District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources Department

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 24, 2018
Submit to appropriate OCD District office

Incident ID	nOY1704158265
District RP	1RP-4599
Facility ID	
Application ID	

Release Notification

Responsible Party

Responsible Party	RAM Energy LLC	OGRID	309777
Contact Name	Matt Patterson	Contact Telephone	(918) 638-7054
Contact email	mpatterson@ramenergy	Incident # *(assigned by OCD)*	nOY1704158265
Contact mailing address	5100 E Skelly Drive, Suite 600, Tulsa, OK 74135		

Location of Release Source

Latitude 32.17222 Longitude -103.09222
(NAD 83 in decimal degrees to 5 decimal places)

Site Name	West Dollarhide Queen Sand Unit Satellite 3	Site Type	Gathering/Header system for injection wells
Date Release Discovered	2/8/2017 10:00am	API# *(if applicable)*	

Unit Letter	Section	Township	Range	County
O	30	24S	38E	Lea

Surface Owner: ☐ State ☐ Federal ☐ Tribal ☒ Private (*Name:* George Willis)

Nature and Volume of Release

Material(s) Released (Select all that apply and attach calculations or specific justification for the volumes provided below)

☐ Crude Oil	Volume Released (bbls)	Volume Recovered (bbls)
☒ Produced Water	Volume Released (bbls) 10-15	Volume Recovered (bbls) -0-
	Is the concentration of dissolved chloride in the produced water >10,000 mg/l?	☐ Yes ☐ No
☐ Condensate	Volume Released (bbls)	Volume Recovered (bbls)
☐ Natural Gas	Volume Released (Mcf)	Volume Recovered (Mcf)
☐ Other (describe)	Volume/Weight Released (provide units)	Volume/Weight Recovered (provide units)

Cause of Release

Release was caused by faulty valve on 4" trunk line. Line was shut in, no further fluid spilled. Line has been repaired. New dikes will be built around all fluid production satellites.

State of New Mexico
Oil Conservation Division

Incident ID	nOY1704158265
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Was this a major release as defined by 19.15.29.7(A) NMAC? ☐ Yes ☒ No	If YES, for what reason(s) does the responsible party consider this a major release?
If YES, was immediate notice given to the OCD? By whom? To whom? When and by what means (phone, email, etc)?	

Initial Response

The responsible party must undertake the following actions immediately unless they could create a safety hazard that would result in injury

☒ The source of the release has been stopped.
☒ The impacted area has been secured to protect human health and the environment.
☒ Released materials have been contained via the use of berms or dikes, absorbent pads, or other containment devices.
☒ All free liquids and recoverable materials have been removed and managed appropriately.

If all the actions described above have not been undertaken, explain why:

Per 19.15.29.8 B. (4) NMAC the responsible party may commence remediation immediately after discovery of a release. If remediation has begun, please attach a narrative of actions to date. If remedial efforts have been successfully completed or if the release occurred within a lined containment area (see 19.15.29.11(A)(5)(a) NMAC), please attach all information needed for closure evaluation.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: Connie Swan Title: Regulatory Administrator

Signature: CSwan Date: 12/6/2021

email: csswan@swanderlandok.com Telephone: (918) 621-6533

OCD Only

Received by: Date:

Incident ID	nOY1704158265
District RP	1RP-4599
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Site Assessment/Characterization

This information must be provided to the appropriate district office no later than 90 days after the release discovery date.

What is the shallowest depth to groundwater beneath the area affected by the release?	>100 (ft bgs)
Did this release impact groundwater or surface water?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of a continuously flowing watercourse or any other significant watercourse?	☐ Yes ☒ No
Are the lateral extents of the release within 200 feet of any lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark)?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of an occupied permanent residence, school, hospital, institution, or church?	☐ Yes ☒ No
Are the lateral extents of the release within 500 horizontal feet of a spring or a private domestic fresh water well used by less than five households for domestic or stock watering purposes?	☐ Yes ☒ No
Are the lateral extents of the release within 1000 feet of any other fresh water well or spring?	☐ Yes ☒ No
Are the lateral extents of the release within incorporated municipal boundaries or within a defined municipal fresh water well field?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of a wetland?	☐ Yes ☒ No
Are the lateral extents of the release overlying a subsurface mine?	☐ Yes ☒ No
Are the lateral extents of the release overlying an unstable area such as karst geology?	☐ Yes ☒ No
Are the lateral extents of the release within a 100-year floodplain?	☐ Yes ☒ No
Did the release impact areas **not** on an exploration, development, production, or storage site?	☐ Yes ☒ No

Attach a comprehensive report (electronic submittals in .pdf format are preferred) demonstrating the lateral and vertical extents of soil contamination associated with the release have been determined. Refer to 19.15.29.11 NMAC for specifics.

Characterization Report Checklist: ***Each of the following items must be included in the report.***

- ☒ Scaled site map showing impacted area, surface features, subsurface features, delineation points, and monitoring wells.
- ☒ Field data
- ☒ Data table of soil contaminant concentration data
- ☒ Depth to water determination
- ☒ Determination of water sources and significant watercourses within ½-mile of the lateral extents of the release
- ☒ Boring or excavation logs
- ☒ Photographs including date and GIS information
- ☒ Topographic/Aerial maps
- ☒ Laboratory data including chain of custody

If the site characterization report does not include completed efforts at remediation of the release, the report must include a proposed remediation plan. That plan must include the estimated volume of material to be remediated, the proposed remediation technique, proposed sampling plan and methods, anticipated timelines for beginning and completing the remediation. The closure criteria for a release are contained in Table 1 of 19.15.29.12 NMAC, however, use of the table is modified by site- and release-specific parameters.

Form C-141
Page 4

State of New Mexico
Oil Conservation Division

Incident ID	nOY1704158265
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I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: Connie Swan Title: Regulatory Compliance Administrator

Signature: CSwan Date: 12/6/2021

email: csswan@swanderlandok.com Telephone: 918-621-6533

OCD Only

Received by: Date:

State of New Mexico
Oil Conservation Division

Incident ID	nOY1704158265
District RP	1RP-4599
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Remediation Plan

Remediation Plan Checklist: ***Each of the following items must be included in the plan.***

- [x] Detailed description of proposed remediation technique
- [x] Scaled sitemap with GPS coordinates showing delineation points
- [x] Estimated volume of material to be remediated
- [x] Closure criteria is to Table 1 specifications subject to 19.15.29.12(C)(4) NMAC
- [x] Proposed schedule for remediation (note if remediation plan timeline is more than 90 days OCD approval is required)

Deferral Requests Only: ***Each of the following items must be confirmed as part of any request for deferral of remediation.***

- [ ] Contamination must be in areas immediately under or around production equipment where remediation could cause a major facility deconstruction.
- [ ] Extents of contamination must be fully delineated.
- [ ] Contamination does not cause an imminent risk to human health, the environment, or groundwater.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: Connie Swan Title: Regulatory Compliance Administrator

Signature: CSwan Date: 12/6/2021

email: csswan@swanderlandok.com Telephone: 918-621-6533

OCD Only

Received by: _____ Date: _____

- [ ] Approved
- [x] Approved with Attached Conditions of Approval
- [ ] Denied
- [ ] Deferral Approved

Signature: Bradford Billings Date: 12/08/2021

Incident ID	
District RP	
Facility ID	
Application ID	

Closure

The responsible party must attach information demonstrating they have complied with all applicable closure requirements and any conditions or directives of the OCD. This demonstration should be in the form of a comprehensive report (electronic submittals in .pdf format are preferred) including a scaled site map, sampling diagrams, relevant field notes, photographs of any excavation prior to backfilling, laboratory data including chain of custody documents of final sampling, and a narrative of the remedial activities. Refer to 19.15.29.12 NMAC.

Closure Report Attachment Checklist: ***Each of the following items must be included in the closure report.***

☐ A scaled site and sampling diagram as described in 19.15.29.11 NMAC

☐ Photographs of the remediated site prior to backfill or photos of the liner integrity if applicable (Note: appropriate OCD District office must be notified 2 days prior to liner inspection)

☐ Laboratory analyses of final sampling (Note: appropriate ODC District office must be notified 2 days prior to final sampling)

☐ Description of remediation activities

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations. The responsible party acknowledges they must substantially restore, reclaim, and re-vegetate the impacted surface area to the conditions that existed prior to the release or their final land use in accordance with 19.15.29.13 NMAC including notification to the OCD when reclamation and re-vegetation are complete.

Printed Name: _____ Title: _____

Signature: _____ Date: _____

email: _____ Telephone: _____

OCD Only

Received by: _____ Date: _____

Closure approval by the OCD does not relieve the responsible party of liability should their operations have failed to adequately investigate and remediate contamination that poses a threat to groundwater, surface water, human health, or the environment nor does not relieve the responsible party of compliance with any other federal, state, or local laws and/or regulations.

Closure Approved by: _____ Date: _____

Printed Name: _____ Title: _____

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
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1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 8, 2011

Submit 1 Copy to appropriate District Office in accordance with 19.15.29 NMAC.

Release Notification and Corrective Action

OPERATOR

[X] Initial Report [ ] Final Report

Name of Company	RAM ENERGY LLC	Contact	Matt Patterson
Address	5100 E Skelly Drive, Suite 600, Tulsa, OK 74135	Telephone No.	(918) 638-7054
Facility Name	Satellite 3	Facility Type	Gathering/Header system for injection wells

Surface Owner Mr. Green (575) 441-4660	Mineral Owner	API No. n/a

LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
SE/4 SE/4	30	24S	38E					Lea

Latitude 32.17222 **Longitude** -103.09222

NATURE OF RELEASE

Type of Release Saltwater	Volume of Release 10-15 bbls	Volume Recovered
Source of Release Faulty valve on 4" trunk line	Date and Hour of Occurrence 2/8/17	Date and Hour of Discovery 2/8/17 10am
Was Immediate Notice Given? [x] Yes [ ] No [ ] Not Required	If YES, To Whom? Olivia Yu, NMOCD Environmental Specialist	
By Whom? Chris Lanbrano, RAM production foreman	Date and Hour 2/8/2017	
Was a Watercourse Reached? [ ] Yes [x] No	If YES, Volume Impacting the Watercourse.	

If a Watercourse was Impacted, Describe Fully.*

N/A

RECEIVED
By Olivia Yu at 4:01 pm, Feb 10, 2017

Describe Cause of Problem and Remedial Action Taken.*

Release was caused by faulty valve on 4" trunk line. Line was shut in, no further fluid spilled. Line has been repaired. New dikes will be built around all fluid production satellitse.

Describe Area Affected and Cleanup Action Taken.*

Fluid traveled down the road approximately 300' toward WDQSU #37 in 3-4' wide stream. Photographs attached. Vacuum truck deployed immediately to suck up standing water.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Signature: CSwan	OIL CONSERVATION DIVISION
Printed Name: Connie Swan	Approved by Environmental Specialist:
Title: Regulatory Administrator	Approval Date: 2/10/2017 Expiration Date:
E-mail Address: csswan@swanderlandok.com	Conditions of Approval: see attached directive Attached [x]
Date: 2/8/2017 Phone: (918) 621-6533	

* Attach Additional Sheets If Necessary

1RP-4599 fOY1704157843 nOY1704158265

pOY1704158602

Operator/Responsible Party,

The OCD has received the form C-141 you provided on _2/8/2017__ regarding an unauthorized release. The information contained on that form has been entered into our incident database and remediation case number __1R-_4599__ has been assigned. **Please refer to this case number in all future correspondence.**

It is the Division's obligation under both the Oil & Gas Act and Water Quality Act to provide for the protection of public health and the environment. Our regulations (19.15.29.11 NMAC) state the following,

> *The responsible person shall complete division-approved corrective action for releases that endanger public health or the environment. The responsible person shall address releases in accordance with a remediation plan submitted to and approved by the division or with an abatement plan submitted in accordance with 19.15.30 NMAC.* [emphasis added]

Release characterization is the first phase of corrective action unless the release is ongoing or is of limited volume and all impacts can be immediately addressed. Proper and cost-effective remediation typically cannot occur without adequate characterization of the impacts of any release. Furthermore, the Division has the ability to impose reasonable conditions upon the efforts it oversees. **As such, the Division is requiring a workplan for the characterization of impacts associated with this release be submitted to the OCD District _1_ office in __Hobbs____ on or before _3/10/2017_. If and when the release characterization workplan is approved, there will be an associated deadline for submittal of the resultant investigation report. Modest extensions of time to these deadlines may be granted, but only with acceptable justification.**

The goals of a characterization effort are: 1) determination of the lateral and vertical extents along with the magnitude of soil contamination. 2) determine if groundwater or surface waters have been impacted. 3) If groundwater or surface waters have been impacted, what are the extents and magnitude of that impact. 4) The characterization of any other adverse impacts that may have occurred (examples: impacts on vegetation, impacts on wildlife, air quality, loss of use of property, etc.). To meet these goals as quickly as possible, the following items must, at a minimum, be addressed in the release characterization workplan and subsequent reporting:

● Horizontal delineation of soil impacts in each of the four cardinal compass directions. Adsorbed soil contamination must be characterized for the following constituents using the associated laboratory methods: benzene, toluene, ethylbenzene, and total xylenes by either Method 8260 or 8021, total petroleum hydrocarbons by Method 8015 extended range (GRO+DRO+MRO; C_6 thru C_{36}), and for chloride by Method 300. This is not an exclusive list of potential contaminants. Analyzed parameters should be modified based on the nature of the released substance(s). Soil sampling must be both within the impacted area and beyond.

● Vertical delineation of soil impacts. Adsorbed soil contamination must be characterized for the following constituents using the associated laboratory methods: benzene, toluene, ethylbenzene, and total xylenes by either Method 8260 or 8021, total petroleum hydrocarbons by Method 8015 extended range (GRO+DRO+MRO; C_6 thru C_{36}), and for chloride by Method 300. As above, this is not an exclusive list of potential contaminants and can be modified. Vertical characterization samples should be taken at depth intervals no greater than five feet apart. Lithologic description of encountered soils must also be provided. At least ten vertical feet of soils with contaminant concentrations at or below these values must be demonstrated as existing above the water table.

● Nominal detection limits for field and laboratory analyses must be provided.

● Composite sampling is not generally allowed.

● Field screening and assessment techniques are acceptable (headspace, titration, EC [include algorithm for validation purposes], EM, etc.), but the sampling and assay procedures must be clearly defined. Copies of field notes are highly desirable. A statistically significant set of split samples must be submitted for confirmatory laboratory analysis, including the laterally farthest and vertically deepest sets of soil samples. Make sure there are at least two soil samples submitted

for laboratory analysis from each borehole or test pit (highest observed contamination and deepest depth investigated). Copies of the actual laboratory results must be provided including chain of custody documentation.

●Probable depth to shallowest protectable groundwater and lateral distance to nearest surface water. If there is an estimate of groundwater depth, the information used to arrive at that estimate must be provided. If there is a reasonable assumption that the depth to protectable water is 50 feet or less, the responsible party should anticipate the need for at least one groundwater monitoring well to be installed in the area of likely maximum contamination.

● If groundwater contamination is encountered, an additional investigation workplan may be required to determine the extents of that contamination. Groundwater and/or surface water samples, if any, must be analyzed by a competent laboratory for volatile organic hydrocarbons (typically Method 8260 full list), total dissolved solids, pH, major anions and cations including chloride and sulfate, dissolved iron, and dissolved manganese. The investigation workplan must provide the groundwater sampling method(s) and sample handling protocols. To the fullest extent possible, aqueous analyses must be undertaken using nominal method detection limits. As with the soil analyses, copies of the actual laboratory results must be provided including chain of custody documentation.

● Accurately scaled and well-drafted site maps must be provided providing the location of borings, test pits, monitoring wells, potentially impacted areas, and significant surface features including roads and site infrastructure that might limit either the release characterization or remedial efforts. Field sketches may be included in subsequent reporting, but should not be considered stand-alone documentation of the site's layout. Digital photographic documentation of the location and fieldwork is recommended, especially if unusual circumstances are encountered.

Nothing herein should be interpreted to preclude emergency response actions or to imply immediate remediation by removal cannot proceed as warranted. Nonetheless, characterization of impacts and confirmation of the effectiveness of remedial efforts must still be provided to the OCD before any release incident will be closed.

Jim Griswold
OCD Environmental Bureau Chief
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
505-476-3465
jim.griswold@state.nm.us

ALTAMIRA
formerly known as Enviro Clean Cardinal

September 13, 2019

Mr. Brad Billings
Environmental Bureau
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

SUBMITTED VIA EMAIL
Bradford.Billings@state.nm.us

Re: Proposed Soil Remediation Work Plan Update
West Dollarhide Queen Sand Unit Satellite 3 Release
NMOCD Case No. 1RP-4599
Lea County, New Mexico

Dear Mr. Billings:
Altamira (formerly Enviro Clean Cardinal, LLC) has been retained by RAM Energy, LLC (RAM) to prepare a Soil Remediation Work Plan for RAM's West Dollarhide Queen Sand Unit (WDQSU) Satellite 3 site (Site) located in Unit Letter I, Section 31, Township 24 South, Range 38 East of Lea County, New Mexico (geographical coordinates 32.1703148N, 103.0941925W). The Site is approximately one and seven tenths (1.7) mile west of the New Mexico/Texas state line and seven (7) miles northeast of Jal, New Mexico. The Site location and topographical features are shown on the attached *Figure 1*.

The objective of this Proposed Soil Remediation Work Plan Update is to detail findings to date and to propose soil remediation to address the impacts at the Site resulting from the February 8th, 2017 release of approximately 10 to 15 barrels (bbls) of produced water, as well as historic releases predating RAM's operation at the Site. The proposed remediation will be protective of groundwater.

Shallow Soil Assessment
On February 28, 2017, Altamira visually assessed the Site and performed an electromagnetic (EM) terrain conductivity survey, in order to better delineate the release for remediation response planning. The EM survey results (*Figure 2*) and visual indications of impacted soil indicated that the produced water flowed approximately 475 feet to the south and southwest across scrubland and then another 725 feet to the south and west along a lease road, terminating to the southeast of the West Dollarhide Queen Sand Unit #92 well location. The initial field assessment findings were consistent with information provided by Site personnel.

Based upon these findings, RAM submitted a Remediation Work Plan to New Mexico Oil Conservation Division (NMOCD) on March 10, 2017 (*Appendix A*) which proposed excavation of impacted soil, with depth and extent of excavation to be delineated by confirmation sampling.

Through a series of correspondences in 2017 and 2018, NMOCD noted that additional delineation should be completed for the Site, prior to commencing excavation. In March 2018, NMOCD approved a delineation workplan (communicated via e-mail) that included collecting and analyzing samples from 14 hand-augered soil borings and one deeper soil boring within the area that the EM survey and visual observations indicated had been impacted by the release. Samples collected from the borings were to be assessed for Total Petroleum Hydrocarbons (TPH); benzene, toluene, ethylbenzene, and xylenes (BTEX); and chlorides.

