



Western Enviro - Agricultural Laboratory Association  
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**December 2005 Round Robin Results – Soil Salinity by Saturated Paste**

WEALA Round Robin Report for December 2005  
Soil Analysis - Salinity via Saturated Paste  
**SAMPLE 105**

Analytical Parameter	Units	Reference Method	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Mean	Stddev	CV(%)	95% Conf.		99% Conf.	
			1	2	3	4	5	6	7	8	-2xStd				+2xStd	-3xStd	+3xStd	
			105	105	105	105	105	105	105	105								
pH (sat. paste)		McKeague 4.13	7.2	6.9	7.46	7.20	7.10	7.30	7.20	7.15		7.2	0.2	2.2	6.9	7.5	6.7	7.7
Conductivity (sat. paste)	mS/cm	McKeague 4.13	0.52	0.51	0.52	0.429	0.7	0.52	0.5	0.76		0.6	0.1	19.9	0.3	0.8	0.2	0.9
Calcium	mg/L (ppm)	McKeague 3.21	93.3	94.0	83.77	64	109	86	71	109		88.8	16.2	18.2	56.5	121.1	40.3	137.3
Magnesium	mg/L (ppm)	McKeague 3.21	17.0	20.0	18.84	16.0	22.0	19.6	15.0	26		19.3	3.6	18.5	12.2	26.4	8.6	30.0
Potassium	mg/L (ppm)	McKeague 3.21	3.3	3.0	2.74	<5	3	3	2	4		3.1	0.7	22.8	1.7	4.4	1.0	5.1
Sodium	mg/L (ppm)	McKeague 3.21	17.5	17.0	16.78	34	30	15	22	26		22.2	7.0	31.4	8.3	36.2	1.3	43.2
Bicarbonate	mg/L (ppm)	McKeague 3.21		-	280.68		-	230	-	-		255.3	35.8	14.0	183.7	327.0	147.8	362.8
Chloride	mg/L (ppm)	McKeague 3.21	4.8	<20	4.61	12	14	6	<20	-		8.3	4.4	53.2	-0.5	17.1	-4.9	21.5
Nitrate	mg/L (ppm)	McKeague 3.21	4.9	-	2.02	<2	27.0	4.1	4.00	6.7		8.1	9.4	115.4	-10.6	26.9	-20.0	36.2
Sulphate	mg/L (ppm)	McKeague 3.21	31.6	46.0	29.78	56	48	13	37			37.3	14.3	38.2	8.8	65.9	-5.4	80.1
Calcium	meq/L	McKeague 3.21	4.7	4.7	4.18	3.2	5.4	4.31	3.5	5.4		4.4	0.8	18.2	2.8	6.0	2.0	6.8
Magnesium	meq/L	McKeague 3.21	1.4	1.7	1.55	1.3	1.8	1.62	1.2	2.1		1.6	0.3	18.5	1.0	2.2	0.7	2.5
Potassium	meq/L	McKeague 3.21	0.1	0.1	0.07	<0.13	0.1	0.1	0.1	0.11		0.1	0.0	23.4	0.0	0.1	0.0	0.1
Sodium	meq/L	McKeague 3.21	0.8	0.7	0.73	1.5	1.3	0.7	1.0	1.1		1.0	0.3	31.5	0.4	1.6	0.1	1.9
Bicarbonate	meq/L	McKeague 3.21		-	4.60		-	3.70	-	-		4.2	0.6	15.3	2.9	5.4	2.2	6.1
Chloride	meq/L	McKeague 3.21	0.1	<0.5	0.13	0.3	0.4	0.20	<0.6	-		0.2	0.1	50.5	0.0	0.5	-0.1	0.6
Nitrate	meq/L	McKeague 3.21	0.4	-	0.14	<0.14	1.9	0.29	0.29	0.5		0.6	0.7	115.6	-0.8	1.9	-1.4	2.6
Sulphate	meq/L	McKeague 3.21	0.7	0.96	0.62	1.2	1.0	0.82	0.77	-		0.9	0.2	22.9	0.5	1.2	0.3	1.4
Sodium Adsorption Ratio		McKeague 3.26	0.4	0.4	0.43	1	0.7	0.4	0.6	0.6		0.5	0.1	23.3	0.3	0.7	0.2	0.9
Saturation	%	McKeague 3.21	42.2	44.9	44.60	46.0	46	52.0	41.5	49.6		45.9	3.5	7.7	38.8	52.9	35.3	56.4
TEXTURE: Sand	%		36.9	5	38	44	54	44	42	48		43.9	5.9	13.4	32.2	55.6	26.3	61.5
Silt	%		44.2	66	28	27	21	27	30	22		28.4	7.7	27.0	13.0	43.7	5.4	51.4
Clay	%		18.9	29	34	29	24	29	28	30		27.8	4.5	16.2	18.8	36.7	14.3	41.2

1 = Outlier @ 5% critical value (Grubs Test) - Not included in Statistical analysis

