SUMMARY OF KEY WASTEWATER
MATH FORMULAS

General:

1. **Mass, Lbs/Day** = **(Vol, MGD) x (Conc., mg/l) x (8.34 lbs/gal)**

   (BOD)/(SS), Lbs/Day = **(Vol, MGD) x (SS, mg/l) x (8.34 lbs/gal)**

2. **Dosage, mg/l** = $\dfrac{(\text{Feed, lbs/day})}{(\text{ Vol, MGD }) \text{ X } (8.34 \text{ lbs/gal })}$

3. **Rectangular Tank Volume, cu. ft.** = **(Length, ft) x (Width, ft) x (Height, ft)**

   i) **Vol, Gals** = **Multiply the above by the factor 7.48 gals/cu.ft.**

4. **Right Cylinder Volume, cu. ft.** = **(0.785) x (D^2,ft) x (Height or Depth,ft)**

   i) **Vol, Gals** = **Multiply the above by the factor 7.48 gals/cu.ft.**

5. **Conical Base Volume, Cu. ft.** = $\dfrac{(0.785) \text{ x } (D^2,\text{ft}) \text{ x (Height or Depth,ft)}}{(3)}$

   i) **Vol, Gals** = **Multiply the above by the factor 7.48 gals/cu.ft.**

6. **Removal, Percent** = $\dfrac{(\text{In - Out })}{\text{In}} \text{ x } 100$

7. **Decimal Fraction** = $\dfrac{(\text{Percent })}{100}$

8.   **Population Equivalent, BOD/TSS Lbs. Loading** = (Population) x BOD or TSS, lbs/day/capita

    a)   **Population Equivalent, No. of People** =

$$\frac{(\text{Vol, MGD}) \times (\text{Conc., mg/l}) \times 8.34 \text{ lbs/gal})}{(\text{BOD or TSS, 0.17 lbs/day/capita})}$$

    b)   **Population Equivalent - BOD, mg/l** =

$$\frac{(\text{Population}) \times (\text{BOD or TSS, lbs/day per capita})}{(\text{Flow, MGD}) \times (8.34 \text{ lbs/day})}$$

9.   **Daily Hydraulic Loading, GPD** = (Population, No. of People) x (100 GPCD)

    a)   **Population, No. of People** =

$$\frac{(\text{Daily Hydraulic Loading, GPD})}{(100 \text{ GPCD})}$$

10.   **GPD** =

$$\frac{(\text{2nd Meter Reading - 1st Meter Reading})}{(\text{Elapsed Time, Days})}$$

11.   **Supply, Hrs (Full or Tank Dry)** =

$$\frac{(\text{Storage Volume, Gallons})}{(\text{Flow In, GPM - Flow Out, GPM}) \times 60 \text{ Min/Hr.}}$$

12.   **Percent (%) of Increase** =

$$\frac{(\text{Larger Amount})}{(\text{Smaller Amount})} - 1.0 \times 100$$

Rectangular Horizontal-Flow Grit Chambers:

1.   **Velocity**

Q,cfs = (Area, sq.ft.) x (Velocity, fps), or

$$\frac{(\text{ GPM })}{(\text{ 448.8 GPM/cfs })} = (0.785) \times (D,\text{ft})^2 \times \frac{(\text{ Distance, ft })}{(\text{ Time, sec. })}$$
or . . . (Base x Height, ft.)

$Q = (A) \times (V)$

$A = \dfrac{(Q)}{(V)}$

$V = \dfrac{(Q)}{(A)}$

IMPORTANT CONVERSIONS: 1.55 CFS/MGD   448.8 gpm / CFS

2.   **1.0 FPS = 3.0 sq. ft. of area for
every 3.0 cfs of flow.**

3.   **Velocity = At 1.25 fps, or greater, bottom
scour begins to occur.**

4.   **Flow Conversions:**

Flow, GPM = (Q, cfs) X (448.8 GPM/cfs)

$$\text{Q, cfs} = \frac{(\text{ Flow, GPM })}{(\text{ 448.8 GPM/cfs })}$$

5.   **Cubic Yards = $\dfrac{(\text{ Cubic Feet })}{(\text{ 27 cubic ft./Cu. Yd })}$**

