

State of Colorado
Oil and Gas Conservation Commission



1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax:(303)894-2109

FOR OGCC USE ONLY
RECEIVED 10/24/2014
REM 8713
DOC 2142260

SITE INVESTIGATION AND REMEDIATION WORKPLAN

This form shall be submitted to the Director for approval prior to the initiation of site investigation and remediation activities. Form 27 is intended to be used whenever possible. Additional documentation will be required when large volumes of soil and groundwater have been impacted or involve large facilities with multiple source areas. See Rule 910. Attach as many pages as needed to fully describe the proposed work.

OGCC Employee:
Spill Complaint
Inspection NOAV
Tracking No:

CAUSE OF CONDITION BEING INVESTIGATED AND REMEDIATED

Spill or Release Plug & Abandon Central Facility Closure Site/Facility Closure Other (describe): _____

OGCC Operator Number: _____	Contact Name and Telephone: _____
Name of Operator: _____	_____
Address: _____	No: _____
City: _____ State: _____ Zip: _____	Fax: _____

API Number: _____	County: _____
Facility Name: _____	Facility Number: _____
Well Name: _____	Well Number: _____
Location: (QtrQtr, Sec, Twp, Rng, Meridian): _____	Latitude: _____ Longitude: _____

TECHNICAL CONDITIONS

Type of Waste Causing Impact (crude oil, condensate, produced water, etc): _____

Site Conditions: Is location within a sensitive area (according to Rule 901e)? Y N If yes, attach evaluation.

Adjacent land use (cultivated, irrigated, dry land farming, industrial, residential, etc.): _____

Soil type, if not previously identified on Form 2A or Federal Surface Use Plan: _____

Potential receptors (water wells within 1/4 mi, surface waters, etc.): _____

Description of Impact (if previously provided, refer to that form or document):

Impacted Media (check):	Extent of Impact:	How Determined:
Soils	_____	_____
Vegetation	_____	_____
Groundwater	_____	_____
Surface Water	_____	_____

REMEDATION WORKPLAN

Describe initial action taken (if previously provided, refer to that form or document):

Describe how source is to be removed:

Describe how remediation of existing impacts is to be accomplished, including removal and disposal at an injection well or licensed facility, land treatment on site, removal of impacted groundwater, insitu bioremediation, burning of oily vegetation, etc.:

FORM
27
Rev 6/99

State of Colorado
Oil and Gas Conservation Commission
1120 Lincoln Street, Suite 801, Denver, Colorado 80203
(303)894-2100 Fax:(303)894-2109



Tracking Number: _____
Name of Operator: _____
OGCC Operator No: _____
Received Date: _____
Well Name & No: _____
Facility Name & No: _____

Page 2

REMEDIATION WORKPLAN (Cont.)

OGCC Employee: _____

If groundwater has been impacted, describe proposed monitoring plan (# of wells or sample points, sampling schedule, analytical methods, etc.):

Describe reclamation plan. Discuss existing and new grade recontouring; method and testing of compaction alleviation; and reseeding program, including location of new seed, seed mix and noxious weed prevention. Attach diagram or drawing. Use additional sheet for description if required.

The tank hole was treated with agricultural pelleted gypsum and covered with 3' of fill dirt. The location will be seeded and straw will be crimped to help prevent erosion and promote re-growth.

Attach samples and analytical results taken to verify remediation of impacts. Show locations of samples on an onsite schematic or drawing.

Is further site investigation required? Y N If yes, describe:

We will continue to monitor the location for re-growth and erosion and will take the necessary steps to alleviate any issues or problems

Final disposition of E&P waste (landtreated and disposed onsite, name of licensed disposal facility, recycling, reuse, etc.):

IMPLEMENTATION SCHEDULE

Date Site Investigation Began: 09/24/14 Date Site Investigation Completed: 09/26/14 Date Remediation Plan Submitted: 10/24/14
Remediation Start Date: 10/01/14 Anticipated Completion Date: 10/03/14 Actual Completion Date: _____

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.

