Letter Health Consultation

KINDER-MORGAN FACILITY IN NORTH GILA VALLEY

YUMA, ARIZONA

MARCH 24, 2009

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

KINDER-MORGAN FACILITY IN NORTH GILA VALLEY

YUMA, ARIZONA

Prepared By:

Arizona Department of Health Services
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Division of Public Health Services

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JANICEK BREWER, GOVERNOR
WILL HUMBLE, INTERIM DIRECTOR

December 8, 2008

(REDACTED FOR PRIVACY)

DRAFT LETTER

P.O Box 25293
Prescott Valley, AZ 86312

Dear Ms.(REDACTED FOR PRIVACY) ,

RE: Kinder Morgan Facility in North Gila Valley, Yuma

We received your request via Ms. Sheila Stoeller at Arizona Corporation Commission and Mr. Brian Davison at Arizona Department of Environmental Quality. It is our understanding that Kinder-Morgan installed monitoring wells around its Yuma Booster Station, which is surrounded by agricultural fields. Two of the monitoring wells (MW-6 and MW-7) are located on the North Gila Thomas estate property. The purpose of the monitoring wells is to provide early detection of potential contaminants associated with the pipeline running through the agricultural fields. This pipeline is from Colton, CA to Phoenix, AZ. It is also our understanding that MACTEC Engineering and Consulting, Inc. (MACTEC) has provided laboratory data to you since April 2005. However, the recent elevated readings of Volatile Fuel Hydrocarbons (VFH), Benzene, Toluene, Ethyl benzene, total Xylenes, and Methyl-tert-butyl Ether (MTBE) have caused your concern. We have reviewed the groundwater sampling data collected from the two monitoring wells (MW-6 and MW-7) and conducted an assessment to evaluate whether the chemicals are at levels of public health concern.

Presence of a contaminant in the environment does not necessary mean that people actually come into contact with that contaminant, thereby, allowing the contaminant to be a threat to public health. To pose a human health risk, the source of contaminants must be linked to receptors (e.g. water supply wells) via different exposure pathways (e.g. inhalation, ingestion or skin contact). Monitoring wells are designed and installed to obtain representative groundwater quality samples and hydrogeologic information from an aquifer. They allow potential environmental concerns to be identified early, and aggressively evaluated and corrected (when necessary) in accordance with regulations. Workers may contact chemicals though ingestion or skin contact. However, the exposure pathways are considered insignificant due to the limited amount and frequency of exposure. It should be noted that workers performing routine monitoring in these wells would be typically follow a health and safety plan (HASP) designed to minimize or eliminated potential contact and exposure. The public are not likely to have directly contact with chemical in these two monitoring wells through inhalation, ingestion or dermal contact. However, groundwater in the same area is used for vegetable crop irrigation; therefore, the public may uptake these chemicals via food ingestion if they can be bioaccumulated in crops.

ADHS evaluated the potential of these chemicals to be concentrated or accumulated in plants. Our research results indicated that the bioaccumulation potential of these chemicals is low. Benzene does not build up in plants or animals (ATSDR 2007a). Only small amounts of toluene, ethylbenzene, xylene and MTBE could be uptaken up into plants but they are not expected to concentrate to high levels in plants (ATSDR 1996, 2000, 2007b,c). Hence, no public health concern would be expected.

Although there is no known residential wells in the area, as precaution, ADHS further evaluated the potential public health impacts associated with these two monitoring wells if they were used for drinking, cooking or personal hygiene. In Arizona, all aquifers are identified as drinking water source aquifers unless specifically exempt (ARS§49-224). The Arizona Aquifer Water Quality Standards (AAWQSs) are enforceable standards developed to protect groundwater sources for drinking water use (AAC§R18-11-406) and protective of human health.

ADHS conducted an initial evaluation by comparing the averaged concentrations to accepted comparison values (CVs), which are screening tools used with environmental data relevant to the exposure pathways. CVs are conservatively developed based on the available scientific data and consideration for the most sensitive groups (e.g. children). If public exposure concentrations related to a site are below the corresponding CV, then the exposures are not considered of public health concern and no further analysis is conducted. However, while concentrations below the CV are not expected to lead to any observable adverse health effect, it should not be inferred that a concentration greater than the CV would necessarily lead to adverse health effects. Depending on site-specific environmental exposure factors (e.g. duration and amount of exposure) and individual human factors (e.g. personal habits, occupation, and/or overall health), exposure to levels above the comparison value may or may not lead to a health effect. Therefore, the CVs should not be used to predict the occurrence of adverse health effects.

