ATSDR
Health Consultation

Health Evaluation of drinking water
Former Fort Ord Army Base From 1985 to 1994

Monterey County, California 93944

USEPA Facility ID: CA7210020676

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U.S. Department of
Health and Human Services
Agency for Toxic Substances
and Disease Registry

Health Consultation: A Note of Explanation

A health consultation is written documentation of analysis and health conclusions from ATSDR about health risks related to a National Priorities List (NPL) or other specific site, a chemical release, or the presence of hazardous material. 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; collection and analysis of additional environmental samples to better characterize exposures; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This health consultation is released for a 45-day public comment period. ATSDR will address all public comments and revise or append the document as appropriate. The health consultation will then be reissued as a final document. The final document will conclude the public health assessment 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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U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Office of Community Health Hazard Assessment
Atlanta, Georgia, 30333

About ATSDR

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency of the U.S. Department of Health and Human Services (HHS). ATSDR works with other agencies and tribal, state, and local governments to study possible health risks in communities where people could come in contact with dangerous chemicals. For more information about ATSDR, visit the ATSDR website at www.atsdr.cdc.gov/.

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Acronyms and Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BRAC	Army Base Realignment and Closure
CE	Corps of Engineers
COC	contaminants of concern
CTE	central tendency exposure
CRs	cancer risks
CREG	cancer risk evaluation guides
CSFs	cancer slope factors
CVs	comparison values
DDW	California State Water Resources Control Board, Division of Drinking Water
DEH	Directorate of Engineering and Housing
DEHP	Di(2-ethylhexyl)phthalate
DHHS	U.S. Department of Health and Human Services
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
FFA	Federal Facilities Agreement
FO-SVA	Fort Ord Salinas Valley Aquitard
FODIS	Fort Ord Data Integration System
HEC	human equivalency concentration
HQ	hazard quotient
HC	health consultation
HLA	Harding-Lawson Associates
IARC	International Agency for Research on Cancer
idPODs	internal dose points of departure
LOAEL	lowest-observed-adverse-effect level
MCWD	Marina Coast Water District
mg/kg/day	milligrams per kilogram body weight per day
mg/L	milligrams per liter
MRLs	Minimal Risk Levels
NOAEL	no-observed-adverse-effect level
NPL	National Priorities List
OU2	Operable Unit 2
PBPK	physiologically based pharmacokinetic
PCE	Tetrachloroethylene
PFAS	per- and polyfluoroalkyl substances

PHA	public health assessment
PHAGM	public health assessment guidance manual
PHAST	Public Health Assessment Site Tool
PODs	potential points of departure
ppb	parts per billion
RfC	reference concentration
RfD	reference dose
RME	reasonable maximum exposure
RMEG	reference dose media evaluation guide
RWQCB	Regional Water Quality Control Board
SHOWER	Shower and Household Water-use Exposure
TCE	Trichloroethylene
UCL	upper confidence level
US	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VA	Veterans Affairs
VI	vapor intrusion
VOCs	volatile organic compounds
yrs	Years

1. Summary

In 2022, the Agency for Toxic Substances and Disease Registry (ATSDR) received petitions from two US Congressional Representatives and from a veteran previously stationed at the Former Fort Ord Army Base in Monterey County, California. The petitions asked ATSDR to re-evaluate potential health risks from drinking water exposures that occurred between 1985–1994 at Former Fort Ord Army Base. ATSDR accepted the petitions. They used new tools and methods to re-analyze data from 1985–1994 and assess potential health risks related to drinking water exposures. ATSDR re-evaluated the site following the agency's 2022 public health assessment (PHA) process, as summarized in Appendix A, and detailed in *ATSDR's Public Health Assessment Guidance Manual (PHAGM) [ATSDR 2022a]*.

ATSDR reached the following conclusions from the re-evaluation:

Conclusion 1 Health effect: Noncancer and cancer risks Sampling time: 1985–1994	ATSDR concluded that drinking water contaminants were not a past health hazard. Residents and soldiers-in-training who drank, showered, washed, and cooked with water from former Fort Ord and Marina Coast Water District (MCWD) drinking-water wells from 1985 to 1994 were not at risk for health effects due to contaminant exposures. The analysis of contaminant levels in drinking-water wells during this period indicated that these levels were below health concern thresholds.
Basis for Conclusion	▪ Nine contaminants had concentrations greater than one or more screening comparison levels. ▪ ATSDR further evaluated the nine contaminants of concern to assess whether potential exposures to the water (through drinking, inhaling vapors, and skin contact during everyday household activities) could lead to an increased risk of noncancerous health effects. ▪ ATSDR compared each contaminant's highest exposure point concentration (calculated from the sampling data) to health guideline values (minimal risk levels and then health effect levels). The analyses showed that people were not exposed to the nine contaminants at concentrations that pose an increased risk of noncancerous health effects. ▪ ATSDR evaluated cancer risks for eight of the nine contaminants of concern based on potential long-term (chronic) exposure scenarios. ATSDR assessed whether potential exposures to the water (through drinking, inhaling vapors, and skin contact during everyday household activities) could lead to an increased lifetime excess risk of cancer. ▪ ATSDR did not assess cancer risks for benzene exposure because exposure to benzene was not long-term (1 detection in 200 samples) and did not warrant lifetime cancer risk evaluation. ▪ Seven of the contaminants in the residential scenario and five of the contaminants in the soldier-in-training scenario had an estimated cancer risk greater than 1 in 1,000,000 for at least one age group. Across these contaminants and exposure scenarios, carbon tetrachloride had the highest excess cancer risk of 33 in 1,000,000. ▪ ATSDR does not consider excess lifetime cancer risk estimates in the 1 in 1,000,000 to 33 in 1,000,000 range a

	concern for increased cancer risks. ▪ Section 4.5 in this report provides the detailed analyses and findings that form the basis for this conclusion.

Conclusion 2 Lack of data Uncertain health hazard Time: Prior to 1985	ATSDR cannot conclude whether contaminants in former Fort Ord and Marina Coast drinking water systems prior to 1985 could have harmed people's health. There were no available water quality sampling data prior to 1985.
Basis for Conclusion	▪ ATSDR cannot determine whether drinking water exposures prior to 1985 may have harmed people's health because there were no drinking water sampling data available from that timeframe. ▪ The former Fort Ord landfill is the primary source of groundwater contamination that affected the former Fort Ord and Marina Coast water systems [Dames & Moore 1993]. The landfill site was used for over 30 years, from 1956 to until 1987. ▪ While it is possible that groundwater contamination predated 1985, ATSDR cannot estimate drinking water exposure levels and draw health conclusions for that timeframe.

2. Background

The Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta, Georgia, is a federal, nonregulatory, environmental public health agency within the U.S. Department of Health and Human Services (HHS). ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent people from coming into contact with harmful toxic substances.

In 1990, the Former Fort Ord Army Base (hereafter referred to as Fort Ord) was placed on the National Priorities List (NPL) by the U.S. Environmental Protection Agency (EPA). The NPL is a list of sites of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. ATSDR is required to conduct public health assessment activities for sites listed on the NPL. ATSDR determined that the re-evaluation of the Fort Ord site would best be achieved through an HC.

ATSDR has completed several previous health evaluations for the Fort Ord site. In 1996, ATSDR completed a PHA for the site. In 2001, ATSDR completed a Health Consultation regarding air data for a future controlled burn. In 2005, ATSDR completed a second Health Consultation to assess air exposures during a 2003 prescribed burn for several former firing ranges [ATSDR 1996; ATSDR 2001; ATSDR 2005a]. The 1996 Fort Ord PHA conducted by ATSDR concluded there were no apparent public health hazards. However, since completion of the 1996 PHA, additional scientific information has become available regarding contaminants at Fort Ord and their potential health effects. In addition, there are updated analytical methods and evaluation tools.

2.1. Statement of Issue and Purpose

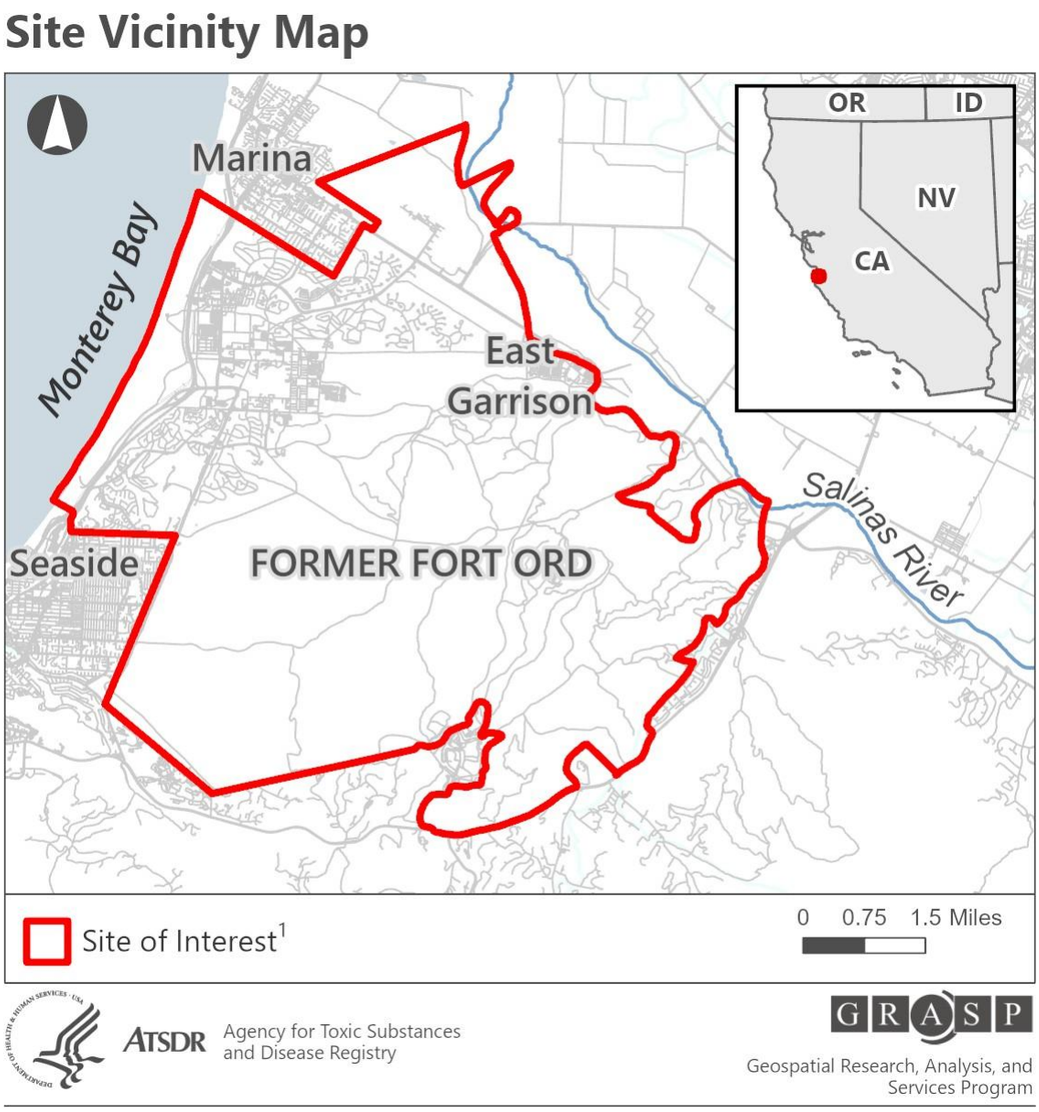
In 2022, ATSDR was petitioned to re-evaluate health risks associated with past exposure to contaminants in drinking water at the Fort Ord site. The purpose of this health consultation is to re-evaluate contamination levels from 1985–1994 in Fort Ord drinking water supplies to determine whether exposures to drinking water presented human health risks in the past.

Using available historical data, ATSDR's re-evaluation of Fort Ord's health risks used new science, methods, and tools to better understand drinking water exposures that took place between 1985 and 1994. No drinking water data are available prior to 1985. Scientific advances since 1994 have given us a better understanding of how trichloroethylene (TCE), tetrachloroethylene (PCE), and carbon tetrachloride, as well as other contaminants, can affect human health. In addition to drinking water exposures, new ATSDR methods and tools can be used to estimate exposures from showering and other household water uses.

2.2. Site Description and Timeline[1]

Fort Ord is a 46 square mile (28,000 acres) former United States Army (Army) installation in northwestern Monterey County, California. It is located approximately 80 miles south of San Francisco, California. The installation is bounded on the north and east by the Salinas River alluvial basin, on the west by the Pacific Ocean, and on the south by the Santa Lucia Range. The cities of Marina and Seaside are adjacent to Fort Ord on the northwest and southwest corners, respectively. The area consists of "gently rolling hills of active and older dune sand deposits" [Dames & Moore 1993]. Figure 1 shows the location of Fort Ord and surrounding areas.

Figure 1. Site Location Map



[1] Much of the text in Section 2.2 was taken from ATSDR's 1996 PHA [ATSDR 1996].

2.3. Site History

The Army purchased land on the east side of Fort Ord for maneuver and training ground for artillery and cavalry troops in 1917 [HLA 1995]. In the late 1930's, administrative buildings, barracks, mess halls, tents pads, and a sewage treatment plant were added [USACE 2022]. Additional land was purchased in 1938 for the development of the Main Garrison, which was constructed between 1940 and the 1960's. Fritzsche Army Airfield was completed in the early 1960's.

Between 1947 and 1975, Fort Ord served as a basic training center for the 4th Infantry Division [HLA 1995]. Fort Ord was the 7th Infantry Division's home prior to 1947 and after 1975. In 1983, the 7th Division was converted to a light infantry division; the light infantry division did not use heavy tanks, armor, or artillery. Fort Ord, when active, employed approximately 15,000 active-duty military personnel and 5,000 civilian employees.

In 1985, chemical analyses of groundwater samples were collected from Fort Ord and the city of Marina through the Marina Coast Water District (MCWD) [Dames & Moore 1993]. When those samples showed trace levels of volatile organic compounds (VOCs), an evaluation of potential contaminant sources was initiated. The Fort Ord Landfill facility, which was active at the time, was suspected of being a potential source area. The Central Coast Region of the California Regional Water Quality Control Board (RWQCB) then issued a Cleanup and Abatement Order to Fort Ord in February 1986. This order required Fort Ord to begin a hydrogeologic study to assess the possible effects of their landfills on the groundwater.

To comply with the RWQCB order, the Fort Ord Directorate of Engineering and Housing (DEH), the Sacramento District of the Corps of Engineers (CE), and Harding-Lawson Associates (HLA) performed an investigation to evaluate groundwater quality and hydrogeologic characteristics in the Upper, 180-Foot, and 400-Foot Aquifer systems [Dames & Moore 1993]. Because the landfills were considered a source of contamination to water supply wells, the investigation was primarily concerned with the area immediately adjacent to the landfill.

The Fort Ord landfills site (Operable Unit 2 [OU2]) is believed to be the primary source of drinking water chemical contamination on Fort Ord and nearby Marina, CA [Dames & Moore 1993]. The landfill site, consisting of 150 acres, was used for over 30 years. The northern portion of the landfill was used from 1956 to 1966. The main landfill was operated from 1960 until May 1987 when the facility was placed under interim closure. Available records do not include detailed information on the amount or types of waste disposed. The landfill is believed to contain household and commercial refuse, ash from incinerated infectious wastes, dried sewage sludge, demolition materials, and in the main landfill, small amounts of chemical waste.

Fort Ord was placed on the NPL by the EPA on February 21, 1990 [HLA 1995]. The U.S. Army, EPA, and state of California entered into a Federal Facilities Agreement (FFA) in July 1990, which outlined the projected scope of work and schedule of remediation work to be conducted at the site. In 1991, Fort Ord was selected as a Base Realignment and Closure (BRAC) site, and it was closed in September 1994.

Since 1994, environmental remediation and monitoring have been ongoing. Remediation efforts for OU2 have included covering the landfill with a protective layer to prevent rainwater infiltration and contaminant migration, installing and operating a landfill gas extraction and treatment system, and installing and improving groundwater treatment systems [USACE 2022]. ATSDR completed the first PHA of Fort Ord in 1996. In 2020, the Fort Ord site was awarded the 2020 National Federal Facility Excellence in Site Reuse Award in the NPL BRAC Category [EPA 2025]. Over 19,000 acres of the Fort Ord property have been transferred and redeveloped for various uses, including college buildings, mixed-use housing, senior and low-income housing, a state park, a cemetery, and a veteran’s affairs (VA) outpatient clinic.

During the 2022 5th Five-Year Review Technical Assessment, the U.S. Army Corps of Engineers (USACE) identified several issues that were not of immediate concern but were identified to be addressed in the future [USACE 2022]. For example, part of the groundwater plume was

migrating outside of the existing groundwater extraction area, and new extraction wells were needed to capture the contaminants. The USACE indicated that the remedies currently in place for OU2 were protective of human health and the environment because there were no opportunities for people to come into contact with the contaminated water, but additional remedies would be needed in the future. Groundwater at OU2 is not used as a source for drinking water, industrial water, or agricultural water [USACE 2022].

In 2001, the Marina Coast Water District (MCWD) acquired the Fort Ord water and wastewater systems from the Army [MCWD 2018; MCWD 2025]. MCWD currently provides drinking water to Central Marina and the former Fort Ord area within the Ord Community. Water pumped from MCWD wells consistently meets safe drinking water standards established by the USEPA and the California State Water Resources Control Board, Division of Drinking Water (DDW) [U.S. Army 2025]. MCWD regularly tests drinking water quality and reports results to DDW and in their annual Consumer Confidence Report [MCWD 2023].

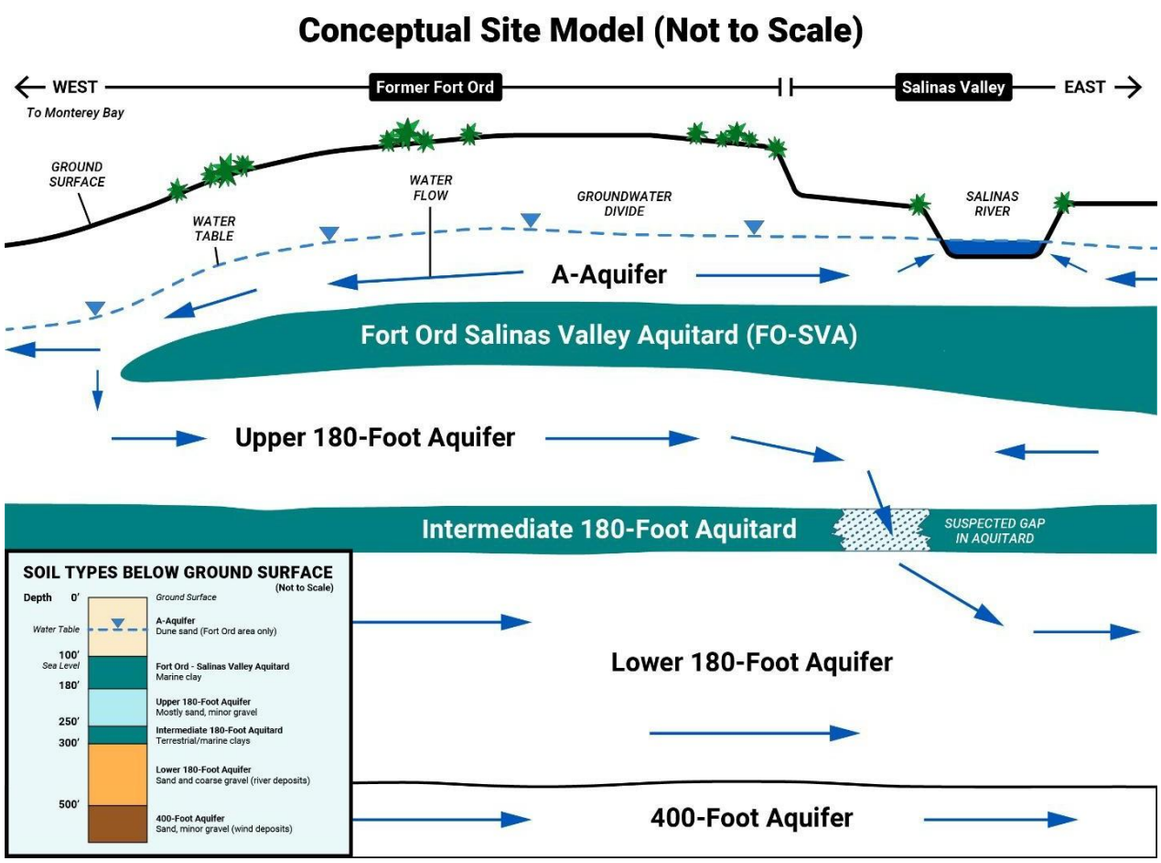
2.4. Groundwater Characteristics

The groundwater below the Fort Ord site is in areas defined as aquifers. An aquifer is an underground layer of permeable rock, sediment, or soil that yields water. Aquifers can range from a few square kilometers to thousands of square kilometers in size. Four separate groundwater-bearing zones, or aquifers, characterize the Salinas Basin beneath Fort Ord. The four aquifers are shown in Figure 2:

- The Upper A-Aquifer
- The Upper and Lower 180-Foot Aquifer
- The 400-Foot Aquifer
- The 900-Foot Aquifer

The 900-foot Aquifer is below the 400-Foot Aquifer and is not depicted in Figure 2 . In the Fort Ord area, the 900-Foot Aquifer is isolated from sources of Fort Ord contamination [HLA 1995].

Figure 2. Fort Ord Groundwater Model



Source: Modified from United States Army Fort Ord Cleanup 2024
https://fortordcleanup.com/programs/groundwater/

The information below was mostly taken from ATSDR's 1996 PHA on Fort Ord. The information characterizes the depths and composition of the aquifers and was accurate around the time contaminant data were collected.

The Upper A-aquifer has groundwater levels ranging from 100 to 150 feet below ground surface (bgs). It is composed of fine- to medium-grained, well-sorted sands within the Pleistocene-age older dune sand [HLA 1994]. The Upper A-aquifer is unconfined and is recharged from rainfall and surface water infiltration. The groundwater in that aquifer generally flows northwestward towards the Pacific Ocean. Notably, the Upper A-Aquifer is not used for drinking water supply, but it is vulnerable to contamination and can transport contaminants to lower levels of the aquifer [HLA 1994].

Beneath the A-aquifer is an extensive fine-grained relatively impermeable deposit, the Fort Ord-Salinas Valley Aquitard (FO-SVA), that separates it from and locally confines the deeper 180-Foot Aquifer. In the Fort Ord area, the FO-SVA underlies much of the northwestern portion of the Fort but thins-out and is absent under the remainder of the Fort. The FO-SVA disappears near the Main Garrison and along the southern Salinas basin boundary [HLA 1994]. The 180-Foot Aquifer consists of 50 to 150 feet of clay, silt, sand, and gravel. The 180-Foot Aquifer is a confined aquifer where it underlies the FO-SVA but is interconnected with the A-aquifer where the FO-SVA is absent. The Upper and Lower 180-Foot Aquifers are separated from one another by a silty and clayey sand called the Intermediate 180-Foot Aquitard.

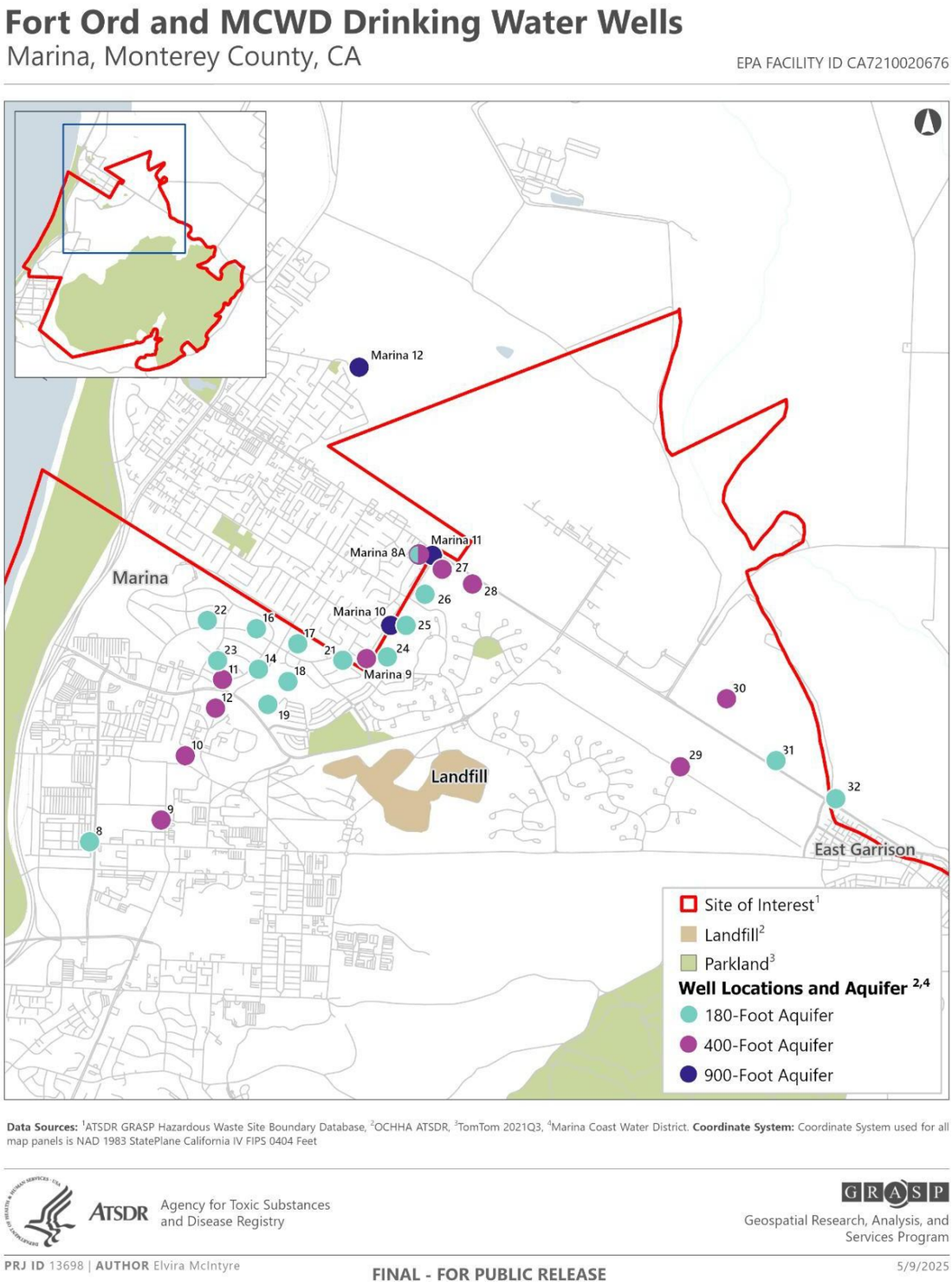
The 400-Foot Aquifer is a confined aquifer that generally consists of 50 to 200 feet of fine sand and silts. The water levels within the 400-Foot Aquifer vary from depths of 300 to 450 feet bgs. Much deeper, the confined 900-Foot Aquifer consists of water-bearing sands and gravels interbedded with layers of clay between depths of 750 to 1500 feet.

The two zones of OU2 impacted by contamination are the A-Aquifer and the Upper 180-foot Aquifer [USACE 2022]. Even though the 400-Foot Aquifer is confined and probably isolated from sources of Fort Ord contamination, a few scattered detections of contaminants have been recorded. The wells in the 400-Foot Aquifer may have been affected by contaminants migrating beyond the limits of the FO-SVA and merging with the groundwater in the lower Aquifer, or by cross-contamination of the aquifers by poorly constructed or damaged wells [HLA 1988; HLA 1995].