Print Name: Loni J. Davis Signed: Loni J. Davis
Title: Operations Accounting and Regulatory Specialist Date: 10/24/14

OGCC Approved: _____ Title: _____ Date: _____

SOIL ANALYSIS REPORT

CLIENT: 18250	AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758
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1816 E. Wyatt Earp
PO Box 1397
Dodge City, KS 67801
800.557.7509
620.227.7123
Fax 620.227.2047

LAB NO:	3956 - 3957
INVOICE NO:	193403
DATE RECEIVED:	10/10/2014
DATE REPORTED:	10/23/2014

SOIL ANALYSIS RESULTS FOR: HILLMAN **FIELD IDENTIFICATION: TANK REMOVALS**

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
3956	01-25 TANK	0 - 36	8.5		2.44	Hi			481	3441	141	1604					
3957	01-25 BACKG	0 - 12	7.9		0.49	Hi			874	3161	188	5					

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			
3956	01-25 TANK	0 - 36	38	8.0	10.1	77	16	148	15.6	2050	<10	190	3220	3.12	42.8	99.8 / 95.7		
3957	01-25 BACKG	0 - 12	40	7.7	1.33	165	11	151	18.5	6	<10	220	15	0.13	0.1	13.6 / 4.8		

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						
				6.0	6.5	7.0												CEC	%H	%K	%Ca	%Mg	%Na
3956	01-25 TANK																	27	0	5	65	4	26
3957	01-25 BACKG																	20	0	11	80	8	0

SPECIAL COMMENTS AND SUGGESTIONS:

Lab Number(s): 3956
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): 3956, 3957
 Servi-Tech Laboratory fertilizer recommendations were not requested.

Lab Number(s): 3956, 3957
 CEC calculated by cation summation may overestimate true CEC and underestimate exchangeable sodium percentage (ESP) in soils containing excess lime.



Servi-Tech Laboratories

1816 E. Wyatt Earp • PO Box 1397 • Dodge City, KS 67801
www.servitechlabs.com

Phone: 620.227.7123

800.557.7509

Fax: 620.227.2047

Lab No.: 3956 **SOIL ANALYSIS RESULTS** Date Reported: 10/23/2014

Send To: 18250	AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758	 Steve Harrold Technical Coordinator
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Results For: Sample Identification: Sample Depth:	HILLMAN 01-25 TANK 0-36"	Invoice No.: Date Received: Field ID	193403 10/10/2014 TANK REMOVALS
--	--------------------------------	---	---------------------------------------

Exchangable:	ppm	%		
Calcium, Ca	3441	65	Cation Exchange Capacity, CEC meq/100g	27
Magnesium, Mg	141	4	Soil pH - 1:1	8.5
Potassium, K	481	5	Soil pH - Saturated Paste	8.0
Sodium, Na	1604	26	Soluble Salts, mmho/cm	2.44
Excess Lime Rating		HIGH	Exchangable Sodium Percent, ESP	26

Extractable (from saturated paste, based on 38% water saturation):

	mg/L	meq/L
Calcium (Ca)	148	7.4
Magnesium (Mg)	15.6	1.3
Sodium (Na)	2050	89.1
Chloride (Cl)	3220	90.8
Sulfur (S)	16	1.0
Boron (B)	3.12	
Potassium (K)	77	2.0
Bicarbonate (HCO3)	190	3.1
Carbonate (CO3)	<10	<0.3

Sodium Adsorption Ratio (SAR)	42.8
Electrical Conductivity (ECe), mmho/cm	10.1
Cation:Anion	99.8 / 95.7

Calculated Gypsum Recommendation (from ESP and CEC)		Gypsum Rec. T/A	
Soil Texture			
COARSE (sands, loamy sands, sandy loams)		5.8 To	7.0
MEDIUM (loams, silt loams, clay loams)		8.7 To	9.9
FINE (silty clay, clay loams, clays)		10.4 To	11.6

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".



