

From: Dean Hinton
Sent: Wed, 1 Aug 2012 16:10:08 -0500
To: 'Russell Schreiber'; 'Daniel Nix'; 'Crawford, Susan'
Subject: FW: Couple of items - Revised Reuse Analyte Recommendations
Attachments: ReuseAnalyses_8-1-12.docx

First response email from Red.

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From: James Weddell [mailto:james.weddell@tceq.texas.gov]
Sent: Wednesday, August 01, 2012 1:06 PM
To: Dean Hinton
Cc: Joel Klumpp; Ada Lichaa
Subject: FW: Couple of items - Revised Reuse Analyte Recommendations

Dean, see below on analytical question. Thanks for letting us know. Attached table is corrected.

Working on other questions.

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From: Alicia Diehl
Sent: Wednesday, August 01, 2012 12:53 PM
To: James Weddell
Subject: RE: Couple of items - Revised Reuse Analyte Recommendations

I should know better than to think I am right. I was right in my head, because I used everything I could from UCMR3. However, I was wrong in my typing – I typed “537” instead of “539” for the estradiol method.

Here is the corrected version, sorry about that!

A

Direct/Indirect Reuse Facility

Water Quality Monitoring Recommendations

Background

As water resources are diminished by drought, Texas communities may seek approval to reuse (reclaim) wastewater to produce drinking water. Wastewater is subject to contamination from microbes and chemicals; many of these contaminants have been identified, but some are not yet regulated.

List of Chemicals to Sample in Wastewater Effluent proposed as Drinking Water Source

The Texas rules require that any entity proposing to use a new source of water identify the quality of that source water. Wastewater effluent is by definition fecally impacted, and is subject to the presence of chemicals of human origin. Therefore, it is critical that the quality of wastewater effluent be characterized before use as a drinking water source.

Texas adopts specific guidelines under 30 TAC 210 for reclaimed water quality. However, the 30 TAC 210 standards do not address all of the chemical and microbial constituents of concern in drinking water. Drinking water rules are based on removal of constituents at levels found in ambient water, which is of higher quality than wastewater effluent.

The list presented here is for planning purposes only. A public water system may wish to sample additional constituents that are not listed here. Additionally, when a public water system requests that they be granted permission to use wastewater effluent as a drinking water source, the Texas Commission on Environmental Quality (TCEQ) may require additional, site-specific testing.

Frequency

Although a single ‘snapshot’ view of water quality may be considered sufficient by a PWS’s design engineers, that snapshot must be viewed as a non-statistically representative sample.

Seasonal variation

It is highly recommended that wastewater intended for use as a drinking water source be characterized over a period of time that includes seasonal variation. Without seasonal data, changes in quality cannot be scientifically factored in to treatment plant design. For example; indoor use of drinking water increases in the summer, suggesting that the contaminant levels in summer may be less than those in the winter. Further, PWSs often use different initial sources of raw water on a seasonal basis, so that the baseline water quality characteristics can change seasonally. For example; a systems may use surface water as their initial source, but also use well water during the high-demand summer periods.

Locations

The wastewater effluent that is intended as a new source of drinking water should be characterized. It is recommended that any water streams intended for blending with the wastewater be characterized. Likewise, any raw water used for treatment as surface water should be sampled. Treated water should be analyzed in accordance with the site-specific requirements applied by the TCEQ.

Sampling at various stages in the process allows a PWS to demonstrate the source of any pathogens or chemical contaminants. A map showing the sampling locations, and a list describing the sample location(s) should be provided when the sampling regime is proposed.

Lists of Recommended Analyses

The constituents of concern in wastewater effluent can be broadly grouped as microbes or chemicals and other constituents such as hardness and pH. Although the lists of recommended analytes are not exhaustive, they provide a starting place for planning.

