

Contaminant of Concern	Concentrations	Republican WCS Sample #1 Line Leak 10-19-15	Republican WCS Sample #2 Line Leak 10-19-15	Republican WCS Sample #3 Line Leak 10-19-15	Republican WD Sample #4 Line Leak 10-19-15	Republican WCS Background 10-19-15
Organic Compounds in Soil						
Inorganics in Soils						
Electrical Conductivity (EC)	<4 mmhos/cm or 2x background	12.9	11.8	14.1	10.6	0.59
Sodium Adsorption Ratio (SAR)	<12 _s	27.6	40.1	32.6	31.6	0.2
pH	6-9	7.5	7.9	7.5	7.8	7.7

SOIL ANALYSIS REPORT

CLIENT:
18250
AUGUSTUS ENERGY RESOURCES
LLC
36695 HWY 385
PO BOX 250
WRAY, CO 80758



1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
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620.227.7123
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LAB NO: 13499 - 13503
INVOICE NO: 204991
DATE RECEIVED: 10/23/2015
DATE REPORTED: 10/28/2015

SOIL ANALYSIS RESULTS FOR: FIELD IDENTIFICATION: FIX SEC 2 MS LINE

METHOD USED:			1:1 Water-Soil	1:1 Water-Soil	Ammonium Acetate		Ammonium Acetate										
Lab Number	Sample ID	Sample Depth	Soil pH	Buffer pH	Sol. Salts mmho/cm	Excess Lime	% Organic Matter	Phosphorus ppm P	Potassium ppm K	Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Iron ppm Fe	Manganese ppm Mn	Copper ppm Cu	Boron ppm B
13499	SAMPLE 1	0 - 6	8.0		3.24	Hi			361	3998	180	1700					
13500	SAMPLE 2	0 - 6	8.4		2.77	Hi			706	3816	162	2037					
13501	SAMPLE 3	0 - 6	7.9		3.33	Lo			488	2080	132	1533					
13502	SAMPLE 4	0 - 6	8.2		2.86	Lo			774	3093	111	1593					
13503	SAMPLE BG	0 - 6	8.0		0.26	Hi			565	3950	153	45					

METHOD USED:			Sat. Paste													Cation:Anion	
Lab Number	Sample ID	Sample Depth	Saturation % Sat	Soil pH	Electrical Conductivity mmho/cm	Potassium mg/L K	Sulfur mg/L S	Calcium mg/L Ca	Magnesium mg/L Mg	Sodium mg/L Na	Carbonate mg/L CO3	Bicarbonate mg/L HCO3	Chloride mg/L Cl	Boron mg/L B	Sodium Adsorption Ratio	Cation:Anion	
13499	SAMPLE 1	0 - 6	42	7.5	12.9	48	7	482	38.0	2340	<10	140	3890	2.14	27.6	130.2 / 112.9	
13500	SAMPLE 2	0 - 6	46	7.9	11.8	109	32	221	22.2	2340	<10	200	4220	1.95	40.1	117.4 / 124.7	
13501	SAMPLE 3	0 - 6	37	7.5	14.1	129	7	423	42.1	2630	<10	230	4530	1.95	32.6	142.3 / 132.4	
13502	SAMPLE 4	0 - 6	49	7.8	10.6	160	7	290	17.5	2050	<10	260	3170	0.89	31.6	109.2 / 94.2	
13503	SAMPLE BG	0 - 6	47	7.7	0.59	45	7	100	6.7	7	<10	270	24	0.11	0.2	7.0 / 5.6	

FERTILIZER RECOMMENDATIONS:			POUNDS ACTUAL NUTRIENT PER ACRE														
Lab Number	Sample ID	Crop To Be Grown	Yield Goal	Lime, ECC Tons/A to raise pH to:			N	P2O5	K2O	Zn	S	Mn	Cu	MgO	B	Ca	Cl
				6.0	6.5	7.0											
13499	SAMPLE 1																
13500	SAMPLE 2																
13501	SAMPLE 3																
13502	SAMPLE 4																
13503	SAMPLE BG																

Cation Exchange Capacity						
CEC	%H	%K	%Ca	%Mg	%Na	
30	0	3	67	5	25	
31	0	6	61	4	28	
19	0	6	54	6	34	
25	0	8	61	4	27	
23	0	6	87	6	1	