WEALA Round Robin Report for December 2005

Soil Analysis - Salinity via Saturated Paste

SAMPLE 105 - Statistical Outlier Data

Analytical Parameter	If Calculated T > T from Table - Data point outlier				T Values from Table	
	Min	Max	T <sub>min</sub>	T <sub>max</sub>	5%	1%
pH (sat. paste)	6.9	7.5	1.805	1.696	2.030	2.22
Conductivity (sat. paste)	0.4	0.8	1.152	1.797		
Calcium	64.0	109.0	1.534	1.251		
Magnesium	15.0	26.1	1.211	1.902		
Potassium	2.0	4.3	1.512	1.835		
Sodium	15.0	34.0	1.034	1.687		
Bicarbonate	230.0	280.7	0.707	0.707		
Chloride	4.6	14.0	0.832	1.300		
Nitrate	2.0	27.0	0.651	2.014		
Sulphate	13.0	56.0	1.707	1.309		
Calcium	3.2	5.4	1.536	1.250		
Magnesium	1.2	2.1	1.215	1.895		
Potassium	0.1	0.1	1.439	1.859		
Sodium	0.7	1.5	1.041	1.686		
Bicarbonate	3.7	4.6	0.707	0.707		
Chloride	0.1	0.4	0.905	1.284		
Nitrate	0.1	1.9	0.650	2.014		
Sulphate	0.6	1.2	1.204	1.578		
Sodium Adsorption Ratio	0.4	1.0	0.811	2.099		
Saturation	41.5	52.0	1.236	1.748		
TEXTURE: Sand	5.0	54.0	2.302	1.012		
Silt	21.0	66.0	0.802	2.183		
Clay	18.9	34.0	1.968	1.390		

min, max values from before outliers removed

[Blue shaded cell] = Outlier @ 5% critical value - Not included in Statistical analysis

$$\text{Calculated } T = |X_{\text{mean}} - X_i| / s$$

where X<sub>i</sub> = suspect outlier, s = Standard Deviation

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Soil Analysis - Salinity via Saturated Paste  
**SAMPLE 205**

Analytical Parameter	Units	Reference Method	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Lab I.D.	Mean	Stddev	CV(%)	95% Conf.		99% Conf.	
			1	2	3	4	5	6	7	8	-2xStd				+2xStd	-3xStd	+3xStd	
			205	205	205	205	205	205	205	205								
pH (sat. paste)		McKeague 4.13	7.70	7.40	7.84	7.50	7.50	7.70	7.60	7.57		7.6	0.1	1.9	7.3	7.9	7.2	8.0
Conductivity (sat. paste)	mS/cm	McKeague 4.13	7.23	6.01	6.62	5.09	7.4	6.65	5.8	6.71		6.4	0.8	11.9	4.9	8.0	4.1	8.7
Calcium	mg/L (ppm)	McKeague 3.21	256	252	204	249	328	263	247	201		250.1	39.2	15.7	171.6	328.5	132.3	367.8
Magnesium	mg/L (ppm)	McKeague 3.21	40	43	34	45.0	50.0	48.0	41.0	37.3		42.3	5.4	12.6	31.6	53.0	26.3	58.4
Potassium	mg/L (ppm)	McKeague 3.21	1.5	2.0	4.7	<5	2	<10	<2	3.1		2.7	1.3	48.1	0.1	5.2	-1.2	6.5
Sodium	mg/L (ppm)	McKeague 3.21	1160	1260	1350	1200	1540	1320	1100	1139		1258.6	143.3	11.4	971.9	1545.3	828.5	1688.6
Bicarbonate	mg/L (ppm)	McKeague 3.21		-	159		-	180	-	-		169.3	15.1	8.9	139.1	199.5	124.0	214.6
Chloride	mg/L (ppm)	McKeague 3.21	1680	1890	1532	1660	2060	1600	1310.0	-		1675.9	242.9	14.5	1190.1	2161.8	947.1	2404.8
Nitrate	mg/L (ppm)	McKeague 3.21	1.4	-	<0.5	<2	9.0	0.8	2.00	1.56		3.0	3.4	115.5	-3.9	9.8	-7.3	13.2
Sulphate	mg/L (ppm)	McKeague 3.21	933	988	889	946	1110	380.0	890			959.3	82.7	8.6	793.8	1124.7	711.1	1207.4
Calcium	meq/L	McKeague 3.21	12.8	12.57	10.20	12.4	16.4	13.2	12.3	10.0		12.5	2.0	15.7	8.6	16.4	6.6	18.4
Magnesium	meq/L	McKeague 3.21	3.3	3.54	2.79	3.7	4.1	4.0	3.4	3.1		3.5	0.4	12.9	2.6	4.4	2.1	4.8
Potassium	meq/L	McKeague 3.21	0.0	0.05	0.12	<0.13	0.1	<0.2	<0.1	0.1		0.1	0.0	48.2	0.0	0.1	0.0	0.2
Sodium	meq/L	McKeague 3.21	50.5	54.80	58.70	52.2	67.0	57.4	47.8	49.5		54.7	6.2	11.4	42.3	67.2	36.0	73.4
Bicarbonate	meq/L	McKeague 3.21		-	2.60		-	2.9	-	-		2.8	0.2	7.7	2.3	3.2	2.1	3.4
Chloride	meq/L	McKeague 3.21	47.4	53.30	43.20	46.8	58.1	45.1	37.0	-		47.3	6.9	14.5	33.6	61.0	26.7	67.8
Nitrate	meq/L	McKeague 3.21	0.1	-	<0.05	<0.14	0.6	0.1	0.1	0.11		0.2	0.2	116.8	-0.3	0.7	-0.5	0.9
Sulphate	meq/L	McKeague 3.21	19.4	20.60	18.50	19.7	23.1	23.0	18.5	-		20.4	1.9	9.5	16.5	24.3	14.6	26.2
Sodium Adsorption Ratio		McKeague 3.26	17.8	19.4	23.1	18.3	21	19.6	17.1	19.36		19.5	1.9	9.8	15.6	23.3	13.7	25.2
Saturation	%	McKeague 3.21	61.4	65.9	74.2	73.0	66	68	60.0	73.0		67.7	5.4	8.0	56.9	78.5	51.5	83.9
TEXTURE: Sand	%		28	41.0	32.0	33	35	36.6	36	40		35.2	4.3	12.2	26.6	43.8	22.3	48.1
Silt	%		54.6	28.0	30.0	34	30	31.4	34	41		32.6	4.3	13.2	24.0	41.2	19.7	45.5
Clay	%		18	31.0	38.0	33	35	32	30	19		29.4	7.3	24.9	14.8	44.1	7.5	51.4