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Lab No.: 3956		SOIL ANALYSIS RESULTS		Date Reported: 10/23/2014
Send To: 18250	AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		 Steve Harrold Technical Coordinator	
Results For:	HILLMAN	Invoice No.:	193403	
Sample Identification:	01-25 TANK	Date Received:	10/10/2014	
Sample Depth:	0-36"	Field ID	TANK REMOVALS	
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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Lab No.: 3956 **SOIL ANALYSIS RESULTS** Date Reported: 10/23/2014

Send To: 18250	AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758	 Steve Harrold Technical Coordinator
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Results For: HILLMAN	Invoice No.: 193403	
Sample Identification: 01-25 TANK	Date Received: 10/10/2014	
Sample Depth: 0-36"	Field ID TANK REMOVALS	

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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Lab No.: 3957		SOIL ANALYSIS RESULTS		Date Reported: 10/23/2014	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		 Steve Harrold Technical Coordinator	
Results For: Sample Identification: Sample Depth:		HILLMAN 01-25 BACKG 0-12"		Invoice No.: 193403 Date Received: 10/10/2014 Field ID TANK REMOVALS	
Exchangable:					
	<u>ppm</u>	<u>%</u>			
Calcium, Ca	3161	80	Cation Exchange Capacity, CEC meq/100g		20
Magnesium, Mg	188	8	Soil pH - 1:1		7.9
Potassium, K	874	11	Soil pH - Saturated Paste		7.7
Sodium, Na	5	0	Soluble Salts, mmho/cm		0.49
Excess Lime Rating		HIGH	Exchangable Sodium Percent, ESP		0
Extractable (from saturated paste, based on 40% water saturation):					
		<u>mg/L</u>		<u>meq/L</u>	
Calcium (Ca)		151		7.5	
Magnesium (Mg)		18.5		1.5	
Sodium (Na)		6		0.3	
Chloride (Cl)		15		0.4	
