

ENCLOSURE A

GROUNDWATER FLOW MODEL INPUT FILES

Note:

Enclosure A consisted of 38 “native format” files for the following software:

- MODFLOW-2000 (Harbaugh et. al., 2000)
- Groundwater Vistas, Version 6 (Environmental Simulations, Inc., 2011)
- Surfer Version 12 (Golden Software, 2015)
- ArcMap 10 (ESRI, 2010)
- Microsoft Excel

These files were be uploaded in native format to the US Nuclear Regulatory Commission’s ADAMS repository; consequently, they are not available in the Public Document Room.



May 3, 2019

Mr. Paul Davis
Oklahoma Department of Environmental Quality
707 North Robinson
Oklahoma City, OK 73101

Mr. Ken Kalman
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

Mr. Robert Evans
U.S. Nuclear Regulatory Commission
1600 East Lamar Blvd; Suite 400
Arlington, TX 76011-4511

Re: Docket No. 70-925; License No. SNM-928
Potential Technetium 99 Impact to Influent, Waste, and Effluent

Dear Sirs:

Solely as Trustee for the Cimarron Environmental Response Trust (CERT), Environmental Properties Management LLC (EPM) attended meetings at the Nuclear Regulatory Commission (NRC) offices in Rockville, Maryland, on April 4th and 5th, 2019. During those meetings, discussions addressed the anticipated presence of technetium 99 (Tc-99) in groundwater that will be extracted and treated to remove uranium and nitrate during proposed remediation activities. Also discussed was the potential for Tc-99 to be present in spent ion exchange resin and/or biomass generated by the uranium and nitrate treatment processes, respectively, as well as in effluent that will be discharged or injected. This letter summarizes the issues discussed and a proposed path forward.

Background

Elevated concentrations of gross beta were discovered in groundwater at the Cimarron site in the 1990s in the Uranium Pond #1 (UP1) and Uranium Pond #2 (UP2) Areas, and at locations downgradient from these areas. The radionuclide Tc-99 was identified as the source of the elevated beta concentrations, and monitoring for Tc-99 began in 1996. Beginning in 1997, groundwater and surface water samples were collected and analyzed for Tc-99 at locations where the ratio of gross beta to gross alpha exceeded 3:1 **and** gross beta results exceeded 30 picoCuries/liter (pCi/L).

It was determined that Tc-99 was a contaminant in some of the uranium hexafluoride (UF₆) received at the facility; Tc-99 was present in the UF₆ generated by the processing of recycled nuclear material at the Department of Energy's Paducah, Kentucky facility. Tc-99, along with nitrates and fluoride, was present in the liquid waste stream that was discharged to UP1 and UP2.

Mr. Paul Davis
Oklahoma Department of Environmental Quality
Page 2

Consequently, groundwater and surface water samples that exceeded the gross beta criteria (and which were therefore analyzed for Tc-99) were generally located in, around, and downgradient of the UP1 and UP2 Areas.

Although groundwater samples collected from monitor wells located in Burial Area #1 (BA1) were analyzed for Tc-99, the reported Tc-99 concentrations were below laboratory detection limits. The December 30, 2003 *Tc-99 Groundwater Assessment Report*¹ concluded,

“This characterization demonstrated that elevated levels of Tc-99 are present downgradient from the two former waste management areas of U-Pond #1 and U-Pond #2 within the shallow sandstones and at the seep outcrops and are not generally present at concentrations above laboratory detection limits anywhere else on site.”

Tc-99 is a radionuclide that emits beta radiation, and The Environmental Protection Agency (EPA) has established a primary drinking water standard for beta emitters. The Maximum Contaminant Level (MCL) established by the EPA for beta emitters is a radiation dose of 4 millirem per year (mrem/yr). Other beta emitters are present at the Cimarron site; thorium 234 and protactinium 234 are daughters of uranium 238, but due to the extremely long half-life of their parent (uranium 238), the beta activity associated with these radionuclides is negligible. Consequently, the primary contributor to the beta activity detected in groundwater at the Cimarron site is believed to be Tc-99.

The NRC and the EPA have independently calculated activity concentration limits for beta emitting radionuclides that equate to 4 mrem/yr. The EPA calculated an activity concentration limit of 900 pCi/L for Tc-99, based on the *Report of Committee II on Permissible Dose for Internal Radiation*², and the NRC calculated an activity concentration limit of 3,790 pCi/L for Tc-99, based on *Limits for Intakes of Radionuclides by Workers*³.

Prior to 2012, the concentration of Tc-99 had only exceeded the NRC criterion of 3,790 pCi/L at two locations: Monitor Well 1312 (located in UP1) and surface water sample location 1208 (located north of UP2). In addition, Tc-99 concentrations did not exceed the NRC criterion at any locations after March 2004. In 2012, groundwater samples were collected from four locations that had previously exhibited elevated concentrations of Tc-99. The results of those samples were as follows:

¹ Cimarron Corporation, December 2003.

² International Commission on Radiological Protection, Publication 2, 1959.

³ International Commission on Radiological Protection, Publication 30, 1979.

Mr. Paul Davis
Oklahoma Department of Environmental Quality
Page 3

- 875 pCi/L at Monitor Well 1313 (UP1)
- 1,190 pCi/L at Monitor Well 1346 (UP2)
- 1,050 pCi/L at Monitor Well 1336A (UP2)
- 1,850 pCi/L at surface water location 1208 (north of UP2)

Because Tc-99 concentrations had not exceeded the NRC criterion at any groundwater or surface water sample location since 2004, and all 2012 groundwater sampling results were below the NRC criterion, the NRC approved the discontinuation of monitoring for Tc-99 in a letter dated April 22, 2013.

Evaluation of Available Tc-99 Groundwater Data

Unlike the historical groundwater concentration data sets available for other contaminants of concern at the Cimarron site (i.e., uranium, nitrate, and fluoride), the data available for Tc-99 is limited in the number, spatial distribution, and temporal distribution of data points. In addition, groundwater samples have not been analyzed for Tc-99 since 2012 and the data sets for several monitor wells exhibit significant variability over time. As stated above, Tc-99 had not been identified in groundwater until 1996 and an evaluation of gross alpha and beta results was performed to demonstrate that Tc-99 was the source of elevated beta emissions detected in groundwater. By 2004, Tc-99 concentrations in all but one monitor well sampled for Tc-99 (Monitor Well 1312) were well below the NRC criterion of 3,790 pCi/L. A Tc-99 concentration of 4,590 pCi/L was reported for a sample collected from Monitor Well 1312 in March 2004; however, this well was sampled 13 more times between May 2004 and June 2008 and the concentration never exceeded 1,150 pCi/L over this time period. The number of monitor wells included in Tc-99 groundwater monitoring events conducted since 2003 was very limited, and, as stated above, NRC approved the discontinuation of monitoring for Tc-99 in 2013. Consequently, comprehensive, synoptic monitoring for Tc-99 in groundwater has not been conducted and a data set that could be used to generate current representative Tc-99 concentrations in groundwater is not available.

To provide the best available estimates of Tc-99 groundwater concentrations for remediation areas and the Western Area Treatment Facility (WATF) influent stream, a cursory evaluation of available Tc-99 data was conducted. Groundwater sampling results from monitoring events conducted from 2005 through 2012 consisted of 40 data points (including four duplicate samples), of which 25 came from Monitor Wells 1312 and 1336A. Extending the data set back to 2003 added an additional 108 data points (including 7 duplicate samples). Consequently, groundwater sampling results from monitoring events conducted from 2003 through 2012 were used in this evaluation. In addition, the database records detection limits of 0.00 pCi/L for numerous samples which yielded low Tc-99 concentrations; that data was used although the quality of the data may be questionable.

Mr. Paul Davis
Oklahoma Department of Environmental Quality
Page 4

In contrast to the Tc-99 data available for evaluation, representative groundwater concentrations for uranium, nitrate, and fluoride presented in the *Facility Decommissioning Plan – Rev 1*⁴, submitted to the NRC and the DEQ in November 2018, were derived from the statistical evaluation of hundreds of sample results (generated only since the license was transferred to the CERT in 2011).

The following table presents average Tc-99 groundwater concentrations calculated for Western remediation areas from which groundwater will be extracted. The values presented in the table were calculated by averaging all available Tc-99 results for groundwater samples collected between 2003 and 2012, for monitor wells located in each of the corresponding remediation areas. The locations and extents of the Western remediation areas, including those presented in the table, are illustrated on Attachment 1 – a proposed revision of Figure 8-1 from *Facility Decommissioning Plan – Rev 1*.

Tc-99 Concentration Averages			
Remediation Area	Average Concentration (pCi/L)	Nominal Cumulative Flow Rate (GPM)	Flow Rate Weighted Average Concentration (pCi/L)
WU-PBA	300	5	6.00
WAA U>DCGL	346	99	137
WAA-EAST	62	20	4.96
WAA-BLUFF	750	104	312
1206-NORTH	27	8	0.86
WAA-WEST ¹	11	10	0.44
WU-1348 ²	300	4	4.80
Total		250	466

Notes:

¹Tc-99 concentrations were not detected in the WAA-West remediation area. The lowest value reported for adjacent area WAA-EAST was used for the purpose of this evaluation.

²Tc-99 concentration data are not available for the WU-1348 remediation area; consequently, the Tc-99 concentration for the nearby WU-PBA remediation area was used for the purpose of this evaluation.

GPM – gallons per minute

⁴ Environmental Properties Management LLC, November 2018.

Mr. Paul Davis
Oklahoma Department of Environmental Quality
Page 5

The nominal groundwater extraction rate for each remediation area, based on the 60-percent remediation design effort, was used to develop flow-rate-weighted average Tc-99 concentrations for groundwater extracted from each Western remediation area. Both the nominal groundwater extraction rates and the flow-rate-weighted average Tc-99 concentration for each remediation area are presented in the table above. The sum of flow-rate-weighted average Tc-99 concentrations for each area represents the potential Tc-99 concentration in the combined WATF groundwater influent stream, also presented in the table above.

The table shown above reports only the concentrations of Tc-99 anticipated for remediation areas from which groundwater will be *extracted*. Treated water will be *injected* into the following remediation areas:

1. WU-UP1
2. WU-UP2-SSA
3. WU-UP2-SSB
4. WU-BA3

Although there is no Tc-99 data available for monitor wells located in the following remediation areas: WAA-WEST, 1206-NORTH, WU-1348, or WU-BA3, approximately 50% of the Tc-99 concentration data available from 2003 through 2012 pertains to groundwater samples collected from monitor wells located in the first three injection areas listed above, as well as one monitor well screened in UP1 Sandstone B (SSB).

During remediation activities, treated groundwater will be injected into WU-UP1, WU-UP2-SSA, and WU-UP2-SSB and subsequently recovered by extraction wells located within the WAA-BLUFF remediation area. The average Tc-99 concentration for these UP1 and UP2 remediation areas is approximately 707 pCi/L; less than the 750 pCi/L Tc-99 concentration calculated for the WAA-BLUFF remediation area (see table above). Because the Tc-99 in groundwater flushed from injection areas will be mixed with the injected water, the 750 pCi/L Tc-99 concentration calculated for the WAA-BLUFF area provides the most conservative (i.e., highest) estimate of the Tc-99 concentration anticipated for the WAA-BLUFF extraction wells.

As detailed in the table above, the estimated concentration of Tc-99 in the influent is approximately 466 pCi/L. The specific activity of Tc-99 is approximately 17,000 pCi per microgram (μg). The *activity* concentration of 466 pCi/L for Tc-99 in influent (see table above) would therefore be approximately equal to a *mass* concentration of 0.027 $\mu\text{g/L}$ Tc-99.

Mr. Paul Davis
Oklahoma Department of Environmental Quality
Page 6

Tc-99 in the Cimarron River

The Cimarron River was sampled for Tc-99 only once between 2003 and 2012. The sample was collected in May 2005 at Location 1202 – the sampling location representing the Cimarron River water quality downstream of the Cimarron site. The result for this sample was 300 pCi/L, with a detection limit of 300 pCi/L; the laboratory assigned a data qualifier of “U” (undetected) to the result.

The Oklahoma Water Resources Board (OWRB) has established water quality standards for designated beneficial uses of surface water. The OWRB determines what beneficial uses apply to various surface water bodies in the State of Oklahoma. There are no water quality standards for either Tc-99 or gross beta for any of the Cimarron River’s designated beneficial uses. However, for a public water supply, the OWRB has established a water quality standard of 50 pCi/L for gross beta. The DEQ has informed the CERT that this value may be considered a relevant and appropriate discharge permit limit for the WATF effluent to Outfall 001.

Samples collected from Cimarron River locations 1201 (upstream of the Cimarron site near the Highway 74 bridge) and 1202 (downstream of the Cimarron site northeast of BA1) were analyzed for gross beta every year from 2003 through 2006, and from 2009 through 2018, as part of the license-required environmental monitoring program. Gross beta results have consistently been below or slightly above the laboratory detection limit of 10 pCi/L, with three exceptions – the sample collected from 1201 (upstream) in May 2005 yielded a gross beta concentration of 28.6 pCi/L, and samples collected from 1202 (downstream) in May 2005 and May 2006 yielded gross beta concentrations of 31.6 and 22.6 pCi/L, respectively. Due to the uncertainties associated with the analytical methods used for these samples, the results are considered essentially the same for the upstream and downstream samples. Based on available data there is no evidence of Tc-99 impact to the Cimarron River. From 2003 through 2018, there have been more gross beta detections in upstream samples than in downstream samples.

Tc-99 in Waste Materials

Facility Decommissioning Plan – Rev 1, submitted to the NRC and the DEQ in November 2018, proposes to dispose of spent resin generated by the ion exchange system at a facility licensed to receive low level radioactive waste (LLRW). It also proposes to dispose of biomass generated by the biodenitrification system at an industrial waste disposal facility.

