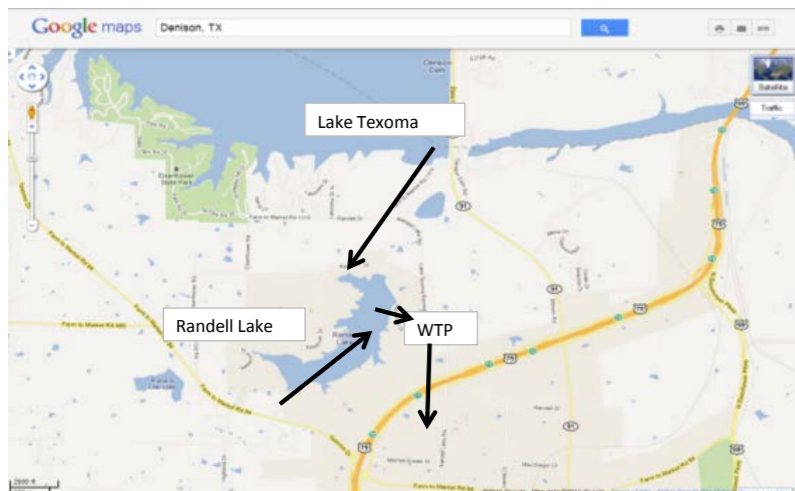


Chloride Mass Balance for Denison WTP with usage of Full Water Rights

Denison, TX situation

- > No additional treatment for chlorides, etc.
- > Raw water blended from Randell Lake and Lake Texoma
- > Production limited from Lake Randell based on watershed
- > As population increases or drought occurs, larger fraction of Texoma water needed



<http://water.epa.gov/drink/contaminants/secondarystandards.cfm>

Table I. Secondary Maximum Contaminant Levels

Contaminant	Secondary MCL	Noticeable Effects above the Secondary MCL
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/ 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 TON (threshold odor number)	"rotten-egg", musty or chemical smell
pH	6.5 - 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 the 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

* mg/L is milligrams of substance per liter of water

Data	Units	THIS TABLE USED FOR ONE-SCENARIO CALCULATION - BLUE BOLDED DATA USED FOR TABLE AND GRAPH BELOW
250 mg/L		EPA secondary water quality standard for chloride
300 mg/L		Texas Chloride secondary MCL for surface-water bodies designated for the public water supply use. 30 TAC §290.118
350 mg/L		Lake Texoma Chloride concentration - select case
5.2 mgd		Flow from Lake Texoma blended into Randell Lake
15178.8 ppd		mass of chloride from Texoma
100 mg/L		Randell Lake Chloride concentration - unblended
4.8 mgd		Flow from Randell Lake watershed - full water right
4003.2 ppd		mass of chloride from Randell
19182 ppd		Blended water total chloride mass
10 mgd		Total required flow - monthly avg
230 mg/L		Resulting Chloride concentration

Water Right on Lake Randell
 5400 acre/ft/yr
 235224000 cubic feet/yr
 644449 cubic feet/day
 4.8 mgd

Total Water Demand, mgd	Lake Texoma Cl = 450 mg/L	Lake Texoma Cl = 400 mg/L	Lake Texoma Cl = 350 mg/L	Lake Texoma Cl = 300 mg/L	Lake Texoma Cl = 250 mg/L
4	30	40	50	60	70
4.5	77	80	83	87	90
5	114	112	110	108	106
5.5	145	138	132	125	119
6	170	160	150	140	130
6.5	192	178	165	152	139
7	210	194	179	163	147
7.5	226	208	190	172	154
8	240	220	200	180	160
8.5	252	231	209	187	165
9	263	240	217	193	170
9.5	273	248	224	199	174
10	282	256	230	204	178
10.5	290	263	236	209	181
11	297	269	241	213	185
11.5	304	275	246	217	187
12	310	280	250	220	190
12.5	316	285	254	223	192
13	321	289	258	226	195
13.5	326	293	261	229	197
14	330	297	264	231	199

