential Sources of TCE and Nitrate at TAG**

| Potential Source | Contaminant of Concern and Level of Concern (L=Low; M=Medium; H=High) | Period of Operations | Estimate Volume of release (gallons), acreage and/or volume of debris |
|---|---|---|---|
| COA Eubank Landfill – Northeast Area | TCE (H); Nitrate (H) | 1974(?) - 1989 | 27 acres of landfill area; No liner identified; estimated 1,000,000 cubic yards of municipal and industrial debris dumped; sewer lines associated with residential waste lagoons and septic tanks cross site. |
| COA Eubank Landfill – Southwest Area | TCE (H); Nitrate (M) | Early 1960s – 1973(?) | 60 acres of landfill area; no liner identified; no estimate of volume of municipal and industrial debris dumped |
| COA Sanitary-Sewer Rupture/Temporary Sewage Pond | TCE (L); Nitrate (H) | 1994 | 100 million gallons spilled; unknown volume of septic water recovered from temporary pond on floodplain |
| COA Sanitary Sewer Lines | TCE (L); Nitrate (H) | 1940s – Present (as of 2005) | Leaking sewer lines may be ongoing problem on KAFB |
| COA Montessa Park/Tree Farm | TCE (None); Nitrate (H) | 1950s – Present (as of 2005) | No volume estimate provided; Sewage lagoon use at Montessa Park Correctional Facility; Irrigation ponds and fertilizer used at US Forest Service Tree Farm |

***What are the Potential Sources of Contamination at TA-V?***

Three waste disposal sites previously operated by SNL have been identified by as potential sources of contamination detected at TA-V.

**Wastewater Disposal History at Potential Sources of Contaminants at TA-V**

| Disposal Site | Period of Operation | Estimated Volume of Release – gallons | SWMU Number |
|---|---|---|---|
| TA-V Seepage Pits | 1960s - 1992 | 30 – 50 million | 275 |
| Liquid Waste Disposal System (LWDS) Drain Field | 1962 - 1967 | 6.5 million | 5 |
| Liquid Waste Disposal System Surface Impoundments | 1967 - 1972 | 12 million | 4 |

*Sources:*
*These tables are derived from TA-V and TAG documents posted by New Mexico Environment Department – Hazardous Waste Bureau (HWB) at:*
- "ftp" site for TAG documents 2005 – 2011 ftp://ftp.nmenv.state.nm.us/hwbdocs/HWB/snl/TAG
- "ftp" site for TA-V documents 2005 – 2011 ftp://ftp.nmenv.state.nm.us/hwbdocs/HWB/snl/TA-V