



# 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, 2014.

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## 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. **This is a potable water system. Base on the most recent sanitary survey (2014), it is determined that our drinking water essentially meets U.S standard. PUB has confirmed that our water do not have any reading of Cryptosporidium.**

## 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 'flocculate' 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.

**Nitrite** – Once ingested, conversion of nitrate to nitrite takes place in saliva and gastrointestinal tract. Infants convert approximately double, or 10 percent of ingested nitrates to nitrites compared to 5 percent conversion in order children and adults and can lead to blue baby symptoms. High enough concentrations of nitrate in drinking water can result in a temporary blood disorder in infants called methemoglobinemia, commonly called "blue baby syndrome." In severe, untreated cases, brain damage and eventually death can result from suffocation due to lack of oxygen.

**Arsenic** – Arsenic occurs in inorganic and organic forms. Inorganic arsenic compounds (such as those found in water) are highly toxic while organic arsenic compounds (such as those found in seafood) are less harmful to health.

### 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](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](mailto: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)	MCL (Goal)	Highest Level Detected	Lowest Level Detected	Date of Detection	Date of Sample	Typical Sources of Contaminants	Violation
<b>Inorganic Contaminants</b>	<b>Vary for each contaminant</b>	<b>Vary for each contaminant</b>	<b>Passed</b>	<b>Passed</b>	<b>2014</b>	<b>2014</b>	<b>Erosion of natural deposits; water additive which promotes strong teeth</b>	<b>No</b>
Arsenic (mg/L)	0.01	0.01	<0.001	<0.001	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Antimony (mg/L)	0.006	0.006	<0.0006	<0.0006	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Barium (mg/L)	2	2	0.032	0.02	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Beryllium (mg/L)	0.004	0.004	<0.0004	<0.0004	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Cadmium (mg/L)	0.005	0.005	<0.0003	<0.0003	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Chromium (mg/L)	0.1	0.1	<0.005	<0.005	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Cyanide (mg/L)	0.2	0.2	<0.005	<0.005	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Fluoride (mg/L)	4	4	0.5	0.5	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Mercury (mg/L)	0.002	0.002	<0.0001	<0.0001	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Nickel (mg/L)	0.1	0.1	<0.001	<0.001	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Nitrate (mg/L) (as N)	10	10	1.1	0.33	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Nitrite (mg/L) (as N)	1	1	0.051	0.018	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Total Nitrite & Nitrate (mg/L) (as N)	10	10	1.0151	0.34	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Selenium (mg/L)	0.05	0.05	<0.001	<0.001	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Sodium (mg/L)	200	200	20	2.5	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
Thallium (mg/L)	0.002	0.002	<0.0002	<0.0002	April 18, 2014 Dec 15, 2014	March 10, 2014 Nov 17, 2014		No
<b>Organic Contaminants</b>	<b>Vary for each contaminant</b>	<b>Vary for each contaminant</b>	<b>Passed</b>	<b>Passed</b>	<b>2014</b>	<b>2014</b>		<b>No</b>
33 Pesticides/PCB								
Alachlor (µg/L)	2	2	<0.1	<0.1	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Aldicarb (µg/L)	3	3	<0.5	<0.5	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Aldicarb sulfone (µg/L)	2	2	<0.7	<0.7	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No



Aldicarb sulfoxide (µg/L)	4	4	<0.5	<0.5	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Atrazine (µg/L)	3	3	<0.1	<0.1	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Benzo[a]pyrene (µg/L)	0.2	0.2	<0.02	<0.02	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Carbofuran (µg/L)	40	40	<0.9	<0.9	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Chlordane (µg/L)	2	2	<0.1	<0.1	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Dalapon (µg/L)	200	200	<1	<1	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
2,4-D (µg/L)	70	70	<1	<1	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
1,2-Dibromo-3-chloropropane (DBCP) (µg/L)	0.2	0.2	<0.01	<0.01	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Di (2-ethylhexyl) adipate (µg/L)	400	400	<0.6	<0.6	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Di (2-ethylhexyl) phthalate (µg/L)	6	6	<0.6	<0.6	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Dinoseb (µg/L)	7	7	<0.5	<0.5	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Diquat (µg/L)	20	20	<0.4	<0.4	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Endrin (µg/L)	2	2	<0.01	<0.01	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Endothall (µg/L)	100	100	<9	<9	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Ethylene dibromide (EDB) (µg/L)	0.05	0.05	<0.01	<0.01	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Glyphosphate (µg/L)	700	700	<6	<6	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Heptachlor (µg/L)	0.4	0.4	<0.04	<0.04	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Heptachlor Epoxide (µg/L)	0.2	0.2	<0.02	<0.02	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Hexachlorobenzene (µg/L)	1	1	<0.1	<0.1	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Hexachlorocyclopentadiene (µg/L)	50	50	<0.1	<0.1	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No



