

**Evaluation of Potential Exposures
Bulk Fuels Facility Groundwater Plume
Kirtland Air Force Base
Albuquerque, New Mexico**

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Water Protection Advisory Board
July 30, 2013

Community Concerns

Characterization/Remediation Process

Sampling/Monitoring Methods/Locations

Remediation Goals and Strategy

Evaluation of Potential Exposures

Public Health Question

**Could potential human exposures
to contaminants from the leaked fuels
harm people's health?**

What does this Health Consultation evaluate?

- **Pathways of exposure to BFF contaminants**
- **Contaminant concentrations and distributions in groundwater wells and air/soil vapor samples**
- **Comparison of contaminant concentrations with the health comparison values used to identify exposures of public health concern**



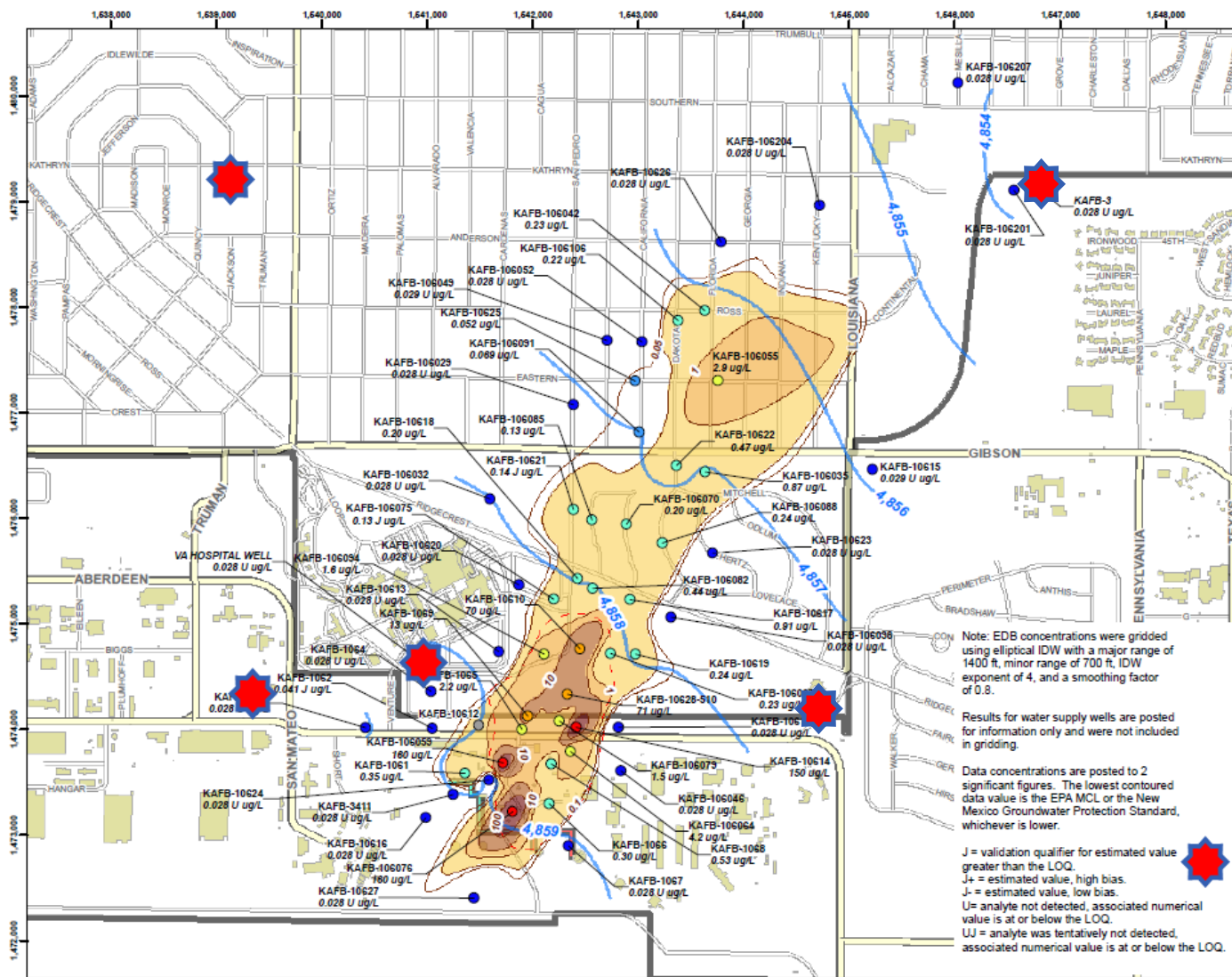
Vacant Land

