ANNEXURES

ANNEXURE I

ORGANIC CONTAMINANTS ASSESSED IN THE RAND WATER VALUE CHAIN DURING STEP IV OF THE PROTOCOL

Date **22-May-07**

Matrix	Contaminant or Pesticide residue	Method of Analysis	Lab
Water	Endrin	GC-MS	BioCrop
	Acephate	GC-MS	BioCrop
	Dimethoate	GC-MS	BioCrop
	Methadithion	GC-MS	BioCrop
	Terbufos	GC-MS	BioCrop
	Cypermethrin I	GC-MS	BioCrop
	Cypermethrin II	GC-MS	BioCrop
	Cypermethrin III	GC-MS	BioCrop
	Cypermethrin IV	GC-MS	BioCrop
	Cyfluthrin I	GC-MS	BioCrop
	Cyfluthrin II	GC-MS	BioCrop
	Cyfluthrin III	GC-MS	BioCrop
	Cyfluthrin IV	GC-MS	BioCrop
	Deltamethrin	GC-MS	BioCrop
	Esfenvalerate	GC-MS	BioCrop
	Fenvalerate	GC-MS	BioCrop
	Permethrin I	GC-MS	BioCrop
	Permethrin II	GC-MS	BioCrop
	Cyhalothrin	GC-MS	BioCrop
	PCB-153	GC-MS	BioCrop
	Metalochlor	GC-MS	BioCrop
	HBC	GC-MS	BioCrop
	Volatile organic compounds		
	Benzene	Purge&Trap GC-MS	CSIR
	Toluene	Purge&Trap GC-MS	CSIR
	Ethylbenzene	Purge&Trap GC-MS	CSIR
	m,p-Xylene	Purge&Trap GC-MS	CSIR
	o-Xylene	Purge&Trap GC-MS	CSIR
	Chlorobenzene	Purge&Trap GC-MS	CSIR
	1,4-Dichlorobenzene	Purge&Trap GC-MS	CSIR
	1,2-Dichlorobenzene	Purge&Trap GC-MS	CSIR
	1,2,4-Trichlorobenzene	Purge&Trap GC-MS	CSIR
	1,2,3-Trichlorobenzene	Purge&Trap GC-MS	CSIR
	Phenol	GC-MS	CSIR
	2-Methylphenol	GC-MS	CSIR

4-Methylphenol	GC-MS	CSIR
2,4-Dimethylphenol	GC-MS	CSIR
2-Chlorophenol	GC-MS	CSIR
4-Chloro-3-methylphenol	GC-MS	CSIR
2,4-Dichlorophenol	GC-MS	CSIR
2,4,6-Trichlorophenol	GC-MS	CSIR
2,4,5-Trichlorophenol	GC-MS	CSIR
Pentachlorophenol	GC-MS	CSIR
Naphthalene	GC-MS	CSIR
Acenaphthylene	GC-MS	CSIR
Acenaphthene	GC-MS	CSIR
Fluorene	GC-MS	CSIR
Phenanthrene	GC-MS	CSIR
Anthracene	GC-MS	CSIR
Fluoranthene	GC-MS	CSIR
Pyrene	GC-MS	CSIR
Benzo[a]anthracene	GC-MS	CSIR
Chrysene	GC-MS	CSIR
Benzo[b]+[k]fluoranthene	GC-MS	CSIR
Benzo[a]pyrene	GC-MS	CSIR
Indeno-[1,2,3-cd]pyrene	GC-MS	CSIR
Diben[a,h]anthracene	GC-MS	CSIR
Benzo[g,h,i]perylene	GC-MS	CSIR
Dimethylphthalate	GC-MS	CSIR
Diethylpthalate	GC-MS	CSIR
Di-n-butylphthalate	GC-MS	CSIR
Butylbenzylphthalate	GC-MS	CSIR
Bis(2-Ethylhexyl)phthalate	GC-MS	CSIR
Di-n-octylphthalate	GC-MS	CSIR
Bisphenol A	GC-MS	CSIR
Organochlorine pesticides	AOAC international	SABS
α-BHC	AOAC international	SABS
γ-BHC	AOAC international	SABS
β-Endosulfan	AOAC international	SABS
Heptachlor	AOAC international	SABS
Aldrin	AOAC international	SABS
Heptachlor epoxide	AOAC international	SABS
α-Endosulfan	AOAC international	SABS
Endosulfan Sulphate	AOAC international	SABS
Dieldrin	AOAC international	SABS
p-p'-DDE	AOAC international	SABS
Endrin	AOAC international	SABS
p,p'-DDD	AOAC international	SABS
o,p'-DDT	AOAC international	SABS
p,p'-DDT	AOAC international	SABS