The treatability test conducted in 2013 indicated that the ion exchange resin to be used for uranium removal will also remove Tc-99. Because the removal of Tc-99 was not considered to be a remediation objective, influent groundwater used during the treatability test was not analyzed for Tc-99; consequently, it is not known if all Tc-99 present in the groundwater routed to the WATF will be removed by the ion exchange resin.

Mr. Paul Davis
Oklahoma Department of Environmental Quality
Page 7

If it is assumed that some of the Tc-99 in groundwater will pass through the ion exchange treatment systems, it is not known if that Tc-99 will accumulate in the biomass generated by the biodenitrification process that follows the ion exchange systems.

If it is assumed that a portion of the Tc-99 in the WATF influent passes through both the ion exchange and biodenitrification treatment systems Tc-99 and is present in the effluent, it appears that water quality standards for beneficial use designations for the Cimarron River do not include limits for either Tc-99 or gross beta concentrations. A similar situation exists for the injection of treated water into the Western Upland remediation areas.

Conclusion and Proposed Path Forward

Tc-99 may emerge from the WATF groundwater treatment systems in one of three ways:

1. It may be removed from the groundwater by the ion exchange resin and be disposed in the spent resin as LLRW.
2. If Tc-99 is present in the ion exchange treatment system effluent, some or all of it may be metabolized by microorganisms in the biodenitrification system, resulting in detectable Tc-99 concentrations in the waste generated as biomass. If Tc-99 *is not* detected in the biomass, the waste material will be disposed of in accordance with discharge permit OK0015010 in an industrial waste disposal facility. If Tc-99 *is* detected in the biomass, the disposition of the waste will need to be determined.
3. If Tc-99 passes through both the ion exchange and biodenitrification systems, it may be present in detectable concentrations in the WATF effluent. Most of the treated water will be discharged to the Cimarron River via Outfall 001, with the remainder injected into the Western Upland remediation areas as shown in the attached figure.

EPM proposes to conduct a comprehensive, synoptic sampling and analysis event to evaluate current gross beta and Tc-99 activity concentrations in groundwater at the Cimarron site. At least one monitor well within each Western and BA1 remediation area will be sampled and analyzed for gross beta and Tc-99 activity to provide a data set with adequate spatial distribution. Upon evaluation of the data generated by this sampling and analysis event, additional events may be conducted to provide a more extensive data set. Due to the temporal variability observed in historical Tc-99 groundwater data, multiple synoptic sampling events may be required to establish representative Tc-99 concentration values for each remediation area and the WATF influent stream.

Mr. Paul Davis
Oklahoma Department of Environmental Quality
Page 8

EPM also proposes to conduct a treatability test using site-specific groundwater and the ion exchange resin selected for uranium removal to assess the potential for the ion exchange resin to remove Tc-99 from the influent groundwater.

EPM contacted the DEQ Water Quality Division to determine if an Oklahoma Pollution Discharge Elimination System (OPDES) permit modification should be requested to address the potential presence of Tc-99 in the discharge to Outfall 001. The DEQ requested a letter describing this issue. Based on the information provided in this letter, and/or data generated by the above-described sampling and analysis program, the DEQ will determine if a permit modification may be needed.

EPM also contacted the DEQ Underground Injection Control (UIC) Program to determine if the presence of Tc-99 in the treated water to be injected into Burial Area #3 and the UP1 and UP2 remediation areas must be included in the description of the injected water. The UIC Program staff requested information similar to that requested by the Water Quality Division. Based on the information provided in this letter, and/or data generated by the above-described sampling and analysis program, the UIC Program staff will determine if additional notification is needed.

A scope of work and proposed budget to conduct additional groundwater assessment and the ion exchange treatability study described above will be submitted to the NRC and the DEQ. Funding is already available in the proposed budget for 2019 in Task 6, "Unanticipated Work". However, the scope of work and allocation of costs must be approved to authorize this additional work.

Finally, *Facility Decommissioning Plan – Rev 1* will be revised to include statements addressing the potential presence of Tc-99 in the WATF influent, effluent, and spent ion exchange resin, as well as the disposition of biomass, should Tc-99 be detected in the biomass, at a facility that is licensed or permitted to receive this material. The analysis of both spent resin and biomass for Tc-99 will be added to Table 8-3b, In-Process Monitoring. The analysis of Tc-99 in WATF influent and ion exchange treatment system effluent will also be added to Table 8-3b. These revisions will be included in the responses to the NRC's February 28, 2019 request for supplemental information.

If the DEQ Water Quality Division determines that a modification to the OPDES permit is needed, and that the concentration of Tc-99 (or gross beta activity) in Outfall 001 must be included in monthly discharge monitoring reports, Table 8-3c will also be revised to address permit requirements. The revision of Table 8-3c to reflect the addition of Tc-99 to the discharge monitoring program will be made in accordance with License Condition 27(e).



Mr. Paul Davis
Oklahoma Department of Environmental Quality
Page 9

Please call me at (405) 642-5152 or e-mail me at jlux@envpm.com if you have questions or desire clarification. Thank you.

Sincerely,

Jeff Lux, P.E.
Project Manager

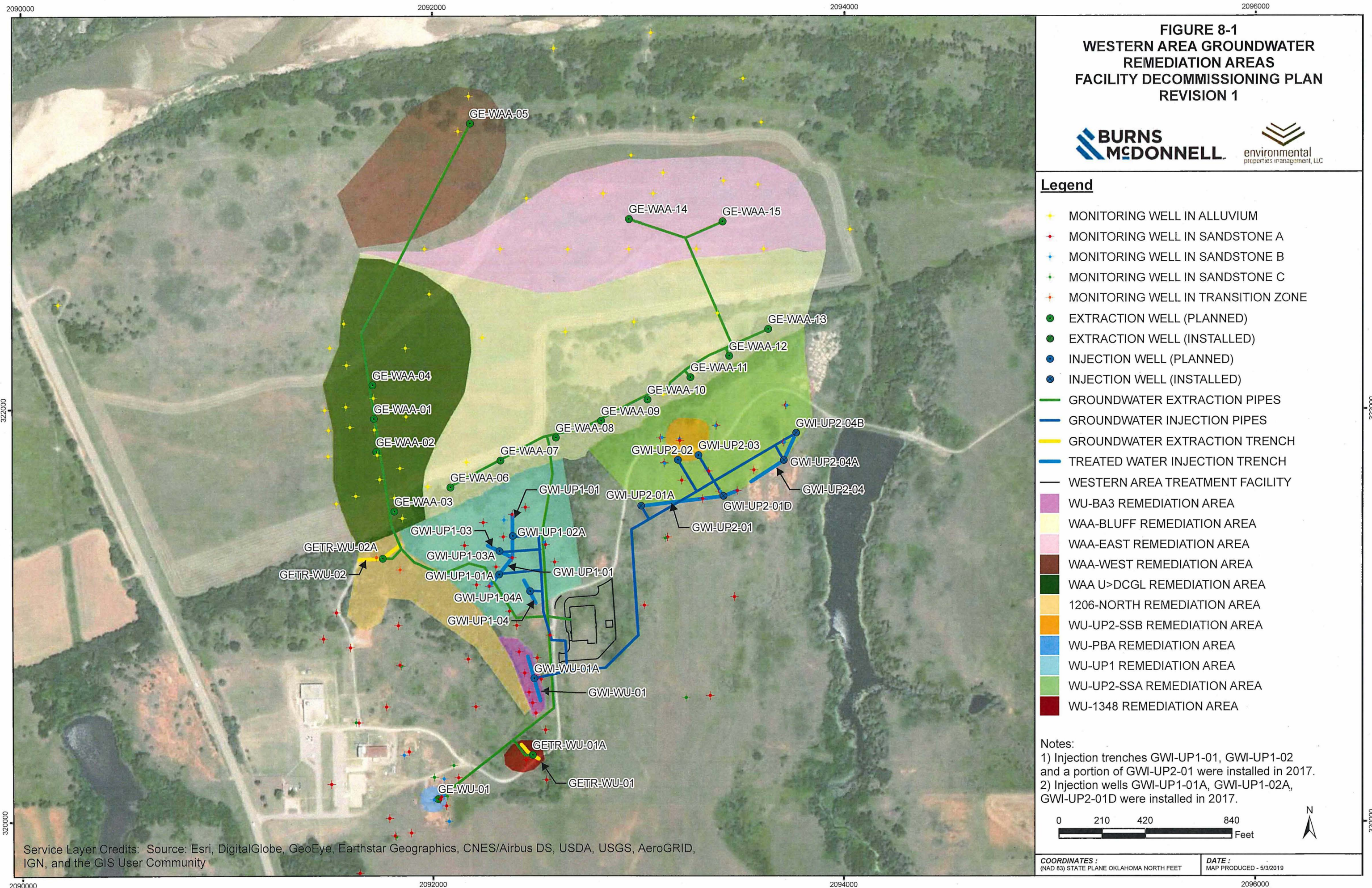
cc: Michael Broderick, DEQ Land Protection Division (electronic copy only)
Carol Paden, DEQ Water Quality Division (electronic copy only)
Hillary Young, DEQ Land Protection Division (electronic copy only)
NRC Public Document Room (electronic copy only)





Mr. Paul Davis
Oklahoma Department of Environmental Quality
Page 10


ATTACHMENT 1
PROPOSED REVISED FIGURE 8-1 FROM
FACILITY DECOMMISSIONING PLAN – REV 1

Path: X:\ClientInfo\Sites\Geospatial\Maps & Dwg\ArcGIS\BMC\Updated D-Plan Figures\Figure 8-1 _Western Area GW Remediation Areas.mxd
COPYRIGHT © 2018 BURNS & MCDONNELL ENGINEERING COMPANY, INC.



 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 12 WITH 44-9 DETECTOR	
Document No. RP-101	Rev. 0	Effective date: 3/20/2019
		Page 1


Reviews and Approvals	
Prepared by: Todd S. Brautigam	
Signature: 	Date: Digitally signed by Todd S. Brautigam DN: cn=Todd S. Brautigam, o=ENERCON Services, Inc., ou=O.ESG.EAST.SE.PIT, email=tbrautigam@enercon.com, c=US Date: 2019.03.19 15:34:39 -04'00'
Reviewed by Quality Assurance Coordinator: Charles Beatty	
Signature: 	Date: Digitally signed by Charles Beatty Jr. Date: 2019.03.19 15:43:55 -04'00'
Approved by Radiation Safety Officer: Jay Maisler, CHP	
Signature: 	Date: Digitally signed by Jay Maisler, CHP DN: cn=Jay Maisler, CHP, o=ENERCON, ou=Radiation Safety Officer, email=jmaisler@enercon.com, c=US Date: 2019.03.19 15:50:40 -04'00'

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 12 WITH 44-9 DETECTOR	
Document No. RP-101	Rev. 0	Effective date: 3/20/2019
		Page 2

Summary of Changes

Revisions to this document will be identified, and revisions or addenda will be issued as needed. The Project Manager maintains the signed original of this document; no controlled copies are issued. The end user is responsible to verify with the Project Manager that any hard copy being referenced is the current revision. A summary description of each revision or addenda will be noted in the following table.

Revision Number	Date	Comments
Rev. 0	Mar. 20, 2019	Initial conversion from desk instruction to procedure

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 12 WITH 44-9 DETECTOR	
Document No. RP-101	Rev. 0	Effective date: 3/20/2019
		Page 3

1.0 **PURPOSE**

This procedure provides instructions to individuals who are qualified to perform radiation contamination surveys using the Ludlum Model 12 Survey Meter with Model 44-9 Geiger-Mueller (frisker) detector.


2.0 **RESPONSIBILITIES**

- 2.1 The Radiation Safety Officer (RSO) or designee is responsible for:
 - 2.1.1 Authorizing survey methods and instrumentation to be used for unconditional release surveys of material and equipment.
 - 2.1.2 Ensuring only trained and qualified personnel perform surveys and authorize the unconditional release of material and equipment.
 - 2.1.3 Timely review and approval of completed radiological surveys.
- 2.2 Health Physics Technicians and Task Qualified Individuals are responsible for:
 - 2.2.1 Conducting surveys in accordance with RP-39, "Performance of Radiation, Contamination, and Airborne Radioactivity Surveys.
 - 2.2.2 Ensuring source checks have been performed prior to the use of selected instrumentation.
 - 2.2.3 Verifying operability of selected instrumentation in accordance with the instrument operating procedure.
 - 2.2.4 Authorizing the unconditional release of material that meets unconditional release criteria.
 - 2.2.5 Timely completion of radiological survey documentation for review and approval by RSO or designee.

3.0 **PRECAUTIONS AND LIMITATIONS**

- 3.1 Handle all instruments carefully. Do not drop or handle roughly.

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 12 WITH 44-9 DETECTOR	
Document No. RP-101	Rev. 0	Effective date: 3/20/2019
		Page 4

- 3.2 Consideration of initial activity analysis results without accounting for background radioactivity may overestimate the presence of contamination.
- 3.3 Ensure all instrumentation is in proper working condition and meets daily pre-operational check requirements.
- 3.4 DO NOT lift the detector by the detector cable. Acceptable handling methods include the handle securely attached to the meter detector holder or direct handling of the detector.
- 3.5 The Ludlum Model 12/44-9 will be calibrated by a qualified vendor.

4.0 **EQUIPMENT AND MATERIALS**

- 4.1 Tc-99 Check Source.
- 4.2 Attachment 101-01, Frisker Reference Reading – Post-Calibration: Section 1
- 4.3 Attachment 101-02, Frisker Daily Pre / Post-Use Response Check: Section 2


5.0 **PROCEDURE**

5.1 OVERVIEW

The Ludlum Model 12 is a rate meter field instrument with an analog (i.e. needle display) that collects count rate information and provides results in counts per minute (cpm). This instrument is only used in rate meter mode. The Ludlum Model 44-9 is a sealed Geiger-Mueller tube detector with a surface area of 15.5 cm².

