



# 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, 2011.

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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.

## 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. 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](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 routinely test based on U.S. Overseas Environmental Baseline Guidance Document (OEBGD). The water samples were collected from our installation and analyzed 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.

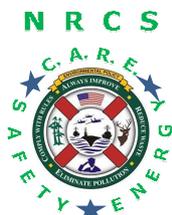
Contaminants in the Water

Table 1-1

Contaminants(units)	MCL (Allowed)	MCLG (Goal)	(Average) Level Detected	Date of Detection	Date of Sample	Typical Sources of Contaminants	Violation
<b>Inorganic Contaminants</b>	Vary for each contaminant	Vary for each contaminant	Passed	FEB, MAY, AUG & NOV	2011	Erosion of natural deposits; water additive which promotes strong teeth	No
Arsenic (mg/L)	0.01	0.01	0.001	FEB	2011		No
Antimony (mg/L)	0.006	0.006	0.0006	FEB	2011		No
Barium (mg/L)	2.0	2.0	0.03	FEB	2011		No
Beryllium (mg/L)	0.004	0.004	0.0004	FEB	2011		No
Cadmium (mg/L)	0.005	0.005	0.0005	FEB	2011		No
Chromium (mg/L)	0.1	0.1	0.01	FEB	2011		No



Cyanide (mg/L)	0.2	0.2	0.01	FEB	2011		No
Fluoride (mg/L)	4.0	4.0	0.515	FEB, MAY & AUG	2011		No
Mercury (mg/L)	0.002	0.002	0.0001	FEB	2011		No
Nickel (mg/L)	0.1	0.1	0.01	FEB	2011		No
Nitrate (mg/L) (as N)	10	10	0.9175	FEB, MAY, AUG & NOV	2011		No
Nitrite (mg/L) (as N)	1	1	0.076	FEB, MAY, AUG & NOV	2011		No
Total Nitrite & Nitrate	10	10	0.88	MAY & AUG	2011		No
Selenium (mg/L)	0.05	0.05	0.005	FEB	2011		No
Sodium (mg/L)	200	200	9.4	FEB	2011		No
Thallium (mg/L)	0.002	0.002	0.0002	FEB	2011		No
Copper (mg/l)	1.3	1.3	0.116	FEB & NOV	2011	Corrosion of household plumbing systems; Erosion of natural deposits	No
Lead (mg/L)	0.015	0.015	0.002085	FEB & NOV	2011	Corrosion of household plumbing systems; Erosion of natural deposits	No
<b>Organic Contaminants</b>							
33 Pesticides/PCB	Vary for each contaminant	Vary for each contaminant	Passed	MAY, AUG & NOV	2011	Runoff from herbicide used on row corps	No
Alachlor	0.002	0.002	0.0002	MAY, AUG & NOV	2011		No
Aldicarb	0.003	0.003	0.0005	MAY, AUG & NOV	2011		No
Aldicarb sulfone	0.003	0.003	0.0005	MAY, AUG & NOV	2011		No
Aldicarb sulfoxide	0.004	0.004	0.0005	MAY, AUG & NOV	2011		No
Atrazine	0.003	0.003	0.00011	MAY, AUG & NOV	2011		No
Benzo[a]pyrene	0.0002	0.0002	0.00011	MAY, AUG & NOV	2011		No
Carbofuran	0.04	0.04	0.0005	MAY, AUG & NOV	2011		No
Total Chlordane	0.002	0.002	0.0005	MAY, AUG & NOV	2011		No
Dalapon	0.2	0.2	0.001	MAY, AUG & NOV	2011		No
2,4-D	0.07	0.07	0.001	MAY, AUG & NOV	2011		No
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	0.0002	0.00002	MAY, AUG & NOV	2011		No
Di (2-ethylhexyl) adipate	0.4	0.4	0.002	MAY, AUG & NOV	2011		No
Di (2-ethylhexyl) phthalate	0.006	0.006	0.002	MAY, AUG & NOV	2011		No
Dinoseb	0.007	0.007	0.0005	MAY, AUG & NOV	2011		No
Diquat	0.02	0.02	0.001	MAY, AUG & NOV	2011		No
Endrin	0.002	0.002	0.0002	MAY, AUG & NOV	2011		No