VA Parking and Bullhead Memorial Park

500 feet



Bulk Fuels Facility

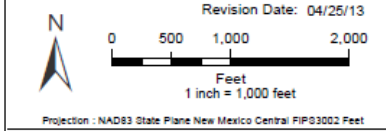


Legend

- EDB Result (ug/L)**
- 0.028 - 0.050
 - 0.051 - 0.10
 - 0.11 - 1.0
 - 1.1 - 10
 - 11 - 100
 - 110 - 180
 - Water Supply Well
 - Not Sampled
 - Groundwater Level Contour (ft msl)
 - EDB Concentration Contour (ug/L)
 - Historical Area of Observed NAPL (July 2009)
- EDB Concentration (ug/L)**
- 0.014 - 0.1
 - 0.11 - 1
 - 1.1 - 10
 - 11 - 100
 - 110 - 180



Note: EDB concentrations were gridded using elliptical IDW with a major range of 1400 ft, minor range of 700 ft, IDW exponent of 4, and a smoothing factor of 0.8.



Revision Date: 04/25/13
 FIRST QUARTER 2013
 BULK FUELS FACILITY
 KIRTLAND AIR FORCE BASE, NEW MEXICO

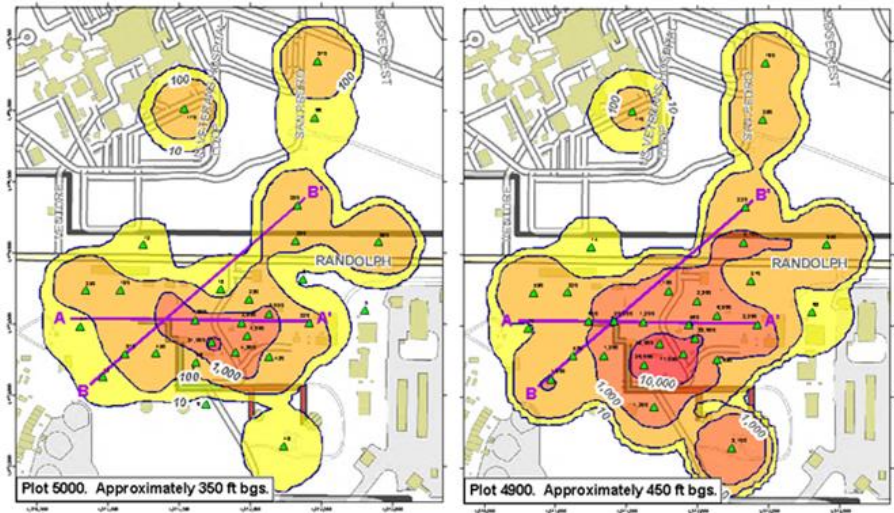
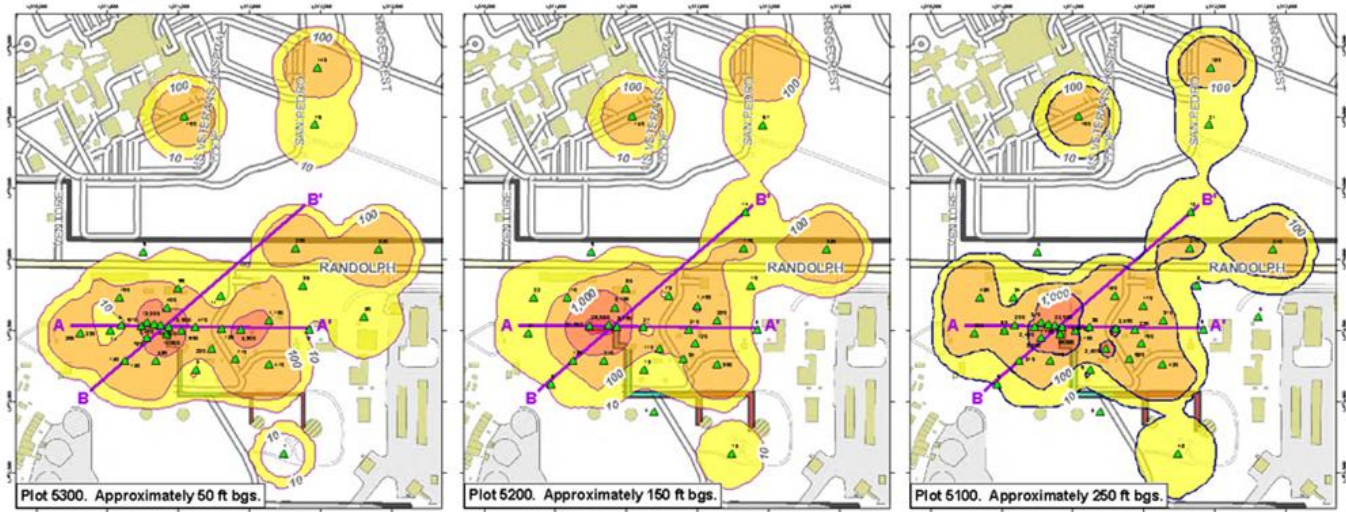
FIGURE 5-13
 1,2-DIBROMOETHANE (EDB)
 CONCENTRATIONS IN
 SHALLOW GROUNDWATER