- 5.1.1 The Ludlum Model 12/44-9 calibration sticker should include the following information. Additional information may be provided by the calibration vendor:
 - 5.1.1.1 Date of calibration and/or calibration due date.
 - 5.1.1.2 Instrument manufacturer, model, and serial number.

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 12 WITH 44-9 DETECTOR	
Document No. RP-101	Rev. 0	Effective date: 3/20/2019
		Page 5

5.1.1.3 Detector model and serial number.

5.1.1.4 Initials or name of the individual who performed the calibration.

5.1.2 The Instrument Check Forms are provided in an electronic spreadsheet. Information related to the Ludlum Model 12/44-9 Frisker is included in Attachments 101-01 and 101-02. The spreadsheet, which is approved by the RSO or designee, is considered equivalent to these attachments.

5.2 PHYSICAL CHECKS

5.2.1 Verify that the calibration due date on the calibration sticker has not lapsed. If the calibration has expired, place the instrument out of service and notify the RSO or designee.

5.2.2 Examine the instrument and detector casings for deformation or cracks. If the case or detector appear damaged notify the RSO or designee.

5.3 POST-CALIBRATION REFERENCE RESPONSE

NOTE: The reference response determination is to be performed by the RSO (or designee) upon receipt of the instrument following calibration.


5.3.1 The RSO or designee will perform the following steps using the beta (Tc-99) check source.

5.3.2 Obtain the appropriate Instrument Source Check Form – Frisker Reference Reading – Post-Calibration Form: Section 1 (Attachment 101-01 or equivalent) and fill in the appropriate instrument information in Section 1. At a minimum this shall include:


5.3.2.1 Instrument model.

5.3.2.2 Instrument serial number.

5.3.2.3 Detector model.

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
Document No. RP-101	Rev. 0	OPERATION AND USE OF THE LUDLUM MODEL 12 WITH 44-9 DETECTOR Effective date: 3/20/2019
		Page 6

- 5.3.2.4 Detector serial number.
- 5.3.2.5 Calibration due date.
- 5.3.2.6 Calibration efficiency – The calibration efficiency is the efficiency as reported on the calibration certificate from the calibration vendor.
- 5.3.2.7 Total efficiency – Total efficiency is the calibration efficiency adjusted to account for surface efficiency. NUREG-1507 recommendations for surface efficiency correction factor by radiation type are to be applied. Multiply the beta calibration efficiency by a beta emitter surface correction factor of 0.5.
- 5.3.2.8 Source serial number.
- 5.3.2.9 Source certification date.
- 5.3.2.10 Source nuclide: Tc-99.
- 5.3.2.11 Source 2 π activity in dpm.
- 5.3.3 Check mechanical zero (Note: Range selector switch should be in off position when performing this mechanical zero check). Rotate the scale selector switch to the "BAT" position and verify indicated voltage is in "BAT OK" region.
- 5.3.4 If voltage does not indicate "BAT OK" region, install new batteries and repeat step 5.3.3.
- 5.3.5 Rotate the scale selector switch to the "x100" position and allow instrument display to stabilize.
- 5.3.6 Move the cable that connects the detector to the instrument. If the movement of the cable has an effect on the reading, then replace the cable with a like cable and perform this check again.

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 12 WITH 44-9 DETECTOR	
Document No. RP-101	Rev. 0	Effective date: 3/20/2019
		Page 7

5.3.7 Place the "F/S" toggle switch toward "S".

5.3.8 Perform background reading – Choose a location away from the source or any sources of radiation to obtain a background reading. With the detector in air, allow the reading to stabilize and record the result in cpm in the appropriate field for background reading on the Instrument Source Check Form – Frisker Reference Reading – Post-Calibration Form: Section 1 (Attachment 101-01 or equivalent).

5.3.9 Rotate the scale selector switch to the appropriate position for the source placement.

5.3.10 Place the active side of the Tc-99 beta check source so that it is on the open face of the detector.

5.3.11 Allow the reading to stabilize and record the reading in the appropriate field on Frisker Reference Reading – Post-Calibration: Section 1 (Attachment 101-01 or equivalent).

5.3.12 Remove the source and repeat steps 5.3.8 through 5.3.11 for a total of 10 readings.


5.3.13 When using the electronic version of Instrument Source Check Form – Frisker Reference Reading – Post-Calibration Form: Section 1 (Attachment 101-01 or equivalent), the average reading and the upper and lower control limits are calculated automatically. The upper and lower control limits are ± 10 percent of the calculated average.

5.4 PRE- AND POST-USE INSTRUMENT RESPONSE CHECK

5.4.1 Check mechanical zero (Note: Range selector switch should be in off position when performing this mechanical zero check). Rotate the scale selector switch to the "BAT" position and verify indicated voltage is in "BAT OK" region.


5.4.2 If voltage does not indicate "BAT OK" region, install new batteries and repeat step 5.4.1.

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 12 WITH 44-9 DETECTOR	
Document No. RP-101	Rev. 0	Effective date: 3/20/2019
		Page 8

- 5.4.3 Place the "F/S" toggle switch toward "S".
- 5.4.4 Rotate the scale selector switch to the "x100" position and allow instrument display to stabilize.
- 5.4.5 Move the cable that connects the detector to the instrument. If the movement of the cable has an effect on the reading, then replace the cable with a like cable and perform this check again.
- 5.4.6 Enter the technician initials and date/time of the source check in the appropriate fields of the Instrument Source Check Form Frisker Daily Pre / Post-Use Response Check: Section 2 (Attachment 101-02 or equivalent).
- 5.4.7 Enter either 'Pre' or 'Post' as appropriate in the "Pre / Post Check" column of the Instrument Source Check Form Frisker Daily Pre / Post-Use Response Check: Section 2 (Attachment 101-02 or equivalent).
- 5.4.8 Perform background reading – Choose a location away from the source or any sources of radiation to obtain a background reading. With the detector in air, allow the reading to stabilize and record the result in cpm in the appropriate field for background reading of the Instrument Source Check Form Frisker Daily Pre / Post-Use Response Check: Section 2 (Attachment 101-02 or equivalent).
- 5.4.9 Place the active side of the Tc-99 beta check source so that it is on the open face of the detector.
- 5.4.10 Allow the reading to stabilize and record the reading in the appropriate field of the Instrument Source Check Form Frisker Daily Pre / Post-Use Response Check: Section 2 (Attachment 101-02 or equivalent).
- 5.4.11 If the physical and source response checks are satisfactory (within the acceptable response ranges), the instrument is ready for use.
- 5.4.12 If source response check results are unacceptable, document actions taken, as directed by the RSO or designee.

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
Document No. RP-101	Rev. 0	OPERATION AND USE OF THE LUDLUM MODEL 12 WITH 44-9 DETECTOR Effective date: 3/20/2019 Page 9

5.4.13 Place range selector switch in the "Off" position. Return Tc-99 source to its storage location.

5.5 LUDLUM MODEL 12 WITH 44-9 DETECTOR OPERATING INSTRUCTIONS

5.5.1 Perform physical, background, and source response checks prior to use as detailed in Section 5.4.

5.5.2 Rotate the scale selector switch to the "x100" position.

5.5.3 Place the "F/S" toggle switch toward "S"

5.5.4 Operate the instrument with the audio switch on when scanning an area for contamination.

5.5.5 Hold the detector less than 1 cm (0.5 inches) above the surface to be surveyed while scanning an area.


5.5.6 Move the detector along the surface being scanned at a rate not to exceed 1 probe-width (~2 inches) per second.

5.5.7 Listen to the audio, if the count rate increases pause over the area of increased count rate and allow the readings to stabilize.

5.5.8 When recording readings for a scanned area, read the instrument display, verify the scale or range, and record the maximum and average readings.

5.5.9 Avoid surveying in wet weather. The presence of water may reduce or eliminate the detection of contamination.

5.5.10 When survey is complete, perform an instrument source check as detailed in Section 5.4. Enter initials, date/time, and measurement results on the Frisker Daily Pre / Post Use Response Check form (Attachment 101-02 or equivalent). Take the instrument out of service if results are not within the acceptance response ranges shown on the Frisker Reference Reading – Post-Calibration form (Attachment 101-01 or equivalent).

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 12 WITH 44-9 DETECTOR	
Document No. RP-101	Rev. 0	Effective date: 3/20/2019
		Page 10

5.5.11 If the instrument must be taken out of service, contact the RSO or designee to determine if the survey must be repeated.

5.5.12 If results are within the acceptance response ranges shown on the Reference Reading – Post-Calibration form (Attachment 101-01 or equivalent), return the meter to the instrument storage cabinet.

6.0 **RECORDS**

6.1 Instrument Source Check (spreadsheet)

6.1.1 Frisker Reference Reading – Post-Calibration: Section 1

6.1.2 Frisker Daily Pre / Post-Use Response Check: Section 2

7.0 **REFERENCES**

7.1 Ludlum Model 12 Technical Manual, February 2013.

7.2 Ludlum Model 44-9 Technical Manual, March 2014.

7.3 NUREG-1507, "Minimum Detectable Concentrations with typical Radiation Survey Instruments for Various Contaminants and Field Conditions," December 1997.

7.4 RP-38, Survey Requirements and Frequencies.

7.5 RP-39, Performance of Radiation, Contamination, and Airborne Radioactivity Surveys.

7.6 RP-40, Survey Documentation and Review.


7.7 RP-46, Calibration and Use of Radiation Detection Instrumentation.

8.0 **ATTACHMENTS**

8.1 Attachment 101-01, Frisker Reference Reading – Post-Calibration: Section 1

8.2 Attachment 101-02, Frisker Daily Pre / Post-Use Response Check: Section 2

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 12 WITH 44-9 DETECTOR	
Document No. RP-101	Rev. 0	Effective date: 3/20/2019
		Page 11

Attachment 101-01


Frisker Reference Reading - Post-Calibration: Section 1

Frisker Reference Reading - Post-Calibration: Section 1			Form version: 2.3	
SOURCE and INSTRUMENT/DETECTOR - Frisker		Reading	Contact	
			Gross Reading	Net Reading
Instrument Model:				
Instrument S/N:				
Detector Model:		1		
Detector S/N:		2		
Calibration Due:		3		
Calibration Efficiency % (Beta):		4		
Total Efficiency (Cal eff % x 0.5):		5		
Background (cpm):		6		
Source S/N:		7		
Certificate date:		8		
Nuclide:		9		
2 π Activity (dpm):		10		
ACCEPTABLE RESPONSE RANGES		Lower Limit (-10%):		
		Average:		
		Upper Limit (+10%):		
Technician (print):				
Technician (sign/date):				
RSO Review by (print):				
RSO (sign/date):				


This document must be verified with Project Manager prior to use



This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF LUDLUM MODEL 19 MICRO-R SURVEY METER	
Document No. RP-102	Rev. 0	Effective date: 3/20/2019
		Page 1


Reviews and Approvals	
Prepared by: Todd S. Brautigam	
Signature: 	Date: Digitally signed by Todd S. Brautigam DN: cn=Todd S. Brautigam, o=ENERCON Services, Inc., ou=O.ESG.EAST.SE.PIT, email=tbrautigam@enercon.com, c=US Date: 2019.03.19 15:33:02 -04'00'
Reviewed by Quality Assurance Coordinator: Charles Beatty	
Signature: 	Date: Digitally signed by Charles Beatty Jr. Date: 2019.03.19 15:44:46 -04'00'
Approved by Radiation Safety Officer: Jay Maisler, CHP	
Signature: 	Date: Digitally signed by Jay Maisler, CHP DN: cn=Jay Maisler, CHP, o=ENERCON, ou=Radiation Safety Officer, email=jmaisler@enercon.com, c=US Date: 2019.03.19 15:49:57 -04'00'

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF LUDLUM MODEL 19 MICRO-R SURVEY METER	
Document No. RP-102	Rev. 0	Effective date: 3/20/2019
		Page 2

Summary of Changes

Revisions to this document will be identified, and revisions or addenda will be issued as needed. The Project Manager maintains the signed original of this document; no controlled copies are issued. The end user is responsible to verify with the Project Manager that any hard copy being referenced is the current revision. A summary description of each revision or addenda will be noted in the following table.

Revision Number	Date	Comments
Rev. 0	Mar. 20, 2019	Initial conversion from desk instruction to procedure

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF LUDLUM MODEL 19 MICRO-R SURVEY METER	
Document No. RP-102	Rev. 0	Effective date: 3/20/2019
		Page 3

1.0 **PURPOSE**

This procedure provides instructions to individuals who are qualified to perform radiation dose rate surveys using the Ludlum Model 19 Micro-R Survey Meter.

2.0 **RESPONSIBILITIES**

2.1 The Radiation Safety Officer (RSO) or designee is responsible for:


- 2.1.1 Authorizing survey methods and instrumentation to be used for unconditional release surveys of material and equipment.
- 2.1.2 Ensuring only trained and qualified personnel perform surveys and authorize the unconditional release of material and equipment.
- 2.1.3 Timely review and approval of completed radiological surveys.

2.2 Health Physics Technicians and Task Qualified Individuals are responsible for:

- 2.2.1 Conducting surveys in accordance with RP-39, "Performance of Radiation, Contamination, and Airborne Radioactivity Surveys.
- 2.2.2 Ensuring source checks have been performed prior to the use of selected instrumentation.
- 2.2.3 Verifying operability of selected instrumentation in accordance with the instrument operating procedure.
- 2.2.4 Authorizing the unconditional release of material that meets unconditional release criteria.
- 2.2.5 Timely completion of radiological survey documentation for review and approval by RSO or designee.

3.0 **PRECAUTIONS AND LIMITATIONS**

- 3.1 Handle all instruments carefully. Do not drop or handle roughly.
- 3.2 Ensure all instrumentation is in proper working condition and meets daily pre-
This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF LUDLUM MODEL 19 MICRO-R SURVEY METER	
Document No. RP-102	Rev. 0	Effective date: 3/20/2019
		Page 4

operational check requirements.