Endothall	0.1	0.1	0.03	MAY, AUG & NOV	2011		No
Ethylene dibromide (EDB)	0.00005	0.00005	0.00001	MAY, AUG & NOV	2011		No
Glyphosphate	0.7	0.7	0.006	MAY, AUG & NOV	2011		No
Heptachlor	0.0004	0.0004	0.0001	MAY, AUG & NOV	2011		No
Heptachlor Epoxide	0.0002	0.0002	0.00012	MAY, AUG & NOV	2011		No
Hexachlorobenzene	0.001	0.001	0.000193	MAY, AUG & NOV	2011		No
Hexachlorocyclopentadiene	0.05	0.05	0.0005	MAY, AUG & NOV	2011		No
Lindane	0.0002	0.0002	0.0001	MAY, AUG & NOV	2011		No
Methoxychlor	0.04	0.04	0.0001	MAY, AUG & NOV	2011		No
Oxamyl (Vydate)	0.2	0.2	0.0005	MAY, AUG & NOV	2011		No
Pentachlorophenol	0.001	0.001	0.0005	MAY, AUG & NOV	2011		No
Picloram	0.5	0.5	0.001	MAY, AUG & NOV	2011		No
Simazine	0.004	0.004	0.0004	MAY, AUG & NOV	2011		No
2,3,7,8-TCDD (Dioxin)	0.00000003	0.00000003	0.000000005	MAY, AUG & NOV	2011		No
Toxaphene	0.003	0.003	0.0014	MAY, AUG & NOV	2011		No
2,4,5-TP (Silvex)	0.05	0.05	0.0005	MAY, AUG & NOV	2011		No
<b>21 Volatile Organic Chemicals</b>	Vary for each contaminant	Vary for each contaminant	Passed	FEB, MAY, AUG & NOV	2011		No
Benzene (mg/L)	0.005	0.005	0.0005	FEB, MAY, AUG & NOV	2011		No
Carbon tetrachloride (mg/L)	0.005	0.005	0.0005	FEB, MAY, AUG & NOV	2011		No
0-Dichlorobenzene (mg/L)	0.6	0.6	0.0005	FEB, MAY, AUG & NOV	2011		No
Cis-1,2-Dichloroethylene (mg/L)	0.07	0.07	0.0005	FEB, MAY, AUG & NOV	2011		No
Trans-1,2-Dichloroethylene (mg/L)	0.1	0.1	0.0005	FEB, MAY, AUG & NOV	2011		No
1,1-Dichloroethylene (mg/L)	0.007	0.007	0.0005	FEB, MAY, AUG & NOV	2011		No
1,1,1-Trichloroethane (mg/L)	0.2	0.2	0.0005	FEB, MAY, AUG & NOV	2011		No
1,2-Dichloroethane (mg/L)	0.005	0.005	0.0005	FEB, MAY, AUG & NOV	2011		No
Dichloromethane (mg/L)	0.005	0.005	0.0005	FEB, MAY, AUG & NOV	2011		No
1,1,2-Trichloroethane (mg/L)	0.005	0.005	0.0005	FEB, MAY, AUG & NOV	2011		No
1,2,4-Trichloro-	0.07	0.07	0.0005	FEB, MAY,	2011		No



benzene (mg/L)				AUG & NOV			
1,2-Dichloropropane (mg/L)	0.005	0.005	0.0005	FEB, MAY, AUG & NOV	2011		No
Ethylbenzene (mg/L)	0.7	0.7	0.0005	FEB, MAY, AUG & NOV	2011		No
Monochlorobenzene (mg/L)	0.1	0.1	0.0005	FEB, MAY, AUG & NOV	NIL		No
para-Dichlorobenzene (mg/L)	0.075	0.075	0.0005	FEB, MAY, AUG & NOV	2011		No
Styrene (mg/L)	0.1	0.1	0.0005	FEB, MAY, AUG & NOV	2011		No
Tetrachloroethylene (mg/L)	0.005	0.005	0.0005	FEB, MAY, AUG & NOV	2011		No
Trichloroethylene (mg/L)	0.005	0.005	0.0005	FEB, MAY, AUG & NOV	2011		No
Toluene (mg/L)	1.0	1.0	0.0005	FEB, MAY, AUG & NOV	2011		No
Vinyl chloride (mg/L)	0.002	0.002	0.0005	FEB, MAY, AUG & NOV	2011		No
Xylene (total) (mg/L)	10	10	0.0005	FEB, MAY, AUG & NOV	2011		No
<b>Other</b>							
pH	Around 7	Around 7	Around 7	Monthly	2011	By-product of drinking water disinfection	No
Free Available Chlorine (ppm)	MRDL=4	MRDLG=4	MRDL=0.6	Monthly	2011	Disinfectant. Stabilized by ammonia. Procedure changed to test for chloramines.	No
Total Haloacetic Acid (HAA5)	0.045	0.045	0.0253	MAY, AUG & NOV	2011	By-product of drinking water disinfection	No
Total Trihalomethanes (ppb)	0.060	0.060	0.0452	FEB, MAY, AUG & NOV	2011	By-product of drinking water disinfection	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