ACQWS Paper No. 17 Water Safety Plan For Water Supplies Department

Purpose

 To seek agreement from members of ACQWS on the implementation of the Water Safety Plan for Water Supplies Department.

Background

- 2. Hong Kong as a metropolitan city enjoys one of the safest drinking water supplies in the world. The Water Supplies Department (WSD) is committed to providing a safe, clean and reliable water supply in Hong Kong (HK). To ensure the quality of drinking water in HK, the WSD has adopted the Guidelines for Drinking-water Quality published by the World Health Organization (WHO) as the drinking water quality standards in HK.
- 3. The WHO has officially launched the new Guidelines for Drinking-water Quality, third edition (WHO 2004) on 21 September 2004. Apart from the deletion of 12 existing parameters in WHO 1993 and the addition of 11 new chemical parameters as well as reviewing the guideline values of individual parameters based on health significance and latest available scientific evidences, the fully revised WHO 2004 introduces a preventive framework for safe drinking water based on risk management as the effective means to ensure a sustainable supply of safe drinking water. The change in approach has addressed the limitations of managing drinking water safety by merely focusing on compliance with 'end of pipe' standards. The key component of the new framework for safe drinking water is the Water Safety Plan (WSP), which is guided by health-based targets and overseen through the surveillance of drinking water quality. The complete set of chemical parameters and the corresponding guideline values of WHO 2004 are listed in Annex I.

Development of a Water Safety Plan (WSP)

4. The WHO 2004 recommends the application of a preventive WSP as an effective means to provide a proactive mechanism to ensure the quality of drinking water for the protection of public health. A WSP systematically assesses risks throughout a drinking water supply system from the source through treatment to the customers' taps. It identifies the control measures and operational monitoring actions that can minimize risks posing hazards to public health. The preparation of a WSP for the WSD calls for a team of experts with a thorough understanding of source protection, pollution control, treatment, operation, supply and distribution systems in HK. To take it forward, the Working Group on the Development and Implementation of WSP for the WSD chaired by the WSD Chief Chemist was formed in February 2005 with members from the Water Science Division, Operation Regions and other concerned units of WSD. A draft General Plan of the WSP incorporating comments from the Department of Health (DH) has been endorsed by the Director of Water Supplies in February 2006.

Objectives of WSP

- 5. The primary objectives of the WSP for the WSD are set out as follows :
 - (i) Prevention of contamination of source waters;
 - (ii) Reduction or removal of contamination through treatment processes to meet water quality targets; and
 - (iii) Prevention of contamination during storage, distribution and handling of drinking water.

Based on the above objectives, the WSP is developed on a multi-barrier approach providing an integrated system of procedures and processes that collectively will prevent and reduce the risks of contamination of drinking water from source to tap for the protection of public health.

Health-based Targets of WSP

6. Health-based targets are an essential component of the WSP. Established health-based targets assist in determining interventions appropriate to the delivery of safe drinking water, including control measures such as source protection and treatment processes. Upon being consulted on the health-based targets to be used in HK, the DH observes that the quality of treated water in HK has maintained at a high level and there is practically no measurable burden of water-related disease. In view of this, it has been agreed between the DH and the WSD that the guidelines values of chemical parameters specified in the WHO 2004 are to be taken as the water quality targets to ensure the chemical quality of treated water. As to the microbiological quality of treated water is to be taken as the performance target.

WSP for Dongjiang Water

7. Currently, about 70-80% of raw water in Hong Kong is supplied from the Dongjiang in the Guangdong (GD) Province. As the management and control of the catchment area of Dongjiang is outside the jurisdiction of Hong Kong, the WSD has been communicating and liaising closely with the Environmental Protection Bureau, GD Province (廣東省環保局) and relevant agencies including as the GD Provincial Department of Water Resources (廣東省水利廳) during cross-border meetings to discuss the development of a WSP for Dongjiang water. The plan includes risk assessment, control measures taken by the GD authorities to protect the Dongjiang water quality and reduce the pollution risks, and establishment of an emergency notification mechanism on incidents that may affect the quality and safety of Dongjiang water supply to HK. During the Dongjiang Water Quality Protection Special Panel Meeting No.7 on 23 February 2006,

the GD Environmental Protection Bureau has indicated general agreement on the WSP for Dongjiang water.

