Contaminant of Concern	Concentrations	Kiser 03-13 Line Leak	Kiser 03-13 Background
Organic Compounds in Soil			
Inorganics in Soils			
Electrical Conductivity (EC)	<4 mmhos/cm or 2x background	11.3	0.73
Sodium Adsorption Ratio (SAR)	<12[5]	91.9	0.5
pH	6-9	8.1	7.4

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www.servitechlabs.com

Phone: 620.227.7123
800.557.7509
Fax: 620.227.2047

Lab No.: 53171

SOIL ANALYSIS RESULTS

Date Reported: 02/10/2015

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	**Invoice No.:**	196993
Sample Identification:	LINE LEAK	**Date Received:**	02/06/2015
Sample Depth:	0-6"	**Field ID**	TANK REMOVAL 03-13

Exchangable:

	ppm	%		
Calcium, Ca	2217	57	Cation Exchange Capacity, CEC meq/100g	19
Magnesium, Mg	75	3	Soil pH - 1:1	8.7
Potassium, K	159	2	Soil pH - Saturated Paste	8.1
Sodium, Na	1649	37	Soluble Salts, mmho/cm	2.69
Excess Lime Rating		HIGH	Exchangable Sodium Percent, ESP	37

Extractable (from saturated paste, based on 33% water saturation):

	mg/L	meq/L
Calcium (Ca)	37	1.8
Magnesium (Mg)	9.7	0.8
Sodium (Na)	2430	105.7
Chloride (Cl)	3780	106.6
Sulfur (S)	29	1.8
Boron (B)	10.6	
Potassium (K)	26	0.7
Bicarbonate (HCO3)	430	7.0
Carbonate (CO3)	<10	<0.3
Sodium Adsorption Ratio (SAR)	91.9	
Electrical Conductivity (ECe), mmho/cm	11.3	
Cation:Anion	109.0 / 118.3	

Calculated Gypsum Recomendation (from ESP and CEC)

Soil Texture		Gypsum Rec. T/A		
COARSE	(sands, loamy sands, sandy loams)	8.6	To	9.4
MEDIUM	(loams, silt loams, clay loams)	10.6	To	11.4
FINE	(silty clay, clay loams, clays)	11.8	To	12.7

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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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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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.) . .	HIGH
BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.)	HIGH

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Results For:	KISER 03-13	**Invoice No.:**	196993
Sample Identification:	BACKGROUND	**Date Received:**	02/06/2015
Sample Depth:	0-6"	**Field ID**	TANK REMOVAL 03-13

Exchangable:

	ppm	%		
Calcium, Ca	1402	77	Cation Exchange Capacity, CEC meq/100g	9
Magnesium, Mg	131	12	Soil pH - 1:1	7.7
Potassium, K	348	10	Soil pH - Saturated Paste	7.4
Sodium, Na	26	1	Soluble Salts, mmho/cm	0.24
Excess Lime Rating		NO	Exchangable Sodium Percent, ESP	1

Extractable (from saturated paste, based on 42% water saturation):

	mg/L	meq/L
Calcium (Ca)	82	4.1
Magnesium (Mg)	12.7	1.0
Sodium (Na)	17	0.7
Chloride (Cl)	42	1.2
Sulfur (S)	7	0.4
Boron (B)	0.50	
Potassium (K)	66	1.7
Bicarbonate (HCO3)	260	4.3
Carbonate (CO3)	<10	<0.3
Sodium Adsorption Ratio (SAR)	0.5	
Electrical Conductivity (ECe), mmho/cm	0.73	
Cation:Anion	7.6 / 6.0	

Calculated Gypsum Recomendation (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, 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.)	CAUTION
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