2.5. Fort Ord and City of Marina Drinking Water Systems

The tap water provided at Fort Ord and nearby communities comes from water supply wells that draw from groundwater. Fort Ord and the nearby community of Marina both draw groundwater from the Salinas Basin [HLA 1994]. Seaside, located on the southwest side of Fort Ord, draws groundwater from the Seaside Basin Aquifers. In the 1996 Fort Ord PHA, ATSDR concluded that the groundwater contamination at Fort Ord had not affected, and was not expected to affect, the drinking water supply of Seaside. Figure 3 shows the 180-, 400- and 900-Foot well locations in Marina and Fort Ord.

Figure 3. Fort Ord and Marina Coast Water District (MCWD) Drinking-Water Wells



During the 1985–1994 timeframe, the water used at Fort Ord was drawn from more than one well at a time and blended with water from other wells in sand filtration tanks. Wells were designated as active, stand-by, out of service, or emergency use only, depending on each well's testing results, as part of Fort Ord's well monitoring program [Meurer 1985; ATSDR 1996]. Blended water was then treated with chlorine and fluoride before being pumped to storage tanks [ATSDR 1996]. It was then distributed as tap water.

The contaminant level(s) of the blended and treated tap water supplied to a residence or other point of use was likely less than those measured in an individual water supply well with greater contaminants levels. Additionally, the blending process allowed for off-gassing of volatile chemicals, which further reduced the level of volatile contaminants.

In 1985, the Army Environmental Hygiene Agency reported Fort Ord's blended drinking water complied with the California assembly bill for public drinking water safety and quality [Meurer

1985]. The Fort Ord director of engineering and housing acknowledged contaminant levels in certain individual drinking-water wells contained traces of halogenated hydrocarbons, some of which were above State Action Levels [Meurer 1985]. Further sampling and analyses in 1985 showed that Fort Ord's blended water from multiple wells produced drinking water compliant with State Action Levels. Certain wells with elevated contaminants were taken out of service as part of Fort Ord's water management plan and monitoring program [Meurer 1985].

Over time, the development and use of groundwater at Fort Ord and nearby areas lowered the groundwater level of the 180-Foot Aquifer. As a result, saltwater intrusion began to impact the aquifer. The Main Garrison area of Fort Ord and Marina first observed saltwater intrusion in the 1960's.

As a result of declining water quality, Fort Ord relocated its wells to the east [HLA 1994]. To accomplish this, Fort Ord stopped using its 180-Foot Aquifer wells under the Main Garrison area and drilled drinking-water wells 29 and 30 to the 400-Foot Aquifer and drinking-water wells 31 and 32 to 180-Foot Aquifer (not the 180-Foot Aquifer under the Main Garrison area). The new wells, drilled in 1984 and located in the East Garrison Area, are isolated from and up-gradient to known sources of contamination at Fort Ord. In 1989, inactive wells FO-11, FO-14, FO-16, FO-17, FO-18, FO-19, FO-21, FO-22, and FO-23 were destroyed to eliminate suspected conduits between the A-Aquifer and the 180-Foot Aquifer [HLA 1994]. Well 24 was retained as an emergency water supply. In 1996, well 32 was closed. It was replaced by well 33 in 2005.

The city of Marina could not move its wells farther east due to its geographical constraints, so the city opted to drill its wells deeper below the zone of saltwater intrusion [HLA 1994]. Marina closed all 180-Foot Aquifer wells by 1978 and replaced them with wells in the 400-Foot and 900-Foot aquifers.

The Upper A-aquifer was thought to be unaffected by seawater intrusion because the aquifer was above sea level [HLA 1994]. Seawater intrusion into the 180-Foot Aquifer beneath the Main Garrison appeared to have decreased over time. The confined 400-Foot Aquifer had not been affected by the seawater intrusion.

Table 1 shows the dates of when the Marina Coast Water District and Fort Ord production wells were drilled, the year they were closed and/or destroyed, their aquifer's depth, and the years between 1985 and 1994 when chemical sampling data were collected. Information is pulled from ATSDR's 1996 Fort Ord PHA [ATSDR 1996], HLA's Basewide Hydrogeologic Characterization [HLA 1994], and information the Marina Coast Water District provided to ATSDR.

Table 1. Drinking-Water Well Operation and Sampling History for Wells in Operation before 1994

Jurisdiction	Well Station	Year Drilled	Aquifer Depth	Year – Well Status*	Years of Chemical Sampling Between 1985 – 1994
Fort Ord	8	1940	180-Foot	1952 – closed/destroyed*	No sampling data
Fort Ord	9	1940	400-Foot	1952 – closed/destroyed*	No sampling data
Fort Ord	10	1940	400-Foot	1952 – closed/destroyed*	No sampling data
Fort Ord	11	1940	400-Foot	1983 – closed; 1989 – destroyed	No sampling data
Fort Ord	12	1942	400-Foot	1952 – closed/destroyed*	No sampling data
Fort Ord	14	1941	180-Foot	1975 – backup well; 1989 – destroyed	1985
Fort Ord	16	1942	180-Foot	1962–closed; 1989 –destroyed	No sampling data
Fort Ord	17	1946	180-Foot	1971–closed; 1989 –destroyed	1985
Fort Ord	18	1952	180-Foot	1975 – backup well; 1989 – destroyed	1985
Fort Ord	19	1952	180-Foot	1986–standby; 1989 – destroyed	1985–1988
Fort Ord	21	1952	180-Foot	1986–standby; 1989 – destroyed	1985–1986
Fort Ord	22	1952	180-Foot	1969–closed; 1989- destroyed	No sampling data
Fort Ord	23	1952	180-Foot	1975 – standby; 1989 – destroyed	1985
Fort Ord	24	1963	180-Foot	1986–inactive backup well; 1989–closed/destroyed*	1985–1990, 1992–1993
Fort Ord	25	1963	180-Foot	1975– backup well; 1989 – destroyed	No sampling data
Fort Ord	26	1962	180-Foot	1986–inactive; 1990–destroyed	1985–1986
Fort Ord	27	1968	400-Foot	1986 – inactive status	1985–1988, 1990–1991
Fort Ord	28	1968	400-Foot	1986–standby; 1988 – closed	1985–1986, 1988–1990
Fort Ord	29	1984	400-Foot	Active	1985, 1987–1988, 1993
Fort Ord	30	1984	400-Foot	Active	1985, 1993
Fort Ord	31	1984	180-Foot	Active	1985
Fort Ord	32	1984	180-Foot	1996 - closed	1985–1986
Marina Coast Water District (MCWD)	8A	1982	180 Foot and 400-Foot	1989– standby; 1993 – closed	1985–1987, 1989–1991
MCWD	9	1972	400-Foot	2005 – inactive	1985–1994
MCWD	10	1983	900-Foot	Active	1985–1994
MCWD	11	1986	900-Foot	Active	1987–1991, 1993–1994
MCWD	12	1989	900-Foot	2016- Standby; 2019-inactive	1990-1994

*Table 7 in ATSDR's 1996 Fort Ord PHA indicates the year a well was closed or destroyed, but the table does not distinguish which of the two activities (closed or destroyed) occurred in a given year.

There were no private wells in Seaside or off base near the landfill or Fritzsche Airfield [ATSDR 1996]. A small number of private wells were located throughout Marina. These wells were drilled to depths between 80–120 feet and were used for irrigation only. These private wells showed traces of nitrates. Nitrates commonly originate from sources such as fertilizers or onsite sewage disposal systems. The private wells did not pose a human health risk for the residents if they were used for irrigation only.

ATSDR obtained a database containing drinking-water well sampling results from the Army Base Realignment and Closure (BRAC) group in 2023 for the wells that were in operation or had not been destroyed during 1985–1994. ATSDR also received drinking-water well sampling results from MCWD for wells that supplied their system during the 1985–1994 timeframe. ATSDR's re-evaluation is limited to the 1985–1994 timeframe

- because no Fort Ord drinking-water well sampling data are available prior to 1985,
- because Fort Ord closed in 1994, and
- to align with the drinking water evaluation in ATSDR's 1996 PHA [ATSDR 1996].

3. Community Description and Concerns

3.1. Community Demographics

Between 1985 and 1994, Fort Ord was a training and deployment staging center for infantry troops, with residential barracks and military family housing on site.

Figure 4 is a map ATSDR developed to identify the demographic characteristics of residents within the Fort Ord Boundary and within 1-mile of the site. ATSDR used U.S. Census 1990 data because it falls in the middle of the timeframe investigated for this report.

Using U.S. Census 1990 data, ATSDR estimated approximately 28,770 people living within the site, and up to 71,706 total population within a 1-mile radius of the site boundary. A Fort Ord neighborhood map (Figure 5), provided by the Army, shows locations and years first occupied of several on-site residential neighborhoods. In 1990, residential barracks for soldiers (first occupied in 1940) were in the northwest corner of the Fort Ord base. Family housing was located to the northeast – Patton Park (first occupied in 1962), Abrams Park (1979), Fredricks Park (1982), Schoonover Park (1988), Preston Park (1989). Additional family housing was located to the south – Stilwell Park (1958), Fitch Park (1959) and Marshall Park (1961). The barracks had a higher population density than the family housing neighborhoods.

In terms of sensitive populations, in 1990 there were 649 children aged six or younger; 1,433 adults aged 65 or older; and 1,737 females aged 15 – 44 residing on site or within a 1-mile

radius of the site. These sensitive populations represent approximately 5% of the total population residing in the area.

Although Fort Ord closed most operations in 1994, many activities continued onsite, including military reserve centers and military residential housing used for Defense Language Institute students, faculty, staff, and their families.

Figure 4. Demographic Information in 1990 Within Former Fort Ord Boundary and Within 1-Mile of the Site

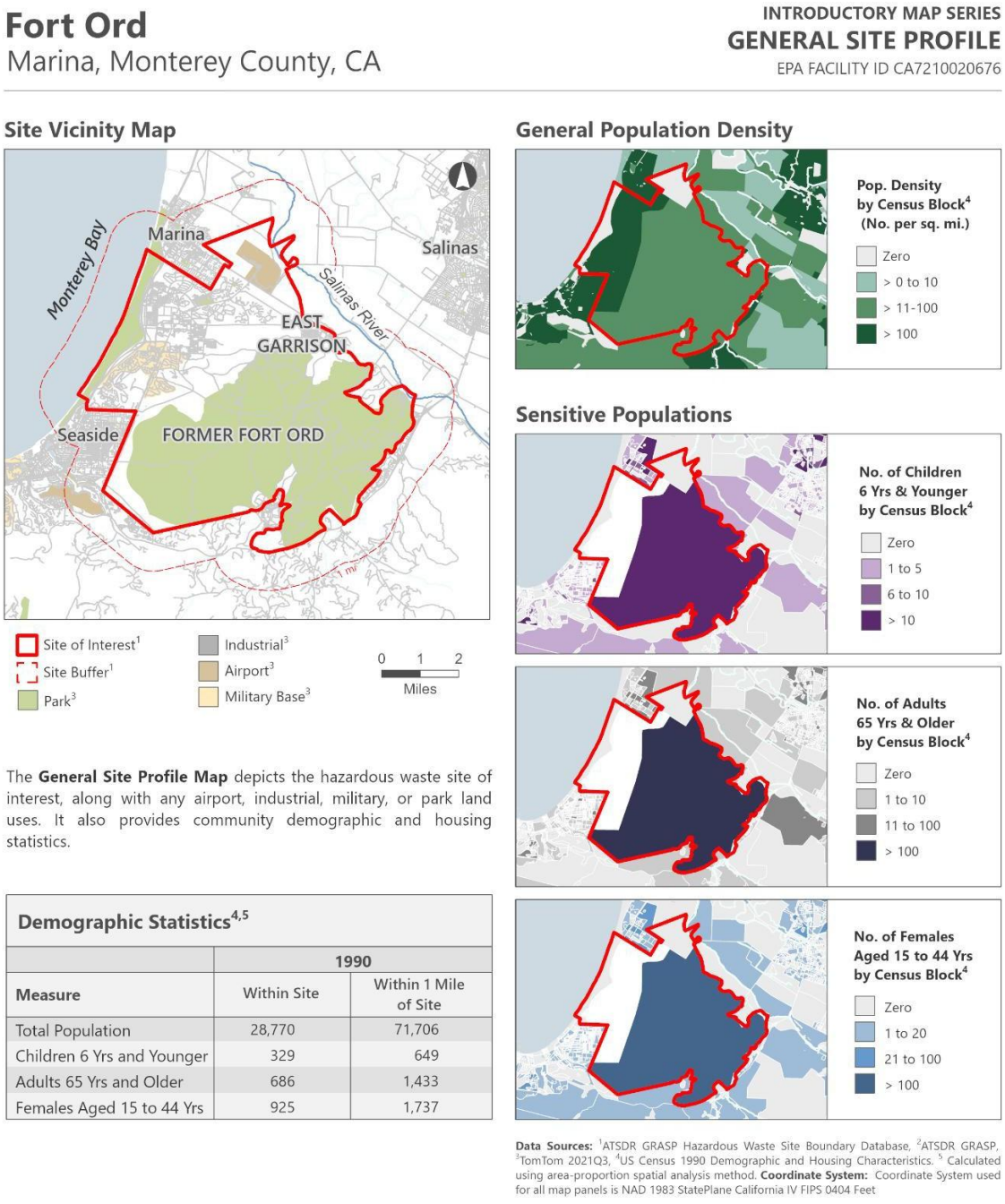
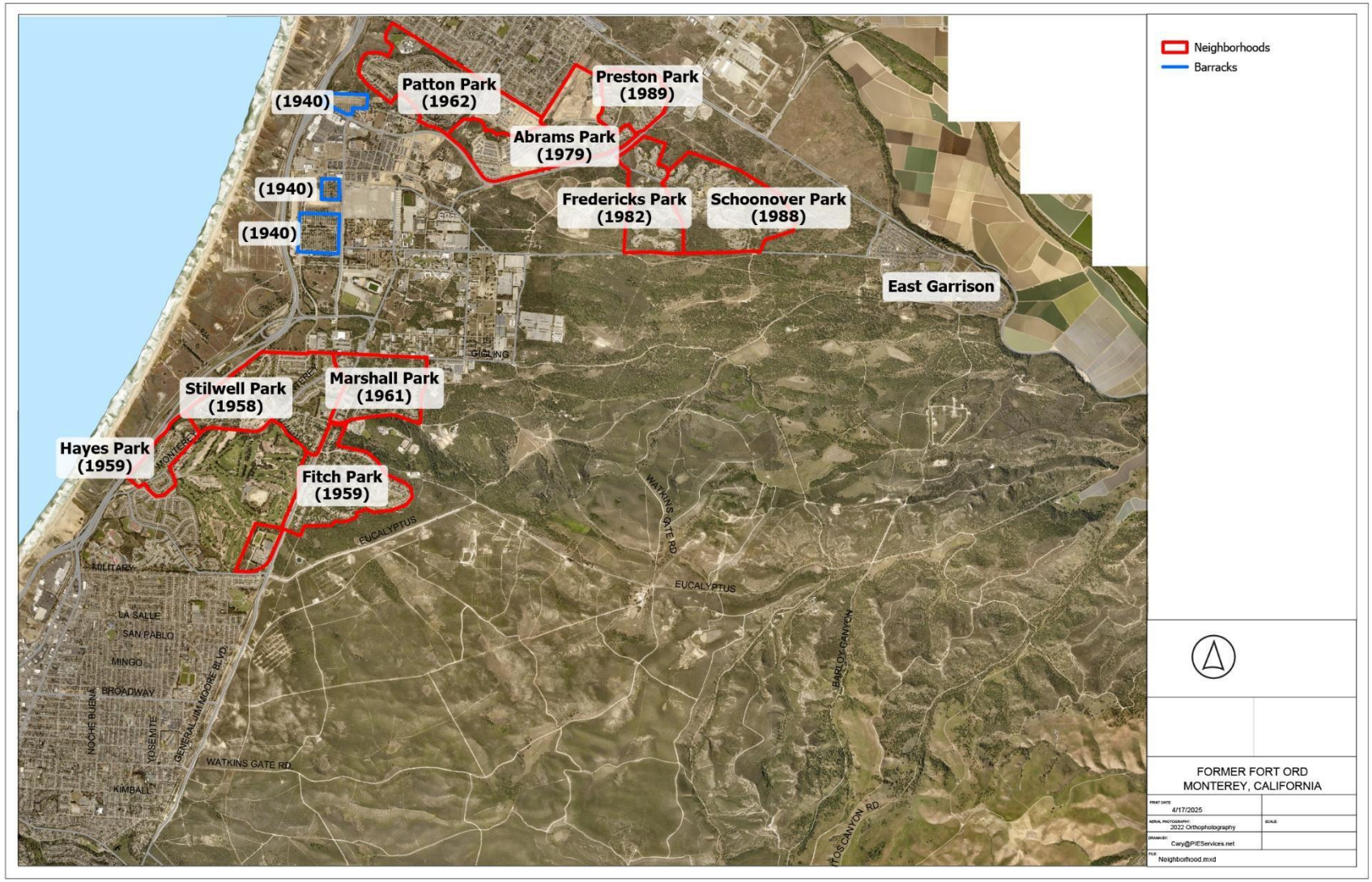


Figure 5. Location of Fort Ord Barracks and Residential Neighborhoods and Approximate Dates when First Occupied



Source: Modified from United States Army Fort Ord Cleanup map created 4/17/2025 using 2022 orthophotography.

3.2 Community Concerns

U.S. Congressional representatives wrote to ATSDR on behalf of veterans and their families who had been stationed at Fort Ord and asked ATSDR to re-evaluate possible exposures to chemicals ingested through drinking water supplying the Fort. Over the years, Fort Ord served as a center for basic and advanced training for several infantry divisions and had a variety of housing barracks and neighborhoods. The neighborhoods served the families of civilians working at other Defense Department institutes nearby.

ATSDR also received several individual inquiries from former service members and their family members who were stationed at Fort Ord but now reside elsewhere.

Through these communications, past and current community members expressed the following concerns:

- Cancer and noncancer health risks associated with exposure to chemicals in Fort Ord drinking water while living on Fort Ord
- Cancer and noncancer health risks associated with exposure to Fort Ord drinking water while completing rigorous physical activities during Army basic training on Fort Ord
- Cumulative exposures to chlorinated chemicals, including inhalation, ingestion, and dermal contact
- Volatilization of chlorinated chemicals from groundwater to indoor air
- Impact of PFAS on drinking water in the past
- Ongoing use of Fort Ord beyond 1994 and potential for exposures through drinking water
- Health risks from the drinking water currently (at the time of release of this report) supplied by the MCWD to the organizations and businesses located in the Fort Ord area

ATSDR responses to these concerns are provided in section 4, Scientific Evaluations, and/or section 4.7, Addressing Community Concerns.

4. Scientific Evaluations

After examining the available site-specific information and data, ATSDR performs a sequence of steps that include

- evaluating site-specific exposure scenarios and potential exposure pathways,
- comparing contaminant concentrations to media-specific screening levels,
- estimating exposure doses, and
- analyzing toxicological information for contaminants, if necessary, to assess potential health risks.

This section covers ATSDR's scientific evaluation of potential exposures and health risks due to contaminants in Fort Ord drinking water from available historical data between 1985 and 1994.

4.1. Exposure Pathway Analysis

A person must make contact with an environmental contaminant for there to be any possibility of health risks from that contaminant. ATSDR determined that Fort Ord residents could have been exposed to contaminated drinking water based on the following five key elements.

- Drinking-water wells were a source of certain contaminants.
- Contaminants from the source were distributed through drinking water systems used by residences.
- The specific location, or exposure point, included water faucets or taps on the Fort Ord base and in Marina, CA.
- Contaminants could have entered people's body through skin (dermal contact through washing or bathing), inhalation (breathing in water vapors being used) and ingestion (such as drinking the water or cooking with it).
- The people who lived at Fort Ord or in Marina, CA, made up the exposed population.

Based on the review of all five key elements for the Fort Ord drinking water scenario, ATSDR considers there was a completed exposure pathway.

ATSDR determined the drinking water pathway was complete for people who used Fort Ord or MCWD water from 1985 through 1994. The sampling data showed contaminant concentrations above ATSDR's comparison values (CVs). ATSDR conducted further evaluations of the potential risks from contaminant exposures while recognizing some of the limitations with the available historical data.

4.2. Exposure Analysis Limitations

Beginning in 1947, Fort Ord site was used by the 4th and 7th Infantry Divisions at various times. However, groundwater sampling did not occur until 1985. The contaminants found in the groundwater were likely the result of leaching from the landfill soils in Operable Unit 2. The landfill was used from 1960 to 1987, but it is not known when the contaminants first started leaching into the groundwater. ATSDR classified exposures to drinking water prior to 1985 as an indeterminate health hazard because there is no drinking water monitoring data to determine contaminant levels.

Some of the contaminants detected in the groundwater are volatile organic contaminants (VOCs). Volatile contaminants are characterized by their ability to vaporize from the water into the surrounding air. When the contaminants vaporize from the water into the soil, they can migrate through the soil and seep into buildings through a process called vapor intrusion (VI). Air sampling data from within and directly beneath the buildings is needed to determine if VI is occurring and to what extent. Air monitoring for VI was not done during 1985–1994 so ATSDR

cannot determine if individuals were exposed through this potential pathway. ATSDR is uncertain if VI was occurring and, if it was, to what extent.

Prior to 1985, there are no available historical data to assess exposure for any of the possible pathways. Based on the available historical data from 1985–1994, ATSDR considers the Fort Ord and Marina residents and soldiers to have had completed drinking water exposure pathways from drinking and household uses (e.g., inhalation while showering). The VI pathway is classified as indeterminate or potential, because no VI data exists (Table 2).

Table 2. Exposure pathways between 1985–1994

Exposure Pathway	Exposure Route	Pathway After 1985	Reason for exposure pathway determination
Drinking water	Ingestion, dermal	Completed	Sampling data from 1985–1994
Indoor air from household use of water	Inhalation	Completed	Sampling data from 1985–1994
Indoor air from vapor intrusion (VI)	Inhalation	Potential	Lack of sampling data

4.3. ATSDR SHOWER Model

ATSDR used the Shower and Household Water-use Exposure (SHOWER) model to estimate exposure doses for residents and soldiers-in-training who used water from the drinking-water wells. The ATSDR SHOWER model evaluates inhalation and dermal exposures to volatile contaminants from indoor water sources [ATSDR 2025a]. This model did not exist when ATSDR completed the 1996 Fort Ord PHA.

Several of the contaminants evaluated are VOCs. ATSDR's SHOWER model estimates the VOC concentrations in indoor air from normal household water usages (e.g., showering, laundering, cooking) based upon the concentrations measured in the water. Except for TCE, ATSDR used the maximum concentration for each contaminant of concern as the exposure concentration input for the SHOWER model to estimate exposure dose. For TCE, ATSDR used the ATSDR Exposure Point Concentration (EPC) Tool [ATSDR 2023] to calculate the 95 Upper Confidence Limit (UCL) of the mean as the exposure concentration to estimate exposure dose.

ATSDR used site-specific parameters in analyzing two SHOWER model scenarios: a residential scenario and a soldier-in-training scenario. The residential scenario assumed 4 people lived in a residence and all took sequential showers and stayed in the residence all day. In ATSDR's SHOWER model, the "target" individual represents the most highly exposed person. The most highly exposed person is defined as the fourth individual to shower in the residence each day. This individual is considered the most highly exposed because successive showers allow volatile contaminants to accumulate in indoor air, approaching steady-state concentrations by the fourth shower. Appendix B has a more complete description of the residential scenario assumptions.

The soldier-in-training scenario assumes 100 people were using the communal shower and bathroom facilities for soldiers living in the barracks or dorms at the Fort Ord facility. Appendix B has a more complete description of assumptions for the SHOWER model soldier-in-training scenario.

ATSDR calculated the combined exposures of drinking the water, showering in the water, being exposed through the skin, or breathing air that contains the VOCs in the following section. The average daily exposure concentration in the different age groups for each contaminant is provided in the Public Health Assessment Site Tool (PHAST) output tables (Appendix C for residential scenario and Appendix D for soldier-in-training scenario). Note that the PHAST output tables in Appendices express contaminant concentrations as µg/L (micrograms per liter), which is the same as ppb (parts per billion) used in this report's text and tables.

4.4. Household Water Evaluation

4.4.1. Sampling Data

In 2023, ATSDR obtained a database containing drinking-water well sampling results from the Army BRAC group for wells that were sampled during 1985–1994. Sampling results were obtained for the 22 Fort Ord drinking-water wells described previously (see Table 1). Additional sampling results were obtained for the same timeframe (1985–1994) for the five MCWD wells (see Table 1). The sampling data from MCWD wells were included in this health consultation because the data were evaluated in the 1996 PHA and because of their location relative to contaminant sources at the site (see Figure 3 above). Both Fort Ord and MCWD wells also had been drilled to depths that access two of the same aquifers (180-foot, 400-foot; refer to Table 1) and were sampled during similar time frames. The MCWD sampling data may represent past drinking water exposures for military personnel who lived on or off the Fort Ord base. The Fort Ord and MCWD drinking-water wells and their operational and sampling status are described in Section 2.5.

ATSDR's re-evaluation is limited to the 1985–1994 timeframe because no drinking-water well sampling data are available prior to 1985; Fort Ord closed in 1994 through the BRAC process; and to align with the drinking water evaluation in ATSDR's 1996 PHA. The number of samples, detections, years with detections, and ranges are shown for each of the contaminants of concern for the Fort Ord wells (Table 3) and for the MCWD wells (Table 4).

ATSDR's 1996 PHA report provided a summary for all contaminants detected in the Fort Ord and MCWD wells [ATSDR 1996]. There were additional contaminants detected in Fort Ord and MCWD sampling data that were initially screened for in this HC but did not exceed ATSDR's most current CVs; the Fort Ord contaminants below their respective CVs were not retained for further analyses (Appendix E, Table E- 1). Table 3 for Fort Ord wells and Table 4 for MCWD wells provide information about the nine drinking-water contaminants that exceeded ATSDR's current CVs. These nine contaminants identified as contaminants of concern and retained for more analysis.

Three of the nine contaminants of concern were detected in both the Fort Ord and the MCWD drinking-water samples: carbon tetrachloride, chloroform, and TCE (trichloroethylene). Four other contaminants were detected in Fort Ord drinking water samples that were not detected in MCWD well samples: PCE (tetrachloroethylene), methylene chloride, benzene, and DEHP [Di(2-ethylhexyl)phthalate]. Two other contaminants, dibromochloromethane and bromodichloromethane, were detected in MCWD well samples but were not detected in Fort Ord drinking water samples.

ATSDR received drinking water sampling data for this health consultation that was not reported in ATSDR's 1996 PHA report. The sampling data for this health consultation had a total of 28 more detections from the Fort Ord wells and 14 more detections from the MCWD wells.[2] Table 3 and Table 4 detail any differences from the data used in the 1996 PHA regarding number of samples and detections for the individual contaminants. With three exceptions, the maximum concentrations for contaminants were the same in the data used for this re-evaluation as those reported in the 1996 PHA; maximum concentrations of methylene chloride and benzene in Fort Ord supply wells and carbon tetrachloride in MCWD supply wells were higher compared to the 1996 PHA.