3.3 The Ludlum Model 19 Micro-R Meter will be calibrated by a qualified vendor.

4.0 **EQUIPMENT AND MATERIALS**

4.1 Cs-137 Gamma Check Source.

4.2 Attachment 102-01, Gamma Reference Reading – Post-Calibration: Section 1

4.3 Attachment 102-02, Gamma Daily Pre / Post-Use Response Check: Section 2

5.0 **PROCEDURE**

5.1 OVERVIEW

The Ludlum Model 19 is a dose rate meter field instrument with an analog (i.e. needle display) that detects gamma radiation and provides results in microrentgen per hour (microR/hr).

5.1.1 The Ludlum Model 19 calibration sticker should include the following information. Additional information may be provided by the calibration vendor:

5.1.1.1 Date of calibration and/or calibration due date.

5.1.1.2 Instrument manufacturer, model, and serial number.


5.1.1.3 Initials or name of the individual who performed the calibration.

5.1.2 The Instrument Check Forms are provided in an electronic spreadsheet. Information related to the Ludlum Model Micro-R Survey Meter is included in Attachments 102-01 and 102-02. The spreadsheet, which is approved by the RSO or designee, is considered equivalent to these attachments.

5.2 PHYSICAL CHECKS

5.2.1 Verify that the calibration due date on the calibration sticker has not

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
Document No. RP-102	Rev. 0	Effective date: 3/20/2019
		Page 5

lapsed. If the calibration has expired, place the instrument out of service and notify the RSO or designee.

- 5.2.2 Examine the instrument casing for deformation or cracks. If the case appears damaged notify the RSO or designee.

5.3 POST-CALIBRATION REFERENCE RESPONSE

NOTE: The reference response determination is to be performed by the RSO (or designee) upon receipt of the instrument following calibration.


- 5.3.1 The RSO or designee will perform the following steps using the Cs-137 gamma check source.

- 5.3.2 Obtain an appropriate Instrument Source Check Form – Gamma Reference Reading – Post-Calibration Form: Section 1 (Attachment 102-01 or equivalent) and fill in the appropriate instrument information in Section 1. At a minimum this shall include:

- 5.3.2.1 Instrument model.
- 5.3.2.2 Instrument serial number.
- 5.3.2.3 Calibration due date.
- 5.3.2.4 Readings units: $\mu\text{R/hr}$
- 5.3.2.5 Source serial number.
- 5.3.2.6 Source certification date.
- 5.3.2.7 Source nuclide: Cs-137
- 5.3.2.8 Source activity in μCi .


- 5.3.3 Check mechanical zero (Note: Range selector switch should be in off position when performing this mechanical zero check). Rotate the scale selector switch to the "5000" position and verify indicated voltage is in "BAT OK" region by depressing the BAT button.

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF LUDLUM MODEL 19 MICRO-R SURVEY METER	
Document No. RP-102	Rev. 0	Effective date: 3/20/2019
		Page 6

- 5.3.4 If voltage does not indicate "BAT OK" region, install new batteries and repeat step 5.3.3.
- 5.3.5 Place the "F/S" toggle switch toward "S".
- 5.3.6 Rotate the scale selector switch to the "25" position and allow instrument warm up for at least two minutes.
- 5.3.7 Perform background reading – Choose a location away from the source or any sources of radiation to obtain a background reading. With the detector in air, allow the reading to stabilize and record the result in $\mu\text{R/hr}$ in the field for background reading. Repeat to document a total of 10 background measurements.
- 5.3.8 Place instrument in the source jig (or equivalent) such that instrument internal detector faces directly toward source position in the holder.
- 5.3.9 Position range selector switch to appropriate range.
- 5.3.10 Place the Cs-137 source in the 10 cm (4 inch) position with the top face of the source toward the instrument.
- 5.3.11 Allow the reading to stabilize and record the reading in the appropriate field of the Instrument Source Check Form – Gamma Reference Reading – Post-Calibration Form: Section 1 (Attachment 102-01 or equivalent).
- 5.3.12 Remove the source and repeat steps 5.3.10 and 5.3.11 for a total of 10 readings in this position.
- 5.3.13 Position range selector switch to appropriate range.
- 5.3.14 Place the Cs-137 source in the 5 cm (2 inch) position with the top face of the source toward the instrument
- 5.3.15 Allow the reading to stabilize and record the reading in the appropriate field of the Instrument Source Check Form – Gamma Reference Reading – Post-Calibration Form: Section 1 (Attachment 102-01 or equivalent).

This document must be verified with Project Manager prior to use

	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF LUDLUM MODEL 19 MICRO-R SURVEY METER	
Document No. RP-102	Rev. 0	Effective date: 3/20/2019
		Page 7

5.3.16 Remove the source and repeat steps 5.3.14 and 5.3.15 for a total of 10 readings in this position.

5.3.17 Position range selector switch to appropriate range.

5.3.18 Place the Cs-137 source in the contact position with the top face of the source toward the instrument

5.3.19 Allow the reading to stabilize and record the reading in the appropriate field of the Instrument Source Check Form – Gamma Reference Reading – Post-Calibration Form: Section 1 (Attachment 102-01 or equivalent).

5.3.20 Remove the source and repeat steps 5.3.18 and 5.3.19 for a total of 10 readings in this position.

5.3.21 When using the electronic version of the Instrument Source Check Form – Gamma Reference Reading – Post-Calibration Form: Section 1(Attachment 102-01 or equivalent), the average reading and the upper and lower control limits are calculated automatically. The upper and lower control limits are ± 10 percent of the calculated average.

5.4 PRE- AND POST-USE INSTRUMENT RESPONSE CHECK

5.4.1 Check mechanical zero (**NOTE:** Range selector switch should be in off position when performing this mechanical zero check). Rotate the scale selector switch to the "5000" position and verify indicated voltage is in "BAT OK" region by depressing the BAT button.


5.4.2 If voltage does not indicate "BAT OK" region, install new batteries and repeat step 5.4.1.

5.4.3 Place the "F/S" toggle switch toward "S".

5.4.4 Rotate the scale selector switch to the "25" position and allow instrument warm up for at least two minutes.

5.4.5 Measure and record the daily background reading one meter above surface of ground at designated background measurement site and


This document must be verified with Project Manager prior to use

	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF LUDLUM MODEL 19 MICRO-R SURVEY METER	
Document No. RP-102	Rev. 0	Effective date: 3/20/2019
		Page 8

record results on the Instrument Source Check form -Gamma Reference Reading- Post Calibration Form: Section 2 (Attachment 102-02 or equivalent).

- 5.4.6 Place instrument in the source jig (or equivalent) such that instrument internal detector faces directly toward source position in the holder. Position range selector switch to appropriate range.
- 5.4.7 Place the Cs-137 source in the 10 cm (4 inch) position with the top face of the source toward the instrument.
- 5.4.8 Record the reading in the applicable field on the Instrument Source Check form -Gamma Reference Reading- Post Calibration Form: Section 2 (Attachment 102-02 or equivalent).
- 5.4.9 Position range selector switch to appropriate range.
- 5.4.10 Place the Cs-137 source in the 5 cm (2 inch) position with the top face of the source toward the instrument
- 5.4.11 Record the reading in the applicable field on the Instrument Source Check form -Gamma Reference Reading- Post Calibration Form: Section 2 (Attachment 102-02 or equivalent).
- 5.4.12 Position range selector switch to appropriate range.
- 5.4.13 Place the Cs-137 source in the contact position with the top face of the source toward the instrument
- 5.4.14 Record the reading in the applicable field on the Instrument Source Check form -Gamma Reference Reading- Post Calibration Form: Section 2 (Attachment 102-02 or equivalent).
- 5.4.15 If the physical and source response checks are satisfactory (within the acceptable response ranges), the instrument is ready for use.
- 5.4.16 If source response check results are unacceptable, document actions taken, as directed by the RSO or designee.

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF LUDLUM MODEL 19 MICRO-R SURVEY METER	
Document No. RP-102	Rev. 0	Effective date: 3/20/2019
		Page 9

5.4.17 Place range selector switch in the "Off" position. Return Cs-137 source to its storage location.

5.5 LUDLUM MODEL 19 OPERATING INSTRUCTIONS

5.5.1 Perform physical, background, and source response checks prior to use as detailed in Section 5.4.

5.5.2 Rotate the scale selector switch to the "25" position.

5.5.3 Place the "F/S" toggle switch toward "S".

5.5.4 Hold the instrument approximately one meter above the ground while scanning an area.

5.5.5 When taking recorded readings, read the instruments meter and check to see what scale or range the instrument is on.

5.5.6 Readings should be taken at one meter and at surface when surveying grid locations.


5.5.7 Listen to the audio, if the rate increases pause and allow the readings to stabilize.

5.5.8 When recording readings for a scanned area, read the instrument display, verify the scale or range, and record the maximum and average readings.

5.5.9 Avoid surveying in wet weather. The presence of water may reduce or eliminate the detection of contamination.

5.5.10 When survey is complete, perform an instrument source check as detailed in Section 5.4. Enter initials, date/time, and measurement results on the Instrument Source Check form -Gamma Reference Reading- Post Calibration Form: Section 2 (Attachment 102-02 or equivalent). Take the instrument out of service if results are not within the acceptance response ranges shown on the Reference Reading – Post-Calibration form.

This document must be verified with Project Manager prior to use

	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF LUDLUM MODEL 19 MICRO-R SURVEY METER	
Document No. RP-102	Rev. 0	Effective date: 3/20/2019
		Page 10

5.5.11 If the instrument must be taken out of service, contact the RSO or designee to determine if the survey must be repeated.

5.5.12 If results are within the acceptance response ranges shown on the Instrument Source Check form -Gamma Reference Reading- Post Calibration Form: Section 2 (Attachment 102-02 or equivalent), return the meter to the instrument storage cabinet.

6.0 RECORDS

6.1 Instrument Source Check (spreadsheet)

6.1.1 Gamma Reference Reading – Post-Calibration: Section 1

6.1.2 Gamma Daily Pre / Post-Use Response Check: Section 2

7.0 REFERENCES

7.1 Ludlum Micro R Meter Technical Manual, February 2012.

7.2 RP-38, Survey Requirements and Frequencies.

7.3 RP-39, Performance of Radiation, Contamination, and Airborne Radioactivity Surveys.

7.4 RP-40, Survey Documentation and Review.


7.5 RP-46, Calibration and Use of Radiation Detection Instrumentation.

8.0 ATTACHMENTS

8.1 Gamma Reference Reading – Post-Calibration: Section 1

8.2 Gamma Daily Pre / Post-Use Response Check: Section 2

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF LUDLUM MODEL 19 MICRO-R SURVEY METER	
Document No. RP-102	Rev. 0	Effective date: 3/20/2019
		Page 11

Attachment 102-01


Gamma Reference Reading - Post-Calibration: Section 1


Gamma Reference Reading - Post-Calibration: Section 1				Form version: 2.3				
SOURCE and INSTRUMENT/DETECTOR - GAMMA		Reading	Position 1 - Contact		Position 2 - 5 cm		Position 3 - 10 cm	
			Gross Reading	Net Reading	Gross Reading	Net Reading	Gross Reading	Net Reading
Instrument Model:		1						
Instrument S/N:		2						
Detector Model:		3						
Detector S/N:		4						
Calibration Due Date:		5						
Reading Units (cpm or μ Rem/hr):		6						
Background reading:		7						
Source S/N:		8						
Certificate date:		9						
Nuclide:		10						
Activity (μ Ci):								
ACCEPTABLE RESPONSE RANGES		Lower Limit (-10%):						
		Average:						
		Upper Limit (+10%):						
Technician (print):		Technician (sign/date):						
RSO Review by (print):		RSO (sign/date):						

This document must be verified with Project Manager prior to use




This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2221 with 44-10 DETECTOR	
Document No. RP-103	Rev. 0	Effective date: 3/20/2019
		Page 1

Reviews and Approvals	
Prepared by: Todd S. Brautigam	
Signature: 	Date: Digitally signed by Todd S. Brautigam DN: cn=Todd S. Brautigam, o=ENERCON Services, Inc., ou=O.ESG.EAST.SE.PIT, email=tbrautigam@enercon.com, c=US Date: 2019.03.19 15:33:49 -04'00'
Reviewed by Quality Assurance Coordinator: Charles Beatty	
Signature: 	Date: Digitally signed by Charles Beatty Jr. Date: 2019.03.19 15:45:24 -04'00'
Approved by Radiation Safety Officer: Jay Maisler, CHP	
Signature: 	Date: Digitally signed by Jay Maisler, CHP DN: cn=Jay Maisler, CHP, o=ENERCON, ou=Radiation Safety Officer, email=jmaisler@enercon.com, c=US Date: 2019.03.19 15:49:01 -04'00'

Verify current version with RSO prior to use


 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2221 with 44-10 DETECTOR	
Document No. RP-103	Rev. 0	Effective date: 3/20/2019
		Page 2

Summary of Changes

Revisions to this document will be identified, and revisions or addenda will be issued as needed. The Project Manager maintains the signed original of this document; no controlled copies are issued. The end user is responsible to verify with the Project Manager that any hard copy being referenced is the current revision. A summary description of each revision or addenda will be noted in the following table.

Revision Number	Date	Comments
Rev. 0	Mar. 20, 2019	Initial conversion from desk instruction to procedure

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2221 with 44-10 DETECTOR	
Document No. RP-103	Rev. 0	Effective date: 3/20/2019
		Page 3

1.0 **PURPOSE**

This procedure provides instructions to individuals who are qualified to perform gross gamma surveys using the Ludlum Model 2221 Survey Meter with a 44-10 sodium iodide (NaI) scintillation detector.


