

Health Consultation

CHEVRON USA

HOLIDAY, PASCO COUNTY, FLORIDA

DECEMBER 20, 1999

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WATER PROGRAMS

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
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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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HEALTH CONSULTATION

CHEVRON USA

HOLIDAY, PASCO COUNTY, FLORIDA

Prepared by:

Exposure Investigation and Consultation Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

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Background and Statement of Issues

On September 24, 1999, the Pasco County Health Department of Florida, requested that the Agency for Toxic Substances and Disease Registry (ATSDR) conduct an evaluation of groundwater samples obtained from private residential and commercial wells near the Chevron USA site in Holiday, Pasco County, Florida. In addition, ATSDR received a petition for a public health assessment of this site from a community member in October 1999. Specifically, the petitioner asked whether levels of contaminants, particularly methyl tertiary-butyl ether (MTBE), detected in groundwater samples from these private residential wells pose health threats to the residents who use this water daily for domestic purposes. The petitioner also mentioned birth defects and other unspecified health issues in the community and the use of groundwater to wash fruit at a fruit stand located in the community.

The Chevron USA site is located at 1533 U.S. Highway 19 in the city of Holiday, Pasco County, Florida. A commercial gasoline station located on the site closed in 1989. Currently, the site consists of the abandoned gasoline station (Figure 1, Appendix 1, map of Chevron USA site).

The Florida Department of Environmental Protection sampled well water around the site for chemicals from 1990 to 1995. In 1995, water sampling results showed that levels of chemical contaminations in residential wells were below state regulatory levels for drinking water. The groundwater was re-sampled in March 1999, in response to concerns from residents. Some residents complained of gastrointestinal symptoms and wondered whether their symptoms were related to exposure to methyl tertiary-butyl ether (MTBE), a chemical found in some of the water samples.

The wells near the site are shallow, approximately 10-40 feet deep. Also, the residents use septic tanks; however, no information was provided to indicate whether these septic tanks are upgradient or downgradient from the residential wells of concern.

Environmental data

Analysis of environmental data was limited to chemicals detected in groundwater samples from private residential and commercial wells surrounding Chevron USA site. This analysis is based on site-specific data sets provided to ATSDR.

Representativeness of two data sets, one from a resident and another from the Florida Department of Health, is limited. These data sets report past water sampling results from 1989 to 1996. (Tables 2, 3, Appendix 1).

More recently, the Florida Department of Environmental Protection sampled five residential and two commercial wells in March of 1999 in response to concerns community residents expressed. Florida Department of Health Bureau of Laboratories, Jacksonville, Florida, tested water samples for 59 organic chemicals. Sample results had adequate quality control and quality assurance data, including blank analysis. (Table 1, Appendix 1).

No air sampling data, or biologic water monitoring data, were provided to ATSDR to review in regard to the Chevron USA site.

This health consultation is based on site-specific data provided to the ATSDR for review, thus the conclusions are applicable only to this site and cannot be generalized to other populations.

Discussion

ATSDR approaches evaluating a public health investigation of a particular site by considering the source of exposure, pathways of human exposure, character of the potentially exposed population, identifying routes of exposure, and the quality and quantity of contamination. It then determines whether a public health hazard exists and recommends appropriate public health actions.

At the Chevron USA site, the contamination of concern is gasoline products in groundwater from the old abandoned gasoline station. In general, gasoline can potentially migrate to groundwater from soil surrounding a spill or a leaking underground storage tank or pipeline. However, ATSDR received no data or evidence that documented a spill or a leaking underground storage tank or pipeline at Chevron USA site.

The composition of gasoline varies depending on geographic region and blending stocks. It typically contains hydrocarbons and small quantities of additives and blending agents. Given this, the contaminants suspected in the groundwater sampling at this site would include primarily hydrocarbons (paraffins, olefins, and aromatic compounds such as benzene, toluene, and xylenes) and additives such as antiknock agents MTBE, tertiary butyl ether, methanol, and ethanol.

In general, gasoline-contaminated groundwater can be a potential source of exposure for humans, not only through ingestion, but also through inhalation and dermal absorption during bathing and laundering. In regard to the Chevron USA site, the exposure routes considered relevant to groundwater use by residents and children using the water daily are primarily ingestion via drinking, dermal absorption via bathing and washing, and volatilization into air such as via showering.

To determine whether a public health hazard exists, ATSDR reviewed all available environmental data from Chevron USA site. Analysis of environmental data was limited to the chemicals detected in groundwater samples from private residential and commercial wells surrounding Chevron USA site. This analysis is based on the site-specific data sets provided to ATSDR for review.

Two data sets of past water sampling results are of limited value in assessing the levels of contaminants to which people might have been exposed in the past. These data sets report past water sampling results from 1989 to 1996. These data are limited by the time period of data collection and by the lack of information on analytic method, laboratory used for the sample analysis, and quality assurance/quality control of analytic laboratory results (Tables 2 and 3, Appendix 1).

More recently, in March of 1999, the Florida Department of Environmental Protection sampled residential and commercial wells following concern expressed by residents in the community. Florida Department of Health Bureau of Laboratories, Jacksonville, Florida, tested the water samples for 59 organic chemicals. These sample results had adequate quality control and quality assurance data, including blank analysis (Table 1, Appendix 1).

All data sets provided to ATSDR were reviewed. ATSDR assembled tables summarizing each data set for ease of presentation and discussion (Tables 1, 2, and 3). The tables comprised water sample results with the maximum concentration of the chemical and the date and location of the sample. The maximum concentration of the chemical was selected to use a conservative approach when going on to the next stage of identifying “contaminants of concern.”