Table 3. Sampling data for contaminants of concern from former Fort Ord drinking-water wells (1985–1994)

Contaminant	Number of Detections/Number of Samples	Years with Detections*	Minimum to Maximum Range (ppb)	Data Differences with 1996 Public Health Assessment†
Carbon tetrachloride	36/200	1985–1991	0.5–9.8	3 more detections
Chloroform	6/204	1987, 1988	0.9–1.8	1 more detection
Methylene chloride	2/191	1985	1.2–6.9	1 more detection; Maximum of 6.9 ppb not in 1996 PHA
PCE (Tetrachloroethylene)	21/189	1985–1988	0.6–53.0	7 more detections
TCE (Trichloroethylene)	54/166	1985–1990	0.6–25.0	11 more detections; Ranges are the same

[2] ATSDR did not retain the dataset used for the 1996 PHA. To complete the reanalysis for the current report, ATSDR had to re-request the dataset. The new dataset included data that was not included in 1996 PHA but is included in this report.

Contaminant	Number of Detections/Number of Samples	Years with Detections*	Minimum to Maximum Range (ppb)	Data Differences with 1996 Public Health Assessment†
Benzene	1/198	1987	30.0	1 detection of 30.0 ppb not in 1996 PHA
DEHP [Di(2-ethylhexyl)phthalate]	4/22	1985	25.0–99.0	4 detections not in 1996 PHA

* Years contaminants were detected within the sampling timeframe of 1985–1994

† Comparison of number of detections and minimum to maximum range

Table 4. Sampling data for contaminants of concern from Marina Coast Water District drinking-water wells (1985–1994)

Contaminant	Number of Detections/Number of Samples	Years with Detections*	Minimum to Maximum Range (ppb)	Data Differences with 1996 Public Health Assessment†
Carbon tetrachloride	8/168	1987, 1989, 1990, 1991	0.7–2.5	5 more detections; Range in 1996 PHA was 0.8–1.3 ppb
Chloroform	3/171	1990, 1991	0.9–3.8	No differences
Dibromochloromethane	2/171	1990, 1991	1.4–6.2	No differences
Bromodichloromethane	2/171	1990, 1991	1.0–5.3	No differences
TCE (Trichloroethylene)	42/168	1985–1990, 1994	0.5–2.9	9 more detections

* Years contaminants were detected within the sampling timeframe of 1985–1994

† Comparison of number of detections and minimum to maximum ranges

4.4.2. Screening Analysis

ATSDR used a consistent, systematic screening method to identify potential contaminants of concern that required further evaluation. Comparison values (CVs) are concentrations of contaminants at which human exposure would not likely cause harmful health effects. Each CV is specific to an environmental medium, such as air, soil, or water.

Although concentrations below the CV are considered safe, it cannot be assumed that exposure to concentrations above the CV will cause harmful health effects. ATSDR uses CVs to either identify contaminants that are not expected to cause harmful health effects or identify contaminants that should be further evaluated.

In this evaluation, ATSDR compared the drinking water sampling results to three types of CVs: cancer risk evaluation guides (CREGs), environmental media evaluation guide (EMEGs), and reference dose media evaluation guides (RMEGs).

- ATSDR CREGs are estimated concentrations of carcinogens that are predicted to cause no more than one excess cancer in a million people exposed in a lifetime.
- ATSDR EMEGs are estimated concentrations of contaminants that are predicted to not cause noncancer health effects during acute (14 days or less), intermediate (between 15 and 364 days), and chronic (365 days or more) exposures.
- ATSDR RMEGs represent the concentration in a specific medium (e.g., water, soil) at which daily human exposure for a chronic duration is unlikely to result in noncarcinogenic effects.

ATSDR compared the maximum concentration of each contaminant with its respective pathway-specific CV. The contaminants that exceeded a CV were retained for further evaluation. Table 5 and Table 6 list the contaminants that exceeded a CV and thus require further evaluation from Fort Ord and MCWD wells, respectively. ATSDR does not have an inhalation CV for DEHP and dibromochloromethane, and there is no dermal CV for benzene.

Table 5. Screening analysis for contaminants in Fort Ord distribution wells for ingestion, inhalation, and dermal pathways

Contaminant and Maximum Concentration (ppb)	Ingestion Pathway Screening Comparison Value (ppb)	Inhalation Pathway Screening Comparison Value† (ppb)	Dermal Pathway Screening Comparison Value† (ppb)	Does comparison indicate further evaluation is needed?
Carbon tetrachloride 9.8	CREG* 0.35	CREG 0.21	CREG 2.5	Yes
Chloroform 1.8	RMEG 71 (CV Not exceeded)	CREG 0.06	RMEG 5,700 (CV	Yes

Contaminant and Maximum Concentration (ppb)	Ingestion Pathway Screening Comparison Value (ppb)	Inhalation Pathway Screening Comparison Value† (ppb)	Dermal Pathway Screening Comparison Value† (ppb)	Does comparison indicate further evaluation is needed?
			Not exceeded)	
Methylene chloride (Dichloromethane) 6.9	CREG 6.4	CREG 86 (CV Not exceeded)	CREG 86 (CV Not exceeded)	Yes
PCE (Tetrachloroethylene) 53.0	CREG 12.0	CREG 5.2	CREG 38.0	Yes
TCE (Trichloroethylene) 25.0	CREG 0.44	CREG 0.21	CREG 5.6	Yes
Benzene 30.0	CREG 0.44	CREG 0.17	CV Not Applicable	Yes
DEHP [Di(2-ethylhexyl)phthalate] 99.0	EMEG 0.71	CV Not Available	EMEG 220 (CV Not exceeded)	Yes

*Cancer Risk Evaluation Guide (CREG) identifies concentrations of cancer-causing contaminants that are unlikely to result in increased cancer risks to people exposed every day over their lifetime.

† The inhalation and dermal pathway screening comparison values presented here are for the shower and household-use exposure pathways.

Table 6. Screening analysis for contaminants in Marina Coast Water District (MCWD) distribution wells for ingestion, inhalation, and dermal pathways

Contaminant and Maximum Concentration (ppb)	Ingestion Pathway Screening Comparison Value (ppb)	Inhalation Pathway Screening Comparison Value† (ppb)	Dermal Pathway Screening Comparison Value† (ppb)	Does comparison indicate further evaluation is needed?
Carbon tetrachloride 2.5	CREG* 0.35	CREG 0.21	CREG 2.5	Yes
Chloroform 3.8	RMEG 71 (CV Not exceeded)	CREG 0.06	RMEG 5,700 (CV Not exceeded)	Yes
Dibromochloromethane 6.2	CREG 0.29	CV Not Available	CREG 7.4 (CV Not exceeded)	Yes
TCE (Trichloroethylene) 2.9	CREG 0.44	CREG 0.21	CREG 5.6	Yes

Contaminant and Maximum Concentration (ppb)	Ingestion Pathway Screening Comparison Value (ppb)	Inhalation Pathway Screening Comparison Value† (ppb)	Dermal Pathway Screening Comparison Value† (ppb)	Does comparison indicate further evaluation is needed?
Bromodichloromethane 5.3	CREG 0.39	CV Not Available	CREG 10.0 (CV Not exceeded)	Yes

*Cancer Risk Evaluation Guide (CREG) identifies concentrations of cancer-causing contaminants that are unlikely to result in increased cancer risks to people exposed every day over their lifetime.

† The inhalation and dermal pathway screening comparison values presented here are for the shower and household-use exposure pathways.

Nine contaminants from Fort Ord wells (Table 5) and MCWD wells (Table 6) exceeded ATSDR's current CVs. Several ATSDR's CVs are now lower than what they were in 1996, which provides a more health-protective measure in analyzing health risks. These nine contaminants from Table 5 and Table 6 are further evaluated in the following section based on exposure doses estimated from EPCs or maximum measured concentrations.

4.4.3. Exposure Point Concentrations

An exposure point concentration (EPC) is the representative contaminant concentration to which people may have been exposed. ATSDR used the sampling results from the production wells sampled from 1985–1994 to calculate the EPCs for the contaminants that exceeded CVs. The EPCs were determined based on ATSDR's discrete sampling guidance [ATSDR 2023]. When a contaminant's sampling data has detections measured in greater than 20% of the samples, ATSDR's EPC Tool was used to calculate a 95% Upper Confidence Limit (95 UCL) of the arithmetic mean (average) concentration. The only contaminant that was found in greater than 20% of the samples was TCE (for both the Fort Ord and MCWD sampling data). All other contaminants had detections in less than 20% of the samples, and ATSDR used the maximum concentrations as the EPCs.

Soldiers in residences and barracks were assessed for potential exposure using the highest of the two EPCs from the Fort Ord and MCWD wells to be protective of health. Since the MCWD wells are located very close to the Fort Ord wells and had the same source of contamination, ATSDR considered the MCWD samples to be potentially representative of Fort Ord well concentrations. ATSDR used the greater EPC from the two systems to calculate the highest potential exposure dose for the site-specific scenarios. If the exposure and health evaluation does not show a potential health hazard for the greater EPC for a contaminant, any lower concentrations would also not present a health concern for the same exposure scenario.

Table 7 has the highest EPCs for each of the contaminants that exceeded their CV from the 1985–1994 sampling data.

Table 7. Exposure Point Concentrations (EPCs) for the contaminants of concern from former Fort Ord and Marina Coast Water District (MCWD) production wells sampled from 1985–1994

Contaminant	Exposure Point Concentration (ppb)
Carbon tetrachloride	9.8
Chloroform	3.8
Methylene chloride	6.9
PCE (Tetrachloroethylene)	53.0
TCE (Trichloroethylene)	2.7
Benzene	30.0
DEHP (Di(2-ethylhexyl)phthalate)	99.0
Dibromochloromethane	6.2
Bromodichloromethane	5.3

4.4.4. Exposure Dose Calculations and Exposure Factors

The contaminants that exceeded CVs were further evaluated by using the EPCs to calculate estimated exposure doses for the ingestion, inhalation, and dermal pathways. An exposure dose estimates how much of a contaminant a person might contact based on their actions, habits, and the exposure pathway. Estimating an exposure dose requires identifying how much, how often, and how long a person may come in contact with the contaminant EPC in the Fort Ord and MCWD drinking water. The calculated exposure doses are then compared to the ATSDR health guidelines specific to each contaminant to determine if there is a health risk.

ATSDR estimated pathway-specific exposure doses. Ingestion and dermal exposure doses are expressed as milligrams of contaminant per kilogram of body weight per day (mg/kg/day). Inhalation exposure dose calculations adjust for air concentrations with released volatile and semi-volatile contaminants during indoor water use [ATSDR 2022a]. Inhalation exposure dose is expressed as micrograms per cubic meter ($\mu g/m^3$) or as parts per billion (ppb) [ATSDR 2024a]. Appendix B has the formulas used to calculate the various exposure doses for ingestion, inhalation, and dermal pathways.

ATSDR estimated exposure doses for different water use scenarios and exposure durations. ATSDR calculated an ingestion dose for those that only drank the water but didn't shower in it. ATSDR also calculated an inhalation dose, and a combined ingestion and dermal (skin) dose with the SHOWER model.

ATSDR evaluated scenarios for residents living at the Fort or in Marina and not training (residential scenario) and for soldiers living and training at the base (soldier-in-training). The soldier-in-training scenario involved determining how much more water a person would ingest (drink) compared to a person in the residential scenario. The default ingestion rate of drinking water in a residential scenario is age specific. For instance, 3.1 liters per day is the drinking water intake rate for an adult. The US Army's Water Support Operations guide recommends

that a soldier training in hot weather conditions would need to drink 11.4 liters of water per day [U.S. Department of the Army 2022].

The residential scenario in the SHOWER model assumes a four-person household. The soldier-in-training scenario assumes a 100-person communal shower scenario like those in barracks.

With the residential scenario, ATSDR calculated exposure doses for different age groups using their age-specific intake rates. Further, both the average and the upper end of water drinking rates were used in calculating residential exposures. An average drinking water rate (central tendency exposure (CTE) rate) for children was between 0.2 and 0.7 liters per day and for adults between 1.2 and 1.5 liters per day, including pregnant women and breastfeeding women. For the upper end of the drinking water rate (reasonable maximum exposure rate), children were assumed to drink between 0.9 and 2.2 liters per day and adults to drink 2.9 to 3.2 liters per day, which represents an approximate 95th percentile of water consumption in the U.S. population.

The intake rates (CTE and RME intake rates) and exposure parameters for each age group used for PHAST calculations are shown in Appendix B (Table B-1 for residential scenario and Table B-2 for soldier-in-training scenario). Other factors that influence exposure doses include the persons activity, age, diet, and lifestyle. Differences among individuals for these various factors also present some uncertainties in estimating exposure doses for this assessment.

ATSDR uses the SHOWER Model to evaluate inhalation and dermal exposures to volatile and semi-volatile contaminants from household water use for showering, tub bathing, clothes washing, and other activities. The EPC for household water concentration is imported into the SHOWER Model to develop a dermal dose for the dermal pathway and an air concentration for the inhalation pathway. The ingestion (oral) dose is also calculated using the EPC Tool. The dermal dose, air concentration, and ingestion dose are imported into PHAST which evaluates noncancerous health and cancer risks for all three pathways for each contaminant.

As much site-specific information as possible was used to estimate people's exposures to contaminants in Fort Ord and MCWD drinking water. In assessing health effects, ATSDR made conservative assumptions about peoples' exposures, to represent high-end exposure scenarios for drinking-water contaminants. This is a health-protective approach that may result in overestimating exposures. For example, ATSDR assumed that an adult living at Fort Ord would have been exposed to contaminants in their water for 365 days a year for 12, 21, or 33 years, depending on the dose level used. A CTE is calculated based on an average exposure for 12 years; whereas the reasonable maximum exposure (RME) is the upper end of exposure for 33 years. Both the CTE and RME are calculated for the different age groups.

As noted earlier, ATSDR chose the higher exposure point concentration (EPC) from the two sampling data sets–Fort Ord wells and MCWD wells–to calculate exposure doses for each contaminant of concern. ATSDR calculated the ingestion exposure doses and used the SHOWER model to determine inhalation and dermal exposures from showering and being in the residence throughout the day. The adjustment for inhalation exposure enables comparisons to duration-related inhalation noncancer health guidelines and inhalation cancer risks [ATSDR

2022a]. Appendix B has the SHOWER and PHAST general equations for pathway-specific exposure doses, hazard quotients (HQs) and cancer risks (CRs) formulas, default exposure factors for each exposure duration, age-specific default exposure parameters (e.g., intake rate; Appendix B, Table B-1 for residential scenario and Table B-2 for soldier-in-training scenario), and a narrative of the scenarios (e.g., number of residents in a household).

ATSDR's PHAST model calculates contaminant-specific exposure doses and concentrations for the three exposure pathways (ingestion, inhalation, dermal) and pathway combinations (ingestion and dermal) for acute, intermediate, and chronic exposure durations. Each of the age-specific exposure doses and concentrations for each of the exposure pathways are shown in the PHAST output tables for each contaminant of concern (Appendix C for residential scenario and Appendix D for soldier-in-training scenario). The estimated exposure dose is then compared to ATSDR health guidelines specific to each contaminant to determine if there is a health risk.

4.5. Health Effects Evaluations

ATSDR calculates an HQ to evaluate noncancerous health risks and calculates a CR to evaluate lifetime excess cancer risk from contaminant exposures. The following sections present the calculated HQs and CRs for each contaminant, each exposure pathway (ingestion, inhalation, dermal), and each age-group within the two site-specific scenarios (residential and soldier-in-training).

4.5.1. Hazard Quotients for Noncancerous Health Effects

ATSDR examines noncancer health effects of contaminants by comparing site-specific estimated exposure doses to observed-effect levels in available human and animal studies. A contaminant-specific estimate of an exposure level posing minimal risk to humans, or minimal risk level (MRL), is an amount of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified route and duration of exposure. MRLs are intended to serve as health guideline values or screening levels. When an exposure estimate is greater than the health guideline value, further evaluation of the exposure dose is needed to determine if there is any health hazard.

The exposure dose is compared to ATSDR's health guideline value using a calculated HQ, which is the exposure dose divided by the health guideline value. If the exposure dose is less than the health guideline value, the HQ will be less than one. If the HQ is less than one, then there is no need to evaluate further because the exposure dose is less than the health guideline value. Alternatively, if the HQ is more than one then it is because the calculated exposure dose is more than the health guideline value, and there is a need for further evaluation of the potential for a noncancer health risk.

ATSDR's health guideline values for many contaminants are developed for the different exposure durations, acute (14 days or less), intermediate (15 to 364 days), and chronic (365 days or more) exposures. If ATSDR does not have a health guideline value developed for a particular exposure duration or pathway for a contaminant it is likely because of lack of data [ATSDR 2022a].

In summary, the HQ is the ratio of a single substance exposure dose over a specified time to a reference dose for that substance derived from a similar exposure timeframe. If the HQ calculated is equal to or less than one, noncancer adverse health effects are not expected to result from exposure to the contaminant. If the HQ is greater than one, further toxicological evaluation is warranted by reviewing the critical and supporting studies used to develop the health guideline.

4.5.2. Lifetime Cancer Risk Estimates

ATSDR evaluated whether potentially exposed people could be at increased risk for cancer from long-term exposures to contaminants in their household water. Cancer typically takes long-term exposures (many years) to be of concern, and ATSDR evaluated exposure scenarios for residents (12 years or more) and soldiers being exposed (5 years or more).

A person's risk for developing cancer depends on many factors such as the contaminant level a person is exposed to, the length of time of exposure, a person's genetic makeup, age, health and nutritional status, diet, smoking habits, and other lifestyle variables [ATSDR 2022a]. In the United States, four in ten people are diagnosed with cancer during their lifetime [ACS 2025a].

For assessing cancer risks from oral exposures, ATSDR uses EPA's oral cancer slope factors (CSFs). EPA's CSFs measure the carcinogen's relative potency, based on EPA's quantitative evaluation of animal and human studies. ATSDR uses the CSF to estimate the increases in cancer cases in a human population depending on the level of exposure.

ATSDR uses age-dependent formulas that incorporate exposure duration, body weight, water intake rate, and CSF to to estimate lifetime excess cancer risk. More simply, the cancer risk is the total exposure dose estimated for different age groups multiplied by a cancer potency factor (the CSF). More detailed information and the cancer risk formula are described in Appendix B.

Cancer risks are calculated for different age groups. Depending on the age group, it is calculated for an assumed exposure duration of either 12 years, 21 years, or 33 years. It is also calculated for various pathways, ingestion, inhalation, and dermal contact.

Because the actual length of time Fort Ord residents were exposed to contaminated water is unknown, ATSDR evaluated cancer risks for two different scenarios for each age group. For children, cancer risks are calculated for combined child scenarios at a given residence: 12 years for the CTE and 21 years for the reasonable maximum exposure (RME). For the adult ATSDR used 12 years for the CTE scenario and 33 years for the RME scenario.

The CTE and RME results represent the 50th and 95th percentile exposures, respectively. Based on ATSDR's site-specific exposure scenarios, the average or most common exposure levels would be represented by the CTE values. The RME is a more protective value and represents the higher or maximum levels of exposure considered likely given the exposure scenarios. Whenever possible, ATSDR accounts for limitations by using protective, reasonable upper bound exposure estimates as the basis for determining whether harmful health effects are possible.

ATSDR's quantitative excess cancer risk is a theoretical risk estimate calculated assuming people in a population have the same exposures and do not represent individual cancer risks or account for variations in exposure. If a calculated cancer risk exceeds 1 extra cancer case in 1,000,000 people similarly exposed (or 1 x 10^{-6}), further analysis may be needed. An excess lifetime cancer risk represents the additional risk above the existing background cancer risk. A CR of less than 1 extra cancer case in 1,000,000, or less than 1 x 10^{-6}, is not considered a concern for increased risk and further evaluation is not needed.

ATSDR uses calculated estimates of lifetime excess cancer risk as a tool for making recommendations to reduce exposure and protect public health. These ATSDR-calculated lifetime excess cancer risks from contaminant exposure are estimated excess cancer risks in addition to the already existing lifetime risk of developing cancer in a lifetime from all causes. The lifetime risk of developing cancer from all risk factors during a lifetime is based on the incidence of cancer cases diagnosed and reported to state cancer registries across the United States. Therefore, ATSDR excess cancer risks estimates for residents and workers exposed over their lifetime are estimates of excess cancer risk in addition to the already existing lifetime cancer risk of four out of every ten people in the United States developing cancer during their lifetime [ACS 2025a]. Another example is the lifetime risk that a woman in the United States will develop breast cancer during her lifetime is one out of every eight women [ACS 2025b].

The ATSDR calculated lifetime excess cancer risk estimates from contaminant exposures are not actual cancer cases, do not represent the actual cases of cancer in Fort Ord residents, and are not estimates of an individual's cancer risk. ATSDR cannot determine an individual's risk of developing cancer. An individual's lifetime risk of developing cancer depends on many factors other than exposure to site-specific contaminants. Any risk of developing cancer from contaminant exposures is in addition to an individual's risk from other factors.

4.5.3. Residential Scenario Evaluation of Noncancer Health Risk and Cancer Risk

Using the EPCs calculated from the available historical data from 1985–1994 (refer to

Table 7 above for contaminant EPC values), noncancerous and cancerous health risks were evaluated by calculating HQs and CRs, respectively. ATSDR evaluated the residential scenario for each of the contaminants that screened in from the Fort Ord drinking-water wells and the MCWD wells.

Carbon Tetrachloride

Carbon tetrachloride is a manufactured chemical used as a solvent and does not occur naturally. Exposure to this contaminant is usually from breathing air (inhalation), drinking water, or dermal contact with soils. High exposure to carbon tetrachloride can cause liver, kidney, and central nervous system damage. The U.S. Department of Health and Human Services (HHS), the International Agency for Research on Cancer (IARC), and the EPA have determined that carbon tetrachloride may reasonably be anticipated to be a carcinogen [ATSDR 2005b; ATSDR 2025b].

The maximum carbon tetrachloride level detected in the Fort Ord water supply was 9.8 parts per billion (ppb). The maximum carbon tetrachloride detected in MCWD wells was 2.5 ppb. Using the 9.8 ppb concentration, ATSDR calculated the ingestion exposure doses for residents and used the SHOWER model to determine what individuals' exposure may have been through the inhalation and dermal pathways when showering and being in the residence throughout the day. Exposure doses for the exposure pathways causing noncancer or cancer risks to exceed ATSDR's criteria for further evaluation are shown in Appendix C (Table C- 1, Table C- 2, Table C- 3, Table C- 4).

Noncancer HQ

The RME noncancer HQ did not exceed 1 for any of the age groups through any of the exposure pathways and durations (Appendix C, Table C- 1, Table C- 2, Table C- 3, Table C- 4). Calculating HQs for acute inhalation of carbon tetrachloride is not possible because an acute MRL does not exist. However, ATSDR considers the intermediate-duration inhalation MRL to be protective for acute exposures [ATSDR 2005b]. The acute- and intermediate-inhalation RME are the same, 1.2 ppb, which is considerably lower than the 30 ppb inhalation-MRL. All exposure pathways and durations RMEs were less than the MRLs or reference doses, resulting in HQs less than one. Consequently, noncancer health effects are not expected from exposure to carbon tetrachloride in the water for the Fort Ord residential scenario.

Lifetime Cancer Risk

Calculated lifetime excess cancer risks indicate chronic exposure levels are not high enough for there to be a reasonable possibility that carbon tetrachloride exposure over many years could cause cancer in members of the exposed population. ATSDR does not consider resident exposure to carbon tetrachloride from 1985–1994 to be a concern for increased risk of causing cancer during a lifetime.

Using the more protective RME for carbon tetrachloride and assuming the water was used for all household uses including drinking and bathing, combined CR estimates across age groups ranged from an increase of 21 additional cases in 1,000,000 to 33 in 1,000,000 (Table 8). Again, these cancer risk estimates in Table 8 assume residents were ingesting the contaminated water and bathing in the water for 21 or 33 years. The maximum estimated excess cancer risk increase due to carbon tetrachloride in drinking water was 19 extra cases in 1,000,000 for the inhalation pathway and 12 extra cases in 1,000,000 for the ingestion pathway (Appendix C, Table C- 1 and Table C- 3). This was for adults and birth-to-adult age groups exposed for 33 years. The dermal exposure pathway had minimal effect on the calculated increased cancer risk.

Table 8. Carbon tetrachloride reasonable maximum exposure cancer risk estimates using exposure concentration of 9.8 ppb in the residential scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Combined Cancer Risk
Total Child (21 years)	8 in 1,000,000	12 in 1,000,000	1 in 1,000,000	21 in 1,000,000
Adult (33 years)	12 in 1,000,000	19 in 1,000,000	2 in 1,000,000	33 in 1,000,000
Birth to Adulthood (33 years)	12 in 1,000,000	19 in 1,000,000	2 in 1,000,000	33 in 1,000,000

Chloroform

Chloroform is produced naturally and can also enter the environment as an unwanted disinfection byproduct that originates from the chlorination of drinking water. The general population is most likely exposed to chloroform through inhalation of indoor and outdoor air, ingestion of food or disinfected water, or dermal contact with disinfected water. Chloroform will readily volatize from treated water to air. Thus, low levels of chloroform vapor may be breathed in while using chlorine-treated water during household uses such as bathing or cleaning or during food preparation [ATSDR 2024b].

The maximum chloroform level detected was 3.8 ppb from the MCWD water supply in October 1991. The maximum chloroform level in the Fort Ord water supply was 1.8 ppb. Both levels are below the ATSDR CV 71 ppb for the ingestion pathway, and well below the ATSDR CV of 2,600 ppb for the dermal pathway. The ingestion and dermal pathways would not need to be evaluated further.

Both the 3.8 ppb (MCWD supply) and the 1.8 ppb (Fort Ord supply) chloroform maximums are above the CV for inhalation from household use (0.06 ppb).Thus, ATSDR calculated the inhalation exposure concentrations for residents and used the SHOWER model to determine what residents' exposure may have been through the inhalation pathway when showering and being in the residence throughout the day. The maximum EPC of 3.8 ppb chloroform was used to calculate HQs and CRs.

Noncancer HQ

The chronic RME noncancer HQ of one was exceeded for all age groups for only the inhalation exposure pathway (Appendix C, Table C- 5). If residents of any age inhaled vapors from water contaminated with 3.8 ppb chloroform for one year or more, their RME dose of 0.56 ppb exceeded the chronic MRL of 0.40 ppb. Residents inhaling the maximum EPC of 3.8 ppb chloroform for one year or more require further evaluation of the potential for increased risk of

noncancerous health effects (Appendix C, Table C- 5), because the hazard quotient for RME is greater than one. Further evaluation is provided in section 4.5.4.

Except for the inhalation pathway for chronic exposures, all other exposure durations and pathways had HQs less than one.

Lifetime Cancer Risk

Calculated lifetime excess cancer risk indicates chronic exposure levels are not high enough for there to be a reasonable possibility that chloroform exposure over many years could cause cancer in members of the exposed population. Therefore, ATSDR does not consider resident exposure to chloroform at these levels measured from 1985–1994 to be a concern for increased risk of causing cancer during a lifetime.

Using the more protective RME to chloroform of 0.56 ppb, lifetime CR estimates for the inhalation pathway across all age groups ranged from 17 to 27 extra cases in 1,000,000 (Appendix C, Table C- 5). This assumes that chloroform-contaminated water at 3.8 ppb was inhaled during bathing and other household uses for 21 years for a child or for 33 years for adult and birth to adult age groups (Table 9). The inhalation-CTE estimates were about half of the RME estimates and resulted in an increased risk of 5 extra cases in 1,000,000 (Appendix C, Table C- 5). The ingestion and dermal exposure pathways did not show an increased risk of extra cancer cases.