Pumps and Pumping:

1.   **Hydraulics:**

        Head, ft.   =   **(2.31 ft/psi) x PSI, or**

        PSI   =   **(0.433 PSI/Ft) x (Head, ft.)**

2.   **Pumping: Rates:**

        Volume, Gals   =   **GPM x Time, minutes**

        Fill Rate, GPM   = $\dfrac{\textbf{(Tank Volume, Gals)}}{\textbf{(Time, minutes)}}$

        Fill Time, Minutes   = $\dfrac{\textbf{(Tank Volume, Gals)}}{\textbf{(Fill Rate, GPM)}}$

3.   **Pump Size:**

        Water Hp.   = $\dfrac{\textbf{(GPM) x (Head,ft)}}{\textbf{(3,960)}}$

        Brake Hp.   = $\dfrac{\textbf{(GPM) x (Head,ft)}}{\textbf{(3,960 x (%, Effic.)}}$

        %, Effic.   = $\dfrac{\textbf{(GPM) x (Head,ft)}}{\textbf{(3,960 x (Brake Hp.)}}$ **x 100**

        GPM   = $\dfrac{\textbf{(Brake Hp.) x (3,960) x (%, Efffic)}}{\textbf{(Head, ft.)}}$

        Head, ft.   = $\dfrac{\textbf{(Brake Hp.) x (3,960) x (%, Efffic)}}{\textbf{(GPM)}}$

4.   **Vol, GPM**   =   **(0.785) x (Bore,ft)^2 x (Stroke, ft.) x 7.48 x**
                                 S/min x %, Effic.

        Gals   =   **(0.785) x (Bore,ft)^2 x (Stroke, ft.) x 7.48 gals/cu. ft. x**
                                 (Strokes/minute) x (%, Effic.) x (Pumping Minute)

5.   **Cost/day**   =   **(Brake Hp.) x (0.746 Kw/Hp.) x Operating Time, Hrs.**
                                x $\dfrac{\textbf{(¢ /Kw- Hr.)}}{\textbf{100}}$

6.   **Speed, RPM (N_2)**   = $\dfrac{\textbf{(}N_1\textbf{ x }D_1\textbf{)}}{\textbf{(}D_2\textbf{)}}$

7.   **Drawdown, ft.**   =   **Pumping Level, ft. - Static Level, ft.**

Strength of Solutions:

1. **Chemical Feed Pumps:**

$$\text{GPD} = \frac{(\text{ Required Feed, Lbs/Day })}{(\text{ Dry lbs/Gal })} = \frac{(\text{MGD}) \times \text{ mg/L} \times 8.34}{(\text{ Dry lbs/Gal })}$$

2. **Chemical Feed Rate:**

$$\text{GPD} = \frac{(\text{ Feed, ml/minute} \times 1{,}440 \text{ min/day })}{(1{,}000 \text{ ml/L} \times 3.785 \text{ L/gallon })}$$

$$\text{ml/min} = \frac{(\text{ GPD} \times 1{,}000 \text{ ml/L} \times 3.785 \text{ L/Gallon })}{(1{,}440 \text{ min/day })}$$

$$\text{ml/min} = (\text{ GPM} \times 3{,}785 \text{ ml/gal })$$

3. **Lbs/gallon** $=$ $\dfrac{(\text{ \% Solution })}{(100)} \times 8.34 \text{ lbs/gallon} \times (\text{Specific Gravity, if needed})$

4. **Lbs Chemical** $=$ Specific Gravity $\times$ 8.34 lbs/gallons $\times$ Gallons of Solution

5. **Specific Gravity** $=$ $\dfrac{(8.34 \text{ lbs/gallon} + \text{ Chemical Wt., Lbs/gallon })}{(8.34 \text{ lbs/gallon })}$

6. **Specific Gravity, Lbs/gallon** $=$ $(\text{S.G.} \times 8.34 \text{ lbs/gal}) - (8.34 \text{ lbs/gal})$