Results for water supply wells are posted for information only and were not included in gridding.

Data concentrations are posted to 2 significant figures. The lowest contoured data value is the EPA MCL or the New Mexico Groundwater Protection Standard, whichever is lower.

J = validation qualifier for estimated value greater than the LOQ.
 J+ = estimated value, high bias.
 J- = estimated value, low bias.
 U= analyte not detected, associated numerical value is at or below the LOQ.
 UJ = analyte was tentatively not detected, associated numerical value is at or below the LOQ.

Water Supply Wells



Note:
 The vadose zone VOC plume was gridded in three dimensions using inverse distance weighting in RiskWiz2 and then concentration plan view maps were "cut" at respective elevations. Ground elevations range from 5314 to 5304 ft above mean sea level across the ST-100/S-111 investigation area.

SVE well locations are presented with the total vapor VOC concentration in ppmv for each elevation. Sample results within 25 ft of the elevation are posted. For example, plot 5000 includes sample results within the 5025 to 4975 ft interval. Locations are not shown at elevations where there is no sample result for the elevation interval.

See Figure 4-2 for SVE well locations with ID numbers.

- Legend**
- ▲ SVE Well with Vapor VOC Concentration (ppmv)
 - Cross-Section Line
 - VOC Concentration Contour (ppmv)
 - VOC Concentration (ppmv)
 - 10 - 99
 - 100 - 999
 - 1,000 - 9999
 - ≥ 10,000
 - ▭ Installation Boundary
 - Aboveground Fuel Transfer Lines
 - Underground Fuel Transfer Lines
 - Highway
 - Major Road
 - Road
 - Structure
 - Demished Structure
 - ▭ Runway



Revision Date: 09/09/11

0 400 800 1,600

Feet
 1 inch = 400 feet

Projection: NAD83 State Plane New Mexico Central FIP 53002 Feet

SWMUS ST. 106 AND SS-111
 BULK FUELS FACILITY
 KIRTLAND AIR FORCE BASE, NEW MEXICO

FIGURE 4-5

**LAB TOTAL VAPOR VOC PLUME
 FOOTPRINTS BY ELEVATION
 JUNE 2011**

When is a chemical a health hazard?

- **When you are exposed at levels that may make you sick,**
- **Most chemicals are present at background levels everywhere.**

How do we find if a chemical is a health hazard?

- **Look for a complete exposure pathway**
 - Eating, breathing, or contacting a chemical creates a potential pathway
- **Estimate exposure dose**
 - How much of each chemical a person may have come in contact with
- **Compare exposure doses at the site with other doses that have harmed people**

What is an exposure pathway?

- **Complete pathways have 5 components**
 - Source (e.g., leaked fuels)
 - Contaminant migration from source to people
 - Exposure area or location
 - Exposure route (e.g., breathing, swallowing, touching)
 - Exposed people
- **Can occur in past, present, or future**

Pathways of Exposure to Fuels Released from Bulk Fuel Facility, KAFB

Pathway	Timeframe and Status
Groundwater: Down-gradient Water Supply Wells (KAFB and Water Authority wells)	<u>Incomplete</u> for past/present/future exposure. Ongoing and planned remedial actions should retard migration and contingency plans are in place to prevent exposure should contaminants reach water supply wells.
Indoor air at BFF Buildings	<u>Potentially complete</u> , past/present/future. Benzene air concentrations below occupational limits and 10E-04 risk for occupational exposures. Levels are within background range for indoor air and fuel facility- no indication that benzene is due to VI.
Vapor Intrusion at VA Hospital and vacant land (San Pedro and Ridgecrest Drives)	<u>Indeterminate</u> for past/present/future exposure. Subsurface (15-25 ft. bgl) benzene vapor concentration is elevated in these areas. No indoor air or shallow subsurface (5 ft. bgl) data are available.
Air emissions from SVE treatment system at BFF	<u>Incomplete</u> for past/present/future exposure. Emissions are treated prior to release with appropriate monitoring and permitting.