A “contaminant of concern” is merely a site-specific chemical substance that the health assessor has selected for further evaluation of potential health effects, i.e., the term does not imply any level of hazard. Generally, a chemical is selected as a contaminant of concern because its maximum concentration in air, water or soil (media) at the site exceeds at least one of ATSDR’s screening **comparison values**. This approach is conservative by design.

ATSDR **comparison values** are media-specific (air, water, soil, or food chain) concentrations that are considered to be “safe” under default conditions of exposure. They are used as **screening values** in the preliminary identification of “contaminants of concern” at a site. **Comparison values are not thresholds of toxicity**; that is, they are not bright lines above which persons will get sick and below which they are safe. Although concentrations at or below the relevant comparison value may reasonably be considered safe, any environmental concentration that exceeds a comparison value would not automatically be expected to produce adverse health effects. In fact, the whole purpose behind these highly conservative (erring on the side of human safety) health-based standards and guidelines is to recognize and resolve potential public health problems before they become actual health hazards. The probability that adverse health outcomes will occur depends not on environmental concentrations alone but on site-specific conditions and an individual’s lifestyle, predisposition, and genetic susceptibility that affect the route, magnitude, and duration of actual exposure. Refer to glossary for specific definitions of the comparison values.

ATSDR also selects as “contaminants of concern,” for further evaluation and discussion, any detected substances for which ATSDR has no comparison values, and any substance about which the community has expressed special concern. Methyl tertiary-butyl ether, or MTBE, is a “contaminant of concern” at the Chevron USA site because of special concern by the community.

1999 Sampling Data

In the most recent and best quality data set of groundwater sampling at the Chevron USA site in 1999, MTBE was detected, and was above the analytical method detection limit. MTBE was detected at the **maximum** concentration of 6.2 ppb ($\mu\text{g/L}$). This maximum concentration is well below the ATSDR health screening comparison value of 3,000 ppb child EMEG, theoretically the most sensitive population. In addition, it falls below the most conservative screening comparison value for MTBE, EPA’s Long Term Health Advisory, 20 ppb ($\mu\text{g/L}$). To protect consumer acceptance of the water, this EPA screening comparison value is based on the odor or taste of the chemical. EPA Drinking Water Advisory for MTBE states, “Comparison indicates that there are four to five orders of magnitude between the 20-40 $\mu\text{g/L}$ range and concentrations associated with observed ranges of effects in animals. There is little likelihood that an MTBE concentration of 20-40 $\mu\text{g/L}$ would cause adverse health effects in humans, recognizing that some people may detect the chemical below this range. It can be noted that at this range of concentrations, the margins of

exposure are about 10 to 100 times greater than would be provided by an EPA reference dose for noncancer effects.” [15].

The levels of MTBE reported in the 1999 data set are below all relevant health-based screening comparison values, and as a result are not expected to cause any adverse human health effects. Studies have been conducted on the concentrations of MTBE in drinking water at which individuals respond to the odor or taste of this chemical. Human responses vary widely in this respect. Persons who are sensitive can detect MTBE at very low concentrations below this range; others do not taste or smell the chemical at even much higher concentrations. If the EPA Long Term Health Advisory (LTHA) was primarily based on the *adverse health and toxicologic information*, as is usual, the LTHA would be approximately 3,000 $\mu\text{g/L}$ (i.e., the health-based ATSDR child EMEG). Because the LTHA is based on odor or taste threshold, it provides an even wider margin of safety [15] (Appendix 2, general discussion of MTBE).

In this 1999 data set, three other chemicals were detected, monochlorobenzene, para-dichlorobenzene, and isopropylbenzene; however, they were reported with result qualifiers stating that the result was the detection limit of the method. All were below 0.5 ppb ($\mu\text{g/L}$). These levels are well below all relevant health-based screening comparison values and as a result, are not expected to cause any adverse human health effects. Benzene was not detected in any of the samples from this data set.

Because no data were provided to quantify air (inhalation) and dermal exposures, EPA devised an estimated total exposure method. This method estimates the total combined exposure from all relevant exposure routes by assuming the **total exposure** is twice that of the ingestion exposure. In addition to ingestion from drinking water, this result would encompass inhalation, and to a lesser extent, dermal exposures encountered during daily activities such as showering, washing dishes, and doing laundry, etc. [16]. **Applying this EPA estimated total exposure method, the resultant levels representing all exposure routes are not expected to cause any adverse human health effects.**

For all chemicals detected in these data, the maximum levels detected fall below 1999 Florida Department of Health Guidance Concentrations for drinking water. Table 1 in Appendix 1 gives a detailed list and summary of specific levels and relevant comparison values and a glossary defining each comparison value.

Past sampling data of the Chevron USA site

The two other data sets of past water sampling data collected in the years 1989 through 1996 are of questionable quality and representativeness, as discussed previously. Thus they should be interpreted with caution. Given this, the chemicals detected were benzene, chloromethane, dibromochloromethane, ethylbenzene, isopropylbenzene, monochlorobenzene, MTBE, para-dichlorobenzene, toluene, and xylenes.

Of these, chloromethane, isopropylbenzene, monochlorobenzene, and para-dichlorobenzene were detected in residential water samples at *maximum* levels (with undefined result qualifiers) below 0.5 ppb ($\mu\text{g/L}$). These levels are well below all relevant health-based screening comparison values for ingestion, and as a result, are not expected to cause any adverse human health effects.