List of Microbes Recommended for Sampling in Wastewater Effluent Proposed for use as a Drinking Water Source

MICROBIALS	Method¹	Regulated?
Viruses²		
*Endovirus	1615	UCMR3 ³
*Norovirus		
Rotavirus	1	No ²
Poliovirus	1	No ²
Echoviruses	1	No ²
Coxsackie viruses group A and B	1	No ²
Adenovirus	1	No ²
Hepatitis A	1	No ²
Protozoans		
* <i>Cryptosporidium</i>	1623	Yes
* <i>Giardia</i>		
<i>Naegleria fowleri</i>	5	No
<i>Cyclospora</i>	5	No
Microsporidia (fungus)	5	No
Bacteria		
*Total coliform (indicator)	1604 ⁴	Yes ³
* <i>Escherichia coli</i> (<i>E. coli</i>) (indicator)	1604 ⁴	Yes ³
Enterococci	1600, 1106	No
Salmonella (and / or Shigella, Campylobacter, Pseudomonas ⁵)	1200	No
Aeromonas	1605	No
Heterotrophic plate count (indicator)	9215	No

* Highly recommended for sampling

1 Method listed is an EPA method unless otherwise noted. List of methods is not exhaustive, but is included for reference only.

- 2 Viruses are regulated as a group through treatment technique requirements of the EPA's Surface Water Treatment Rules and Ground Water Rule
- 3 Regulations cover distribution levels and removal requirements.
- 4 Several approved methods exist. A PWS should propose one of these approved methods for analysis.
- 5 Methods are in development. A PWS should propose the method they plan to use.

List of Chemicals and Other Constituents Recommended for Sampling in Wastewater Effluent Proposed for use as a Drinking Water Source

CHEMICALS	Method ¹	Regulated?
Disinfection byproducts		
*Trihalomethanes	524	Yes ²
*Haloacetic acids (also report bromochloroacetic acid)	552	Yes ² No
*Nitroso-dimethylamine (NDMA)	521	UCMR3 ³
*Nitroso-pyrrolidine (NPYR)		
Any other DBPs expected to occur on a site-specific basis, for example chlorite, if chlorine dioxide is used.		
Organic chemicals		
*SOC (Regulated (and tentatively identified unregulated) synthetic organic chemicals): Alachlor, atrazine, benzo(a)pyrene, di(ethylhexyl)-adipate, di(ethylhexyl)-phthalate, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene (HCB), Hexachlorocyclopentadiene, lindane, methoxychlor, pentachlorophenol (PCP), simazine.	525.2	Yes
*SOC (Regulated (and tentatively identified unregulated) synthetic organic chemicals): 2, 4, 5-TP (Silvex), 2,4-D, Dalapon, Dinoseb, pentachlorophenol, picloram	515.4	Yes
* SOC Chlordane, toxaphene (and unregulated aroclor species)	531.1	Yes
*EDP/DBCP (ethylene dibromide & 1,2-dichloro-3-propane)	504.1	Yes
*carbofuran, oxamyl (Vydate)	531.1	Yes
*Glyphosate	547	Yes
*2,3,7,8-TCDD (Dioxin)	1613	Yes
Diquat	549.2	Yes
Endothall	548.1	Yes
*VOC (Regulated (and tentatively identified unregulated) volatile organic chemicals): 1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, 1,1-Dichloroethylene, 1,2-dichloroethane, 1,2-dichloropropane, 1,2,4-trichlorobenzene, benzene, carbon tetrachloride, cis-1,2-dichloroethylene, dichloromethane, ethylbenzene, monochlorobenzene, o-dichlorobenzene, para-dichlorobenzene, styrene, tetrachloroethylene, toluene, trans-1,2-dichloroethylene, trichloroethylene, vinyl chloride, xylenes	524.2	Yes
*Pharmaceutical indicators: 17- α -ethynylestradiol (ethinyl estradiol), 16- α -hydroxyestradiol (estriol), equilin, estrone, testosterone, 4-androstene-3,17-dione	539	UCMR3
*Chemicals of human origin: Perfluorooctanesulfonic sulfonate (PFOS), perfluorooctanoic acid (PFOA)	537	UCMR3

CHEMICALS	Method¹	Regulated?
perfluorononanoic acid (PFNA) perfluorohexanesulfonic acid (PFHxS) perfluoroheptanoic acid (PFHpA) perfluorobutanesulfonic acid (PFBS)		
*Sucralose	4	
1,4 dioxane	522	
Caffeine	1694	
N,N-Diethyl-meta-toluamide (DEET)		
Gemfibrozil	1694	
Iopromide	1694	
Inorganic chemicals		
*Nitrate/nitrate, as nitrogen	300.0	Yes
*Other regulated minerals: fluoride, chloride, sulfate, total dissolved solids (TDS)		
*Regulated primary metals: Antimony, arsenic, barium, beryllium, cadmium, chromium, mercury, selenium, thallium	200.5	Yes
*Regulated secondary metals: Aluminum, copper, iron, manganese, silver, zinc		
Asbestos (if asbestos/cement pipe is used in drinking water distribution, wastewater collection, or associated piping)	100.2	Yes
Cyanide	335.4	Yes
Sodium	200.7	Yes ²
Perchlorate	314	UCMR2
Other water quality parameters		
*pH		
*Temperature		
Bicarbonate and carbonate alkalinity		
Total hardness		
Total suspended solids		
Total chlorine, free chlorine, monochloramine		
Ammonia		

* Highly recommended for sampling.