On April 19, 2018, Altamira installed the 14 soil borings and completed sampling and analysis, as prescribed by the approved work plan. Of the 14 borings, six borings had reported concentrations of chloride above the NMOCD action level of 600 ppm in samples from depths of two feet or greater, four had concentrations of 600 ppm or greater only in in samples from depths of one foot or less, and four borings had concentration levels of chloride below action levels in all samples (Table 1).

Deep Soil Assessment

Following email correspondence with NMOCD regarding selection of an appropriate deep boring location, on February 12, 2019, Scarborough Drilling (Lamessa, Texas) completed the agreed-upon deep soil boring (*Figure 3*) with a Midway 1500 air-rotary drill rig at the site, under the supervision of Altamira. The boring was completed to a depth of 100 feet below ground surface (bgs). The boring did not extend to the top of groundwater.

Soil and cutting samples were collected and described at five-foot intervals. Samples were also field-analyzed for estimated chloride concentration using a conductivity meter and Mettler Toledo scale, to help determine the necessary depth of borings to meet the NMOCD requirement for soil delineation to a depth at which chloride concentration <600 mg/kg. The soil boring log with field estimates of chloride concentration is included as *Figure 4*.

All samples were collected in 4-ounce jars and transferred to the lab under proper chain of custody. The samples were analyzed by XENCO Laboratories (XENCO) in Midland, Texas for chlorides using EPA Method 300. Additionally, the uppermost soil sample (four to five feet bgs) was also analyzed for Total Petroleum Hydrocarbons (TPH) utilizing EPA Method SW8015 and benzene, toluene, ethylbenzene, and xylenes (BTEX) using EPA Method 8021B.

XENCO provided analytical results for the samples to Altamira on February 19, 2018. A summary of the laboratory analytical results for the deep soil sampling event is included as Table 2, with results above laboratory detection limits in bold and NMOCD cleanup criteria exceedances highlighted in yellow. The complete laboratory analytical reports are attached as *Appendix B*.

Based upon the analytical results for the soil samples, soil with concentrations of chloride exceeding NMOCD cleanup standards are present to a depth of 64 to 65 feet bgs. Seven successive sample at five-foot intervals, from depths of 69-70 feet bgs to 99-100 feet bgs, had concentrations well below 600 ppm. Neither BTEX or TPH were not reported above laboratory detection limits from the 4-5 feet bgs soil boring sample.

Discussion of Deep Soil Assessment Results

The depth of chloride impact to soil was initially unexpected based upon the size, age, and nature of the release, as well as the relatively shallow impact of BTEX and TPH, based upon the April 2018 and February 2019 sampling events. Additionally, the vertical delineation analytical results indicate that chloride concentrations “yo-yo;” concentrations decrease with depth, but then spike, followed by a deeper “decreasing concentration with depth” trend. This type of stacked “decreasing with depth” trend is typical for soil that has been impacted by multiple chloride releases over a long period of time.

To further understand the unexpected deep and irregular chloride impact of site soil, Altamira reviewed historical aerial photographs of the site and hydrogeologically-upgradient areas (to the west). Based upon this review, two historic reserve pits were identified within 1,200 feet

upgradient from the February 2019 soil boring (*Appendix C*). An approximately 11-acre area of historically stressed vegetation is located approximately 250 feet west of the soil boring. It is likely that the high concentrations of chlorides at depths below 19 to 24 feet bgs are the result of historic releases, possibly from materials placed in upgradient reserve pits and from releases associated with the historically-stressed vegetation to the west.

Proposed Soil Remediation

The constituent that is the driver for soil remediation is chloride. Since chloride cannot be reduced using degradation processes, the proposed remedial option is the excavation of impacted media coupled with off-site disposal. Altamira recommends the removal and replacement of Site soils that exceed the RRALs and the chloride cleanup level. The proposed remediation areas are shown on *Figure 5*.

Data collected by Altamira indicates that soil impacted by the February 8th, 2017 release generally fell into two groups: soil with only near-surficial impact (less than one foot) and soil that has been impacted with concentrations of chloride above 600 ppm to depths exceeding three (3) feet bgs,

Altamira proposes that the upper 4 feet of soil be excavated for all areas which have been deeply impacted by the release. The areal extent of this remediation area measures 9,180 square feet. An estimated volume of 1,360 cubic yards of soil (in-situ) is expected to be removed. Sidewall samples will be collected to confirm that impacted soil has been removed. Following confirmation of appropriate excavation, a 20-mil synthetic liner will be installed at the base of the excavation. The excavation will then be backfilled with clean fill from an acceptable source and compacted to existing grade.

Altamira proposes that the upper one foot of soil be excavated for areas at which only near-surficial impact occurred. Following the removal of impacted soil, confirmation samples from the sidewalls and bottom of the excavation will be collected and analyzed collected to confirm that impacted soil has been removed. Following confirmation of appropriate excavation, the excavation will be backfilled with clean fill from an acceptable source and compacted to existing grade.

Altamira hopes the NMOCD will find this Proposed Soil Remediation Work Plan Update appropriate and compliant and will approves the remediation work proposed herein. If you have questions regarding this document, please do not hesitate to contact Mr. Darrell Pennington at at RAM at 918-947-6304 or me at 713-208-6481.

Sincerely,

David Lehmann

David Lehmann, M.S.T.C., Ph.D., P.G.
Senior Project Manager I Altamira
713.208.6481 office I 281.757.5054 cell

Attachments

Tables:

- *1 – Soil Sampling Analytical Results, April 2018*

- *2 – Soil Sampling Analytical Results, February, 2019*

Figures:

- *1 – Site Location Map*
- *2 – EM Survey Results*
- *3 – Soil Boring Location Map*
- *4 – Soil Boring Log*
- *5 – Proposed Remediation Area*

Appendices:

- *A – Remediation Work Plan, 2017*
- *B – Laboratory Analytical Results*
- *C – Historic Aerial Photographs*

ALTAMIRA
formerly known as Enviro Clean Cardinal

Tables

Table 1
SOIL ANALYTICAL RESULTS
RAM ENERGY, LLC
WEST DOLLARHIDE SATELLITE 3
LEA COUNTY, NEW MEXICO

Parameters	Cleanup Levels	Sample ID:	AH-1 (0-6")	AH-1 (6"-1)	AH-1 (2')	AH-1 (3')	AH-1 (4')	AH-2 (0-6")	AH-2 (6"-1')	AH-2 (2')	AH-2 (3')	AH-2 (4')	AH-3 (0-6")	AH-3 (6"-1')	AH-3 (2')	AH-3 (3')	AH-3 (4')	AH-4 (0-6")	AH-4 (6"-1")	AH-4 (2')
		Sample Date:	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18
BTEX		***Units***																		
Benzene	10	mg/kg	<0.00201	-	-	-	-	<0.00198	-	-	-	-	<0.00200	-	-	-	-	<0.00201	-	-
Toluene	-	mg/kg	<0.00201	-	-	-	-	<0.00198	-	-	-	-	<0.00200	-	-	-	-	<0.00201	-	-
Ethylbenzene	-	mg/kg	<0.00201	-	-	-	-	<0.00198	-	-	-	-	<0.00200	-	-	-	-	<0.00201	-	-
Xylenes, Total	-	mg/kg	<0.00201	-	-	-	-	<0.00198	-	-	-	-	<0.00200	-	-	-	-	<0.00201	-	-
Total BTEX	50	mg/kg	<0.00201	-	-	-	-	<0.00198	-	-	-	-	<0.00200	-	-	-	-	<0.00201	-	-
TPH		***Units***																		
TPH GRO	-	mg/kg	<15.0	-	-	-	-	<15.0	-	-	-	-	<14.9	-	-	-	-	<15.0	-	-
TPH DRO	-	mg/kg	<15.0	-	-	-	-	77	-	-	-	-	<14.9	-	-	-	-	31.5	-	-
TPH ORO	-	mg/kg	<15.0	-	-	-	-	<15.0	-	-	-	-	<14.9	-	-	-	-	<15.0	-	-
Total TPH	**1,000**	mg/kg	<15.0	-	-	-	-	77	-	-	-	-	<14.9	-	-	-	-	31.5	-	-
CHLORIDES		***Units***																		
Cholorides	**600**	mg/kg	<4.98	<4.99	<4.97	<4.96	<4.98	351	257	762	2,280	4,030	453	25.3	125	128	302	936	156	125

Parameters	Cleanup Levels	Sample ID:	AH-4 (3')	AH-4 (4')	AH-5 (0-6")	AH-5 (6"-1')	AH-5 (2')	AH-5 (3')	AH-5 (4')	AH-6 (0-6")	AH-6 (6"-1')	AH-6 (2')	AH-6 (3')	AH-6 (4')	AH-7 (0-6")	AH-7 (6"-1')	AH-7 (2')	AH-7 (3')	AH-8 (0-6")	AH-8 (6"-1')
		Sample Date:	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18
BTEX		***Units***																		
Benzene	10	mg/kg	-	-	<0.00200	-	-	-	-	<0.00199	-	-	-	-	<0.00200	-	-	-	<0.00202	-
Toluene	-	mg/kg	-	-	<0.00200	-	-	-	-	<0.00199	-	-	-	-	<0.00200	-	-	-	<0.00202	-
Ethylbenzene	-	mg/kg	-	-	<0.00200	-	-	-	-	<0.00199	-	-	-	-	<0.00200	-	-	-	<0.00202	-
Xylenes, Total	-	mg/kg	-	-	<0.00200	-	-	-	-	<0.00199	-	-	-	-	<0.00200	-	-	-	<0.00202	-
Total BTEX	50	mg/kg	-	-	<0.00200	-	-	-	-	<0.00199	-	-	-	-	<0.00200	-	-	-	<0.00202	-
TPH		***Units***																		
TPH GRO	-	mg/kg	-	-	<15.0	1,390	-	-	<15.0	<15.0	-	-	-	-	<15.0	-	-	-	<15.0	-
TPH DRO	-	mg/kg	-	-	1,830	10,200	-	-	275	<15.0	-	-	-	-	75.2	-	-	-	<15.0	-
TPH ORO	-	mg/kg	-	-	84.8	1,070	-	-	15.7	<15.0	-	-	-	-	<15.0	-	-	-	<15.0	-
Total TPH	**1,000**	mg/kg	-	-	1,915	12,700	-	-	290.7	<15.0	-	-	-	-	75.2	-	-	-	<15.0	-
CHLORIDES		***Units***																		
Cholorides	**600**	mg/kg	788	937	528	338	858	1,110	1,410	<4.97	<5.00	<5.00	<5.00	85.7	1,260	546	746	1,020	1,220	209

Notes:

1. BTEX : Benzene, Toluene, Ethylbenzene, Xylenes.
2. TPH : Total Petroleum Hydrocarbons.
3. mg/kg : milligrams per kilogram.
4. < : Analyte not detected at the laboratory reporting limit (RL).
5. Cleanup Level : NMOCD Standards
6. - not analyzed
7. exceeds NMOCD standards

Table 1
SOIL ANALYTICAL RESULTS
RAM ENERGY, LLC
WEST DOLLARHIDE SATELLITE 3
LEA COUNTY, NEW MEXICO

Parameters	Cleanup Levels	Sample ID:	AH-8 (2')	AH-9 (0-6")	AH-9 (6"-1)	AH-9 (2')	AH-9 (3')	AH-10 (0-6")	AH-10 (6"-1')	AH-10 (2')	AH-10 (3')	AH-11 (0-6")	AH-11 (6"-1')	AH-11 (2')	AH-11 (3')	AH-12 (0-6")	AH-12 (6"-1')	AH-12 (2')	AH-12 (3')	AH-12 (4')
		Sample Date:	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18
BTEX		***Units***																		
Benzene	10	mg/kg	-	<0.00200	-	-	-	<0.00198	-	-	-	<0.00202	-	-	-	<0.00199	-	-	-	-
Toluene	-	mg/kg	-	<0.00200	-	-	-	<0.00198	-	-	-	<0.00202	-	-	-	<0.00199	-	-	-	-
Ethylbenzene	-	mg/kg	-	<0.00200	-	-	-	<0.00198	-	-	-	<0.00202	-	-	-	<0.00199	-	-	-	-
Xylenes, Total	-	mg/kg	-	<0.00200	-	-	-	<0.00198	-	-	-	<0.00202	-	-	-	<0.00199	-	-	-	-
Total BTEX	50	mg/kg	-	<0.00200	-	-	-	<0.00198	-	-	-	<0.00202	-	-	-	<0.00199	-	-	-	-
TPH		***Units***																		
TPH GRO	-	mg/kg	-	<15.0	-	-	-	<15.0	-	-	-	<15.0	-	-	-	<15.0	-	-	-	-
TPH DRO	-	mg/kg	-	51.7	-	-	-	<15.0	-	-	-	<15.0	-	-	-	126	-	-	-	-
TPH ORO	-	mg/kg	-	<15.0	-	-	-	<15.0	-	-	-	<15.0	-	-	-	<15.0	-	-	-	-
Total TPH	**1,000**	mg/kg	-	51.7	-	-	-	<15.0	-	-	-	<15.0	-	-	-	126	-	-	-	-
CHLORIDES		***Units***																		
Cholorides	**600**	mg/kg	460	369	631	6.78	<4.92	<5.00	<4.98	<4.97	<5.00	114	240	440	1,560	2,720	38.8	608	546	<5.00

Parameters	Cleanup Levels	Sample ID:	AH-13 (0-6")	AH-13 (6"-1')	AH-13 (2')	AH-14 (0-6")	AH-14 (6"-1')	AH-14 (2')	AH-14 (3')	Backgnd (0-6")	Backgnd (6"-1')	Backgnd (2')	Backgnd (3')	Backgnd (4')	Backgnd (5')
		Sample Date:	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18	04/19/18
BTEX		***Units***													
Benzene	10	mg/kg	<0.00200	-	-	<0.00200	-	-	-	-	-	-	-	-	-
Toluene	-	mg/kg	<0.00200	-	-	<0.00200	-	-	-	-	-	-	-	-	-
Ethylbenzene	-	mg/kg	<0.00200	-	-	<0.00200	-	-	-	-	-	-	-	-	-
Xylenes, Total	-	mg/kg	<0.00200	-	-	<0.00200	-	-	-	-	-	-	-	-	-
Total BTEX	50	mg/kg	<0.00200	-	-	<0.00200	-	-	-	-	-	-	-	-	-
TPH		***Units***													
TPH GRO	-	mg/kg	15.4	<15.0	-	<15.0	-	-	-	-	-	-	-	-	-
TPH DRO	-	mg/kg	2,630	123	-	101	-	-	-	-	-	-	-	-	-
TPH ORO	-	mg/kg	98	<15.0	-	<15.0	-	-	-	-	-	-	-	-	-
Total TPH	**1,000**	mg/kg	2,740	123	-	101	-	-	-	-	-	-	-	-	-
CHLORIDES		***Units***													
Cholorides	**600**	mg/kg	<5.00	21.2	328	612	998	552	382	<4.95	<4.96	<4.95	<4.94	<4.97	<4.96

Notes:

1. BTEX : Benzene, Toluene, Ethylbenzene, Xylenes.
2. TPH : Total Petroleum Hydrocarbons.
3. mg/kg : milligrams per kilogram.
4. < : Analyte not detected at the laboratory reporting limit (RL).
5. Cleanup Level : NMOCD Standards
6. - not analyzed
7. exceeds NMOCD standards

Table 1: RAM Energy, West Dollarhide, Satellite 3, Soil Sample Results – Sampling Even 2/12/2019

Boring ID	Sample Depth (bgs)	Sample Date	GRO (mg/g)k	DRO (mg/kg)	MRO (mg/kg)	Total TPH (mg/kg)	Benzene mg/kg	Toluene mg/kg	Ethyl-benzene mg/kg	Total Xylenes mg/kg	Chlorides (mg/kg)
SB-1	4 – 5’	2/12/19	<15.0	<15.0	<15.0	<15.0	<0.00200	<0.00200	<0.00200	<0.00200	**5,050**
SB-1	9 – 10’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**2,790**
SB-1	14 – 15’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**1,630**
SB-1	19 – 20’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**1,850**
SB-1	24 – 25’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**983**
SB-1	29 – 30’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**1,130**
SB-1	34 – 35’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**2,030**
SB-1	39 – 40’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**1,480**
SB-1	44 – 45’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**1,350**
SB-1	49 – 50’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**2,870**
SB-1	54 – 55’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**2,450**
SB-1	59 – 60’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**2,320**
SB-1	64 – 65’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**681**
SB-1	69 – 70’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**207**
SB-1	74 – 75’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**221**
SB-1	79 – 80’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**282**
SB-1	84 – 85’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**326**
SB-1	89 – 90’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**194**
SB-1	94 – 95’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**157**
SB-1	99 – 100’	2/12/19	NA	NA	NA	NA	NA	NA	NA	NA	**202**

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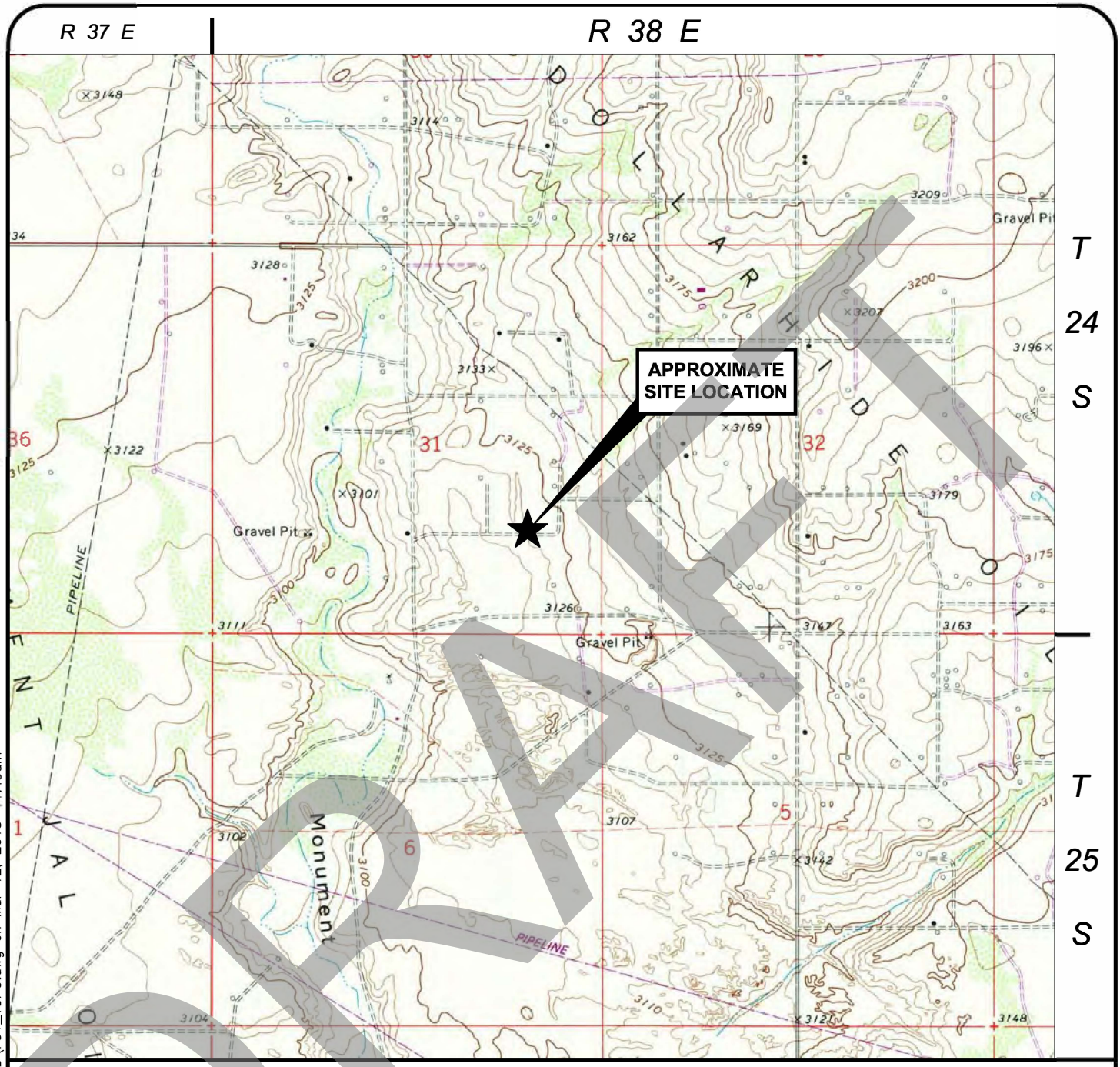
Figures