Methoxychlor	AOAC international	SABS
Organophosphorus pesticides		
Dichlorvos	AOAC international	SABS
Mevinphos	AOAC international	SABS
Sulfotep	AOAC international	SABS
Diazinon	AOAC international	SABS
Pirimifos-Methyl	AOAC international	SABS
Fenithrothion	AOAC international	SABS
Parathion	AOAC international	SABS
Malathion	AOAC international	SABS
Fenthion	AOAC international	SABS
Chlorpyrifos	AOAC international	SABS
Chlorfenvinphos	AOAC international	SABS
Profenophos	AOAC international	SABS
	AOAC international	SABS
Synthetic pyrethroids		
	AOAC	
Cypermethrin	**international**	SABS
Deltamethrin	AOAC international	SABS
Cyhalothrin	AOAC international	SABS
Cyfluthrin	AOAC international	SABS
	AOAC international	SABS
PCB congeners		
	AOAC	
PCB- 291	**international**	
PCB-293	AOAC international	SABS
PCB-294	AOAC international	SABS
PCB-297	AOAC international	SABS
PCB-296	AOAC international	SABS
PCB-298	AOAC international	SABS
Triazines	AOAC international	SABS
Simazine	AOAC international	SABS
Atrazine	AOAC international	SABS
Terbutylazine	AOAC international	SABS
	AOAC international	SABS
Chloroacetamides		
Acetochlor	AOAC international	SABS
Alachlor	AOAC international	SABS
S-Metolachlor	AOAC international	SABS
Trifluralin	AOAC international	SABS
	AOAC international	SABS
Phenoxycarboxylic acids		
2,4-D	EPA Method 625	SABS

MCPA	EPA Method 626	SABS
Dichlorprop	EPA Method 627	SABS
	EPA Method 628	SABS

Carbamate pesticides

Aldicarb	Method AM 127	SABS
Aldicarb sulphoxide	Method AM 128	SABS
Aldicarb sulphone	Method AM 129	SABS
Carbaryl	Method AM 130	SABS
Carbofuran	Method AM 131	SABS
Carbosulfan	Method AM 132	SABS
Propoxur	Method AM 133	SABS
	Method AM 134	SABS

ANNEXURE 2: Questionnaire for Drinking Water Utilities- Organic contaminant Analysis in the drinking water value chain

Information or data requested for organic contaminants analysis in the drinking water value chain (source water, process, distribution network and the consumer's tap (final drinking water, at the consumption point)

Q1: Do you analyze for any of the organic contaminants on the attached Table?

Answer: Yes_____ No_____

Q2: If your answer to Q1 is "yes", please fill in the information requested in the attached table.

Q3: Are there any other organic contaminants that you have analyzed for that are not on the provided list? Please provide the names on the section provided below:

i)_____ ii)_____

iii)_____ iv)_____

v)_____ vi)_____

Q4: If your answer to Q3 was "Yes" please state the reasons that prompted you to analyze for the specific organic contaminants you listed in the above section.

N.B-All answers will be treated in high confidence, no list of organic contaminants will be provided to a third party without permission from the institution or organization that provided it. An example of a response is attached for your convenience.

The information can be provided in Ms Word version 2003 or 2007 or as an Excel spreadsheet version 2003 or 2007. You are also welcome to fax or courier hard copies to the following details: Ms Esper Ncube, Rand Water, 522 Impala Rd, Glenvista, JHB 2000. Tel:+27116820075, Fax:+27116820733,Cell:+27823892358 E-mail: encube@randwater.co.za

ANNEXURE 2.1: Recommended list of priority organic contaminants for analysis in the drinking water supply chain

