University of New Mexico Teach-In: Contamination of Albuquerque Groundwater by AvGas and Jet Fuel

The KAFB Fuel Plume

What chemicals are present?
How do they behave?
How much has gotten into the groundwater?

Steve Cabaniss
Dept. Chemistry
Water Resources Program

University of New Mexico Teach-In: What chemicals are present in the KAFB fuel plume?

The fuel plume was created by leaking aviation gasoline (Avgas) and jet fuel (formulations JP-4 and JP-8) from an underground pipe at the bulk fuel facility of KAFB over the period 1950-1999. Today, leaked fuel is floating on top of and dissolved in our groundwater.

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KAFB report to Congress, March 2011
www.kirtland.af.mil/shared/media/document/AFD-110412-031.pdf

What chemicals are present in the KAFB fuel plume?

BTEX-	**B**enzene, **T**oluene, **E**thylbenzene and **X**ylenes (aromatic hydrocarbons)
GRO-	**G**asoline **R**ange **O**rganics (smaller, lighter aliphatic hydrocarbons)
DRO-	**D**iesel **R**ange **O**rganics (larger, heavier aliphatic hydrocarbons)
EDB-	**E**thylene **D**i**B**romide (an anti-knocking additive)
PAH-	**P**oly**A**romatic **H**ydrocarbons (trace contaminants found in many fuels)

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What chemicals are present in the KAFB fuel plume?

Jet fuel and Avgas are ***mixtures*** of many different chemicals. The principal groups are:

Aliphatic hydrocarbons
Olefins (GRO and DRO)

Least toxic, >75% of fuel by mass

Aromatics (incl. BTEX)

More toxic, <25%

'Additives' like EDB

Some very toxic, <1%

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http://www.atsdr.cdc.gov/ToxProfiles/tp76-c3.pdf
http://www.atsdr.cdc.gov/ToxProfiles/tp121-c3.pd

How do the KAFB fuel plume chemicals behave?

BTEX-	Soluble in water (ppm), volatile
GRO-	Soluble in water (ppm), volatile
DRO-	Less soluble in water, less volatile than GRO
EDB-	Most soluble in water, less volatile than GRO
PAH-	Less soluble in water, less volatile than GRO

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The KAFB Fuel Plume:
How much has gotten into the groundwater?

1 ppm = part per million 1 ppb = part per billion

Mass per mass (for groundwater)
1 ppm = 1 mg per liter (kg) = penny vs full-size pickup truck
1 ppb = 1 μg per liter (kg) = penny vs 6 loaded Boeing 747's

Volume per volume (for gases)
1 ppmV = 1 teaspoon vs 3 refrigerators
1 ppbV = 1 teaspoon vs 2 Olympic swimming pools

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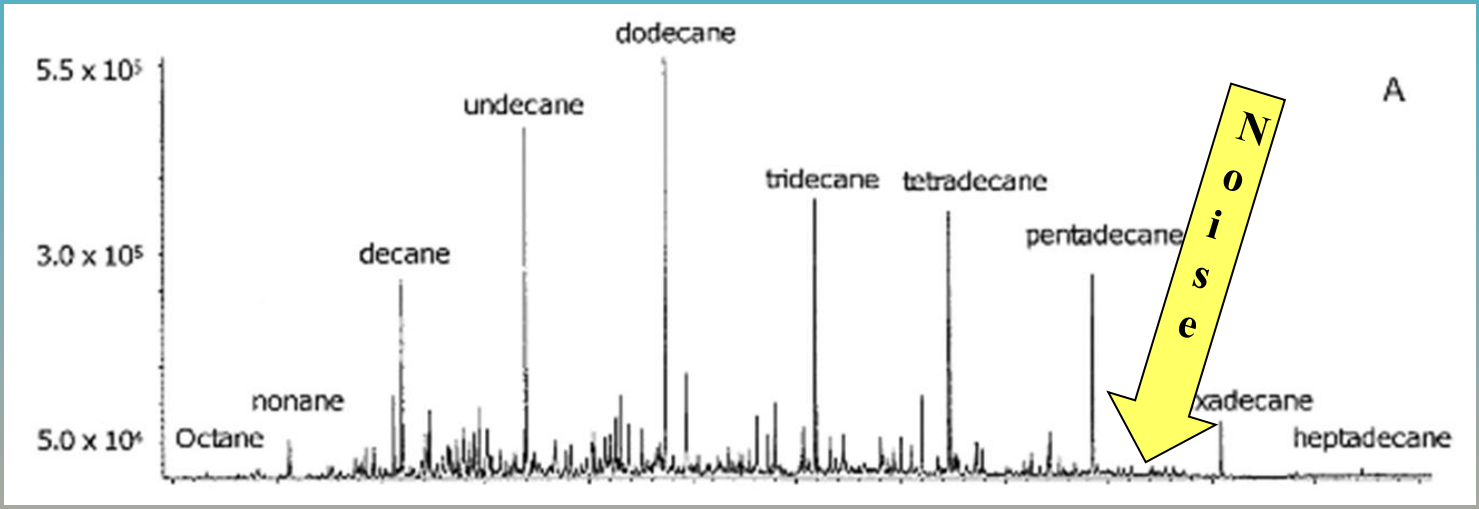
Based on a 2.5 g penny, a 5,500 lb truck and a 900,000 lb Boeing 747.