7. **% Percent of Chemical in Solution from Dry Stock** $=$ $\dfrac{(\text{ Dry Chemical, Lbs })}{(\text{ Dry Wt. Chemical, Lbs }) + (\text{ Water, Lbs })} \times 100$

8. **Mixture Gals for Percentage (%)** $=$ $\dfrac{(\text{ Gals of Dilute Solution} \times \text{Lower Concentration, \% })}{(\text{ Higher Concentration Solution, \% })}$

9. **Two-Normal Equations:**
    a) $\quad C_1 V_1 = C_2 V_2$

    b) $\quad \dfrac{Q_1}{V_1} = \dfrac{Q_2}{V_2}$

10. **Three Normal equations:**
    a) $\quad (Q_1 C_1) + (Q_2 C_2) = (Q_3 C_3)$

    b) $\quad \dfrac{Q_1}{V_1} = \dfrac{Q_2}{V_2} = \dfrac{Q_3}{V_3}$

Sedimentation Tanks and Clarifiers:

Hydraulic Cross- Check Formulas

1. **Detention** $=$ $\dfrac{\text{(Volume, gals) x (24 Hrs./day)}}{\text{(Total 24 Hr. Flow, gals/day)}}$
    Time, Hrs.
    Design Data: 1 - 2.5 Hours; Average 1.5 hours.

2. **Total Flow, GPD** $=$ $\dfrac{\text{(Volume, gals) x (24 Hrs./day)}}{\text{(Detention Time, Hrs.   )}}$

3. **Surface Loading** $=$ $\dfrac{\text{(Total Flow, GPD   )}}{\text{(Surface Area, sq.ft.)}}$
    Rate, GPD/sq ft.
    Design Data: 800 - 1,200 GPD/Sq. Ft.

4. **Weir Overflow** $=$ $\dfrac{\text{(Flow, GPD   )}}{\text{(Weir Length, ft)}}$
    Rate, GPD/Ft

    Weir Length, ft $=$ **Circumference, ft.** $=$ π **x Diameter, ft**
    Design Data: 10,000 - 20,000 GPD/LF; Average 15,000 GPD/L.F.

5. **Solids Loading** $=$ $\dfrac{\text{(Solids into Clarifier, lbs/day)}}{\text{(Surface Area, sq. ft.   )}}$
    Rate, lbs/day/sq. ft.
    Design Rate: Primary Clarifiers: Not a design consideration.
    2nd. Clarifiers: 12 - 30 lbs/day/sq. ft.

6. **Sludge Solids, lbs** $=$ (Flow, Gals) x (8.34 lbs/gal) x $\left(\dfrac{\text{Sludge, \%}}{100} \right)$
    or GPD

7. **Raw Sludge** $=$ $\dfrac{\text{(Settleable Solids, ml/L) x (Plant Flow, GPM)}}{\text{(1,000 mls/L   )}}$
    Pumping, gpm

Ponds and Lagoons:

1. Organic Loading = $\dfrac{(\text{BOD In, lbs/day})}{(\text{Pond Area, acres})}$

   Rate, Lbs/day/acre

   Design Data: 25 - 50 Lbs/day of BOD

2. Pond Area, Acres = $\dfrac{(\text{BOD In, Lbs/day})}{(\text{Organic Loading Rate, lbs/day/acre})}$

   Design Data: 20 - 50 Acres (Range)

3. Detention Time, = $\dfrac{(\text{Volume, Acre-ft})}{(\text{Flow, Acre-ft/Day})}$

   Days

   Design Data: 60 - 180 Days

4. Surface Area, Acres = $\dfrac{(\text{Flow, MGD}) \times (\text{BOD Conc. mg/l}) \times (8.34 \text{ lbs/gal})}{(\text{Loading Rate, Lbs/Acre/Day})}$

   (BOD Loading)

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5. Hydraulic Loading = $\dfrac{(\text{Pond Depth, Inches})}{(\text{Detention Time, Days})}$

   Rate, Inches/day

6. Pond Depth, Ft. = $\dfrac{(\text{Daily Flow Into The Pond, Cu.ft.})}{(\text{Total Surface Area of the Pond, Sq.ft.})}$

