CE 480 Capstone Project: Water Quality Regulations

Stated By the California Water Quality Control Boards, these are following contaminant levels for inorganic chemicals that are allowed in drinking water [1]:

Constituent	Maximum Contaminant Level (mg/L)
Aluminum	1.0
Antimony	0.006
Arsenic	0.010
Asbestos	7 MFL*
Barium	1.0
Beryllium	0.004
Cadmium	0.005
Chromium	0.05
Cyanide	0.15
Fluoride	2.0
Mercury	0.002
Nickel	0.1
Nitrate	45.0
Nitrate+Nitrite	10.0
Nitrite	1.0
Perchlorate	0.006
Selenium	0.05
Thallium	0.002

- Stated By the California Water Quality Control Boards, these are following contaminant levels for organic chemicals that are allowed in drinking water [1]:

Constituents	Maximum Contaminant Level (mg/L)
Volatile Organic Chemicals (VOCs)	

Benzene	0.001
Carbon Tetrachloride	0.005
1,2-Dichlorobenzene	0.6
1,4-Dichlorobenzene	0.005
1,1-Dichloroethane	0.005
1,2-Dichloroethane	0.0005
1,1-Dichloroethylene	0.006
cis-1,2-Dichloroethylene	0.006
trans-1,2-Dichloroethylene	0.01
Dichloromethane	0.005
1,2-Dichloropropane	0.005
1,3-Dichloropropene	0.0005
Ethylbenzene	0.3
Methyl-tert-butyl ether	0.013
1,1,2,2-Tetrachloroethane	0.001
Tetrachloroethylene	0.005
Toluene	0.15
1,2,4-Trichlorobenzene	0.005
1,1,1-Trichloroethane	0.200
1,1,2-Trichloroethane	0.005
Trichloroethylene	0.005
Trichlorofluoromethane	0.15
1,1,2-Trichloro-1,2,2-Trifluoroethane	1.2
Vinyl Chloride	0.0005
Xylenes	1.750*
Non-Volatile Synthetic Organic Chemicals	
Alachlor	0.002

Atrazine	0.001
Bentanzon	0.018
Benzo(a)pyrene	0.0002
Carbofuran	0.018
Chlordane	0.0001
2,4-D	0.07
Dalapon	0.2
Dibromochloropropane	0.0002
Di(2-ethylhexyl)adipate	0.4
Di(2-ethylhexyl)phthalate	0.004
Dinoseb	0.007
Diquat	0.02
Endothall	0.1
Endrin	0.002
Ethylene Dibromide	0.00005
Glyphosate	0.7
Heptachlor	0.00001
Heptachlor Epoxide	0.00001
Hexachlorobenzene	0.001
Hexachlorocyclopentadiene	0.05
Lindane	0.0002
Methoxychlor	0.03
Molinate	0.02
Oxamyl	0.05
Pentachlorophenol	0.001
Picloram	0.5
Polychlorinated Biphenyls	0.0005

Simazine	0.004
Thiobencarb	0.07
Toxaphene	0.003
2,3,7,8-TCDD (Dioxin)	3e^-8
2,4,5-TP (Silvex)	0.05

Aesthetic [1]:

- The physical aesthetic of water can be caused naturally or by external uses, and though it may not be inherently dangerous, water color can pose a future threat. Water quality can prevent light penetration, which could lead to subsequent water quality problems. Specifically, drinking water must meet the standards of 15 color unints.
- Following, the odor and taste will also play a role in human consumption, for it may not be a factor in health risk but it is unpleasant.

Biostimulatory Substances[1]:

- Water should not have excessive concentration of biostimulatory substances (nutrients: nitrogen phosphorus), for it can deteriorate water quality.

Chemical Constituents [1]:

- Over saturation of chemicals can be harmful for human consumption. This includes various forms of nitrogen, which can have health problems when consumed.

Salinity [2]:

- For salinity of water resourcing, the concentration of salinity shall not exceed 1 and 10 parts per thousand at 25C. However, the salinity criteria vary by regions, as more or less salinity may be allowed.