Organic contaminant	Classification	Concern to the Drinking water industry	Currently being analyzed for?	Method for analysis in place?	Need for New Method development?
INDUSTRIAL CHEMICALS					
Benzene	VOC	chronic lymphatic leukemia	Y	P/T, GC-MS	N
Chlorobenzene	VOC	Liver and kidney toxicity	N		Y, P/T, GC-MS
1,2-Dichlorobenzene	VOC	Liver and kidney toxicity	N		Y, P/T, GC-MS
1,2,4-Trichlorobenzene	VOC	Changes in adrenal glands	N		Y, P/T, GC-MS
1,4-Dichlorobenzene	VOC	cirrhosis of the liver	N		Y, P/T, GC-MS
Benz [a] pyrene	PAH	Human carcinogen, EDC	Y	SPE, GC-MS	N
Bisphenol A	Plasticizer	Endocrine disruption	N		Y, SPE-HPLC
Dibutylphthalate (DBP)	Plasticizer	Endocrine disruption	Y	SPE, GC-MS	Standards available
Di (2-ethylhexyl) phthalate	Plasticizer	Endocrine disruption	Y	SPE, GC-MS	
Ethylbenzene	VOC	Taste and odour, health	Y	P/T, GC-MS	N
Glycol esters	VOC	Taste and odour	N		Y
Octylphenol	Surfactant	Endocrine disruption	Y	SPE, GC-MS	N
p-Nonylphenol	Surfactant	Endocrine disruption	Y	SPE, GC-MS	
Polychlorinated biphenyls [PCBs	PCB	Teratogenic	Y, PCB-153	SPE, GC-MS	
Toluene	VOC	Taste and odour	Y	P/T, GC-MS	
Xylene isomers	VOC	Taste and odour	Y	P/T, GC-MS	
2,3,7,8-Tetrachlorodiphenyldioxin(TCDD	Dioxin	Endocrine disruption, Teratogenic	N	No capacity in SA	Dioxin, not in SA
Nitrilotriacetic acid (NTA)	Detergent metabolite	2B carcinogen, IARC	N		Need to research
Di-2-(ethylhexyl) adipate (DEHA)	Plasticizer	Endocrine disruption	Y		N
Dibutyltin (DBT)	Organotin	Reproductive toxicity	N		Y, SPE, LC-MS
Dimethyltin (DMT)	Organotin	Reproductive toxicity	N		Y, SPE, LC-MS
Tributyltin (TBT)	Organotin	Endocrine disruption	N		Y, SPE, LC-MS
PESTICIDES					
2,4-Dichlorophenoxyacetic acid	Herbicide	Internal haemorrage	N	Standards available	Y, SPE, HPLC
Aldrin	Organochlorine pesticide	Liver & CNS toxicity	Y	SPE, GC-MS	N
Atrazine	S-triazine herbicide	Endocrine disruption	Y	SPE, GC-MS	
Chloropyrifos	Organochlorine pesticide	Decreased plasma ChE	Y	SPE, GC-MS	
Cyhexatin	Organotin pesticide	Reproductive toxicity	N		Y
DDT	Organochlorine pesticide	Endocrine disruption	Y, p,p- and o,p-	SPE, GC-MS	N
DDE	DDT metabolite	Endocrine disruption	Y, p,p- and o,p-	SPE, GC-MS	
Dieldrin	Organochlorine pesticide	Endocrine disruption	Y	SPE, GC-MS	N
Diquat	Bipyridillium salt pesticide	Liver & kidney toxicity	N		Y, SPE, LC-MS
Endosulfan	Organochlorine pesticide	Class II human carcinogen, EDC	Y, I and II	SPE, GC-MS	

Annexure 2.1 cont.