Dibromochloromethane was detected in residential water samples at a *maximum* level of 8 ppb ($\mu\text{g/L}$). Using the ATSDR CREG, 0.4 ppb ($\mu\text{g/L}$), which is calculated taking into account that this chemical is a possible human carcinogen, and EPA's Risk Based Concentration for tap water, this maximum level detected is extrapolated to estimate a conservative theoretical lifetime estimate of 1.9 cases excess cancer risk per 100,000 persons, assuming a lifetime exposure (70 years) to water of 8 ppb or $\mu\text{g/L}$ of dibromochloromethane, ingested at 2 liters per day. However, dibromochloromethane was only detected in three of all the samples taken, and only in the year 1994, and has not been detected in any samples since 1994. Thus, taking into account this limited exposure, the theoretical excess cancer risk would likely be much lower. In addition, this maximum level falls below all other health-based screening comparison values, and, as a result, is not expected to cause any adverse human health effects. In addition, dibromochloromethane was not detected in the most recent 1999 water sampling data analysis.

Ethylbenzene, toluene, and xylenes were detected in monitoring wells only at the Chevron site; however, each of these chemicals was detected only once, and *not detected in any other monitoring wells or residential sampling wells* in these data sets, and has not been detected in samples since 1995. The *maximum* levels detected for these chemicals are well below all relevant health-based screening comparison values, and as a result, are not expected to cause any adverse health effects. Because the monitoring wells were not used by residents, no exposure of residents to these levels occurred. In addition, these chemicals were not detected in the most recent 1999 water sampling data analysis.

Benzene was detected in sampling results in the data set from the community member at a maximum level of 380 ppb ($\mu\text{g/L}$). This level was detected in a 1991 sample from a monitoring well only, and not detected after 1992, and was *not detected in any other monitoring wells or sampling wells*. Because the monitoring well was not used by residents, no exposure of residents to this level of benzene occurred in 1991. Because benzene was not detected in this monitoring well's samples after 1992, *or in any other monitoring wells or residential sampling wells during the sampling time period*, it is not expected to cause any adverse health effects. In addition, the most recent data from 1999 did not detect benzene in any of the groundwater samples.

MTBE was detected in both the past sampling result data sets. The *maximum* level of MTBE detected was 352 ppb ($\mu\text{g/L}$). This level was detected in a 1990 sample from an on-site well that is no longer in use. **The MTBE levels measured at this on-site well have since decreased steadily over the sampling years**, down to 33 ppb ($\mu\text{g/L}$) in 1996, the last sampling year in the data sets. In summary, the *maximum* concentration of MTBE detected in these past water-sampling data sets, 352 ppb ($\mu\text{g/L}$) in 1990 from an on-site well no longer in use, is well below the ATSDR health-based screening comparison value of 3,000 ppb child EMEG, the theoretically most sensitive population, and as a result, is not expected to cause any adverse health effects. MTBE was not detected in samples from three other on-site monitoring wells since 1994.

The most recent 1995 and 1996 maximum MTBE levels from residential wells fall below the most conservative screening comparison value for MTBE, EPA's Long Term Health Advisory, 20 ppb ($\mu\text{g/L}$), and as a result, are not expected to cause any adverse health effects. MTBE levels for residential wells sampled in these data sets ranged from ND (not detected) to a maximum of 46 ppb ($\mu\text{g/L}$), which was detected in a 1992 sample. **Overall, the levels of MTBE measured in residential wells have decreased steadily over the sampling years**, to a maximum of 20 ppb

($\mu\text{g/L}$) in 1995, down to a maximum of 10 ppb ($\mu\text{g/L}$) in 1996, the most recent year of sampling in these data sets. In addition, the most recent 1999 water-sampling data set for the Chevron USA site shows MTBE was detected in residential sampling wells at the *maximum* concentration of 6.2 ppb ($\mu\text{g/L}$), as previously discussed (Appendix 2, general discussion of MTBE).

Because no data were provided to quantify air (inhalation) and dermal exposures, EPA devised an estimated total exposure method. This method estimates the total combined exposure from all relevant exposure routes by assuming the **total exposure** is twice that of the ingestion exposure. In addition to ingestion from drinking water, this result would encompass inhalation, and to a lesser extent, dermal exposures encountered during daily activities such as showering, washing dishes, and doing laundry, etc. [16]. **Applying this EPA estimated total exposure method, the resultant levels representing all exposure routes are not expected to cause any adverse human health effects.**

Tables 2 and 3 in Appendix 1 give a detailed list of specific levels and relevant comparison values and a glossary defining each comparison value.

Because no biologic water-monitoring data were provided to ATSDR to review, this ATSDR evaluation could not evaluate the possible biologic contamination of the private wells near Chevron USA site. Furthermore, at this site, no information was provided to indicate where the residential septic tanks are located in relation to the wells. If the septic tanks are located upgradient from the wells, biologic contamination may possibly leach or migrate into the underlying shallow groundwater from leaking septic tanks.

Shallow private wells near septic tanks are more susceptible than are other water supplies to biologic contamination (i.e., coliform bacteria from feces, viruses such as hepatitis A, protozoa such as *Giardia* and *Cryptosporidium*, and parasites). In a Canadian study conducted in 1997, 53% of shallow well's groundwater contained biologic contamination above drinking water regulatory levels. When a septic tank was present less than 30 meters from the well, 75% of those groundwater wells contained contamination [12]. In addition, nitrate contamination of water supplies can result from malfunctioning septic systems. Consequently, persons using septic tanks should be encouraged to have their private water supply tested for primary public health indicators-nitrates and coliform bacteria. [17].

ATSDR's Child Health Initiative

The Child Health Initiative recognizes that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination of environmental media. As part of this initiative, ATSDR health consultations must indicate whether any site-related exposures are of particular concern for children. At this site, sampling has identified contaminants in the groundwater at the Chevron USA site. From the data reviewed, ATSDR did not identify any chemical contaminants at levels that would pose health hazards to children who use this groundwater.

