September 19, 2017

Ms. Olivia Yu
Environmental Specialist
New Mexico Oil Conservation Division
Hobbs District 1 Office
1625 French Drive
Hobbs, New Mexico 88240

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

APPROVED
By Olivia Yu at 2:05 pm, Oct 02, 2017

NMOCD approves of the proposed location of the 2 temporary groundwater monitoring wells for 1RP-4587. Please see email for conditions related to the proposed remediation plan.

Re: Release Characterization Report and Proposed Remediation Work Plan - Addendum
Yates State #2 Tank Battery
NMOCD Case No. 1R-4587
Lea County, New Mexico

Dear Ms. Yu:

On July 31, 2017, Enviro Clean Cardinal, LLC (ECC) submitted a document titled ***Release Characterization Report and Proposed Remediation Work Plan*** to the New Mexico Oil Conservation Division (NMOCD) regarding the Yates State #2 Tank Battery site on behalf of our client RAM Energy Resources (RAM). On August 29 and 30, 2017, the NMOCD provided RAM and ECC with comments on this submitted document. On September 7, 2017, a conference call was held that included representatives of the NMOCD (Olivia Yu and Brad Billings), RAM (Darrell Pennington), and ECC (George Richardson) to discuss RAM's responses to the NMOCD's comments. The NMOCD's comments and RAM's responses are as follows:

Comment No. 1: A Google Earth image indicates the potential presence of a playa to the north of the release location for 1R-4587.

Response: It is ECC's opinion that this shallow depression, located immediately north of the site, is likely a remnant of an old reserve pit that was constructed at the time of drilling, and that it is not a natural feature. This depression is approximately 120 feet west-to-east and 100 feet north-to-south and is usually dry and vegetated. Accepting that this depression is a water body, and that it lies within 1,000 feet of the site, causes the site ranking to increase 20 points from 40 to 60 points. However, this does not change the soil RRALs for the site as ECC has already determined the most conservative cleanup levels are appropriate for the site.

Comment No. 2: HA-1, HA-3, HA-4 and WSB-1 do not have complete vertical delineation.

Response: It is ECC's opinion that the borings inside this relatively small secondary containment area (HA-1 through HA-4) were adequately delineated vertically by the drilling and sampling of boring HA-2 to a depth of 20 feet, and the three borings outside containment, WSB-1, ESB-2 and SSB-3, that were drilled and sampled to 25 feet. The HA-2 boring was selected for deepening for vertical delineation because it appeared to be the lowest lying area inside the containment wall and it had the highest surficial chloride impact. This boring was advanced only to 20 feet because ECC felt it was not prudent to take a boring within the source area into groundwater which is expected to be present at or near 25 feet. The chloride results for HA-2 indicate that this recent

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release, which is the subject of RAM's current assessment, were quite surficial and do not extend to 5 feet. Soil impacts from a historic release (possibly the 2012 release) appear to have impacted soils at depths of 10-15 feet that are just greater than the NMOCD's current cleanup level for chloride. However, these subsurface soil samples would not have exceeded the NMOCD's chloride cleanup levels for soil used back in 2012 (1,500 mg/kg).

Regarding WSB-1, it is ECC's opinion that this boring has also been vertically delineated as the boring was taken to groundwater saturation and the deepest soil sample contained a chloride level of only 373 mg/kg. This concentration is slightly above the NMOCD's cleanup level, but ECC interprets this sample to have been collected within either the capillary fringe or zone of groundwater saturation. It is important to note that regional groundwater flows are generally from west to east. This indicates that boring WSB-1 is expected to be located hydraulically upgradient of the tank battery, and that these levels of chloride in groundwater would not result from the current tank battery release. Furthermore, downgradient borings located east and south of the tank battery (borings ESB-2 and SSB-3, respectively) were also extended to groundwater and the soil samples collected at a depth of 25 feet in both ESB-2 (238 mg/kg) and SSB-3 (102 mg/kg) were below the NMOCD's chloride cleanup level. These indicate that no significant impacts to groundwater have occurred because of RAM's current release.

Comment No. 3: For HA-2, permissible chloride levels are obtained at 20 ft. bgs; however, there are no additional depths.

Response: As stated above, the HA-2 boring was not advanced below 20 feet because ECC felt it was not prudent to take a boring directly within the release area where high chloride impacts to soil were known to exist at the surface and to drill into groundwater saturation. This boring was drilled short of groundwater saturation and was completely pressure grouted from bottom to top immediately after drilling and sampling.