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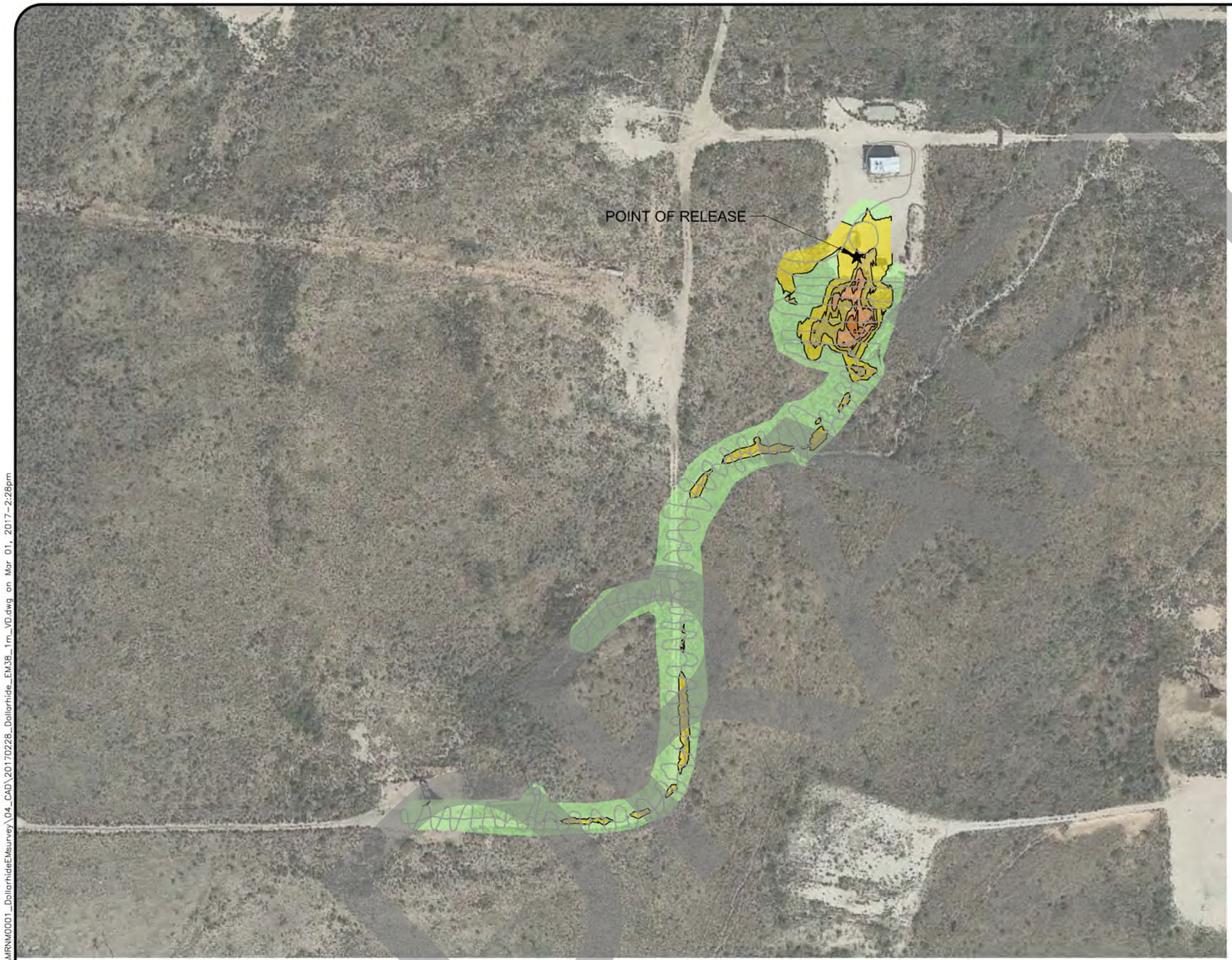
CLIENT	RAM ENERGY TULSA, OKLAHOMA
FIGURE TITLE	*SITE LOCATION LOCATION MAP*
LOCATION	WEST DOLLARHIDE QUEEN SAND UNIT SATELLITE 3 RELEASE SEC. 31, T24S R38E, LEA COUNTY, NEW MEXICO
DOCUMENT TITLE	SOIL REMEDIATION WORK PLAN

ENVIRO CLEAN CARDINAL

Enviro Clean Cardinal, LLC
2405 East County Road 123
Midland, Texas 79706
432.301.0209
www.ECGRP.com

		DESIGNED BY	GHR\JK
DATE	3/12/2018	APPROVED BY	GHR\JK
SCALE	AS SHOWN	DRAWN BY	SKG
PROJECT NUMBER		FIGURE NUMBER	
RAMRNM0001		1	



LEGEND

★ LOCATION OF RELEASE POINT

× LOCATION OF EM38-MK2 GROUND CONDUCTIVITY MEASUREMENT IN mmhos/m

APPARENT GROUND CONDUCTIVITIES

Minimum mmhos/m	Maximum mmhos/m	Color
0	60	
60	120	
120	180	
180	240	
240	300	
300	360+	

N

75 0 75 150
SCALE FEET

NOTES:

1) EM SURVEY PERFORMED BY ENVIRO CLEAN CARDINAL, LLC ON FEBRUARY 28, 2017.
2) EM SURVEY CONDUCTED BY GEORGE H. (BUDDY) RICHARDSON, P.G. USING GEONICS EM38-MK2 GROUND CONDUCTIVITY METER.
3) AERIAL PHOTOGRAPH DATED NOVEMBER 22, 2016, GEOREFERENCED FROM GOOGLE EARTH IMAGE SERVICES.

ENVIRO CLEAN CARDINAL
Enviro Clean Cardinal, LLC
7060 South Yale Avenue, Suite 603
Tulsa, Oklahoma 74136
918.794.7828
www.EnviroCleanPS.com

DOCUMENT TITLE: EM38 SURVEY RESULTS

FIGURE TITLE: ***EM38 1.0-METER VERTICAL DIPOLE SURVEY RESULTS***

CLIENT: RAM ENERGY RESOURCES
TULSA, OKLAHOMA

LOCATION: WEST DOLLARHIDE QUEEN SAND UNIT SATELLITE 3
SECTION 31, T24S, R38E, LEA COUNTY, NEW MEXICO

DESIGNED BY	GHR		
APPROVED BY	GHR	SCALE	1"= 150'
DRAWN BY	SKG	DATE	2/28/2017

PROJECT NUMBER	FIGURE NUMBER
RAMRNM0001	2

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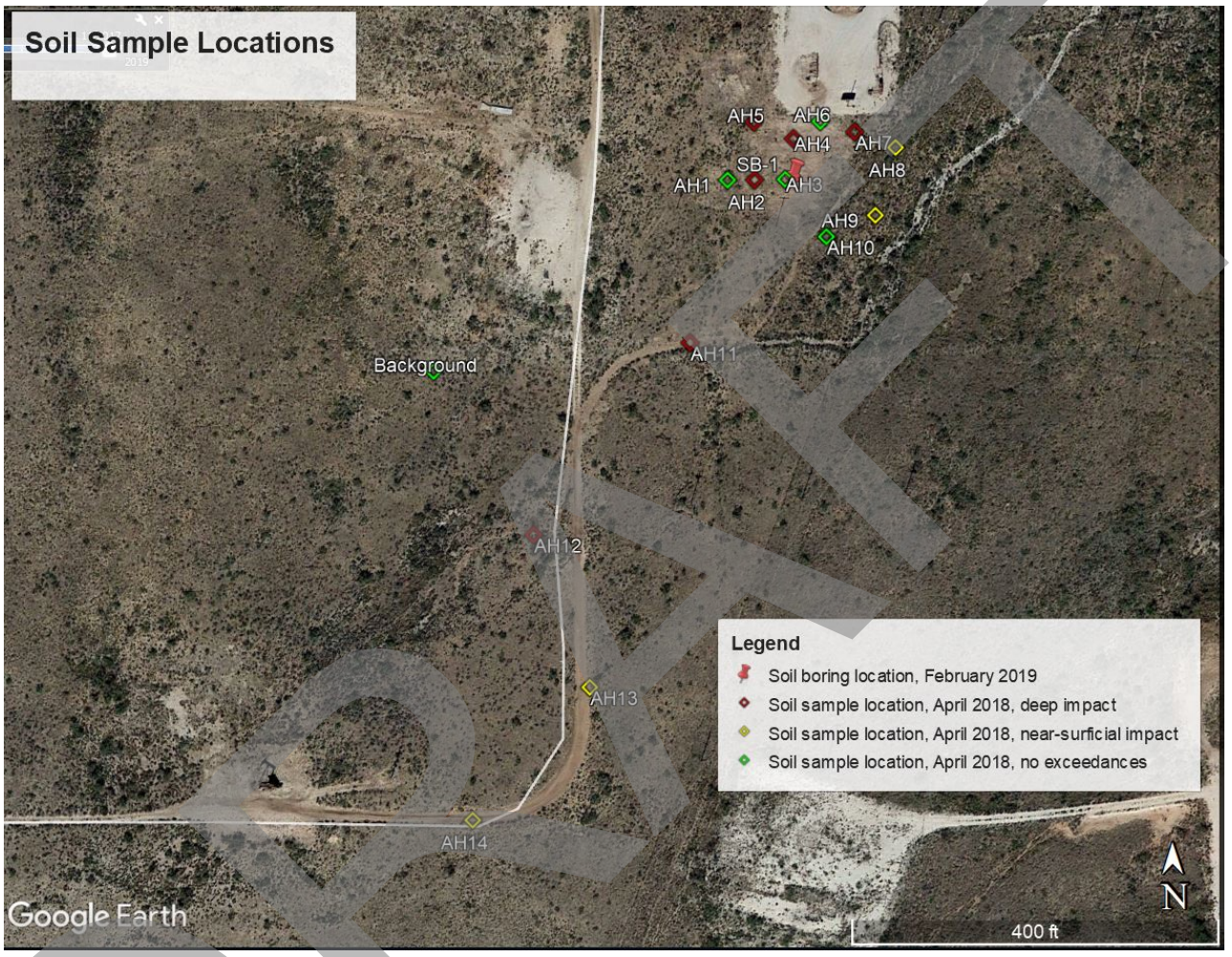
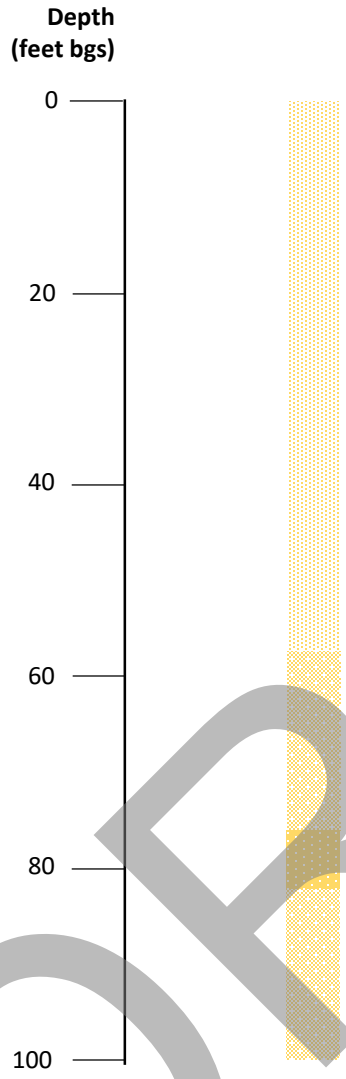


Image Source: Google Earth Pro (Image date: 2/20/2019)

Soil Boring Location Map, RAM Energy, Satellite 3 Release		
Drawn By: DL	ALTAMIRA	Date: 9/3/2018
Project Manager: DL		Figure No.: **3**

Figure 4: Soil Boring Logs, RAM Energy, Satellite 3, February 12, 2019



Fine to medium sand, tan, with scattered layers of caliche, to 55'. Loamy sand to sandy loam, tan, from 59' to 75'. Reddish tan clay loam, 79 to 80'. 84' to 100' sandy loam to loamy sand. Boring complete at 100 feet bgs.

Chloride concentration estimates, in ppm, based on soil paste conductivities, are as follows :

- 4 to 5': 7,910 ppm
- 9 to 10': 6,410 ppm
- 14 to 15': 4,730 ppm
- 19 to 20': 5,162 ppm
- 24 to 25': 2,570 ppm
- 29 to 30': 1,242 ppm
- 34 to 35': 2,810 ppm
- 39 to 40': 1,784 ppm
- 44 to 45': 1,091 ppm
- 49 to 50': 4,685 ppm
- 54 to 55': 4,100 ppm
- 59 to 60': 3,360 ppm
- 64 to 65': 1,503 ppm
- 69 to 70': 872 ppm
- 74 to 75': 794 ppm
- 79 to 80': 810 ppm
- 84 to 85': 980 ppm
- 89 to 90': 756 ppm
- 94 to 95': 540 ppm
- 99 to 100': 722 ppm

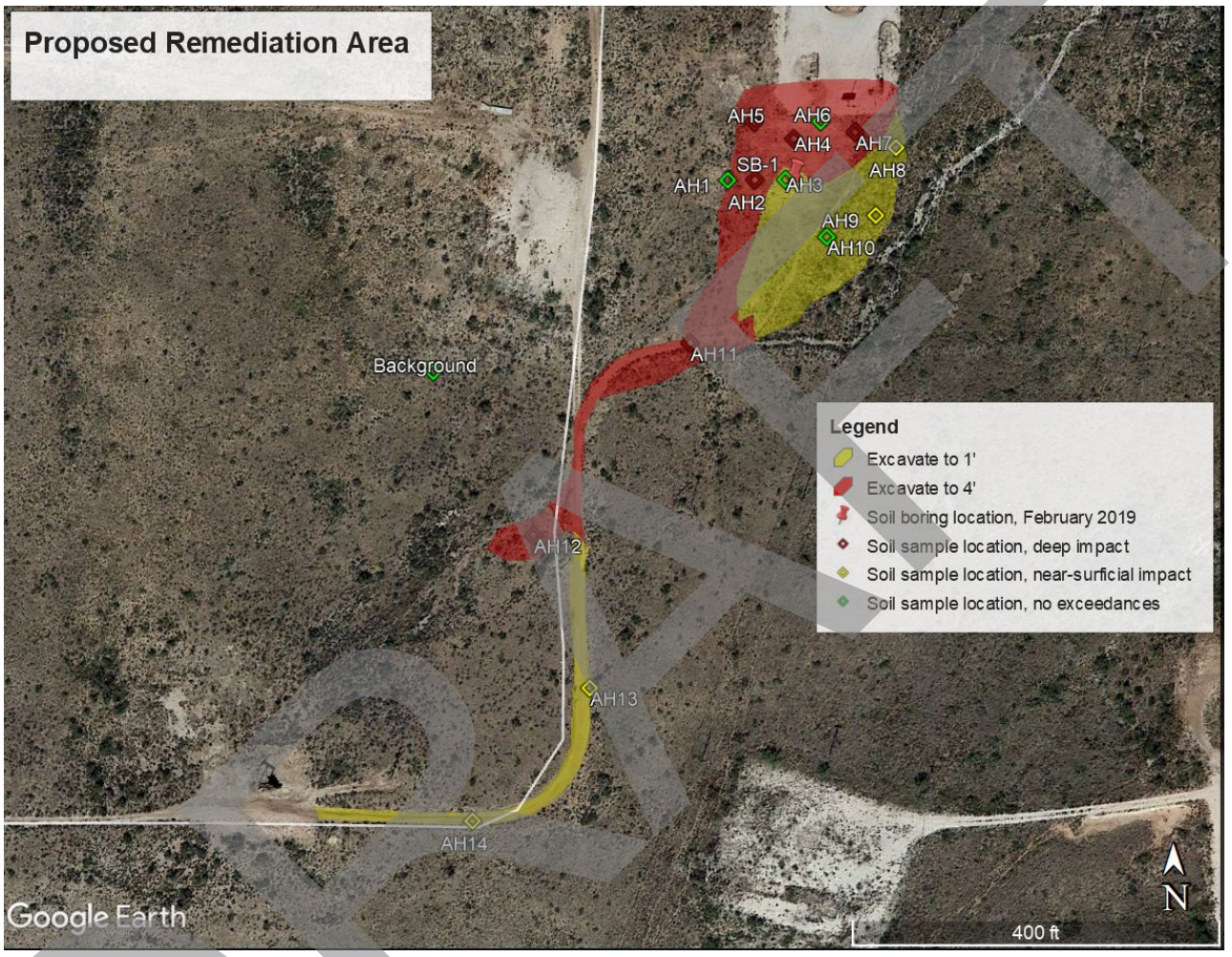


Image Source: Google Earth Pro (Image date: 2/20/2019)

Proposed Remediation Area, RAM Energy, Satellite 3 Release		
Drawn By: DL	ALTAMIRA	Date: 9/3/2018
Project Manager: DL		Figure No.: **5**

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Appendix A – Remediation Work Plan, 2017

March 10, 2017

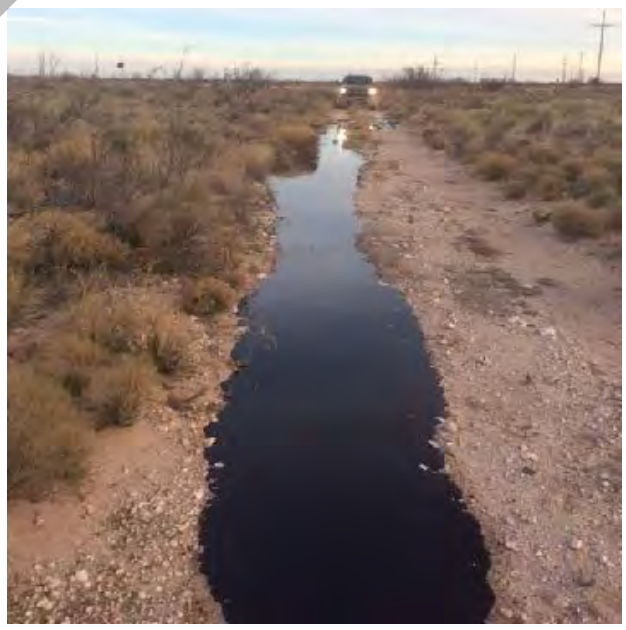
Ms. Olivia Yu, Environmental Specialist
New Mexico Oil Conservation Division
Hobbs District Office
1625 French Drive
Hobbs, New Mexico 88240

SUBMITTED VIA EMAIL
Olivia.Yu@state.nm.us

RE: Remediation Workplan, NMOCD Case No. 1RP-4599
West Dollarhide Queen Sand Unit Satellite 3, T24S, R38E, Sec 31, Unit I
32.1723°N, 103.0921°W
Lea County, New Mexico
Project No. RAMRNM0001

Dear Ms. Yu:

Enviro Clean Cardinal, LLC (ECC) has prepared the following remedial workplan to address the New Mexico Oil Conservation Division (OCD) correspondence concerning the February 8, 2017, release at the RAM Energy Resources (RAM) West Dollarhide Queen Sand Unit Satellite 3 (WDQSU Sat 3), in Lea County, New Mexico. RAM's Form C-141 indicates the release was 10 to 15 barrels (bbls) of produced water which flowed approximately 1,200 feet along a spill path terminating at the West Dollarhide Queen Sand Unit #92 well location. The following photographs represent conditions at the time of release, and current site conditions as observed on February 13th.