SPECIAL COMMENTS AND SUGGESTIONS:

Analyses are representative of the samples submitted Samples are retained 30 days after report of analysis Explanations of soil analysis terms are available upon request

Reviewed and
Approved By:

Ed McGuire
Data Review Coordinator

Edwin J. McDevine

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SOIL ANALYSIS REPORT

CLIENT: 18250	AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758
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LAB NO:	13499 - 13503
INVOICE NO:	204991
DATE RECEIVED:	10/23/2015
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SOIL ANALYSIS RESULTS FOR:	FIELD IDENTIFICATION: FIX SEC 2 MS LINE
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Lab Number(s): 13499, 13500, 13501, 13502

WARNING: Soil sodium (% Na) is very high. Typical symptoms of a sodic soil are surface crusting, soil sealing, and poor water penetration. Additional soil analysis can determine the proper rate of gypsum or other soil amendment. If irrigated, water analysis can help identify the sodium source. Contact the laboratory for more information.

Lab Number(s): 13499, 13500, 13501, 13502, 13503

Servi-Tech Laboratory fertilizer recommendations were not requested.

Analyses are representative of the samples submitted

Samples are retained 30 days after report of analysis

Explanations of soil analysis terms are available upon request

Reviewed and
Approved By:

Ed McGuire
Data Review Coordinator

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Lab No.: 13499		SOIL ANALYSIS RESULTS		Date Reported: 10/28/2015	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		<i>Edwin J. McGuire</i> Ed McGuire Data Review Coordinator	
Results For:		Invoice No.: 204991		Date Received: 10/23/2015	
Sample Identification: SAMPLE 1		Field ID		FIX SEC 2 MS LINE	
Sample Depth: 0-6"					
Exchangable:					
	<u>ppm</u>	<u>%</u>			
Calcium, Ca	3998	67	Cation Exchange Capacity, CEC meq/100g		30
Magnesium, Mg	180	5	Soil pH - 1:1		8.0
Potassium, K	361	3	Soil pH - Saturated Paste		7.5
Sodium, Na	1700	25	Soluble Salts, mmho/cm		3.24
Excess Lime Rating		HIGH	Exchangable Sodium Percent, ESP		25
Extractable (from saturated paste, based on 42% water saturation):					
		<u>mg/L</u>		<u>meq/L</u>	
Calcium (Ca)		482		24.1	
Magnesium (Mg)		38.0		3.1	
Sodium (Na)		2340		101.7	
Chloride (Cl)		3890		109.7	
Sulfur (S)		7		0.4	
Boron (B)		2.14			
Potassium (K)		48		1.2	
Bicarbonate (HCO ₃)		140		2.3	
Carbonate (CO ₃)		<10		<0.3	
Sodium Adsorption Ratio (SAR) 27.6					
Electrical Conductivity (ECe), mmho/cm 12.9					
Cation:Anion 130.2 / 112.9					
Calculated Gypsum Recommendation (from ESP and CEC)					
Soil Texture			Gypsum Rec. T/A		
COARSE	(sands, loamy sands, sandy loams)		5.8	To	7.1
MEDIUM	(loams, silt loams, clay loams)		9.0	To	10.3
FINE	(silty clay, clay loams, clays)		11.0	To	12.3
This soil is considered: SALINE/SODIC					
GYPSUM SUGGESTIONS: If soil has good internal drainage, full gypsum rate can be used to reclaim the affected area, but keep applications below 2 to 3 tons in a single year. Reclamation may not be feasible if a high water table is present, but applying 1/2 to 1 ton of gypsum every one to two years may help prevent crusting and surface "sealing".					



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Results For:		Invoice No.: 204991		Date Received: 10/23/2015	
Sample Identification: SAMPLE 1		Date Received: 10/23/2015		Field ID: FIX SEC 2 MS LINE	
Sample Depth: 0-6"		Field ID: FIX SEC 2 MS LINE			

SOIL PERMEABILITY HAZARD (based on ESP and SAR):

Soil texture	Potential hazard
COARSE (sands, loamy sands, sandy loams)	CAUTION
MEDIUM (loams, silt loams, clay loams)	HIGH
FINE (silty clay loams, clays)	HIGH

SOIL SALINITY: Saline soils can be managed by choosing tolerant crops, keeping the seedbed moist until crop establishment, and/or irrigating with relatively good quality irrigation water. Good internal soil drainage is needed to reclaim saline areas, so lowering water tables may be necessary. Test soil (and water) annually to monitor changes in salinity levels.