2.0 **RESPONSIBILITIES**

- 2.1 The Radiation Safety Officer (RSO) or designee is responsible for:
 - 2.1.1 Authorizing survey methods and instrumentation to be used for unconditional release surveys of material and equipment.
 - 2.1.2 Ensuring only trained and qualified personnel perform surveys and authorize the unconditional release of material and equipment.
 - 2.1.3 Timely review and approval of completed radiological surveys.
- 2.2 Health Physics Technicians and Task Qualified Individuals are responsible for:
 - 2.2.1 Conducting surveys in accordance with RP-39, "Performance of Radiation, Contamination, and Airborne Radioactivity Surveys.
 - 2.2.2 Ensuring source checks have been performed prior to the use of selected instrumentation.
 - 2.2.3 Verifying operability of selected instrumentation in accordance with the instrument operating procedure.
 - 2.2.4 Authorizing the unconditional release of material that meets unconditional release criteria.
 - 2.2.5 Timely completion of radiological survey documentation for review and approval by RSO or designee.

3.0 **PRECAUTIONS AND LIMITATIONS**

- 3.1 Handle all instruments carefully. Do not drop or handle roughly.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2221 with 44-10 DETECTOR	
Document No. RP-103	Rev. 0	Effective date: 3/20/2019
		Page 4

- 3.2 Ensure all instrumentation is in proper working condition and meets daily pre-operational check requirements.
- 3.3 DO NOT lift the detector by the data cable. Acceptable handling methods include a lanyard or handle securely attached to the detector housing or direct handling of the detector.
- 3.4 The current calibration and setup for the 2221 only supports use for gross gamma counts.
- 3.5 The Ludlum Model 2221 will be sent to a qualified vendor for calibration.

4.0 EQUIPMENT AND MATERIALS


- 4.1 Cs-137 Gamma Check Source.
- 4.2 Attachment 102-01 to RP-102, Gamma Reference Reading – Post-Calibration Form: Section 1
- 4.3 Attachment 102-02 to RP-102, Gamma Daily Pre / Post-Use Response Check: Section 2

5.0 PROCEDURE

5.1 OVERVIEW

The Ludlum Model 2221 with 44-10 NaI scintillator detector is a portable scaler/rate meter capable of being used for either gross counts or as a single channel analyzer. Prior to use as a single channel analyzer, proper settings for threshold and window must be determined and an appropriate calibration must be completed for the radionuclide of interest. This instrument may be used in scaler (digital) mode with count information collected over a set time period and results reported in total counts per defined time duration or it may be used in rate meter (analog) mode with count rate information collected and reported in counts per minute. This instrument may be used in scaler or ratemeter modes individually or simultaneously. Source response check results should be in scaler mode.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2221 with 44-10 DETECTOR	
Document No. RP-103	Rev. 0	Effective date: 3/20/2019
		Page 5

5.1.1 The Ludlum Model 2221 / 44-10 calibration sticker should include the following information:

- 5.1.1.1 Date of calibration and/or calibration due date.
- 5.1.1.2 Instrument manufacturer, model, and serial number.
- 5.1.1.3 Detector model and serial number
- 5.1.1.4 Initials of the individual who performed the calibration.

5.1.2 The Instrument Check Forms are provided in an electronic spreadsheet. Information related to the Ludlum Model 2221/44-10 Detector is included in Attachments 102-01 and 102-02 to procedure RP-102. The spreadsheet, which is approved by the RSO or designee, is considered equivalent to these attachments.

5.2 PHYSICAL CHECKS


- 5.2.1 Verify that the calibration due date on the calibration sticker has not elapsed. If the calibration has expired, place the instrument out of service and notify the RSO or designee.
- 5.2.2 Examine the instrument and detector casings for deformation or cracks. If the case or detector appear damaged notify the RSO or designee.

5.3 POST-CALIBRATION REFERENCE RESPONSE

NOTE: The reference response determination is to be performed by the RSO (or designee) upon receipt of the instrument following calibration.


- 5.3.1 The RSO or designee will perform the following steps using the Cs-137 gamma check source.
- 5.3.2 Obtain an appropriate Instrument Source Check Form – Gamma Reference Reading – Post-Calibration Form: Section 1 (Attachment 102-01 to RP-102 or equivalent) and fill in the appropriate instrument information in Section 1. At a minimum this shall include:

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2221 with 44-10 DETECTOR	
Document No. RP-103	Rev. 0	Effective date: 3/20/2019
		Page 6

- 5.3.2.1 Instrument model
- 5.3.2.2 Instrument serial number
- 5.3.2.3 Detector model
- 5.3.2.4 Detector serial number.
- 5.3.2.5 Calibration due date.
- 5.3.2.6 Source serial number.
- 5.3.2.7 Source certification date.
- 5.3.2.8 Reading units: cpm
- 5.3.2.9 Source nuclide: Cs-137
- 5.3.2.10 Source activity in μCi .
- 5.3.3 Ensure the "WIN" selector is set to "out".
- 5.3.4 Rotate the scale selector switch to the "x100" position.
- 5.3.5 In the "DIGITAL CONTROL" section, place the selector switch on "1" and the "SCALER / DIG. RATE" toggle switch to "SCALER".
- 5.3.6 Place the "Power On/Off" switch in the "On" position
- 5.3.7 Perform background reading – With the detector in air at the designated background measurement site, press the "COUNT" button to initiate a 1-minute count and record the result as the background reading.
- 5.3.8 Rotate the scale selector switch to the appropriate position for the source placement.
- 5.3.9 Using the Cs-137 gamma check source, place the source at the 10 cm (4 inch) position.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2221 with 44-10 DETECTOR	
Document No. RP-103	Rev. 0	Effective date: 3/20/2019
		Page 7

5.3.10 Place detector in the source jig (or equivalent) such that detector faces directly toward source position in the holder.

5.3.11 Using the Cs-137 gamma check source with the bottom face of the detector towards the source holder, place the source at the 30 cm (12 inch) position, allow the reading to stabilize and record the reading in the appropriate field in Gamma Reference Reading – Post-Calibration Form: Section 1 (Attachment 102-01 to RP-102 or equivalent).

5.3.12 Remove the source and repeat steps 5.3.9 and 5.3.11 for a total of 10 readings in this position. Using the Cs-137 gamma check source with the bottom face of the detector towards the source holder, place the source at the 15 cm (6 inch) position, allow the reading to stabilize and record the reading in the appropriate field in Gamma Reference Reading – Post-Calibration Form: Section 1 (Attachment 102-01 to RP-102 or equivalent).

5.3.13 Using the Cs-137 gamma check source with the bottom face of the detector towards the source holder, place the source at the contact position, allow the reading to stabilize and record the reading in the appropriate field in Gamma Reference Reading – Post-Calibration Form: Section 1 (Attachment 102-01 to RP-102 or equivalent).

5.3.14 When using the electronic version of the Instrument Source Check form, the average reading and the upper and lower control limits are calculated automatically. The upper and lower control limits are ± 10 percent of the calculated average.

5.4 PRE- AND POST-USE INSTRUMENT RESPONSE CHECK


5.4.1 Check mechanical zero (Note: the "Power on/off" switch should be in off position when performing this mechanical zero check).

5.4.2 Place the "Power on/off" switch in the "on" position.

5.4.3 Depress the "BAT" button to check the indicated voltage is at least 4.8 volts. If voltage <4.8 volts, replace with 4 new D cells.


5.4.4 Ensure "WIN" selector is set to "out".

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2221 with 44-10 DETECTOR	
Document No. RP-103	Rev. 0	Effective date: 3/20/2019
		Page 8

- 5.4.5 Rotate the scale selector switch to the "x100" position and allow the instrument display to stabilize.
- 5.4.6 Perform cable check by moving the cable that connects the detector to the instrument. If the movement of the cable has an effect on the reading, then replace the cable with a like cable, i.e. same connectors and length, and perform this check again.
- 5.4.7 Measure and record the daily background reading one meter above surface of ground at designated background measurement site and record results on the Gamma Daily Pre / Post-Use Response Check: Section 2 (Attachment 102-02 to RP-102 or equivalent).
- 5.4.8 Place instrument in the source jig (or equivalent) such that the detector faces directly toward source position in the holder. Position range selector switch to appropriate range.
- 5.4.9 Place the Cs-137 source in the 30 cm (12 inch) position and record in the applicable field on the Gamma Daily Pre / Post-Use Response Check: Section 2 (Attachment 102-02 to RP-102 or equivalent).
- 5.4.10 Position range selector switch to appropriate range, and place Cs-137 source in 15 cm (6 inch) position and record in the applicable field on the Gamma Daily Pre / Post-Use Response Check: Section 2 (Attachment 102-02 to RP-102 or equivalent).
- 5.4.11 Position range selector switch to appropriate range, and place Cs-137 source in contact position and record in the applicable field on the Gamma Daily Pre / Post-Use Response Check: Section 2 (Attachment 102-02 to RP-102 or equivalent).
- 5.4.12 If the physical and source response checks are satisfactory (within the acceptable response ranges), the instrument is ready for use.
- 5.4.13 If source response check results are unacceptable, document actions taken, as directed by The RSO or designee.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2221 with 44-10 DETECTOR	
Document No. RP-103	Rev. 0	Effective date: 3/20/2019
		Page 9

5.4.14 Place the "On/Off" switch in the "Off" position. Return Cs-132 source to its storage location.

5.5 LUDLUM MODEL 2221 WITH 44-10 DETECTOR OPERATING PROCEDURE

5.5.1 Perform physical, background, and source response checks prior to use as detailed in Section 5.4.

5.5.2 Place the "Power on/off" switch in the "on" position.

5.5.3 Ensure the "WIN" selector switch is set to "OUT".

5.5.4 Rotate the "Rate Meter" switch to the "x100" position.

5.5.5 Operate the instrument with the audio turned to a comfortable listening volume when scanning an area for contaminate

5.5.6 Hold the instrument approximately one meter above the ground while scanning an area.

5.5.7 Set the audio divide so an increase in count rate will be noticeable (10 or 100 recommended for operation at typical background levels).

5.5.8 Hold the detector approximately 10 to 15 cm (4 to 6 inches) above the ground while scanning an area.


5.5.9 Move the detector along the surface being scanned using a body-wide zig-zag pattern, at a rate not to exceed 1/2 meter (18 inches) per second.

5.5.10 Listen to the audio, if the count rate increases pause over the area of increased count rate and allow the readings to stabilize.

5.5.11 When recording readings for a scanned area, read the instrument display, verify the scale or range, and record the maximum and average readings.

5.5.12 Document data collected in accordance with RP-40.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
Document No. RP-103	Rev. 0	OPERATION AND USE OF THE LUDLUM MODEL 2221 with 44-10 DETECTOR Effective date: 3/20/2019
		Page 10

- 5.5.13 Avoid surveying in wet weather. The presence of water may reduce or eliminate the detection of contamination.
- 5.5.14 When survey is complete, perform an instrument source check as detailed in Section 5.4. Enter initials, date/time, and measurement results on the Daily Pre / Post Use Response Check form.
- 5.5.15 Take the instrument out of service if results are not within the acceptance response ranges shown on the Reference Reading – Post-Calibration form.
- 5.5.16 If the instrument must be taken out of service, contact The RSO or designee to determine if the survey must be repeated.
- 5.5.17 If results are within the acceptance response ranges shown on the Reference Reading – Post-Calibration form, return the meter to the instrument storage cabinet.


6.0 RECORDS

- 6.1 Instrument Source Check (spreadsheet)
 - 6.1.1 Gamma Reference Reading – Post-Calibration: Section 1
 - 6.1.2 Gamma Daily Pre / Post-Use Response Check: Section 2

7.0 REFERENCES

- 7.1 Ludlum Model 2221 Portable Scaler Ratemeter Technical Manual, February 2003.
- 7.2 Ludlum Model 44-10 Gamma Scintillator Technical Manual, February 2012.
- 7.3 RP-38, Survey Requirements and Frequencies.
- 7.4 RP-40, Survey Documentation and Review.
- 7.5 RP-46, Calibration and Use of Radiation Detection Instrumentation.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2221 with 44-10 DETECTOR	
Document No. RP-103	Rev. 0	Effective date: 3/20/2019
		Page 11


7.6 RP-102, Operation and Use of Ludlum Model 19 Micro-R Survey Meter.

8.0 **ATTACHMENTS**

8.1 Attachment 102-01 (See RP-102): Gamma Reference Reading – Post-Calibration: Section 1


8.2 Attachment 102-02 (See RP-102: Gamma Daily Pre / Post-Use Response Check: Section 2

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 1

Reviews and Approvals	
Prepared by: Todd S. Brautigam	
Signature: 	Date: Digitally signed by Todd S. Brautigam DN: cn=Todd S. Brautigam, o=ENERCON Services, Inc., ou=O.ESG.EAST.SE.PIT, email=tbrautigam@enercon.com, c=US Date: 2019.03.19 14:18:54 -04'00'
Reviewed by Quality Assurance Coordinator: Charles Beatty	
Signature: 	Date: Digitally signed by Charles Beatty Jr. Date: 2019.03.19 15:04:14 -04'00'
Approved by Radiation Safety Officer: Jay Maisler, CHP	
Signature: 	Date: Digitally signed by Jay Maisler, CHP DN: cn=Jay Maisler, CHP, o=ENERCON, ou=Radiation Safety Officer, email=jmaisler@enercon.com, c=US Date: 2019.03.19 15:17:50 -04'00'

Verify current version with RSO prior to use


 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 2

Summary of Changes

Revisions to this document will be identified, and revisions or addenda will be issued as needed. The Project Manager maintains the signed original of this document; no controlled copies are issued. The end user is responsible to verify with the Project Manager that any hard copy being referenced is the current revision. A summary description of each revision or addenda will be noted in the following table.

Revision Number	Date	Comments
Rev. 0	Mar. 20, 2019	Initial conversions from desk instruction to Procedure

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 3

1.0 PURPOSE

This procedure provides instructions to individuals who are qualified to perform radiation contamination surveys using the Ludlum Model 2360 Survey Meter with Model 43-93 alpha/beta scintillator detector.