This OCD workplan has been prepared to comply with 19.15.29.11 NMAC as well as the *Guidelines for Remediation of Leaks, Spills and Releases* (August 13, 1993) delineation requirements. The attached *Release Location Map* identifies the visibly impacted media covered by this response workplan.

General Site Characteristics

The release site is in the Dollarhide Oil Field, and is situated at approximately 3,135 feet above mean sea level, with a slight slope towards the southwest and the Monument Draw. There is not a Waters of the United States identified watercourse in the vicinity of the site. The primary land use is for livestock grazing, with significant oilfield development in the region. The area is semiarid, with a net annual average precipitation/evaporation loss of approximately 80 inches.

The surface soil surrounding the release site and release-affected area is listed by the USDA-Soil Conservation Service as “SE” (Simona fine sandy loam, 0 to 3 percent slopes) and is a Typic Paleorthid. This indicates a loamy, mixed thermic shallow soil that is well drained, and is derived of calcareous eolian deposits from sedimentary rocks.

The surficial geologic unit is listed as "Qsu" (Quaternary sand deposits, undivided) and is described as windblown deposits, sand sheets and dunes, undivided. The underlying unit is the Tertiary-age Ogallala Formation (lower Pliocene to middle Miocene), which is comprised of alluvial and eolian deposits and petrocalcic soils of the southern High Plains. Site observations indicate the surface soil is shallow to thick wind-deposited sands overlaying carbonate-indurated bedded sands. Scattered cobbles of freshwater limestone and calcareous sandstone were observed during site visits.

The Ogallala Formation is part of the regional High Plains Aquifer system. Records from the Office of the State Engineer indicate there are no water wells or extraction points of diversion within a mile radius of the site. The 2005 *ChevronTexaco Depth to Ground Water Water Wells Facilities* map indicates the depth to water is greater than 100 feet below ground surface (bgs).

Site History and Release Summary

No prior environmental releases were identified at this location, however a nearby release, RP-10-5-2512 (Drinkard Unit 148, May 1, 2010), is about 940 feet west of the WDQSU Sat 3 point of release. At this location, after removing approximately 2,232 cubic yards (cyds) of impacted media, a 20mil polyethylene liner was installed at the base of the 5-foot deep excavation. This 88 bbl release was closed May 24, 2013.

The release that is the subject of this workplan occurred on February 8, 2017. This release was reported as 10 to 15 barrels (bbls) of produced water which flowed approximately 1,200 feet along the main spill path terminating at the West Dollarhide Queen Sand Unit #92 well location. The release-affected soils cover approximately 0.75 acres.

Typically, total fluids releases tend to separate gravimetrically with the release of pressure. This means that the hydrocarbons tend to float on top of salt water, spreading farther downslope than the salt water, and leaving a "bathtub ring" in pooling areas as the briny fluids vertically infiltrate into soil.

Soil Remediation Action Levels

The OCD established the Recommended Remediation Action Level (RRAL) for soils contaminated with petroleum hydrocarbons. The ranking criteria is based on numeric scores to determine the appropriate soil remediation action level for relative threats to public health, fresh water, and the environment. Based on site data, these are the input:

Ranking Score	Depth to Groundwater	<1000 feet from Water Source	<200 feet from Private Domestic Water Source	Distance to Surface Water Body
20	<50 feet	Yes	Yes	<200 feet
10	50 – 99 feet			200 – 1,000 feet
0	>100 feet	No	No	>1,000 feet
TOTAL	0			

The least stringent hydrocarbon cleanup values are assigned to sites with an RRAL less than 9; the WDQSU Sat 3 site has a ranking score of "0", which corresponds to clean-up values of:

- 10 parts per million (ppm) benzene,
- 50 ppm benzene, toluene, ethylbenzene, and total xylenes (BTEX) totaled, and
- 5,000 ppm total petroleum hydrocarbons (TPH).

The Water Quality Control Commission's (WQCC's) *Standards for Ground Water of 10,000 mg/l TDS Concentration or Less* (20.6.2.3102 NMAC, aka the 3102 list) establishes a 250 ppm chloride delineation standard.

Based on the negotiated values granted at other closed release sites with more sensitive groundwater conditions, ECC respectfully requests that the delineation and cleanup requirements for chlorides be established at 1,500 ppm.

Non-Intrusive Electromagnetic Conductivity Survey

Most of the hydrocarbon-affected area is expected to be less than two feet bgs (about 2,400 cyds of impacted media), however, chloride impacts are suspected to be deeper where fluids pooled in topographic depressions in the fine sands. At this site the released produced water that was not recovered from the surface is suspected to have infiltrated into the subsurface sand. To better delineate the release for response planning, a non-intrusive geophysical technique was employed.

On February 28, 2017, ECC performed an electromagnetic (EM) terrain conductivity survey of the Site using an EM38-MK2 meter manufactured by Geonics Limited. The electromagnetic (EM) terrain conductivity survey uses the principle of induction to measure the ground conductivity of the subsurface. This instrument uses a rectified alternating electric current of a known frequency and magnitude, which is passed through a transmitter coil creating a primary magnetic field in the space surrounding the coil, including the underground. Eddy currents are generated in the ground that induce a secondary current within underground conductors, which result in an alternating secondary magnetic field that is sensed by the receiving coil. The ratio of the magnitudes of the primary and secondary currents is proportional to the terrain conductivity. Apparent electrical conductivity readings will increase with increases in clay content, soluble salt, water and temperature.

The EM38 meter is equipped with two transmitter coils and two receiver coils each with a fixed separation of 0.5-meters (m) and-1 m. The depth of signal penetration and response profile are governed by the coil separation and their orientation of the coil dipole (horizontal or vertical dipole). The amplitude of the secondary field is converted into values of ground conductivity. The ground conductivity is measured in millimhos per meter (mmhos/m) or milliSiemens per meter (mS/m). The surveys at this site were performed with the EM38 meter in the vertical dipole (VD) orientation and the measured ground conductivities are measured to depths of 2.5 feet (0.5-m coil) and 5 feet (1-m coil),

collecting geo-referenced data at the rate of two readings per second. A separate in-phase mode is also used to distinguish metal objects that could interfere with true ground conductivity measurements. During the survey the EM38 provides a constant output of the following four channels of information:

- Ground conductivity from 0 to 2.5 feet in depth (0.5-m VD)
- In-phase response for metal detection (0.5-m VD)
- Ground conductivity from 0 to 5 feet in depth (1-m VD)
- In-phase response for metal detection (1-m VD)

The data from these four channels of information are reduced to spreadsheet tables, which are then importing into drafting programs for mapping.

Using walking traverses that were generally perpendicular to the flowpath of the released fluids, ECC collected 6,369 data-point locations across the site. The pathways are shown as light gray lines on the *Survey Results* maps attached to this workplan.

From ECC's review of the conductivity results, it appears that background levels for the WDQSU Sat 3 site range from 3 to 40 mmhos/m. The maximum 0.5-m and 1-m conductivity measurements at the site were 541.95 and 385.70 mmhos/m, respectively.

The EM results have been contoured using a 60 mmhos/m interval. Soils having background conductivity levels up to 60 mmhos/m are shown in the light green shading. Based upon ECC's experience with this meter, we expect EM conductivities greater than approximately 60 mmhos/m to exceed the WQCC 250 mg/kg chloride level. Within these light green areas, very little to none of the soils are expected to have been impacted above WQCC levels. Areas shaded in yellow, orange and red are progressively more impacted by brine and will likely require remedial delineation. The following potentially impacted areas have been calculated for both the 0.5-m and 1-m EM responses:

- EM38 0.5 m response >60 mmhos/m = 17,045 square feet or 0.39 acres
- EM38 1 m response >60 mmhos/m = 25,095 square feet or 0.58 acres

The relationship between chloride levels in soil and the contoured EM values can only be confirmed by the collection of position-referenced soil samples that are submitted to the laboratory for chloride analyses. Samples that will used to compare the EM38 response to laboratory chloride and field conductivity concentrations are depicted on the *EM-38/Chloride Calibration Map* and are further discussed in the Proposed Remediation and Waste Management section below.

Proposed Remediation and Waste Management

BTEX and TPH impacts are expected to be shallow, generally less than 2-feet in depth. The constituent expected to be the driver for delineation and remedial activities is the chloride content. Since chlorides cannot be reduced using degradation processes, the proposed remedial option is the excavation of impacted media for disposal.

There are three distinct remediation areas:

- an upper pooling area near the point of release, impacted with both hydrocarbons and chlorides;
- the main flowpath that terminates near the WDQSU #92 wellhead which is primarily hydrocarbon impacts, but has three small pooling areas with potential chloride impacts; and
- a side channel that appears to be an unrelated less-than-reportable volume crude oil release, but was requested by RAM personnel to be addressed as part of this response.

Initial Chloride Calibration

To start the remediation project, test pits for initial EM38 survey to laboratory chloride concentration calibration will be performed. This is to reduce over-excavating "clean" unimpacted media. To calibrate the EM38 survey results, soil samples will be collected at 1-foot depth intervals from surface to four or five feet bgs at the 10 locations shown on the attached *EM-38/Chloride Calibration Map*. Additionally, field chloride screening will be performed using an electroconductivity meter using 1:1 volumetric soil-to-water extractions.

These chloride calibration laboratory analyses are intended to assess both the low impact and high impact areas identified in the EM-38 survey. Additionally, two background soil samples will be collected for chloride laboratory analyses from profiled locations (light green tinted areas) assumed to be removed from potential impacts. All sample aliquots collected for the calibration will be split in field, one portion used for 1:1 volumetric field electroconductivity measurements, while the other portion will be properly logged onto a chain of custody and placed in an ice-chilled cooler for laboratory analyses.

The laboratory results for chlorides will be cross-referenced to both EM38 and field electroconductivity measurements, to estimate the field measurement values that would be below the chloride delineation values When further excavation samples are determined to meet or be below the estimated delineation value, laboratory chloride samples will be collected for delineation confirmation.

Upper Pooling Area
In the upper pooling area, if bedrock is encountered, or the depth of an excavation exceeds five feet before delineation to the RRALs, then a separate workplan for second-phase of assessment will be prepared, requesting delineation by drilling, the installation of an impervious liner, or alternative clean-up standards. For lateral delineation, soil samples will be collected from the base of the excavation walls at pooling locations. For vertical delineation by excavation, soil samples will be collected from approximately every 1,000 square feet of excavated area and analyzed for BTEX and TPH until vertical delineation to RRALs is achieved, with chlorides analyses expected to continue to greater depths.

Main Flowpath
For the main flowpath, samples will be collected approximately every 100 feet, beginning at the path terminus and working towards the main flowpath, near the centerline of the excavation and analyzed for BTEX/TPH/chlorides, until each constituent class is vertically delineated.

Side Channel
The side channel is expected to be delineated in shallow soils for BTEX/TPH, but confirmation chloride samples will be collected near the centerline of the excavation about every 100 linear feet.

Waste Disposal and Backfill
Disposal for wastes generated at the WDQSU Sat 3 release site will most likely be at the Lealand facility between Jal and Carlsbad, NM. Suitable backfill material will most likely be sourced either from the disposal facility, or from the landowner, dependent on RAM's contractual requirements.

Operations Personnel
Personnel conducting the evaluations will have completed OSHA Hazwoper and Safeland training. Fire resistant clothing, H_2S monitor, and Level D personal protective equipment will be used by personnel.

Soil Sampling and Analyses

Soil samples will be collected from the bottom of excavated areas as described in the Proposed Remediation and Waste Management section of this workplan.

All confirmation soil samples will be submitted to a National Environmental Laboratory Accreditation Program (NELAP) environmental laboratory for OCD-approved TPH, benzene/BTEX, and chloride analytical methods, requesting the results on the OCD-preferred wet-weight basis. Analytical methods will include:

- TPH by EPA SW-846 method 8015M (modified for OCD carbon ranges)
- BTEX by EPA SW-846 8000-series (either 8021B or 8260B at the laboratory's discretion)
- Chlorides by EPA CWA inorganic anion method 300 series

Activities Timeline

Within ten business days of the workplan approval, begin the approved scope of work (this assumes delineation by excavation will be the accepted remedial technology).

Within ten business days of receipt of all data (laboratory reports, waste documentation, clean fill receipts, etc.), compile and submit electronically, a final form C-141 and report of remedial actions to the OCD with all supporting documentation.

Please feel free to contact me at 432.301.0209 if you have questions or concerns, or would like to discussed the proposed activities.

Sincerely,

Enviro Clean Cardinal, LLC

William "Bill" Green, PG No. 136, CPM
Texas Professional Geologist, Certified Project Manager
Hydrogeologist/Environmental Compliance Specialist

Attached: Release Location Map
EM38 1.0-Meter Vertical Dipole Survey Results
EM38 0.5-Meter Vertical Dipole Survey Results
EM-38/Chloride Calibration Map

Legend

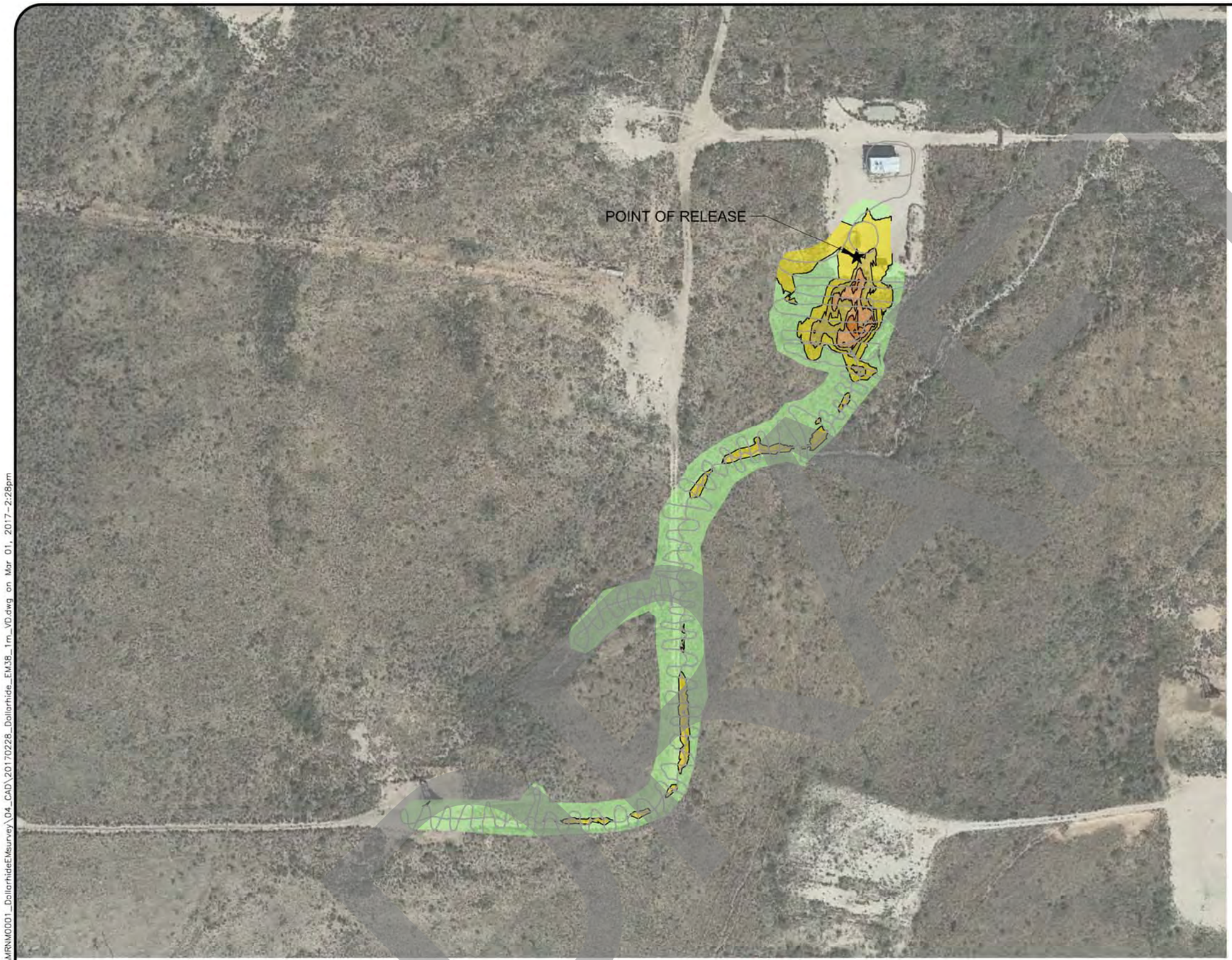
Visibly Affected Surface Soils

N32.1724°
W103.0922°

Release Location Map

RAM Energy Resources - WDQSU Satellite 3
OCD Case No. 1RP-4599
Lea County, New Mexico

Approx. Scale:		Date:
1" = 120'	ENVIRO CLEAN CARDINAL	3/9/2017
2405 E. Co. Rd. 123, Midland, Texas 79706		Project No.: RAMRNM0001



LEGEND

★ LOCATION OF RELEASE POINT

× LOCATION OF EM38-MK2 GROUND CONDUCTIVITY MEASUREMENT IN mmhos/m

APPARENT GROUND CONDUCTIVITIES

Minimum mmhos/m	Maximum mmhos/m	Color
0	60	
60	120	
120	180	
180	240	
240	300	
300	360+	

N

75 0 75 150

SCALE FEET

NOTES:

1) EM SURVEY PERFORMED BY ENVIRO CLEAN CARDINAL, LLC ON FEBRUARY 28, 2017.
2) EM SURVEY CONDUCTED BY GEORGE H. (BUDDY) RICHARDSON, P.G. USING GEONICS EM38-MK2 GROUND CONDUCTIVITY METER.
3) AERIAL PHOTOGRAPH DATED NOVEMBER 22, 2016, GEOREFERENCED FROM GOOGLE EARTH IMAGE SERVICES.

