By Pat McCool, KRWA Consultant

Non-Enforceable Standards Being Used as Enforceable Standards

Non-enforceable drinking water standards are being used as river quality standards for the Arkansas River and for wastewater discharges to protect the river for domestic water supply, that is, for drinking water use.

More importantly, a precedent might be set that could have significant, costly consequences for some Kansas water suppliers and wastewater treatment facilities. The issue here is the chloride in the Arkansas River near Arkansas City before the river enters Oklahoma. This is all proceeding with the Kansas Department of Health and Environment (KDHE) applying non-enforceable standards, that is, standards that are not intended by law to be used.

KDHE regulates both the drinking water suppliers and the wastewater discharges into the Kansas surface waters. It is important to understand some basics of how both are being regulated to begin to understand the unreasonableness, the consequences and the precedent that might be set.

Enforceable MCLs for Drinking Water

Several decades ago the federal government issued Primary Drinking Regulations establishing enforceable Maximum Contaminant Levels (MCLs) for certain contaminants for drinking water that have potential health effects. The State of Kansas has established the same MCLs.

Some of the common contaminants of concern to Kansas water suppliers for which MCLs have been established include: arsenic; nitrate; radium 226 & 228; uranium; selenium; disinfection byproducts; turbidity; atrazine; fecal coliform; total coliform; and, *E. coli*. The MCLs are enforceable under both federal and state law.

Above photo shows the flow rate of 32,200 cubic feet per second (cfs) on the Arkansas River at Arkansas City, KS on August 6, 2013. *– Photo by Slade Hackney, United States Geological Survey (USGS)*

This photo shows an extremely low flow of 110 cfs on the Arkansas River at Arkansas City, KS on August 7, 2012. *– Photo by Chris Moehring, USGS.*

Non-Enforceable Secondary Standards for Drinking Water

The federal government has also established *non-enforceable, non-mandatory, secondary standards* for fifteen "contaminants" in drinking water. These fifteen "contaminants" are considered not to be a risk to human health. The nearby table lists these fifteen contaminants, "recommended" levels, and possible noticeable effects.

EPA states that these secondary standards are only guidelines and are "reasonable" goals. The State of Kansas can issue regulations establishing higher or lower levels for these secondary standards but has chosen not to establish any enforceable secondary standards at any level in drinking water.

The federal government allows the states to establish higher or lower levels for the fifteen secondary standards. The federal government also states that these fifteen "are established only as guidelines to assist public water systems in managing their drinking water". Again, these fifteen secondary standards are not federal or state mandates that public water supplies are required to meet.

There are water supplies in Kansas that do not meet the secondary standards. This has shown to be the situation by extensive testing started by the State in the early 1960s and before. There have been no adverse health effects attributed to drinking or using such water.

Chloride has the federally stated, possible noticeable effect of "salty" taste. The secondary standard level is 250 mg/L; that is a level that may cause a salty taste in the water. Before the federal government established the secondary standards in 1979, the common stated description was that below 250 mg/L chloride the water did not taste salty; above 500 mg/L chloride the water did taste salty; and between 250 to 500 mg/L chloride, the water tasted salty to most with the threshold level varying among the drinkers/tasters.

It is the chloride secondary standard for drinking water that is being used as an enforceable standard by the KDHE in a wastewater permit that is the issue herein discussed. And it is important, especially for Kansas water suppliers, to remember that sulfate and total dissolved solids (TDS) also have secondary standards because of "salty" taste.

Secondary, Non-enforceable Drinking Water Standards

Contaminant	Level	Possible Noticeable Effects
Aluminum	0.05 to 0.2 mg/L	colored water
Chloride	250 mg/L	salty taste
Color	15 color units	visible tint
Copper	1.0 mg/L	metallic taste; blue green staining
Corrosivity	Non-corrosive	metallic taste; corroded pipes or fixtures staining
Fluoride	2.0 mg/L	tooth discoloration
Foaming agents	0.5 mg/L	frothy, cloudy; bitter taste; odor
Iron	0.3 mg/L	rusty color; sediment; metallic taste; reddish or orange staining
Manganese	0.05 mg/L	black to brown color; black staining; bitter metallic taste
Odor	3 threshold odor number	"rotten-egg", musty or chemical taste
pH	6.5 to 8.5	low pH – bitter metallic taste; corrosion high pH: slippery feel; soda taste; deposits
Silver	0.1 mg/L	skin discoloration; graying of the white part of eye
Sulfate	250 mg/L	salty taste
Total dissolved solids (TDS)	500 mg/L	hardness; deposits; colored water; staining; salty taste
Zinc	5 mg/L	metallic taste