Comment No. 4: ESB and SSB have sufficient data for vertical delineation.

Response: RAM and ECC agree.

Comment No. 5: Based on surface samples of ESB-2, SSB-3, and WSB-1, horizontal delineation of the release area is not complete.

Response: Only 1 bbl of produced water was released outside the containment wall during the RAM release and a good portion of these fluids were then recovered. Therefore, it is ECC's opinion that surficial impacts to soils outside the containment wall should be minimal laterally.

Furthermore, the chloride concentrations in the soils initially collected at SSB-3 on April 11, 2017, did not appear reasonable in that produced water did not seep through the south side of the containment wall, the chloride levels increased with depth from the surface (628 mg/kg) and 5 feet (2,100 mg/kg), and vegetation in this area is dense and unaffected. Therefore, on June 7, 2017, ECC returned to the site and re-collected the surface and 5-foot soil samples at SSB-3. These soil samples were submitted to the laboratory for chloride analysis. The results of these analyses confirmed the chloride levels to be 67.5 mg/kg and <4.97 mg/kg, respectively.

To confirm the horizontal delineation at WSB-1 and ESB-2, ECC recommends that post-excavation soil samples be collected and field screened during excavation of soils outside the containment wall. At least one soil sample will also be submitted from the west and east side to the laboratory for verification.

Comment No. 6: Please demarcate the dimensions of the release area on the scaled map.

Response: The figures provided are scaled drawings, but ECC will denote the dimensions of the secondary containment wall (i.e., the release area). The dimensions of the secondary containment of the tank battery are approximately 120 feet west-to-east and 45 feet north-to-south.

Comment No. 7: Due to the depth to groundwater, a temporary groundwater monitoring well may be required to determine potential impact of release.

Response: ECC agrees that with groundwater saturation at this site occurring at approximately 25 feet below ground surface, and the chloride profiles observed in the soils of deep borings WSB-1, ESB-2, SSB-3 and HA-2, that a groundwater assessment is warranted. An actual groundwater assessment is expected to confirm the chloride trends observed in the soil samples collected at a depth of 25 feet in the deep borings WSB-1, ESB-2 and SSB-3.

Conference Call

As stated above, on September 7, 2017, representatives of NMOCD (Olivia Yu and Brad Billings), RAM (Darrell Pennington), and ECC (Buddy Richardson) participated in a conference call to discuss the NMOCD's comments and a path forward for the site. RAM's above-described responses were also presented. The following technical issues were agreed upon:

1. Two (2) temporary groundwater monitoring wells will be installed to assess brine impacts to groundwater at locations expected to be hydraulically upgradient and downgradient relative to the subject tank battery. RAM's proposed locations of these temporary monitoring wells are shown on attached **Figure 1**. At each of these locations a boring will be drilled using air-rotary drilling methods to a depth of approximately 30 to 35 feet below grade. A temporary PVC screen and casing will be lowered into the open borehole. Prior to sample collection the wells will be developed by removing several bailers of water to ensure representative groundwater samples are being collected. A groundwater sample will be collected from each monitoring well and submitted to the laboratory for analysis. Although not specifically discussed, ECC proposes that the groundwater samples be submitted to the laboratory for chloride, sodium and total dissolved solids analyses. When the groundwater samples have been collected, the temporary screens and casings will be removed and the boreholes will be fully pressure grouted from bottom to top.

2. ECC will provide the NMOCD a figure showing the locations of the two proposed temporary groundwater monitoring wells prior to them being drilled. This is accomplished with this submittal (see **Figure 1**).

3. The results of these groundwater samples will be used to assess the potential for the soils within the tank battery containment wall to be a continuing source of brine impacts to groundwater.

4. RAM has proposed excavating and disposing offsite the soils inside the containment wall of the tank battery to a depth of 3 feet below grade. The three tanks within the tank battery will not be removed and the excavations will leave the tanks and soil pedestals in place. A synthetic liner will be placed at the base of the excavation and the excavation will then be backfilled with clean soils. RAM has also proposed excavating and disposing offsite

the soils east of the tank battery (in vicinity of boring ESB-2) to approximately 1 foot depth. RAM has further agreed to remove the surficial impacted soils west of the tank battery (in vicinity of boring WSB-1). Post-excavation soil samples will be collected laterally to verify adequate remediation has occurred outside the containment wall.