380.0 = Outlier @ 5% critical value (Grubs Test) - Not included in Statistical analysis

WEALA Round Robin Report for December 2005  
Soil Analysis - Salinity via Saturated Paste

**SAMPLE 205 - Statistical Outlier Data**

Analytical Parameter	If Calculated T > T from Table - Data point outlier				T Values from Table	
	Min	Max	T <sub>min</sub>	T <sub>max</sub>	5%	1%
pH (sat. paste)	7.4	7.8	1.431	1.697	<b>2.030</b>	<b>2.22</b>
Conductivity (sat. paste)	5.1	7.4	1.760	1.254		
Calcium	201.0	328.0	1.250	1.986		
Magnesium	33.9	50.0	1.569	1.436		
Potassium	1.5	4.7	0.905	1.593		
Sodium	1100.0	1540.0	1.106	1.963		
Bicarbonate	158.6	180.0	0.707	0.707		
Chloride	1310.0	2060.0	1.506	1.581		
Nitrate	0.8	9.0	0.631	1.775		
Sulphate	380.0	1110.0	<b>2.144</b>	1.008		
Calcium	10.0	16.4	1.252	1.978		
Magnesium	2.8	4.1	1.556	1.395		
Potassium	0.0	0.1	0.904	1.593		
Sodium	47.8	67.0	1.106	1.964		
Bicarbonate	2.6	2.9	0.707	0.707		
Chloride	37.0	58.1	1.505	1.582		
Nitrate	0.1	0.6	0.652	1.772		
Sulphate	18.5	23.1	0.981	1.389		
Sodium Adsorption Ratio	17.1	23.1	1.238	1.914		
Saturation	60.0	74.2	1.425	1.207		
TEXTURE: Sand	27.8	41.0	1.717	1.356		
Silt	28.0	54.6	0.847	<b>2.202</b>		
Clay	17.6	38.0	1.618	1.170		

**min, max values from before outliers removed**

**2.144** = Outlier @ 5% critical value - Not included in Statistical analysis

$$\text{Calculated } T = |X_{\text{mean}} - X_i| / s$$

where  $X_i$  = suspect outlier,  $s$  = Standard Deviation

## WEALA Fall 2005 Round Robin Methodology Questionnaire Summary - Saturated Paste Extraction

It was decided at the November WEALA meeting that participating labs would voluntarily include information about procedures in order to better qualify the data and any abnormalities in the data and possibly identify any trends which may be method related.

The data and information provided will remain anonymous

Saturated Paste Procedure Information	Lab 1	Lab 2	Lab 3	Lab 4	Lab 5	Lab 6	Lab 7	Lab 8
<b>Method for recovering Sat Paste Extract:</b>								
Filter by Vacuum	X	X		X	X	X	X	X
Filter by Gravity								
Filter press used			X					
Other								
<b>Sat Paste Extract: Duration</b>								
The saturated paste was left for (hours):	2	16	24	4	18	6	-	4
The saturated paste was filtered for (minutes):	90	15-30	20	30-60	-	10	-	120
<b>Filter medium</b>								
pore size: (µm)		8	2.7	40	8	8		
speed or filter paper # (Whatman):	#42	#40	#50	#113	#2	#40	#2	#42
filter paper diameter: (cm)	9	7	9	9	11	7		9
<b>Sat Paste Extract: preservative</b>								
A preservative was used for the extract after filtering	No	No	No	Yes	No	No	No	
If Yes what was the preservative?				*				

\* - Sodium Metahexaphosphate Solution 0.1 % w/v