SOIL SALINITY HAZARD (based on extractable salts, ECe):

Crop type	Potential hazard
SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)	HIGH
MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)	HIGH
MODERATELY TOLERANT (wheat, wheatgrass, sudangrass, sorghum, fescue, oats, bromegrass, etc.)	HIGH
SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)	CAUTION

CHLORIDE: Excess soil chloride may cause toxicity symptoms in sensitive plants. Toxicity should be verified by plant tissue analysis. High chloride soils can be managed by choosing tolerant crops, keeping the seed bed moist until crop establishment, and/or by irrigating with relatively good quality irrigation water.

EXTRACTABLE CHLORIDE HAZARD (based on soil extractable chloride, Cl):

- HIGH for chloride sensitive crops (includes berries, fruit trees, grapes, citrus, etc.)
- HIGH for moderately tolerant crops (includes alfalfa, beans, rice, sorghum, etc.)
- HIGH for chloride tolerant crops (includes wheat, flax, tomato, cotton, barley, corn, beets, etc.)

BORON: Excess soil boron may cause toxicity symptoms in sensitive plants. Toxicity should be verified by plant tissue analysis. If toxicity is a problem, choose boron tolerant crops and/or irrigate with relatively good quality irrigation water.



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Results For:		Invoice No.: 204991		Date Received: 10/23/2015	
Sample Identification: SAMPLE 1		Date Received: 10/23/2015		Field ID: FIX SEC 2 MS LINE	
Sample Depth: 0-6"		Field ID: FIX SEC 2 MS LINE			
EXTRACTABLE BORON HAZARD (based on soil extractable boron, B):					
Crop type			Potential hazard		

BORON SENSITIVE (such as sunflower, barley, onions, citrus, fruit trees, grapes, etc.) HIGH					
MODERATELY SENSITIVE (such as potatoes, peppers, peas, radishes, etc.) HIGH					
MODERATELY TOLERANT (such as wheat, corn, oats, clover, lettuce, turnips, celery, etc.) . . CAUTION					
BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.) LOW					



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Results For:		Invoice No.: 204991		Date Received: 10/23/2015	
Sample Identification: SAMPLE 2		Field ID FIX SEC 2 MS LINE			
Sample Depth: 0-6"					
Exchangable:					
	<u>ppm</u>	<u>%</u>			
Calcium, Ca	3816	61	Cation Exchange Capacity, CEC meq/100g		31
Magnesium, Mg	162	4	Soil pH - 1:1		8.4
Potassium, K	706	6	Soil pH - Saturated Paste		7.9
Sodium, Na	2037	28	Soluble Salts, mmho/cm		2.77
Excess Lime Rating		HIGH	Exchangable Sodium Percent, ESP		28
Extractable (from saturated paste, based on 46% water saturation):					
		<u>mg/L</u>		<u>meq/L</u>	
Calcium (Ca)		221		11.0	
Magnesium (Mg)		22.2		1.8	
Sodium (Na)		2340		101.7	
Chloride (Cl)		4220		119.0	
Sulfur (S)		32		2.0	
Boron (B)		1.95			
Potassium (K)		109		2.8	
Bicarbonate (HCO ₃)		200		3.3	
Carbonate (CO ₃)		<10		<0.3	
Sodium Adsorption Ratio (SAR) 40.1					
Electrical Conductivity (ECe), mmho/cm 11.8					
Cation:Anion 117.4 / 124.7					
Calculated Gypsum Recommendation (from ESP and CEC)					
Soil Texture			Gypsum Rec. T/A		
COARSE	(sands, loamy sands, sandy loams)		8.0	To	9.3
MEDIUM	(loams, silt loams, clay loams)		11.3	To	12.7
FINE	(silty clay, clay loams, clays)		13.3	To	14.7
This soil is considered: SALINE/SODIC					
GYPSUM SUGGESTIONS: If soil has good internal drainage, full gypsum rate can be used to reclaim the affected area, but keep applications below 2 to 3 tons in a single year. Reclamation may not be feasible if a high water table is present, but applying 1/2 to 1 ton of gypsum every one to two years may help prevent crusting and surface "sealing".					



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Results For:		Invoice No.: 204991		Date Received: 10/23/2015	
Sample Identification:		Date Received: 10/23/2015		Field ID FIX SEC 2 MS LINE	
Sample Depth: 0-6"					

SOIL PERMEABILITY HAZARD (based on ESP and SAR):

Soil texture	Potential hazard
COARSE (sands, loamy sands, sandy loams)	CAUTION
MEDIUM (loams, silt loams, clay loams)	HIGH
FINE (silty clay loams, clays)	HIGH

SOIL SALINITY: Saline soils can be managed by choosing tolerant crops, keeping the seedbed moist until crop establishment, and/or irrigating with relatively good quality irrigation water. Good internal soil drainage is needed to reclaim saline areas, so lowering water tables may be necessary. Test soil (and water) annually to monitor changes in salinity levels.

SOIL SALINITY HAZARD (based on extractable salts, ECe):

Crop type	Potential hazard
SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)	HIGH
MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)	HIGH
MODERATELY TOLERANT (wheat, wheatgrass, sudangrass, sorghum, fescue, oats, bromegrass, etc.)	HIGH
SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)	CAUTION

CHLORIDE: Excess soil chloride may cause toxicity symptoms in sensitive plants. Toxicity should be verified by plant tissue analysis. High chloride soils can be managed by choosing tolerant crops, keeping the seed bed moist until crop establishment, and/or by irrigating with relatively good quality irrigation water.

EXTRACTABLE CHLORIDE HAZARD (based on soil extractable chloride, Cl):

- HIGH for chloride sensitive crops (includes berries, fruit trees, grapes, citrus, etc.)
- HIGH for moderately tolerant crops (includes alfalfa, beans, rice, sorghum, etc.)
- HIGH for chloride tolerant crops (includes wheat, flax, tomato, cotton, barley, corn, beets, etc.)

BORON: Excess soil boron may cause toxicity symptoms in sensitive plants. Toxicity should be verified by plant tissue analysis. If toxicity is a problem, choose boron tolerant crops and/or irrigate with relatively good quality irrigation water.



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Results For:		Invoice No.: 204991		Date Received: 10/23/2015	
Sample Identification: SAMPLE 2		Date Received: 10/23/2015		Field ID: FIX SEC 2 MS LINE	
Sample Depth: 0-6"					

EXTRACTABLE BORON HAZARD (based on soil extractable boron, B):

Crop type

Potential hazard

BORON SENSITIVE (such as sunflower, barley, onions, citrus, fruit trees, grapes, etc.) HIGH
 MODERATELY SENSITIVE (such as potatoes, peppers, peas, radishes, etc.) CAUTION
 MODERATELY TOLERANT (such as wheat, corn, oats, clover, lettuce, turnips, celery, etc.) LOW
 BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.) LOW



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Lab No.: 13501		SOIL ANALYSIS RESULTS		Date Reported: 10/28/2015	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		<i>Edwin J. McGuire</i> Ed McGuire Data Review Coordinator	
Results For:		Invoice No.: 204991		Date Received: 10/23/2015	
Sample Identification: SAMPLE 3		Field ID FIX SEC 2 MS LINE			
Sample Depth: 0-6"					
Exchangable:					
	<u>ppm</u>	<u>%</u>			
Calcium, Ca	2080	54	Cation Exchange Capacity, CEC meq/100g		19
Magnesium, Mg	132	6	Soil pH - 1:1		7.9
Potassium, K	488	6	Soil pH - Saturated Paste		7.5
Sodium, Na	1533	34	Soluble Salts, mmho/cm		3.33
Excess Lime Rating		LOW	Exchangable Sodium Percent, ESP		34
Extractable (from saturated paste, based on 37% water saturation):					
		<u>mg/L</u>		<u>meq/L</u>	
Calcium (Ca)		423		21.1	
Magnesium (Mg)		42.1		3.5	
Sodium (Na)		2630		114.3	
Chloride (Cl)		4530		127.8	
Sulfur (S)		7		0.4	
Boron (B)		1.95			
Potassium (K)		129		3.3	
Bicarbonate (HCO ₃)		230		3.8	
Carbonate (CO ₃)		<10		<0.3	
Sodium Adsorption Ratio (SAR) 32.6					
Electrical Conductivity (ECe), mmho/cm 14.1					
Cation:Anion 142.3 / 132.4					
Calculated Gypsum Recommendation (from ESP and CEC)					
Soil Texture			Gypsum Rec. T/A		
COARSE	(sands, loamy sands, sandy loams)		7.4	To	8.2
MEDIUM	(loams, silt loams, clay loams)		9.4	To	10.2
FINE	(silty clay, clay loams, clays)		10.6	To	11.4
This soil is considered: SALINE/SODIC					
GYPSUM SUGGESTIONS: If soil has good internal drainage, full gypsum rate can be used to reclaim the affected area, but keep applications below 2 to 3 tons in a single year. Reclamation may not be feasible if a high water table is present, but applying 1/2 to 1 ton of gypsum every one to two years may help prevent crusting and surface "sealing".					



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Results For:		Invoice No.: 204991		Date Received: 10/23/2015	
Sample Identification: SAMPLE 3		Date Received: 10/23/2015		Field ID: FIX SEC 2 MS LINE	
Sample Depth: 0-6"		Field ID: FIX SEC 2 MS LINE			

SOIL PERMEABILITY HAZARD (based on ESP and SAR):

Soil texture	Potential hazard
COARSE (sands, loamy sands, sandy loams)	CAUTION
MEDIUM (loams, silt loams, clay loams)	HIGH
FINE (silty clay loams, clays)	HIGH

SOIL SALINITY: Saline soils can be managed by choosing tolerant crops, keeping the seedbed moist until crop establishment, and/or irrigating with relatively good quality irrigation water. Good internal soil drainage is needed to reclaim saline areas, so lowering water tables may be necessary. Test soil (and water) annually to monitor changes in salinity levels.

SOIL SALINITY HAZARD (based on extractable salts, ECe):

Crop type	Potential hazard
SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)	HIGH
MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)	HIGH
MODERATELY TOLERANT (wheat, wheatgrass, sudangrass, sorghum, fescue, oats, bromegrass, etc.)	HIGH
SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)	CAUTION

CHLORIDE: Excess soil chloride may cause toxicity symptoms in sensitive plants. Toxicity should be verified by plant tissue analysis. High chloride soils can be managed by choosing tolerant crops, keeping the seed bed moist until crop establishment, and/or by irrigating with relatively good quality irrigation water.

EXTRACTABLE CHLORIDE HAZARD (based on soil extractable chloride, Cl):

- HIGH for chloride sensitive crops (includes berries, fruit trees, grapes, citrus, etc.)
- HIGH for moderately tolerant crops (includes alfalfa, beans, rice, sorghum, etc.)
- HIGH for chloride tolerant crops (includes wheat, flax, tomato, cotton, barley, corn, beets, etc.)

BORON: Excess soil boron may cause toxicity symptoms in sensitive plants. Toxicity should be verified by plant tissue analysis. If toxicity is a problem, choose boron tolerant crops and/or irrigate with relatively good quality irrigation water.



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Results For:		Invoice No.: 204991		Date Received: 10/23/2015	
Sample Identification: SAMPLE 3		Date Received: 10/23/2015		Field ID: FIX SEC 2 MS LINE	
Sample Depth: 0-6"		Field ID: FIX SEC 2 MS LINE			
EXTRACTABLE BORON HAZARD (based on soil extractable boron, B):					
Crop type			Potential hazard		

BORON SENSITIVE (such as sunflower, barley, onions, citrus, fruit trees, grapes, etc.) HIGH					
MODERATELY SENSITIVE (such as potatoes, peppers, peas, radishes, etc.) CAUTION					
MODERATELY TOLERANT (such as wheat, corn, oats, clover, lettuce, turnips, celery, etc.) LOW					
BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.) LOW					



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Lab No.: 13502 **SOIL ANALYSIS RESULTS** Date Reported: 10/28/2015

Send To: 18250	AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758	<i>Edwin J. McGuire</i> Ed McGuire Data Review Coordinator
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Results For:		Invoice No.: 204991
Sample Identification:	SAMPLE 4	Date Received: 10/23/2015
Sample Depth: 0-6"		Field ID FIX SEC 2 MS LINE

Exchangable:	ppm	%		
Calcium, Ca	3093	61	Cation Exchange Capacity, CEC meq/100g	25
Magnesium, Mg	111	4	Soil pH - 1:1	8.2
Potassium, K	774	8	Soil pH - Saturated Paste	7.8
Sodium, Na	1593	27	Soluble Salts, mmho/cm	2.86
Excess Lime Rating		LOW	Exchangable Sodium Percent, ESP	27

Extractable (from saturated paste, based on 49% water saturation):

	mg/L	meq/L
Calcium (Ca)	290	14.5
Magnesium (Mg)	17.5	1.4
Sodium (Na)	2050	89.1
Chloride (Cl)	3170	89.4
Sulfur (S)	7	0.4
Boron (B)	0.89	
Potassium (K)	160	4.1
Bicarbonate (HCO3)	260	4.3
Carbonate (CO3)	<10	<0.3

Sodium Adsorption Ratio (SAR)	31.6
Electrical Conductivity (ECe), mmho/cm	10.6
Cation:Anion	109.2 / 94.2

Calculated Gypsum Recommendation (from ESP and CEC)

Soil Texture	Gypsum Rec. T/A	
COARSE (sands, loamy sands, sandy loams)	5.9	To 7.0
MEDIUM (loams, silt loams, clay loams)	8.6	To 9.7
FINE (silty clay, clay loams, clays)	10.2	To 11.3

This soil is considered: SALINE/SODIC

GYPNUM SUGGESTIONS: If soil has good internal drainage, full gypsum rate can be used to reclaim the affected area, but keep applications below 2 to 3 tons in a single year. Reclamation may not be feasible if a high water table is present, but applying 1/2 to 1 ton of gypsum every one to two years may help prevent crusting and surface "sealing".



Servi-Tech Laboratories

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Lab No.: 13502		SOIL ANALYSIS RESULTS		Date Reported: 10/28/2015	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		<i>Edwin J. McGuire</i> Ed McGuire Data Review Coordinator	
Results For:		Invoice No.: 204991		Date Received: 10/23/2015	
Sample Identification: SAMPLE 4		Date Received: 10/23/2015		Field ID: FIX SEC 2 MS LINE	
Sample Depth: 0-6"		Field ID: FIX SEC 2 MS LINE			

SOIL PERMEABILITY HAZARD (based on ESP and SAR):

Soil texture	Potential hazard
COARSE (sands, loamy sands, sandy loams)	CAUTION
MEDIUM (loams, silt loams, clay loams)	HIGH
FINE (silty clay loams, clays)	HIGH

SOIL SALINITY: Saline soils can be managed by choosing tolerant crops, keeping the seedbed moist until crop establishment, and/or irrigating with relatively good quality irrigation water. Good internal soil drainage is needed to reclaim saline areas, so lowering water tables may be necessary. Test soil (and water) annually to monitor changes in salinity levels.

SOIL SALINITY HAZARD (based on extractable salts, ECe):

Crop type	Potential hazard
SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)	HIGH
MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)	HIGH
MODERATELY TOLERANT (wheat, wheatgrass, sudangrass, sorghum, fescue, oats, bromegrass, etc.)	HIGH
SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)	CAUTION

CHLORIDE: Excess soil chloride may cause toxicity symptoms in sensitive plants. Toxicity should be verified by plant tissue analysis. High chloride soils can be managed by choosing tolerant crops, keeping the seed bed moist until crop establishment, and/or by irrigating with relatively good quality irrigation water.

EXTRACTABLE CHLORIDE HAZARD (based on soil extractable chloride, Cl):

- HIGH for chloride sensitive crops (includes berries, fruit trees, grapes, citrus, etc.)
- HIGH for moderately tolerant crops (includes alfalfa, beans, rice, sorghum, etc.)
- HIGH for chloride tolerant crops (includes wheat, flax, tomato, cotton, barley, corn, beets, etc.)

BORON: Excess soil boron may cause toxicity symptoms in sensitive plants. Toxicity should be verified by plant tissue analysis. If toxicity is a problem, choose boron tolerant crops and/or irrigate with relatively good quality irrigation water.