Sulfur (S)		11		0.7	
Boron (B)		0.13			
Potassium (K)		165		4.2	
Bicarbonate (HCO ₃)		220		3.6	
Carbonate (CO ₃)		<10		<0.3	
Sodium Adsorption Ratio (SAR) 0.1					
Electrical Conductivity (ECe), mmho/cm 1.33					
Cation:Anion 13.6 / 4.8					
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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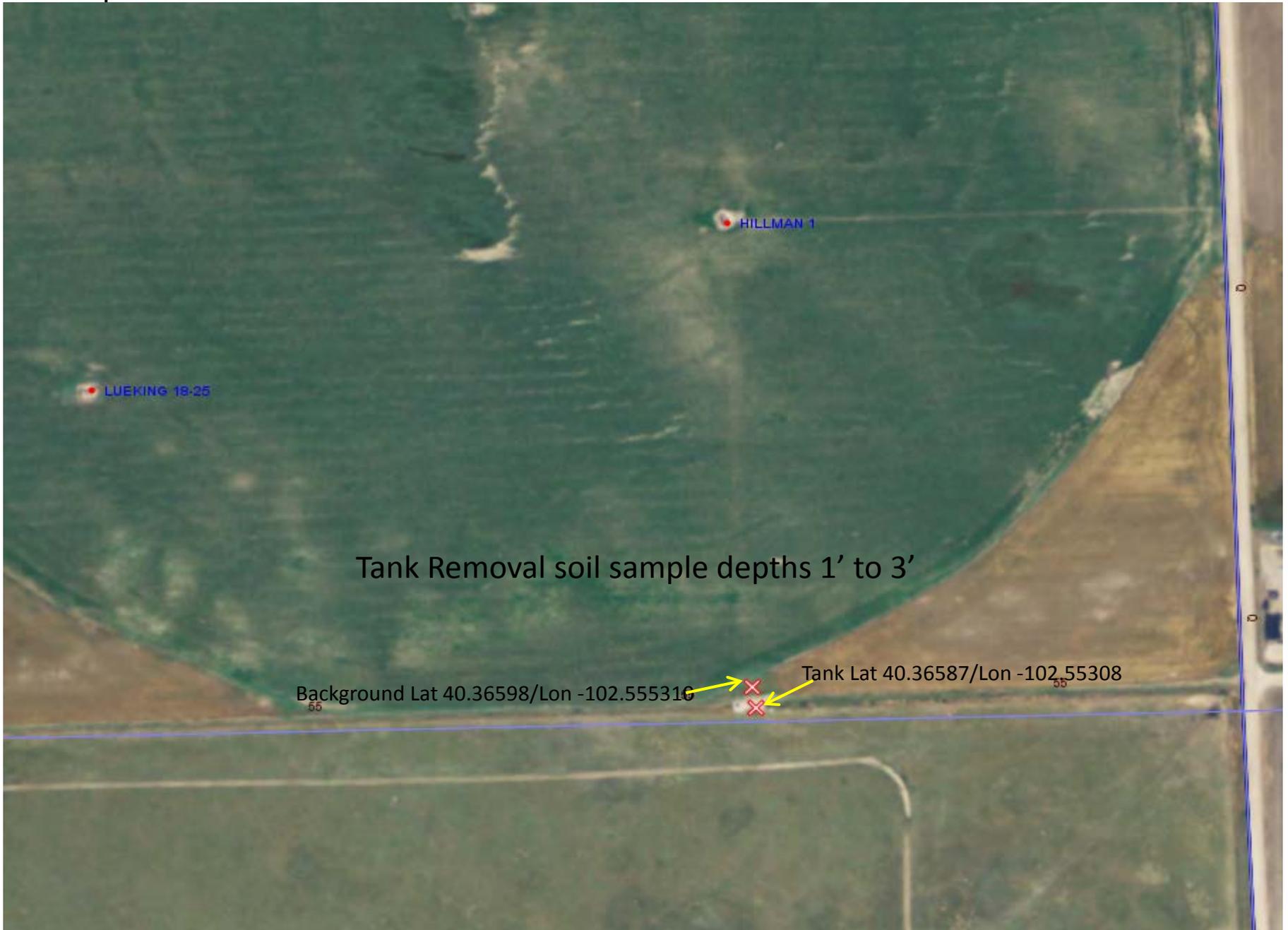
Lab No.: 3957		SOIL ANALYSIS RESULTS		Date Reported: 10/23/2014												
Send To: 18250	AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758	 Steve Harrold Technical Coordinator														
Results For:	HILLMAN	Invoice No.:	193403													
Sample Identification:	01-25 BACKG	Date Received:	10/10/2014													
Sample Depth:	0-12"	Field ID	TANK REMOVALS													
<p>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.</p>																
<p>SOIL SALINITY HAZARD (based on extractable salts, ECe):</p> <table border="0"> <thead> <tr> <th style="text-align: center;">Crop type</th> <th style="text-align: center;">Potential hazard</th> </tr> </thead> <tbody> <tr> <td colspan="2">-----</td> </tr> <tr> <td>SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)</td> <td>CAUTION</td> </tr> <tr> <td>MODERATELY SENSITIVE (seedling alfalfa, corn, soybeans, many vegetables, etc.)</td> <td>LOW</td> </tr> <tr> <td>MODERATELY TOLERANT (wheat, wheatgrass, sudangrass, sorghum, fescue, oats, bromegrass, etc.)</td> <td>LOW</td> </tr> <tr> <td>SALT TOLERANT (barley, bermudagrass, sugarbeets, cotton, etc.)</td> <td>LOW</td> </tr> </tbody> </table>					Crop type	Potential hazard	-----		SALT SENSITIVE (onions, carrots, many ornamentals, many fruit crops, etc.)	CAUTION	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
Crop type	Potential hazard															

