EZ Water Calculator Spreadsheet 2.0

1. Starting Info

A. Starting Water **

	Calcium (Ca ppm)	Magnesium (Mg ppm)	Sodium (Na ppm)	Chloride (Cl ppm)	Sulfate * (SO_4 ppm)	Bicarbonate (HCO_3 ppm) / Alkalinity ($CaCO_3$ ppm)
Starting Water Profile: (ppm = mg/L)	27	6	36	24	78	57

	Mash Water	Sparge Water
Volume (gallons):	6	4.75
% that is Distilled or RO:	0%	0%

** If your water report gives Sulfate as Sulfur (SO_4-S) such as a Ward Lab's report does, multiply by that by 3 to get SO_4*

*** This spreadsheet becomes less accurate for water above 9.0 pH.*

B. Recipe Info

	Total Grain (lb)	Crystal Grain (lb)	Roasted Grain (lb)	Beer Color (SRM)
	15.75	1.25	1.25	32
*Mash Thickness ***:*	*1.52 qt/lb*	*e.g. Caramel, CaraMunich, CaraAroma*	*e.g. Black Patent, Carafa, Roasted Barley*	

**** This spreadsheet becomes less accurate for mash thickness below 1.0 qt/lb or above 2.4 qt/lb.*

2. Adjustments

A. Salts

	Gypsum $CaSO_4$ (Lowers mash pH) (Lowers Cl:SO_4)	Calc. Chloride $CaCl_2$ (Lowers mash pH) (Raises Cl:SO_4)	Epsom Salt $MgSO_4$ (Lowers mash pH) (Lowers Cl:SO_4)	Baking Soda $NaHCO_3$ (Raises mash pH) (No Affect Cl:SO_4)	Non-Iodized Salt NaCl (No affect on pH) (Raises Cl:SO_4)	Chalk † $CaCO_3$ (Raises mash pH) (No Affect Cl:SO_4)
Mash Additions (grams):	0	5	2	6	0	6
Adj for Sparge Water? (y/n):	☑	☑	☐	☑	☑	☐
Sparge Additions (add to boil):	**0.0**	**4.0**	**0.0**	**4.8**	**0.0**	**0.0**

† *Calculations for chalk's true affect on alkalinity are very complex and may require an acid addition to fully dissolve. This spreadsheet uses half of chalk's full potential based on experimental data w/o acid addition. Actual results may vary greatly.*

B. Acids (mash only)

	Lactic Acid (Lowers mash pH)		Sauermalz (acidulated malt) (Lowers mash pH)
acid content:	88%	acid content:	2.0%
ml:	0	oz:	0

0% of total grain weight

3. Results

A. Flavor Ions

	Calcium (Ca ppm)	Magnesium (Mg ppm)	Sodium (Na ppm)	Chloride (Cl ppm)	Sulfate (SO_4 ppm)	Chloride to Sulfate Ratio
Mash Water Profile:	193	14	108	130	112	1.16
Mash + Sparge Water Profile:	**146**	**11**	**108**	**130**	**97**	**1.34**
Palmer's Recommended Ranges:	***50 - 150***	***10 - 30***	***0 - 150***	***0 - 250***	***50 - 350***	

Below .50, Style = Very Bitter
.50 to .77, Style = Bitter
.77 to 1.3, Style = Balanced
1.3 to 2.0, Style = Malty
Above 2.0, Style = Very Malty

B. Mash pH

	Alkalinity ($CaCO_3$ ppm)	Residual Alkalinity	ESTIMATED ‡ Mash pH
Resulting Mash Alkalinity & pH:	334	188	**5.32**

Desired Range: 5.2 - 5.4
Acceptable Range: 5.2 - 5.7

‡ *Estimated Mash pH is just that: an "estimate". Your results may vary. It may be desirable to check actual mash pH with a pH meter.*

Instructions:

Step 1: Enter your starting water profile, mash & sparge volumes, dilution rates (if any), and recipe info.

Step 2: Examine the results:

1) Estimated Mash pH - See if the pH is in the desired or acceptable range. If not, adjustments can be made (see Step 3).

2) Individual Mineral Levels - Take note of which mineral levels need to be adjusted in order to fall within the recommended ranges shown (if desired). Alternatively you can try to match these levels to a particular region or other set of guidelines. Also look at chloride to sulfate ratio to see if an adjustment to these two minerals is desired.

Step 3: Modify the results by diluting water with RO/distilled, adding salts, and/or adding acid. The primary goal is to get pH within an acceptable or even desired range. The secondary goal is to get minerals to levels that provide for desired flavor characteristics. There are varying opinions on what these levels should be, so you may need to do your own research and/or experimentation to determine what's best for you.

Note about Adding Salts:

Add mash salts directly to the mash. Add sparge salts directly to the boil (not the sparge). You may choose not to add certain salts for the sparge water in order to keep some minerals lower in the total water (sodium for example). In this case, simply uncheck the appropriate box.

References:

Calculations for Alkalinity, RA, and pH were based on Kai Troester's paper: "The effect of brewing water and grist composition on the pH of the mash" 2009

Recommended mineral ranges are from John Palmer's "How to Brew"
Recommended Cl to SO4 ratio ranges are from John Palmer's RA spreadsheet

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