Conclusions

Using the data reviewed, ATSDR concludes:

1. The levels of chemicals identified in groundwater samples from private wells at the Chevron USA site represent **no apparent public health hazard**. ATSDR uses this category for sites where human exposure to contaminated media may be occurring, may have occurred in the past, or may occur in the future, but the exposure is not expected to cause adverse health effects. This determination is based on site-specific data provided to ATSDR for review.
2. Exposure through drinking, bathing, or washing fruit and vegetables to the levels of chemicals identified in the groundwater samples from the Chevron USA site are not expected to cause any adverse human health effects, including birth defects.
3. Past sampling data indicates a trend of declining contamination levels over time.

Recommendation

1. Determine whether any biologic contamination from septic tanks is impacting the shallow, underlying groundwater near the site.

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Appendix 1

Table 1 lists four chemicals that were reported by the Florida Department of Environmental Protection and the Florida Department of Health Bureau of Laboratories, Jacksonville, Florida, as detected in analysis of water samples from March 1999. Only one chemical, MTBE, was detected above the method-detection limit. The remaining 58 chemicals tested were reported with result qualifiers (all samples). For 55 of these, the result qualifiers stated that the chemical was not detected in the sample tested, and the result reported was the method-detection limit by default. Three chemicals were reported as detected; however not at levels above the method-detection limit, and the result reported is the method-detection limit by default.

The method-detection limit for vinyl chloride, a known human carcinogen, in this laboratory analysis is 0.22 ppb ($\mu\text{g/L}$). This is above the most stringent comparison value for vinyl chloride, 0.2 ppb ($\mu\text{g/L}$), the chronic EMEG for a child. However, for each sample analyzed, the result reported for vinyl chloride is accompanied by a result qualifier, stating that it was not detected, and the result reported is the method-detection limit by default. Thus, the true concentration could reasonably fall below 0.2 ppb ($\mu\text{g/L}$) because of analytic variability and because the difference between the method-detection limit and the comparison value, 0.02 ppb ($\mu\text{g/L}$), falls within laboratory experimental error. In addition, the method-detection limit for vinyl chloride does fall below the other relevant screening health-based guidelines for vinyl chloride: the adult chronic EMEG of 0.7 ppb ($\mu\text{g/L}$), the CLHA of 10 ppb ($\mu\text{g/L}$), and the MCL of 2 ppb ($\mu\text{g/L}$). As a result, the level of vinyl chloride, conservatively estimated as the method-detection limit, is not expected to cause any adverse human health effects.

Table 1. Chemicals detected in groundwater samples. Chevron USA, Holiday, Florida, March 1999

Chemicals Detected	Levels in $\mu\text{g/L}$ or ppb								Comparison Values
	Commercial Levels 1999		Residential Levels 1999						
	1	2	1	2	3	4	5		
Monochlorobenzene (voc)				0.21	0.21	0.21	0.21		110 $\mu\text{g/L}$ (EPA Risk-Based Concentration-tap water) 700 ppb (Chronic RMEG Adult) 200 ppb (Chronic RMEG Child) 10,000 ppb (Inter. EMEG Adult) 4,000 ppb (Inter. EMEG Child) 2,000 ppb (CLHA) 100 ppb (LTHA) 100 ppb (MCL) 13,000 ppb (EPA Risk-Based Concentration-air)
Para-Dichlorobenzene (voc)				0.24					47 $\mu\text{g/L}$ C (EPA Risk-Based Concentration-tap water) 10,000 ppb (Inter. EMEG Adult) 4,000 ppb (Inter. EMEG Child) 10,000 ppb (CLHA) 75 ppb (MCL) 100 ppb (Chronic inhal. MRL) 200 ppb (Interm. inhal. MRL) 4,600 ppb (EPA Risk-Based Concentration-air)
Isopropylbenzene (voc)							0.20		660 $\mu\text{g/L}$ (EPA Risk-Based Concentration-tap water) 1000 ppb (Chronic RMEG Adult) 400 ppb (Chronic RMEG Child) 82,000 ppb (EPA Risk-Based Concentration-air)
MTBE (voc)	1.7	1.0	3.8	1.6	5.1	2.3	6.2		6,300 $\mu\text{g/L}$ (EPA Risk-Based Concentration-tap water) 10,000 ppb (Inter. EMEG Adult) 3,000 ppb (Inter. EMEG Child) 3,000 ppb (CLHA) 20 ppb (LTHA) -see discussion in separate appendix. 700 ppb (chronic inhal. MRL) 700 ppb (interm. inhal. MRL)

ppb= parts per billion (ppb equivalent to $\mu\text{g/L}$) $\mu\text{g/L}$ = micrograms/liter (water)

MTBE = Methyl ter-butyl ether

voc = volatile organic compound

*Important: Sample results had adequate quality control/quality assurance data, including blank analysis.

Results shown as shaded (0.00) means the chemical was detected, but at a level lower than the method-detection limit and the level reported is the method-detection limit. This represents a conservative estimate of the chemical level.

Table 2 lists chemicals that were reported by the Florida Department of Health, Jacksonville, Florida, as detected in analysis of water samples from 1989 to 1995. Table 2 lists only the sample results in which a chemical was detected. Representativeness of the Florida Department of Health sampling results is limited. Representativeness is defined as the degree to which data accurately and precisely represent an environmental condition. This includes sample design; sample quantity; sample-collection methods; and the date, timing, and location of sampling. In addition, the data set is limited in scope by the overall time period of data collection and by the lack of information on the laboratory used for sample analysis, on the analytic method, and on the quality assurance/quality control of analytic laboratory results. No information was provided on the analytic method-detection limits. No blank sampling data were included. No data were presented to characterize background levels off site for comparison. In addition, many sample results were reported with result qualifiers that were not defined. Thus, this data set does not meet quality assurance/quality control criteria and consequently represents possibly unreliable data that could lead to inaccurate conclusions.