Endrin	Organochlorine pesticide	Liver problems	Y	SPE, GC-MS	N
Heptachlor	Organochlorine pesticide	Liver and CNS damage	Y	SPE, GC-MS	
Heptachlor epoxide	Organochlorine pesticide	Liver toxicity	Y	SPE, GC-MS	
Lindane [γ-BHC]	Organochlorine pesticide	Severe liver , CNS damage	Y	SPE, GC-MS	
MCPA	Phenoxy acetic acid herbicide	Male reproductive toxicity	N	Develop method	Y, SPE, LC-MS
Methoxychlor	Organochlorine pesticide	Reproductive problems, EDC	Y	SPE, GC-MS	
Paraquat	Bipyridillium salt pesticide	Chronic pneumonitis	N	Develop method	Y, SPE, LC-MS
Simazine	S-triazine Herbicide	Endocrine disruption	Y	SPE, GC-MS	N
Terbutylazine (TBA)	S-triazine herbicide	Reduced body weight	Y	SPE, GC-MS	
Vinclozolin	Fungicide	Endocrine disruption	Y	SPE, GC-MS	
Cis-Chlordane	Metabolite of Chlordane	Hepatic necrosis	Y	No cost, standard available SPE, GC-MS	
Trans-Chlordane	Metabolite of Chlordane	Hepatic necrosis	Y		
B-Endosulfan	Metabolite of Endosulfan	Class II human carcinogen, EDC	Y		
Endosulfan sulphate	Metabolite of endosulfan	Endocrine disruption	Y		
Acetochlor	Chloroacetamide,pesticide	Salivation, decrease sugar levels	N	method to be develop	Y
Acetochlor ethane sulfonic acid	Reaction product of Acetochlor	-	N		Y
Acetochlor oxanilic acid	Reaction product of Acetochlor		N		Y
Alachlor	Chloroacetamide,pesticide	Liver , kidneys problems	N	method to be develop	Y, SPE, GC-MS
Alachlor ethane sulfonic acid	Reaction product of Alachlor	-	N		Y
Alachlor ethane oxanilic acid	Reaction product of Alachlor		N		Y
Hexachlorocyclohexane isomers - β-HCH - α-HCH -δ-HCH	Metabolites of HCH organochlorine pesticide	Chronic pneumonitis	Y	No cost, standard available SPE, GC-MS	N
2-(2,4,5-TrichloroPhenoxy acetic, Silvex, Fernoprop	Phenoxy acetic acid herbicide	Hepatic and renal toxicity	N	standards, New method to be developed	Y, SPE, HPLC
2,4,5-T-(Trichlorophenoxyacetic acid)	Phenoxyacetic acid herbicide	Reduced body weight, increased liver, kidney weight	N		Y, SPE, HPLC

Annexure 2.1: cont.

Organic contaminant	Classification	Concern to the Drinking water industry	Currently being analyzed for?	Method for analysis in place?	Need for New Method development?
DISINFECTION BY-PRODUCTS					
2-Chlorophenol	Phenol	Reproductive effects, T&O	Y	SPE, GC-MS	N
2,4-Dichlorophenol	Phenol	Delayed sensitivity response, T&O	Y	SPE, GC-MS	
2,4,6-Trichlorophenol	Phenol	Mutagenic *in vivo,* T&O problems	Y	SPE, GC-MS	
Pentachlorophenol	Phenol	Cancer, liver and kidney effects	Y	standard available SPE, GC-MS	N
Chloroform	Disifection by-product	Kidney and liver toxicity	Y	HS, GC-ECD	N
Bromoform	Disinfection by-product	Kidney, bladder, renal effects	Y	HS, GC-ECD	
Bromodichloromethane	Disifection by-product	Renal cytomegaly, liver effects	Y	HS, GC-ECD	
Dibromochloromethane	Disifection by-product	Liver & kidney damage	Y	HS, GC-ECD	
Dichloroacetonitrile	Disinfection by-product	Developmental toxicity	N		Y, P/T, GC-MS
Dibromoacetonitrile	Disinfection by-product	Reduced body weight	N		Y, P/T, GC-MS
Trichloroacetonitrile	Disinfection by-product	Lachrymator, severe eye irritant	N		Y, P/T, GC-MS
Monochloroacetic acid	Disinfection by-product	Genotoxic, cytotoxic	N		Y, SPE, GC-MS
Dichloroacetic acid	Disinfection by-product	CNS damage, liver &kidney effects	N		Y, SPE, GC-MS
Trichloroacetic acid	Disinfection by-product	Cytotoxic	N		Y, SPE, GC-MS
Bromoacetic acid	Disinfection by-product	Genotoxic, Cytotoxic	N		Y, SPE, GC-MS
Bromochloroacetic acid	Disinfection by-product	Reproductive effects	N		Y, SPE, GC-MS
Dibromoacetic acid	Disinfection by-product	Liver toxicity	N		Y, SPE, GC-MS
Formaldehyde	Disinfection by-product	Irritates nasal cavity	N		Y
Trichloroacetaldehyde			N		
SYNTHETIC ORGANIC POLYMER RESIDUES					
Acrylamide	Water Treatment residue	Nerve damage, benign tumours	N		Y, P/T, GC-MS
Epichlorohydrin	Water treatment residue	Increased cancer risk over time	N		Y, P/T, GC-MS
Diallyldimethylammonium Chloride	Water treatment residue	Genotoxic	N		Y, P/T, GC-MS
Dimethylamine	Water treatment residue	Tissue destruction	N		Y, P/T, GC-MS
1,3-Dichloro-2-propanol	Water treatment residue	-	N		Y, P/T, GC-MS
2,3-Dichloro-1-propanol	Water treatment residue	-	N		Y, P/T, GC-MS
3-Chloro-1,2-propanediol	Water treatment residue	-	N		Y, P/T, GC-MS
NATURAL AND SYNTHETIC HORMONES					
17-Estradiol	Hormone	Endocrine disruption	N		Y, SPE, LC-MS
Estriol	Hormone	Endocrine disruption	N		Y, SPE, LC-MS
Estrone	Hormone	Endocrine disruption	N		Y, SPE, LC-MS
17-Ethinylestradiol	Hormone	Endocrine disruptio	N		Y, SPE, LC-MS
Dietylstilbestrol (DES)	Hormone	Endocrine disruption	N		Y, SPE, LC-MS