Major Content of WSP

8. The WSP for the WSD provides details on hazard identification, risk assessment, monitoring and operational requirements, pollution control measures, as well as verification of treated water quality to confirm the overall safety of the supply system. The monitoring of water quality includes physical, chemical, bacteriological, biological and radiological examination of water samples collected at strategic points of the supply and distribution system for verification of water quality in compliance with WHO 2004. To enhance the dissemination of information and the transparency of data to the public, the plan also stipulates the publication of the Dongjiang water quality as received at Muk Wu Pumping Station and the drinking water quality in Hong Kong at half yearly intervals at the WSD website.

Surveillance of WSP

9. Surveillance forms a vital part of the WSP. It involves a continuous and vigilant public health assessment and overview of the safety and acceptability of the drinking water supply. The DH is the independent surveillance body on drinking water quality in HK. The WSD provides the DH with the monitoring results of drinking water quality at regular intervals and the compliant test results of treated water supply on a weekly basis. Task group meetings on health-related issues concerning drinking water quality between the DH and the WSD are held on a half-yearly or as-needed basis to review and discuss the drinking water quality and related public health issues.

Additional Resources

10. Additional resources including equipment and manpower are envisaged to cater for the fulfillment of the compliance monitoring of health-based targets, tightened operational monitoring and pollution control, reduction of identified risks, management of document control system, review and auditing work, etc. related to the implementation of the WSP. As a start-up, a new Gas Chromatograph Mass Spectrometer has been acquired and a new Trace Analysis Laboratory at Ma On Shan Water Treatment Works has been set up in order to accomplish the target. Follow-up actions will be initiated to seek other resources such as instruments to enhance monitoring and manpower including Waterworks Chemist, Engineering Laboratory Technician and operational staff to address requirements for risk reduction, source protection, operational control, compliance monitoring, document control, WSP review and audit, etc.

Implementation of WSP

- 11. The following are among our objectives in the Departmental Plan of the WSD for 2006/2007:
 - (i) To attain capability of analyzing and to adopt thereafter all the water quality parameters, including the additional 11 parameters, in the WHO 2004 in our routine monitoring regime for drinking water quality.
 - (ii) To develop and implement a WSP for the WSD as recommended by WHO 2004.

Water Supplies Department April 2006

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Guideline Values for Chemicals that are of Health Significance in Drinking Water WHO 2004