Table 9. Chloroform reasonable maximum exposure cancer risk estimates using exposure concentration of 3.8 ppb in the residential scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Combined Cancer Risk
Total Child (21 years)	No increased risk	17 in 1,000,000	No increased risk	17 in 1,000,000
Adult (33 years)	No increased risk	27 in 1,000,000	No increased risk	27 in 1,000,000
Birth to Adulthood (33 years)	No increased risk	27 in 1,000,000	No increased risk	27 in 1,000,000

Methylene chloride

Methylene chloride is a colorless liquid used as an industrial solvent and as a paint stripper. It does not exist naturally in the environment. Small amounts may be found in drinking water, though methylene chloride does not dissolve easily in water [ATSDR 2000; ATSDR 2022b].

The maximum methylene chloride level of 6.9 ppb, measured in the Fort Ord water supply, exceeds the drinking water CV (CREG) of 6.4 ppb [ATSDR 2000]. The next highest drinking water CV is the RMEG of 42 ppb for a child (noncancer). Methylene chloride was not detected in the MCWD sampling data. ATSDR calculated doses for each exposure group and the RME noncancer HQ did not exceed one for all age groups and all exposure pathways in the residential scenario. Therefore, noncancerous adverse health effects are not expected, and no further evaluation is needed.

The cancer risks estimated for chronic exposure durations for all age groups and all exposure pathways were below 1 extra case in 1,000,000 for the residential scenario. Calculated lifetime excess cancer risk indicates chronic exposure levels are not high enough for there to be a reasonable possibility that methylene chloride exposure at the maximum EPC of 6.9 ppb over many years could cause cancer. ATSDR does not consider resident exposure to methylene chloride at the levels measured from 1985–1994 to be a concern for increased risk of causing lifetime cancer.

Dibromochloromethane

Dibromochloromethane is usually formed as a byproduct when chlorine is added to drinking water to kill bacteria. The most likely way people are exposed to dibromochloromethane is by drinking chlorinated water.

The maximum dibromochloromethane level of 6.2 ppb, measured in the MCWD water supply, exceeds the drinking water CV (CREG) of 0.3 ppb [ATSDR 2024a]. Dibromochloromethane was not detected in the Fort Ord drinking-water sampling data. There is not an inhalation CV for the inhalation exposure pathway. The maximum EPC did not exceed the dermal CV of 7.4 ppb.

Noncancer HQ

ATSDR calculated ingestion and dermal doses for each exposure group and determined the RMEs noncancer HQ did not exceed one for all age groups in the residential scenario. Therefore, noncancerous adverse health effects are not expected from drinking or dermal exposure, and no further evaluation is needed. ATSDR's toxicological profile [ATSDR 2005c] found no studies regarding health effects following inhalation exposure, so no further evaluation is presented on the inhalation pathway.

Lifetime Cancer Risk

ATSDR used the more protective RME to dibromochloromethane of 6.2 ppb to calculate lifetime CR estimates for the oral and combined oral and dermal pathways for all age groups (Appendix C, Table C- 6 and Table C- 7). The inhalation and dermal exposure pathways could not be calculated or did not show an increased risk of extra cancer cases, respectively (Table 10). The ingestion only and the combined ingestion and dermal pathways had cancer risk estimates ranging from 6 to 10 extra cases in 1,000,000 (Table 10 and Appendix C, Table C- 6, Table C- 7). This assumes that dibromochloromethane-contaminated water at 6.2 ppb was ingested for 21 years or more.

Table 10. Dibromochloromethane reasonable maximum cancer risk estimates using exposure concentration of 6.2 ppb in the residential scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Ingestion and Dermal Combined Cancer Risk
Total Child (21 years)	6 in 1,000,000	Not calculated	Less than 1 in 1,000,000	6 in 1,000,000
Adult (33 years)	9 in 1,000,000	Not calculated	Less than 1 in 1,000,000	9 in 1,000,000
Birth to Adulthood (33 years)	9 in 1,000,000	Not calculated	Less than 1 in 1,000,000	10 in 1,000,000

Calculated lifetime excess cancer risk indicates chronic exposure levels are not high enough for there to be a reasonable possibility that dibromochloromethane exposure over many years could cause cancer in members of the exposed population. Therefore, ATSDR does not consider resident exposure to dibromochloromethane at the levels measured from 1985–1994 to be a concern for increased cancer risk.

Bromodichloromethane

Small amounts of bromodichloromethane are naturally produced by algae in the oceans. It is also primarily produced for making other chemicals and used in water treatment processes. Bromodichloromethane can be formed as a byproduct during the chlorination of drinking water and is also found in some industrial applications. Due to its potential health effects, including possible carcinogenicity and impacts on liver function, it is monitored for environmental exposure and regulated in drinking water supplies.

The maximum bromodichloromethane level of 5.3 ppb, measured in the MCWD water supply, exceeded the drinking water CV (CREG) of 0.39 ppb [ATSDR 2024a]. Bromodichloromethane was not detected in the Fort Ord sampling data. The dermal CV was not exceeded, and ATSDR does not have an inhalation CV.

Noncancer HQ

ATSDR-derived ingestion MRLs for chronic- and acute-exposure durations (0.008 mg/kg/day and 0.07 mg/kg/day, respectively) were greater than the highest ingestion RMEs (0.00075 mg/kg/day) and combined ingestion and dermal RMEs (0.00077 mg/kg/day), the HQs were less than one. Therefore, noncancerous adverse health effects are not expected, and further chronic- and acute-noncancerous evaluation is not needed.

Because of limited data, ATSDR does not have an intermediate MRL for the ingestion pathway, however, ATSDR considers the chronic MRL of 0.008 mg/kg/day protective for intermediate-

duration exposure [ATSDR 2020]. The chronic MRL was not exceeded by the intermediate RMEs.

ATSDR's toxicological profile [ATSDR 2020] found a lack of inhalation studies to derive chronic-, intermediate-, or acute-MRLs. The limited studies for acute and intermediate exposure duration showed a LOAEL of 10,000 ppb. The Fort Ord RME adjusted EPC of 0.51 ppb is much lower than the ATSDR LOAEL of 10,000 ppb for acute and intermediate exposure and does not indicate potential for health effects. No further evaluation is presented on chronic inhalation exposure since no chronic studies were presented in the toxicological profile.

Lifetime Cancer Risk

ATSDR used the bromodichloromethane RME of 5.3 ppb to calculate lifetime CR estimates for oral and dermal pathways and for all age groups. The cancer risk for the inhalation only exposure pathway is not calculated because no inhalation unit risk was identified [ATSDR 2020]. The dermal pathway showed less than 1 extra case in 1,000,000 (Table 11). The ingestion only and the combined ingestion and dermal pathways had cancer risk estimates ranging from 4 to 6 extra cases in 1,000,000 (Table 11; Appendix C, Table C- 8 and Table C- 9). Even with assuming residents ingested bromodichloromethane-contaminated water at 5.3 ppb for 21 years or more, the estimated increased potential risk of cancer is not considered a concern for increased cancer risk (Table 11).

Table 11. Bromodichloromethane reasonable maximum exposure cancer risk estimates using exposure concentration of 5.3 ppb in the residential scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Ingestion and Dermal Combined Cancer Risk
Total Child (21 years)	4 in 1,000,000	Not calculated	Less than 1 in 1,000,000	4 in 1,000,000
Adult (33 years)	6 in 1,000,000	Not calculated	Less than 1 in 1,000,000	6 in 1,000,000
Birth to Adulthood (33 years)	6 in 1,000,000	Not calculated	Less than 1 in 1,000,000	6 in 1,000,000

Calculated lifetime excess cancer risk indicates chronic exposure levels are not high enough for there to be a reasonable possibility that bromodichloromethane exposure over many years could cause cancer in members of the exposed population. Therefore, ATSDR does not consider resident exposure to bromodichloromethane at these levels measured from 1985–1994 to be a concern for increased cancer risk.

Tetrachloroethylene (PCE)

Tetrachloroethylene (PCE) is used as a dry-cleaning agent and metal degreasing solvent. PCE is also used as a starting material to make other chemicals and is used in some consumer products.

The maximum PCE level of 53 ppb was measured in the Fort Ord water supply in April 1988. This exceeded the ATSDR CVs for the ingestion, inhalation, and dermal pathways. PCE was not detected in the MCWD drinking-water sampling data. The maximum EPC of 53 ppb PCE was used in the risk calculations to use the most protective approach and calculate the three exposure durations and exposure pathway combinations for all age groups. Exposure doses for the exposure pathways causing noncancer or cancer risks to exceed ATSDR's criteria for further evaluation are shown in Appendix C (Table C- 10, Table C- 11, Table C- 12, Table C- 13, Table C- 14).

Noncancer HQ

The RME noncancer HQ was 1.1 (exceeded the HQ of one) for the age group birth to less than one year for the ingestion and dermal combined exposure pathway for chronic, intermediate, and acute exposure durations (Appendix C, Table C- 11, Table C- 12, Table C- 13). If individuals at the age of birth to less than one year ingested and bathed in water contaminated with 53 ppb PCE, their RME dose of 0.009 mg/kg/day PCE exceeded the chronic MRL of 0.008 mg/kg/day PCE. These individuals meeting the ingestion and dermal exposure assumptions, if exposed to the maximum EPC of 53 ppb PCE could have had an increased risk of noncancerous health effects. This does not mean that there was a health risk, only that further evaluation is needed. Further evaluation is provided in section 4.5.4.

All other age groups and exposure durations had HQs less than one for inhalation, for ingestion, and for dermal exposure. Consequently, noncancer health effects are not expected from inhalation only, ingestion only, and dermal only pathways at the maximum EPC for PCE in the water for the Fort Ord residential scenario.

Lifetime Cancer Risk

Using the PCE RME of 53 ppb, lifetime CR estimates for all exposure pathways across all age groups ranged from less than 1 to 7 extra cases in 1,000,000 (Table 12). This assumes that for 21 years or more people were exposed to PCE-contaminated water at 53 ppb. ATSDR does not consider this a concern for increased cancer risk.

Table 12. Tetrachloroethylene (PCE) cancer risk estimates using exposure concentration of 53.0 ppb in the residential scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Combined Cancer Risk
Total Child (21 years)	1 in 1,000,000	3 in 1,000,000	Less than 1 in 1,000,000	4 in 1,000,000

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Combined Cancer Risk
Adult (33 years)	2 in 1,000,000	4 in 1,000,000	Less than 1 in 1,000,000	7 in 1,000,000
Birth to Adulthood (33 years)	2 in 1,000,000	4 in 1,000,000	Less than 1 in 1,000,000	7 in 1,000,000

Calculated lifetime excess cancer risk indicates chronic exposure levels are not high enough for there to be a reasonable possibility that PCE exposure over many years could cause cancer in members of the exposed population. Therefore, ATSDR does not consider resident exposure to PCE at the levels measured from 1985–1994 to be a concern for increased risk of causing cancer over a lifetime.

Trichloroethylene (TCE)

Trichloroethylene (TCE) is a volatile liquid that evaporates quickly. Two major uses of TCE are as a solvent to remove greases, oils, fats, and waxes, and as a chemical to make other chemicals.

The maximum TCE level of 25.0 ppb was measured in the Fort Ord water supply in May 1985. This exceeds the ATSDR CVs for the ingestion, inhalation, and dermal pathways. The maximum TCE level detected in MCWD wells was 2.9 ppb. ATSDR used the Fort Ord drinking water TCE sampling data to estimate a 95 UCL EPC of 2.7 ppb TCE (refer to Section 4.4.3). ATSDR used the 2.7 ppb EPC in the risk calculations for the three exposure durations and exposure pathway combinations for all age groups in the residence scenario.

Noncancer HQ

The RME noncancer HQ of 1.3 exceeded the HQ of one for all age groups for the inhalation exposure pathway for chronic and intermediate exposure durations (Appendix C, Table C- 15 and Table C- 16). Under the assumed exposure conditions and durations, if people inhaled water vapors contaminated with 2.7 ppb TCE, their estimated RME doses of 0.5 ppb likely exceeded the MRLs (inhalation MRL is 0.4 ppb TCE).

The HQs did not exceed one for the ingestion and dermal exposure pathways for all age groups and exposure durations. Ingestion and dermal contact at the RME doses would not increase risk of noncancerous health effects.

In summary, people of all age groups inhaling the EPC for TCE (2.7 ppb) for intermediate duration (15 to 364 days) or for chronic duration (one year or more) could have had an increased risk of having noncancerous health effects. This does not mean that there was a health risk, only that further evaluation is needed. Further evaluation is provided in section 4.5.4.

Lifetime Cancer Risk

Using the EPC of 2.7 ppb TCE, lifetime CR estimates for the inhalation and ingestion pathways across all age groups ranged from 2 to 6 extra cases in 1,000,000 (Table 13). Lifetime CR estimates for the ingestion pathway and the combined ingestion plus dermal pathway were minimally different from the ingestion only because of the very low dermal RME dose (Appendix C, Table C- 17 and Table C- 18). The CR for all combined exposure pathways was 10 extra cases in 1,000,000 for the birth to adulthood age group (Table 13). These analyses assume that people were exposed to TCE-contaminated water at 2.7 ppb for 21 years or more.

Table 13. Trichloroethylene (TCE) reasonable maximum exposure cancer risk estimates using exposure concentration of 2.7 ppb in the residential scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Combined Cancer Risk
Total Child (21 years)	2 in 1,000,000	5 in 1,000,000	Less than 1 in 1,000,000	7 in 1,000,000
Adult (33 years)	2 in 1,000,000	5 in 1,000,000	Less than 1 in 1,000,000	7 in 1,000,000
Birth to Adulthood (33 years)	3 in 1,000,000	6 in 1,000,000	Less than 1 in 1,000,000	10 in 1,000,000

Calculated lifetime excess cancer risks indicate chronic exposure levels are not high enough for there to be a reasonable possibility that TCE exposure over many years could cause cancer in members of the exposed population. Therefore, ATSDR does not consider that residents exposed to TCE at these levels measured from 1985–1994 to be a concern for increased risk of causing cancer over a lifetime.

Benzene

Benzene can enter the environment from various sources (e.g., forest fires, vehicle exhaust) and from industries making the chemical. Although benzene evaporates quickly into the air it can travel through soil into groundwater.

Benzene was detected in just 1 sample [on June 17, 1987, from well 24 (FO-24)] out of 198 samples from the Fort Ord water supply between 1985 and 1992. On that same date there were seven other samples collected, including an additional sample from the same well (FO-24), and all seven samples had non-detect results (less than 2.0 ppb benzene). Samples collected both six months before and after the June 1987 sampling date also included that same well (FO-24) and were also non-detect results. ATSDR does not have further information to validate or invalidate this one benzene detection. Benzene was not detected in the MCWD sampling data.

ATSDR proceeded to evaluate benzene exposures based on the one sample detection of 30 ppb. The single sample detecting benzene from 1985–1994 does not support chronic exposure analysis, so ATSDR limited the analysis to acute and intermediate exposure durations.

The benzene level exceeded the ATSDR CVs for the ingestion and inhalation exposure pathways. ATSDR has not derived a dermal-specific CV for benzene; however, dermal exposure was evaluated by estimating dermal absorbed doses using the SHOWER model and evaluating those doses in PHAST using available oral MRLs, consistent with ATSDR's dose-based evaluation approach when dermal-specific health guidelines are not available. The 30 ppb benzene was used to calculate the RMEs for acute and intermediate exposure durations and exposure pathway combinations for all age groups in the residence scenario (Appendix C, Table C- 19, Table C- 20, Table C- 21, Table C- 22, Table C- 23).

Noncancer HQ

For the ingestion exposure pathway for both the acute and intermediate exposure durations, the RME noncancer HQ exceeded or equaled one for all age groups (Table 14). Similarly, for the combined ingestion and dermal exposure pathway the RME noncancer HQ exceeded one, with minimal contribution from the dermal exposure pathway (Table 14). The dermal-only exposure pathway noncancer HQ did not exceed one. Dermal contact alone at the RME doses would not increase risk of noncancerous health effects. Under the assumed exposure conditions, if individuals ingested water contaminated with 30 ppb benzene, their estimated RME doses likely exceeded the ingestion MRL of 0.0009 mg/kg/day.

For the inhalation intermediate duration exposures all age groups' HQs equaled one, and under the acute duration HQs did not exceed one (Table 14). Under the assumed exposure conditions, if individuals inhaled water vapors contaminated with 30 ppb benzene for two weeks or more, their estimated RME of 7.1 ppb dose were nearly equal to the intermediate inhalation MRL of 7 ppb.

Assuming the single sample used for the maximum EPC 30 ppb benzene exposure represented continuous exposures for the intermediate and acute exposure durations, people of all age groups could have had an increased risk of having noncancerous health effects due to ingestion or inhalation. It is unlikely this exposure level existed for Fort Ord residents and even so, it does not mean that there was a health risk, only that further evaluation is needed. Further evaluation is provided in section 4.5.4. However, given that benzene was only detected in one of 198 samples, continuous exposure at 30 ppb was unlikely. However, short-term (acute) exposure to benzene through the ingestion pathway may have increased the risk of noncancerous health effects. This does not mean that there was a health risk, only that further evaluation is needed. Further evaluation is provided in section 4.5.4.

Table 14. Hazard Quotients (HQs) for ingestion and inhalation exposure pathways as calculated for each age group when exposed to 30.0 ppb benzene in the residential scenario

Exposure Age Group	Intermediate Duration, Ingestion Only Exposure Pathway	Acute Duration, Ingestion Only Exposure Pathway	Intermediate Duration, Combined Ingestion and Dermal Exposure Pathways	Acute Duration, Combined Ingestion and Dermal Exposure Pathways	Intermediate Duration, Inhalation Only Exposure Pathway	Acute Duration, Inhalation Only Exposure Pathway
Birth to < 1 year	4.7	4.7	4.9	4.9	1.0	0.78
1 to < 2 years	1.9	1.9	2.1	2.1	1.0	0.78
2 to < 6 years	1.6	1.6	1.8	1.8	1.0	0.78
6 to < 11 years	1.3	1.3	1.5	1.5	1.0	0.78
11 to < 16 years	1.0	1.0	1.1	1.1	1.0	0.78
16 to < 21 years	1.0	1.0	1.1	1.1	1.0	0.78
Adult	1.3	1.3	1.4	1.4	1.0	0.78
Pregnant Women	1.3	1.3	1.4	1.4	1.0	0.78
Breastfeeding Women	1.4	1.4	1.5	1.5	1.0	0.78

Di(2-ethylhexyl)phthalate (DEHP)

Di(2-ethylhexyl)phthalate (DEHP) is a man-made chemical added to plastics to add flexibility. It is found throughout the environment mostly due to disposal of plastic waste in landfills.

The maximum DEHP level of 99 ppb was measured in the Fort Ord water supply in December 1985 from well 27 (FO-27). This exceeded the ATSDR CVs for the ingestion pathway but not for the dermal pathway. ATSDR does not consider inhalation to be a primary or significant route of DEHP exposure and there is no inhalation CV for DEHP [ATSDR 2022c]. DEHP was not detected in the MCWD sampling data.

The maximum EPC of 99 ppb DEHP was used to take the most health-protective approach. It was also used to calculate the different age groups' RME doses for the three exposure durations and exposure pathway combinations in the residence scenario. Within an age group, the calculated RME doses for ingestion only and combined ingestion and dermal pathways are nearly identical because the dermal dose is negligible regardless of exposure duration (Appendix C, Table C- 24, Table C- 25, Table C- 26, Table C- 27, Table C- 28, Table C- 29).

Noncancer HQ

ATSDR has not derived a chronic MRL for DEHP ingestion because there is insufficient data for deriving a chronic-duration oral MRL [ATSDR 2022c]. Therefore, the chronic HQs cannot be calculated for the ingestion-only and the combined ingestion and dermal exposure pathways (Appendix C, Table C- 24 and Table C- 27).

The inhalation pathway cannot be evaluated for any of the exposure durations because DEHP is not considered a volatile contaminant. DEHP does not have an air exposure concentration calculated by the SHOWER model to evaluate in PHAST.

The RME noncancer HQ exceeded the HQ of one for all age groups for the ingestion and the combined ingestion and dermal exposure pathways for intermediate and acute exposure durations (Table 15). However, it is the ingestion pathway that increases the risk of noncancerous health effects for the ingestion plus dermal combined exposure pathway. Under the assumed exposure conditions and durations, if individuals ingested water contaminated with 99 ppb DEHP, their estimated RME doses likely exceeded the ingestion MRLs (intermediate MRL is 0.0001 mg/kg/day DEHP and the acute MRL is 0.003 mg/kg/day DEHP).

The HQs were less than one for the dermal only exposure pathway for all age groups and exposure durations. Dermal contact alone at the RME doses would not increase risk of noncancerous health effects. Combining ingestion and dermal exposure pathways added minimally to the RME combined doses (Table 15). So, the dermal contact only slightly increased the calculated HQs for combined ingestion plus dermal compared to the ingestion only exposure pathway.

In summary, people of all age groups ingesting the maximum EPC for DEHP (99 ppb) for intermediate (15 to 364 days) or acute (14 days or less) durations could have had an increased risk of having noncancerous health effects. This does not mean that there was a health risk, only that further evaluation is needed. Further evaluation is provided in section 4.5.4.

Table 15. Hazard Quotients (HQs) exceeding 1.0 for ingestion and combined ingestion exposure pathways as calculated for each age group when exposed to 99.0 ppb Di(2-ethylhexyl)phthalate (DEHP) in the residential scenario

Exposure Age Group	Intermediate Duration, Combined Ingestion and Dermal and Ingestion Only Exposure Pathways	Acute Duration, Combined Ingestion and Dermal and Ingestion Only Exposure Pathways
Birth to < 1 year	140*	4.7*
1 to < 2 years	57†, 58‡	1.9*
2 to < 6 years	48†, 49‡	1.6*
6 to < 11 years	39*	1.3*
11 to < 16 years	31*	1.0*
16 to < 21 years	31*	1.0*
Adult	40*	1.3*
Pregnant Women	40*	1.3*
Breastfeeding Women	42*	1.4*

* HQ for both ingestion only and combined ingestion and dermal exposure pathways

† HQ for Ingestion only exposure pathway

‡ HQ for combined ingestion and dermal exposure pathway

Lifetime Cancer Risk

Calculated lifetime excess cancer risk indicates chronic exposure levels were not high enough for there to be a reasonable possibility that DEHP exposure increased cancer risk in Fort Ord residents. ATSDR does not consider resident exposure to DEHP at the levels measured from 1985–1994 to be a concern for increased risk of causing cancer during a lifetime.

Using the more protective RME to DEHP of 99 ppb, lifetime CR estimates for the ingestion pathway across all age groups were at an increased risk of 16 to 25 extra cases in 1,000,000 (Table 16). Lifetime CR estimates for the ingestion pathway and the combined ingestion plus dermal pathway were nearly identical. The dermal only exposure pathway resulted in an increased risk of less than 1 extra case in 1,000,000. These analyses assume that people were exposed to DEHP-contaminated water at 99 ppb for 21 years or more.

Table 16. Di(2-ethylhexyl)phthalate (DEHP) reasonable maximum exposure cancer risk estimates using exposure concentration of 99.0 ppb in the residential scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Ingestion and Dermal Combined Cancer Risk
Total Child (21 years)	16 in 1,000,000	Not Calculated	0.1 in 1,000,000	16 in 1,000,000

Adult (33 years)	24 in 1,000,000	NA	0.1 in 1,000,000	24 in 1,000,000
Birth to Adulthood (33 years)	25 in 1,000,000	NA	0.2 in 1,000,000	25 in 1,000,000

Calculated lifetime excess cancer risks indicate chronic exposure levels are not high enough for there to be a reasonable possibility that DEHP exposure over many years could cause cancer in members of the exposed population. Moreover, DEHP was detected just four times in 22 samples collected from 1985–1994 from wells (FO-21 and FO-27) that were considered standby status in 1985. Therefore, ATSDR does not consider resident exposure to DEHP at the levels measured from 1985–1994 to be a concern for increased risk of causing cancer over a lifetime.

4.5.4. Residential Scenario: Comparing Estimated Site-Specific Doses to Health Study Doses

In the residential scenario, five of the contaminants of concern had calculated HQs exceeding one for various age groups for some of the exposure pathways and durations. To further evaluate whether exposures could have noncancerous health effects, ATSDR compared the estimated exposure doses to the doses from the health studies used for developing the MRLs. This was done by comparing the estimated RME-residential doses to the lowest observed adverse effect levels (LOAEL), which is the lowest dose from the health study causing an adverse health effect for these particular contaminants.

Chloroform

Under the chronic exposure duration and at the assumed exposure conditions using the maximum EPC of 3.8 ppb chloroform, all age groups had an estimated inhalation RME dose (0.56 ppb chloroform) greater than the ATSDR MRL of 0.40 ppb. This led to the HQs exceeding one, suggesting increased risk of noncancerous health effects. ATSDR compared the 0.56 ppb chloroform inhalation RME to the health studies used to derive the chronic MRL.

The chronic-duration MRL of 0.40 ppb for chloroform was based on a LOAEL causing nasal lesions in mice exposed for nearly two years to high levels of chloroform [Yamamoto et al. 2002; ATSDR 2024b]. After converting to a human-equivalent concentration and applying uncertainty factors for exposure timing, the resulting LOAEL in the health study was 110 ppb. This lowest effect level of 110 ppb in air is nearly 200 times higher than the estimated inhalation-exposure dose for Fort Ord residents of 0.56 ppb chloroform.

Based on this comparison for the residential scenario, it is unlikely that residents were exposed to chloroform for a year or longer at levels that could have caused noncancerous health effects.

PCE

Individuals aged less than one year old who ingested PCE at the EPC (53 ppb) for any of the exposure durations (chronic, intermediate, or acute) were estimated to have a RME dose greater than the ATSDR MRL of 0.008 mg/kg/day. ATSDR's MRL is based on a LOAEL of 2.3

mg/kg/day, which is derived from a physiologically based pharmacokinetic (PBPK) model and a neurological effect health outcome, specifically color vision loss in humans [Cavalleri et al. 1994; ATSDR 2019a]. ATSDR compared the age-specific RME dose of 0.0088 mg/kg/day to the health studies extrapolated LOAEL of 2.3 mg/kg/day.

The health studies LOAEL (2.3 mg/kg/day) is more than 250 times the age-specific RME dose of 0.0088 mg/kg/day for all exposure durations. Based on this comparison, ingested PCE at the estimated EPC maximum for Fort Ord well water is unlikely to have resulted in noncancerous health effects.

TCE

People of all age groups who inhaled the 95 UCL EPC for TCE (2.7 ppb) for intermediate duration (15 to 364 days) or for chronic duration (one year or more), were estimated to have RME doses greater than ATSDR's MRL (0.40 ppb for both intermediate and chronic duration). Further, calculated HQs were greater than one, indicating possible increased risk of noncancerous health effects.

ATSDR compared the 0.5 ppb TCE inhalation RME dose to the health studies used to derive the 0.40 ppb MRLs. Both the chronic- and intermediate-duration inhalation MRL of 0.40 ppb was based on drinking water studies in rats and mice that reported LOAELs for endocrine and developmental effects [Johnson et al. 2003; Keil et al. 2009] and a physiologically based pharmacokinetic (PBPK) model developed by EPA [ATSDR 2019b]. However, a recent ATSDR rapid systematic review of data through August 2023 concluded that developmental cardiotoxicity (i.e., fetal heart defects) is not classifiable as a health effect in humans following inhalation or ingestion of TCE [ATSDR 2025c]. The review found low evidence in the scientific literature for cardiac heart defects in children of mothers exposed to TCE during pregnancy. ATSDR cannot determine an exposure dose or air concentration at which developmental cardiotoxicity may occur. Thus, ATSDR relied on the 33 ppb lowest-observed-adverse-effect level from Keil et al. [2009] as the most sensitive health effect level for this assessment. The PBPK model predicts exposure levels for the same effect from a different exposure route, in this case predicting the inhalation exposure level from an ingestion-based exposure study. The EPA model then converted the exposure level from one test species to a human equivalent level, in this case predicting exposure levels in humans or human equivalency concentrations (HECs) that would result in effects like that observed in rodents. Using PBPK modeling, the mouse oral LOAEL was converted to a 99th percentile $HEC_{99,LOAEL}$ of 33 ppb in air.