Annexure 2.1: cont.

Organic contaminant	Classification	Concern to the Drinking water industry	Currently being analyzed for?	Method for analysis in place?	Need for New Method development?
ALGAL TOXINS					
Microcystin-(LR+YR+RR)	Cyanotoxin	Hepatotoxins (liver toxins)	Y	SPE, GC-MS	N
Anatoxin-a	Cyanotoxin	neurotoxin	N		Y, SPE, LC-MS
Homoanatoxin-a	Cyanotoxin	neurotoxin	N		Y, SPE, LC-MS
Anatoxin-a(S)	Cyanotoxin	neurotoxin	N		Y, SPE, LC-MS
Saxitoxins	Cyanotoxin	Paralytic Shellfish poisoning	N		Y, SPE, LC-MS
Cylindrospermopsin	Cyanotoxin	Liver toxicity	N		Y, SPE, LC-MS
Nodularin	Cyanotoxin	Liver toxicity	N		Y, SPE, LC-MS

Legend

Y-Yes

N-N0

P/T-Purge and Trap Gas Chromatography

SPE -Solid Phase Extraction

GC–MS - Gas Chromatography Mass spectrometry

LC-MS-Liquid Chromatography-Mass spectrometry

HS, GC-ECD-Head Space Gas Chromatography with Electron Capture Detector

T&O- Taste and odour

EDC-Endocrine disrupting Chemical

CNS-Central Nervous System

ChE-Cholinesterase Enzyme

ANNEXURE 2.2: An example of a response

Group of organic contaminants	Organic contaminants analyzed for	Concentrations in groundwater	Concentrations in source water	Concentrations along the distribution network	Concentrations in tap water	Analytical Method used	Limit of Detection (LOD)	Limit of Quantification (LOQ)
Volatile organics	Benzene Chlorobenzene 1,2-Dichlorobenzene Trichlorobenzene 1,4-Dichlorobenzene							
Pesticides	Hexachlorocyclohexane DDT and metabolites Dichlorvos Heptachlor Deltamethrin Aldicarb							
Polynuclear Aromatic hydrocarbons (PAHs)	Benzo[a]pyrene Chrysene Fluorene Anthracene							
Disinfection by-products (DBPs)	Trihalomethanes Haloacetic acids Nirosodimethlamine							
Polychlorinated Biphenyls (PCBs)	Arochlor 1016 Arochlor 1254 Arochlor 1248 Arochlor 1260							
Cyanotoxins	Anatoxin-a Saxitoxin Anatoxin-a (S) Homoanatoxin-a Nodularin Microcystin-LR							
Natural and Synthetic Hormones	17β-Estradiol (E2) Estriol (E3) Estrone (E1) 17α-Ethinylestradiol Diethylstilbestrol (DES)							

ANNEXURE 3: PROOF OF ORIGIN ARTICLES SUBMITTED

ANNEXURE 3.1: ARTICLE SUBMITTED TO THE WATER SCIENCE & TECHNOLOGY JOURNAL

Original Message-----
From: Michelle Herbert [mailto:mherbert@iwap.co.uk]
Sent: Wednesday, April 21, 2010 4:21 PM