The KAFB Fuel Plume:
How much has gotten into the groundwater?



A GC-MS ***chromatogram*** of JP-8. Each chemical gives a peak ; if the peak is the same size or smaller than the noise, the concentration is below the method detection limit (<MDL).

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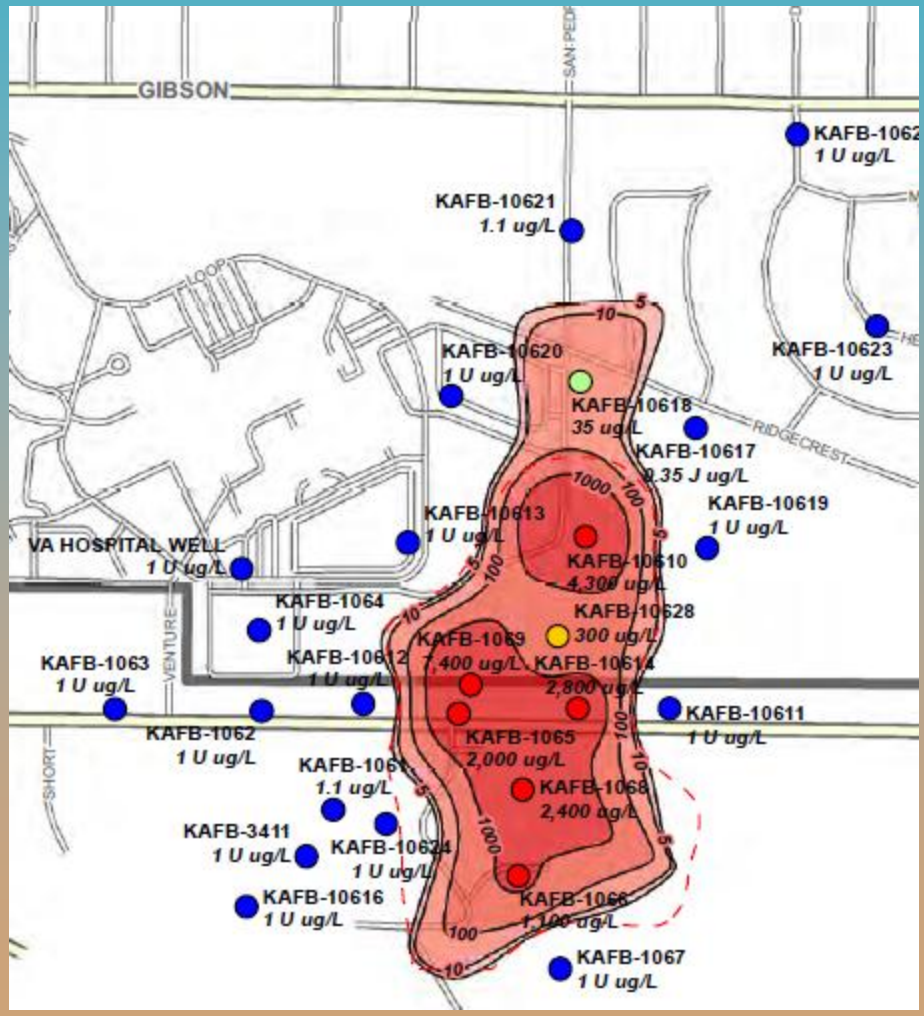
Smith et al., Intl. Journal of Toxicology
http://ijt.sagepub.com/content/24/1/35.full

The KAFB Fuel Plume:
How much has gotten into the groundwater?

Low GRO concentrations have been found in three wells on KAFB. To date, ABCWUA has not detected any fuel contaminants at drinking water wells outside the base.



Benzene in groundwater AFD-110531-028.pdf

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University of New Mexico Teach-In: What chemicals are present in the KAFB fuel plume?

The fuel plume is a mixture of many chemicals.

Major "contaminants of concern" are EDB and BTEX; GRO and DRO are also present.

EDB and BTEX dissolve best in water, while GRO and BTEX are most likely to evaporate.

Measured concentrations in aquifer water are low, contaminants are not detected in ABCWUA drinking wells.

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