7. Volume, = (Area, acres) x (Depth, ft.)

   Acre-Ft

8. Flow Rate, = $\dfrac{(\text{Daily Flow into Pond, GPD})}{(7.48 \text{ Gal/cu.ft.}) \times (43{,}560 \text{ cu.ft/acre-ft.})}$

   Acre-Ft/Day

Evaporation / Percolation Rates

9. Inches/Day = $\dfrac{(\text{Volume lost, Gallons/Day})}{(\text{No. of Acres} \times 325{,}828 \text{ gals/Ac-ft}) \times (12''/\text{ft})}$

10. Vol, Gals = (Acres, sq.ft.) x $\dfrac{(\text{Evap. Rate, inches/day})}{(12'')}$ x 7.48 gals/cf

    Lost/Day

Trickling Filters:

1.   **Organic Loading** = $\dfrac{(\text{ BOD, Lbs/Day })}{(\text{ Media Volume, 1,000's of cu.ft. })}$
      Rate, Lbs/Day/1,000 cu.ft.

      Same as . . . = $\dfrac{(\text{ MGD }) \times (\text{ mg/L BOD }) \times 8.34 \text{ lbs/gal})}{(\text{ Media Volume, 1,000's of cu.ft. })}$

2.   **Hydraulic Loading** = $\dfrac{(\text{ GPM })}{(\text{ Surface Area, sq. ft. })}$
      Rate, GPM/sq.ft.

3.   **Hydraulic Loading** = $\dfrac{(\text{ GPM } \times \text{ 1,440 min/day })}{(\text{ Surface Area, sq. ft. })}$
      Rate, GPD/Sq. Ft.

      a)   **Hydraulic Loading** = $\dfrac{(\text{ GPM })}{(\text{ Surface Area, sq. ft. })}$
            Rate, GPM/sq.ft.

4.   **Recirculation** = $\dfrac{(\text{ Recirculation Flow, } Q_1)}{(\text{ Average Influent Flow, } Q_2)}$
      Ratio

5.   **Total Flow** = $(\text{ Recirculation Flow, } Q_1) + (\text{ Average Influent Flow, } Q_2)$

Rotating Biological Contactors:

1. **Organic BOD Loading Rate, Lbs/Day/1,000 sq.ft.** $=$ $\dfrac{(\text{ Soluble BOD Applied, lbs BOD/Day })}{(\text{ Media Surface Area/1,000 sq. ft. })}$

2. **Hydraulic Loading Rate, GPM/sq.ft.** $=$ $\dfrac{(\text{ GPM })}{(\text{ Surface Area, sq. ft. })}$

3. **Hydraulic Loading Rate, GPD/sq.ft.** $=$ $\dfrac{(\text{Total Flow, GPD }) \text{ Including Recirculation}}{(\text{ Surface Area, sq.ft. })}$

4. **BOD Applied, Lbs/Day** $=$ **(Flow, MGD) x (Soluble BOD, mg/l) x (8.34 lbs/gal)**

5. **Soluble BOD, mg/l** $=$ **Total BOD, mg/l - Suspended BOD, mg/l, or**

    Soluble BOD, mg/l $=$ **(Total BOD, mg/l) - (K x Suspended Solids, mg/l)**

6. **Suspended BOD, mg/l** $=$ **K x Suspended Solids, mg/l**
    (K = 0.5 - 0.7 for most domestic wastewaters.)

SUMMARY OF KEY WASTEWATER
MATH FORMULAS - Continued

Oxidation Ditches:

1. **F/M** $\quad = \quad \dfrac{(\ \text{BOD, lbs/day}\ )}{(\ \text{MLVSS, lbs}\ )}$

2. **BOD Loading Rate, Lbs/Day/1,000 Cu. Ft.** $\quad = \quad \dfrac{(\ \text{BOD, lbs/day}\ )}{(\ \text{Ditch Volume, in 1,000 Cu. ft.}\ )}$

3. **Ditch Detention Time, Hours** $\quad = \quad \dfrac{(\ \text{Ditch Vol, MG}\ ) \times 24 \text{ Hours/Day}\ )}{\text{Flow, MGD}}$