To: Esper Ncube
Subject: RE: Your submission to Water Science and Technology

Dear Esper,
Thank you for sending your paper to us again. I have taken a quick look at it now and I will be able to pass it through to an editor for peer review in the next couple of days.
Kind regards,

Michelle

Michelle Herbert

Journals Production Assistant

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From: em.wst.0.1a59e8.07bf9f84@editorialmanager.com

[mailto:em.wst.0.1a59e8.07bf9f84@editorialmanager.com] On Behalf Of Water Science and Technology

Sent: Wednesday, April 14, 2010 10:02 PM

To: Esper Ncube

Subject: Submission Confirmation for A GENERIC PROTOCOL FOR THE SELECTION AND PRIORITIZATION OF ORGANIC CONTAMINANTS FOR MONITORING IN THE DRINKING WATER VALUE CHAIN

Dear Mrs Ncube,

Your submission entitled "A GENERIC PROTOCOL FOR THE SELECTION AND PRIORITIZATION OF ORGANIC CONTAMINANTS FOR MONITORING IN THE DRINKING WATER VALUE CHAIN" has been received and will

now be peer reviewed for possible publication in the journal Water Science and Technology

You will be able to check on the progress of your paper by logging on to Editorial Manager as an author. The URL is http://wst.edmgr.com/.

You will shortly be notified of the reference number assigned to your submission.

Thank you for submitting your work to this journal.

Kind regards,

Michelle Herbert

Journals Production Assistant

Water Science and Technology

A GENERIC PROTOCOL FOR THE SELECTION AND PRIORITIZATION OF ORGANIC CONTAMINANTS FOR MONITORING IN THE DRINKING WATER VALUE CHAIN

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ABSTRACT

The occurrence of organic contaminants in the drinking water value chain is of growing concern for the Drinking Water industry and its consumers given the high risk these contaminants can cause. Because of the large numbers of these organic contaminants and the need to effectively optimize on the use of resources and protect public health, selecting and prioritizing those few organic contaminants of priority is necessary. There are currently many selection and prioritization approaches but the literature review revealed that a few approaches address the needs of the Drinking Water industry and there is no generic approach to the selection, prioritization and monitoring of organic contaminants in the drinking water value chain. This has led to the need for the development of a generic protocol for the selection and prioritization of organic contaminants for monitoring in the drinking water value chain (from source to tap).This paper describes the methodology followed to develop the protocol including its structural components as relevant to the Drinking Water industry. The methodology emphasizes on expert judgment and stakeholder participation. The approach is intended to provide guidance to Water Services Providers on the selection and prioritization of organic contaminants for monitoring in the drinking water.

Key words: prioritization; organic contaminants; drinking water; validation.

ANNEXURE 3.2 Proof of the submitted Rand Water Position paper on organic contaminants monitoring in the drinking water value chain

FOR INFORMATION OF THE
Scientific Services Management Committee (SSMC)

Prepared by: Esper Jacob Ncube (WQSb)
WATER QUALITY SPECIALIST SERVICES DEPT

RAND WATER

CONFIDENTIAL

SSMC MEETING 25 February 2010

PRIORITY ORGANIC CONTAMINANTS FOR MONITORING IN THE DRINKING WATER SUPPLY CHAIN

INTRODUCTION

Safe drinking water is in everybody's interest, yet providing safe drinking water on an ongoing basis is complex requiring a great deal of knowledge, tenacity and attention to detail. This task is also becoming more difficult in that man, in the 21st century, has become reliant on a vast number of manufactured chemicals and substances to enhance the quality of life with little thought given to what happens to these chemical substances once they have been used and discarded. Drinking water is generally most direct source of human exposure to waterborne contaminants and accordingly receives the most attention in water-related health risk assessments. As a result, effective monitoring and treatment of drinking water will always be required for public health protection. The information contained in Figure I illustrates the magnitude of this problem which now resides with Water Services Authorities that are charged with the responsibility of ensuring that the water that consumers receive on tap is safe and wholesome for lifelong consumption.