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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															
<p>EXTRACTABLE CHLORIDE HAZARD (based on soil extractable chloride, Cl):</p> <p>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.)</p>																
<p>EXTRACTABLE BORON HAZARD (based on soil extractable boron, B):</p> <table border="0"> <thead> <tr> <th style="text-align: center;">Crop type</th> <th style="text-align: center;">Potential hazard</th> </tr> </thead> <tbody> <tr> <td colspan="2">-----</td> </tr> <tr> <td>BORON SENSITIVE (such as sunflower, barley, onions, citrus, fruit trees, grapes, etc.)</td> <td>LOW</td> </tr> <tr> <td>MODERATELY SENSITIVE (such as potatoes, peppers, peas, radishes, etc.)</td> <td>LOW</td> </tr> <tr> <td>MODERATELY TOLERANT (such as wheat, corn, oats, clover, lettuce, turnips, celery, etc.)</td> <td>LOW</td> </tr> <tr> <td>BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.)</td> <td>LOW</td> </tr> </tbody> </table>					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
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BORON TOLERANT (such as alfalfa, beets, cotton, grain sorghum, tomatoes, vetch, etc.)	LOW															

North
↑

Hillman 01-25- Tank Pull



LUEKING 18-25

HILLMAN 1

Tank Removal soil sample depths 1' to 3'

Background Lat 40.36598/Lon -102.555310

Tank Lat 40.36587/Lon -102.55308

FORM 27 Rev 6/99

State of Colorado Oil and Gas Conservation Commission 1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax:(303)894-2109



Tracking Number: Name of Operator: OGCC Operator No: Received Date: Well Name & No: Facility Name & No:

Page 2 REMEDIATION WORKPLAN (Cont.)

OGCC Employee:

Young

If groundwater has been impacted, describe proposed monitoring plan (# of wells or sample points, sampling schedule, analytical methods, etc.):

Describe reclamation plan. Discuss existing and new grade recontouring; method and testing of compaction alleviation; and reseeding program, including location of new seed, seed mix and noxious weed prevention. Attach diagram or drawing. Use additional sheet for description if required.

The tank hole was treated with agricultural pelleted gypsum and covered with 3' of fill dirt. The location will be seeded and straw will be crimped to help prevent erosion and promote re-growth.

Attach samples and analytical results taken to verify remediation of impacts. Show locations of samples on an onsite schematic or drawing.

Is further site investigation required? [X] Y [] N If yes, describe:

We will continue to monitor the location for re-growth and erosion and will take the necessary steps to alleviate any issues or problems

Final disposition of E&P waste (landtreated and disposed onsite, name of licensed disposal facility, recycling, reuse, etc.):

IMPLEMENTATION SCHEDULE

Date Site Investigation Began: 09/24/14 Date Site Investigation Completed: 09/26/14 Date Remediation Plan Submitted: 10/24/14 Remediation Start Date: 10/01/14 Anticipated Completion Date: 10/03/14 Actual Completion Date:

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.

Print Name: Loni J. Davis Signed: Loni Hillman Title: Operations Accounting and Regulatory Specialist Date: 10/24/14

OGCC Approved: Ann C Gekman for Rob Young Title: EPS NE CO Date: 10/27/14

SOIL ANALYSIS REPORT

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



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LAB NO:	3956 - 3957
INVOICE NO:	193403
DATE RECEIVED:	10/10/2014
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SOIL ANALYSIS RESULTS FOR: HILLMAN **FIELD IDENTIFICATION: TANK REMOVALS**

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
3956	01-25 TANK	0 - 36	8.5		2.44	Hi			481	3441	141	1604					
3957	01-25 BACKG	0 - 12	7.9		0.49	Hi			874	3161	188	5					

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			
3956	01-25 TANK	0 - 36	38	8.0	10.1	77	16	148	15.6	2050	<10	190	3220	3.12	42.8	99.8 / 95.7		
3957	01-25 BACKG	0 - 12	40	7.7	1.33	165	11	151	18.5	6	<10	220	15	0.13	0.1	13.6 / 4.8		

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	%Na		
				6.0	6.5	7.0																			
3956	01-25 TANK																	27	0	5	65	4	26		
3957	01-25 BACKG																	20	0	11	80	8	0		

SPECIAL COMMENTS AND SUGGESTIONS:

Lab Number(s): 3956
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): 3956, 3957
 Servi-Tech Laboratory fertilizer recommendations were not requested.

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 CEC calculated by cation summation may overestimate true CEC and underestimate exchangeable sodium percentage (ESP) in soils containing excess lime.