No.	Parameter	參數	Guideline Value	Unit
1	Acrylamide	丙烯酰胺	0.5 ^b	ug/L
2	Alachlor	草不綠	20 ^b	ug/L
3	Aldicarb	丁醛肟威	10	ug/L
4	Aldrin/Dieldrin	艾氏劑/狄氏劑	0.03	ug/L
5	Antimony	銻	20	ug/L
6	Arsenic	砷	0.01 (P)	mg/L
7	Atrazine	阿特拉津	2	ug/L
8	Barium	鋇	0.7	mg/L
9	Benzene	苯	10 ^b	ug/L
10	Benzo(a)pyrene	苯并(a)芘	0.7 ^b	ug/L
11	Boron	硼	0.5 (T)	mg/L
12	Bromate	溴酸鹽	10 ^b (A,T)	ug/L
13	Bromodichloromethane	溴二氯甲烷	60 ^b	ug/L
14	Bromoform	溴仿	100	ug/L
15	Cadmium	鎘	0.003	mg/L
16	Carbofuran	好年冬	7	ug/L
17	Carbon tetrachloride	四氯化碳	4	ug/L
18	Chloral hydrate	三氯 乙醛	10 (P)	ug/L
19	Chlorate (ClO ₃)*	氯酸鹽*	700 (D)	ug/L
20	Chlordane	氯丹	0.2	ug/L
21	Chlorine	氯	5 (C)	mg/L
22	Chlorite (ClO ₂)	亞氯酸鹽	700 (D)	ug/L
23	Chloroform	氯仿	200	ug/L
24	Chlorotoluron	3-(3-氯-對-甲苯)-1,1- 二甲脲	30	ug/L
25	Chlorpyrifos*	毒死蜱*	30	ug/L
26	Chromium (total)	鉻(總)	0.05 (P)	mg/L
27	Copper	銅	2	mg/L
28	Cyanazine*	氰草津*	0.6	ug/L
29	Cyanide	氰化物	0.07	mg/L
30	Cyanogen chloride (as CN)	氯化氰	70	ug/L
31	2,4-D (2,4-dichlorophenoxyacetic acid)	2,4-二氯苯氧基乙酸	30	ug/L
32	2,4-DB	4-(2,4-二氯苯氧基)丁酸	90	ug/L
33	DDT & metabolites	滴滴涕	1	ug/L
34	Di(2-ethyhexyl)phthalate	苯二甲酸雙-2-乙基己酯	8	ug/L
35	Dibromoacetonitrile	二溴乙腈	70	ug/L
36	Dibromochloromethane	二溴氯甲烷	100	ug/L
37	1,2-Dibromo-3-chloropropane	1,2-二溴-3-氯丙烷	1 b	ug/L
38	1,2-Dibromoethane*	1,2-二溴乙烷*	0.4 ^b (P)	ug/L
39	Dichloroacetate	二氯乙酸鹽	50 (T, D)	ug/L
40	Dichloroacetonitrile	二氯乙腈	20 (P)	ug/L
41	1,2-Dichlorobenzene	1,2-二氯苯	1000 (C)	ug/L
42	1,4-Dichlorobenzene	1,4-二氯苯	300 (C)	ug/L
43	1,2-Dichloroethane	1,2-二氯乙烷	30 b	ug/L
44	1,1-Dichloroethene	1,1-二氯乙烯	30	ug/L
45	1,2-Dichloroethene	1,2-二氯乙烯	50	ug/L
46	Dichloromethane	二氯甲烷	20	ug/L