Table 2. Chemicals detected in water samples. Chevron USA, Holiday, Florida, 1989 to 1995

Chemicals Detected	Maximum level detected ($\mu\text{g/L}$ or ppb)	Sampling date and location of sample with maximum level detected	Comparison Values ¹ [1,3-10]
Chloromethane (voc)	0.41*	1995; Residence	2.1 $\mu\text{g/L}$ C(EPA Risk-Based Concentration-tap water) 400 ppb (CLHA) 3 ppb (LTHA) 50 ppb (Chronic inhal. MRL) 200 ppb (Interm. inhal. MRL)
Monochlorobenzene (voc)	0.15*	1994; Residence	110 $\mu\text{g/L}$ (EPA Risk-Based Concentration-tap water) 700 ppb (Chronic RMEG Adult) 200 ppb (Chronic RMEG Child) 10,000 ppb (Inter. EMEG Adult) 4,000 ppb (Inter. EMEG Child) 2,000 ppb (CLHA) 100 ppb (LTHA) 100 ppb (MCL) 13,000 ppb (EPA Risk-Based Concentration-air)
para-Dichlorobenzene (voc)	0.14*	1995; Residence	0.47 $\mu\text{g/L}$ C(EPA Risk-Based Concentration-tap water) 10,000 ppb (Inter. EMEG Adult) 4,000 ppb (Inter. EMEG Child) 10,000 ppb (CLHA) 75 ppb (MCL) 100 ppb (Chronic inhal. MRL) 200 ppb (Interm. inhal. MRL) 4,600 ppb (EPA Risk-Based Concentration-air)

Isopropylbenzene (voc)	0.21*	1995; Commercial Location	660 $\mu\text{g/L}$ (EPA Risk-Based Concentration-tap water) 1000 ppb (Chronic RMEG Adult) 400 ppb (Chronic RMEG Child) 82,000 ppb (EPA Risk-Based Concentration-air)
MTBE (voc)	35	1993; Residence	6,300 $\mu\text{g/L}$ (EPA Risk-Based Concentration-tap water) 10,000 ppb (Inter. EMEG Adult) 3,000 ppb (Inter. EMEG Child) 3,000 ppb (CLHA) 20 ppb (LTHA) -see discussion in separate appendix. 700 ppb (chronic inhal. MRL) 700 ppb (interm. inhal. MRL)
Dibromochloromethane (voc)	8	1994; Residence	0.13 $\mu\text{g/L}$ C (EPA Risk-Based Concentration-tap water) 0.4 ppb (CREG) 700 ppb (Chronic RMEG Adult) 200 ppb (Chronic RMEG Child) 1,000 ppb (Chronic EMEG Adult) 300 ppb (Chronic EMEG Child) 2,000 ppb (CLHA) 60 ppb (LTHA) 87,000 ppb (EPA Risk-Based Concentration-air)

*result reported with an undefined result qualifier.

voc = volatile organic compound

Table 3 lists chemicals that were reported by the Florida Department of Environmental Protection, Jacksonville, Florida, in conjunction with a community member, as detected in analysis of water samples from 1990 to 1996. Table 3 lists only the sample results in which a chemical was detected. Representativeness of these sampling results is limited. Representativeness is defined as the degree to which data accurately and precisely represent an environmental condition. This includes sample design; sample quantity; sample-collection methods; and the date, timing, and location of sampling. In addition, the data set is limited in scope by the overall time period of data collection and by the lack of information on the laboratory used for sample analysis, on the analytic method, and on the quality assurance/quality control of analytic laboratory results. No blank sampling data were included. No data were presented to characterize background levels off site for comparison. In addition, it is unclear whether result qualifiers were used. Thus, this data set does not meet quality assurance/ quality control criteria and consequently represents possibly unreliable data that could lead to inaccurate conclusions.

Table 3. Chemicals detected in water samples. Chevron USA, Holiday, Florida, 1990 to 1996.

Chemicals Detected	Maximum level detected ($\mu\text{g/L}$ or ppb)	Sampling date and location of sample with maximum level detected	Comparison Values ² [1,3-10]
Benzene (voc)	380	1991; monitoring well number one. <u>Not detected after 1992.</u> <u>Not detected in any other monitoring wells or commercial wells or residential sampling wells.</u>	1 ppb (CREG) 1 ppb (MCL) 0.36 $\mu\text{g/L}$ C (EPA Risk-Based Concentration-tap water) 4 ppb (Interm. inhal. MRL)
Toluene (voc)	10	1994; monitoring well seven. Detected only once. <u>Not detected after 1994.</u> <u>Not detected in any other monitoring wells or commercial wells or residential sampling wells.</u>	750 $\mu\text{g/L}$ (EPA Risk-Based Concentration-tap water) 7000 ppb (Chronic RMEG Adult) 2000 ppb (Chronic RMEG Child) 700 ppb (Inter. EMEG Adult) 200 ppb (Inter. EMEG Child) 2000 ppb (CLHA) 1000 ppb (LTHA) 1000 ppb (MCL) 400 ppb (chronic inhal. MRL)
Ethylbenzene (voc)	1	1995; monitoring well one. Detected only once. <u>Not detected in any other monitoring wells or commercial wells or residential sampling wells.</u>	1300 $\mu\text{g/L}$ (EPA Risk-Based Concentration-tap water) 4000 ppb (Chronic RMEG Adult) 1000 ppb (Chronic RMEG Child) 1000 ppb (CLHA) 700 ppb (LTHA) 700 ppb (MCL) 200 ppb (interm. inhal. MRL) 253,000 ppb (EPA Risk-Based Concentration-air)