Bacteria (Coliform) [1]:

- **In Marine Waters Designated for Water Contact Recreation**
    - **Geometric Means Limit:**
        - Total coliform density: 1000/100 ml.
        - Fecal coliform density: 200/100 ml.
        - Enterococcus density: 35/100 ml.
    - **Single Sample Limit:**
        - Total coliform density: 10,000/100 ml.
        - Fecal coliform density: 400/100 ml.
        - Enterococcus density: 104/100 ml.
        - Total coliform density: 1000/100 ml.
- **In Fresh Waters Designated for Water Recreation**
    - **Geometric Mean Limit:**

        - E.coli density: 126/100 ml.
    - **Single Sample Limit: 3**
        - E.coli density: 235/100 ml.
- **In Fresh Waters Designated for Water Contact Recreation**
    - **Geometric Mean Limit:**
        - E.coli destiny: 126/100 ml.
    - **Single Sample Limit:**
        - E.coli density: 576/100 ml.

Gray Water:

- Gray water is wastewater sourced from bathtubs, showers, bathroom wash basins, washing machines, laundry facilities, and similar types of discharge. However, it excludes discharge from kitchen sinks, photo lab sinks, dishwashers, or laundry water contaminated with wastewater [3].
- A clothing washing system discharges approximately 250 gallons per day [3].

Indoor Uses:

- Indoor water uses for grey water include: toilet/urinal flushing, laundry washing, and trap primers and oolong tower make-up [6].
    - Treatment and water quality must follow the CCR Title 22 Recycled Water Quality Equivalence or NSF 350 disinfection standards [6].

Outdoor Uses:

- For untreated graywater, it will be used for mulch basin or subsurface irrigation. This does not require you to meet a water quality standard or follow a treatment process [6].
- Treated gray water can be utilized for similar purposes as untreated, as well as, spray/drip irrigation, non-interactive outdoor water features [6]. Treated graywater must follow NSF 350 with disinfection and Title 22 Recycled Water Quality Equivalence [6].

Wastewater:

- Wastewater is water generated from manufacturing, commercial, or other facilities, which exclude domestic wastewater [4].

Storm Water:

Indoor Uses:

- Storm water potentially contains various contaminants. The following uses for recycled stormwater include: toilet/urinal flushing and trap primers and cooling tower make-up [6].
- Recycled storm water quality must follow: NSF 350, CCR Title 22, bacterial limits at distribution points, and California Maximum Contamination Levels and California Toxic Rule Standards [6].
- Treatment Process must follow: NSF 350 and the adhering to specific treatment types based on chemical components required [6].

Outside Uses:

- Treated stormwater can be utilized for mulch basin, drip, and subsurface irrigation. The water quality must follow California Maximum Contamination Levels and California Toxic Rule Standard.
- Untreated stormwater can be utilized for the same procedures as treated, as well as spray irrigation, non-interactive outdoor water features, street sweeping, and dust

control. Quality standards must adhere to NSF 350 (if sprayed), CCR Title 22, bacterial limits at point of distribution, and California Maximum Contamination Levels and California Toxic Rule Standard [6].

Recycled Water Usage:

- Based on the Title 22 Code of Regulations, water that is recycled can only be used for the following purposes: irrigation, cooling, impoundments, and various non-potable uses [5].

Indoor Uses:

- Uses for recycled water are as follows: toilet/urinal flushing, laundry washing, cooling tower make-up, and industrial processes [6].
- Water Quality and treatment process must follow the CCR Title 22 requirements and point use and onsite treatment that complies with water quality standards [6].

Outside Uses:

- Recycled water can be utilized for drip/spray/subsurface irrigation, non-interactive outdoor water features, street sweeping, dust control, and industrial uses [6]
- The water quality standard must adhere to CCR Title 22 and bacterial limits at the point of distribution for spray irrigation [6].

Sources

[1] www.EPA.gov
[2] www.ecfr.gov
[3] Gray Water Los Angeles
[4] LA Sanitation
[5] Title 22 Code of Regulations
[6] Guidelines for Alternate Water Sources: Indoor and Outdoor Non-Potable Uses