



Singapore Area Coordinator Annual Overseas Drinking Water System Consumer Confidence Report

This Report meets Chief of Naval Operations/Commander, Navy Installations Command and Naval Facilities Engineering Command Guidance for Consumer Confidence Reports. This report is updated annually and reflects monitoring data collected up to December 31, 2013.

Water Provider

Singapore Public Utilities board (PUB) owns and operates the water system servicing your area. We, at Navy Region Center Singapore (NRCS), do not provide any treatment to the water except additional surveillance. Public Works Environmental and CLWP Medical Aid Station take samples and test the water (some monthly, some annually) to ensure the water quality meets U.S. standards.

Source of Water

Your drinking water comes from surface water sources. Raw water from various sources is conveyed by pipelines to local waterworks where it is chemically treated, filtered and disinfected. Treatment frees the water of harmful bacteria, makes it clear, sparkling, odourless, colourless, and safe for consumption.

Most treatment plants use chemical coagulation and rapid gravity filtration to remove suspended matter in the raw water. For chemical coagulation, correct doses of suitable coagulants and coagulant-aids are added to the raw water to combine or 'floculate' the colloidal and larger particles of suspended matter. This causes the suspended matters to settle more readily and then be removed in the sedimentation tank. The water is then passed through rapid gravity filters which remove the finer particles of suspended matter. The filtered water, temporarily stored in water tank, is disinfected to get rid of all harmful bacteria and viruses. The water is then pumped into the distribution system, ready for consumption.

Aluminium sulphate is the main coagulant. In most cases, hydrated lime is also added to adjust the pH of the raw water for the best flocculation results. Polyelectrolyte is used as a coagulant aid. For

disinfection, chlorine is used to destroy the bacteria and viruses. Ozone is used as well as chlorine in some cases. Ammonia is added in the treated water containing free chlorine to form a stable chlorine residual. Activated carbon is also used to remove any bad taste and odour.

Sodium silicofluoride is also added to the water on its way from the filters to the clear water tank. Fluoridation is a requirement by the Ministry of Health (Singapore) and has been a practice since 1957. It helps in the prevention of dental caries.

Drinking Water Standards

Last year, as in years past, your drinking water met all U.S. Environmental Protection Agency (EPA) and Singapore Public Utility Board, World Health Organization Guidelines for Drinking Water Quality and parameters on contaminants regulated by the U.S. Overseas Environmental Baseline Guidance Document and CNICINST 5090.1 series. In accordance with Navy guidance, we are required to test your water for contaminants on a regular basis, making sure it is safe to drink, and to report our results accordingly.

To ensure that our water is safe to drink, EPA and World Health prescribes limits to which the water standards must meet.

In the latest compliance monitoring period, we conducted tests for over 120 contaminants that have potential for being found in your drinking water. Table 1-1 identifies all contaminants found in your water and their levels of concentration. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does



not necessarily indicate that the water poses a health risk.

Potential Contaminants

Contaminants that may be present in your source water include:

Microbial contaminants – such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

Inorganic contaminants – such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Pesticides and herbicides – which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.

Organic chemical contaminants – including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.

Radionuclide contaminants – which can be naturally-occurring or be the result of oil and gas production and mining activities.

Lead – If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to two minutes before using water for drinking or cooking.

Additional Sources of Information:

U.S. EPA provides guidance for water suppliers in “Preparing your Drinking Water Consumer Confidence Report” document available at http://www.epa.gov/safewater/ccr/pdfs/guide_ccr_for_watersuppliers.pdf; or reviewing the <http://www.ccriwriter.com/> website for formatting assistance.

Concerns/Additional Copies:

For questions, information, and /or additional copies, please contact Navy Region Center Singapore, Public Works Department/Environmental at (65) 6750-2052/2911 or alice.wilson@fe.navy.mil.

Water Quality Data Table

The following table lists contaminants that PWD/ENV routinely test based on U.S. Overseas Environmental Baseline Guidance Document (OEBGD). The water samples were collected from our installation and analysed by *the* Laboratory Sciences Division USA Public Health Command Region-Pacific. The presence of contaminants does not necessarily indicate that the water poses a health risk.

Contaminants in the Water

Table 1-1

Contaminants(units)	MCL (Allowed)	MCLG (Goal)	(Average) Level Detected	Date of Detection	Date of Sample	Typical Sources of Contaminants	Violation
Inorganic Contaminants	Vary for each contaminant	Vary for each contaminant	Passed	Annual	2013	Erosion of natural deposits; water additive which promotes strong teeth	No
Arsenic (mg/L)	0.01	0.01	< 0.001	NOV	2013		No
Antimony (mg/L)	0.006	0.006	< 0.0006	NOV	2013		No
Asbestos (Mfibers/L (longer than 10µm))	7	7	< 0.17	APRIL	2009	* 1 sample every 9 years	No
Barium (mg/L)	2	2	0.035	NOV	2013		No
Beryllium (mg/L)	0.004	0.004	< 0.0004	NOV	2013		No