Xylenes (voc)	5	1995; monitoring well one. Detected only once. <u>Not detected in any other monitoring wells or commercial wells or residential sampling wells.</u>	12,000 µg/L (EPA Risk-Based Concentration-tap water) 70,000 ppb (Chronic RMEG Adult) 20,000 ppb (Chronic RMEG Child) 7,000 ppb (Inter. EMEG Adult) 2,000 ppb (Inter. EMEG Child) 40,000 ppb (CLHA) 10,000 ppb (LTHA) 10,000 ppb (MCL) 100 ppb (chronic inhal. MRL) 700 ppb (interm.inhal. MRL)
MTBE (voc)	352	1990; on-site well no longer in use. Level decreased to 33 ppb in 1996. <u>Not detected in any monitoring wells since 1994.</u> Highest residential well level in 1992 was 46 ppb. Highest residential well level in 1995 was 18 ppb. Highest residential well level in 1996 was 10 ppb.	6,300 µg/L (EPA Risk-Based Concentration-tap water) 10,000 ppb (Inter. EMEG Adult) 3,000 ppb (Inter. EMEG Child) 3,000 ppb (CLHA) 20 ppb (LTHA) -see discussion in separate appendix. 700 ppb (chronic inhal. MRL) 700 ppb (interm. inhal. MRL)

voc = volatile organic compound

Glossary of Comparison values

ATSDR's comparison values are considered media-specific screening values and are used to select contaminants of concern at a particular site. They are not intended for use as health-based comparison values to assess human health hazard. ATSDR interprets the phrase, a "contaminant of concern" as merely a site-specific chemical substance that the health assessor has selected for further evaluation of potential health effects. Generally, a chemical is selected as a contaminant of concern because its maximum concentration in air, water, or soil at the site exceeds one of ATSDR's comparison values.

However, comparison values are not thresholds of toxicity. Although concentrations at or below the relevant comparison value may reasonably be considered safe, it does not automatically follow that any environmental concentration that exceeds a comparison value would be expected to produce adverse health effects following human exposure. The purposes behind highly conservative, health-based standards and guidelines is to enable health professionals to recognize and resolve potential public health problems before they became health hazards. The probability that adverse health effect outcomes will actually occur depends not on environmental concentrations alone, but on site-specific conditions and individual lifestyle and genetic factors that affect the route and duration of actual exposure. Listed and described below are the various comparison value that ATSDR used in this consultation.

EPA Risk-Based Concentrations (RBCs) are media-specific values derived by the Region III Office of the Environmental Protection Agency. They assume default values for body weight, exposure duration, and ingestion/inhalation rates. These values represent levels of contaminants in air, water, soil, and fish that are considered safe over a *lifetime* of exposure. In this case, the RBC for tap water is applied. The letter C denotes that the chemical-specific carcinogenic effects were considered in the RBC.

Child Longer-Term Health Advisories (CLHAs) are contaminant concentrations in water that the Environmental Protection Agency deems protective of public health (taking into consideration the availability and economics of water treatment technology) over a lifetime (70 years), using a child's weight (10 kg) and ingestion rate (1 liter per day).

Lifetime Health Advisories (LTHAs) represent the concentration of a substance in drinking water estimated to have negligible deleterious effects in humans over a lifetime of 70 years, assuming two liters per day water consumption for a 70 kilogram adult, and taking into account other sources of exposure. They are calculated from EPA's oral reference doses, which are dose estimates of the daily exposure to a contaminant unlikely to cause any non-carcinogenic adverse health effects over a lifetime of chronic exposure.

Minimal Risk Levels (MRLs) are ATSDR's estimates of daily human exposure to a chemical that the agency considers unlikely to be associated with any appreciable risk of deleterious noncancer effects over a specified duration of exposure. MRLs are calculated using data from human and animal studies and are reported for acute (≤ 14 days), intermediate (15-364 days), and chronic (≥ 365 days) exposures. MRLs are published in ATSDR's Toxicological Profiles for specific chemicals.

Environmental Media Evaluation Guides (EMEGs) are media-specific concentrations that are calculated from ATSDR's minimal risk levels by factoring in default weights and ingestion rates. Different EMEGs are calculated for adults and children.

Reference Dose Media Evaluation Guides (RMEGs) are the concentrations of a contaminant in air, water or soil that ATSDR derives from EPA's RfD for that contaminant by factoring in default values for body weight and intake rate. RMEGs are calculated for adults and children.

EPA's Reference dose (RfD) is an estimate of the daily exposure to a contaminant unlikely to cause any non-carcinogenic adverse health effects over a lifetime of chronic exposure. It is a dose expressed in mg/kg/day.

Maximum Contaminant Levels (MCLs) are legally enforceable drinking water standards promulgated by EPA. They are contaminant concentrations in drinking water that EPA deems protective of public health (considering the availability and economics of water treatment technology) over a lifetime (70 years) at an exposure rate of 2 liters of water per day.

Selected Chemicals

Dichlorofluoromethane is a colorless gas used as a refrigerant [9]. About 40% of 113 major US cities have drinking water levels of dibromochloromethane between 0.06 $\mu\text{g/L}$ and 0.14 $\mu\text{g/L}$ [5,9].

Chloromethane is also a colorless gas with an ethereal type odor and is used as a refrigerant [9]. In the United States, levels of chloromethane are generally detected at less than 0.1-6 nanograms/liter (ppt). In industrial effluents, the levels were reported at 6-4194 $\mu\text{g/L}$ [7,9]. Usual daily US inhalation intake of this chemical is 42 μg [7,9].

