Chloride

"Standard Methods for the Examination of Water and Wastewater" reports that chloride, in the form of the chloride ion, is one of the major inorganic anions in water and wastewater. The salty taste is dependent upon chemistry of the ground water and variations in the threshold of human taste. In reasonable concentrations, it is not harmful to humans, but in concentrations above 250 mg/l chloride, it causes a salty taste in water which is objectionable to some people. Richter and MacLean, in a study found taste thresholds which are consistent with the recommended limit of 250 mg/l for chloride. The only other reference to its effect upon human health has been in fairly recent research which suggests a possible correlation between chloride concentrations and hypertension.

In Michigan, aquifers with naturally high concentrations of chloride associated with sedimentary rocks are often considered to be "old water". High chloride water also occurs in chloride rich rock such as the Keweenaw Conglomerate. Ground water chloride concentrations also my be elevated as a result of land disposal of wastewater, faulty industrial brine wells, faulty landfills, oil fields, and as a result of road salt.

Higher concentrations of chlorides are known to accelerate corrosion of metallic pipes and structures. There is a lack of precise data on the effect and economic impact of corrosive effects of chloride. In the Nahma public water supply system, for example, some individuals report marked corrosive effects from concentrations at the level of 400 mg/l and others do not. As with taste, the tolerances are variable and dependent upon chemical composition of the water. People may detect taste at 250 mg/l if the cation is sodium while the salty taste may be absent with concentrations as high as 1,000 mg/l when the predominant cations are calcium or magnesium.

Chloride can be removed from drinking water by distillation, reverse osmosis or electrodialysis. The technology for treatment is available, but it is not economically practical on an individual basis. Therefore, on a practical basis, chloride is untreatable. Alternatives need to be considered, including the possibility that aquifer selection and well construction may be minimize the problem. Additionally, the problem of high concentrations of chlorides in terms of well contamination resulting from well casing corrosion and intrusion of contaminants must be reviewed. The health department may need to require special well construction to protect bacteriological quality of potable water, including grouting and/or the use of inert material for water well casings.

The recommended limit for chloride is 250 mg/l based upon experience with taste studies and the effects of corrosion. Since taste and corrosion problems are related to total chemistry, care must be taken in making generalizations. For the sake of expediency, 250 mg/l has been identified as a recommended limit without making it necessary to identify any economic impact or any taste problem through disclosure below 250 mg/l.

Quality is categorized as marginal between 250 mg/l and 500 mg/l with the probability that most people will complain about the taste. Corrosion may be accelerated sufficiently to have an effect on metal system components at higher concentrations, and the predictable economic impact should be recognized and identified in disclosure. Water having greater than 500 mg/l has been identified as poor or

very poor depending upon concentration, although many people tolerate water at high chloride levels because of lack of suitable alternatives. The water has a definate saline taste to most persons, significantly accelerates corrosion, and thus requires full disclosure of the concentration, effects, and the impact, as well as declaring the water untreatable. At concentrations higher than 750 mg/l, the water is unpalatable and, therefore, not normally usable for drinking or household purposes.

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Quality (1)	**Concentration (2)**	**Effect* (3)**	**Significance (4)**	**Treatment (5)**	**Disclosure**
Good	0-250 mg/l	Below recommended limit No known health risk Generally no taste problem Corrosion probably is not significant	No known health impact No significant economic impact	None required	1, 2 or none.
Marginal	250-500 mg/l	Above recommended limit No known health risk Probably taste Corrosion is definitely accelerated.	No known health impact-some people may find taste objectionable, may have corrosive effect on metal, including pipes, fixtures, appliances, etc. Usually some economic impact.	Treatment not normally economically feasible.	1, 2, 3, 4
Poor	500-750 mg/l	Above recommended limit No known health risk Definite saline taste Greatly accelerated corrosion	No known health impact-most individuals find taste objectionable. Corrosion of plumbing and appliances can cause leaks and malfunction of equipment. Corrosion can have significant economic impact.	Treatment not normally economically feasible.	1, 2, 3, 4, 5
Very poor	> 750 mg/l	Saline taste Highly corrosive	Unpalatable-plumbing and appliances will deteriorate rapidly due to corrosion. Severe economic impact. Normally not usable for drinking or household purposes.	Treatment not normally economically feasible.	1, 2, 3, 4, 5
* Taste and corrosion problems are related to total chemistry, and the above are generalizations					