The Fort Ord EPC 2.70 ppb TCE resulted in an inhalation RME of 0.5 ppb TCE, considerably less than the HEC of 33 ppb TCE in air from the Keil et al. [2009] health guideline study. The LOAEL is more than 65 times higher than the RME. Based on this comparison for the residential scenario inhalation, it is unlikely that residents were exposed to TCE levels for chronic or intermediate durations that could have led to noncancerous health effects.

Benzene

As noted earlier, benzene was detected in just one of 198 samples from Fort Ord wells. However, it is unlikely that people were exposed at the 30 ppb level for acute or intermediate durations. This is because water from Fort Ord drinking-water wells was blended prior to

distribution, and benzene was not detected in seven other samples collected on the same day as the detection. Additionally, the well (FO-24) that recorded the 30 ppb benzene level was in standby status since 1985 and was likely not utilized in the blended drinking water production, as previously noted in Section 2.5, which cites the Fort Ord well operations memorandum [Meurer 1985].

Still, taking a conservative, health-protective approach, ATSDR evaluated health risks if people were exposed to benzene at the level measured in that single sample (30 ppb) for acute or intermediate durations. In that scenario, all age groups could have had RME doses greater than ATSDR's MRLs for intermediate-inhalation and for intermediate- and acute-ingestion exposures. This suggests possible increased risk of noncancerous health effects due to inhalation for intermediate duration and for ingestion for intermediate and acute durations.

If individuals of all age groups inhaled or ingested the maximum EPC of benzene-contaminated water (30 ppb) for an intermediate duration (15 to 364 days), their estimated RME doses would exceed ATSDR's MRLs of 7.0 ppb for intermediate inhalation and 0.0009 mg/kg/day for intermediate and acute ingestion. As a result, the calculated HQs were equal to or greater than 1, indicating a potential increased risk of noncancer health effects. ATSDR next compared the inhalation RME dose of 7.1 ppb and the age-specific RME doses for ingestion, which ranged from 0.00093 to 0.0043 mg/kg/day, against the corresponding MRLs from health studies [ATSDR 2024c].

ATSDR's provisional intermediate-duration inhalation MRL of 7.0 ppb is based on a LOAEL of 11,100 ppb for immune response in mice. This lowest reliable LOAEL was adjusted for intermittent exposure and then converted to a human equivalent concentration, resulting in a LOAEL of 1,980 ppb [Rosenthal and Snyder 1987; ATSDR 2024c]. The inhalation LOAEL of 1,980 ppb is over 275 times higher than the inhalation RME calculated for residents (7.1 ppb). Thus, it is unlikely that the exposures to Fort Ord drinking-water vapors with 30 ppb benzene increased a risk of noncancerous health effects in residents.

The intermediate- and acute-duration oral MRL of 0.0009 mg/kg/day is based on an adjusted NOAEL of 0.09 mg/kg/day (adjusted for continuous exposure from a NOAEL of 0.1 mg/kg/day) [Li et al. 2018; ATSDR 2024c]. The adjusted LOAEL of 0.9 mg/kg/day (adjusted for continuous

exposure from a LOAEL of 1 mg/kg/day) is over 200 times higher than the highest-oral RME (0.0043 mg/kg/day) estimated for Fort Ord residential scenarios. Based on the comparisons of the RME doses for Fort Ord residents to the health study LOAEL, ATSDR concludes that Fort Ord residents were not exposed to benzene levels from 1985–1994 at levels that could harm their health. Additional health studies in ATSDR's MRL worksheet support these findings, indicating benzene LOAELs in the ranges of 50,000 to 200,000 ppb for inhalation and 1 to 50 mg/kg/day for ingestion [ATSDR 2024c].

Di(2-ethylhexyl)phthalate (DEHP)

Under the assumed exposure conditions and durations, if individuals ingested water contaminated with 99 ppb DEHP, their estimated RME doses likely exceeded the MRLs (intermediate MRL is 0.0001 mg/kg/day DEHP and the acute MRL is 0.003 mg/kg/day DEHP). Adding dermal exposure to the ingestion exposure contributed minimally to the RME combined doses, and ATSDR compared the higher combined RME doses to the respective doses from health studies used as the basis for MRLs. The intermediate- and acute-RME doses ranged from 0.0031–0.014 mg/kg/day for the combined ingestion and dermal exposure pathway (Appendix C, Table C- 25 and Table C- 26).

ATSDR's intermediate-duration oral MRL of 0.0001 mg/kg/day DEHP is based on a health study LOAEL of 0.04 mg/kg/day for altered reproductive development in mice [Zhang et al. 2015; ATSDR 2022c]. ATSDR's acute-duration oral MRL of 0.003 mg/kg/day DEHP is based on a health study LOAEL of 1.0 mg/kg/day for altered glucose homeostasis in rats [Rajesh and Balasubramanian 2014; ATSDR 2022c]. The intermediate- and acute-duration LOAELs are nearly three times higher and 70 times higher, respectively, than the highest RME dose (0.014 mg/kg/day) estimated from Fort Ord drinking water with maximum EPC of 99 ppb DEHP.

The analysis of intermediate exposure revealed considerably higher HQs compared to acute exposure, despite both exposure durations having the same exposure doses (see Appendix C, Table C- 25 and Table C- 26). This difference is because the LOAEL (1.0 mg/kg/day) for acute exposure is 25 times greater than the LOAEL for intermediate exposure, which is 0.04 mg/kg/day. ATSDR further compared age-specific RMEs for the intermediate duration scenario to the LOAELs from health studies.

At the LOAEL of 0.04 mg/kg/day of DEHP, the health effect for the intermediate-duration exposure is hormonal changes that interfere with normal reproductive developments (i.e., ovarian developmental delays) in female mice [Zhang et al. 2015; ATSDR 2022c]. This effect may be particularly relevant due to DEHP exposures in adult or pubescent females consuming DEHP-contaminated water in the Fort Ord residential scenario. The highest RME dose estimated is for infants under one year old (0.014 mg/kg/day) and again, the LOAEL is 2.9 times higher. Or in other words, the RME dose for the infant age group is 34% of the LOAEL. For individuals aged 11 years and older, including pregnant women and breastfeeding women, the health-study LOAEL is at least ten times higher than the RME doses estimated for Fort Ord residents.

Other studies with potentially temporary changes in reproductive organ weight and sperm parameters in mouse offspring identified a similar ingestion LOAEL of 0.05 mg/kg/day [Pocar et al. 2012]. Permanent reproductive injuries were found in rat offspring at maternal doses of 3–10 mg/kg/day [Arcadi et al. 1998; Christiansen et al. 2010; Klinefelter et al. 2012; Lin et al. 2008, 2009; ATSDR 2022c]. The LOAELs from these studies are 3.6 to over 700 times higher than the highest RME (0.014 mg/kg/day) for infants.

Based on the comparisons, the estimated RME doses for DEHP were less than the LOAELs identified in animal studies and, although approaching these levels, remain below effect thresholds and do not indicate a public health concern. It is important to note that the drinking water was produced from a blended source, which dilutes potential contaminants. Furthermore, the sample containing 99 ppb DEHP was taken from well FO-27, which had been in standby status since 1985 [Meurer 1985]. ATSDR's assessment is that it is unlikely residents were exposed to DEHP at the 99 ppb level, as the well was likely not in use during the relevant exposure period. Accordingly, the weight of evidence supports the conclusion that harmful health effects are unlikely.

4.5.5. Soldier-in-Training Scenario Evaluation of Noncancerous Health Risk and Cancer Risk

ATSDR evaluated potential exposures for soldiers-in-training to determine if there was an increased risk of noncancerous health effects or cancer for soldiers living at the Fort Ord barracks. For each contaminant of concern there are two exposure groups evaluated.

- The 16 to less than 21 years old age group, with a maximum exposure duration of 5 years, and
- the adult age group, with a maximum exposure duration of 6 years.

As with the residential scenario, ATSDR evaluated soldier-in-training health risks based on the highest EPC from either the Fort Ord or MCWD drinking-water sampling data in the available historical data from 1985–1994. This is a conservative, health protective approach, especially given that Fort Ord barracks were served by the Fort Ord water system (not MCWD).

Carbon Tetrachloride

The maximum carbon tetrachloride level detected in the Fort Ord water supply was 9.8 ppb. ATSDR calculated the ingestion exposure doses for soldiers and used the SHOWER model to determine what individuals' exposure may have been through the inhalation and dermal pathways when showering and being in the barracks throughout the day. Evaluating acute inhalation of carbon tetrachloride is not possible because an acute MRL was not derived but ATSDR considers the intermediate-duration inhalation MRL to be protective for acute exposures [ATSDR 2005b].

Noncancer HQ

The RME noncancer HQ did not exceed one for any of the age groups through any of the exposure pathways and durations. Consequently, ATSDR does not expect carbon tetrachloride in the water to have produced noncancer health effects among Fort Ord soldiers-in-training.

Lifetime Cancer Risk

Using the more protective RME to carbon tetrachloride and assuming water was used for all household uses including drinking and bathing for 5 or 6 years, CR estimates across both age groups ranged from an increase of less than 1 additional case in 1,000,000 to 8 in 1,000,000 (Table 17; Appendix D, Table D- 1 and Table D- 2). ATSDR does not consider soldier-in-training exposures to carbon tetrachloride at these levels measured from 1985–1994 to be a concern for increased cancer risk during a lifetime.

Table 17. Carbon tetrachloride reasonable maximum exposure cancer risk estimates using exposure concentration of 9.8 ppb in the soldier-in-training scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Ingestion and Dermal Combined Cancer Risk
16 to less than 21 years	7 in 1,000,000	Less than 1 in 1,000,000	Less than 1 in 1,000,000	7 in 1,000,000
Adult	8 in 1,000,000	Less than 1 in 1,000,000	Less than 1 in 1,000,000	8 in 1,000,000

Chloroform

The maximum chloroform level detected was 3.8 ppb from the MCWD water supply in October 1991. The maximum chloroform level in the Fort Ord water supply was 1.8 ppb. Both levels are below the ATSDR CV (71 ppb) for the ingestion pathway, and well below the ATSDR CV (2,600 ppb) for the dermal pathway. There is no need to further evaluate chloroform for ingestion and dermal exposures in the soldier-in-training scenario.

However, both the 3.8 ppb (MCWD supply) and the 1.8 ppb (Fort Ord supply) chloroform maximums are above the CV for inhalation (0.06 ppb). Thus, ATSDR calculated ingestion exposure doses for soldiers and used the SHOWER model to determine what soldiers' exposures may have been through the inhalation pathway when showering and being in the barracks throughout the day. The maximum EPC of 3.8 ppb chloroform was used in the calculations to use the most protective approach.

Noncancer HQ

The RME noncancer HQs were all less than one for both age groups for the inhalation exposure pathway. All other exposure pathways also had HQs less than one. Since the analysis with the higher EPC of 3.8 ppb had HQs less than one, as expected the HQs calculated for the lower EPC of 1.8 ppb from Fort Ord supply were also less than one. Consequently, noncancer health effects from any pathway (inhalation, ingestion, or dermal) are not expected at this chloroform level in the drinking water for the Fort Ord soldier-in-training scenario.

Lifetime Cancer Risk

Using the more protective RME to chloroform (0.037 ppb), lifetime CR estimates for the inhalation pathway were less than 1 extra case in 1,000,000. ATSDR does not consider soldier-in-training exposures to chloroform at the levels measured from 1985–1994 to be a concern for increased cancer risk during a lifetime.

Methylene chloride

The maximum methylene chloride level of 6.9 ppb, measured in the Fort Ord water supply, exceeds the drinking water CV (CREG) of 6.4 ppb [ATSDR 2000]. The next highest drinking water CV is the RMEG of 42 ppb for a child (noncancer). ATSDR calculated doses for each exposure group and determined the RME noncancer HQ was below one for both age groups and all exposure pathways in the soldier-in-training scenario. Therefore, noncancerous adverse health effects are not expected, and no further evaluation is needed.

Also, the soldier-in-training scenario cancer risks estimated for chronic exposure durations for both age groups and all pathways were below 1 extra case in 1,000,000. ATSDR does not consider soldier-in-training exposure to methylene chloride at the levels measured from 1985–1994 to be a concern for increased cancer risk over a lifetime.

Dibromochloromethane

The maximum dibromochloromethane level of 6.2 ppb (measured in the MCWD water supply) exceeds the drinking water CV (CREG) of 0.3 ppb. There is not an inhalation CV for dibromochloromethane, and the maximum EPC did not exceed the dermal CV of 7.4 ppb.

The dibromochloromethane EPC of 6.2 ppb found in the MCWD wells was used to evaluate potential health risks from exposure, despite the chemical not being detected in the Fort Ord water supply. ATSDR used this precautionary approach to ensure health protection in case the Fort Ord water supply had been contaminated with this chemical of concern.

Noncancer HQ

ATSDR calculated doses for each solider-in-training group and determined the RME noncancer HQ was below one for both age groups and all exposure pathways. Therefore, noncancerous adverse health effects are not expected from drinking or dermal exposure, and no further evaluation is needed. ATSDR's toxicological profile [ATSDR 2005c] found no studies regarding health effects following inhalation exposure, so no further evaluation is presented on the inhalation pathway.

Lifetime Cancer Risk

ATSDR used the more protective RME to dibromochloromethane of 6.2 ppb to calculate lifetime CR estimates for all exposure pathways and for both age groups (Table 18). The inhalation and dermal exposure pathways could not be calculated or did not show an increased risk of extra cancer cases, respectively (Table 18). The ingestion only and the combined ingestion and dermal pathways had cancer risk estimates ranging from 5 to 6 extra cases in 1,000,000 (Table 18; Appendix D, Table D- 3 and Table D- 4). ATSDR does not consider soldier-in-training exposures to dibromochloromethane at the levels measured from 1985–1994 to be

a concern for increased cancer risk during a lifetime.

Table 18. Dibromochloromethane reasonable maximum exposure cancer risk estimates using exposure concentration of 6.2 ppb in the soldier-in-training scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Ingestion and Dermal Combined Cancer Risk
16 to less than 21 years	5 in 1,000,000	Not calculated	Less than 1 in 1,000,000	5 in 1,000,000
Adult	6 in 1,000,000	Not calculated	Less than 1 in 1,000,000	6 in 1,000,000

Bromodichloromethane

The maximum bromodichloromethane level of 5.3 ppb (measured in the MCWD water supply) exceeded the drinking water CV (CREG) of 0.39 ppb. The dermal CV was not exceeded and ATSDR does not have an inhalation CV.

The bromodichloromethane EPC of 5.3 ppb found in the MCWD wells was used to evaluate potential health risks from exposure, despite the chemical not being detected in the Fort Ord water supply. This precautionary measure was taken to ensure health protection in case the Fort Ord water supply had been contaminated with this chemical of concern.

Noncancer HQ

ATSDR calculated doses for both exposure groups and determined the RME noncancer HQ did not exceed one for any exposure pathway in the soldier-in-training scenario. Therefore, noncancerous adverse health effects are not expected, and further noncancer evaluation is not needed.

Lifetime Cancer Risk

ATSDR used the more protective RME to bromodichloromethane of 5.3 ppb to calculate lifetime CR estimates for both age groups and the ingestion, dermal, and combined exposure pathways (Table 19). The dermal pathway showed less than 1 extra case in 1,000,000. The ingestion only and the combined ingestion and dermal pathways had cancer risk estimates ranging from 3 to 4 extra cases in 1,000,000 (Table 19; Appendix D, Table D- 5 and Table D-6). The cancer risk for the inhalation only exposure pathways is not calculated because no chronic-duration inhalation studies were identified [ATSDR 2020].

Table 19. Bromodichloromethane reasonable maximum exposure cancer risk estimates using exposure concentration of 5.3 ppb in the soldier-in-training scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Ingestion and Dermal Combined Cancer Risk
16 to less than 21 years	3 in 1,000,000	Not calculated	Less than 1 in 1,000,000	3 in 1,000,000
Adult	4 in 1,000,000	Not calculated	Less than 1 in 1,000,000	4 in 1,000,000

ATSDR does not consider soldier-in-training exposures to bromodichloromethane at the levels measured from 1985–1994 to be a concern for increased cancer risk during a lifetime.

Tetrachloroethylene (PCE)

The maximum PCE level of 53 ppb, measured in the Fort Ord water supply in April 1988, exceeded ATSDR CVs for the ingestion, inhalation, and dermal pathways. ATSDR used the maximum EPC of 53 ppb PCE to calculate soldier-in-training health risks for the three exposure durations and exposure pathway combinations scenario.

Noncancer HQ

The RME noncancer HQ was 1.2 for the 16 – 21 age group and 1.1 for the adult age group (slightly exceeding the HQ of 1) for both age groups for the ingestion and dermal combined exposure pathway for chronic, intermediate, and acute exposure durations (Appendix D, Table D- 7, Table D- 8, Table D- 9). The RME HQ was 1.1 for the 16 to less than 21 years old age group and slightly less than 1 for the adult age group for ingestion only exposure pathway for all exposure durations (Appendix D, Table D- 10, Table D- 11, Table D- 12). If soldiers ingested and bathed in water contaminated with 53 ppb PCE, their RME dose of nearly 0.009 mg/kg/day PCE exceeded the chronic MRL of 0.008 mg/kg/day PCE, possibly increasing the risk of noncancerous health effects. This does not mean that there was a health risk, only that further evaluation is needed.

Both age groups and all exposure durations had HQs less than one for inhalation exposures and for dermal only exposures. Consequently, ATSDR does not expect noncancer health effects from inhalation and dermal only pathways at the maximum EPC for PCE in the water for the Fort Ord soldier-in-training scenario.

Lifetime Cancer Risk

Using the more protective RME to PCE of 53 ppb, lifetime CR estimates for the ingestion and combined ingestion and dermal exposure pathways for both age groups ranged from less than 1 extra case in 1,000,000 to 1 in 1,000,000 (Table 20; Appendix D, Table D- 7 and Table D- 10). ATSDR does not consider soldier-in-training exposures to PCE at the levels measured from 1985–1994 to be a concern for increased cancer risk during a lifetime.

Table 20. Tetrachloroethylene (PCE) reasonable maximum exposure cancer risk estimates using exposure concentration of 53.0 ppb in the soldier-in-training scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Ingestion and Dermal Combined Cancer Risk
16 to less than 21 years	1 in 1,000,000	Less than 1 in 1,000,000	Less than 1 in 1,000,000	1 in 1,000,000
Adult	1 in 1,000,000	Less than 1 in 1,000,000	Less than 1 in 1,000,000	1 in 1,000,000

Trichloroethylene (TCE)

The maximum TCE level detected in the Fort Ord water supply was 25 ppb in May 1985 and was 2.9 ppb in the MCWD water supply in January 1990. The calculated 95 UCL EPCs were 2.7 ppb and 0.5 ppb in Fort Ord and MCWD wells, respectively. ATSDR used the higher EPC of 2.7 ppb to evaluate soldier-in-training health risks to ensure a conservative, health protective approach. The RME noncancer HQs were below one for both age groups and all exposure pathways. However, the chronic- and intermediate-RMEs for ingestion and combined ingestion and dermal approached ATSDR's MRL of 0.0005 mg/kg/day (Appendix D, Table D- 13, Table D- 14, Table D- 15, Table D- 16). ATSDR does not expect noncancerous adverse health effects from exposures at these TCE levels, and no further evaluation is needed.

ATSDR also used the higher 2.7 ppb EPC to calculate soldier-in-training cancer risks. Cancer risk estimates for chronic exposure durations for both age groups and all pathways were below 1 extra case in 1,000,000 (Appendix D, Table D- 13 and Table D- 15). ATSDR does not consider soldier-in-training exposures to TCE at the levels measured from 1985–1994 to be a concern for increased cancer risk during a lifetime

Benzene

Benzene was detected in just one sample [on June 17, 1987, from well 24 (FO-24)] out of 198 samples from the Fort Ord water supply between 1985 and 1992. As noted earlier in the residential scenario section, based on the sampling data patterns for benzene and the well status with blended water production, ATSDR considers benzene exposures unlikely during the 1984–1995 timeframe.

Nonetheless, ATSDR proceeded with a soldier-in-training scenario evaluation for intermediate and acute exposure durations. The detection of 1 sample out of nearly 200 samples over a time span of nearly eight years does not support the potential for a chronic duration exposure. The one sample of 30 ppb benzene exceeded the ATSDR CVs for the ingestion and inhalation exposure pathways. There is not a CV for the dermal pathway for benzene. The 30 ppb benzene was used in the calculations to use the most protective approach and calculate the RMEs for the two exposure durations and all exposure pathway combinations for both age groups.

Noncancer HQ

The RME noncancer HQ exceeded one for both age groups for the combined ingestion and dermal and the ingestion only exposure pathways for both exposure durations (Table 21 and Appendix D, Table D- 17, Table D- 18, Table D- 19, Table D- 20).

For the inhalation only and dermal only exposure pathways, the RME noncancer HQ was less than one for both age groups and both exposure durations. Inhalation or dermal contact alone at the RME doses would not increase risk of noncancerous health effects. Dermal contact slightly increased the calculated HQs for combined ingestion plus dermal compared to the ingestion only exposure pathway. It is the ingestion pathway that increases the risk of noncancerous health effects for the ingestion plus dermal combined exposure pathway.

Assuming the single sample used for the maximum EPC 30 ppb benzene exposure represented continuous exposures for the intermediate or acute exposure durations, soldiers could have had an increased risk of having noncancerous health effects due to ingestion. However, it is unlikely this exposure level existed for Fort Ord soldiers and even so, it does not mean that there was a health risk, only that further evaluation is needed.

Table 21. Hazard Quotients (HQs) for acute and intermediate exposure durations for ingestion only and for combined ingestion and dermal exposure pathways as calculated for each age group when exposed to 30.0 ppb benzene in the soldier-in-training scenario

Exposure Age Group	Intermediate Duration, Ingestion and Dermal Exposure Pathway	Acute Duration, Ingestion and Dermal Exposure Pathway	Intermediate Duration, Ingestion Only Exposure Pathway	Acute Duration, Ingestion Only Exposure Pathway
16 to less than 21 years	5.4	5.4	5.3	5.3
Adult	4.9	4.9	4.7	4.7

Di(2-ethylhexyl)phthalate (DEHP)

The maximum DEHP level detected was 99 ppb from the Fort Ord water supply in December 1985. This maximum level exceeded ATSDR CVs for the ingestion pathway but not for the dermal pathway. ATSDR does not consider inhalation to be a primary or significant route of DEHP exposure and there is no CV for DEHP inhalation [ATSDR 2022c]. ATSDR used the maximum EPC of 99 ppb DEHP to calculate soldier-in-training health risks for the three exposure durations and exposure pathway combinations for both age groups.

Noncancer HQ

ATSDR has not derived a chronic MRL for DEHP ingestion pathway because there is insufficient data for deriving a chronic-duration oral MRL [ATSDR 2022c]. Therefore, chronic HQs cannot be calculated for the combined ingestion and dermal and the ingestion only exposure pathways.

The RME noncancer HQ exceeded one for both age groups for the combined ingestion and dermal and the ingestion only exposure pathways for intermediate and acute exposure durations (Table 22; Appendix D, Table D- 21, Table D- 22, Table D- 23, and Table D- 24). Under the assumed exposure conditions and durations, if soldiers ingested and contacted water contaminated with 99 ppb DEHP, their estimated RME doses exceeded the MRLs (intermediate MRL is 0.0001 mg/kg/day DEHP and the acute MRL is 0.003 mg/kg/day DEHP).

The HQs were less than one for the dermal only exposure pathway for both age groups for the intermediate and acute exposure durations. Dermal contact alone at the RME doses would not increase risk of noncancerous health effects. Combining ingestion and dermal exposure pathways did not add to the RME combined doses. In the soldier-in-training scenario, the dermal contact did not increase the calculated HQs for combined ingestion plus dermal compared to the ingestion only exposure pathway. It is the ingestion pathway that increases the risk of noncancerous health effects for the ingestion plus dermal combined exposure pathway.

In summary, soldiers of both age groups ingesting the maximum EPC for DEHP (99 ppb) for intermediate (15 to 364 days) or acute (14 days or less) durations could have had an increased risk of noncancerous health effects. This does not mean that there was a health risk, only that further evaluation is needed.

Table 22. Hazard Quotients (HQs) exceeding 1 for ingestion and combined ingestion exposure pathways as calculated for each age group when exposed to 99.0 ppb Di(2-ethylhexyl)phthalate (DEHP) in the soldier-in-training scenario

Exposure Age Group	Intermediate Duration, Combined Ingestion and Dermal and Ingestion Only Exposure Pathways	Acute Duration, Combined Ingestion and Dermal and Ingestion Only Exposure Pathways
16 to less than 21 years	160	5.3
Adult	140	4.7

Lifetime Cancer Risk

Using the more protective RME to DEHP of 99 ppb, lifetime CR estimates for the combined ingestion and dermal and the ingestion only pathway across all age groups were at an increased risk of 14 or 15 extra cases in 1,000,000 (Table 23; Appendix D, Table D- 25 and Table D- 26). Lifetime CR estimates for the ingestion pathway and the combined ingestion plus dermal pathway were identical. The dermal only exposure pathway resulted in an increased risk of less than 1 extra case in 1,000,000 (Table 23). ATSDR does not consider soldier-in-training exposures to DEHP at the levels measured from 1985–1994 to be a concern for increased cancer risk during a lifetime

Table 23. Di(2-ethylhexyl)phthalate (DEHP) reasonable maximum exposure cancer risk estimates using exposure concentration of 99 ppb in the soldier-in-training scenario

Exposure Age Group	Ingestion Pathway Cancer Risk	Inhalation Pathway Cancer Risk	Dermal Pathway Cancer Risk	Ingestion and Dermal Combined Cancer Risk
16 to less than 21 years	14 in 1,000,000	NA	Less than 1 in 1,000,000	14 in 1,000,000
Adult	15 in 1,000,000	NA	Less than 1 in 1,000,000	15 in 1,000,000

4.5.6. Soldier-in-Training Scenario: Comparing Estimated Site-Specific Doses to Health Study Doses

In the soldier-in-training scenario, three of the contaminants of concern had calculated HQs exceeding one for certain age-groups, exposure pathways, and durations. To further evaluate site-specific doses showing potential increased risk of noncancerous health effects, ATSDR compared the estimated exposure doses to the doses from the health studies used for developing the MRLs. This was done by comparing the estimated RME-soldier doses to the LOAEL, which is the lowest dose from the health study causing an adverse health effect for these particular contaminants.

PCE

For all three exposure durations the combined ingestion and dermal RME doses (0.009 mg/kg/day, age group 16 to less than 21 years; 0.008 mg/kg/day, adults) were slightly higher than the MRL of 0.008 mg/kg/day PCE. ATSDR compared the RME doses to the health study's LOAEL used to derive the MRL.