- 18 million substances are listed and described in the "Chemical Abstracts"
- 400 million tons of chemicals were produced worldwide in 2000. (Compared to 1 million ton manufactured in 1930)
- 100 000 chemicals were listed with the European Community in 1981 (old chemicals)
- 720 chemicals were listed under the Swiss Ordinance on Environmental Pollutants between 1988 and 2000
- 8 700 different food additives are known
- 3 300 substances are being used as drugs in human medicine
- 8,4million substances are commercially available and 240,000 are reported to be inventoried/regulated chemicals according to Chemical Abstract Services website
- 82,000 industrial chemicals are in the US Toxic Substances Chemical Agents inventory
- Nano-materials reported to be toxic to humans exist in more than 116 sunscreens, cosmetics and personal care products currently on the market
- 458 pesticides are registered for use in South Africa alone as per the PAN-UK database

Figure I – Some facts on industrially produced Chemicals

The consequences of these substances in drinking water are largely inconclusive and controversial and therefore the setting of guidelines/standards for these constituents is tenuous. Often very stringent water quality standards are set because a lack of adequate information engenders the concept of rather safe than sorry. Complicating the situation is the large number of organic compounds produced, the rapid rate at which new compounds are developed, the hazardous potential of many of these substances, the demand for organically derived compounds, the stability of many of these substances in the environment, the ability of many of these substances to accumulate through the food chain and the many derivatives that can be formed from particular substances.

ANNEXURE 3.3: Proof of Original article prepared for the Water SA Journal

IMPLEMENTATION OF A GENERIC PROTOCOL FOR THE SELECTION AND PRIORITIZATION OF ORGANIC CONTAMINANTS TO THE RAND WATER SITUATION

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ABSTRACT

Approaches that prioritize chemicals according to their importance as environmental contaminants have been developed by government agencies and private industries. However, it has been noticed that a few approaches such as one published by the United States Environmental Protection Agency (USEPA), address the needs of the Drinking Water industry. There is also no generic approach to the selection, prioritization and monitoring of organic contaminants in the drinking water value chain. To safeguard Drinking Water industry customers, it was necessary to develop a generic protocol to assist with the identification of a list of organic contaminants for monitoring in the drinking water value chain. Once the protocol was developed, it was validated in a prototype drinking water value chain. This paper describes the implementation of such a generic protocol. The exercise comprised of testing each step of the protocol from the selection of the "pool of organic contaminants (Step I) to recommending the final priority list of organic contaminants (Step VII). The implementation was successfully conducted in the Rand Water drinking water value chain (from catchment to tap). Expert judgment was emphasized during the implementation as each step was validated and the opinion of key stakeholders used to shape the process. The tailor made prioritization criteria reflective of the Drinking Water industry perspective proved to be successful in selecting and prioritizing organic contaminants for monitoring in the drinking water value chain. The organic contaminants in the current study were successfully prioritized in three classes: short-term priority for analysis, medium term priority for analysis and long term priority for analysis. This is a very important guide for water utilities to assist in optimizing their resources while not compromising the role of public health protection. A priority list of organic contaminants has been identified for use by Rand Water and other water utilities.

Key words: generic protocol, organic contaminants, validation, selection and prioritization, drinking water value chain, expert judgment

INTRODUCTION

Today's vast chemical industry and particularly its giant offspring, the production of synthetic organic chemicals (Middleton and Rosen,1956) have introduced new challenges to the scientists and public officers engaged in providing and protecting public health through the provision of safe drinking water. This challenge was noticed more than half a century ago (Middleton and Rosen, 1956). Industrial contamination of water while important is not the only factor to consider in the complex organic pollution situation. Domestic sewage, natural run-off and materials derived from the life cycle of aquatic plants and animals contribute substantial quantities of organic materials to streams. (Meintjes et al, 2000, Kolpin et al 2004, Cheevaporn et al 2005, Voutsa et al 2006, Ellis, 2006)

ANNEXURE 4: PROOF OF ETHICS COMMITTEE APPROVAL

FWA 00002567, Approved dd 22 May 2002 and Expires 24 Jan 2009
IRB 0000 2235 IORG0001762 Approved dd Jan 2006 and Expires 21 Nov 2008

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Faculty of Health Sciences Research Ethics Committee
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Date: 7/03/2007

PROTOCOL NO.	**22/2007**
PROTOCOL TITLE	Selection and prioritization of organic contaminants for monitoring in the drinking water value chain.
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DEPARTMENT	School of Health Systems and Public Health
STUDY DEGREE	PhD in Public Health
SPONSOR	None.
MEETING DATE	28/02/2007

This Protocol and Informed Consent have been considered by the Faculty of Health Sciences Research Ethics Committee, University of Pretoria on 28/02/2007 and found t be acceptable.

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