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Lab No.: 3956		SOIL ANALYSIS RESULTS		Date Reported: 10/23/2014	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		 Steve Harrold Technical Coordinator	
Results For: Sample Identification: Sample Depth:		HILLMAN 01-25 TANK 0-36"		Invoice No.: 193403 Date Received: 10/10/2014 Field ID TANK REMOVALS	
Exchangable:					
	<u>ppm</u>	<u>%</u>			
Calcium, Ca	3441	65	Cation Exchange Capacity, CEC meq/100g		27
Magnesium, Mg	141	4	Soil pH - 1:1		8.5
Potassium, K	481	5	Soil pH - Saturated Paste		8.0
Sodium, Na	1604	26	Soluble Salts, mmho/cm		2.44
Excess Lime Rating		HIGH	Exchangable Sodium Percent, ESP		26
Extractable (from saturated paste, based on 38% water saturation):					
		<u>mg/L</u>		<u>meq/L</u>	
Calcium (Ca)		148		7.4	
Magnesium (Mg)		15.6		1.3	
Sodium (Na)		2050		89.1	
Chloride (Cl)		3220		90.8	
Sulfur (S)		16		1.0	
Boron (B)		3.12			
Potassium (K)		77		2.0	
Bicarbonate (HCO ₃)		190		3.1	
Carbonate (CO ₃)		<10		<0.3	
Sodium Adsorption Ratio (SAR) 42.8					
Electrical Conductivity (ECe), mmho/cm 10.1					
Cation:Anion 99.8 / 95.7					
Calculated Gypsum Recommendation (from ESP and CEC)					
Soil Texture			Gypsum Rec. T/A		
COARSE	(sands, loamy sands, sandy loams)		5.8	To	7.0
MEDIUM	(loams, silt loams, clay loams)		8.7	To	9.9
FINE	(silty clay, clay loams, clays)		10.4	To	11.6
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".					



Servi-Tech Laboratories

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Results For: HILLMAN		Invoice No.: 193403		Date Received: 10/10/2014	
Sample Identification: 01-25 TANK		Date Received: 10/10/2014		Field ID: TANK REMOVALS	
Sample Depth: 0-36"		Field ID: TANK REMOVALS			
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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Lab No.: 3956 **SOIL ANALYSIS RESULTS** Date Reported: 10/23/2014

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Results For: HILLMAN	Invoice No.: 193403
Sample Identification: 01-25 TANK	Date Received: 10/10/2014
Sample Depth: 0-36"	Field ID: TANK REMOVALS

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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Lab No.: 3957		SOIL ANALYSIS RESULTS		Date Reported: 10/23/2014	
Send To: 18250		AUGUSTUS ENERGY RESOURCES LLC 36695 HWY 385 PO BOX 250 WRAY, CO 80758		 Steve Harrold Technical Coordinator	
Results For: Sample Identification: Sample Depth:		HILLMAN 01-25 BACKG 0-12"		Invoice No.: 193403 Date Received: 10/10/2014 Field ID TANK REMOVALS	
Exchangable:					
	<u>ppm</u>	<u>%</u>			
Calcium, Ca	3161	80	Cation Exchange Capacity, CEC meq/100g		20
Magnesium, Mg	188	8	Soil pH - 1:1		7.9
Potassium, K	874	11	Soil pH - Saturated Paste		7.7
Sodium, Na	5	0	Soluble Salts, mmho/cm		0.49
Excess Lime Rating		HIGH	Exchangable Sodium Percent, ESP		0
Extractable (from saturated paste, based on 40% water saturation):					
		<u>mg/L</u>		<u>meq/L</u>	
Calcium (Ca)		151		7.5	
Magnesium (Mg)		18.5		1.5	
Sodium (Na)		6		0.3	
Chloride (Cl)		15		0.4	
Sulfur (S)		11		0.7	
Boron (B)		0.13			
Potassium (K)		165		4.2	
Bicarbonate (HCO ₃)		220		3.6	
Carbonate (CO ₃)		<10		<0.3	
Sodium Adsorption Ratio (SAR) 0.1					
Electrical Conductivity (ECe), mmho/cm 1.33					
Cation:Anion 13.6 / 4.8					
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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Results For: HILLMAN	Invoice No.: 193403	
Sample Identification: 01-25 BACKG	Date Received: 10/10/2014	
Sample Depth: 0-12"	Field ID TANK REMOVALS	

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.)	CAUTION
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):