Cadmium (mg/L)	0.005	0.005	< 0.0003	NOV	2013		No
Chromium (mg/L)	0.1	0.1	< 0.005	NOV	2013		No
Cyanide (mg/L)	0.2	0.2	< 0.005	FEB	2013		No
Fluoride (mg/L)	4	4	0.46	NOV	2013		
Mercury (mg/L)	0.002	0.002	< 0.00010	NOV	2013		No
Nickel (mg/L)	0.1	0.1	< 0.01	NOV	2013		No
Nitrate (mg/L) (as N)	10	10	0.92	NOV	2013		
Nitrite (mg/L) (as N)	1	1	< 0.05	NOV	2013		No
Total Nitrite & Nitrate (mg/L) (as N)	10	10	0.96	NOV	2013		No
Selenium (mg/L)	0.05	0.05	< 0.0010	NOV	2013		No
Sodium (mg/L)	200	200	1.8	NOV	2013		No
Thallium (mg/L)	0.002	0.002	< 0.00020	NOV	2013		No
Inorganic Contaminants	Vary for each contaminant	Vary for each contaminant	Passed	Annual	2013		No
Corrosivity (mg/L)	0.2	0.2	< 0.004	APRIL	2008	* Once	
Lead & Copper	Vary for each contaminant	Vary for each contaminant	Passed	Annual	2013		No
Copper (mg/L)	1.3	1.3	0.131	NOV	2013	Corrosion of household plumbing systems; Erosion of natural deposits	No
Lead (mg/L)	0.015	0.015	0.00142	NOV	2013	Corrosion of household plumbing systems; Erosion of natural deposits	No
Organic Contaminants	Vary for each contaminant	Vary for each contaminant	Passed	Annual	2013		No
33 Pesticides/PCB							
Alachlor (µg/L)	2	2	< 0.1	DEC	2013		No
Aldicarb (µg/L)	3	3	< 0.5	DEC	2013		No
Aldicarb sulfone (µg/L)	2	2	< 0.7	DEC	2013		No
Aldicarb sulfoxide (µg/L)	4	4	< 0.5	DEC	2013		No
Atrazine (µg/L)	3	3	< 0.1	DEC	2013		No
Benzo[a]pyrene (µg/L)	0.2	0.2	< 0.02	DEC	2013		No
Carbofuran (µg/L)	40	40	< 0.9	DEC	2013		No
Chlordane (µg/L)	2	2	< 0.1	DEC	2013		No
Dalapon (µg/L)	200	200	< 1.0	DEC	2013		No
2,4-D (µg/L)	70	70	< 1.0	DEC	2013		No



1,2-Dibromo-3-chloropropane (DBCP) (µg/L)	0.2	0.2	< 0.01	DEC	2013		No
Di (2-ethylhexyl) adipate (µg/L)	400	400	< 0.6	DEC	2013		No
Di (2-ethylhexyl) phthalate (µg/L)	6	6	< 0.6	DEC	2013		No
Dinoseb (µg/L)	7	7	< 0.5	DEC	2013		No
Diquat (µg/L)	20	20	0.8	DEC	2013		No
Endrin (µg/L)	2	2	< 0.01	DEC	2013		No
Endothall (µg/L)	100	100	< 9.0	DEC	2013		No
Ethylene dibromide (EDB) (µg/L)	0.05	0.05	< 0.01	DEC	2013		No
Glyphosphate (µg/L)	700	700	< 6.0	DEC	2013		No
Heptachlor (µg/L)	0.4	0.4	< 0.04	DEC	2013		No
Heptachlor Epoxide (µg/L)	0.2	0.2	< 0.02	DEC	2013		No
Hexachlorobenzene (µg/L)	1	1	< 0.1	DEC	2013		No
Hexachlorocyclopentadiene (µg/L)	50	50	< 0.1	DEC	2013		No
Lindane (µg/L)	0.2	0.2	< 0.02	DEC	2013		No
Methoxychlor (µg/L)	40	40	< 0.1	DEC	2013		No
Oxamyl (Vydate) (µg/L)	200	200	< 1.0	DEC	2013		No
Decachlorobiphenol (µg/L)	0.5	0.5	< 0.5	DEC	2013		
Pentachlorophenol (µg/L)	1	1	< 0.50	DEC	2013		No
Picloram (µg/L)	500	500	< 1.0	DEC	2013		No
Simazine (µg/L)	4	4	< 0.07	DEC	2013		No
2,3,7,8-TCDD (Dioxin) (pg/L)	30	30	< 5.0	DEC	2013		No
Toxaphene (µg/L)	3	3	< 1.0	DEC	2013		No
2,4,5-TP (Silvex) (µg/L)	50	50	< 0.20	DEC	2013		No
21 Volatile Organic Chemicals	Vary for each contaminant	Vary for each contaminant	Passed	Annual	2013		No
Benzene (µg/L)	5	5	< 0.5	FEB, MAY, AUG & NOV	2013		No
Carbon tetrachloride (µg/L)	5	5	< 0.5	FEB, MAY, AUG & NOV	2013		No
0-Dichlorobenzene (µg/L)	600	600	< 0.5	FEB, MAY, AUG & NOV	2013		No
Cis-1,2-Dichloroethylene (µg/L)	70	70	< 0.5	FEB, MAY, AUG & NOV	2013		No