5. Floor and wall soil samples will be collected during the excavation of the brine impacted soils within the secondary containment walls of the tank battery. Floor samples may exceed 250 mg/kg but will be covered with a synthetic liner prior to backfilling.

ECC is hopeful the NMOCD will now find this Release Characterization Report and Proposed Remediation Work Plan responsive to their C-141 response, and with the submittal and implementation of this Addendum will approve the remediation work proposed herein. If you have questions regarding this document, please do not hesitate to contact Mr. Darrel Pennington at RAM at 918-947-6304, or myself at 918-794-7828.

Sincerely,
Enviro Clean Cardinal, LLC

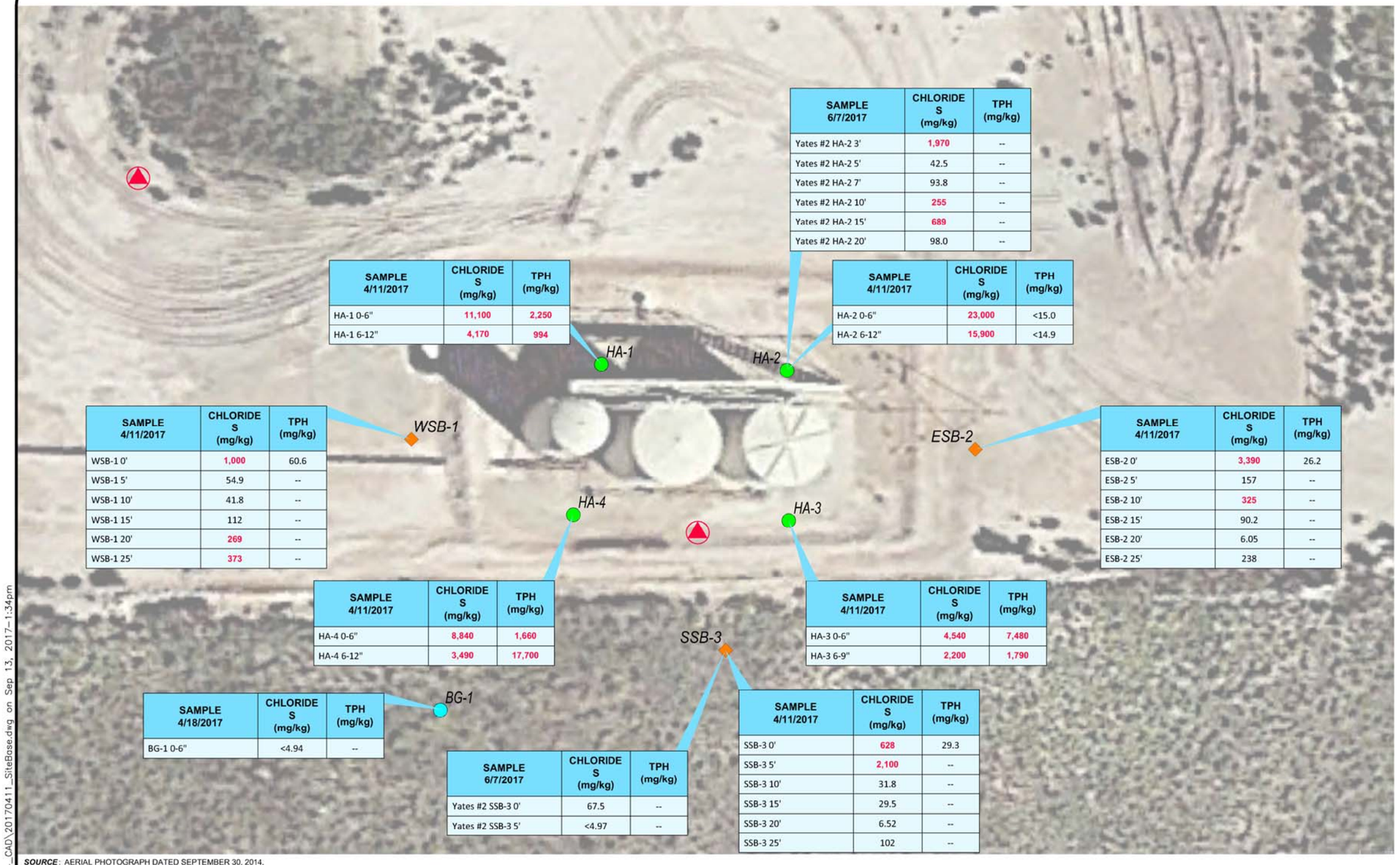
George H. (Buddy) Richardson, P.G.
Manager Hydrogeology