The initial evaluation results indicated that the averaged concentrations of ethyl benzene, toluene, total xylenes and MTBE in well MW-6 or MW-7 did not exceed their respective comparison values (CVs) for noncancerous health effects. Therefore, ADHS does not expect to see these chemicals to cause noncancerous adverse health effects in people who may use the well water as drinking water source.

The average benzene concentrations in MW-6 (6.05 parts per billion, ppb) and MW-7 (6.9 ppb) exceeded the AAWQS of 5 ppb. US Environmental Protection Agency (US EPA) also has set 5 ppb as the Maximum Contaminant Level (MCL) of benzene in drinking water. These standards are not threshold levels of toxicity because they include a substantial margin of safety to account for uncertainties in studies and technology. Thus, people ingesting chemicals slightly above MCLs will not necessarily experience any illness or other adverse health effects. ADHS further estimated the daily exposure doses for benzene via water ingestion as well as inhalation and skin absorption during shower for adults and children. The estimated doses were below the oral, inhalation and dermal reference doses of benzene. Reference dose is an estimate of daily exposure to the human population (including sensitive subgroups) that is not likely to cause noncancerous health effects during a lifetime. ADHS also used a mathematical model to estimate the opportunity of a person developing cancer via all exposure routes. The results show that benzene would pose an estimated increased risk of 1.73 in 100,000 (MW-6) and 2.12 in 100,000 (MW-7), which represents a low to very low risk of cancer for a lifetime of exposure. They are within the levels of public health concern (i.e. 1 in 1,000,000 to 1 in 10,000).

Since ingesting or breathing high levels of chemicals may cause acute health effects within hours or days, ADHS also evaluated the risk from acute exposure to the detected chemicals if they were used for drinking, cooking or personal hygiene. However, in this evaluation, the results indicated that none of the individual chemical concentrations are at the levels which could cause acute adverse health effects. ADHS does not expect to see people experience acute health effects during household water use, primary during showering or bathing.

There is no comparison value available for VFH. VFH is a general analytical test, which is indicative of a presence of fuel compounds within the groundwater. Benzene, ethyl benzene, toluene, xylenes, and MTBE are the major constituents of fuel products. As described earlier, none of the individual chemicals are at the levels to cause adverse health effects if they were used for drinking, cooking or personal hygiene. To addressing the potential for cumulative effects from multiple chemicals occur through more than one exposure pathways, ADHS assumed that adverse health effects are additive and the calculated cumulative risk is within the level of public health concern. Therefore, ADHS does not expect to see adverse health effects associated with VFH exposures if exposures were to occur.

ADHS concludes that *at the present time*, the chemicals detected in the two monitoring wells located at the North Gila Thomas estate property pose *no apparent public health hazard*. Although the general public or workers are having no or limited contacts with the well water, the groundwater in the area are used for vegetable crop irrigation. While the general public may upake very small amounts of ethylbenzene, toluene, xylene and MTBE via food ingestion, the evaluation results indicated that this route of exposure is not likely to result in adverse impact to human health.

ADHS also concluded that there will be *no apparent public health hazard* if these wells were used as residential wells, because no acute or chronic adverse health effects would be expected under the assumed exposure scenarios. In addition, the evaluation results indicated that the total exposure pose no apparent increased risk of cancer.

To protect the public health, we recommend continuation of monitoring the quality of the well waters on a regular basis as well as taking necessary corrective actions after the cause of elevated reading is determined.

If you have any questions, please contact me at (602) 803-3740 or linh@azdhs.gov.