ENVIRO CLEAN CARDINAL
Enviro Clean Cardinal, LLC
7060 South Yale Avenue, Suite 603
Tulsa, Oklahoma 74136
918.794.7828
www.EnviroCleanPS.com

DOCUMENT TITLE: EM38 SURVEY RESULTS

FIGURE TITLE: ***EM38 1.0-METER VERTICAL DIPOLE SURVEY RESULTS***

CLIENT: RAM ENERGY RESOURCES TULSA, OKLAHOMA

LOCATION: WEST DOLLARHIDE QUEEN SAND UNIT SATELLITE 3 SECTION 31, T24S, R38E, LEA COUNTY, NEW MEXICO

DESIGNED BY	GHR		
APPROVED BY	GHR	SCALE	1"= 150'
DRAWN BY	SKG	DATE	2/28/2017

PROJECT NUMBER: RAMRNM0001

FIGURE NUMBER:

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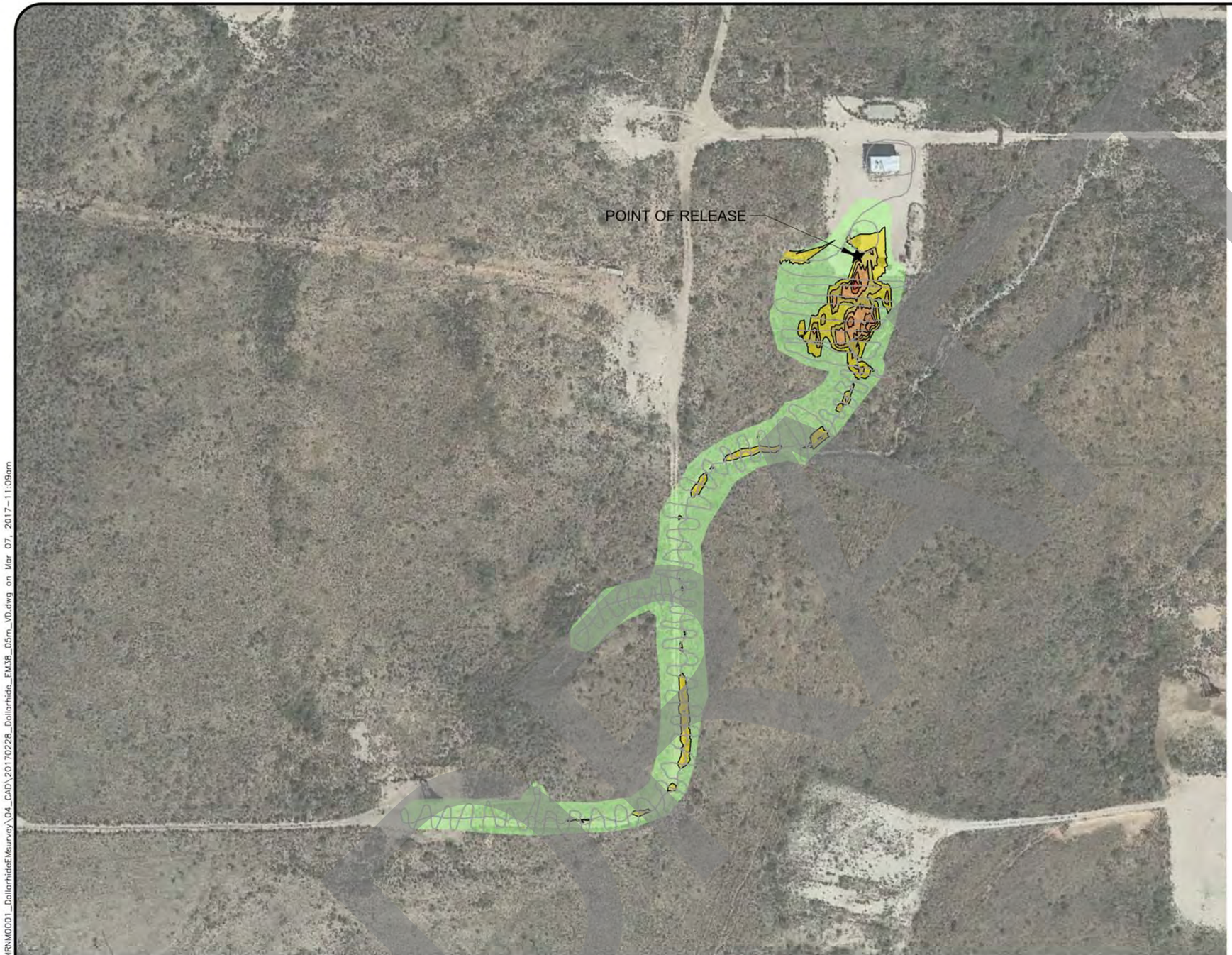

LEGEND

★ LOCATION OF RELEASE POINT

× LOCATION OF EM38-MK2 GROUND CONDUCTIVITY MEASUREMENT IN mmhos/m

APPARENT GROUND CONDUCTIVITIES

Minimum mmhos/m	Maximum mmhos/m	Color
0	60	
60	120	
120	180	
180	240	
240	300	
300	360+	

N

75 0 75 150

SCALE FEET

NOTES:

1) EM SURVEY PERFORMED BY ENVIRO CLEAN CARDINAL, LLC ON FEBRUARY 28, 2017.
2) EM SURVEY CONDUCTED BY GEORGE H. (BUDDY) RICHARDSON, P.G. USING GEONICS EM38-MK2 GROUND CONDUCTIVITY METER.
3) AERIAL PHOTOGRAPH DATED NOVEMBER 22, 2016, GEOREFERENCED FROM GOOGLE EARTH IMAGE SERVICES.

ENVIRO CLEAN CARDINAL
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Tulsa, Oklahoma 74136
918.794.7828
www.EnviroCleanPS.com

DOCUMENT TITLE: EM38 SURVEY RESULTS

FIGURE TITLE: ***EM38 0.50-METER VERTICAL DIPOLE SURVEY RESULTS***

CLIENT: RAM ENERGY RESOURCES TULSA, OKLAHOMA

LOCATION: WEST DOLLARHIDE QUEEN SAND UNIT SATELLITE 3 SECTION 31, T24S, R38E, LEA COUNTY, NEW MEXICO

DESIGNED BY	GHR		
APPROVED BY	GHR	SCALE	1"= 150'
DRAWN BY	SKG	DATE	2/28/2017

PROJECT NUMBER	FIGURE NUMBER
RAMRNM0001	

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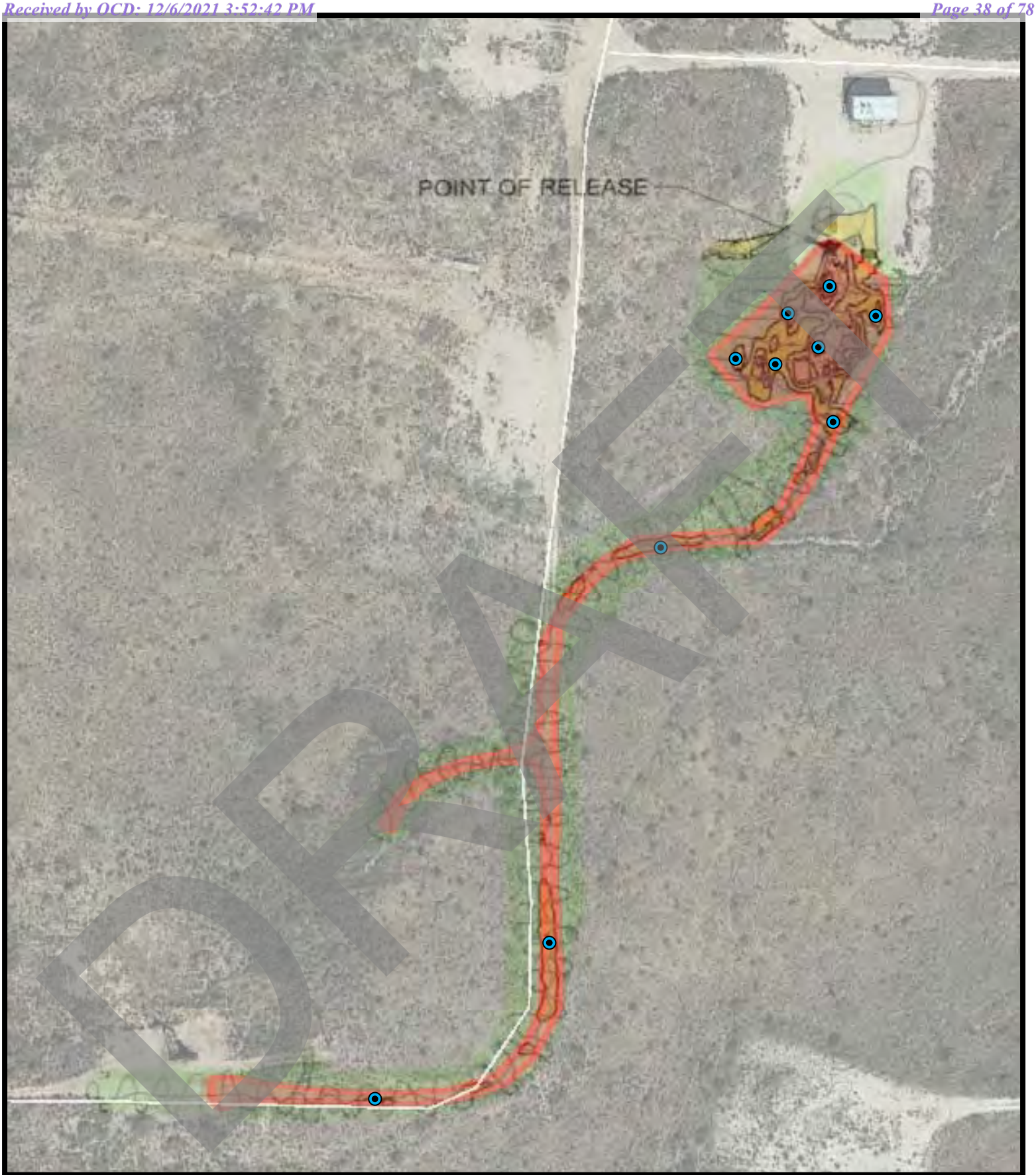

Legend

Chloride Calibration Sample Point

Visibly Affected Surface Soils

Yellow and Green Colors are the 1M EM-38 Survey Plot Overlay

N

N32.1724°

W103.0922°

EM-38/Chloride Calibration Map

RAM Energy Resources - WDQSU Satellite 3

OCD Case No. 1RP-4599

Lea County, New Mexico

Approx. Scale:		Date:
1" = 120'	ENVIRO CLEAN CARDINAL	3/7/2017
2405 E. Co. Rd. 123, Midland, Texas 79706		Project No.: RAMRNM0001

ALTAMIRA
formerly known as Enviro Clean Cardinal

Appendix B – Laboratory Analytical Results

Analytical Report 614454

for

Enviro Clean Services

Project Manager: David Lehmann

RAM Energy Sat. 3

RAM RNM 0001 WDQSSU

19-FEB-19

Collected By: Client

1211 W. Florida Ave, Midland TX 79701

Xenco-Houston (EPA Lab Code: TX00122):
Texas (T104704215-18-28), Arizona (AZ0765), Florida (E871002-24), Louisiana (03054)
Oklahoma (2017-142)

Xenco-Dallas (EPA Lab Code: TX01468):
Texas (T104704295-18-17), Arizona (AZ0809), Arkansas (17-063-0)

Xenco-El Paso (EPA Lab Code: TX00127): Texas (T104704221-18-14)
Xenco-Lubbock (EPA Lab Code: TX00139): Texas (T104704219-18-18)
Xenco-Midland (EPA Lab Code: TX00158): Texas (T104704400-18-18)
Xenco-San Antonio (EPA Lab Code: TNI02385): Texas (T104704534-18-4)
Xenco Phoenix (EPA Lab Code: AZ00901): Arizona (AZ0757)
Xenco-Phoenix Mobile (EPA Lab Code: AZ00901): Arizona (AZM757)
Xenco-Atlanta (LELAP Lab ID #04176)
Xenco-Tampa: Florida (E87429), North Carolina (483)
Xenco-Lakeland: Florida (E84098)

19-FEB-19

Project Manager: **David Lehmann**
Enviro Clean Services
6238 Forest Bend
San Antonio, TX 78240

Reference: XENCO Report No(s): **614454**
RAM Energy Sat. 3
Project Address:

David Lehmann:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number(s) 614454. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. The uncertainty of measurement associated with the results of analysis reported is available upon request. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 614454 will be filed for 45 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Jessica Kramer

Jessica Kramer
Project Assistant

Sample Cross Reference 614454

Enviro Clean Services, San Antonio, TX

RAM Energy Sat. 3

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
Sat 3-B1-4-5'	S	02-12-19 10:43	4 - 5 ft	614454-001
Sat 3-B1-9-10'	S	02-12-19 10:45	9 - 10 ft	614454-002
Sat 3-B1-14-15'	S	02-12-19 10:48	14 - 15 ft	614454-003
Sat 3-B1-19-20'	S	02-12-19 10:50	19 - 20 ft	614454-004
Sat 3-B1-24-25'	S	02-12-19 11:05	24 - 25 ft	614454-005
Sat 3-B1-29-30'	S	02-12-19 11:09	29 - 30 ft	614454-006
Sat 3-B1-34-35'	S	02-12-19 11:15	34 - 35 ft	614454-007
Sat 3-B1-39-40'	S	02-12-19 11:31	39 - 40 ft	614454-008
Sat 3-B1-44-45'	S	02-12-19 11:35	44 - 45 ft	614454-009
Sat 3-B1-49-50'	S	02-12-19 11:42	49 - 50 ft	614454-010
Sat 3-B1-54-55'	S	02-12-19 11:47	54 - 55 ft	614454-011
Sat 3-B1-59-60'	S	02-12-19 11:50	59 - 60 ft	614454-012
Sat 3-B1-64-65'	S	02-12-19 11:52	64 - 65 ft	614454-013
Sat 3-B1-69-70'	S	02-12-19 12:00	69 - 70 ft	614454-014
Sat 3-B1-74-75'	S	02-12-19 12:04	74 - 75 ft	614454-015
Sat 3-B1-79-80'	S	02-12-19 12:06	79 - 80 ft	614454-016
Sat 3-B1-84-85'	S	02-12-19 12:10	84 - 85 ft	614454-017
Sat 3-B1-89-90'	S	02-12-19 12:12	89 - 90 ft	614454-018
Sat 3-B1-94-95'	S	02-12-19 12:15	94 - 95 ft	614454-019
Sat 3-B1-95-100'	S	02-12-19 12:20	99 - 100 ft	614454-020

Version: 1.%

CASE NARRATIVE

Client Name: Enviro Clean Services

Project Name: RAM Energy Sat. 3

Project ID: *RAM RNM 0001 WDQSSI*
Work Order Number(s): *614454*

Report Date: *19-FEB-19*
Date Received: *02/13/2019*

Sample receipt non conformances and comments:

None

Sample receipt non conformances and comments per sample:

None

Analytical non conformances and comments:

Batch: LBA-3079374 Inorganic Anions by EPA 300

Lab Sample ID 614454-009 was randomly selected for Matrix Spike/Matrix Spike Duplicate (MS/MSD). Chloride recovered below QC limits in the Matrix Spike and Matrix Spike Duplicate. Outlier/s are due to possible matrix interference. Samples in the analytical batch are: 614454-001, -002, -003, -004, -005, -006, -007, -008, -009, -010, -011, -012, -013, -014, -015, -016, -017, -018, -019, -020.

The Laboratory Control Sample for Chloride is within laboratory Control Limits, therefore the data was accepted.

Batch: LBA-3079574 BTEX by EPA 8021B

Soil samples were not received in Terracore kits and therefore were prepared by method 5030.