Lindane (µg/L)	0.2	0.2	<0.02	<0.02	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Methoxychlor (µg/L)	40	40	<0.1	<0.1	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Oxamyl (Vydate) (µg/L)	200	200	<1	<1	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
PCBs (as Decachlorobiphenol) (µg/L)	0.5	0.5	<0.5	<0.5	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Pentachlorophenol (µg/L)	1	1	<0.5	<0.5	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Picloram (µg/L)	500	500	<1	<1	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Simazine (µg/L)	4	4	<0.07	<0.07	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
2,3,7,8-TCDD (Dioxin) (pg/L)	30	30	<5	<5	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
Toxaphene (µg/L)	3	3	<1	<1	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
2,4,5-TP (Silvex) (µg/L)	50	50	<0.2	<0.2	April 18, 2014 April 18, 2014 June 16, 2014	March 10, 2014 March 11, 2014 May 5, 2014		No
21 Volatile Organic Chemicals	Vary for each contaminant	Vary for each contaminant	Passed	Passed	2014	2014		No
Benzene (µg/L)	5	5	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Carbon tetrachloride (µg/L)	5	5	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
0-Dichlorobenzene (µg/L)	600	600	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Cis-1,2-Dichloroethylene (µg/L)	70	70	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Trans-1,2-Dichloroethylene (ug/L)	100	100	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
1,1-Dichloroethylene (µg/L)	7	7	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
1,1,1-Trichloroethane (µg/L)	200	200	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
1,2-Dichloroethane (µg/L)	5	5	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No



Dichloromethane (µg/L)	5	5	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
1,1,2-Trichloroethane (µg/L)	5	5	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
1,2,4-Trichlorobenzene (µg/L)	70	70	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
1,2-Dichloropropane (µg/L)	5	5	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Ethylbenzene (µg/L)	700	700	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Monochlorobenzene (µg/L)	100	100	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
para-Dichlorobenzene (µg/L)	75	75	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Styrene (µg/L)	100	100	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Tetrachloroethylene (µg/L)	5	5	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Trichloroethylene (µg/L)	5	5	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Toluene (µg/L)	1000	1000	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Vinyl chloride (µg/L)	2	2	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Xylene (total) (µg/L)	10000	10000	<0.5	<0.5	May 14, 2014 Oct 7, 2014 Dec 15, 2014	April 7, 2014 Sep 9, 2014 Nov 17, 2014		No
Disinfectant/Disinfection Byproducts	<b>Vary for each contaminant</b>	<b>Vary for each contaminant</b>	<b>Passed</b>	<b>Passed</b>	<b>2014</b>	<b>2014</b>		No
Bromate (mg/L)	0.01	0.01	<0.003	<0.003	Monthly	2014	By-product of drinking water disinfection	No
Other	<b>Vary for each contaminant</b>	<b>Vary for each contaminant</b>	<b>Passed</b>	<b>Passed</b>	<b>2014</b>	<b>2014</b>		No
pH	Around 7	Around 7	Around 7	Around 7	Monthly	2014		No
Chloramine (ppm)	MRDL=4	MRDLG =4	MRDL = 2.5	MRDL = 0.02	Monthly	2014	Disinfectant. Stabilized by ammonia. Procedure changed to test for chloramines in the future.	No



Contaminants(units)	Action Level (Allowed)	Action Level (Goal)	Highest Level Detected	Lowest Level Detected	Date of Detection	Date of Sample	Typical Sources of Contaminants	Violation
Lead & Copper <sup>*AL</sup>			Passed	Passed	2014	2014		No
Copper (mg/L)	1.3	1.3	0.24	<0.10	April 21, 2014 Dec 15, 2014	Mar 10, 2014 Nov 17, 2014	Corrosion of household plumbing systems; Erosion of natural deposits	No
Lead (mg/L)	0.015	0.015	0.0058	<0.0010	April 21, 2014 Dec 15, 2014	Mar 10, 2014 Nov 17, 2014	Corrosion of household plumbing systems; Erosion of natural deposits	No

Contaminants(units)	MCL (Allowed)	MCL (Goal)	Highest Level Detected	Lowest Level Detected	Date of Detection	Date of Sample	Typical Sources of Contaminants	Violation
Disinfectant/Disinfection Byproducts	Vary for each contaminant	Vary for each contaminant	Passed	Passed	2014	2014		No
Total Trihalomethanes (TTHM) (µg/L)	80	60	52.9	41.5	April 18, 2014 May 14, 2014 June 16, 2014 Oct 7, 2014 Dec 15, 2014	March 10, 2014 April 7, 2014 May 5, 2014 Sep 9, 2014 Nov 17, 2014	By-product of drinking water disinfection	No
Total Haloacetic Acid (HAA5) (µg/L)	60	45	45	9.9	April 18, 2014 May 14, 2014 June 16, 2014 Oct 7, 2014 Jan 7, 2015	March 10, 2014 April 7, 2014 May 5, 2014 Sep 9, 2014 Dec 12, 2014	By-product of drinking water disinfection	No

### Table Definitions:

#### Treatment Technique

**AL** A required process intended to reduce the level of contaminant in drinking water. Action Level, Based on 90<sup>th</sup> percentile level of tap water samples, 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



$\mu\text{g/L}$  microgram per liter  
pCi/L picocurie per liter  
Mfibers/L million fibers per liter