1 Method listed is an EPA method unless otherwise noted. List of methods is not exhaustive, but is included for reference only.

2 Regulated in distribution systems.

3 Regulatory monitoring requirements, not health-based standards.

4 Acceptable methods exist but have not yet been approved by the EPA.

It is generally understood that the cost of analysis may be a concern to a PWS. A system should consider this cost in planning. It is acceptable if a system wishes to propose a shorter list of analytes for consideration during the source approval request process; but it is highly recommended that the 'starred' analytes in the list above be included in analyses. The intent of the sampling is to establish what viral, bacterial, protozoan, and chemical contaminants are present in order to protect public health; an acceptable sampling regime will ensure that characterization is accomplished.

In general, analyses should be performed at NELAC-accredited labs using EPA-approved methods. Where those labs or methods are unavailable, a PWS should identify a capable lab and request permission for its use. Methods listed in these tables are recommendations; other approved EPA-methods exist, and may be proposed for use.

The analytes of greatest concern are those with documented, immediate negative health effects (“acute” health effects), such as pathogens and nitrate/nitrite. It may be acceptable for a system to perform sampling for constituents that have long-term health effects, like regulated organics, less frequently than sampling for pathogens or nitrate/nitrite.

Depending on the treatment method selected by the PWS, it may be necessary for a PWS to perform additional sampling to characterize the impact on treatment. For example, selenium interferes with adsorption under some conditions; if adsorption is used for treatment, additional selenium sampling may be required.

Results

Results should be tabulated in a clear, easy-to-read manner for submittal; analytical detail such as the quality assurance documentation should also be submitted. The summary tables should be organized with sample sites in order of extent of treatment; for sampling over a period of time, analyses should be presented in the order that the samples were collected. The summary tables should contain the units of measurement.

Notes Related to Sampling for Chemicals of Emerging Concern

Simultaneously, the drinking water industry and EPA are becoming concerned about contaminants of emerging concern (CEC). Many of the CEC are of human origin, especially pharmaceuticals and personal care products.

Analytical methods do not yet exist for some of these CEC chemicals. The best current (May 4, 2012) methods for CEC chemicals are captured in the EPA’s Unregulated Contaminant Monitoring Regulations (UCMRs), 1 through 3.

Although the UCMR contaminants are not required by EPA to be sampled in all direct and indirect reuse sources, the list provides a well-researched source of information for chemicals that EPA is most likely to regulate in the future, and that are most likely to have negative health effects.

Additionally, as interest in chemicals of emerging concern grows, researchers have identified chemicals that can indicate the presence of anthropogenic contamination, but that are not harmful to human health.

Pharmaceutical indicators

The UCMR3 list includes estrogenic hormones used in pharmaceuticals. It is recommended that reuse sources be evaluated for these chemicals using analytical method 537.

Personal care product indicator

The UCMR3 list includes 1,4 dioxane, which is used in personal care products such as soaps and makeup. It is recommended that reuse sources be evaluated for 1,4 dioxane using method EPA 522.

Chemicals of human origin

New research has identified sucralose as an excellent, conservative, easy-to-measure indicator that water contains chemicals of human origin. Sucralose is not biologically degraded, so it passes through wastewater biological treatment plants unchanged. Sucralose should be quantified in reuse sources.

Additionally, EPA identified six perfluorinated compounds that may indicate contamination from human industrial activities. These should be quantified using method EPA 537 (1.1).

Disinfection byproducts of emerging concern

Wastewater sources are frequently chlorinated during the wastewater treatment process. Known, regulated disinfection byproducts (trihalomethanes and haloacetic acids) are known to frequently occur at levels of concern in wastewater. Additionally, the EPA has identified the presence of other potentially carcinogenic disinfection byproducts called nitrosamines. It is recommended that the two most-frequently occurring nitrosamines be quantified using method EPA 521.