4. **Determine Sludge Age:**

   a) **Aeration Solids, lbs.** $\quad = \quad$ (Vol, MG) x (MLSS, mg/l) x (8.34 lbs/gal)

   b) **Solids Added, lbs/day** $\quad = \quad$ ((Vol, MG) x (Inf. SS, mg/l) x (8.34 lbs/gal)

   c) **Sludge Age, Days** $\quad = \quad \dfrac{(\ \text{Solids Under Aeration, lbs}\ )}{\text{Solids Added, lbs/day}}$

5. **Calculate Ditch Volume:**

   a) **Average Width, ft.** $\quad = \quad \dfrac{(\ \text{Bottom, ft.}\ ) + (\ \text{Depth, ft}\ )}{(\ \text{Slope}\ )}$

   b) **Area Determination**

       i)   **Area, sq. ft.** $\quad = \quad$ **Width, ft x Depth, Ft., or**

       ii   **Area, sq. ft.** $\quad = \quad \dfrac{(\text{B,Width}_1, \text{ft.} + \text{T,Width}_2, \text{ft.})}{(\ 2\ )}$

   c) **End Lengths, ft.** $\quad = \quad$ (2 π) x Radius, ft.

   d) **Total Length, ft.** $\quad = \quad$ Ends Lengths, ft + (2 Lengths, ft.)

   e) **Volume, cu. ft.** $\quad = \quad$ (Length, ft.) x (Area, sq. ft.)

Activated Sludge:

1. **F/M RATIO** = $\dfrac{\text{(BOD in Primary Effluent, lbs/day)}}{\text{(Lbs of Mixed liquor VSS in the Aeration Tanks)}}$

2. **Mean Cell Residence Time, Days, (MCRT)** = $\dfrac{\text{(Aeration Tank TSS, lbs + Clarifier TSS, lbs)}}{\text{(TSS Wasted, lbs/day + Effluent TSS, lbs/day)}}$

   a) **TSS Wasted, =** $\dfrac{\text{(Aer. Tnk TSS,lbs) + (Clar.TSS, lbs)}}{\text{(MCRT, Days)}} - \text{Effluent TSS, Lbs}$

   b) **MCRT, Days** = $\dfrac{\text{(Aeration Tank TSS, lbs) + (RAS, Lbs)}}{\text{(TSS Wasted, lbs + Effluent TSS, lbs)}}$

3. **Sludge Volume Index (SVI), ml/g** = $\dfrac{\text{(Settled Volume, ml/L) x (1,000 Mg/G)}}{\text{(MLSS, Mg/L)}}$

   MLSS, mg/l = $\dfrac{\text{(1,000,000)}}{\text{SVI}}$

4. **Sludge Density Index (SDI)** = $\dfrac{\text{(100)}}{\text{SVI}}$

5. **Sludge to Waste, lbs/day** = $\dfrac{\text{(Secondary SS, lbs)}}{\text{(MCRT, days)}} - \text{Effluent SS, lbs/day}$

6. **Sludge Age, Days** = $\dfrac{\text{(Aeration Tank TSS, lbs)}}{\text{(Primary Clarifer Effluent TSS, lbs/day)}}$ (Refer to MCRT)

7. **Return Sludge** = (Aerator Flow, MGD) x (Settable Solids, %) Rate, **MGD**

8. **Desired MLSS, mg/l** = $\dfrac{\text{(Desired MLSS in Aerator, lbs.)}}{\text{(Aerator Vol., MG) x (8.34 lbs/gal)}}$

9. **Cu.ft. Air/ Lb. BOD Removed** = $\dfrac{\text{(Air, Cu.ft.)}}{\text{(Primary Effl., lbs BOD - Secondary Effl., lbs. BOD)}}$

Anaerobic Digesters:

1. Volatile Solids Loading, Lbs VS/Day/Cu.Ft. $= \dfrac{\text{(Feed Sludge VS, lbs/day)}}{\text{(Digester Volume, cu.ft.)}}$