Attachment: Figure 1 – Locations of Proposed Temporary Groundwater Monitoring Wells

xc: Matt Patterson, RAM Tulsa, Oklahoma

ATTACHMENT

FIGURE



SAMPLE 6/7/2017	CHLORIDES (mg/kg)	TPH (mg/kg)
Yates #2 HA-2 3'	1,970	--
Yates #2 HA-2 5'	42.5	--
Yates #2 HA-2 7'	93.8	--
Yates #2 HA-2 10'	255	--
Yates #2 HA-2 15'	689	--
Yates #2 HA-2 20'	98.0	--

SAMPLE 4/11/2017	CHLORIDES (mg/kg)	TPH (mg/kg)
HA-1 0-6"	11,100	2,250
HA-1 6-12"	4,170	994

SAMPLE 4/11/2017	CHLORIDES (mg/kg)	TPH (mg/kg)
HA-2 0-6"	23,000	<15.0
HA-2 6-12"	15,900	<14.9

SAMPLE 4/11/2017	CHLORIDES (mg/kg)	TPH (mg/kg)
WSB-1 0'	1,000	60.6
WSB-1 5'	54.9	--
WSB-1 10'	41.8	--
WSB-1 15'	112	--
WSB-1 20'	269	--
WSB-1 25'	373	--

SAMPLE 4/11/2017	CHLORIDES (mg/kg)	TPH (mg/kg)
ESB-2 0'	3,390	26.2
ESB-2 5'	157	--
ESB-2 10'	325	--
ESB-2 15'	90.2	--
ESB-2 20'	6.05	--
ESB-2 25'	238	--

SAMPLE 4/11/2017	CHLORIDES (mg/kg)	TPH (mg/kg)
HA-4 0-6"	8,840	1,660
HA-4 6-12"	3,490	17,700

SAMPLE 4/11/2017	CHLORIDES (mg/kg)	TPH (mg/kg)
HA-3 0-6"	4,540	7,480
HA-3 6-9"	2,200	1,790

SAMPLE 4/18/2017	CHLORIDES (mg/kg)	TPH (mg/kg)
BG-1 0-6"	<4.94	--

SAMPLE 6/7/2017	CHLORIDES (mg/kg)	TPH (mg/kg)
Yates #2 SSB-3 0'	67.5	--
Yates #2 SSB-3 5'	<4.97	--

SAMPLE 4/11/2017	CHLORIDES (mg/kg)	TPH (mg/kg)
SSB-3 0'	628	29.3
SSB-3 5'	2,100	--
SSB-3 10'	31.8	--
SSB-3 15'	29.5	--
SSB-3 20'	6.52	--
SSB-3 25'	102	--

LEGEND

- HA-1 — LOCATION OF SOIL BORING SAMPLE
- SSB-3 — LOCATION OF HAND AUGERED SAMPLE
- BG-1 — LOCATION OF BACKGROUND SOIL SAMPLE
- LOCATION OF PROPOSED TEMPORARY MONITORING WELL

SOURCE: AERIAL PHOTOGRAPH DATED SEPTEMBER 30, 2014, GOOGLE EARTH PRO SCREEN CAPTURE

N

10 0 10 20
SCALE FEET

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DOCUMENT TITLE: RELEASE CHARACTERIZATION REPORT AND PROPOSED REMEDIATION WORK PLAN - ADDENDUM

FIGURE TITLE: ***PROPOSED TEMPORARY MONITORING WELLS***

CLIENT: RAM ENERGY RESOURCES TULSA, OKLAHOMA

LOCATION: YATES STATE #2 SEC. 16, T12S R38E, LEA COUNTY, NEW MEXICO

DESIGNED BY	GHR		
APPROVED BY	GHR	SCALE	1"= 20'
DRAWN BY	SKG	DATE	9/13/2017

PROJECT NUMBER	FIGURE NUMBER
RAMRNM0002	1