The MRL of 0.008 mg/kg/day PCE is the same for all three exposure durations and is based on an inhalation-health study with a route-to-route converted oral dose of 2.3 mg/kg/day as the LOAEL [ATSDR 2019a]. The health study by Cavalleri et al. [1994] was on visual function in rats and found that PCE exposure can lead to color vision loss, suggesting potential neurotoxic effects. The LOAEL of 2.3 mg/kg/day is over 250 times higher than the soldiers' estimated RME dose of 0.009 mg/kg/day. Based on the comparisons of the RME doses for Fort Ord soldiers to

the LOAEL, ATSDR concludes that Fort Ord soldiers exposed to PCE levels from available historical data from 1985–1994 were not at risk of noncancerous health effects.

Benzene

As previously discussed, benzene was detected in one of 198 Fort Ord drinking water samples and the sample was from well FO-24, which was likely not utilized after 1985. While soldiers were unlikely to have been exposed at the level measured in that sample (30 ppb), ATSDR evaluated potential exposures at that maximum 30 ppb level to ensure a health-protective approach. Assuming the single sample used for the maximum EPC of 30 ppb benzene exposure represented continuous exposures for intermediate and acute exposure durations, both age groups had RME doses greater than ATSDR's MRL (0.0009 mg/kg/day) for intermediate- and acute-ingestion exposures.

The intermediate- and acute-duration oral MRL of 0.0009 mg/kg/day is based on an adjusted LOAEL of 0.9 mg/kg/day (adjusted for continuous exposure from a NOAEL of 0.1 mg/kg/day) [ATSDR 2024c]. The intermediate and acute RME doses, 0.005 mg/kg/day for 16 to 21 years old and 0.004 mg/kg/day for adults, are considerably lower than the adjusted LOAEL of 0.9 mg/kg/day. Based on the comparisons of the RME doses to the health-study LOAELs, ATSDR concludes that Fort Ord soldiers exposed to benzene levels from available historical data from 1985–1994 were not at risk of noncancerous health effects.

Di(2-ethylhexyl)phthalate (DEHP)

Under the assumed exposure conditions and durations, if soldiers ingested water contaminated with 99 ppb DEHP, their estimated RME doses exceeded the MRLs (intermediate MRL is 0.0001 mg/kg/day DEHP and the acute MRL is 0.003 mg/kg/day DEHP). Combining ingestion and dermal exposure pathways and ingestion-only had identical RME doses for all exposure durations. ATSDR compared the RME doses to the respective doses from health studies used as the basis for MRLs. The intermediate- and acute-RME doses were 0.016 mg/kg/day for ages 16 to less than 21 years and 0.014 mg/kg/day for adults.

ATSDR's intermediate-duration oral MRL of 0.0001 mg/kg/day DEHP is based on a health study LOAEL of 0.04 mg/kg/day for altered reproductive development [Zhang et al. 2015; ATSDR 2022c]. ATSDR's acute-duration oral MRL of 0.003 mg/kg/day DEHP is based on a health study LOAEL of 1.0 mg/kg/day for altered glucose homeostasis [Rajesh and Balasubramanian 2014; ATSDR 2022c].

The intermediate-duration LOAEL (0.04 mg/kg/day) is 2.5 times higher than the intermediate RME dose (0.016 mg/kg/day) estimated from Fort Ord drinking water with maximum EPC of 99 ppb DEHP. The acute-duration LOAEL (1.0 mg/kg/day) is more than 60 times higher than the acute-duration RME dose. Based on the comparisons of the RME doses for Fort Ord soldiers to these LOAELs, ATSDR concludes that Fort Ord soldiers exposed to DEHP levels measured from 1985–1994 were not at risk of noncancerous health effects.

4.6. Key Findings Evaluating Noncancer Health Effects and Cancer Risks

ATSDR assessed noncancer health effects and cancer risks for residential and soldier-in-training scenarios by applying health-protective exposure conditions and parameters. Health risks related to potential exposures to the nine contaminants of concern were evaluated using the maximum EPCs. Key findings from ATSDR's health evaluation of the available historical (1985–1994) drinking water data are summarized below:

ATSDR found that there was a completed exposure pathway from ingesting, inhaling, and contacting contaminated well water for residents and soldiers. The maximum concentrations of nine contaminants in the sampling data for Fort Ord and MCWD wells exceeded one or more of ATSDR's CVs for different exposure routes. ATSDR assigned or calculated a health-protective EPC for each contaminant and evaluated potential health effects and cancer risks from exposures using ATSDR's SHOWER model and PHAST tool.

In the assessment of noncancerous health effects for the residential scenario, five of the nine contaminants of concern – chloroform, PCE, TCE, benzene, and DEHP – required further evaluation because estimated site-specific exposure doses exceeded ATSDR's MRLs for certain exposure durations, pathways, and age-groups. Three of the nine contaminants of concern – PCE, benzene, and DEHP – also required further evaluation for the soldier-in-training scenario.

However, further analysis revealed that the highest exposure doses for these contaminants were substantially lower than the LOAELs identified in health studies. Table 24 and Table 25 provide a summarized comparison of the highest site-specific RMEs and their corresponding LOAELs. Ultimately, ATSDR determined that none of the exposure doses for these contaminants posed a concern for increased risk of noncancerous health effects in either residential or soldier-in-training scenarios.

For the lifetime cancer risk evaluation, seven of the nine contaminants (with methylene chloride and benzene as exceptions) had an increased cancer risk above 1 extra case in 1,000,000 for at least one age group and exposure pathway. The highest increased cancer risk was associated with inhalation of carbon tetrachloride, which showed an increase of 33 extra cases in 1,000,000. In the soldier-in-training scenario, five of the nine contaminants evaluated for increasing lifetime cancer risks showed an increase above 1 in 1,000,000 for the ingestion pathway. DEHP had the highest increased cancer risk rate, with an increase of 15 extra cases in 1,000,000.

These excess cancer risks indicate that chronic exposures were not high enough for there to be a reasonable possibility that exposure over many years could cause cancer in members of the exposed population. ATSDR does not consider residential or soldier-in-training scenario exposures to any individual carcinogen to be a concern for increased cancer risk over a lifetime.

Neither the Fort Ord or MCWD sampling data support the continuous presence of any individual or combination of contaminants at their maximum concentration in tap water for chronic durations of 21 years (residential scenario) and 6 years (soldier-in-training scenario). Nevertheless, ATSDR calculated cumulative cancer risks for a person potentially exposed to all

carcinogens that screened into the cancer risk evaluation. ATSDR summed cancer risks for maximum EPCs in both the residential and soldier-in-training scenarios for adults with the combined exposure pathways (ingestion plus dermal plus inhalation). The cumulative cancer risks were 90 extra cases in 1,000,000 (residential scenario) and 20 in 1,000,000 (soldier-in-training scenario). Even under this unrealistic exposure scenario, the increased cancer risks were not a concern.

Table 24. Residential scenario comparisons of the highest reasonable maximum exposure (RME) to the minimal risk level (MRL) health study's lowest observed adverse effect level (LOAEL) for the five contaminants with hazard quotients equal to or greater than one

Contaminant	Exposure Pathway and Duration	Highest Estimated Dose, RME* (ppb or mg/kg/day)	Health Study LOAEL (ppb or mg/kg/day)	Comparison of Site-Specific Exposure Dose to LOAEL†
Chloroform	Inhalation: Chronic	0.56 ppb	110.0 ppb	LOAEL is 196 times higher than the highest RME
PCE (tetrachloroethylene)	Ingestion: Chronic Intermediate: Acute	0.008 mg/kg/day	2.3 mg/kg/day	LOAEL is over 250 times higher than the highest RME
TCE (trichloroethylene)	Inhalation: Chronic and Intermediate	0.5 ppb	33.0 ppb	LOAELs are at least 66 times higher than the highest RME
Benzene	Inhalation and Ingestion: Intermediate; Ingestion: Acute	7.1 ppb (inhalation); 0.0043 mg/kg/day (ingestion)	1,980 ppb (inhalation); 0.9 mg/kg/day (ingestion)	Inhalation LOAEL is 279 times higher than the highest inhalation RME; ingestion LOAEL is 209 times higher than the highest ingestion RME
DEHP (Di(2-ethylhexyl) phthalate)	Ingestion: Intermediate and Acute	0.014 mg/kg/day	0.04 mg/kg/day (intermediate); 1.0 mg/kg/day (acute)	Intermediate LOAEL is 2.9 times higher than the highest intermediate RME; acute LOAEL is 71 times higher than the highest acute RME

* RME is the site- and age-specific highest level of exposure reasonably expected for individuals coming into contact with the contaminant; it represents the 95th percentile of exposure levels and is based on the maximum exposure point concentration.
† LOAEL comparisons and information sources (i.e., ATSDR Toxicological Profiles and original journal articles) as provided by ATSDR PHA process [ATSDR 2022a].

Table 25. Soldier-in-Training scenario comparisons of the highest reasonable maximum exposure (RME) to the minimal risk level (MRL) health study's lowest observed adverse effect level (LOAEL) for the three contaminants having hazard quotients equal to or greater than one

Contaminant	Exposure Pathway and Duration	Highest Estimated Dose, RME* (mg/kg/day)	Health Study LOAEL (mg/kg/day)	Comparison of Site-Specific Exposure Dose to LOAEL†
PCE (tetrachloroethylene)	Ingestion and Dermal, Chronic, Intermediate, Acute	0.009 mg/kg/day	2.3 mg/kg/day	Ingestion-LOAEL is over 250 times higher than the highest ingestion-RME
Benzene	Ingestion, Intermediate and Acute	0.005 mg/kg/day	0.9 mg/kg/day	Ingestion-LOAEL is 180 times higher than the highest ingestion-RME
DEHP (Di(2-ethylhexyl)phthalate)	Ingestion, Intermediate and Acute	0.016 mg/kg/day	0.04 mg/kg/day (intermediate); 1.0 mg/kg/day (acute)	Intermediate-LOAEL is 2.5 times higher than the highest intermediate-RME; acute-LOAEL is 63 times higher than the highest acute-RME

* RME is the site- and age-specific highest level of exposure reasonably expected for individuals coming into contact with the contaminant; it represents the 95th percentile of exposure levels and is based on the maximum exposure point concentration.
† LOAEL comparisons and information sources (i.e., ATSDR Toxicological Profiles and original journal articles) as provided by ATSDR PHA process [ATSDR 2022a].

4.7. Addressing Community Concerns

Past and current community members expressed health concerns to ATSDR. ATSDR responses to those concerns are noted in Table 26.

Table 26. Community health concerns related to the Fort Ord drinking water and ATSDR responses

Community Concern	ATSDR Response
Cancer and noncancer health risks associated with exposure to chemicals in Fort Ord drinking water while living on Fort Ord	ATSDR addresses residential exposures throughout this report, especially in the Summary and Scientific Evaluation sections.
Cancer and noncancer health risks associated with exposure to Fort Ord drinking water while completing rigorous physical activities during Army basic training	ATSDR addresses soldier-in-training exposures throughout this report, especially in the Summary and Scientific Evaluation sections.
Cumulative exposures to chlorinated chemicals, including inhalation, ingestion, and dermal contact	ATSDR used the SHOWER model and the PHAST tool to estimate dermal, ingestion, and inhalation exposure doses for contaminants of concern in drinking water. Where possible, multiple exposure pathways were combined to evaluate combined exposure doses. ATSDR also estimated cumulative cancer risks for all carcinogenic contaminants that screened into the evaluation.
Volatilization to indoor air from chlorinated chemicals from groundwater	ATSDR determined that vapor intrusion sampling was not conducted from 1985–1994 or prior to 1985. ATSDR cannot assess the health risks related to vapor intrusion due to the lack of sampling data.
Impact of PFAS on drinking water in the past	ATSDR determined that PFAS sampling in drinking water was not conducted during the 1985–1994 timeframe and cannot assess the health risks related to PFAS exposure during that period.
Ongoing use and occupation of Fort Ord beyond 1994 and	ATSDR is aware of Fort Ord use and occupancy continuing beyond 1994. ATSDR evaluated data for the 1985 – 1994 timeframe to align with dates evaluated in the 1996 ATSDR

Community Concern	ATSDR Response
potential for exposure through drinking water	Public Health Assessment. In addition, based on our review of the 1985 – 1996 drinking water data, the 1985 – 1994 timeframe includes the highest drinking water contamination measurements.
Concern about health risks from the drinking water currently (at the time of release of this report) supplied by the Marina Coast Water District (MCWD) to the organizations and businesses located in the former Fort Ord area	The Marina Coast Water District (MCWD) provides drinking water to the former Fort Ord. Water pumped from MCWD supply wells on former Fort Ord consistently meets drinking water safety standards established by the USEPA and the California State Water Resources Control Board, Division of Drinking Water. Drinking water quality is regularly tested and results are reported in an annual Consumer Confidence Report available at https://www.mcwd.org/gsa_ccr.html

4.8. Summary of Limitations and Uncertainties

ATSDR's Fort Ord drinking water re-evaluation has several limitations and uncertainties. Whenever possible, ATSDR accounts for limitations by using protective, reasonable upper bound exposure estimates as the basis for determining whether harmful health effects are possible. Limitations and uncertainties of ATSDR's health consultation include both sampling data limitations and exposure assumptions.

4.8.1. Sampling Data Limitations

Limitations with the sampling data are primarily related to spatial and temporal data gaps. The sampling data that ATSDR analyzed covered the years of 1985 to 1994.

The lack of drinking water sampling data prior to 1985 prevents evaluating exposure levels for years prior to 1985. While groundwater contamination likely predated 1985, ATSDR cannot estimate drinking water exposure levels and determine health risks for that timeframe.

Samples were collected from individual wells before drinking water was distributed to residences and barracks. In most cases with the Fort Ord wells, the water was drawn from more than one well at a time, blended with the water from other wells, treated, and pumped to storage tanks [ATSDR 1996]. Consequently, the contaminant levels of the blended, finished tap water supplied to a residence or barrack would usually have been different from the measured concentration in an individual drinking-water well sample. ATSDR's use of sampling data measuring an individual well's contaminant concentration may have overestimated the actual contaminant concentration at taps in the residences and barracks.

There were a limited number of detections among contaminants of concern in the sampling data. TCE was the only contaminant with more than 20% detections in the samples, which

allowed ATSDR to calculate a 95 UCL as the EPC. Among the other eight contaminants, five contaminants had detections in less than 5% of the total samples and three contaminants had less than 20% detections of the total samples. Using the maximum concentrations measured may result in overestimate of the exposure concentrations.

4.8.2. Exposure Assumptions

Assessing exposures requires estimating how much, how often, and how long a person may come into contact with a contaminant. ATSDR made assumptions to develop conservative site-specific resident and soldier-in-training exposure scenarios. Resident and soldier exposures at Fort Ord base could be higher or lower depending on their drinking water source, consumption rate, time spent on site, and other factors.

The estimated exposure doses are calculated based on certain exposure assumptions. For example, ATSDR assumed that the contaminant's EPC was constant for the entire length of time for each exposure duration (chronic, intermediate, acute) assessed. For chronic exposures, ATSDR used a continuous exposure frequency assumption of 24-hours a day, 7 days a week, and 52 weeks a year. These assumptions could overestimate the amount of time people were actually exposed at the levels ATSDR used to determine the health risks.

For the residential scenario, the default exposure parameters were used to calculate exposure doses and health risks. The default values used include exposure frequency, exposure duration, intake rate, and body weight. Given the warm and dry climate in this region and that some of the Fort Ord residents likely worked outdoors, they may have had differences that make their exposure doses different than what ATSDR estimated using only default values.

ATSDR also made assumptions about certain exposure parameters for the soldier-in-training scenario. For instance, one of the customized parameters assumed all soldiers consumed 11.4 liters per day of water, a rate that is nearly four times that of an average adult in a non-training role. Other assumptions include that soldiers took two showers per day and that each barrack had 100 soldiers showering each day for a six-year period. These exposure parameters could have overestimated the exposure doses used to determine health risks if soldiers had different water-intake rates or shower frequencies.

In assessing potential exposures and health outcomes, uncertainties and limitations related to factors such as age, genetics, sex, health, and nutritional status are recognized as critical components that can influence exposure risk and health outcomes. ATSDR's assessment process may not fully account for developmental differences and varying susceptibilities amongst different age groups. Population-level assessments may not capture genetic differences that can influence how individuals metabolize and respond to certain contaminants. Biological differences between sexes can also affect susceptibility to certain contaminants. As well, since health and nutritional status can modify an individual's response to contaminant exposures, there may be differences among individuals that are not fully accounted for in the assessment. Variability in such factors as age, genetics, sex, and health and nutritional status may lead to different health outcomes among potentially exposed individuals.

Finally, it is not known whether all residents or soldiers were using only well water as their sole source of water. There could have been other sources of drinking water or alternative beverages that were available to them on or off the base. If other sources of drinking water or beverages were used, then the residents or soldiers may have had a different drinking water intake rate used as the exposure parameter for the site-contaminated well water.

ATSDR used health-protective exposure parameters and assumptions to calculate exposure doses that were then compared to health-protective guideline study values for determining noncancer and cancer health risks. ATSDR accounted for limitations and uncertainties by using protective, RME estimates as the basis for determining conclusions whether exposures at the Fort Ord site could have harmed people's health.

5. Conclusions

After evaluating available data using ATSDR's PHA process as described in Appendix A, ATSDR reached the following two conclusions:

Conclusion 1 Health effect: Noncancer and cancer risks Sampling time: 1985–1994	ATSDR concluded that drinking water contaminants were not a past health hazard. Residents and soldiers-in-training who drank, showered, washed, and cooked with water from former Fort Ord and Marina Coast Water District (MCWD) drinking-water wells from 1985 to 1994 were not at risk for health effects due to contaminant exposures. The analysis of contaminant levels in drinking-water wells during this period indicated that these levels were below health concern thresholds.
Basis for Conclusion	▪ Nine contaminants had concentrations greater than one or more screening comparison levels. ▪ ATSDR further evaluated the nine contaminants of concern to assess whether potential exposures to the water (through drinking, inhaling vapors, and skin contact during everyday household activities) could lead to an increased risk of noncancerous health effects. ▪ ATSDR compared each contaminant's highest exposure point concentration (calculated from the sampling data) to health guideline values (minimal risk levels and then health effect levels). The analyses showed that people were not exposed to the nine contaminants at concentrations that pose an increased risk of noncancerous health effects. ▪ ATSDR evaluated cancer risks for eight of the nine contaminants of concern based on potential long-term (chronic) exposure scenarios. ATSDR assessed whether potential exposures to the water (through drinking, inhaling

	vapors, and skin contact during everyday household activities) could lead to an increased lifetime excess risk of cancer. ▪ ATSDR did not assess cancer risks for benzene exposure because exposure to benzene was not long-term (1 detection in 200 samples) and did not warrant lifetime cancer risk evaluation. ▪ Seven of the contaminants in the residential scenario and five of the contaminants in the soldier-in-training scenario had an estimated cancer risk greater than 1 in 1,000,000 for at least one age group. Across these contaminants and exposure scenarios, carbon tetrachloride had the highest excess cancer risk of 33 in 1,000,000. ▪ ATSDR does not consider excess lifetime cancer risk estimates in the 1 in 1,000,000 to 33 in 1,000,000 range a concern for increased cancer risks. ▪ Section 4.5 in this report provides the detailed analyses and findings that form the basis for this conclusion.

Conclusion 2 Lack of data Uncertain health hazard Time: Prior to 1985	ATSDR cannot conclude whether contaminants in former Fort Ord and Marina Coast drinking water systems prior to 1985 could have harmed people's health. There were no available water quality sampling data prior to 1985.
Basis for Conclusion	▪ ATSDR cannot determine whether drinking water exposures prior to 1985 may have harmed people's health because there were no drinking water sampling data available from that timeframe. ▪ The former Fort Ord landfill is the primary source of groundwater contamination that affected the former Fort Ord and Marina Coast water systems [Dames & Moore 1993]. The landfill site was used for over 30 years, from 1956 to until 1987. ▪ While it is possible that groundwater contamination predated 1985, ATSDR cannot estimate drinking water exposure levels and draw health conclusions for that timeframe.

6. Recommendations and Public Health Action Plan

ATSDR has the following public health recommendations.

- ATSDR recommends that the Fort Ord BRAC continue monitoring and addressing OU2 contamination, including monitoring and addressing contaminant plumes migrating outside of the A-Aquifer.
- ATSDR recommends that MCWD continue monitoring drinking water to ensure that drinking water quality standards are maintained.
- ATSDR recommends that people who have personal health questions about drinking water exposures at the Fort Ord share this report and discuss their questions with their doctor.

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8. References

[ATSDR] Agency for Toxic Substances and Disease Registry. 1996. Public Health Assessment. Fort Ord, Marina, Monterey County, California. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. https://docs.fortordcleanup.com/ar_pdfs/AR-BW-1521//BW-1521.pdf

[ATSDR] Agency for Toxic Substances and Disease Registry. 2000. Toxicological profile for Methylene Chloride. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2001. Health Consultation. Former Fort Ord Site, Marina, Monterey County, California. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. https://docs.fortordcleanup.com/ar_pdfs/AR-OE-0345//OE-0345.pdf

[ATSDR] Agency for Toxic Substances and Disease Registry. 2005a. Health Consultation. Former Fort Ord Site, Marina, Monterey County, California. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. https://docs.fortordcleanup.com/ar_pdfs/AR-OE-0522//OE-0522.pdf

[ATSDR] Agency for Toxic Substances and Disease Registry. 2005b. Toxicological profile for Carbon Tetrachloride. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2005c. Toxicological profile for Bromoform and Chlorodibromomethane. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2019a. Toxicological profile for Tetrachloroethylene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2019b. Toxicological profile for Trichloroethylene (TCE). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2020. Toxicological profile for Bromodichloromethane. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2022a. Public health assessment guidance manual. Atlanta: US Department of Health and Human Services. Available from: https://www.atsdr.cdc.gov/pha-guidance/index.html.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2022b. Systematic Evidence Map (SEM) for methylene chloride. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2022c. Toxicological profile for Di(2-Ethylhexyl)Phthalate (DEHP). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2023. Exposure Point Concentration Guidance for Discrete Sampling. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2024a. PHAST: Public Health Assessment Support Tool. U.S. Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2024b. Toxicological Profile for Chloroform. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2024c. Toxicological profile for Benzene (Draft for Public Comment). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2025a. Shower and Household Water-use Exposure (SHOWER) Model v4.0 User's Guide. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2025b. Systematic Evidence Map (SEM) for carbon tetrachloride. Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2025c. Targeted Systematic Evidence Map (SEM) and Rapid Systematic Review for Trichloroethylene and Developmental Cardiotoxicity. Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service. https://www.atsdr.cdc.gov/ToxProfiles/SEM-for-Trichloroethylene-508.pdf

[ACS] American Cancer Society. 2025a. Cancer Facts and Figures 2025. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2025/2025-cancer-facts-and-figures-acs.pdf.

[ACS] American Cancer Society. 2025b. Key Statistics for Breast Cancer. https://www.cancer.org/cancer/types/breast-cancer/about/how-common-is-breast-cancer.html.

Arcadi FA, Costa C, Imperatore C, et al. 1998. Oral toxicity of bis(2-ethylhexyl) phthalate during pregnancy and suckling in the Long-Evans rat. Food Chem Toxicol 36(11):963–970. http://doi.org/10.1016/s0278-6915(98)00065-9.

Cavalleri A; Gobba F; Paltrinieri M; et al. 1994. Perchloroethylene exposure can induce colour vision loss. Neurosci Lett 179:162–166.

Christiansen S, Boberg J, Axelstad M, et al. 2010. Low-dose perinatal exposure to di(2-ethylhexyl) phthalate induces anti-androgenic effects in male rats. Reprod Toxicol 30(2):313-321.

Dames & Moore. 1993. Final Feasibility Study Report, Remedial Investigation/Feasibility Study, Fort Ord, Landfills, Fort Ord, Monterey, California October 1, 1993. https://docs.fortordcleanup.com/ar_pdfs/AR-OU2-251//OU2-251_text.pdf

[EPA] U.S. Environmental Protection Agency. 2025. Fort Ord Spotlight. Fort Ord Site Spotlight | US EPA. https://www.epa.gov/fedfac/fort-ord-site-spotlight

[HLA] Harding Lawson Associates. 1988. Draft Fort Ord Landfills Preliminary Hydrogeologic Landfill Investigation. Volume I of III. June 1, 1988. https://docs.fortordcleanup.com/ar_pdfs/AR-OU2-037//OU2-037_bw-0010a.pdf

[HLA] Harding Lawson Associates. 1994. Basewide Hydrogeologic Characterization. Draft Final. June 10, 1994. https://docs.fortordcleanup.com/ar_pdfs/AR-BW-0608//BW-0608.pdf

[HLA] Harding Lawson Associates. 1995. Basewide Remedial Investigation/Feasibility Study Fort Ord, California Volume I, Background and Executive Summary. https://docs.fortordcleanup.com/ar_pdfs/AR-BW-1283A/Volume_1/BW_RIFS_Volume1.pdf

Johnson PD, Goldberg SJ, Mays MZ, et al. 2003. Threshold of trichloroethylene contamination in maternal drinking waters affecting fetal heart development in the rat. (Erratum in: Environ Health Perspect 113(1): A18; Erratum in: Environ Health Perspect 122(4):A94). Environ Health Perspect 111(3):289–292.

Keil DE, Peden-Adams MM, Wallace S, et al. 2009. Assessment of trichloroethylene (TCE) exposure in murine strains genetically prone and non-prone to develop autoimmune disease. J Environ Sci Health A Tox Hazard Subst Environ Eng 44(5):443–453.

Klinefelter GR, Laskey JW, Winnik WM, et al. 2012. Novel molecular targets associated with testicular dysgenesis induced by gestational exposure to diethylhexyl phthalate in the rat: a role for estradiol. Reproduction 144(6):747–761. http://doi.org/10.1530/rep-12-0266

Li H, Li D, He Z, et al. 2018. The effects of Nrf2 knockout on regulation of benzene-induced mouse hematotoxicity. Toxicol Appl Pharmacol 358:56-67. https://doi.org/10.1016/j.taap.2018.09.002

Lin H, Ge R, Chen G, et al. 2008. Involvement of testicular growth factors in fetal Leydig cell aggregation after exposure to phthalate in utero. Proc Natl Acad Sci U S A 105(20):7218–7222. http://doi.org/10.1073/pnas.0709260105.

Lin H, Lian Q, Hu G, et al. 2009. In utero and lactational exposures to diethylhexyl-phthalate affect two populations of Leydig cells in male Long-Evans rats. Biol Reprod 80(5):882–888. http://doi.org/10.1095/biolreprod.108.072975.

[MCWD] Marina Coast Water District. 2018. Year in Review, Marina Coast Water District. https://www.mcwd.org/docs/gsa/20457-01%20MCWD18%20Annual%20Report-WEB%20spreads.pdf

[MCWD] Marina Coast Water District. 2023. Annual Consumer Confidence Report. https://www.mcwd.org/gsa_ccr.html

[MCWD] Marina Coast Water District. 2025. Frequently Asked Questions. Ord Community Customers. https://www.mcwd.org/customer_service_faqs.php.

Meurer, FE. 1985 August 30. Letter regarding Fort Ord water blending and monitoring program. Recipient Cliff Bowen, California Department of Health Services, Berkeley, California. https://docs.fortordcleanup.com/ar_pdfs/AR-BW-0020//BW-0020.pdf

Pocar P, Fiandanese N, Secchi C, et al. 2012. Exposure to di(2-ethyl-hexyl) phthalate (DEHP) in utero and during lactation causes long-term pituitary-gonadal axis disruption in male and female mouse offspring. Endocrinology 153(2):937–948. http://doi.org/10.1210/en.2011-1450.

Rajesh P, Balasubramanian K. 2014. Phthalate exposure in utero causes epigenetic changes and impairs insulin signalling. J Endocrinol 223(1):47–66. http://doi.org/10.1530/JOE-14-0111.