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No.	Parameter	參數	Guideline Value		Unit
47	1,2-Dichloropropane (1,2-DCP)	1,2-二氯丙烷	40	(P)	ug/L
48	1,3-Dichloropropene	1,3-二氯丙烯	20	b	ug/L
49	Dichlorprop (or 2,4-DP)	2-(2,4-二氯苯氧基)丙酸	100		ug/L
50	Dimethoate*	樂果*	6		ug/L
51	Edetic acid (EDTA)	乙二胺四乙酸	600		ug/L
52	Endrin*	異狄氏劑*	0.6		ug/L
53	Epichlorohydrin	表氨醇	0.4	(P)	ug/L
54	Ethylbenzene	苯乙烷	300	(C)	ug/L
55	Fenoprop	2-(2,4,5-三氯苯氧基)丙酸	9		ug/L
56	Fluoride	氟化物	1.5		mg/L
57	Formaldehyde	甲醛	900		ug/L
58	Hexachlorobutadiene	六氯丁二烯	0.6		ug/L
59	Isoproturon	3-(對- 異丙苯基)-1,1- 二甲脲	9		ug/L
60	Lead	鉛	10		ug/L
61	Lindane	六氯化苯	2		ug/L
62	Manganese	錳	0.4	(C)	mg/L
63	МСРА	2-甲基-4-氯苯氧乙酸	2		ug/L
64	Mecoprop (or MCPP)	2-(4-氯苯氧基-2-甲基) 丙酸	10		ug/L
65	Mercury (total)	汞(總)	0.001		mg/L
66	Methoxychlor	甲氧氯	20		ug/L
67	Metolachlor	乙基丙草安	10		ug/L
68	Microcystin-LR (total)*	微囊藻毒素-LR (總)*	1	(P)	ug/L
69	Molinate	禾大壯	6		ug/L
70	Molybdenum	鉬	0.07		mg/L
71	Monochloramine	氯胺	3		mg/L
72	Monochloroacetate*	一氯乙酸鹽*	20		ug/L
73	Nickel	鎳	20	(P)	ug/L
74	Nitrate (as NO ₃)	硝酸鹽	50		mg/L
75	Nitrilotriacetic acid (NTA)	次氮基三乙酸	200		ug/L
76	Nitrite (as NO ₂)	こ。古るでは「ない」である。	3 (short-term exposure)		mg/L
		上的政重	0.2 (Long-term exposure)	(P)	mg/L
77	Pendimethalin	二甲戉樂靈	20		ug/L
78	Pentachlorophenol	五氯苯酚	9	^b (P)	ug/L
79	Pyriproxyfen*	蚊蠅醚*	300		ug/L
80	Selenium	硒	0.01		mg/L
81	Simazine	西瑪三嗪	2		ug/L
82	Styrene	苯乙烯	20	(C)	ug/L
83	2,4,5-T	2,4,5-三氯苯氧基乙酸	9		ug/L
84	Terbuthylazine (TBA)*	特丁津*	7		ug/L
85	Tetrachloroethene	四氯乙烯	40		ug/L
86	Toluene	甲苯	700	(C)	ug/L
87	Trichloroacetate	三氯 乙酸鹽	200		ug/L
88	Trichloroethene	三氯乙烯	70	(P)	ug/L
89	2,4,6-Trichlorophenol	2,4,6-三氯苯酚	200	^b (C)	ug/L
90	Trifluralin	茄科靈	20		ug/L
91	Uranium*	鈾*	0.015	(P, T)	mg/L
92	Vinyl chloride	氯乙烯	0.3	b	ug/L
93	Xylenes	二甲苯	500	(C)	ug/L

Remarks :

1. Abbreviations for Guideline Value (WHO 2004) :

(P) = provisonal guideline value, as there is evidence of a hazard, but the available information on helath effects is limited.

(T) = provisional guideline value because calculated guideline value is below the level that can be achieved through practical treatment methods, source protection, etc.

(D) = provisional guideline value because disinfection is likely to result in the guideline value being exceeded.

(A) = provisional guideline value because calculated guideline value is below the practical quantification level.

(C) = concentrations of the substance at or below the health-based guideline value may affect the appearance, taste or odour of the water, leading to consumer complaints.

^b For substances that are considered to be carcinogenic, the guideline value is the concentration in drinking-water associated with an upper-bound excess lifetime cancer risk of 10^{-5} (one additonal cancer per 100,000 of the population ingesting drinking-water containing the substance at the guideline value for 70 years). Concentrations associated with estimated upper-bound excess lifetime cancer risk of 10^{-4} and 10^{-6} can be calculated by multiplying and dividing, respectively , the guideline value by 10.

- 2. * denotes a total of 11 new chemical parameters added in WHO 2004.
- 3. The following 12 chemical parameters in WHO 1993 have been deleted in WHO 2004 : -

Propanil (敵稗); Pyridate (達草止); Heptachlor/Heptachlor epoxide (七氯/七氯環氧化物); Hexachlorobenzene (六氯苯); Permethrin (二氯苯醚菊酯); Bentazon (滅草松); Trichloroacetonitrile (三氯乙腈); 1,1,1-Trichloroethane (1,1,1-三氯乙烷); Monochlorobenzene (氯苯); Trichlorobenzenes (total) (三氯苯 (總)); Tributyltin oxide (三丁基氧化錫); Di(2-ethyhexyl)adipate (己二酸雙-2-乙基己酯).