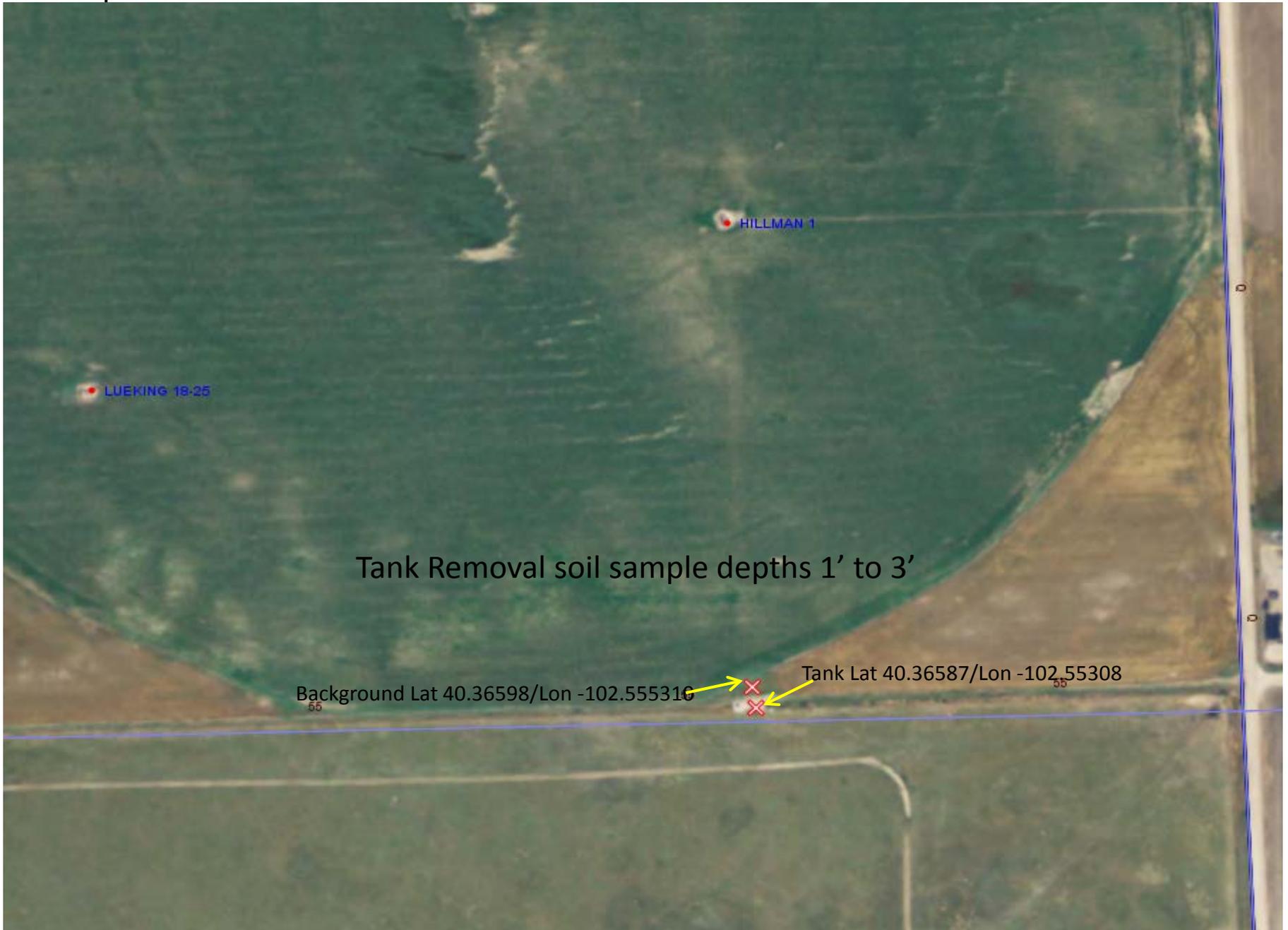
LOW for chloride sensitive crops (includes berries, fruit trees, grapes, citrus, etc.)
 LOW for moderately tolerant crops (includes alfalfa, beans, rice, sorghum, etc.)
 LOW for chloride tolerant crops (includes wheat, flax, tomato, cotton, barley, corn, beets, etc.)

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

North
↑

Hillman 01-25- Tank Pull



LUEKING 18-25

HILLMAN 1

Tank Removal soil sample depths 1' to 3'

Background Lat 40.36598/Lon -102.555310

Tank Lat 40.36587/Lon -102.55308