Sincerely,

Hsin-I Lin, ScD, MSPH
Health Risk Assessor

Cc: Brian Davison, Arizona Department of Environmental Quality
Sheila Stoeller, Arizona Corporation Commission

Reference

1. Agency for Toxic Substances and Disease Registry (ATSDR). 2007a. Toxicological Profile for Benzene. Atlanta, GA: US Department of Health Services, Public Health Service
2. Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Toluene. Atlanta, GA: US Department of Health Services, Public Health Service
3. Agency for Toxic Substances and Disease Registry (ATSDR). 2007b. Toxicological Profile for Ethylbenzene. Atlanta, GA: US Department of Health Services, Public Health Service
4. Agency for Toxic Substances and Disease Registry (ATSDR). 2007c. Toxicological Profile for Xylene. Atlanta, GA: US Department of Health Services, Public Health Service
5. Agency for Toxic Substances and Disease Registry (ATSDR). 1996. Toxicological Profile for Methyl-tert-butyl Ether. Atlanta, GA: US Department of Health Services, Public Health Service

Calculations for the Exposure Assessment

Non-cancer Health Effects

(a) Estimated Exposure Dose via Water Ingestion (Oral Reference Dose = 0.004 mg/kg/day)

$$CDI = \frac{Conc \times IR \times EF \times ED}{BW \times AT}$$

Parameter		Unit	Adult	Child
CDI	Chronic daily intake	mg/kg/day	0.00017 (MW-6) 0.00019 (MW-7)	0.00039 (MW-6) 0.00044 (MW-7)
Conc	Water concentration	mg/L	0.0061 (MW-6) 0.0069 (MW-7)	0.0061 (MW-6) 0.0069 (MW-7)
IR	Ingestion rate	L/day	2	1
EF	Exposure frequency	day/year	350	350
ED	Exposure duration	year	30	6
BW	Body weight	kg	70	15
AT	Averaging time	days	10,950	2,190

(b) Estimated Exposure Dose during Shower

Individuals may be exposed to volatile organic chemicals (VOCs) while showing through two routes of exposure, dermal and inhalation. A resident could inhale the vapor while showering and while standing in the bathroom immediately after showering. Studies in human have demonstrated that the dermal absorption dose of VOC is comparable to the shower inhalation. ADHS used a model, provided by Agency for Toxic Substances and Disease Registry (ATSDR), to estimate the exposure with the following assumptions:

- A resident would take a 15 minute shower once per day, and
- A resident spends an additional 15 minutes in the bathroom after showering.

Estimated air concentration in the bathroom

$$C_{air} = \frac{C_w \times k \times F \times T_s}{V}$$

Parameter		Unit	Value
Cair	Air concentration	mg/m^3	0.04 (MW-6); 0.05 (MW-7)
Cw	Water concentration	mg/L	0.0061 (MW-6); 0.0069 (MW-7)
k	Volatilization rate		0.6
F	Water flow rate through the showerhead	L/min	8
Ts	Time in shower	min	15
V	Bathroom volume	m^3	10

Estimated exposure dose during shower

$$D = \frac{C_{air} \times B \times T}{BW}$$

Parameter		Unit	Value
D	Dose	mg/day	See below
Cair	Air concentration	mg/m^3	0.04 (MW-6); 0.05 (MW-7)
B	Breathing Rate	m^3/min	0.014 (adult); 0.007 (child)
T	Time	min/day	15 (shower); 15 (sink)
BW	Body weight	kg	70 (adult); 15 (child)

Dose	MW-6		MW-7	
(mg/kg/day)	Adult	Child	Adult	Child
Shower inhalation	0.00012	0.00028	0.00015	0.00035
Sink inhalation	0.00012	0.00028	0.00015	0.00035
Total	0.00024	0.00056	0.00030	0.00070
Inhalation Reference Dose	*0.00857*			
Shower dermal	0.00012	0.00028	0.00015	0.00035
Dermal Reference Dose	*0.00288*			

Cancer Health Effects

$$R = CDI_C \times SF$$

Parameter		Unit	MW-6			MW-7		
R	Cancer Risk		Oral	Inhale	Dermal	Oral	Inhale	Dermal
CDIc	Chronic daily intake for cancer risk	mg/kg/day	0.00007	0.00024	0.00012	0.00008	0.0003	0.00015
SF	Slope factor	$(mg/kg/day)^{-1}$	0.055	0.0273	0.0567	0.055	0.0273	0.0567
Total Cancer Risk			1.73E-5			2.12E-5		

Certification

This Kinder-Morgan Facility letter health consultation was prepared by the Arizona Department of Health Services (ADHS) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.

Charisse J. Walcott
Technical Project Officer, CAT, CAPEB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

Alan Yarbrough
Team Lead, CAT, CAPEB, DHAC, ATSDR