Certificate of Analysis Summary 614454

Enviro Clean Services, San Antonio, TX

Project Name: RAM Energy Sat. 3

Project Id: RAM RNM 0001 WDQSSU
Contact: David Lehmann
Project Location:

Date Received in Lab: Wed Feb-13-19 12:00 pm
Report Date: 19-FEB-19
Project Manager: Jessica Kramer

Analysis Requested													
	Lab Id:	614454-001		614454-002		614454-003		614454-004		614454-005		614454-006	
	Field Id:	Sat 3-B1-4-5'		Sat 3-B1-9-10'		Sat 3-B1-14-15'		Sat 3-B1-19-20'		Sat 3-B1-24-25'		Sat 3-B1-29-30'	
	Depth:	4-5 ft		9-10 ft		14-15 ft		19-20 ft		24-25 ft		29-30 ft	
	Matrix:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
	Sampled:	Feb-12-19 10:43		Feb-12-19 10:45		Feb-12-19 10:48		Feb-12-19 10:50		Feb-12-19 11:05		Feb-12-19 11:09	
BTEX by EPA 8021B	***Extracted:***	Feb-18-19 10:00											
	Analyzed:	Feb-18-19 16:44											
	Units/RL:	mg/kg	RL										
Benzene		ND	0.00200										
Toluene		ND	0.00200										
Ethylbenzene		ND	0.00200										
m,p-Xylenes		ND	0.00399										
o-Xylene		ND	0.00200										
Total Xylenes		ND	0.00200										
Total BTEX		ND	0.00200										
Inorganic Anions by EPA 300	***Extracted:***	Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00	
	Analyzed:	Feb-15-19 10:40		Feb-15-19 12:48		Feb-15-19 12:55		Feb-15-19 13:01		Feb-15-19 10:22		Feb-15-19 13:07	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL
Chloride		5050	49.7	2790	24.9	1630	24.8	1850	25.0	983	4.98	1130	4.99
TPH by SW8015 Mod	***Extracted:***	Feb-14-19 17:00											
	Analyzed:	Feb-15-19 00:47											
	Units/RL:	mg/kg	RL										
Gasoline Range Hydrocarbons (GRO)		ND	15.0										
Diesel Range Organics (DRO)		ND	15.0										
Motor Oil Range Hydrocarbons (MRO)		ND	15.0										
Total TPH		ND	15.0										

Houston - Dallas - Midland - Tampa - Phoenix - Lubbock - San Antonio - El Paso - Atlanta - New Mexico

Version: 1.%

Jessica Kramer
Project Assistant

Final 1.000

Certificate of Analysis Summary 614454

Enviro Clean Services, San Antonio, TX

Project Name: RAM Energy Sat. 3

Project Id: RAM RNM 0001 WDQSSU
Contact: David Lehmann
Project Location:

Date Received in Lab: Wed Feb-13-19 12:00 pm
Report Date: 19-FEB-19
Project Manager: Jessica Kramer

Analysis Requested													
	Lab Id:	614454-007		614454-008		614454-009		614454-010		614454-011		614454-012	
	Field Id:	Sat 3-B1-34-35'		Sat 3-B1-39-40'		Sat 3-B1-44-45'		Sat 3-B1-49-50'		Sat 3-B1-54-55'		Sat 3-B1-59-60'	
	Depth:	34-35 ft		39-40 ft		44-45 ft		49-50 ft		54-55 ft		59-60 ft	
	Matrix:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
	Sampled:	Feb-12-19 11:15		Feb-12-19 11:31		Feb-12-19 11:35		Feb-12-19 11:42		Feb-12-19 11:47		Feb-12-19 11:50	
Inorganic Anions by EPA 300	***Extracted:***	Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00	
	Analyzed:	Feb-15-19 13:13		Feb-15-19 13:19		Feb-15-19 13:38		Feb-15-19 13:26		Feb-15-19 13:32		Feb-15-19 14:22	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL
Chloride		2030	24.9	1480	25.0	1350	4.99	2870	25.0	2450	25.0	2320	25.0

Houston - Dallas - Midland - Tampa - Phoenix - Lubbock - San Antonio - El Paso - Atlanta - New Mexico

Version: 1.%

Jessica Kramer
Project Assistant

Certificate of Analysis Summary 614454

Enviro Clean Services, San Antonio, TX

Project Name: RAM Energy Sat. 3

Project Id: RAM RNM 0001 WDQSSU
Contact: David Lehmann
Project Location:

Date Received in Lab: Wed Feb-13-19 12:00 pm
Report Date: 19-FEB-19
Project Manager: Jessica Kramer

Analysis Requested													
	Lab Id:	614454-013		614454-014		614454-015		614454-016		614454-017		614454-018	
	Field Id:	Sat 3-B1-64-65'		Sat 3-B1-69-70'		Sat 3-B1-74-75'		Sat 3-B1-79-80'		Sat 3-B1-84-85'		Sat 3-B1-89-90'	
	Depth:	64-65 ft		69-70 ft		74-75 ft		79-80 ft		84-85 ft		89-90 ft	
	Matrix:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
	Sampled:	Feb-12-19 11:52		Feb-12-19 12:00		Feb-12-19 12:04		Feb-12-19 12:06		Feb-12-19 12:10		Feb-12-19 12:12	
Inorganic Anions by EPA 300	***Extracted:***	Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00		Feb-15-19 09:00	
	Analyzed:	Feb-15-19 14:28		Feb-15-19 14:34		Feb-15-19 14:40		Feb-15-19 14:46		Feb-15-19 14:53		Feb-15-19 14:59	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL
Chloride		681	4.98	207	4.96	221	4.96	282	4.97	326	4.99	194	4.95

Version: 1.%

Jessica Kramer
Project Assistant

Final 1.000

Certificate of Analysis Summary 614454

Enviro Clean Services, San Antonio, TX

Project Name: RAM Energy Sat. 3

Project Id: RAM RNM 0001 WDQSSU
Contact: David Lehmann
Project Location:

Date Received in Lab: Wed Feb-13-19 12:00 pm
Report Date: 19-FEB-19
Project Manager: Jessica Kramer

Analysis Requested									
	Lab Id:	614454-019		614454-020					
	Field Id:	Sat 3-B1-94-95'		Sat 3-B1-95-100'					
	Depth:	94-95 ft		99-100 ft					
	Matrix:	SOIL		SOIL					
	Sampled:	Feb-12-19 12:15		Feb-12-19 12:20					
Inorganic Anions by EPA 300	***Extracted:***	Feb-15-19 09:00		Feb-15-19 09:00					
	Analyzed:	Feb-15-19 15:05		Feb-15-19 15:11					
	Units/RL:	mg/kg	RL	mg/kg	RL				
Chloride		157	5.00	202	5.00				

Houston - Dallas - Midland - Tampa - Phoenix - Lubbock - San Antonio - El Paso - Atlanta - New Mexico

Version: 1.%

Jessica Kramer
Project Assistant

Final 1.000

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to affect the recovery of the spike concentration. This condition could also affect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the quantitation limit and above the detection limit.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

JN A combination of the "N" and the "J" qualifier. The analysis indicates that the analyte is "tentatively identified" and the associated numerical value may not be consistent with the amount actually present in the environmental sample.

** Surrogate recovered outside laboratory control limit.

BRL Below Reporting Limit.

RL Reporting Limit

MDL Method Detection Limit **SDL** Sample Detection Limit **LOD** Limit of Detection

PQL Practical Quantitation Limit **MQL** Method Quantitation Limit **LOQ** Limit of Quantitation

DL Method Detection Limit

NC Non-Calculable

SMP Client Sample **BLK** Method Blank

BKS/LCS Blank Spike/Laboratory Control Sample **BKSD/LCSD** Blank Spike Duplicate/Laboratory Control Sample Duplicate

MD/SD Method Duplicate/Sample Duplicate **MS** Matrix Spike **MSD:** Matrix Spike Duplicate

+ NELAC certification not offered for this compound.

***** (Next to analyte name or method description) = Outside XENCO's scope of NELAC accreditation

Form 2 - Surrogate Recoveries

Project Name: RAM Energy Sat. 3

Work Orders : 614454,

Project ID: RAM RNM 0001 WDQSSU

Lab Batch #: 3079290 **Sample:** 614454-001 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg **Date Analyzed:** 02/15/19 00:47

SURROGATE RECOVERY STUDY

TPH by SW8015 Mod

Analytes	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	90.5	99.8	91	70-135	
o-Terphenyl	45.1	49.9	90	70-135	

Lab Batch #: 3079574 **Sample:** 614454-001 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg **Date Analyzed:** 02/18/19 16:44

SURROGATE RECOVERY STUDY

BTEX by EPA 8021B

Analytes	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1,4-Difluorobenzene	0.0340	0.0300	113	70-130	
4-Bromofluorobenzene	0.0341	0.0300	114	70-130	

Lab Batch #: 3079290 **Sample:** 7671840-1-BLK / BLK **Batch:** 1 **Matrix:** Solid

Units: mg/kg **Date Analyzed:** 02/14/19 22:08

SURROGATE RECOVERY STUDY

TPH by SW8015 Mod

Analytes	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	97.5	100	98	70-135	
o-Terphenyl	48.8	50.0	98	70-135	

Lab Batch #: 3079574 **Sample:** 7671983-1-BLK / BLK **Batch:** 1 **Matrix:** Solid

Units: mg/kg **Date Analyzed:** 02/18/19 14:32

SURROGATE RECOVERY STUDY

BTEX by EPA 8021B

Analytes	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1,4-Difluorobenzene	0.0323	0.0300	108	70-130	
4-Bromofluorobenzene	0.0286	0.0300	95	70-130	

Lab Batch #: 3079290 **Sample:** 7671840-1-BKS / BKS **Batch:** 1 **Matrix:** Solid

Units: mg/kg **Date Analyzed:** 02/14/19 22:27

SURROGATE RECOVERY STUDY

TPH by SW8015 Mod

Analytes	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	123	100	123	70-135	
o-Terphenyl	54.6	50.0	109	70-135	

* Surrogate outside of Laboratory QC limits

** Surrogates outside limits; data and surrogates confirmed by reanalysis

*** Poor recoveries due to dilution

Surrogate Recovery [D] = 100 * A / B

All results are based on MDL and validated for QC purposes.

Version: 1.%

Form 2 - Surrogate Recoveries

Project Name: RAM Energy Sat. 3

Work Orders : 614454,

Project ID: RAM RNM 0001 WDQSSU

Lab Batch #: 3079574 **Sample:** 7671983-1-BKS / BKS **Batch:** 1 **Matrix:** Solid

Units: mg/kg **Date Analyzed:** 02/18/19 12:58

SURROGATE RECOVERY STUDY

BTEX by EPA 8021B Analytes	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1,4-Difluorobenzene	0.0328	0.0300	109	70-130	
4-Bromofluorobenzene	0.0299	0.0300	100	70-130	

Lab Batch #: 3079290 **Sample:** 7671840-1-BSD / BSD **Batch:** 1 **Matrix:** Solid

Units: mg/kg **Date Analyzed:** 02/14/19 22:48

SURROGATE RECOVERY STUDY

TPH by SW8015 Mod Analytes	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	124	100	124	70-135	
o-Terphenyl	54.2	50.0	108	70-135	

Lab Batch #: 3079574 **Sample:** 7671983-1-BSD / BSD **Batch:** 1 **Matrix:** Solid

Units: mg/kg **Date Analyzed:** 02/18/19 13:17

SURROGATE RECOVERY STUDY

BTEX by EPA 8021B Analytes	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1,4-Difluorobenzene	0.0328	0.0300	109	70-130	
4-Bromofluorobenzene	0.0298	0.0300	99	70-130	

Lab Batch #: 3079290 **Sample:** 614452-001 S / MS **Batch:** 1 **Matrix:** Soil

Units: mg/kg **Date Analyzed:** 02/14/19 23:27

SURROGATE RECOVERY STUDY

TPH by SW8015 Mod Analytes	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	117	99.7	117	70-135	
o-Terphenyl	46.9	49.9	94	70-135	

Lab Batch #: 3079574 **Sample:** 614404-001 S / MS **Batch:** 1 **Matrix:** Soil

Units: mg/kg **Date Analyzed:** 02/18/19 13:36

SURROGATE RECOVERY STUDY

BTEX by EPA 8021B Analytes	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1,4-Difluorobenzene	0.0325	0.0300	108	70-130	
4-Bromofluorobenzene	0.0316	0.0300	105	70-130	

* Surrogate outside of Laboratory QC limits

** Surrogates outside limits; data and surrogates confirmed by reanalysis

*** Poor recoveries due to dilution

Surrogate Recovery [D] = 100 * A / B

All results are based on MDL and validated for QC purposes.

Version: 1.%

Form 2 - Surrogate Recoveries

Project Name: RAM Energy Sat. 3

Work Orders : 614454,

Project ID: RAM RNM 0001 WDQSSU

Lab Batch #: 3079290 **Sample:** 614452-001 SD / MSD **Batch:** 1 **Matrix:** Soil

Units: mg/kg **Date Analyzed:** 02/14/19 23:47

TPH by SW8015 Mod Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	110	99.9	110	70-135	
o-Terphenyl	45.5	50.0	91	70-135	

Lab Batch #: 3079574 **Sample:** 614404-001 SD / MSD **Batch:** 1 **Matrix:** Soil

Units: mg/kg **Date Analyzed:** 02/18/19 13:55

BTEX by EPA 8021B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1,4-Difluorobenzene	0.0319	0.0300	106	70-130	
4-Bromofluorobenzene	0.0336	0.0300	112	70-130	

* Surrogate outside of Laboratory QC limits
** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Version: 1.%

BS / BSD Recoveries

Project Name: RAM Energy Sat. 3

Work Order #: 614454 **Project ID:** RAM RNM 0001 WDQSSU

Analyst: SCM **Date Prepared:** 02/18/2019 **Date Analyzed:** 02/18/2019

Lab Batch ID: 3079574 **Sample:** 7671983-1-BKS **Batch #:** 1 **Matrix:** Solid

Units: mg/kg

BLANK /BLANK SPIKE / BLANK SPIKE DUPLICATE RECOVERY STUDY

BTEX by EPA 8021B Analytes	Blank Sample Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Spike Added [E]	Blank Spike Duplicate Result [F]	Blk. Spk Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Benzene	<0.000385	0.100	0.127	127	0.100	0.126	126	1	70-130	35	
Toluene	<0.000456	0.100	0.110	110	0.100	0.109	109	1	70-130	35	
Ethylbenzene	<0.000565	0.100	0.105	105	0.100	0.104	104	1	70-130	35	
m,p-Xylenes	<0.00101	0.200	0.210	105	0.201	0.208	103	1	70-130	35	
o-Xylene	<0.000344	0.100	0.103	103	0.100	0.103	103	0	70-130	35	

Analyst: CHE **Date Prepared:** 02/15/2019 **Date Analyzed:** 02/15/2019

Lab Batch ID: 3079374 **Sample:** 7671814-1-BKS **Batch #:** 1 **Matrix:** Solid

Units: mg/kg

BLANK /BLANK SPIKE / BLANK SPIKE DUPLICATE RECOVERY STUDY

Inorganic Anions by EPA 300 Analytes	Blank Sample Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Spike Added [E]	Blank Spike Duplicate Result [F]	Blk. Spk Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Chloride	<0.858	250	249	100	250	251	100	1	90-110	20	

Relative Percent Difference RPD = 200*|(C-F)/(C+F)|
Blank Spike Recovery [D] = 100*(C)/[B]
Blank Spike Duplicate Recovery [G] = 100*(F)/[E]
All results are based on MDL and Validated for QC Purposes

Version: 1.%

BS / BSD Recoveries

Project Name: RAM Energy Sat. 3

Work Order #: 614454 **Project ID:** RAM RNM 0001 WDQSSU

Analyst: ARM **Date Prepared:** 02/14/2019 **Date Analyzed:** 02/14/2019

Lab Batch ID: 3079290 **Sample:** 7671840-1-BKS **Batch #:** 1 **Matrix:** Solid

Units: mg/kg

BLANK /BLANK SPIKE / BLANK SPIKE DUPLICATE RECOVERY STUDY

TPH by SW8015 Mod Analytes	Blank Sample Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Spike Added [E]	Blank Spike Duplicate Result [F]	Blk. Spk Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Gasoline Range Hydrocarbons (GRO)	<8.00	1000	910	91	1000	881	88	3	70-135	20	
Diesel Range Organics (DRO)	<8.13	1000	1000	100	1000	976	98	2	70-135	20	

Relative Percent Difference RPD = 200*|(C-F)/(C+F)|
Blank Spike Recovery [D] = 100*(C)/[B]
Blank Spike Duplicate Recovery [G] = 100*(F)/[E]
All results are based on MDL and Validated for QC Purposes

Version: 1.%

Form 3 - MS / MSD Recoveries

Project Name: RAM Energy Sat. 3

Work Order # : 614454 **Project ID:** RAM RNM 0001 WDQSSU

Lab Batch ID: 3079574 **QC- Sample ID:** 614404-001 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 02/18/2019 **Date Prepared:** 02/18/2019 **Analyst:** SCM

Reporting Units: mg/kg

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY

BTEX by EPA 8021B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Benzene	<0.000388	0.101	0.108	107	0.0994	0.103	104	5	70-130	35	
Toluene	<0.00202	0.101	0.0954	94	0.0994	0.0977	98	2	70-130	35	
Ethylbenzene	<0.000569	0.101	0.0907	90	0.0994	0.0942	95	4	70-130	35	
m,p-Xylenes	<0.00102	0.202	0.185	92	0.199	0.196	98	6	70-130	35	
o-Xylene	<0.000347	0.101	0.0912	90	0.0994	0.0970	98	6	70-130	35	

Lab Batch ID: 3079374 **QC- Sample ID:** 614454-005 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 02/15/2019 **Date Prepared:** 02/15/2019 **Analyst:** CHE

Reporting Units: mg/kg

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY

Inorganic Anions by EPA 300 Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Chloride	983	249	1220	95	249	1190	83	2	90-110	20	X

Lab Batch ID: 3079374 **QC- Sample ID:** 614454-009 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 02/15/2019 **Date Prepared:** 02/15/2019 **Analyst:** CHE

Reporting Units: mg/kg

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY

Inorganic Anions by EPA 300 Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Chloride	1350	250	1450	40	250	1470	48	1	90-110	20	X

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*|(C-F)/(C+F)|

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not Applicable
N = See Narrative, EQL = Estimated Quantitation Limit, NC = Non Calculable - Sample amount is > 4 times the amount spiked.

Form 3 - MS / MSD Recoveries

Project Name: RAM Energy Sat. 3

Work Order # : 614454 **Project ID:** RAM RNM 0001 WDQSSU

Lab Batch ID: 3079290 **QC- Sample ID:** 614452-001 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 02/14/2019 **Date Prepared:** 02/14/2019 **Analyst:** ARM

Reporting Units: mg/kg

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY

TPH by SW8015 Mod Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Gasoline Range Hydrocarbons (GRO)	<7.98	997	887	89	999	894	89	1	70-135	20	
Diesel Range Organics (DRO)	11.8	997	907	90	999	906	90	0	70-135	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

Relative Percent Difference RPD = 200*|(C-F)/(C+F)|

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not Applicable

N = See Narrative, EQL = Estimated Quantitation Limit, NC = Non Calculable - Sample amount is > 4 times the amount spiked.