2. Detention Time, Days $= \dfrac{\text{(Digester Volume, Gallons)}}{\text{(Sludge Feed, GPD)}}$

3. Digester Loading, Lbs Vol. Matter/ Cu. Ft./day $= \dfrac{\text{(Lbs of Volatile Matter Added/Day)}}{\text{(Volume of Digester, Cu. Ft.)}}$

4. Volatile Solids Reduced, % $= \dfrac{\text{(VS In - VS Out)}}{\text{(VS In) - (VS, In }\times\text{ VS, Out)}} \times 100$

5. Gas Production, Cu.Ft./lb VS Reduced $= \dfrac{\text{(Gas Produced, cu.ft./day)}}{\text{(VS Feed, lbs/day) x (Reduction/100)}}$

6. Gas, Lbs $=$ Volatile Solids, lbs x % Reduction of Volatile Matter

7. VA/Alk Ratio $= \dfrac{\text{(Volatile Acids, mg/L)}}{\text{(Alkalinity, mg/L)}}$

8. Volatile Matter Destroyed, lbs/day/cu.ft. $= \dfrac{\text{Sludge Pumped, gals/day x \% Solids x \% Volatile x \% Reduction x 8.34 lbs/gal}}{\text{(Digester Volume, cu. ft.)}}$

9. Pumping, Minutes $= \dfrac{\text{(Flow, MGD) x (Inf. SS, mg/L - Effl, SS, mg/L) x 100\%}}{\text{(Pump, GPM) x (Sludge Solids, \% x (24 Hours/day)}}$

10. V.S. Destroyed, Lbs/day/cu. ft. $= \dfrac{\text{(VS Added, lbs/day)(VS Reduction, \%)}}{\text{(Disgester Volume, Cu. ft. }\div\text{ 100\%)}}$

11. Digested Sludge in Storage, Lbs. $=$ (VS Added, lbs/day) x $\dfrac{\text{(Loading, Lbs Digester Sludge)}}{\text{(Lbs VS / Day)}}$

12. Volatile Solids, Lbs $= \dfrac{\text{(Dry Solids, lbs) x (Raw Sludge, \% VS)}}{\text{(100 \%)}}$

Tertiary Filtration:

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1. **Filter Flow Rate:**

Filtration Rate, = (Filter Area,sq.ft.) x (GPM/sq.ft.)
GPM

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2. **Filter Backwash:**

Backwash, gals = (Filter Area,sq.ft.) x (Backewash Rate, gpm) x (Time, min)

Backwash = (Backwash Volume, gpm)
Rate, gpm/sq.ft. (Filter Area, sq.ft.)

Backwash,gals = (Filter Area, sq.ft.) x (Rise/Fall,ft/min)
x (7.48 gals/cu.ft.)

Land Application:

1. **Required Acres** **=** $\dfrac{\text{(Total Volume of sludge, tons/year)}}{\text{(Limit, tons per acre)}}$

2. **Sludge Application, Lbs.** **=** (Gal. of Sludge) x (8.34 lbs/gal) x (% Solids in Sludge)

Waterways Discharge:

1. **Diluted Concentration, mg/l or µg/l** **=** $\dfrac{\text{(Stream Conc. 1 x Stream, } Q_1 \text{) + (Waste Conc. 2 x Waste, } Q_2 \text{)}}{\text{(Stream } Q_1 \text{ + Waste } Q_2 \text{)}}$

2. **Lbs O_2/Day** **=** (Flow, MGD) x (Conc. O_2, mg/l) x (8.34 lbs/gal)

Effluent Disinfection

Gas Chlorine Feed, Lbs/day

1.   **Lbs/Day**   =   **(Vol, MGD) x (Conc., mg/l) x (8.34 lbs/gal)**

   Dosage, mg/l   = $\dfrac{(\text{Lbs/day})}{(\text{MGD}) \times (8.34 \text{ lbs/gal})}$

65% HTH Feed, Lbs/day - Calcium Hypochlorite

2.   **HTH, lbs/Day**   = $\dfrac{(\text{Vol, MGD}) \times (\text{Conc., mg/l}) \times (8.34 \text{ lbs/gal})}{0.65}$