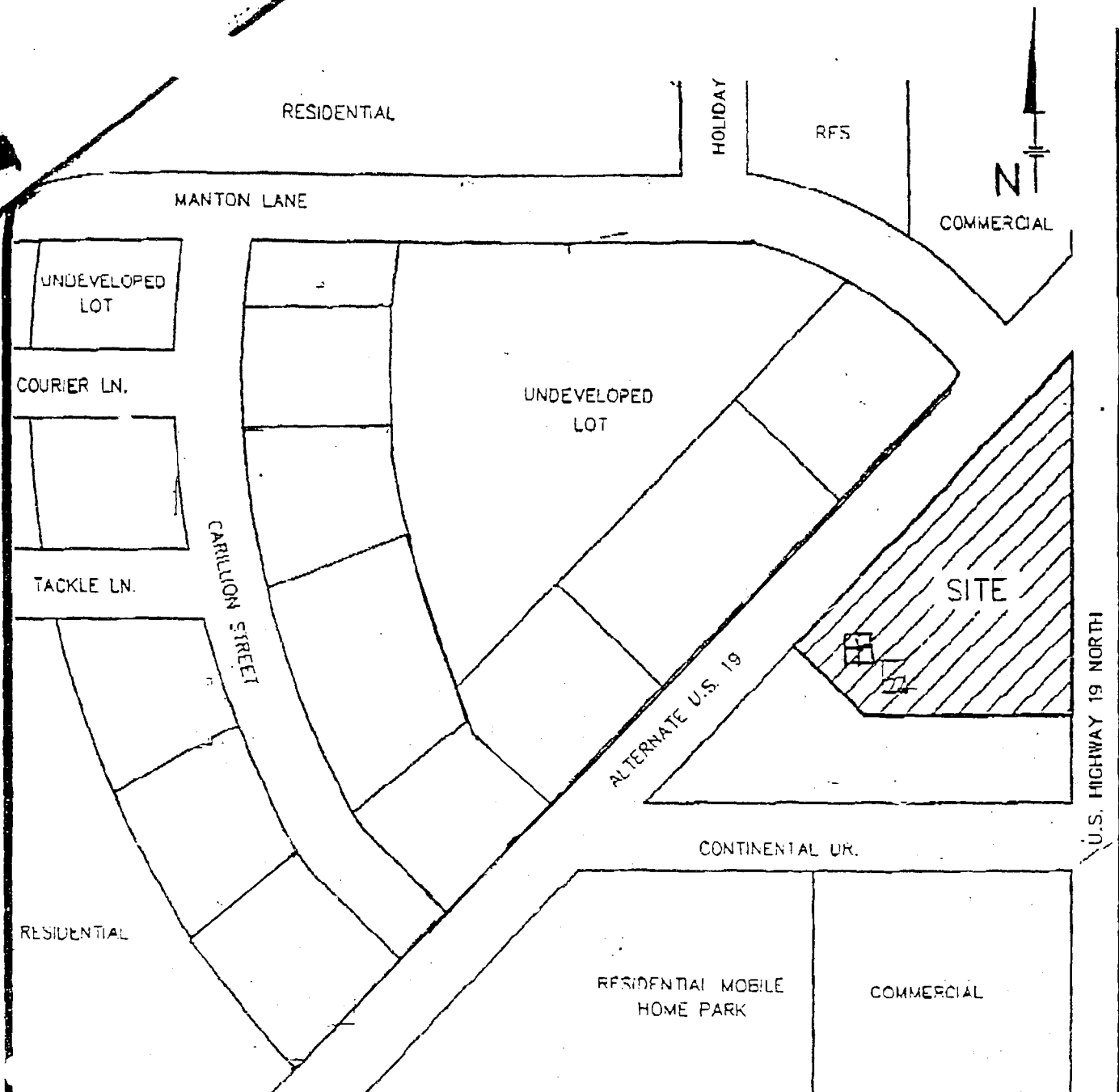
Vinyl chloride is a colorless gas with an ethereal type odor. Its main use is in the plastic industries. It is a carcinogen to humans and animals. About 13 % of major US cities have vinyl chloride at levels in their drinking water ranging 0.0015-0.15 $\mu\text{g/L}$ (median value 0.006 $\mu\text{g/L}$) [8,9]. In a US study, about 7 % of the wells studied contained vinyl chloride at a maximum level of 5900 $\mu\text{g/L}$ [8,9].

Monochlorobenzene is a colorless liquid with a faint, unpleasant odor; it is used as a solvent. The average concentrations found in areas away from industrial sites or landfills are 0.2-30 $\mu\text{g/L}$ [6,9].

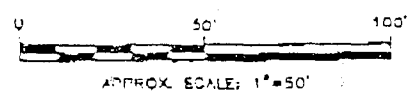
Para-dichlorobenzene is a white crystal at room temperature, with a strong and sharp odor at levels 30-60 ppm [9]. It is used as an insecticide. When detected in water in several studies, the levels were reported between 0.0030 $\mu\text{g/L}$ and 1.15 $\mu\text{g/L}$ [4,9]. It is classified as a possible human carcinogen.

Isopropylbenzene is a colorless liquid with a sharp, penetrating odor. It is used as a paint thinner, in high octane aviation fuel, and in minor amounts in gasoline blending. In several studies, the levels detected in drinking water were between 0.06 $\mu\text{g/L}$ and 0.14 $\mu\text{g/L}$ [9]. It is a possible human carcinogen.

Methyl tertiary-butyl ether (MTBE) is a liquid, highly volatile organic chemical with a terpene like odor. The odor threshold is 0.32 $\mu\text{g/L}$ to 0.47 $\mu\text{g/L}$. Since the late 1970's, MTBE has been used as a replacement for lead as an octane enhancer in unleaded gasoline. As a gasoline additive, MTBE promotes cleaner burning by reducing the emissions of gasoline constituents that are either directly toxic (carbon monoxide) or contribute to the formation of air pollutants (ozone). In several studies, the levels detected in groundwater samples from wells were between 0.5 $\mu\text{g/L}$ and 1000 $\mu\text{g/L}$ [3,9,14]. The US average daily water intake of MTBE is 140 $\mu\text{g/kg/d}$ [2]. In addition, MTBE is used as a medicine to dissolve gallstones [3]. A more extensive review of MTBE is available in Appendix 2.