2.0 RESPONSIBILITIES

- 2.1 The Radiation Safety Officer (RSO) or designee is responsible for:
 - 2.1.1 Authorizing survey methods and instrumentation to be used for unconditional release surveys of material and equipment.
 - 2.1.2 Ensuring only trained and qualified personnel perform surveys and authorize the unconditional release of material and equipment.
 - 2.1.3 Timely review and approval of completed radiological surveys.
- 2.2 Health Physics Technicians and Task Qualified Individuals are responsible for:
 - 2.2.1 Conducting surveys in accordance with RP-39, "Performance of Radiation, Contamination, and Airborne Radioactivity Surveys.
 - 2.2.2 Ensuring source checks have been performed prior to the use of selected instrumentation.
 - 2.2.3 Verifying operability of selected instrumentation in accordance with the instrument operating procedure.
 - 2.2.4 Authorizing the unconditional release of material that meets unconditional release criteria.
 - 2.2.5 Timely completion of radiological survey documentation for review and approval by RSO or designee.

3.0 PRECAUTIONS AND LIMITATIONS

- 3.1 Handle all instruments carefully. Do not drop or handle roughly.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 4

- 3.2 Consideration of initial activity analysis results without accounting for background radioactivity may overestimate the presence of contamination.
- 3.3 Ensure all instrumentation is in proper working condition and meets daily pre-operational check requirements.
- 3.4 DO NOT lift the detector by the detector cable. Acceptable handling methods include the handle securely attached to the meter detector holder or direct handling of the detector.
- 3.5 The Ludlum Model 12 / 44-9 will be sent to a qualified vendor for calibration.

4.0 EQUIPMENT AND MATERIALS


- 4.1 Tc-99 Check Source.
- 4.2 Th-230 Check Source.
- 4.3 Attachment 104-01a, Alpha Reference Reading – Post-Calibration: Section 1
- 4.4 Attachment 104-01b, Beta Reference Reading – Post-Calibration: Section 1
- 4.5 Attachment 104-02a, Alpha Daily Pre / Post-Use Response Check: Section 2
- 4.6 Attachment 104-02b, Beta Daily Pre / Post-Use Response Check: Section 2

5.0 PROCEDURE

5.1 OVERVIEW

The Ludlum Model 2360 with 43-93 alpha/beta scintillator detector is a scaler/rate meter data logging field instrument. This instrument may be used in scaler (digital) mode with count information collected over a set time period and results reported in total counts per defined time duration or it may be used in rate meter (analog) mode with count rate information collected and reported in counts per minute. This instrument may be used in scaler or ratemeter modes individually or simultaneously. Source response check results should be in scaler mode.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 5

5.1.1 The Ludlum Model 2360 / 43-93 calibration sticker should include the following information:

- 5.1.1.1 Date of calibration and/or calibration due date.
- 5.1.1.2 Instrument manufacturer, model, and serial number.
- 5.1.1.3 Detector model and serial number.
- 5.1.1.4 Initials of the individual who performed the calibration.

5.2 PHYSICAL CHECKS

5.2.1 Verify that the calibration due date on the calibration sticker has not elapsed. If the calibration has expired, place the instrument out of service and notify the RSO or designee.

5.2.2 Examine the instrument and detector casings for deformation or cracks. If the case or detector appear damaged notify the RSO or designee.

- 5.2.2.1 Carefully exam the probe face for any indications of holes or perforations. Light leaks caused by small holes or perforations adversely affect instrument response.


5.3 POST-CALIBRATION REFERENCE RESPONSE

NOTE: The reference response determination is to be performed by the RSO (or designee) upon receipt of the instrument following calibration.

5.3.1 The RSO or designee will perform the following steps using the alpha (Th-230) and beta (Tc-99) check sources.


5.3.2 Obtain the appropriate Instrument Source Check Form – Alpha Reference Reading – Post-Calibration: Section 1 (Attachment 104-01a or equivalent) and Beta Reference Reading – Post-Calibration: Section 1 (Attachment 104-01b or equivalent). Fill in the appropriate instrument information in Section 1 of the forms. At a minimum this shall include:

- 5.3.2.1 Instrument model.
Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 6


- 5.3.2.2 Instrument serial number.
- 5.3.2.3 Detector model.
- 5.3.2.4 Detector serial number.
- 5.3.2.5 Calibration due date.
- 5.3.2.6 Calibration efficiency – The calibration efficiency is the efficiency as reported on the calibration certificate from the calibration vendor.
- 5.3.2.7 Total efficiency – Total efficiency is the calibration efficiency adjusted to account for surface efficiency. NUREG-1507 recommendations for surface efficiency correction factor by radiation type are to be applied. Multiply the calibration efficiency by the following appropriate correction factor to arrive at the total efficiency:
 - 5.3.2.7.2 Alpha emitter surface correction factor = 0.25.
 - 5.3.2.7.3 Beta emitter surface correction factor = 0.5.
- 5.3.2.8 Source serial number.
- 5.3.2.9 Source certification date.
- 5.3.2.10 Source nuclide: Th-230 or Tc-99 as appropriate.
- 5.3.3 Perform background reading – With the detector in air at the designated background measurement site, perform a 10-minute count and record the result in the appropriate field for the reading in cpm (i.e. total counts divided by 10).
 - 5.3.3.1 The alpha and beta background readings may be performed simultaneously. Alpha and beta readings are read by appropriate selection of the α / $\alpha+\beta$ / β selector switch.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 7

- 5.3.4 Switch to the position for alpha (α) or beta (β), as appropriate for the source being used.
- 5.3.5 Place the active side of the appropriate check source at the toe (top) of the detector face, perform a 1-minute count and record the reading in the appropriate field in the Instrument Source Check Form – Alpha Reference Reading – Post-Calibration: Section 1 (Attachment 104-01a or equivalent) and Beta Reference Reading – Post-Calibration: Section 1 (Attachment 104-01b or equivalent).
- 5.3.6 Remove the source and repeat to achieve a total of 10 readings in this position. The source should be rotated slightly each time.
- 5.3.7 Place the active side of appropriate check source at the middle (center) of the detector face, perform a 1-minute count and record the reading in the appropriate field in Section 1 of the Instrument Source Check Form – Alpha Reference Reading – Post-Calibration: Section 1 (Attachment 104-01a or equivalent) and Beta Reference Reading – Post-Calibration: Section 1 (Attachment 104-01b or equivalent).
- 5.3.8 Remove the source and repeat to achieve a total of 10 readings in this position. The source should be rotated slightly each time.
- 5.3.9 Place the active side of the appropriate check source at the heel (bottom) of the detector face, perform a 1-minute count and record the reading in the appropriate field in Section 1 of the Instrument Source Check Form – Alpha Reference Reading – Post-Calibration: Section 1 (Attachment 104-01a or equivalent) and Beta Reference Reading – Post-Calibration: Section 1 (Attachment 104-01b or equivalent).
- 5.3.10 Remove the source and repeat to achieve a total of 10 readings in this position. The source should be rotated slightly each time.
- 5.3.11 When using the electronic version of the Instrument Source Check form, the average reading and the upper and lower control limits are calculated automatically. The upper and lower control limits are ± 10 percent of the calculated average.


Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 8

5.4 PRE- AND POST-USE INSTRUMENT RESPONSE CHECK

- 5.4.1 Check mechanical zero (Note: Range selector switch should be in off position when performing this mechanical zero check). Rotate the scale selector switch to the "BAT" position and verify indicated voltage is in "BAT OK" region.
 - 5.4.2 If voltage does not indicate "BAT OK" region, install new batteries.
 - 5.4.3 Rotate the scale selector switch to the "x1000" position and allow instrument display to stabilize.
 - 5.4.4 Perform light leak check by ensuring the audio output is able to be heard, rotate the "selector switch" to the x1 position, and turn the detector face towards a light source. If the audio output of the meter responds wildly notify the RSO or designee and remove the instrument from service for repair.
 - 5.4.5 With the "selector switch" to the x1 position move the cable that connects the detector to the meter. If the movement of the cable has an effect on the reading, then replace the cable with a like cable and perform this check again.
- NOTE:** The following steps apply to both the alpha (Th-230) and beta (Tc-99) check sources.
- 5.4.6 Perform background reading – With the detector in air at the designated background measurement site, perform a 10-minute count. Record the result in the appropriate field on the appropriate Instrument Check Source Form – Alpha Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02a or equivalent), or Beta Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02b or equivalent) for the background reading in counts per minute (i.e. total counts divided by 10).
 - 5.4.6.1 The alpha and beta background readings may be performed simultaneously. Alpha and beta readings are read by appropriate selection of the α / $\alpha+\beta$ / β selector switch.

Verify current version with RSO prior to use


	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 9

- 5.4.7 Select the proper detection type switch for alpha (α) or beta (β), as appropriate.
- 5.4.8 Place the appropriate check source at the toe (top) of the detector face, perform a 1-minute count and record the reading in the appropriate field in the appropriate Instrument Check Source Form – Alpha Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02a or equivalent), or Beta Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02b or equivalent).
- 5.4.9 Place the appropriate check source at the middle (center) of the detector face, perform a 1-minute count and record the reading in the appropriate field in the appropriate Instrument Check Source Form – Alpha Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02a or equivalent), or Beta Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02b or equivalent).
- 5.4.10 Place the appropriate check source at the heel (bottom) of the detector face, perform a 1-minute count and record the reading in the appropriate field in the appropriate Instrument Check Source Form – Alpha Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02a or equivalent), or Beta Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02b or equivalent).
- 5.4.11 If the physical and both source response checks are satisfactory (within the acceptable response ranges), the instrument is ready for use.
- 5.4.12 If the physical or either source response check results are unacceptable, document actions taken, as directed by the RSO or designee.
- 5.4.13 Place range selector switch in the "Off" position. Return the check source(s) to the storage location.

5.5 LUDLUM MODEL 2360 WITH 43-93 DETECTOR OPERATING PROCEDURE


- 5.1.1 Perform physical, background, and source response checks prior to use as detailed in Section 5.6.6.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 10

- 5.1.2 Rotate the scale selector switch to the "x1" position.
- 5.1.3 Operate the instrument with the audio switch on when scanning an area for contamination.
- 5.1.4 Scan measurements
 - 5.5.1.1 Hold the detector approximately 0.5 to 1 cm (0.25 to 0.5 inches) above the surface to be surveyed while scanning an area.
 - 5.5.1.2 Move the detector along the surface being scanned at a rate not to exceed 1 probe-width (~2 inches) per second.
 - 5.5.1.3 Listen to the audio, if the count rate increases pause over the area of increased count rate and allow the readings to stabilize.
 - 5.5.1.4 When recording readings for a scanned area, read the instrument display, verify the scale or range, and record the maximum and average readings.
- 5.1.5 Static (fixed) Measurements.
 - 5.5.1.5 Ensure the surface to be surveyed is free on debris or other items that may puncture the detector face.
 - 5.5.1.6 Place the detector on the surface to be surveyed and perform a 1-minute count.
 - 5.5.1.7 Record the alpha and beta results by proper selection of the α / $\alpha+\beta$ / β selector switch and reading the digital display area of the meter.
- 5.5.2 Avoid surveying in wet weather. The presence of water may reduce or eliminate the detection of contamination.
- 5.5.3 Document results in accordance with RP-40.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 11

- 5.5.4 When survey is complete, perform an instrument source check as detailed in Section 5.6.6. Enter initials, date/time, and measurement results on the appropriate Instrument Check Source Form – Alpha Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02a or equivalent), or Beta Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02b or equivalent). Take the instrument out of service if results are not within the acceptance response ranges shown on the appropriate Instrument Check Source Form – Alpha Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02a or equivalent), or Beta Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02b or equivalent).
- 5.5.5 If the instrument must be taken out of service, contact The RSO or designee to determine if the survey must be repeated.
- 5.5.6 If results are within the acceptance response ranges shown on the appropriate Instrument Check Source Form – Alpha Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02a or equivalent), or Beta Daily Pre / Post-Use Response Check: Section 2 (Attachment 104-02b or equivalent), return the meter to the instrument storage cabinet.


6.0 RECORDS

- 6.1 Instrument Check Source Form (spreadsheet)
- 6.1.1 Alpha Reference Reading – Post-Calibration: Section 1
- 6.1.2 Beta Reference Reading – Post-Calibration: Section 1
- 6.1.3 Alpha Daily Pre / Post-Use Response Check: Section 2
- 6.1.4 Beta Daily Pre / Post-Use Response Check: Section 2

7.0 REFERENCES

- 7.1 Ludlum Model 2360 Scaler/Ratemeter Data logger Technical Manual, August 2012.
- 7.2 Ludlum Model 43-93 & 43-93-1 Technical Manual, November 2011.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 12

7.3 NUREG-1507 Minimum Detectable Concentrations with typical Radiation Survey Instruments for Various Contaminants and Field Conditions, December 1997.