Rosenthal GJ, Snyder CA. 1987. Inhaled benzene reduces aspects of cell-mediated tumor surveillance in mice. Toxicol Appl Pharmacol 88:35–43. https://doi.org/10.1016/0041-008x(87)90267-5.

[USACE] U.S. Army Corps of Engineers. 2022. Final 5th Five-Year Review Report for Fort Ord Superfund Site Monterey County, California. https://docs.fortordcleanup.com/ar_pdfs/ar-bw-2925/BW-2925.pdf

U.S. Army. 2025. Fort Ord Cleanup. https://fortordcleanup.com/programs/groundwater/

U.S. Department of the Army. 2022. Army Techniques Publication No. 4-44. December 16, 2022. Water support operations. Headquarters, Department of the Army.

Yamamoto S, Kasai T, Matsumoto M, et al. 2002. Carcinogenicity and chronic toxicity in rats and mice exposed to chloroform by inhalation. J Occup Health 44(5):283–293. https://doi.org/10.1539/joh.44.283

Zhang XF, Zhang T, Han Z, et al. 2015. Transgenerational inheritance of ovarian development deficiency induced by maternal diethylhexyl phthalate exposure. Reprod Fertil Dev 27(8):1213–1221. http://doi.org/10.1071/rd14113

Appendices

Appendix A: Brief Summary of ATSDR's Public Health Assessment (PHA) Process

ATSDR follows the PHA process to find out:

- Whether people living near a hazardous waste site are being exposed to toxic substances.
- Whether that exposure is harmful.
- What must be done to stop or reduce exposure.

The PHA process is a step-by-step consistent approach during which ATSDR:

- Establishes communication mechanisms, including engaging communities at the beginning of site activities and involving them throughout the process to respond to their health concerns.
- Collects many different kinds of site information.
- Obtains, compiles, and evaluates the usability and quality of environmental and biological sampling data (and sometimes modeling data) to examine environmental contamination at a site.
- Conducts four main, sequential scientific evaluations.
    - Exposure pathways evaluation to identify past, present, and future site-specific exposure situations, and categorize those exposures as completed, potential, or eliminated.
    - Screening analysis to compare the available sampling data to media-specific environmental screening levels (ATSDR comparison values [CVs] and non-ATSDR screening levels). This process identifies potential contaminants of concern that require further evaluation for completed and potential exposure pathways.
    - Exposure Point Concentrations (EPCs) and exposure calculations for contaminants flagged as requiring further evaluation in completed and potential exposure pathways. It involves calculating EPCs, using EPCs to perform calculations that characterize exposure, and determining which site-specific exposure scenarios require an in-depth toxicological effects analysis.
    - In-depth toxicological effects evaluation, if necessary, based on the three previous scientific evaluations. This step looks more closely at contaminant-specific toxicity information in the context of site exposures. This evaluation

can also help determine if there is a potential for noncancer or cancer health effects and what those effects might be.

- Summarizes findings and next steps, while acknowledging uncertainties and limitations.
- Provides recommendations to site-related entities, partner agencies, and communities to prevent and minimize harmful exposures.

The sequence of steps can differ based on site-specific factors. For instance, health assessors might define an exposure unit before or after the screening analysis or refine EPC calculations as they go through their site-specific analysis.

For more detail on the PHA process, visit Explanation of ATSDR's PHA Process Evaluation. Readers can also refer to ATSDR's Public Health Assessment Guidance Manual for all information related to the PHA process.

Appendix B: Exposure Dose Equations and Exposure Scenario Assumptions for Water Ingestion, Inhalation, and Dermal Pathways

SHOWER Model Air Inhalation Exposure Equation

$$\textbf{Adjusted EPC} = \textbf{EPC} \times \textbf{EF}_{\textbf{noncancer}} \qquad \textbf{Equation 1}$$

EPC = exposure point concentration from SHOWER model (µg/m^3 or ppb), $EF_{noncancer}$ = exposure factor (unitless)

SHOWER Model Dermal Exposure Dose Equation

$$\textbf{SM\_D}_{\textbf{noncancer}} = \textbf{SM\_ADD} \times \textbf{EF}_{\textbf{noncancer}} \qquad \textbf{Equation 2}$$

$SM\_D_{noncancer}$ = dermal exposure dose from SHOWER Model (mg/kg/day), SM_ADD = SHOWER Model administered dermal dose (mg/kg/day),

$EF_{noncancer}$ = exposure factor (unitless)

Water Ingestion Exposure Dose Equation

$$\textbf{D}_{\textbf{noncancer}} = (\textbf{C} \times \textbf{IR} \times \textbf{EF}_{\textbf{noncancer}}) \div \textbf{BW} \qquad \textbf{Equation 3}$$

$D_{noncancer}$ = ingestion exposure dose (mg/kg/day), C = contaminant concentration (mg/L), IR = intake rate (L/day),

$EF_{noncancer}$ = exposure factor (unitless), BW = body weight (kg)

Hazard Quotient Equations

$$\mathbf{HQ_{inhalation} = Inhalation\ Adjusted\ EPC \div inhalation\ HG} \qquad \textbf{Equation 4}$$

$$\mathbf{HQ_{dermal} = Dermal\ D_{noncancer} \div oral\ HG} \qquad \textbf{Equation 5}$$

$$\mathbf{HQ_{oral} = Drinking\ Water\ D_{noncancer} \div oral\ HG} \qquad \textbf{Equation 6}$$

$HQ_{inhalation}$ = inhalation hazard quotient, EPC = exposure point concentration (ug/m^3 or ppb), HG = health guideline (e.g., inhalation MRL, RfC, oral MRL, RfD),

HQ_{dermal} = dermal hazard quotient, $D_{noncancer}$ = dose (mg/kg/day), HQ_{oral} = oral hazard quotient

Oral Cancer Risk Equations

$$\mathbf{CR_{exposure\ group} = Drinking\ Water\ D_{exposure\ group} \times CSF \times (ED_{exposure\ group,\ years} \div LY)} \qquad \textbf{Equation 7}$$

$$\mathbf{ADAF\text{-}adjusted\ CR_{exposure\ group} = (Drinking\ Water\ D_{exposure\ group} \times CSF) \times (ED_{exposure\ group} \div LY) \times ADAF} \qquad \textbf{Equation 8}$$

$$\mathbf{\sum CR_{child/adult} = Sum\ of\ the\ CR_{child/adult\ exposure\ groups}} \qquad \textbf{Equation 9}$$

CR = cancer risk (unitless), $D_{exposure\ group}$ = dose by exposure group, CSF = oral cancer slope factor [$(mg/kg/day)^{-1}$], ED = exposure duration by exposure

group (years), LY = lifetime years (78 years), ADAF = age-dependent adjustment factor (unitless)

Inhalation Cancer Risk Equations

$$\mathbf{CR_{exposure\ group} = Inhalation\ Adjusted\ EPC \times IUR \times (ED_{exposue\ group,\ years} \div LY)} \qquad \textbf{Equation 10}$$

$$\mathbf{ADAF\text{-}adjusted\ CR_{exposure\ group} = (Inhalation\ Adjusted\ EPC_{exposure\ group} \times IUR) \times (ED_{exposure\ group} \div LY) \times ADAF} \qquad \textbf{Equation 11}$$

$$\sum CR_{child/adult} = \text{Sum of the } CR_{child/adult\ exposure\ groups} \qquad \textbf{Equation 12}$$

CR = cancer risk (unitless), EPC = exposure point concentration (ug/m^3), IUR = inhalation unit risk [$(ug/m^3)^{-1}$],

ED = exposure duration (years), LY = lifetime years (78 years), ADAF = age-dependent adjustment factor (unitless)

Dermal Cancer Risk Equations

$$CR_{exposure\ group} = \text{Dermal } D_{noncancer} \times CSF \times (ED_{exposue\ group,\ years} \div LY) \qquad \textbf{Equation 13}$$

$$\text{ADAF-adjusted } CR_{exposure\ group} = (\text{Dermal } D_{exposure\ group} \times CSF) \times (ED_{exposure\ group} \div LY) \times ADAF \qquad \textbf{Equation 14}$$

$$\sum CR_{child/adult} = \text{Sum of the } CR_{child/adult\ exposure\ groups} \qquad \textbf{Equation 15}$$

CR = cancer risk (unitless), $D_{exposure\ group}$ = dose by exposure group, CSF = oral cancer slope factor [$(mg/kg/day)^{-1}$], ED = exposure duration by exposure

group (years), LY = lifetime years (78 years), ADAF = age-dependent adjustment factor (unitless)

SHOWER Model Residential Scenario Description

Table B-1. Residential scenario's site-specific exposure parameters for the different age groups

Exposure Group	Body Weight (kg)	CTE Exposure Duration (years)	CTE Intake Rate (liters/day)	RME Exposure Duration (years)	RME Intake Rate (liters/day)
Birth to < 1 year	7.8	1	0.595	1	1.106
1 to < 2 years	11.4	1	0.245	1	0.658
2 to < 6 years	17.4	4	0.337	4	0.852
6 to < 11 years	31.8	5	0.455	5	1.258
11 to < 16 years	56.8	1	0.562	5	1.761
16 to < 21 years	71.6	0	0.722	5	2.214
Total Child (all age groups)	-	12	-	21	-
Adult	80	12	1.313	33	3.229
Pregnant Women	73	-	1.158	-	2.935
Breastfeeding Women	73	-	1.495	-	3.061

Abbreviations: CTE = central tendency exposure (typical); kg = kilograms; RME = reasonable maximum exposure (higher); - = not applicable

The default scenario report provides RME and CTE results for households with four people. In this scenario, four people take consecutive morning showers. The default RME scenario for the 4-person household assumes the first three people take 10-minute morning showers and the fourth person takes a 15-minute morning shower, each followed by 5-minute bathroom stays. The CTE scenario for the 4-person household assumes all four people take 7-minute morning showers, each followed by 5-minute bathroom stays. More information about the RME and CTE scenarios can be found in the SHOWER model Exposure Dose Guidance (EDG) and the technical document for the SHOWER model.

The results are based on a time-weighted average (TWA) air concentration calculated for the target person as they spend their time in various parts of the house. The daily exposure concentration applies to children and adults who take showers. The CTE and RME results

represent the 50th and 95th percentile exposures, respectively, for the fourth person to take a morning shower. Children birth to < 1 year do not take showers but are exposed from taking baths. Their inhalation and dermal exposures from a 20-minute bath scenario are comparable to the RME inhalation and dermal exposures from the default shower scenario.

For each contaminant, the number of tables in this report can range from 3 to 12 depending upon whether the SHOWER model can run inhalation or dermal exposure (or both) and whether you included drinking water as a pathway. In general, ATSDR does not include all these tables in the public health document.

Like other pathways in PHAST, the RME results serve as the basis for public health determinations at most sites because the RME scenario is the most protective. When available, ATSDR uses the RME inhalation results to evaluate inhalation exposure from showering in household water. It is assumed that residents were drinking household water and if dermal estimates are available from the SHOWER model, the combined doses from those two pathways are used to evaluate exposure. If residents were not drinking the water but are showering in it, the dermal-only estimates from the SHOWER model are used to evaluate this route of exposure.

For the 4-morning shower (default) scenario, the RME results from the SHOWER model represent the person with the highest exposure in a 4-person household where everyone takes a morning shower.

The results are based on a scenario where residents were both bathing in and drinking the water. Because the SHOWER model has both inhalation and dermal parameters for the modeled contaminant, results are available as daily inhalation exposure concentrations and as dermal doses. Since residents are drinking the water, results are available as a combined dose (ingestion and dermal), dermal only, and ingestion only doses.

SHOWER Model Soldier-In-Training Scenario Description

Table B-2. Soldier-in-training scenario's site-specific exposure parameters for the two age groups

Exposure Group	Body Weight (kg)	Weekly (days/week)	Annually (weeks/year)	Age-Specific Exposure Duration (years)	Intake Rate (liters/day)	Notes
16 to < 21 years	71.6	7	52.14	5	11.4	-
Adult	80	7	52.14	6	11.4	-

Abbreviations: kg = kilograms; - = not applicable

This report provides RME and CTE results for the soldier-in-training scenario in the Fort Ord barracks (including communal shower and locker room) imported from the SHOWER model. The RME result is the result for the person with the 95th percentile exposure across all persons simulated, and the CTE result is the result for the person with the 50th percentile (median) exposure.

Like other pathways in PHAST, the RME results serve as the basis for public health determinations because the RME scenario is the most protective. When available, ATSDR uses the RME inhalation results to evaluate inhalation exposure from persons using water in the facility. It is assumed that facility users were drinking the facility water and if dermal estimates are available from the SHOWER model, the combined doses from those two pathways are used to evaluate exposure. If soldiers were not drinking the water, the dermal-only estimates from the SHOWER model are used to evaluate this route of exposure.

The results are based on a scenario where people were drinking and using water in the facility. Because the SHOWER model has both inhalation and dermal parameters for the modeled contaminant, results are available as daily inhalation exposure concentrations and as dermal doses. Since facility users are drinking the water, results are available as a combined dose (ingestion and dermal), dermal only, and ingestion only doses.

Appendix C: Residential Scenario PHAST Output Tables

Chronic (Default 4-Person Household)

Table C- 1. Default inhalation only exposure concentrations for chronic exposure to carbon tetrachloride in household water at 9.8 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Adjusted EPC (ppb)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Adjusted EPC (ppb)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.54	0.034	-	1	1.2	0.077	-	1
1 to < 2 years	0.54	0.034	-	1	1.2	0.077	-	1
2 to < 6 years	0.54	0.034	-	4	1.2	0.077	-	4
6 to < 11 years	0.54	0.034	-	5	1.2	0.077	-	5
11 to < 16 years	0.54	0.034	-	1	1.2	0.077	-	5
16 to < 21 years	0.54	0.034	-	0	1.2	0.077	-	5
Total Child	-	-	3.2E-6 ‡	12	-	-	1.2E-5 ‡	21
Adult	0.54	0.034	3.2E-6 ‡	12	1.2	0.077	1.9E-5 ‡	33
Pregnant Women	0.54	0.034	-	-	1.2	0.077	-	-
Breastfeeding Women	0.54	0.034	-	-	1.2	0.077	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	1.9E-5 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; ppb = parts per billion; CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher); yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) reference concentration of 16 ppb and the cancer risks were calculated using the inhalation unit risk of 3.8E-05 $(ppb)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 2. Default combined ingestion and dermal exposure doses for chronic exposure to carbon tetrachloride in household water at 9.8 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.00082	0.20	-	1	0.0015	0.37	-	1
1 to < 2 years	0.00028	0.069	-	1	0.00066	0.17	-	1
2 to < 6 years	0.00025	0.062	-	4	0.00056	0.14	-	4
6 to < 11 years	0.00019	0.047	-	5	0.00046	0.11	-	5
11 to < 16 years	0.00013	0.034	-	1	0.00036	0.090	-	5
16 to < 21 years	0.00013	0.033	-	0	0.00035	0.089	-	5
Total Child	-	-	2.8E-6 ‡	12	-	-	9.2E-6 ‡	21
Adult	0.00019	0.049	2.1E-6 ‡	12	0.00045	0.11	1.3E-5 ‡	33
Pregnant Women	0.00019	0.047	-	-	0.00045	0.11	-	-
Breastfeeding Women	0.00023	0.059	-	-	0.00046	0.12	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	1.4E-5 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (lifetime) reference dose of 0.004 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.07 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 3. Default ingestion only exposure doses for chronic exposure to carbon tetrachloride in household water at 9.8 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.00075	0.19	-	1	0.0014	0.35	-	1
1 to < 2 years	0.00021	0.053	-	1	0.00057	0.14	-	1
2 to < 6 years	0.00019	0.047	-	4	0.00048	0.12	-	4
6 to < 11 years	0.00014	0.035	-	5	0.00039	0.097	-	5
11 to < 16 years	9.7E-05	0.024	-	1	0.00030	0.076	-	5
16 to < 21 years	9.9E-05	0.025	-	0	0.00030	0.076	-	5
Total Child	-	-	2.3E-6 ‡	12	-	-	7.9E-6 ‡	21
Adult	0.00016	0.040	1.7E-6 ‡	12	0.00040	0.099	1.2E-5 ‡	33
Pregnant Women	0.00016	0.039	-	-	0.00039	0.099	-	-
Breastfeeding Women	0.00020	0.050	-	-	0.00041	0.10	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	1.2E-5 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (lifetime) reference dose of 0.004 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.07 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 4. Default dermal only exposure doses for chronic exposure to carbon tetrachloride in household water at 9.8 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	7.2E-05	0.018	-	1	0.00011	0.027	-	1
1 to < 2 years	6.6E-05	0.017	-	1	9.9E-05	0.025	-	1
2 to < 6 years	5.7E-05	0.014	-	4	8.5E-05	0.021	-	4
6 to < 11 years	4.6E-05	0.012	-	5	6.9E-05	0.017	-	5
11 to < 16 years	3.8E-05	0.0094	-	1	5.6E-05	0.014	-	5
16 to < 21 years	3.5E-05	0.0086	-	0	5.2E-05	0.013	-	5
Total Child	-	-	5.7E-7	12	-	-	1.3E-6 ‡	21
Adult	3.4E-05	0.0085	3.6E-7	12	5.1E-05	0.013	1.5E-6 ‡	33
Pregnant Women	3.4E-05	0.0085	-	-	5.1E-05	0.013	-	-
Breastfeeding Women	3.4E-05	0.0085	-	-	5.1E-05	0.013	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	1.8E-6 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (lifetime) reference dose of 0.004 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.07 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 5. Default inhalation only exposure concentrations for chronic exposure to chloroform in household water at 3.8 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Adjusted EPC (ppb)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Adjusted EPC (ppb)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.27	0.65	-	1	0.56	1.4 †	-	1
1 to < 2 years	0.27	0.65	-	1	0.56	1.4 †	-	1
2 to < 6 years	0.27	0.65	-	4	0.56	1.4 †	-	4
6 to < 11 years	0.27	0.65	-	5	0.56	1.4 †	-	5
11 to < 16 years	0.27	0.65	-	1	0.56	1.4 †	-	5
16 to < 21 years	0.27	0.65	-	0	0.56	1.4 †	-	5
Total Child	-	-	4.6E-6 ‡	12	-	-	1.7E-5 ‡	21
Adult	0.27	0.65	4.6E-6 ‡	12	0.56	1.4 †	2.7E-5 ‡	33
Pregnant Women	0.27	0.65	-	-	0.56	1.4 †	-	-
Breastfeeding Women	0.27	0.65	-	-	0.56	1.4 †	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	2.7E-5 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; ppb = parts per billion; CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher); yrs = years; - = not applicable
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.40 ppb and the cancer risks were calculated using the inhalation unit risk of 0.00011 $(ppb)^{-1}$.
† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.
‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.
§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 6. Default combined ingestion and dermal exposure doses for chronic exposure to dibromochloromethane in household water at 6.2 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.00049	0.0054	-	1	0.00090	0.010	-	1
1 to < 2 years	0.00014	0.0016	-	1	0.00038	0.0042	-	1
2 to < 6 years	0.00013	0.0014	-	4	0.00032	0.0035	-	4
6 to < 11 years	9.7E-05	0.0011	-	5	0.00026	0.0029	-	5
11 to < 16 years	6.8E-05	0.00076	-	1	0.00020	0.0022	-	5
16 to < 21 years	6.9E-05	0.00076	-	0	0.00020	0.0022	-	5
Total Child	-	-	1.8E-6 ‡	12	-	-	6.3E-6 ‡	21
Adult	0.00011	0.0012	1.4E-6 ‡	12	0.00026	0.0029	9.2E-6 ‡	33
Pregnant Women	0.00010	0.0012	-	-	0.00026	0.0029	-	-
Breastfeeding Women	0.00013	0.0015	-	-	0.00027	0.0030	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	9.7E-6 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; - = not applicable
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.09 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.084 $(mg/kg/day)^{-1}$.
‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.
§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 7. Default ingestion only exposure doses for chronic exposure to dibromochloromethane in household water at 6.2 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.00047	0.0053	-	1	0.00088	0.0098	-	1
1 to < 2 years	0.00013	0.0015	-	1	0.00036	0.0040	-	1
2 to < 6 years	0.00012	0.0013	-	4	0.00030	0.0034	-	4
6 to < 11 years	8.9E-05	0.00099	-	5	0.00025	0.0027	-	5
11 to < 16 years	6.1E-05	0.00068	-	1	0.00019	0.0021	-	5
16 to < 21 years	6.3E-05	0.00069	-	0	0.00019	0.0021	-	5
Total Child	-	-	1.7E-6 ‡	12	-	-	6.0E-6 ‡	21
Adult	0.00010	0.0011	1.3E-6 ‡	12	0.00025	0.0028	8.9E-6 ‡	33
Pregnant Women	9.8E-05	0.0011	-	-	0.00025	0.0028	-	-
Breastfeeding Women	0.00013	0.0014	-	-	0.00026	0.0029	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	9.3E-6 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; - = not applicable
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.09 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.084 $(mg/kg/day)^{-1}$.
‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.
§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 8. Default combined ingestion and dermal exposure doses for chronic exposure to bromodichloromethane in household water at 5.3 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.00042	0.052	-	1	0.00077	0.096	-	1
1 to < 2 years	0.00012	0.015	-	1	0.00032	0.040	-	1
2 to < 6 years	0.00011	0.014	-	4	0.00027	0.034	-	4
6 to < 11 years	8.3E-05	0.010	-	5	0.00022	0.028	-	5
11 to < 16 years	5.8E-05	0.0073	-	1	0.00017	0.022	-	5
16 to < 21 years	5.9E-05	0.0073	-	0	0.00017	0.021	-	5
Total Child	-	-	1.2E-6 ‡	12	-	-	4.0E-6 ‡	21
Adult	9.2E-05	0.012	8.8E-7	12	0.00022	0.028	5.8E-6 ‡	33
Pregnant Women	8.9E-05	0.011	-	-	0.00022	0.028	-	-
Breastfeeding Women	0.00011	0.014	-	-	0.00023	0.029	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	6.1E-6 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.008 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.062 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 9. Default ingestion only exposure doses for chronic exposure to bromodichloromethane in household water at 5.3 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.00040	0.051	-	1	0.00075	0.094	-	1
1 to < 2 years	0.00011	0.014	-	1	0.00031	0.038	-	1
2 to < 6 years	0.00010	0.013	-	4	0.00026	0.032	-	4
6 to < 11 years	7.6E-05	0.0095	-	5	0.00021	0.026	-	5
11 to < 16 years	5.2E-05	0.0066	-	1	0.00016	0.021	-	5
16 to < 21 years	5.3E-05	0.0067	-	0	0.00016	0.020	-	5
Total Child	-	-	1.1E-6 ‡	12	-	-	3.8E-6 ‡	21
Adult	8.7E-05	0.011	8.3E-7	12	0.00021	0.027	5.6E-6 ‡	33
Pregnant Women	8.4E-05	0.011	-	-	0.00021	0.027	-	-
Breastfeeding Women	0.00011	0.014	-	-	0.00022	0.028	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	5.8E-6 ‡	33

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.008 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.062 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 10. Default inhalation only exposure concentrations for chronic exposure to PCE (tetrachloroethylene) in household water at 53 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Adjusted EPC (ppb)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Adjusted EPC (ppb)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	2.6	0.43	-	1	5.8	0.95	-	1
1 to < 2 years	2.6	0.43	-	1	5.8	0.95	-	1
2 to < 6 years	2.6	0.43	-	4	5.8	0.95	-	4
6 to < 11 years	2.6	0.43	-	5	5.8	0.95	-	5
11 to < 16 years	2.6	0.43	-	1	5.8	0.95	-	5
16 to < 21 years	2.6	0.43	-	0	5.8	0.95	-	5
Total Child	-	-	7.0E-7	12	-	-	2.7E-6 ‡	21
Adult	2.6	0.43	7.0E-7	12	5.8	0.95	4.3E-6 ‡	33
Pregnant Women	2.6	0.43	-	-	5.8	0.95	-	-
Breastfeeding Women	2.6	0.43	-	-	5.8	0.95	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	4.3E-6 ‡	33

Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; ppb = parts per billion; CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher); yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 6 ppb and the cancer risks were calculated using the inhalation unit risk of 1.8E-06 $(ppb)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 11. Default combined ingestion and dermal exposure doses for chronic exposure to PCE (tetrachloroethylene) in household water at 53 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.0049	0.61	-	1	0.0088	1.1 †	-	1
1 to < 2 years	0.0019	0.24	-	1	0.0043	0.53	-	1
2 to < 6 years	0.0017	0.21	-	4	0.0036	0.45	-	4
6 to < 11 years	0.0013	0.16	-	5	0.0029	0.37	-	5
11 to < 16 years	0.00098	0.12	-	1	0.0023	0.29	-	5
16 to < 21 years	0.00095	0.12	-	0	0.0023	0.28	-	5
Total Child	-	-	5.7E-7	12	-	-	1.8E-6 ‡	21
Adult	0.0013	0.16	4.1E-7	12	0.0028	0.34	2.4E-6 ‡	33
Pregnant Women	0.0013	0.16	-	-	0.0028	0.34	-	-
Breastfeeding Women	0.0015	0.19	-	-	0.0028	0.36	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	2.6E-6 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.008 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.0021 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ Indicates a combined childhood-plus-adulthood exposure assumption.

Intermediate (Default 4-Person Household)

Table C- 12. Default combined ingestion and dermal exposure doses for intermediate exposure to PCE (tetrachloroethylene) in household water at 53 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
Birth to < 1 year	0.0049	0.61	0.0088	1.1 †
1 to < 2 years	0.0019	0.24	0.0043	0.53
2 to < 6 years	0.0017	0.21	0.0036	0.45
6 to < 11 years	0.0013	0.16	0.0029	0.37
11 to < 16 years	0.00098	0.12	0.0023	0.29
16 to < 21 years	0.00095	0.12	0.0023	0.28
Adult	0.0013	0.16	0.0028	0.34
Pregnant Women	0.0013	0.16	0.0028	0.34
Breastfeeding Women	0.0015	0.19	0.0028	0.36

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher)

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.008 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Acute (Default 4-Person Household)

Table C- 13. Default combined ingestion and dermal exposure doses for acute exposure to PCE (tetrachloroethylene) in household water at 53 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
Birth to < 1 year	0.0049	0.61	0.0088	1.1 †
1 to < 2 years	0.0019	0.24	0.0043	0.53
2 to < 6 years	0.0017	0.21	0.0036	0.45
6 to < 11 years	0.0013	0.16	0.0029	0.37
11 to < 16 years	0.00098	0.12	0.0023	0.29
16 to < 21 years	0.00095	0.12	0.0023	0.28
Adult	0.0013	0.16	0.0028	0.34
Pregnant Women	0.0013	0.16	0.0028	0.34
Breastfeeding Women	0.0015	0.19	0.0028	0.36

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher)
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the acute (less than two weeks) minimal risk level of 0.008 mg/kg/day.
† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Chronic (Default 4-Person Household)

Table C- 14. Default ingestion only exposure doses for chronic exposure to PCE (tetrachloroethylene) in household water at 53 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.0040	0.51	-	1	0.0075	0.94	-	1
1 to < 2 years	0.0011	0.14	-	1	0.0031	0.38	-	1
2 to < 6 years	0.0010	0.13	-	4	0.0026	0.32	-	4
6 to < 11 years	0.00076	0.095	-	5	0.0021	0.26	-	5
11 to < 16 years	0.00052	0.066	-	1	0.0016	0.21	-	5
16 to < 21 years	0.00053	0.067	-	0	0.0016	0.20	-	5
Total Child	-	-	3.7E-7	12	-	-	1.3E-6 ‡	21
Adult	0.00087	0.11	2.8E-7	12	0.0021	0.27	1.9E-6 ‡	33
Pregnant Women	0.00084	0.11	-	-	0.0021	0.27	-	-
Breastfeeding Women	0.0011	0.14	-	-	0.0022	0.28	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	2.0E-6 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; - = not applicable
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.008 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.0021 $(mg/kg/day)^{-1}$.
‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.
§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 15. Default inhalation only exposure concentrations for chronic exposure to TCE (trichloroethylene) in household water at 2.65 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Adjusted EPC (ppb)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Adjusted EPC (ppb)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.22	0.56	-	1	0.50	1.3 †	-	1
1 to < 2 years	0.22	0.56	-	1	0.50	1.3 †	-	1
2 to < 6 years	0.22	0.56	-	4	0.50	1.3 †	-	4
6 to < 11 years	0.22	0.56	-	5	0.50	1.3 †	-	5
11 to < 16 years	0.22	0.56	-	1	0.50	1.3 †	-	5
16 to < 21 years	0.22	0.56	-	0	0.50	1.3 †	-	5
Total Child	-	-	1.3E-6 ‡	12	-	-	4.6E-6 ‡	21
Adult	0.22	0.56	7.5E-7	12	0.50	1.3 †	4.7E-6 ‡	33
Pregnant Women	0.22	0.56	-	-	0.50	1.3 †	-	-
Breastfeeding Women	0.22	0.56	-	-	0.50	1.3 †	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	6.3E-6 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; ppb = parts per billion; CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher); yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.40 ppb and the cancer risks were calculated using the inhalation unit risks of 1.1E-05 [NHL], 5.4E-06 [liver], 5.4E-06 [kidney] $(ppb)^{-1}$ and age-dependent adjustment factors.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ Indicates a combined childhood-plus-adulthood exposure assumption.