Chain of Custody

Work Order No: 614454

XENCO LABORATORIES
Houston,TX (281) 240-4200 Dallas,TX (214) 902-0300 San Antonio,TX (210) 509-3334
Midland,TX (432-704-5440) EL Paso,TX (915)585-3443 Lubbock,TX (806)794-1296
Hobbs,NM (575-392-7550) Phoenix,AZ (480-355-0900) Atlanta,GA (770-449-8800) Tampa,FL (813-620-2000)
www.xenco.com

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Project Manager:	David Lehmann	Bill to: (if different)	
Company Name:	EnviroClean	Company Name:	
Address:	2405 ECR 123	Address:	
City, State ZIP:	Midland, TX. 79706	City, State ZIP:	
Phone:	713-208-6481	Email:	David.Lehmann@eccgrp.com

Work Order Comments

Program: UST/PST ☐ PRP ☐ Brownfields ☐ RRC ☐ Superfund ☐
State of Project:
Reporting: Level II ☐ Level III ☐ PST/UST ☐ RRP ☐ Level IV ☐
Deliverables: EDD ☑ ADaPT ☐ Other:

Project Name:	Ram Energy Sat. 3	Turn Around	
Project Number:	RAM RNM 0001 WDBSSU	Routine	☑
P.O. Number:		Rush:	
Sampler's Name:	Buddy Richardson	Due Date:	

SAMPLE RECEIPT			
Temp Blank:	Yes (No)	Wet Ice:	(Yes) No
Temperature (°C):	5.5 | 5.4	Thermometer ID	KE
Received Intact:	(Yes) No		
Cooler Custody Seals:	Yes (No) N/A	Correction Factor:	-0.1
Sample Custody Seals:	Yes (No) N/A	Total Containers:	

Work Order Notes

Note:
Run 4-5' samples for TPH, BTEX
Run all samples for chlorides

TAT starts the day recevied by the lab, if received by 4:30pm

Sample Identification	Matrix	Date Sampled	Time Sampled	Depth	Number of Containers	BTEX	Chlorides	TPH (SW8015)	Sample Comments
Sat3-B1 - 4-5'	S	2/12/19	10:43	4-5'	1	X	X	X	
" " - 9-10'			10:45	9-10'	1	H	X	H	Hold for BTEX, TPH
" " - 14-15'			10:48	14-15'	1		X		
" 3 " - 19-20'			10:50	19-20'	1		X		
" " - 24-25'			11:05	24-25'	1		X		
" " - 29-30'			11:09	29-30'	1		X		
34-35'			11:15	34-35'	1		X		
39-40'			11:31	39-46'	1		X		
44-45'			11:35	44-45'	1		X		
49-50'	↓	↓	11:42	49-50'	1	↓	X	↓	↓

Total 200.7 / 6010 200.8 / 6020: 8RCRA 13PPM Texas 11 Al Sb As Ba Be B Cd Ca Cr Co Cu Fe Pb Mg Mn Mo Ni K Se Ag SiO2 Na Sr Tl Sn U V Zn

Circle Method(s) and Metal(s) to be analyzed **TCLP / SPLP 6010**: 8RCRA Sb As Ba Be Cd Cr Co Cu Pb Mn Mo Ni Se Ag Tl U **1631 / 245.1 / 7470 / 7471** : Hg

Relinquished by: (Signature)	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Received by: (Signature)	Date/Time
1 David Lehmann		2/13/19 1200	2		
3			4		
5			6		

Revised Date 051418 Rev. 2018.1

Chain of Custody

Houston,TX (281) 240-4200 Dallas,TX (214) 902-0300 San Antonio,TX (210) 509-3334
Midland,TX (432-704-5440) EL Paso,TX (915)585-3443 Lubbock,TX (806)794-1296
Hobbs,NM (575-392-7550) Phoenix,AZ (480-355-0900) Atlanta,GA (770-449-8800) Tampa,FL (813-620-2000) www.xenco.com

Work Order No: 614454

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Project Manager:	David Lehmann	Bill to: (if different)	
Company Name:	EnviroClean	Company Name:	
Address:	2405 ECR 123	Address:	
City, State ZIP:	Midland, TX. 79706	City, State ZIP:	
Phone:	713-208-6481	Email:	David.Lehmann@eccgrp.com

Work Order Comments

Program: UST/PST ☐ PRP ☐ Brownfields ☐ RRC ☐ Superfund ☐
State of Project:
Reporting: Level II ☐ Level III ☐ PST/UST ☐ RRP ☐ Level IV ☐
Deliverables: EDD ☑ ADaPT ☐ Other:

Project Name:	Ram Energy Sat. 3	Turn Around	
Project Number:	RAM RNM0001 WD0550	Routine	☑
P.O. Number:		Rush:	
Sampler's Name:	Buddy Richardson	Due Date:	

SAMPLE RECEIPT			
Temp Blank:	Yes (No)	Wet Ice:	(Yes) No
Temperature (°C):	5.5/5.4	Thermometer ID	JC
Received Intact:	(Yes) No		
Cooler Custody Seals:	Yes (No) N/A	Correction Factor:	-0.1
Sample Custody Seals:	Yes (No) N/A	Total Containers:	

ANALYSIS REQUEST

Work Order Notes

TAT starts the day recevied by the lab, if received by 4:30pm

Sample Identification	Matrix	Date Sampled	Time Sampled	Depth	Number of Containers	BTEX	Chlorides	TPH (SW8015)
Sat 3 - B1 - 54-55'	S	2-12-19	11:47	54-55'	1	H	X	H
" " 59-66'			11:50	59-60'	1		X	
" " 64-65'			11:52	64-65'	1		X	
" " 69-70'			12:00	69-70'	1		X	
" " 74-75'			12:04	74-75'	1		X	
" " 79-80'			12:06	79-80'	1		X	
" " 84-85'			12:10	84-85'	1		X	
" " 89-90'			12:12	89-90'	1		X	
" " 94-95'			12:15	94-95'	1		X	
" " 99-100'			12:20	99-100'	1		X	

Sample Comments

Hold for BTEX, TPH

Total 200.7 / 6010 200.8 / 6020: 8RCRA 13PPM Texas 11 Al Sb As Ba Be B Cd Ca Cr Co Cu Fe Pb Mg Mn Mo Ni K Se Ag SiO2 Na Sr Tl Sn U V Zn

Circle Method(s) and Metal(s) to be analyzed **TCLP / SPLP 6010**: 8RCRA Sb As Ba Be Cd Cr Co Cu Pb Mn Mo Ni Se Ag Tl U **1631 / 245.1 / 7470 / 7471** : Hg

Relinquished by: (Signature)	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Received by: (Signature)	Date/Time
1 David Lehmann		Noon 2/13	2		
3			4		
5			6		

Revised Date 051418 Rev. 2018.1

CUSTODY SEAL

Date 3-13-19

Signature

XENCO Laboratories

Prelogin/Nonconformance Report- Sample Log-In

Client: Enviro Clean Services

Date/ Time Received: 02/13/2019 12:00:00 PM

Work Order #: 614454

Acceptable Temperature Range: 0 - 6 degC
Air and Metal samples Acceptable Range: Ambient

Temperature Measuring device used : R8

Sample Receipt Checklist	Comments
#1 *Temperature of cooler(s)?	5.4
#2 *Shipping container in good condition?	**Yes**
#3 *Samples received on ice?	**Yes**
#4 *Custody Seals intact on shipping container/ cooler?	**Yes**
#5 Custody Seals intact on sample bottles?	**N/A**
#6*Custody Seals Signed and dated?	**Yes**
#7 *Chain of Custody present?	**Yes**
#8 Any missing/extra samples?	**No**
#9 Chain of Custody signed when relinquished/ received?	**Yes**
#10 Chain of Custody agrees with sample labels/matrix?	**Yes**
#11 Container label(s) legible and intact?	**Yes**
#12 Samples in proper container/ bottle?	**Yes**
#13 Samples properly preserved?	**Yes**
#14 Sample container(s) intact?	**Yes**
#15 Sufficient sample amount for indicated test(s)?	**Yes**
#16 All samples received within hold time?	**Yes**
#17 Subcontract of sample(s)?	**No**
#18 Water VOC samples have zero headspace?	**N/A**

*** Must be completed for after-hours delivery of samples prior to placing in the refrigerator**

Analyst: PH Device/Lot#:

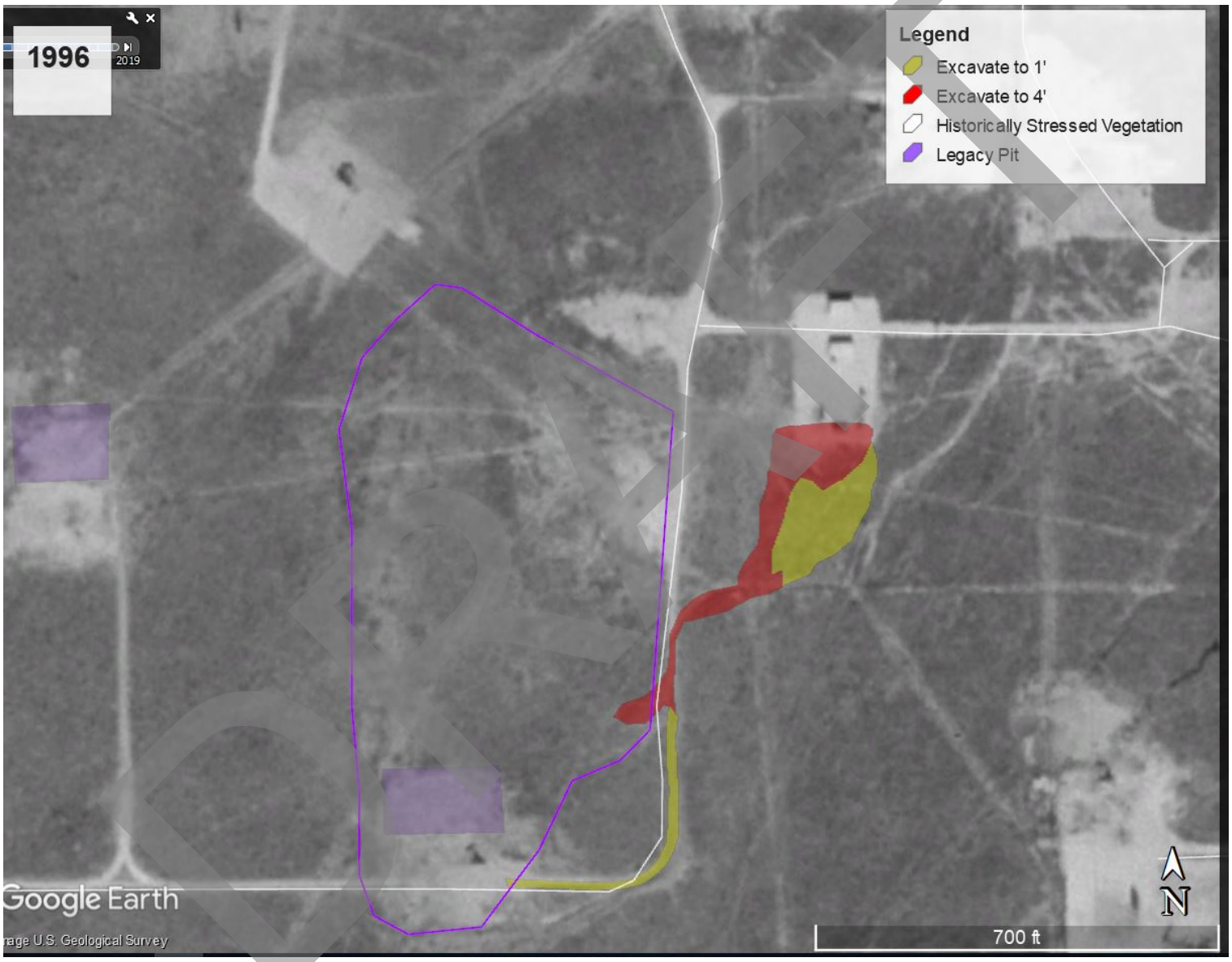
Checklist completed by: Katie Lowe Date: 02/13/2019

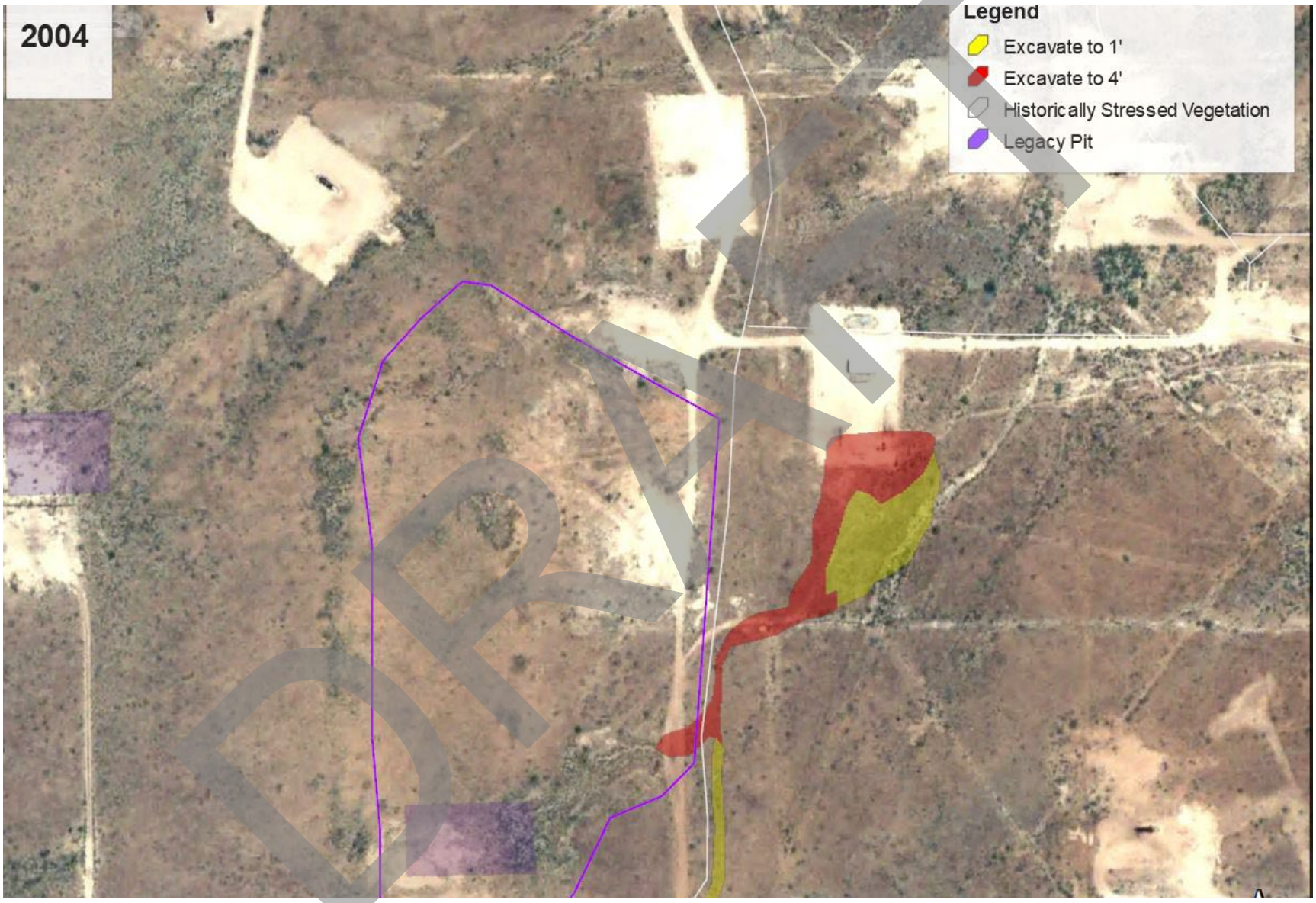
Checklist reviewed by: Jessica Kramer Date: 02/13/2019

Jessica Kramer

ALTAMIRA
formerly known as Enviro Clean Cardinal

Appendix C – Historical Aerial Photographs


1996
2019
Legend
Excavate to 1'
Excavate to 4'
Historically Stressed Vegetation
Legacy Pit
Google Earth
Image U.S. Geological Survey
700 ft
N


2004
Legend
Excavate to 1'
Excavate to 4'
Historically Stressed Vegetation
Legacy Pit


Historically Stressed Vegetation
Legacy Pit
Google Earth
N

March 10, 2017

Ms. Olivia Yu, Environmental Specialist
New Mexico Oil Conservation Division
Hobbs District Office
1625 French Drive
Hobbs, New Mexico 88240

SUBMITTED VIA EMAIL
Olivia.Yu@state.nm.us

RE: Remediation Workplan, NMOCD Case No. 1RP-4599
West Dollarhide Queen Sand Unit Satellite 3, T24S, R38E, Sec 31, Unit I
32.1723°N, 103.0921°W
Lea County, New Mexico
Project No. RAMRNM0001

Dear Ms. Yu:

Enviro Clean Cardinal, LLC (ECC) has prepared the following remedial workplan to address the New Mexico Oil Conservation Division (OCD) correspondence concerning the February 8, 2017, release at the RAM Energy Resources (RAM) West Dollarhide Queen Sand Unit Satellite 3 (WDQSU Sat 3), in Lea County, New Mexico. RAM's Form C-141 indicates the release was 10 to 15 barrels (bbls) of produced water which flowed approximately 1,200 feet along a spill path terminating at the West Dollarhide Queen Sand Unit #92 well location. The following photographs represent conditions at the time of release, and current site conditions as observed on February 13th.




This OCD workplan has been prepared to comply with 19.15.29.11 NMAC as well as the *Guidelines for Remediation of Leaks, Spills and Releases* (August 13, 1993) delineation requirements. The attached *Release Location Map* identifies the visibly impacted media covered by this response workplan.

General Site Characteristics

The release site is in the Dollarhide Oil Field, and is situated at approximately 3,135 feet above mean sea level, with a slight slope towards the southwest and the Monument Draw. There is not a Waters of the United States identified watercourse in the vicinity of the site. The primary land use is for livestock grazing, with significant oilfield development in the region. The area is semiarid, with a net annual average precipitation/evaporation loss of approximately 80 inches.

The surface soil surrounding the release site and release-affected area is listed by the USDA-Soil Conservation Service as “SE” (Simona fine sandy loam, 0 to 3 percent slopes) and is a Typic Paleorthid. This indicates a loamy, mixed thermic shallow soil that is well drained, and is derived of calcareous eolian deposits from sedimentary rocks.

The surficial geologic unit is listed as “Qsu” (Quaternary sand deposits, undivided) and is described as windblown deposits, sand sheets and dunes, undivided. The underlying unit is the Tertiary-age Ogallala Formation (lower Pliocene to middle Miocene), which is comprised of alluvial and eolian deposits and petrocalcic soils of the southern High Plains. Site observations indicate the surface soil is shallow to thick wind-deposited sands overlaying carbonate-indurated bedded sands. Scattered cobbles of freshwater limestone and calcareous sandstone were observed during site visits.

The Ogallala Formation is part of the regional High Plains Aquifer system. Records from the Office of the State Engineer indicate there are no water wells or extraction points of diversion within a mile radius of the site. The 2005 *ChevronTexaco Depth to Ground Water Water Wells Facilities* map indicates the depth to water is greater than 100 feet below ground surface (bgs).

Site History and Release Summary

No prior environmental releases were identified at this location, however a nearby release, RP-10-5-2512 (Drinkard Unit 148, May 1, 2010), is about 940 feet west of the WDQSU Sat 3 point of release. At this location, after removing approximately 2,232 cubic yards (cyds) of impacted media, a 20mil polyethylene liner was installed at the base of the 5-foot deep excavation. This 88 bbl release was closed May 24, 2013.

The release that is the subject of this workplan occurred on February 8, 2017. This release was reported as 10 to 15 barrels (bbls) of produced water which flowed approximately 1,200 feet along the main spill path terminating at the West Dollarhide Queen Sand Unit #92 well location. The release-affected soils cover approximately 0.75 acres.