7.4 RP-40 Survey Documentation and Review.


8.0 **ATTACHMENTS**

8.1 Attachment 104-01a, Alpha Reference Reading – Post-Calibration: Section 1

8.2 Attachment 104-01b, Beta Reference Reading – Post-Calibration: Section 1

8.3 Attachment 104-02a, Alpha Daily Pre / Post-Use Response Check: Section 2

8.4 Attachment 104-02b, Beta Daily Pre / Post-Use Response Check: Section 2


 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 13

Attachment 104-01a

Alpha Reference Reading – Post-Calibration: Section 1

Alpha Reference Reading - Post-Calibration: Section 1					Form version: 2.3			
SOURCE and INSTRUMENT/DETECTOR - ALPHA		Reading	Position 1 - Toe/Top		Position 2 - Middle		Position 3 - Heel/Bottom	
			Gross Reading	Net Reading	Gross Reading	Net Reading	Gross Reading	Net Reading
Instrument Model:								
Instrument S/N:								
Detector Model:		1						
Detector S/N:		2						
Calibration Due:		3						
Calibration Efficiency % (Alpha):		4						
Total Efficiency (Cal eff % x 0.25):		5						
Background (cpm):		6						
Source S/N:		7						
Certificate date:		8						
Nuclide:		9						
2 π Activity (dpm):		10						
ACCEPTABLE RESPONSE RANGES		Lower Limit (-10%):						
		Average:						
		Upper Limit (+10%):						
Technician (print):			Technician (sign/date):					
RSO Review by (print):			RSO (sign/date):					

Verify current version with RSO prior to use


 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 14

Attachment 104-01b

Beta Reference Reading – Post-Calibration: Section 1

Beta Reference Reading - Post Calibration: Section 1				Form version: 2.3				
SOURCE and INSTRUMENT/DETECTOR - BETA		Reading	Position 1 - Toe/Top		Position 2 - Middle		Position 3 - Heel/Bottom	
			Gross Reading	Net Reading	Gross Reading	Net Reading	Gross Reading	Net Reading
Instrument Model:								
Instrument S/N:								
Detector Model:		1						
Detector S/N:		2						
Calibration Due:		3						
Calibration Efficiency % (BETA):		4						
Total Efficiency (Cal eff % x 0.25):		5						
Background (cpm):		6						
Source S/N:		7						
Certificate date:		8						
Nuclide:		9						
2 π Activity (dpm):		10						
ACCEPTABLE RESPONSE RANGES		Lower Limit (-10%):						
		Average:						
		Upper Limit (+10%):						
Technician (print):		Technician (sign/date):						
RSO Review by (print):		RSO (sign/date):						

Verify current version with RSO prior to use


 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 2360 with 43-93 DETECTOR	
Document No. RP-104	Rev. 0	Effective date: 3/20/2019
		Page 16

Attachment 104-02b

Beta Daily Pre / Post-Use Response Check: Section 2


Beta Daily Pre / Post-Use Response Check (To be completed by the RPT): Section 2										Form version: 2.3		
Verify instrument and detector information (Section 1) before continuing. IF the information is incorrect, DO NOT CONTINUE.												
Performed by		Pre / Post Check	BKG Count Time (min)	Total BKG Counts	BKG Count Rate (cpm)	ACTUAL INSTRUMENT RESPONSE - BETA						Pass / Fail
Technician Initials	Date/Time					Position 1 - Toe/Top		Position 2 - Middle		Heel/Bottom		
						Gross Reading	Net Reading	Gross Reading	Net Reading	Gross Reading	Net Reading	
Remarks:												

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 1 of 14

Reviews and Approvals		
Prepared by: Todd S. Brautigam		
Signature:	 Digitally signed by Todd S. Brautigam DN: cn=Todd S. Brautigam, o=ENERCON Services, Inc., ou=O.ESG.EAST.SE.PIT, email=tbrautigam@enercon.com, c=US Date: 2019.03.19 14:17:24 -04'00'	Date:
Reviewed by Quality Assurance Coordinator: Charles Beatty		
Signature:	 Digitally signed by Charles Beatty Jr. Date: 2019.03.19 15:04:49 -04'00'	Date:
Approved by Radiation Safety Officer: Jay Maisler, CHP		
Signature:	 Digitally signed by Jay Maisler, CHP DN: cn=Jay Maisler, CHP, o=ENERCON, ou=Radiation Safety Officer, email=jmaisler@enercon.com, c=US Date: 2019.03.19 15:17:03 -04'00'	Date:

Verify current version with RSO prior to use


 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 2 of 14

Summary of Changes

Revisions to this document will be identified, and revisions or addenda will be issued as needed. The Project Manager maintains the signed original of this document; no controlled copies are issued. The end user is responsible to verify with the Project Manager that any hard copy being referenced is the current revision. A summary description of each revision or addenda will be noted in the following table.

Revision Number	Date	Comments
Rev. 0	Mar. 20, 2019	Initial conversion from desk instruction to procedure

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 3 of 14

1.0 PURPOSE

This procedure provides instructions to individuals who are qualified to perform removable activity and air sample measurements using the Ludlum Model 3030E alpha-beta counter with 43-10-1 detector.

2.0 RESPONSIBILITIES

- 2.1 The Radiation Safety Officer (RSO) or designee is responsible for ensuring this procedure complies with record keeping requirements associated with radiological surveys.


3.0 PRECAUTIONS AND LIMITATIONS

- 3.1 Keep instrument clean and dry.
- 3.2 Handle all instruments carefully. Do not drop or handle roughly.
- 3.3 Ensure that samples (wipes), planchets, and the spacer plate have been removed from the tray prior to moving the instrument.
- 3.4 The Ludlum Model 3030E/43-10-1 will be calibrated by a qualified vendor.

4.0 EQUIPMENT AND MATERIALS

- 4.1 Tc-99 Check Source with spacer tray for the 3030.
- 4.2 Th-230 Check Source with spacer tray for the 3030.
- 4.3 Attachment 105-01, 3030E Alpha Reference Reading – Post-Calibration: Section 1a
- 4.4 Attachment 105-2, 3030E Beta Reference Reading – Post-Calibration: Section 1b
- 4.5 Attachment 105-3, 3030E Daily Pre / Post-Use Response Check: Section 2.
- 4.6 Planchets.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 4 of 14

5.0 **PROCEDURE**

5.1 OVERVIEW

The Ludlum Model 3030E with 43-10-1 detector is a dual channel, scaler-type, sample counter used to analyze air samples and smears for alpha and beta activity. This instrument is designed for use as a benchtop instrument and is not for use in field conditions. It may be used standalone or connected to a computer system.

5.1.1 The Ludlum Model 3030E / 43-10-1 calibration sticker should include the following information:

- 5.1.1.1 Date of calibration and/or calibration due date
- 5.1.1.2 Instrument manufacturer, model, and serial number
- 5.1.1.3 Detector model and serial number
- 5.1.1.4 Initials of the individual who performed the calibration

5.2 PHYSICAL CHECKS


5.2.1 Verify current instrument calibration, as indicated on attached calibration sticker. If calibration has expired, place instrument out of service and contact the Project Manager or RSO.

5.2.2 Examine instrument and detector casings for any deformation or cracks.

5.3 POST-CALIBRATION REFERENCE RESPONSE


NOTE: The poste-calibration reference response determination is to be performed by the RSO (or designee) upon receipt of the instrument following calibration. The post-calibration reference response requires a computer connection via a serial port and control software, downloadable from the Ludlum Measurements, Inc. website. This procedure assumes the software is properly installed and the computer is communicating with the instrument.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 5 of 14


- 5.3.1 The RSO or designee will perform the following steps for the alpha (Th-230) and beta (Tc-99) check sources.
- 5.3.2 Obtain the appropriate Instrument Source Check Form – 3030E Alpha Reference Reading – Post-Calibration: Section 1a (Attachment 105-01 or equivalent) and 3030E Beta Reference Reading – Post-Calibration: Section 1b (Attachment 105-02 or equivalent). Fill in the appropriate instrument information in Sections 1a and 1b of the forms. At a minimum this shall include:
 - 5.3.2.1 Instrument model.
 - 5.3.2.2 Instrument serial number.
 - 5.3.2.3 Detector model.
 - 5.3.2.4 Detector serial number.
 - 5.3.2.5 Calibration due date.
 - 5.3.2.6 Calibration efficiency – The calibration efficiency is the efficiency as reported on the calibration certificate from the calibration vendor.
 - 5.3.2.7 Total efficiency – “N/A” – Surface correction factors do not apply to removable activity measurements.
- 5.3.3 Turn the power switch “ON” and allow the instrument to complete the startup routine.
- 5.3.4 Start the computer interface program and ensure the following choices are set:
 - 5.3.4.1 General Settings tab - The “Count mode” should be set to “Scaler (counts per count time)”.
 - 5.3.4.2 QC Check tab – “QC Settings” should be set to “OFF”.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 6 of 14

- 5.3.4.3 Click "Update".
- 5.3.4.4 Exit the control program
- 5.3.5 Using the "COUNT TIME MINUTES" rotator knob, set the count time to 10 minutes.
- 5.3.6 Perform initial background count
 - 5.3.6.1 Place the tray spacer and a clean, empty planchet in the tray; close and lock the tray, and press the count button.
 - 5.3.6.2 On completion, record the background count on the Instrument Source Check form as counts per minute (i.e. total counts divided by 10).
- 5.3.7 Using the "COUNT TIME MINUTES" rotator knob, set the count time to 1 minute.
- 5.3.8 Perform initial alpha efficiency determination
 - 5.3.8.1 Place the tray spacer plate and a planchet containing the alpha check source in the tray; close and lock the tray and press the count button.
 - 5.3.8.2 On completion, record the source count results in the appropriate field on the appropriate Instrument Source Check Form, 3030E Alpha Reference Reading – Post-Calibration: Section 1a (Attachment 105-01 or equivalent) and 3030E Beta Reference Reading – Post-Calibration: Section 1b (Attachment 105-02 or equivalent).
 - 5.3.8.3 Repeat until a total of 10 alpha check source counts have been completed.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 7 of 14

5.3.8.4 When using the electronic version of the Instrument Source Check Form, the statistical calculations are completed automatically.

5.3.9 Perform initial beta efficiency determination

5.3.9.1 Place the tray spacer plate and a planchet containing the beta check source in the tray; close and lock the tray and press the count button.

5.3.9.2 On completion, record the source count results in the appropriate field on the appropriate Instrument Source Check Form, 3030E Alpha Reference Reading – Post-Calibration: Section 1a (Attachment 105-01 or equivalent) and 3030E Beta Reference Reading – Post-Calibration: Section 1b (Attachment 105-02 or equivalent).

5.3.9.3 Repeat until a total of 10 beta check source counts have been completed.

5.3.9.4 When using the electronic version of the Instrument Source Check form, the statistical calculations are completed automatically.


5.3.10 Start the computer interface program and ensure the "Count mode" on the "General Settings" tab is set to "Scaler (counts per count time)".

5.3.11 On the "QC Check tab", set "QC Settings" to "Normal QC".

5.3.12 Set the remaining parameter values on the QC Check tab as follows:


5.3.12.1 Standard Alpha Efficiency (4pi) % - Enter value from the field labeled Calculated Efficiency % (4 n Alpha) from the 3030E worksheet on the Instrument Source Check Form, 3030E Alpha Reference Reading – Post-Calibration: Section 1a (Attachment 105-01 or equivalent).

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA- BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 8 of 14

- 5.3.12.2 Standard Beta Efficiency (4pi) % - Enter value from the field labeled Calculated Efficiency % (4 π Beta) from the 3030E worksheet on the appropriate Instrument Source Check Form, 3030E Beta Reference Reading – Post-Calibration: Section 1b (Attachment 105-02 or equivalent).
- 5.3.12.3 Set both alpha and beta "Allowable QC Efficiency \pm %:" to "10".
- 5.3.12.4 Alpha Background Limit Upper (cpm) – set to the 1.5x the alpha background value from the 3030E worksheet on the Instrument Source Check Form, 3030E Alpha Reference Reading – Post-Calibration: Section 1a (Attachment 105-01a or equivalent).
- 5.3.12.5 Beta Background Limit Upper (cpm) – set to the 1.5x the beta background value from the 3030E worksheet on the Instrument Source Check Form, 3030E Beta Reference Reading – Post-Calibration: Section 1b (Attachment 105-02 or equivalent).
- 5.3.12.6 Lower (cpm) – set to 0.0 for both alpha and beta
- 5.3.12.7 Alpha source size: 0.004769 μ Ci
- 5.3.12.8 Beta source size: 0.006201 μ Ci
- 5.3.12.9 Alpha QC Source Count Time (min): 1
- 5.3.12.10 Beta QC Source Count Time (min): 1
- 5.3.12.11 Background QC Count Time (min): 10
- 5.3.13 Click "Update".
- 5.3.14 Exit the program.


Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA- BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 9 of 14

5.4 PRE- AND POST-USE INSTRUMENT RESPONSE CHECK

- 5.4.1 To start a QC check, press the "QC CHECK" button on the front of the Model 3030E. The Model 3030E does not need to be connected to a computer for the QC check to function.
- 5.4.2 If the Normal QC mode is selected, the upper LCD should flash "ALPHA". Place the tray spacer plate and a planchet containing the **alpha** check source in the tray; close and lock the tray.
- 5.4.3 Press the "COUNT" button to start the alpha count. At the end of the count, the LCD will flash between displaying the final readings and "ALPHA".
- 5.4.4 Record results on the Instrument Source Check form – the 3030E Daily Pre / Post-Use Response Check form.
- 5.4.5 Unlatch the tray and remove the alpha source. Place the tray spacer plate and a planchet containing the **beta** check source in the tray; close and lock the tray.
- 5.4.6 Press the "COUNT" button to advance to the beta step. The lower LCD should now flash "BETA".
- 5.4.7 Press the "COUNT" button to start the beta count. At the end of the count the LCD will flash between displaying the final readings and "BETA".
- 5.4.8 Record results on the Instrument Source Check form.
- 5.4.9 Unlatch the tray and remove the beta source. Close and latch the tray.
- 5.4.10 Press the "COUNT" button to advance to the background count. Both displays should flash "BAC".
- 5.4.11 Press the "COUNT" button to start the background count. At the end of the count, the LCD will flash between the readings and "BAC".

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 10 of 14

5.4.12 Press the COUNT" button to exit the QC check mode.

5.4.13 If the physical and source response checks are satisfactory, initial next to current date on the appropriate Instrument Source Check Form, 3030E Daily Pre / Post-Use Response Check Section 2 (Attachment 105-03 or equivalent).

5.4.14 If the QC check fails, the instrument should be taken out of service and The RSO or designee notified. No counting will be permitted until the QC check has been successfully completed.

5.5 LUDLUM MODEL 3030E / 43-10-1 OPERATING PROCEDURE

5.5.1 Daily before use perform physical, background, QC and source response checks prior to use as detailed above.

5.5.2 Rotate the "COUNT TIME MINUTES" selector knob to the desired count time position (typically 1 minute but may be longer for air sample evaluation)

5.5.3 Set the audio volume to the desired level.

5.5.4 Unlock and open the tray slide drawer.

5.5.5 Ensure the spacer plate is present.


5.5.6 Place a planchet with a smear or air sample into the tray, ensuring the sample is completely flat.

5.5.7 Close and lock the tray slide drawer.

5.5.8 Press "COUNT".

5.5.9 When count is completed, record the alpha and beta results in the appropriate field on Attachment 39-03 (or equivalent) to RP-39 for air samples or Attachment 40-01 (or equivalent) to RP-40 for surveys.