SOURCE: BASE MAP PREPARED FROM DATA PROVIDED BY CHEVRON U.S.A., INC.



CHEVRON U.S.A., INC. 1533 U.S. HIGHWAY 19, HOLIDAY, FLORIDA MOP IMPLEMENTATION	
JANUARY 29, 1996	
BBL BLASLAND, BOUCK & LEE, INC. Engineers & Scientists	FIGURE 1

DATE: 12/28/95
 DRAWN: JAW-SA JR
 CHECKED: JAW-SA JR

Appendix 2

Holiday, Florida, Chevron USA site

The main chemical of concern at Chevron USA site is MTBE in drinking water. At the beginning of 1990, levels of MTBE on site and at nearby facilities exceeded the most severe limit for drinking water (California: 35 $\mu\text{g/L}$). Since 1993-1994, the levels are under that limit. In 1999, levels have been 1.7 $\mu\text{g/L}$ on site and 1.0 $\mu\text{g/L}$ at a nearby facility.

In the residential area surrounding the site, the 1999 levels have never exceeded the Florida limit of 35 $\mu\text{g/L}$ MTBE in drinking water. Analysis of levels measured in March of 1999 showed MTBE ranging from 1.6 $\mu\text{g/L}$ to 6.2 $\mu\text{g/L}$, median 3.8 $\mu\text{g/L}$. This is also concordant with levels usually found in urban area drinking water.

As already stated, MTBE daily intake through drinking water near Holiday, Florida, Chevron USA site is well below relevant comparison values. Furthermore, it is not a known human carcinogen.

Methyl tertiary-Butyl Ether (MTBE) [3]

CAS 1634-04-4

$\text{C}_5\text{H}_{12}\text{O}$

Physical characteristics [3]

MW: 88.15

Terpene-like odor with a odor threshold of 0.32-0.47 mg/m^3

Density: 0.7405 at 20°C

Solubility: 4.3g/100g of water

Vapor pressure: 250 mmHg at 25°C

Highly flammable volatile organic compound

Conversion factors at 25°C [3]

1 ppm = 3.6 mg/m^3

1 mg/m^3 = 0.28 ppm

Health effects [3,9]

Class A3 carcinogen: carcinogen to animals with no evidence up to now of human carcinogenicity. At high doses (several milliliters): somnolence to sedation, nausea, and vomiting may occur.

Environmental concentrationsGroundwater (wells and springs)

- 27% of 8 major cities in the United States tested positive for MTBE [3, 13]:
 - 23% measured MTBE levels in the range of 0.2 to 20.0 $\mu\text{g/L}$
 - 3% measured MTBE levels greater than 20 $\mu\text{g/L}$

Agricultural areas:

1.3% of shallow groundwater wells contained MTBE at a maximum level of 1.3 $\mu\text{g/L}$. On average, MTBE could be detected in a quarter of the aquifers (0.2-5.8 $\mu\text{g/L}$). Also, at a report level of 5 $\mu\text{g/L}$, 7.5% of water sample for wells from Kings and Queens counties, NY, had levels between 5 $\mu\text{g/L}$ to 1000 $\mu\text{g/L}$. [3,9,13]

Surface water

At a reporting level of 0.5 $\mu\text{g/L}$, MTBE was present in 29% of the water samples collected from 93 streams in Suffolk County, NY. The concentrations ranged from 0.6 to 20 $\mu\text{g/L}$. [3, 9, 13]

Atmospheric concentrations

Median urban concentrations of MTBE are 0.036 $\mu\text{g/L}$. After an hour of commuting, the MTBE concentration in a car ranged 0.012-0.160 $\mu\text{g/L}$. During refueling, MTBE climbed to 0.0003 $\mu\text{g/L}$ to 0.0094 $\mu\text{g/L}$ (0.084-2.60ppm) in the breathing zone. [3,9,13]

Body Burdens

Blood levels of MTBE depend on the level of exposure. Gasoline station attendants range 7.6-28.9 $\mu\text{g/L}$ with a median of 15 $\mu\text{g/L}$. Commuters range from <0.05 $\mu\text{g/L}$ to 2.60 $\mu\text{g/L}$, with a median of 0.11 $\mu\text{g/L}$. Persons working in car repair shops are in between with levels of 0.17-36.7 $\mu\text{g/L}$, median 1.73 $\mu\text{g/L}$. [3,9,13]

Average daily US occupational intake is 100-1000 $\mu\text{g/kg/d}$. Average US daily residential and water daily intake of MTBE are respectively 0.4 to 6 $\mu\text{g/kg/d}$ and 140 $\mu\text{g/kg/d}$. [3] In Holiday, Florida, near Chevron USA, the theoretical water daily intake of MTBE is estimated to be 1.3 $\mu\text{g/kg/d}$, based on the 1999 data.

Standards and Regulations

EPA RfD : 30 $\mu\text{g/kg/d}$

The EPA Drinking Water Advisory on consumer acceptability advice and health effects analysis for MTBE states, "Comparison indicates that there are four to five orders of magnitude between the 20 to 40 $\mu\text{g/L}$ range and concentrations associated with observed ranges of effects in animals. There is little likelihood that an MTBE concentration of 20 to 40 $\mu\text{g/L}$ would cause adverse health effects in humans, recognizing that some people may detect the chemical below this range. It can be noted that at this range of concentrations, the margins of exposure are about 10 to 100 times greater than would be provided by an EPA reference dose for noncancer effects." [15].

A summary of state and federal drinking water standards and guidelines follows [10,15]: