

Contaminant of Concern		Concentrations	Kiser 03-13 Line Leak 06-25-15	Kiser 03-13 Background
Organic Compounds in Soil				
Inorganics in Soils				
Electrical Conductivity (EC)	<4 mmhos/cm or 2x background		12.6	0.61
Sodium Adsorption Ratio (SAR)	<12 _s		27.2	0.3
pH	6-9		7.2	7.3

THIS SOIL ANALYSIS IS FROM THE LINE LEAK ON 6-25-15 WHICH IS THE
SAME LOCATION AS THE ORIGINAL LINE LEAK FROM 2-3-15.

SOIL ANALYSIS REPORT

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



1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
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LAB NO:	76991 - 76992
INVOICE NO:	200905
DATE RECEIVED:	06/29/2015
DATE REPORTED:	07/01/2015

SOIL ANALYSIS RESULTS FOR: KISER 03-13 FIELD IDENTIFICATION:

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
76991	SAMPLE 1	0 - 6	7.7		3.11	Hi					186			3548	71	1248					
76992	BACKGROUND	0 - 6	7.8		0.18	No					386			1552	108	8					

METHOD USED:			Sat. Paste																			
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						
76991	SAMPLE 1	0 - 6	32	7.2	12.6	58	1240	608	36.0	2550	<10	190	2090	5.94	27.2	145.7 / 141.1						
76992	BACKGROUND	0 - 6	38	7.3	0.61	61	15	75	7.3	9	<10	270	8	0.09	0.3	6.3 / 5.6						

FERTILIZER RECOMMENDATIONS:										POUNDS ACTUAL NUTRIENT PER ACRE										Cation Exchange Capacity					
Lab Number	Sample ID	Crop To Be Grown	Yield Goal	Lime, ECC Tons/A to raise pH to:			N	P ₂ O ₅	K ₂ O	Zn	S	Mn	Cu	MgO	B	Ca	Cl	CEC	%H	%K	%Ca	%Mg	%N		
				6.0	6.5	7.0																			
76991	SAMPLE 1																	24	0	2	73	2	2		
76992	BACKGROUND																	10	0	10	80	9			

SPECIAL COMMENTS AND SUGGESTIONS:																							
Lab Number(s): 76991																							
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): 76991, 76992																							
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: Steve Harrold
Technical Coordinator

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Lab No.: 76991		SOIL ANALYSIS RESULTS		Date Reported: 07/01/2015	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		 Steve Harrold Technical Coordinator	
Results For: KISER 03-13 Sample Identification: SAMPLE 1 Sample Depth: 0-6"		Invoice No.: 200905 Date Received: 06/29/2015			

Exchangable:					
	<u>ppm</u>	<u>%</u>			
Calcium, Ca	3548	73	Cation Exchange Capacity, CEC meq/100g		24
Magnesium, Mg	71	2	Soil pH - 1:1		7.7
Potassium, K	186	2	Soil pH - Saturated Paste		7.2
Sodium, Na	1248	22	Soluble Salts, mmho/cm		3.11
Excess Lime Rating		HIGH	Exchangable Sodium Percent, ESP		22

Extractable (from saturated paste, based on 32% water saturation):

	mg/L	meq/L
Calcium (Ca)	608	30.3
Magnesium (Mg)	36.0	3.0
Sodium (Na)	2550	110.9
Chloride (Cl)	2090	59.0
Sulfur (S)	1240	77.3
Boron (B)	5.94	
Potassium (K)	58	1.5
Bicarbonate (HCO ₃)	190	3.1
Carbonate (CO ₃)	<10	<0.3

Sodium Adsorption Ratio (SAR)	27.2
Electrical Conductivity (ECe), mmho/cm	12.6
Cation:Anion	145.7 / 141.1

Calculated Gypsum Recommendation (from ESP and CEC)			
Soil Texture		Gypsum Rec. T/A	
COARSE	(sands, loamy sands, sandy loams)	3.1	To 4.1
MEDIUM	(loams, silt loams, clay loams)	5.7	To 6.7
FINE	(silty clay, clay loams, clays)	7.2	To 8.3

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: Sample Identification: Sample Depth:		KISER 03-13 SAMPLE 1 0-6"		Invoice No.: 200905 Date Received: 06/29/2015											
SOIL PERMEABILITY HAZARD (based on ESP and SAR):															
<table><thead><tr><th>Soil texture</th><th>Potential hazard</th></tr></thead><tbody><tr><td>COARSE (sands, loamy sands, sandy loams)</td><td>CAUTION</td></tr><tr><td>MEDIUM (loams, silt loams, clay loams)</td><td>HIGH</td></tr><tr><td>FINE (silty clay loams, clays)</td><td>HIGH</td></tr></tbody></table>						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 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):															
<table><thead><tr><th>Crop type</th><th>Potential hazard</th></tr></thead><tbody><tr><td>SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)</td><td>HIGH</td></tr><tr><td>MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)</td><td>HIGH</td></tr><tr><td>MODERATELY TOLERANT (wheat, wheatgrass, sudangrass, sorghum, fescue, oats, brome grass, etc.)</td><td>HIGH</td></tr><tr><td>SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)</td><td>CAUTION</td></tr></tbody></table>						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, brome grass, etc.)	HIGH	SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)	CAUTION
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, brome grass, 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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EXTRACTABLE BORON HAZARD (based on soil extractable boron, B):					
Crop type		Potential hazard			
<hr/>					
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.) . . HIGH					
BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.) CAUTION					




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Exchangable:					
	ppm	%			
Calcium, Ca	1552	80	Cation Exchange Capacity, CEC meq/100g		10
Magnesium, Mg	108	9	Soil pH - 1:1		7.8
Potassium, K	386	10	Soil pH - Saturated Paste		7.3
Sodium, Na	8	0	Soluble Salts, mmho/cm		0.18
Excess Lime Rating		NO	Exchangable Sodium Percent, ESP		0
Extractable (from saturated paste, based on 38% water saturation):					
	mg/L		meq/L		
Calcium (Ca)	75		3.7		
Magnesium (Mg)	7.3		0.6		
Sodium (Na)	9		0.4		
Chloride (Cl)	8		0.2		
Sulfur (S)	15		0.9		
Boron (B)	0.09				
Potassium (K)	61		1.6		
Bicarbonate (HCO ₃)	270		4.4		
Carbonate (CO ₃)	<10		<0.3		
Sodium Adsorption Ratio (SAR) 0.3					
Electrical Conductivity (ECe), mmho/cm 0.61					
Cation:Anion 6.3 / 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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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, brome grass, 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		