Table Salt, Salty Taste, and Salt Restricted Diet

Table salt is sodium chloride. The chemical symbol for sodium chloride is NaCl; that is, one atom of sodium (Na) and one atom of chloride (Cl) make one molecule of NaCl.

Salty taste is the description used by the federal government in its secondary standards for drinking water. The salty taste threshold is different to different persons. "Salty taste" is used a secondary standard criteria for chloride, sulfate, and total dissolved solids.

A salt-restricted diet has to do with the amount of intake of table salt, more specifically, the intake of sodium. A better and more exact wording is sodium-restricted diet. Diet guidelines might be 1,500 mg of sodium per day. For the 1,500 mg per day guideline, this would equal drinking 2.4 gallons of water per day of water with 250 mg/L chloride if all the salt in the water was sodium chloride. The amount of water would be more if the chloride salt was partially, for instance, a calcium chloride salt. Again, it is the intake of sodium that is of concern and not chloride.

Both sulfate and TDS also have "salty taste" criteria used by the federal government for secondary drinking water standards. But here KDHE is using the chloride secondary standards to regulate wastewater discharges to protect "domestic water supply". In the Arkansas City example, KDHE must be concerned with the water that are our good neighbors to the south in Oklahoma as no Kansas citizens are drinking the Arkansas River water.

Surface Water Quality and KDHE Protection

KDHE implemented extensive monitoring of surface waters in Kansas in the 1970s. The process was then called the "208 Water Quality Management Plan" because Section 208 of the federal law regulating wastewater discharges mandated such monitoring. KDHE's monitoring and planning have improved considerably since then and KDHE has very good information on the water quality of Kansas lakes and rivers.

The KDHE planning and regulatory processes now include what is called "Total Maximum Daily Load" or TMDL for certain water bodies such as rivers in Kansas. These TMDL are assessment reports quantifying water quality impairments for water bodies. KDHE has issued a TMDL for the lower Arkansas River basin and the water quality impairment is due to chloride in the river.

In this TMDL, KDHE states that the water quality chloride standard for domestic water supply is 250 mg/L and for aquatic life is 860 mg/L. These are the standards that KDHE uses in determining the quality of water in the river and the standard that the sources of chloride in the water are judged/regulated.

The TMDL allows the 250 mg/L chloride standard for the river to increase if higher levels of chloride in the river are due to the intrusion of high chloride groundwater. KDHE will probably not "regulate" natural sources of chloride to and in the river.

In monitoring, assessing, and controlling discharges to Kansas rivers KDHE has used water quality parameters and standards such as dissolved oxygen, BOD, phosphorus, and nitrogen that protect the animal and plant life in the rivers and lakes. KDHE also has used fecal coliform because of its importance to the water being used for swimming, wading and body contact.

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But in the lower Arkansas River basin, KDHE is using a secondary standard for drinking water as a standard for the river to protect "domestic water supply" – that is, a secondary standard that is not even enforced on Kansas water suppliers. This and other facts discussed below raises the question of why the 250 mg/L chloride standard is being used.

In the Name of Protecting the Arkansas River

The TMDL is to assess/protect/regulate the water quality, specifically chloride, in the Arkansas River so that the river water is acceptable to KDHE for drinking and domestic water supply. As we have previously noted though, there are no enforceable standards for chloride in drinking water because drinking water with chloride is not a risk to health.

One way KDHE attempts to achieve the chloride goal for the river is by issuing a wastewater permit limiting the amount of chloride discharged to the river from the Arkansas City wastewater treatment plant. That permit requires that the city monitor the discharge twice monthly for chloride and requires that the discharge not exceed 250 mg/L. That 250 mg/L is the secondary standard for drinking water. The city has at times exceeded the 250 mg/L requirement in the discharge to the river and thus is in violation of its permit. But it is important to know why the high level of chloride in the discharge occurs.