What is the Exposure Dose?

- **Doses are measured in units of mg/kg/day**
 - Milligrams of contaminant per kilogram of body weight per day
- **Child and adult doses are calculations of how much chemical the body absorbs**
 - Intake rates
 - Body weights
 - Absorption rates (bioavailability)
- **For completed pathways doses are calculated for**
 - Short term exposures (hours to 14 days)
 - Intermediate exposures (14 to 365 days)
 - Long term exposures (a year or more)

How is cancer risk estimated?

- **Benzene exposure can cause cancer**
- **Estimated cancer risk = dose x cancer slope factor (CSF)**
 - CSF derived from animal studies
- **Estimated cancer risk is “*excess occupational exposure risk*”**
 - 20 years, 40 hours/week, 50 weeks/year
- **Rate of background cancer risk is high**
 - One of three in US will get cancer; lifetime risk of 0.35
 - ATSDR considers risk range of 0.0001 to 0.000001 to be “low to no apparent increased risk”

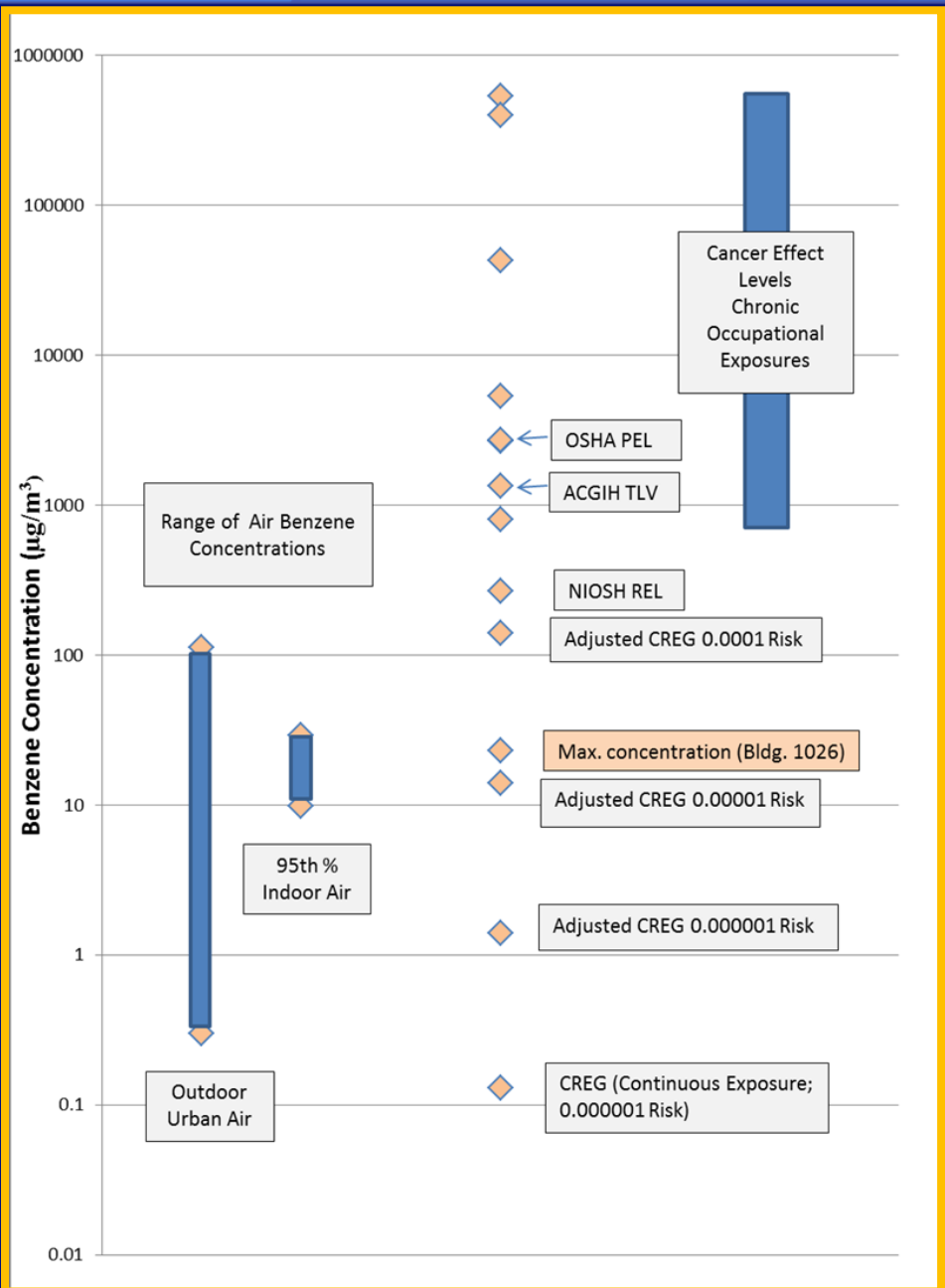
Indoor Air Sampling Results and Non-residential Screening Levels