Typically, total fluids releases tend to separate gravimetrically with the release of pressure. This means that the hydrocarbons tend to float on top of salt water, spreading farther downslope than the salt water, and leaving a “bathtub ring” in pooling areas as the briny fluids vertically infiltrate into soil.

Soil Remediation Action Levels

The OCD established the Recommended Remediation Action Level (RRAL) for soils contaminated with petroleum hydrocarbons. The ranking criteria is based on numeric scores to determine the appropriate soil remediation action level for relative threats to public health, fresh water, and the environment. Based on site data, these are the input:

Ranking Score	Depth to Groundwater	<1000 feet from Water Source	<200 feet from Private Domestic Water Source	Distance to Surface Water Body
20	<50 feet	Yes	Yes	<200 feet
10	50 – 99 feet			200 – 1,000 feet
0	>100 feet	No	No	>1,000 feet
TOTAL	0			

The least stringent hydrocarbon cleanup values are assigned to sites with an RRAL less than 9; the WDQSU Sat 3 site has a ranking score of "0", which corresponds to clean-up values of:

- 10 parts per million (ppm) benzene,
- 50 ppm benzene, toluene, ethylbenzene, and total xylenes (BTEX) totaled, and
- 5,000 ppm total petroleum hydrocarbons (TPH).

The Water Quality Control Commission's (WQCC's) *Standards for Ground Water of 10,000 mg/l TDS Concentration or Less* (20.6.2.3102 NMAC, aka the 3102 list) establishes a 250 ppm chloride delineation standard.

Based on the negotiated values granted at other closed release sites with more sensitive groundwater conditions, ECC respectfully requests that the delineation and cleanup requirements for chlorides be established at 1,500 ppm.

Non-Intrusive Electromagnetic Conductivity Survey

Most of the hydrocarbon-affected area is expected to be less than two feet bgs (about 2,400 cyds of impacted media), however, chloride impacts are suspected to be deeper where fluids pooled in topographic depressions in the fine sands. At this site the released produced water that was not recovered from the surface is suspected to have infiltrated into the subsurface sand. To better delineate the release for response planning, a non-intrusive geophysical technique was employed.

On February 28, 2017, ECC performed an electromagnetic (EM) terrain conductivity survey of the Site using an EM38-MK2 meter manufactured by Geonics Limited. The electromagnetic (EM) terrain conductivity survey uses the principle of induction to measure the ground conductivity of the subsurface. This instrument uses a rectified alternating electric current of a known frequency and magnitude, which is passed through a transmitter coil creating a primary magnetic field in the space surrounding the coil, including the underground. Eddy currents are generated in the ground that induce a secondary current within underground conductors, which result in an alternating secondary magnetic field that is sensed by the receiving coil. The ratio of the magnitudes of the primary and secondary currents is proportional to the terrain conductivity. Apparent electrical conductivity readings will increase with increases in clay content, soluble salt, water and temperature.

The EM38 meter is equipped with two transmitter coils and two receiver coils each with a fixed separation of 0.5-meters (m) and-1 m. The depth of signal penetration and response profile are governed by the coil separation and their orientation of the coil dipole (horizontal or vertical dipole). The amplitude of the secondary field is converted into values of ground conductivity. The ground conductivity is measured in millimhos per meter (mmhos/m) or milliSiemens per meter (mS/m). The surveys at this site were performed with the EM38 meter in the vertical dipole (VD) orientation and the measured ground conductivities are measured to depths of 2.5 feet (0.5-m coil) and 5 feet (1-m coil),

collecting geo-referenced data at the rate of two readings per second. A separate in-phase mode is also used to distinguish metal objects that could interfere with true ground conductivity measurements. During the survey the EM38 provides a constant output of the following four channels of information:

- Ground conductivity from 0 to 2.5 feet in depth (0.5-m VD)
- In-phase response for metal detection (0.5-m VD)
- Ground conductivity from 0 to 5 feet in depth (1-m VD)
- In-phase response for metal detection (1-m VD)

The data from these four channels of information are reduced to spreadsheet tables, which are then importing into drafting programs for mapping.

Using walking traverses that were generally perpendicular to the flowpath of the released fluids, ECC collected 6,369 data-point locations across the site. The pathways are shown as light gray lines on the *Survey Results* maps attached to this workplan.

From ECC's review of the conductivity results, it appears that background levels for the WDQSU Sat 3 site range from 3 to 40 mmhos/m. The maximum 0.5-m and 1-m conductivity measurements at the site were 541.95 and 385.70 mmhos/m, respectively.

The EM results have been contoured using a 60 mmhos/m interval. Soils having background conductivity levels up to 60 mmhos/m are shown in the light green shading. Based upon ECC's experience with this meter, we expect EM conductivities greater than approximately 60 mmhos/m to exceed the WQCC 250 mg/kg chloride level. Within these light green areas, very little to none of the soils are expected to have been impacted above WQCC levels. Areas shaded in yellow, orange and red are progressively more impacted by brine and will likely require remedial delineation. The following potentially impacted areas have been calculated for both the 0.5-m and 1-m EM responses:

- EM38 0.5 m response >60 mmhos/m = 17,045 square feet or 0.39 acres
- EM38 1 m response >60 mmhos/m = 25,095 square feet or 0.58 acres

The relationship between chloride levels in soil and the contoured EM values can only be confirmed by the collection of position-referenced soil samples that are submitted to the laboratory for chloride analyses. Samples that will used to compare the EM38 response to laboratory chloride and field conductivity concentrations are depicted on the *EM-38/Chloride Calibration Map* and are further discussed in the Proposed Remediation and Waste Management section below.

Proposed Remediation and Waste Management

BTEX and TPH impacts are expected to be shallow, generally less than 2-feet in depth. The constituent expected to be the driver for delineation and remedial activities is the chloride content. Since chlorides cannot be reduced using degradation processes, the proposed remedial option is the excavation of impacted media for disposal.

There are three distinct remediation areas:

- an upper pooling area near the point of release, impacted with both hydrocarbons and chlorides;
- the main flowpath that terminates near the WDQSU #92 wellhead which is primarily hydrocarbon impacts, but has three small pooling areas with potential chloride impacts; and
- a side channel that appears to be an unrelated less-than-reportable volume crude oil release, but was requested by RAM personnel to be addressed as part of this response.

Initial Chloride Calibration

To start the remediation project, test pits for initial EM38 survey to laboratory chloride concentration calibration will be performed. This is to reduce over-excavating “clean” unimpacted media. To calibrate the EM38 survey results, soil samples will be collected at 1-foot depth intervals from surface to four or five feet bgs at the 10 locations shown on the attached *EM-38/Chloride Calibration Map*. Additionally, field chloride screening will be performed using an electroconductivity meter using 1:1 volumetric soil-to-water extractions.

These chloride calibration laboratory analyses are intended to assess both the low impact and high impact areas identified in the EM-38 survey. Additionally, two background soil samples will be collected for chloride laboratory analyses from profiled locations (light green tinted areas) assumed to be removed from potential impacts. All sample aliquots collected for the calibration will be split in field, one portion used for 1:1 volumetric field electroconductivity measurements, while the other portion will be properly logged onto a chain of custody and placed in an ice-chilled cooler for laboratory analyses.

The laboratory results for chlorides will be cross-referenced to both EM38 and field electroconductivity measurements, to estimate the field measurement values that would be below the chloride delineation values When further excavation samples are determined to meet or be below the estimated delineation value, laboratory chloride samples will be collected for delineation confirmation.

Upper Pooling Area
In the upper pooling area, if bedrock is encountered, or the depth of an excavation exceeds five feet before delineation to the RRALs, then a separate workplan for second-phase of assessment will be prepared, requesting delineation by drilling, the installation of an impervious liner, or alternative clean-up standards. For lateral delineation, soil samples will be collected from the base of the excavation walls at pooling locations. For vertical delineation by excavation, soil samples will be collected from approximately every 1,000 square feet of excavated area and analyzed for BTEX and TPH until vertical delineation to RRALs is achieved, with chlorides analyses expected to continue to greater depths.

Main Flowpath
For the main flowpath, samples will be collected approximately every 100 feet, beginning at the path terminus and working towards the main flowpath, near the centerline of the excavation and analyzed for BTEX/TPH/chlorides, until each constituent class is vertically delineated.

Side Channel
The side channel is expected to be delineated in shallow soils for BTEX/TPH, but confirmation chloride samples will be collected near the centerline of the excavation about every 100 linear feet.

Waste Disposal and Backfill
Disposal for wastes generated at the WDQSU Sat 3 release site will most likely be at the Lealand facility between Jal and Carlsbad, NM. Suitable backfill material will most likely be sourced either from the disposal facility, or from the landowner, dependent on RAM's contractual requirements.

Operations Personnel
Personnel conducting the evaluations will have completed OSHA Hazwoper and Safeland training. Fire resistant clothing, H_2S monitor, and Level D personal protective equipment will be used by personnel.

Soil Sampling and Analyses

Soil samples will be collected from the bottom of excavated areas as described in the Proposed Remediation and Waste Management section of this workplan.

All confirmation soil samples will be submitted to a National Environmental Laboratory Accreditation Program (NELAP) environmental laboratory for OCD-approved TPH, benzene/BTEX, and chloride analytical methods, requesting the results on the OCD-preferred wet-weight basis. Analytical methods will include:

- TPH by EPA SW-846 method 8015M (modified for OCD carbon ranges)
- BTEX by EPA SW-846 8000-series (either 8021B or 8260B at the laboratory's discretion)
- Chlorides by EPA CWA inorganic anion method 300 series

Activities Timeline

Within ten business days of the workplan approval, begin the approved scope of work (this assumes delineation by excavation will be the accepted remedial technology).

Within ten business days of receipt of all data (laboratory reports, waste documentation, clean fill receipts, etc.), compile and submit electronically, a final form C-141 and report of remedial actions to the OCD with all supporting documentation.

Please feel free to contact me at 432.301.0209 if you have questions or concerns, or would like to discussed the proposed activities.

Sincerely,

Enviro Clean Cardinal, LLC

William “Bill” Green, PG No. 136, CPM
Texas Professional Geologist, Certified Project Manager
Hydrogeologist/Environmental Compliance Specialist

Attached: Release Location Map
EM38 1.0-Meter Vertical Dipole Survey Results
EM38 0.5-Meter Vertical Dipole Survey Results
EM-38/Chloride Calibration Map

Legend

Visibly Affected Surface Soils

N32.1724°
W103.0922°

Release Location Map

RAM Energy Resources - WDQSU Satellite 3
OCD Case No. 1RP-4599
Lea County, New Mexico

Approx. Scale:		Date:
1" = 120'	ENVIRO CLEAN CARDINAL	3/9/2017
2405 E. Co. Rd. 123, Midland, Texas 79706		Project No.: RAMRNM0001

LEGEND

★ LOCATION OF RELEASE POINT

× LOCATION OF EM38-MK2 GROUND CONDUCTIVITY MEASUREMENT IN mmhos/m

APPARENT GROUND CONDUCTIVITIES

Minimum mmhos/m	Maximum mmhos/m	Color
0	60	
60	120	
120	180	
180	240	
240	300	
300	360+	

N

75 0 75 150

SCALE FEET

NOTES:

1) EM SURVEY PERFORMED BY ENVIRO CLEAN CARDINAL, LLC ON FEBRUARY 28, 2017.
2) EM SURVEY CONDUCTED BY GEORGE H. (BUDDY) RICHARDSON, P.G. USING GEONICS EM38-MK2 GROUND CONDUCTIVITY METER.
3) AERIAL PHOTOGRAPH DATED NOVEMBER 22, 2016, GEOREFERENCED FROM GOOGLE EARTH IMAGE SERVICES.

ENVIRO CLEAN CARDINAL
Enviro Clean Cardinal, LLC
7060 South Yale Avenue, Suite 603
Tulsa, Oklahoma 74136
918.794.7828
www.EnviroCleanPS.com

DOCUMENT TITLE: EM38 SURVEY RESULTS

FIGURE TITLE: ***EM38 1.0-METER VERTICAL DIPOLE SURVEY RESULTS***

CLIENT: RAM ENERGY RESOURCES TULSA, OKLAHOMA

LOCATION: WEST DOLLARHIDE QUEEN SAND UNIT SATELLITE 3 SECTION 31, T24S, R38E, LEA COUNTY, NEW MEXICO

DESIGNED BY	GHR		
APPROVED BY	GHR	SCALE	1"= 150'
DRAWN BY	SKG	DATE	2/28/2017

PROJECT NUMBER: RAMRNM0001

FIGURE NUMBER:

D:\Projects\RamEnergy\RAMRNM0001_DollarhideEMsurvey\04_CAD\20170228_Dollarhide_EM38_1m_VD.dwg on Mar 01, 2017-2:28pm

LEGEND

★ LOCATION OF RELEASE POINT

× LOCATION OF EM38-MK2 GROUND CONDUCTIVITY MEASUREMENT IN mmhos/m

APPARENT GROUND CONDUCTIVITIES

Minimum mmhos/m	Maximum mmhos/m	Color
0	60	
60	120	
120	180	
180	240	
240	300	
300	360+	

N

75 0 75 150

SCALE FEET

NOTES:

1) EM SURVEY PERFORMED BY ENVIRO CLEAN CARDINAL, LLC ON FEBRUARY 28, 2017.
2) EM SURVEY CONDUCTED BY GEORGE H. (BUDDY) RICHARDSON, P.G. USING GEONICS EM38-MK2 GROUND CONDUCTIVITY METER.
3) AERIAL PHOTOGRAPH DATED NOVEMBER 22, 2016, GEOREFERENCED FROM GOOGLE EARTH IMAGE SERVICES.

ENVIRO CLEAN CARDINAL
Enviro Clean Cardinal, LLC
7060 South Yale Avenue, Suite 603
Tulsa, Oklahoma 74136
918.794.7828
www.EnviroCleanPS.com

DOCUMENT TITLE: EM38 SURVEY RESULTS

FIGURE TITLE: ***EM38 0.50-METER VERTICAL DIPOLE SURVEY RESULTS***

CLIENT: RAM ENERGY RESOURCES TULSA, OKLAHOMA

LOCATION: WEST DOLLARHIDE QUEEN SAND UNIT SATELLITE 3 SECTION 31, T24S, R38E, LEA COUNTY, NEW MEXICO

DESIGNED BY	GHR		
APPROVED BY	GHR	SCALE	1"= 150'
DRAWN BY	SKG	DATE	2/28/2017

PROJECT NUMBER	FIGURE NUMBER
RAMRNM0001	

D:\Projects\RamEnergy\RAMRNM0001_DollarhideEMsurvey\04_CAD\20170228_Dollarhide_EM38_05m_VD.dwg on Mar 07, 2017-11:09am

Legend

Chloride Calibration Sample Point

Visibly Affected Surface Soils

Yellow and Green Colors are the 1M EM-38 Survey Plot Overlay

N

N32.1724°

W103.0922°

EM-38/Chloride Calibration Map

RAM Energy Resources - WDQSU Satellite 3

OCD Case No. 1RP-4599

Lea County, New Mexico

Approx. Scale:		Date:
1" = 120'	ENVIRO CLEAN CARDINAL	3/7/2017
2405 E. Co. Rd. 123, Midland, Texas 79706		Project No.: RAMRNM0001

ROSE ROCK™
ENVIRONMENTAL SERVICES

September 30, 2021

Mr. Darrell Pennington
Ram Energy LLC
5100 E Skelly Drive
Tulsa, OK 74135

Submitted via email: dpennington@ramenergy.net

Re: Proposed Soil Remediation Work Plan Update
West Dollarhide Queen Sand Unit Satellite 3 Release
NMOCD Case No. 1RP-4599
Lea County, New Mexico

Dear Mr. Pennington,

Rose Rock Environmental Services, LLC (Rose Rock) has been retained by Ram Energy, LLC (Client) to review previously prepared documents pertaining to the original and historical releases as well as provide a Proposed Soil Remediation Work Plan for Client's West Dollarhide Queen Sand Unit (WDQSU) Satellite 3 site (Site) located in Unit Letter I, Section 31, Township 24 South, Range 38 East of Lea County, New Mexico (geographical coordinates 32.1703148N, 103.0941925W). The Site is approximately one and seven tenths (1.7) mile west of the New Mexico/Texas state line and seven (7) miles northeast of Jal, New Mexico.

Brief Company Overview

Rose Rock is a privately owned environmental consulting and field services company, headquartered in Oklahoma City, that combines years of professional experience with innovative thinking. We understand the importance of maintaining environmental compliance but recognize that out of control spending is not required for environmental responsibility. Providing simple solutions for complex problems with communication and customer service is always at the forefront.

Recent Review of Site

On June 29, 2021, Rose Rock was provided all Client files pertaining to this release. Rock Rock personnel reviewed the information from the Shallow Soil Assessment and the Deep Soil Assessment, including but not limited to maps, soil sampling laboratory analytical results, electromagnetic (EM) survey results, soil boring logs, on-site photos, and historical aerial photographs.

Additionally, a field visit was conducted by Rose Rock on September 20, 2021, to review the Site.

Proposed Soil Remediation

The objective of this Proposed Soil Remediation Work Plan Update is to propose soil remediation to address the impacts at the Site resulting from the February 8, 2017 release of approximately 10 to 15

barrels (bbls) of produced water, as well as the historic releases predating Client's operation at the Site. The proposed remediation will be protective of groundwater.

The constituent that is the driver for soil remediation is chloride. The proposed remediation work plan is to excavate the impacted media coupled with off-site disposal. Rose Rock recommends the removal and replacement of Site soils that exceed the RRALs and the chloride cleanup level. Rose Rock proposes that the upper 4 feet of soil be excavated for all areas which have been deeply impacted by the release and up to 1 foot in near surface areas totaling an estimated 6,400 cubic yards which is expected to be removed. Following the removal of the impacted soil, confirmation samples from the sidewalls and bottom of the excavation will be collected and analyzed to confirm that the impacted soil has been removed. In the deeply impacted area of the release, a liner will be installed at the base of the excavation. The excavation will then be backfilled with clean fill from an acceptable source and compacted to existing grade.

Rose Rock hopes Ram Energy LLC as well as the New Mexico Oil Conservation Division will find this Proposed Soil Remediation Work Plan Update appropriate and compliant and will approve the remediation work plan proposed herein. If you have any questions, please do not hesitate to contact any of the Rose Rock representatives listed below.

Sincerely,
Rose Rock Environmental Services, LLC

Jonathan Behymer
Partner
405-990-4225/cell
jb@roserockenv.com

District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 65221

CONDITIONS

Operator: RAM ENERGY LLC 5100 East Skelly Drive Tulsa, OK 74135	OGRID: 309777
	Action Number: 65221
	Action Type: [C-141] Release Corrective Action (C-141)

CONDITIONS

Created By	Condition	Condition Date
bbillings	Approved as per WP's 9/19 and 9/2021	12/8/2021