   Dosage, mg/l   = $\dfrac{(\text{Lbs/day x 0.65})}{(\text{MGD}) \times (8.34 \text{ lbs/gal})}$

   HTH, Lbs   = $\dfrac{(\text{Gals, H}_2\text{O} \times 8.34 \text{ lbs/gal} \times \% \text{ Solution})}{(0.65)}$

5-1/4% Liquid Chlorine - Sodium Hypochlorite

3.   **Lbs/Gal**   = $\dfrac{(\text{Solution Percentage})}{100} \times 8.34 \text{ lbs/gal}$

   GPD   = $\dfrac{(\text{Vol, MGD}) \times (\text{Conc., mg/l}) \times (8.34 \text{ lbs/gal})}{(\text{Lbs/gal})}$

Dosage/Demand/Residual

4.   **Dosage, mg/l**   =   **(Demand, mg/l) + (Residual, mg/l)**

5.   **Demand, mg/l**   =   **(Dosage, mg/l) - (Residual, mg/l)**

6.   **Residual, mg/l**   =   **(Dosage, mg/l) - (Demand, mg/l)**

7.   **Sulphur Dioxide:**

   Lbs/day   =   **(MGD) x (Cl_2 Residual, mg/l) x (8.34 lbs/gal) x 0.90**

   0.9 mg/l of SO_2 is required to dechlorinate 1.0 mg/l of chlorine.

Laboratory:

1. BOD, mg/l = (Initial DO, mg/l - Final DO, mg/l) x $\underline{\text{300 ml}}$
   Sample, ml
   Volume

   BOD, mg/l = (Initial DO, mg/l - Final DO, mg/l) x Dilution
   Factor

   mg/l = $\dfrac{(\ ml \times 1{,}000{,}000\ )}{(\ ml\ of\ Sample\ )}$

   mg/l = ml x 1,000 ml/L

2. TSS (mg/l) = $\dfrac{\text{Paper Wt. and Dried Solids(g) - Paper Wt.(g)}}{(\ \text{Milliliters [ml] of Sample}\ )} \times 1{,}000{,}000$

3. BOD (mg/l) = $\dfrac{(\ \text{Initial D.O. - Final (D.O.)}\ ) \times 300}{(\ \text{Milliliters [ml] of Sample}\ )}$
   (Unseeded)

4. mg/l Total Solids = $\dfrac{(\ \text{Residue, mg}\ ) \times 1{,}000}{(\ \text{ml sample}\ )}$

5. %, Solids = $\dfrac{(\ MLSS\ )}{(\ 10{,}000\ mg/L\ per\ 1\%\ )}$

6. Geometric Mean = $(X_1 \bullet X_2 \bullet X_3 \bullet \ldots X_n)^{1/n}$

7. Temperature:

   F° = (C° x 1.8) + 32°

   C° = $\dfrac{(\ F° - 32°\ )}{(\ 1.8\ )}$

ABBREVIATIONS

Ac-ft	Acre feet	M	Meter
AFC	Actual fluoride content	M	Mile
C°	Celsius	mg/l	Milligram per Liter
CCF	Hundred Cubic Feet	MGD	Million Gals/Day
Cf	Cubic feet (ft^3)	ml	Milliliter
CFS	Cubic Feet Per Second	msl	Mean Sea Level
F°	Fahrenheit	ppm	Parts per Million
Gal	Gallon(s)	Q	Flow, cu. ft/sec.
GPM	Gallons Per Minute	π	Pi (3.141)
GPD	Gallons Per Day	Sq. ft.	Square feet (ft^2)
GPH	Gallons Per Hour	Sq. Yd	Square Yards (ft^3)
GPCD	Gallons per capita per day	SWD	Side Wall Depth
H	Height	µ g/L	Microgram/Liter
Hp	Horsepower	V	Velocity
BHp	Brake Horsepower	V	Volume
Whp	Water Horse power		
KW-Hrs	Kilowatt hours		
Lbs	Pounds		
Lbs/Day	Pounds per day		
L	Liter		

END

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