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Sample Identification: SAMPLE 4		Date Received: 10/23/2015		Field ID: FIX SEC 2 MS LINE	
Sample Depth: 0-6"					

EXTRACTABLE BORON HAZARD (based on soil extractable boron, B):

Crop type	Potential hazard

BORON SENSITIVE (such as sunflower, barley, onions, citrus, fruit trees, grapes, etc.)	HIGH
MODERATELY SENSITIVE (such as potatoes, peppers, peas, radishes, etc.)	CAUTION
MODERATELY TOLERANT (such as wheat, corn, oats, clover, lettuce, turnips, celery, etc.)	LOW
BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.)	LOW



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Lab No.: 13503		SOIL ANALYSIS RESULTS		Date Reported: 10/28/2015	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		<i>Edwin J. McGuire</i> Ed McGuire Data Review Coordinator	
Results For:		Invoice No.: 204991		Date Received: 10/23/2015	
Sample Identification: SAMPLE BG		Field ID		FIX SEC 2 MS LINE	
Sample Depth: 0-6"					
Exchangable:					
	<u>ppm</u>	<u>%</u>			
Calcium, Ca	3950	87	Cation Exchange Capacity, CEC meq/100g		23
Magnesium, Mg	153	6	Soil pH - 1:1		8.0
Potassium, K	565	6	Soil pH - Saturated Paste		7.7
Sodium, Na	45	1	Soluble Salts, mmho/cm		0.26
Excess Lime Rating		HIGH	Exchangable Sodium Percent, ESP		1
Extractable (from saturated paste, based on 47% water saturation):					
		<u>mg/L</u>		<u>meq/L</u>	
Calcium (Ca)		100		5.0	
Magnesium (Mg)		6.7		0.6	
Sodium (Na)		7		0.3	
Chloride (Cl)		24		0.7	
Sulfur (S)		7		0.4	
Boron (B)		0.11			
Potassium (K)		45		1.2	
Bicarbonate (HCO ₃)		270		4.4	
Carbonate (CO ₃)		<10		<0.3	
Sodium Adsorption Ratio (SAR) 0.2					
Electrical Conductivity (ECe), mmho/cm 0.59					
Cation:Anion 7.0 / 5.6					
Calculated Gypsum Recommendation (from ESP and CEC)					
Soil Texture			Gypsum Rec. T/A		
COARSE	(sands, loamy sands, sandy loams)		0.0	To	0.0
MEDIUM	(loams, silt loams, clay loams)		0.0	To	0.0
FINE	(silty clay, clay loams, clays)		0.0	To	0.0
This soil is considered: NON-SALINE/NON-SODIC					
SOIL PERMEABILITY HAZARD (based on ESP and SAR):					
Soil texture		Potential hazard			
-----		-----			
COARSE (sands, loamy sands, sandy loams)		LOW			
MEDIUM (loams, silt loams, clay loams)		LOW			
FINE (silty clay loams, clays)		LOW			



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Sample Depth: 0-6"		Field ID: FIX SEC 2 MS LINE			

SOIL SALINITY HAZARD (based on extractable salts, ECe):

Crop type	Potential hazard
SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)	LOW
MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)	LOW
MODERATELY TOLERANT (wheat, wheatgrass, sudangrass, sorghum, fescue, oats, bromegrass, etc.)	LOW
SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)	LOW

EXTRACTABLE CHLORIDE HAZARD (based on soil extractable chloride, Cl):

- LOW for chloride sensitive crops (includes berries, fruit trees, grapes, citrus, etc.)
- LOW for moderately tolerant crops (includes alfalfa, beans, rice, sorghum, etc.)
- LOW for chloride tolerant crops (includes wheat, flax, tomato, cotton, barley, corn, beets, etc.)

EXTRACTABLE BORON HAZARD (based on soil extractable boron, B):

Crop type	Potential hazard
BORON SENSITIVE (such as sunflower, barley, onions, citrus, fruit trees, grapes, etc.)	LOW
MODERATELY SENSITIVE (such as potatoes, peppers, peas, radishes, etc.)	LOW
MODERATELY TOLERANT (such as wheat, corn, oats, clover, lettuce, turnips, celery, etc.)	LOW
BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.)	LOW