The major source of chloride in the city wastewater treatment plant's discharge to the river is the chloride in the city's drinking water and the river determines that chloride level in the drinking water.

The city obtains its water supply from wells in the Arkansas City River valley near the river. The major source of water for these wells is the Arkansas River. In times of drought and low river flow, these wells have a higher chloride level than during times of higher river flow.

The major source of chloride in the city wastewater treatment plant's discharge to the river is the chloride in the city's drinking water and the river determines that chloride level in the drinking water. For example, in 2009 and through the first half of 2011 the chloride in wastewater discharges was around 100 to 150 mg/L range and the flow in the river flow was moderate/average; but in the second half of 2011 thru early 2014 the wastewater chloride level was in a higher range of above 200 mg/L with some data in the 350 mg/L range when the river flow was very low due to drought conditions.

May 1992 TMDL Chloride Loadings Just Upstream of the Arkansas City Wastewater Treatment Plant

Site	Flow%	Facility Name	Ave. Flow* (cfs)	Ave. Conc. (mg/L)	WLA (tons/day	LA (tons/day)	WLA+LA (tons/day)	May Conc. (mg/L)	May 92 Flow	Load (tons/day)
		Flow from Oxford	306.45			238.92				
		Upper Slate Flows	5.98	153.52			2.48			
		Lower Slate Flows	1	40000		108.00				
		Oxford	0.19	300	0.15					
		Gueda Springs	0.01	300	0.01					
		GW Seepage	71	195		37.38				
Ark City (218)	92%							392	362	383.14
		Total	362.10	391.69			382.94			
		Flow from Ark City	362.10	391.69			382.94			
Below SC218		Ark City	2.17	153.18	0.90					
		Total	364.27	390.27			383.84			

The above table is reproduced from a KDHE TMDL assessment report. The table shows only the KDHE-determined, TMDL chloride loadings for the Arkansas River for May 1992 conditions just upstream of the Arkansas City wastewater treatment plant. The highlighted text indicates that KDHE estimates the Arkansas City wastewater treatment plant chloride contribution to the river is 0.90 tons per day. That is based on a 153 mg/L chloride level in the wastewater discharge. Previously it was noted that this value is somewhat greater during times of low river flow and drought.

Chloride in the Arkansas River

The table above is reproduced from a KDHE TMDL assessment report. The table shows only the KDHE-determined, TMDL chloride loadings for May 1992 conditions for the Arkansas River upstream of the Arkansas City wastewater treatment plant.

KDHE estimates the Arkansas City wastewater treatment plant chloride contribution to the river is 0.90 tons per day.

Certain items are highlighted in yellow on the Table; they are as follows. KDHE estimates the Arkansas City wastewater treatment plant chloride contribution to the river is 0.90 tons per day. That is based on a 153 mg/L chloride level in the wastewater discharge. Previously it was noted that this value is somewhat greater during times of low river flow and drought.

A Hypothetical and Worst Case Scenario

KDHE's concern of the chloride level in the Arkansas River near Arkansas City which is located on the Kansas-Oklahoma state line, is the basis of concern. Both the Arkansas River and the Salt Fork of the Arkansas River in Oklahoma have relatively high chloride levels also due to naturally occurring sources, mainly geological formations. The amount of chloride discharged from the Arkansas City wastewater treatment plant is miniscule compared the amount of chloride in the Arkansas River in Kansas and in Oklahoma.

Let's assume the KDHE number of 1.4 million gallons per day (MGD) discharge flow from the Arkansas wastewater treatment plant, a 500 mg/L chlorite level (twice the KDHE required level) in the discharge, and the lowest monthly, average flow (139.6 cubic feet per second (cfs) for September 2011) in the Arkansas River at Arkansas City for the 50 years from September 1963 thru September 2013. In this case, the treatment plant discharge would raise the chloride level in the river by 7.6 mg/L. That is not enough to affect the "salty taste" of the river water.