	Bldg. 1026 µg/m ³	Bldg. 1032 µg/m ³	Bldg. 1033 µg/m ³	Indoor Air SL µg/m ³
Acetone	16	22	13	31,000 EMEGc
Benzene	23	6.4	0.7	1.4 CREG_{adj}
Bromomethane	ND	1.3	0.72	19 EMEGc
2-Butanone (MEK)	4	4	5.9	5,000 RfC
Carbon tetrachloride	0.39 J	0.44	0.46	1.8 CREG _{adj}
Chloromethane	0.9	1.3	1	100 EMEGc
Dichlorodifluoromethane	2.1	2.2	2.1	260 NJ NR SL
Ethylbenzene	14	1.8	0.2 J	260 EMEGc
Methylene chloride	0.9	4.2	0.3 J	1000 CREG _{adj}
Styrene	1	ND	5.4	850 EMEGc
Tetrachloroethylene	ND	0.5 J	ND	3.8 CREG _{adj}
Toluene	37	14	0.8 J	300 EMEGc
Trichlorofluoromethane	1.2 J	1.1 J	1.3	1,000 NJ NR SL
1,1,2-Trichloro-1,2,2-trifluoroethane	0.5 J	0.6 J	ND	44,000 NJ NR SL
o-Xylene	13	1.8	0.3 J	220* EMEGc

Maximum Measured Soil Gas/Outdoor Air Contaminants from Vacant Land, Bullhead Memorial Park, and VA Hospital

	Vacant Land Soil Gas 15-30 ft. bgl µg/m ³	Bullhead Memorial Park µg/m ³		VA Hospital Soil Gas 15-25 ft. bgl µg/m ³	Soil Gas SL (Residential) (5 ft. bgl) µg/m ³	Soil Gas SL (non-Res) (5 ft. bgl) µg/m ³
		Soil Gas	Outdoor Air			
Benzene	190	2.8	0.6	1,242	16	26
Cyclohexane	680	NM	NM	3,440	310,000	430,000
Ethylbenzene	140	22.8	0.3	660	53,000	74,000
Heptane	560	NM	NM	3,985	NA	NA
Hexane	2,100	NM	NM	945	36,000	51,000
Toluene	3,400	263	2.8	5,320	260,000	360,000
Xylene (total)	1,100	56.8	ND	1,892	5,500	7,700

Observed and estimated cancer effect levels for chronic benzene inhalation and background air concentrations



Conclusion 1

- **Based on currently available groundwater monitoring data there are no past or current exposures via groundwater at down-gradient water supply wells. Future exposures, which are possible, will be prevented if water is treated or supply wells are removed from service prior to contamination.**

Conclusion 2

- **BFF workers may be exposed to benzene in air via vapor intrusion into buildings. As measured benzene air concentrations are within the normal range of US residences and below regulated occupational concentrations, these exposures are not expected to harm people's health.**

Conclusion 3

- **Workers and patients at the VA Hospital may be exposed to benzene in air via vapor intrusion into buildings. Estimated benzene air concentrations are within the normal range of US residences and below regulated occupational concentrations. Based on available data, these exposures are not expected to harm people's health.**

Conclusion 4

- **BFF workers may be exposed to hydrocarbon compounds in air via airborne emissions from the SVE treatment system. Assuming the SVE system is operated and maintained per permit conditions, potential exposures are not expected to harm people's health.**

ATSDR Recommendations

- **Continue ongoing and implement proposed monitoring and remedial actions as planned.**
- **Further characterize soil gas and/or indoor air at the VA Hospital.**

ATSDR Next Steps

- **Evaluate any new environmental data (including planned and recommended indoor air samples) to ensure that potential exposures do not pose a public health hazard.**
- **Present the results and conclusions of this health consultation to the Albuquerque community and respond to community health concerns as appropriate.**

Public Comment Period

- **Health Consultation is available now for public review.**
- **Public comment period ends August 26, 2013.**
- **All comments submitted will be discussed in final version.**

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www.cdc.gov/info