Trans-1,2-Dichloroethylene (ug/L)	100	100	< 0.5	FEB, MAY, AUG & NOV	2013		No
1,1-Dichloroethylene (µg/L)	7	7	< 0.5	FEB, MAY, AUG & NOV	2013		No
1,1,1-Trichloroethane (µg/L)	200	200	< 0.5	FEB, MAY, AUG & NOV	2013		No
1,2-Dichloroethane (µg/L)	5	5	< 0.5	FEB, MAY, AUG & NOV	2013		No
Dichloromethane (µg/L)	5	5	< 0.5	FEB, MAY, AUG & NOV	2013		No
1,1,2-Trichloroethane (µg/L)	5	5	< 0.5	FEB, MAY, AUG & NOV	2013		No
1,2,4-Trichlorobenzene (µg/L)	70	70	< 0.5	FEB, MAY, AUG & NOV	2013		No
1,2-Dichloropropane (µg/L)	5	5	< 0.5	FEB, MAY, AUG & NOV	2013		No
Ethylbenzene (µg/L)	700	700	< 0.5	FEB, MAY, AUG & NOV	2013		No
Monochlorobenzene (µg/L)	100	100	< 0.5	FEB, MAY, AUG & NOV	2013		No
para-Dichlorobenzene (µg/L)	75	75	< 0.5	FEB, MAY, AUG & NOV	2013		No
Styrene (µg/L)	100	100	< 0.5	FEB, MAY, AUG & NOV	2013		No
Tetrachloroethylene (µg/L)	5	5	< 0.5	FEB, MAY, AUG & NOV	2013		No
Trichloroethylene (µg/L)	5	5	< 0.5	FEB, MAY, AUG & NOV	2013		No
Toluene (µg/L)	1000	1000	< 0.5	FEB, MAY, AUG & NOV	2013		No
Vinyl chloride (µg/L)	2	2	< 0.5	FEB, MAY, AUG & NOV	2013		No
Xylene (total) (µg/L)	10000	10000	< 0.5	FEB, MAY, AUG & NOV	2013		No
Other Organic Chemicals	Vary for each contaminant	Vary for each contaminant	Passed	Annual	2013		No
Acylamide (µg/L)	1000	1000	< 0.5	FEB, MAY & AUG	2013		No
Epihydrochlorin (µg/L)	20000	20000	< 1.0	FEB, MAY & AUG	2013		No
Disinfectant/Disinfection Byproducts	Vary for each contaminant	Vary for each contaminant	Passed	Annual	2013		No
Total Trihalomethanes (TTHM) (µg/L)	80	60	47.875	FEB, MAY, AUG & NOV	2013	By-product of drinking water disinfection	No
Total Haloacetic Acid (HAA5) (µg/L)	60	45	38.6	FEB, MAY, AUG & NOV	2013	By-product of drinking water disinfection	No



Bromate (mg/L)	0.01	0.01	< 0.010	DEC	2013	By-product of drinking water disinfection	No
Radionuclide MCLs and Monitoring Requirements	Vary for each contaminant	Vary for each contaminant	Passed	Annual	2013		No
Gross Alpha (pCi/L)	15	15	1.2	DEC, FEB, MAY & AUG	2013		No
Gross Beta (pCi/L)	50	50	6.3	DEC, FEB, MAY & AUG	2013		No
Uranium (µg/L)	30	30	< 0.20	DEC, FEB, MAY & AUG	2013		No
Radium-226 in Water (pCi/L)	< 5	< 5	0.39	DEC, FEB, MAY & AUG	2013		No
Radium-228 in Water (pCi/L)	< 5	< 5	1.7	DEC, FEB, MAY & AUG	2013		No
Combined Radium-226 and -228 (pCi/L)	5	5	2.1	DEC, FEB, MAY & AUG	2013		No
Other	Vary for each contaminant	Vary for each contaminant	Passed	Annual	2013		No
pH	Around 7	Around 7	Around 7	Monthly	2013		No
Free Available Chlorine (ppm) or Chloramine	MRDL=4	MRDLG=4	MRDL = 0.558	Monthly	2013	Disinfectant. Stabilized by ammonia. Procedure changed to test for chloramines in the future.	No

Table Definitions:

Treatment Technique

A required process intended to reduce the level of contaminant in drinking water.

AL

Action Level. The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

MCL

Maximum Contaminant Level. The level of a contaminant in drinking water below which there is no known or expected risk to health, MCLGs allow for a margin of safety.

MRDL

Maximum Residual Disinfectant Level. The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG

Maximum Residual Disinfectant Level Goal. The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contamination.

Table Abbreviations:

ppb parts per billion or micrograms per liter.

Ppm parts per million or milligrams per liter

Nd not detectable at testing limits

Pg/L pico gram per liter

n/a not applicable

mg/L milligram per liter

µg/L microgram per liter

pCi/L picocurie per liter

Mfibers/L million fibers per liter