Intermediate (Default 4-Person Household)

Table C- 16. Default inhalation only exposure concentrations for intermediate exposure to TCE (trichloroethylene) in household water at 2.65 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Adjusted EPC (ppb)	CTE Noncancer Hazard Quotient	RME Adjusted EPC (ppb)	RME Noncancer Hazard Quotient
Birth to < 1 year	0.22	0.56	0.50	1.3 †
1 to < 2 years	0.22	0.56	0.50	1.3 †
2 to < 6 years	0.22	0.56	0.50	1.3 †
6 to < 11 years	0.22	0.56	0.50	1.3 †
11 to < 16 years	0.22	0.56	0.50	1.3 †
16 to < 21 years	0.22	0.56	0.50	1.3 †
Adult	0.22	0.56	0.50	1.3 †
Pregnant Women	0.22	0.56	0.50	1.3 †
Breastfeeding Women	0.22	0.56	0.50	1.3 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; ppb = parts per billion; CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher)
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.40 ppb.
† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Chronic (Default 4-Person Household)

Table C- 17. Default combined ingestion and dermal exposure doses for chronic exposure to TCE (trichloroethylene) in household water at 2.65 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.00021	0.43	-	1	0.00039	0.79	-	1
1 to < 2 years	6.7E-05	0.13	-	1	0.00017	0.34	-	1
2 to < 6 years	6.0E-05	0.12	-	4	0.00014	0.29	-	4
6 to < 11 years	4.5E-05	0.090	-	5	0.00012	0.23	-	5
11 to < 16 years	3.2E-05	0.064	-	1	9.1E-05	0.18	-	5
16 to < 21 years	3.2E-05	0.064	-	0	9.0E-05	0.18	-	5
Total Child	-	-	8.8E-7	12	-	-	2.5E-6 ‡	21
Adult	4.9E-05	0.097	3.5E-7	12	0.00011	0.23	2.3E-6 ‡	33
Pregnant Women	4.7E-05	0.095	-	-	0.00011	0.23	-	-
Breastfeeding Women	6.0E-05	0.12	-	-	0.00012	0.24	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	3.4E-6 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; ppb = parts per billion; CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher); yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.40 ppb and the cancer risks were calculated using the inhalation unit risks of 1.1E-05 [NHL], 5.4E-06 [liver], 5.4E-06 [kidney] $(ppb)^{-1}$ and age-dependent adjustment factors.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ Indicates a combined childhood-plus-adulthood exposure assumption.

Chronic (Default 4-Person Household)

Table C- 18. Default ingestion only exposure doses for chronic exposure to TCE (trichloroethylene) in household water at 2.65 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.00020	0.40	-	1	0.00038	0.75	-	1
1 to < 2 years	5.7E-05	0.11	-	1	0.00015	0.31	-	1
2 to < 6 years	5.1E-05	0.10	-	4	0.00013	0.26	-	4
6 to < 11 years	3.8E-05	0.076	-	5	0.00010	0.21	-	5
11 to < 16 years	2.6E-05	0.052	-	1	8.2E-05	0.16	-	5
16 to < 21 years	2.7E-05	0.053	-	0	8.2E-05	0.16	-	5
Total Child	-	-	7.8E-7	12	-	-	2.3E-6 ‡	21
Adult	4.3E-05	0.087	3.1E-7	12	0.00011	0.21	2.1E-6 ‡	33
Pregnant Women	4.2E-05	0.084	-	-	0.00011	0.21	-	-
Breastfeeding Women	5.4E-05	0.11	-	-	0.00011	0.22	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	3.1E-6 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; ppb = parts per billion; CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher); yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.40 ppb and the cancer risks were calculated using the inhalation unit risks of 1.1E-05 [NHL], 5.4E-06 [liver], 5.4E-06 [kidney] $(ppb)^{-1}$ and age-dependent adjustment factors.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

§ Indicates a combined childhood-plus-adulthood exposure assumption.

Intermediate (Default 4-Person Household)

Table C- 19. Default inhalation only exposure concentrations for intermediate exposure to benzene in household water at 30 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Adjusted EPC (ppb)	CTE Noncancer Hazard Quotient	RME Adjusted EPC (ppb)	RME Noncancer Hazard Quotient
Birth to < 1 year	3.3	0.48	7.1	1.0 †
1 to < 2 years	3.3	0.48	7.1	1.0 †
2 to < 6 years	3.3	0.48	7.1	1.0 †
6 to < 11 years	3.3	0.48	7.1	1.0 †
11 to < 16 years	3.3	0.48	7.1	1.0 †
16 to < 21 years	3.3	0.48	7.1	1.0 †
Adult	3.3	0.48	7.1	1.0 †
Pregnant Women	3.3	0.48	7.1	1.0 †
Breastfeeding Women	3.3	0.48	7.1	1.0 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: adjusted EPC = the exposure point concentration (EPC) times the appropriate exposure factors; ppb = parts per billion; CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher)
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 7 ppb.
† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Intermediate (Default 4-Person Household)

Table C- 20. Default combined ingestion and dermal exposure doses for intermediate exposure to benzene in household water at 30 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
Birth to < 1 year	0.0024	2.7 †	0.0044	4.9 †
1 to < 2 years	0.00076	0.84	0.0019	2.1 †
2 to < 6 years	0.00068	0.76	0.0016	1.8 †
6 to < 11 years	0.00051	0.57	0.0013	1.5 †
11 to < 16 years	0.00036	0.40	0.0010	1.1 †
16 to < 21 years	0.00036	0.40	0.0010	1.1 †
Adult	0.00055	0.61	0.0013	1.4 †
Pregnant Women	0.00054	0.59	0.0013	1.4 †
Breastfeeding Women	0.00067	0.75	0.0013	1.5 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher)
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.0009 mg/kg/day.
† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Acute (Default 4-Person Household)

Table C- 21. Default combined ingestion and dermal exposure doses for acute exposure to benzene in household water at 30 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
Birth to < 1 year	0.0024	2.7 †	0.0044	4.9 †
1 to < 2 years	0.00076	0.84	0.0019	2.1 †
2 to < 6 years	0.00068	0.76	0.0016	1.8 †
6 to < 11 years	0.00051	0.57	0.0013	1.5 †
11 to < 16 years	0.00036	0.40	0.0010	1.1 †
16 to < 21 years	0.00036	0.40	0.0010	1.1 †
Adult	0.00055	0.61	0.0013	1.4 †
Pregnant Women	0.00054	0.59	0.0013	1.4 †
Breastfeeding Women	0.00067	0.75	0.0013	1.5 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher)

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the acute (less than two weeks) minimal risk level of 0.0009 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Intermediate (Default 4-Person Household)

Table C- 22. Default ingestion only exposure doses for intermediate exposure to benzene in household water at 30 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
Birth to < 1 year	0.0023	2.5 †	0.0043	4.7 †
1 to < 2 years	0.00064	0.72	0.0017	1.9 †
2 to < 6 years	0.00058	0.65	0.0015	1.6 †
6 to < 11 years	0.00043	0.48	0.0012	1.3 †
11 to < 16 years	0.00030	0.33	0.00093	1.0 †
16 to < 21 years	0.00030	0.34	0.00093	1.0 †
Adult	0.00049	0.55	0.0012	1.3 †
Pregnant Women	0.00048	0.53	0.0012	1.3 †
Breastfeeding Women	0.00061	0.68	0.0013	1.4 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher)

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.0009 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Acute (Default 4-Person Household)

Table C- 23. Default ingestion only exposure doses for acute exposure to benzene in household water at 30 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
Birth to < 1 year	0.0023	2.5 †	0.0043	4.7 †
1 to < 2 years	0.00064	0.72	0.0017	1.9 †
2 to < 6 years	0.00058	0.65	0.0015	1.6 †
6 to < 11 years	0.00043	0.48	0.0012	1.3 †
11 to < 16 years	0.00030	0.33	0.00093	1.0 †
16 to < 21 years	0.00030	0.34	0.00093	1.0 †
Adult	0.00049	0.55	0.0012	1.3 †
Pregnant Women	0.00048	0.53	0.0012	1.3 †
Breastfeeding Women	0.00061	0.68	0.0013	1.4 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher)
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the acute (less than two weeks) minimal risk level of 0.0009 mg/kg/day.
† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Chronic (Default 4-Person Household)

Table C- 24. Default combined ingestion and dermal exposure doses for chronic exposure to DEHP (di(2-ethylhexyl)phthalate) in household water at 99 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.0076	-	-	1	0.014	-	-	1
1 to < 2 years	0.0022	-	-	1	0.0058	-	-	1
2 to < 6 years	0.0019	-	-	4	0.0049	-	-	4
6 to < 11 years	0.0014	-	-	5	0.0039	-	-	5
11 to < 16 years	0.0010	-	-	1	0.0031	-	-	5
16 to < 21 years	0.0010	-	-	0	0.0031	-	-	5
Total Child	-	-	4.6E-6 ‡	12	-	-	1.6E-5 ‡	21
Adult	0.0016	-	3.5E-6 ‡	12	0.0040	-	2.4E-5 ‡	33
Pregnant Women	0.0016	-	-	-	0.0040	-	-	-
Breastfeeding Women	0.0020	-	-	-	0.0042	-	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	2.5E-5 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; - = not applicable
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The cancer risks were calculated using the cancer slope factor of 0.014 $(mg/kg/day)^{-1}$.
‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.
§ Indicates a combined childhood-plus-adulthood exposure assumption.

Intermediate (Default 4-Person Household)

Table C- 25. Default combined ingestion and dermal exposure doses for intermediate exposure to DEHP (di(2-ethylhexyl)phthalate) in household water at 99 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
Birth to < 1 year	0.0076	76 †	0.014	140 †
1 to < 2 years	0.0022	22 †	0.0058	58 †
2 to < 6 years	0.0019	19 †	0.0049	49 †
6 to < 11 years	0.0014	14 †	0.0039	39 †
11 to < 16 years	0.0010	10 †	0.0031	31 †
16 to < 21 years	0.0010	10 †	0.0031	31 †
Adult	0.0016	16 †	0.0040	40 †
Pregnant Women	0.0016	16 †	0.0040	40 †
Breastfeeding Women	0.0020	20 †	0.0042	42 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher)

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.0001 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Acute (Default 4-Person Household)

Table C- 26. Default combined ingestion and dermal exposure doses for acute exposure to DEHP (di(2-ethylhexyl)phthalate) in household water at 99 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
Birth to < 1 year	0.0076	2.5 †	0.014	4.7 †
1 to < 2 years	0.0022	0.72	0.0058	1.9 †
2 to < 6 years	0.0019	0.65	0.0049	1.6 †
6 to < 11 years	0.0014	0.48	0.0039	1.3 †
11 to < 16 years	0.0010	0.33	0.0031	1.0 †
16 to < 21 years	0.0010	0.34	0.0031	1.0 †
Adult	0.0016	0.55	0.0040	1.3 †
Pregnant Women	0.0016	0.53	0.0040	1.3 †
Breastfeeding Women	0.0020	0.68	0.0042	1.4 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher)
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the acute (less than two weeks) minimal risk level of 0.003 mg/kg/day.
† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Chronic (Default 4-Person Household)

Table C- 27. Default ingestion only exposure doses for chronic exposure to DEHP (di(2-ethylhexyl)phthalate) in household water at 99 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration (yrs)
Birth to < 1 year	0.0076	-	-	1	0.014	-	-	1
1 to < 2 years	0.0021	-	-	1	0.0057	-	-	1
2 to < 6 years	0.0019	-	-	4	0.0048	-	-	4
6 to < 11 years	0.0014	-	-	5	0.0039	-	-	5
11 to < 16 years	0.00098	-	-	1	0.0031	-	-	5
16 to < 21 years	0.0010	-	-	0	0.0031	-	-	5
Total Child	-	-	4.6E-6 ‡	12	-	-	1.6E-5 ‡	21
Adult	0.0016	-	3.5E-6 ‡	12	0.0040	-	2.4E-5 ‡	33
Pregnant Women	0.0016	-	-	-	0.0040	-	-	-
Breastfeeding Women	0.0020	-	-	-	0.0042	-	-	-
Birth to < 21 years plus 12 years during adulthood §	-	-	-	-	-	-	2.5E-5 ‡	33

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; - = not applicable
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The cancer risks were calculated using the cancer slope factor of 0.014 $(mg/kg/day)^{-1}$.
‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.
§ Indicates a combined childhood-plus-adulthood exposure assumption.

Intermediate (Default 4-Person Household)

Table C- 28. Default ingestion only exposure doses for intermediate exposure to DEHP (di(2-ethylhexyl)phthalate) in household water at 99 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
Birth to < 1 year	0.0076	76 †	0.014	140 †
1 to < 2 years	0.0021	21 †	0.0057	57 †
2 to < 6 years	0.0019	19 †	0.0048	48 †
6 to < 11 years	0.0014	14 †	0.0039	39 †
11 to < 16 years	0.00098	9.8 †	0.0031	31 †
16 to < 21 years	0.0010	10 †	0.0031	31 †
Adult	0.0016	16 †	0.0040	40 †
Pregnant Women	0.0016	16 †	0.0040	40 †
Breastfeeding Women	0.0020	20 †	0.0042	42 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher)

* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.0001 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Acute (Default 4-Person Household)

Table C- 29. Default ingestion only exposure doses for acute exposure to DEHP (di(2-ethylhexyl)phthalate) in household water at 99 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
Birth to < 1 year	0.0076	2.5 †	0.014	4.7 †
1 to < 2 years	0.0021	0.71	0.0057	1.9 †
2 to < 6 years	0.0019	0.64	0.0048	1.6 †
6 to < 11 years	0.0014	0.47	0.0039	1.3 †
11 to < 16 years	0.00098	0.33	0.0031	1.0 †
16 to < 21 years	0.0010	0.33	0.0031	1.0 †
Adult	0.0016	0.54	0.0040	1.3 †
Pregnant Women	0.0016	0.52	0.0040	1.3 †
Breastfeeding Women	0.0020	0.68	0.0042	1.4 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]
Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher)
* The calculations in this table were generated using ATSDR's PHAST v2.5.1.0. The noncancer hazard quotients were calculated using the acute (less than two weeks) minimal risk level of 0.003 mg/kg/day.
† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Appendix D: Soldier-In-Training Scenario PHAST Output Tables

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 1. Site-specific combined ingestion and dermal exposure doses for chronic exposure to carbon tetrachloride in facility water at 9.8 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.0016	0.40	7.2E-6 ‡	0.0016	0.41	7.3E-6 ‡	5
Adult	0.0014	0.36	7.8E-6 ‡	0.0015	0.37	7.9E-6 ‡	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the chronic (lifetime) reference dose of 0.004 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.07 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 2. Site-specific ingestion only exposure doses for chronic exposure to carbon tetrachloride in facility water at 9.8 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.0016	0.39	7.0E-6 ‡	0.0016	0.39	7.0E-6 ‡	5
Adult	0.0014	0.35	7.5E-6 ‡	0.0014	0.35	7.5E-6 ‡	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the chronic (lifetime) reference dose of 0.004 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.07 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 3. Site-specific combined ingestion and dermal exposure doses for chronic exposure to dibromochloromethane in facility water at 6.2 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.0010	0.011	5.4E-6 ‡	0.0010	0.011	5.4E-6 ‡	5
Adult	0.00089	0.0099	5.8E-6 ‡	0.00090	0.0099	5.8E-6 ‡	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.09 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.084 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 4. Site-specific ingestion only exposure doses for chronic exposure to dibromochloromethane in facility water at 6.2 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.00099	0.011	5.3E-6 ‡	0.00099	0.011	5.3E-6 ‡	5
Adult	0.00088	0.0098	5.7E-6 ‡	0.00088	0.0098	5.7E-6 ‡	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.09 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.084 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 5. Site-specific combined ingestion and dermal exposure doses for chronic exposure to bromodichloromethane in facility water at 5.3 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.00085	0.11	3.4E-6 ‡	0.00085	0.11	3.4E-6 ‡	5
Adult	0.00076	0.095	3.6E-6 ‡	0.00077	0.096	3.7E-6 ‡	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.008 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.062 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 6. Site-specific ingestion only exposure doses for chronic exposure to bromodichloromethane in facility water at 5.3 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.00084	0.11	3.4E-6 ‡	0.00084	0.11	3.4E-6 ‡	5
Adult	0.00076	0.094	3.6E-6 ‡	0.00076	0.094	3.6E-6 ‡	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.008 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.062 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 7. Site-specific combined ingestion and dermal exposure doses for chronic exposure to PCE (tetrachloroethylene) in facility water at 53 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.0091	1.1 †	1.2E-6 ‡	0.0094	1.2 †	1.3E-6 ‡	5
Adult	0.0082	1.0 †	1.3E-6 ‡	0.0084	1.1 †	1.4E-6 ‡	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.008 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.0021 $(mg/kg/day)^{-1}$.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

Intermediate (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 8. Site-specific combined ingestion and dermal exposure doses for intermediate exposure to PCE (tetrachloroethylene) in facility water at 53 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.0091	1.1 †	0.0094	1.2 †
Adult	0.0082	1.0 †	0.0084	1.1 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.008 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Acute (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 9. Site-specific combined ingestion and dermal exposure doses for acute exposure to PCE (tetrachloroethylene) in facility water at 53 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.0091	1.1 †	0.0094	1.2 †
Adult	0.0082	1.0 †	0.0084	1.1 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the acute (less than two weeks) minimal risk level of 0.008 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 10. Site-specific ingestion only exposure doses for chronic exposure to PCE (tetrachloroethylene) in facility water at 53 µg/L along with noncancer hazard quotients and cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.0084	1.1 †	1.1E-6 ‡	0.0084	1.1 †	1.1E-6 ‡	5
Adult	0.0076	0.94	1.2E-6 ‡	0.0076	0.94	1.2E-6 ‡	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.008 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.0021 $(mg/kg/day)^{-1}$.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

Intermediate (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 11. Site-specific ingestion only exposure doses for intermediate exposure to PCE (tetrachloroethylene) in facility water at 53 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.0084	1.1 †	0.0084	1.1 †
Adult	0.0076	0.94	0.0076	0.94

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.008 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Acute (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 12. Site-specific ingestion only exposure doses for acute exposure to PCE (tetrachloroethylene) in facility water at 53 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.0084	1.1 †	0.0084	1.1 †
Adult	0.0076	0.94	0.0076	0.94

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the acute (less than two weeks) minimal risk level of 0.008 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 13. Site-specific combined ingestion and dermal exposure doses for chronic exposure to TCE (trichloroethylene) in facility water at 2.7 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.00044	0.9	7.3E-10	0.00044	0.9	7.3E-10	5
Adult	0.00038	0.9	6.5E-10	0.0004	0.8	6.6E-10	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.0005 mg/kg/day and the cancer risks were calculated using the cancer slope factors of 0.022 [NHL], 0.016 [liver], 0.0093 [kidney] $(mg/kg/day)^{-1}$ and age-dependent adjustment factors.

Intermediate (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 14. Site-specific combined ingestion and dermal exposure doses for intermediate exposure to TCE (trichloroethylene) in facility water at 2.7 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.0004	0.9	0.0004	0.9
Adult	0.0004	0.8	0.0004	0.8

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.0005 mg/kg/day.

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 15. Site-specific ingestion only exposure doses for chronic exposure to TCE (trichloroethylene) in facility water at 2.7 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.0004	0.8	7.1E-10	0.0004	0.8	7.1E-10	5
Adult	0.0004	0.8	6.4E-10	0.0004	0.8	6.4E-10	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.0005 mg/kg/day and the cancer risks were calculated using the cancer slope factors of 0.022 [NHL], 0.016 [liver], 0.0093 [kidney] $(mg/kg/day)^{-1}$ and age-dependent adjustment factors.

Intermediate (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 16. Site-specific ingestion only exposure doses for intermediate exposure to TCE (trichloroethylene) in facility water at 2.7 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.0004	0.8	0.0004	0.8
Adult	0.0004	0.8	0.0004	0.8

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.0005 mg/kg/day.

Intermediate (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 17. Site-specific combined ingestion and dermal exposure doses for intermediate exposure to benzene in facility water at 30 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.0049	5.4 †	0.0049	5.4 †
Adult	0.0044	4.8 †	0.0044	4.9 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.0009 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Acute (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 18. Site-specific combined ingestion and dermal exposure doses for acute exposure to benzene in facility water at 30 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.0049	5.4 †	0.0049	5.4 †
Adult	0.0044	4.8 †	0.0044	4.9 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the acute (less than two weeks) minimal risk level of 0.0009 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Intermediate (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 19. Site-specific ingestion only exposure doses for intermediate exposure to benzene in facility water at 30 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.0048	5.3 †	0.0048	5.3 †
Adult	0.0043	4.7 †	0.0043	4.7 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.0009 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Acute (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 20. Site-specific ingestion only exposure doses for acute exposure to benzene in facility water at 30 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.0048	5.3 †	0.0048	5.3 †
Adult	0.0043	4.7 †	0.0043	4.7 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the acute (less than two weeks) minimal risk level of 0.0009 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Intermediate (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 21. Site-specific combined ingestion and dermal exposure doses for intermediate exposure to DEHP (di(2-ethylhexyl)phthalate) in facility water at 99 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.016	160 †	0.016	160 †
Adult	0.014	140 †	0.014	140 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.0001 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Acute (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 22. Site-specific combined ingestion and dermal exposure doses for acute exposure to DEHP (di(2-ethylhexyl)phthalate) in facility water at 99 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.016	5.3 †	0.016	5.3 †
Adult	0.014	4.7 †	0.014	4.7 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the acute (less than two weeks) minimal risk level of 0.003 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Intermediate (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 23. Site-specific ingestion only exposure doses for intermediate exposure to DEHP (di(2-ethylhexyl)phthalate) in facility water at 99 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.016	160 †	0.016	160 †
Adult	0.014	140 †	0.014	140 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.0001 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Acute (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 24. Site-specific ingestion only exposure doses for acute exposure to DEHP (di(2-ethylhexyl)phthalate) in facility water at 99 µg/L along with noncancer hazard quotients*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient
16 to < 21 years	0.016	5.3 †	0.016	5.3 †
Adult	0.014	4.7 †	0.014	4.7 †

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The noncancer hazard quotients were calculated using the acute (less than two weeks) minimal risk level of 0.003 mg/kg/day.

† Indicates the hazard quotient is greater than 1, which ATSDR evaluates further.

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 25. Site-specific combined ingestion and dermal exposure doses for chronic exposure to DEHP (di(2-ethylhexyl)phthalate)in facility water at 99 µg/L along with cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.016	-	1.4E-5 ‡	0.016	-	1.4E-5 ‡	5
Adult	0.014	-	1.5E-5 ‡	0.014	-	1.5E-5 ‡	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The cancer risks were calculated using the cancer slope factor of 0.014 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

Chronic (Soldier-in-Training Scenario; Drinking water intake is 11.4 L/day; 2 showers per person per day)

Table D- 26. Site-specific ingestion only exposure doses for chronic exposure to DEHP (di(2-ethylhexyl)phthalate) in facility water at 99 µg/L along with cancer risk estimates*

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration (yrs)
16 to < 21 years	0.016	-	1.4E-5 ‡	0.016	-	1.4E-5 ‡	5
Adult	0.014	-	1.5E-5 ‡	0.014	-	1.5E-5 ‡	6

Source: [Drinking water data obtained from U.S. Army Base Realignment and Closure's Fort Ord Data Integration System and Marina Coast Water District in 2023]

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; yrs = years; - = not applicable

* The calculations in this table were generated using ATSDR's PHAST v2.5.7.0. The cancer risks were calculated using the cancer slope factor of 0.014 $(mg/kg/day)^{-1}$.

‡ Indicates that the cancer risk exceeds one extra case in a million people similarly exposed, which ATSDR evaluates further.

Appendix E: Fort Ord Contaminants Detected Below Comparison Values

Table E- 1. Summary of contaminants detected in Fort Ord drinking-water wells from 1985–1994 that screened below comparison values and required no further evaluation

Contaminant	Maximum Concentration Detected (ppb)	Comparison Value (ppb)
1,1,1-Trichloroethane (TCA)	7.7	5000 (EMEG)*
1,2-Dichloroethane	0.047	0.074 (CREG)†
Acetone	4.0	4200 (EMEG)*
Bromoform	0.56	2.5 (CREG)†
Butylbenzylphthalate	1.5	1400 (RMEG)‡
Chromium	0.01	0.08 (CREG)†
cis-1,2-Dichloroethene	0.5	14 (RMEG)‡
m,p Xylenes	0.47	150 (RMEG)‡
Manganese	0.1	300 (EPA LTHA)¶
Mercury	0.007	2 (EPA MCL)§
Toluene	1	560 (RMEG)‡
Trichlorofluoromethane	5	2100 (RMEG)‡
Zinc	8.1	2100 (RMEG)‡

*EMEG (Environmental Media Evaluation Guide) represents estimated contaminant concentrations below which humans exposed are not expected to experience noncarcinogenic health effects.

†CREG (Cancer Risk Evaluation Guide) identifies concentrations of cancer-causing contaminants that are unlikely to result in increased cancer risks to people exposed every day over their lifetime.

‡RMEG (Reference Dose Media Evaluation Guide) represents a concentration in a specific medium (e.g., water, air) at which daily human exposure for a chronic duration is unlikely to result in noncarcinogenic effects.

§MCL (Maximum Contaminant Level) is a regulatory standard established by the U.S. Environmental Protection Agency (EPA) that represents the maximum allowable concentration of a contaminant in drinking water.

¶LTHA (Lifetime Health Advisory) is a contaminant level established by the U.S. Environmental Protection Agency (EPA) that represents a portion of the total exposure that is attributed to drinking water and is considered protective of noncarcinogenic adverse health effects over a lifetime exposure. It is derived from a reference dose and estimated to be an intake for the general population that is not associated with adverse health effects.