Please note in the table that the chloride contribution to the river from lower Slate Creek flow is 108 tons per day. Also, the contribution from GW Seepage (groundwater flow into the river) is 37.38 tons per day. Thus, the chloride contribution to the river from natural creek flow and natural groundwater flow dwarfs by more than one hundred times the amount from the Arkansas City wastewater treatment plant.

Two interesting points should be noted from the table and understanding of the groundwater system.

Thus, the chloride contribution to the river from natural creek flow and natural groundwater flow dwarfs by more than one hundred times the amount from the Arkansas City wastewater treatment plant.

If the city were not pumping the city water wells, then most of the city's present chloride contribution to the river would still enter the river from groundwater flow (in the area of un-pumped, city water wells) into the river. Secondly, the numbers in the table change monthly depending on many factors, most importantly the amount of water flowing in the river.

The amount of chloride from the city wastewater treatment plant is insignificant at all times as compared to the natural sources of Slate Creek, groundwater flow, and the river itself. But KDHE is regulating the city's wastewater treatment plant so as not degrade the river when the plant is, in fact, an insignificant source of chloride.

Chloride an "Arkansas City Issue"

As noted, at times the city wastewater treatment plant does not meet permit requirements for chloride in the discharge to the river. It is impractical to remove chloride at a wastewater treatment plant due to cost and operational complexities. Thus the city can address chloride removal in its drinking water treatment processes in order to meet wastewater treatment plant discharge requirements.

Arkansas City is in the process of planning a new water treatment plant. The city is considering the construction of a reverse osmosis (RO) plant. Such a plant is very expensive but can lower chlorides in the water.

The city has an older, conventional water treatment plant that presently produces good, safe drinking water. The plant meets or exceeds all required KDHE standards. This plant could be upgraded at a much lower cost than constructing a new RO plant, and the upgraded plant could serve the city for many decades into the future.

But there is a major complication in upgrading the present water treatment plant. A conventional plant does not lower chloride in the water. Thus the city would still have to add very expensive, additional treatment at the wastewater treatment plant because KDHE requires that chloride discharges meet the 250 mg/L requirement that is based on an "unenforceable" drinking water standard. It appears this standard is being used as enforceable.

The Scary Part: This Could Become Precedent

At the beginning of this article the "salty taste" (to some) criteria that causes the situation discussed is the chloride level for "domestic water supply" as determined by KDHE. The precedent is regulating to meet secondary standards for "salty taste" in drinking water.

The real danger in this situation is KDHE regulating Kansas water suppliers for other causes of "salty taste", that is, sulfate and total dissolved solids. There are many water suppliers that exceed these secondary standards and there are no adverse health effects or "salty taste". Regulating these water suppliers would be unreasonable, unfortunate and expensive to provide additional treatment.

A Summary: Some Common Sense

In the Arkansas River/chloride/TMDL/Arkansas City wastewater treatment plant permit requirements situation, there are some common sense, important points that should be understood.

1. No one in Kansas is being harmed by the chloride in the river or by drinking that water.
2. Chloride levels do not harm people; KDHE states chloride harms aquatic life at 860 mg/L.
3. The Arkansas City wastewater treatment plant is not a cause of high chloride in the river.
4. The are important matters on river water quality and drinking water quality; chloride at the levels in the lower Arkansas River is not one of them.
5. In the Arkansas City situation, the level of chloride in the drinking water or in the discharged wastewater should be a local decision only – and not a decision by the State, either directly or indirectly.
6. The chloride level in the Arkansas River will not be significantly lowered if Arkansas City constructs a new reverse osmosis water treatment plant or constructs new treatment processes at the wastewater treatment.

It is important for municipal and rural water district water suppliers, wastewater permit holders, and citizens to be vigilant on all environmental actions of the federal government and the State. There are many regulations and mandates that have considerable and unnecessary costs and do not necessarily make the environment or the drinking water better.

Pat McCool has worked as a consultant to KRWA since January 2004. He previously worked for KDHE for 30 years. Pat has a bachelor degree in Chemical Engineering and a masters degree in Environmental Engineering from the University of Kansas.