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 11 of 14

6.0 RECORDS

- 6.1 Instrument Check Source Form (spreadsheet)
 - 6.1.1 3030E Alpha Reference Reading – Post-Calibration: Section 1a
 - 6.1.2 3030E Beta Reference Reading – Post-Calibration: Section 1b
 - 6.1.3 3030E Daily Pre / Post-Use Response Check: Section 2


7.0 REFERENCES

- 7.1 Ludlum Model 3030, 3030-2 & 3030E Alpha-Beta Sample Counter Technical Manual, October 2012.
- 7.2 RP-38, Survey Requirements and Frequencies
- 7.3 RP-40, Survey Documentation and Review
- 7.4 RP-46, Calibration and Use of Radiation Detection Instrumentation
- 7.5 RP-104, Operation and Use of the Ludlum Model 2360 With 43-93 Detector.

8.0 ATTACHMENTS

- 8.1 Attachment 105-01, 3030E Alpha Reference Reading – Post-Calibration: Section 1a
- 8.2 Attachment 105-02, 3030E Beta Reference Reading – Post-Calibration: Section 1b
- 8.3 Attachment 105-03, 3030E Daily Pre / Post-Use Response Check: Section 2

Verify current version with RSO prior to use


 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 12 of 14

Attachment 105-01

3030E Alpha Reference Reading – Post-Calibration: Section 1a

3030E Alpha Reference Reading - Post Calibration: Section 1a			Form version: 2.2	
SOURCE and INSTRUMENT/DETECTOR - 3030E ALPHA		Reading	Alpha Source Count Results	
			Gross Reading	Net Reading
Instrument Model:	3030E			
Instrument S/N:		1		
Detector Model:	43-10-1	2		
Detector S/N:		3		
Calibration Due:		4		
Calculated Efficiency % (4 π Alpha):		5		
Alpha Background (cpm):		6		
Source S/N:	J8-761	7		
Certificate date:	12/1/2012	8		
Nuclide:	Th-230	9		
2 π Activity (dpm):	5347	10		
ACCEPTABLE RESPONSE RANGES		Lower Limit (-10%):		
		Average:		
		Upper Limit (+10%):		

Verify current version with RSO prior to use

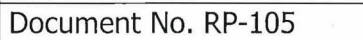
 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR	
Document No. RP-105	Rev. 0	Effective Date: 3/20/2019
		Page 13 of 14

Attachment 105-02

3030E Beta Reference Reading – Post-Calibration: Section 1b

3030E Beta Reference Reading - Post Calibration: Section 1b			Form version: 2.2	
SOURCE and INSTRUMENT/DETECTOR - 3030E BETA		Reading	Beta Source Count Results	
			Gross Reading	Net Reading
Instrument Model:	3030E			
Instrument S/N:		1		
Detector Model:	43-10-1	2		
Detector S/N:		3		
Calibration Due:		4		
Calculated Efficiency % (4 π Beta):		5		
Beta Background (cpm):		6		
Source S/N:	J8-760	7		
Certificate date:	12/1/2012	8		
Nuclide:	Tc-99	9		
2 π Activity (dpm):	7572	10		
ACCEPTABLE RESPONSE RANGES		Lower Limit (-10%):		
		Average:		
		Upper Limit (+10%):		
Technician (print):				
Technician (sign/date):				
RSO Review by (print):				
RSO (sign/date):				

Verify current version with RSO prior to use



OPERATION AND USE OF THE LUDLUM MODEL 3030E ALPHA-BETA SAMPLE COUNTER with 43-10-1 DETECTOR

Rev. 0

Effective Date: 3/20/2019

Page 14 of 14


3030E Daily Pre / Post-Use Response Check: Section 2



Verify instrument and detector information (Sections 1a and 1b) before continuing.

IF the information is incorrect, DO NOT CONTINUE.


[illegible]

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	AIR SAMPLE COLLECTION USING THE RADECO AVS-28A AIR SAMPLER	
Document No. RP-106	Rev. 0	Effective date: 3/20/2019
		Page 1 of 7

Reviews and Approvals	
Prepared by: Todd S. Brautigam	
Signature: 	Date: Digitally signed by Todd S. Brautigam DN: cn=Todd S. Brautigam, o=ENERCON Services, Inc., ou=O.ESG.EAST.SE.PIT, email=tbrautigam@enercon.com, c=US Date: 2019.03.19 14:19:34 -04'00'
Reviewed by Quality Assurance Coordinator: Charles Beatty	
Signature: 	Date: Digitally signed by Charles Beatty Jr. Date: 2019.03.19 15:05:25 -04'00'
Approved by Radiation Safety Officer: Jay Maisler, CHP	
Signature: 	Date: Digitally signed by Jay Maisler, CHP DN: cn=Jay Maisler, CHP, o=ENERCON, ou=Radiation Safety Officer, email=jmaisler@enercon.com, c=US Date: 2019.03.19 15:16:01 -04'00'

Verify current version with RSO prior to use


 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	AIR SAMPLE COLLECTION USING THE RADECO AVS-28A AIR SAMPLER	
Document No. RP-106	Rev. 0	Effective date: 3/20/2019
		Page 2 of 7

Summary of Changes

Revisions to this document will be identified, and revisions or addenda will be issued as needed. The Project Manager maintains the signed original of this document; no controlled copies are issued. The end user is responsible to verify with the Project Manager that any hard copy being referenced is the current revision. A summary description of each revision or addenda will be noted in the following table.

Revision Number	Date	Comments
Rev. 0	Mar. 20, 2019	Initial conversions from desk instruction to procedure

Verify current version with RSO prior to use

	Cimarron Environmental Response Trust Radiation Protection Program	
	AIR SAMPLE COLLECTION USING THE RADECO AVS-28A AIR SAMPLER	
Document No. RP-106	Rev. 0	Effective date: 3/20/2019
		Page 3 of 7

1.0 PURPOSE

This procedure provides instructions and guidance for individuals who are qualified to perform the collection and analysis of radiological air samples using a RADēCO AVS-28A air sample pump for collection and the Ludlum Model 3030E alpha-beta counter with 43-10-1 detector for analysis.


2.0 RESPONSIBILITIES

- 2.1 The Radiation Safety Officer (RSO) or designee is responsible for:
 - 2.1.1 Authorizing survey methods and instrumentation to be used for unconditional release surveys of material and equipment.
 - 2.1.2 Ensuring only trained and qualified personnel perform surveys and authorize the unconditional release of material and equipment.
 - 2.1.3 Timely review and approval of completed radiological surveys.
- 2.2 Health Physics Technicians and Task Qualified Individuals are responsible for:
 - 2.2.1 Conducting surveys in accordance with RP-39, "Performance of Radiation, Contamination, and Airborne Radioactivity Surveys.
 - 2.2.2 Ensuring source checks have been performed prior to the use of selected instrumentation.
 - 2.2.3 Verifying operability of selected instrumentation in accordance with the instrument operating procedure.
 - 2.2.4 Authorizing the unconditional release of material that meets unconditional release criteria.
- 2.3 Timely completion of radiological survey documentation for review and approval by RSO or designee.

3.0 PRECAUTIONS AND LIMITATIONS

- 3.1 Keep air sample pump and instrument clean and dry.

Verify current version with RSO prior to use


 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
Document No. RP-106	Rev. 0	AIR SAMPLE COLLECTION USING THE RADECO AVS-28A AIR SAMPLER Effective date: 3/20/2019
		Page 4 of 7

- 3.2 Handle all samplers and instruments carefully. Do not drop or handle roughly.
- 3.3 Exercise caution when operating electrically powered equipment, especially in wet areas. Use a GFCI at the power source.
- 3.4 Loading of a sample filter with smoke or dust may cause a decrease in the flow rate identified on the instrument unless the pump is self-compensating and may increase sample self-absorption of alpha emitting radionuclides. The air sample filter should be changed more frequently if loading is a concern.
- 3.5 If airflow pattern is unknown, the technician shall evaluate airflow pattern to establish placement of area air sampler(s) to sample predominate radioactive material transport route downwind of source. Airflow pattern shall be re-established when the area configuration has been changed to the extent that known area airflow direction has been altered.
- 3.6 Consideration of initial activity analysis results without accounting for decay of short-lived naturally occurring radioactivity may overestimate the airborne hazard potential.
- 3.7 Ensure the air sample pump is in a vertical position. Variations from vertical may cause erroneous readings.
- 3.8 Do not place sample filters into a plastic bag as that may inhibit decay.

4.0 EQUIPMENT AND MATERIAL

- 4.1 RADēCO AVS-28A air sample pump.
- 4.2 Filter media.
- 4.3 Sample head.
- 4.4 Tygon tubing with a quick disconnect.
- 4.5 Air sample envelope.
- 4.6 Portable GFCI.

Verify current version with RSO prior to use

	Cimarron Environmental Response Trust Radiation Protection Program	
	AIR SAMPLE COLLECTION USING THE RADECO AVS-28A AIR SAMPLER	
Document No. RP-106	Rev. 0	Effective date: 3/20/2019
		Page 5 of 7

5.0 PROCEDURE

5.1 OVERVIEW

The RADēCO AVS-28A air sample pump is a continuous duty sample pump designed for the collection of air samples in field conditions. The RADēCO AVS-28A may be calibrated on-site using a currently calibrated air flow calibrator or may be sent to a qualified vendor for calibration.

5.2 PHYSICAL CHECKS

5.2.1 Verify current sampler calibration, as indicated on attached calibration sticker. If calibration has expired, place sampler out of service and notify The RSO or designee. At a minimum, the calibration sticker should provide the following information:

- 5.2.1.1 Date of calibration and/or calibration due date.
- 5.2.1.2 Instrument manufacturer, model, and serial number.
- 5.2.1.3 Initials of the individual who performed the calibration.

5.2.2 Examine sampler and sample head for any deformation or cracks.

5.3 AIR SAMPLER OPERATING PROCEDURE


5.3.1 Remove the sample head retention ring from the sample head by unscrewing it.

5.3.2 Place an unused sample filter onto the face of the sample head ensuring it completely covers the grid portion of the sample head.

5.3.3 Fully screw the retention ring back onto the sample head making sure the filter remains in the proper position on the sample head grid.


<p>CAUTION: Do not overtighten the retention ring.</p>

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	AIR SAMPLE COLLECTION USING THE RADECO AVS-28A AIR SAMPLER	
Document No. RP-106	Rev. 0	Effective date: 3/20/2019
		Page 6 of 7

- 5.3.4 Position the air sampler along the prevailing downwind side of the work area to be sampled so that the sample head is approximately 3 feet off the ground oriented either 90 degrees relevant to the prevailing wind or facing down.
- 5.3.5 Install the sample head using the quick disconnect.
- 5.3.6 Turn the sampler on using the toggle switch.
- 5.3.7 Record the following information on the air sample envelope:
 - 5.3.7.1 Sample location.
 - 5.3.7.2 Air Sample Number from the air sample log.
 - 5.3.7.3 Date, Time On, and initial flow rate in liters per minute (LPM), ensuring the initial flow rate matches the calibrated flow rate.
 - 5.3.7.4 Periodically (approximately every 4 hours) check the air sampler for proper operation, filter loading and flow rate.
- 5.3.8 At the end of the work evolution:
 - 5.3.8.1 Check and record the flow rate (LPM).
 - 5.3.8.2 Ensure a minimum sample collection duration of 1 hour.
 - 5.3.8.3 Turn the sample unit off using the toggle switch.
 - 5.3.8.4 Record the date and time the sample collection ended.
- 5.3.9 Remove the sample head using the quick-disconnect.
 - 5.3.9.1 Carefully unscrew the retention ring so as not to damage the filter
 - 5.3.9.2 Remove the filter from the sample head using tweezers or forceps taking care not to transfer contamination onto the filter

Verify current version with RSO prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	AIR SAMPLE COLLECTION USING THE RADECO AVS-28A AIR SAMPLER	
Document No. RP-106	Rev. 0	Effective date: 3/20/2019
		Page 7 of 7

5.3.10 Place the filter into the air sample envelope; DO NOT SEAL the envelope.

5.3.11 Transport the air sample envelope to the counting station for analysis.

5.3.12 Hold the sample filter for a minimum 24 hours before analysis.

5.3.13 Perform analysis using the Ludlum Model 3030E per RP-105.

6.0 RECORDS

6.1 None


7.0 REFERENCES




7.1 RADēCO AVS-28A User Manual.

7.2 RP-46, Calibration and Use of Radiation Detection Instrumentation


8.0 ATTACHMENTS

8.1 None

	Cimarron Environmental Response Trust Radiation Protection Program	
	ALARA PROGRAM	
Document No. RP-10	Rev. 2	Effective date: 2/8/2019
		Page 1

Reviews and Approvals	
Prepared by: Jay Maisler	
Signature: 	Date: 1/29/2019
Reviewed by Quality Assurance Coordinator: Charles Beatty	
Signature: 	Date: 2/1/2019
Approved by Radiation Safety Officer: Jay Maisler, CHP	
Signature: 	Date: 2/6/2019

This document must be verified with Project Manager prior to use


 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
Document No. RP-10	Rev. 2	Effective date: 2/8/2019
		Page 2

Summary of Changes

Revisions to this document will be identified, and revisions or addenda will be issued as needed. The Project Manager maintains the signed original of this document; no controlled copies are issued. The end user is responsible to verify with the Project Manager that any hard copy being referenced is the current revision. A summary description of each revision or addenda will be noted in the following table.

Revision Number	Date	Comments
Rev. 0	April 11, 2011	Original
Rev. 1	Jan. 31, 2012	Removed references to SWPs. Radiological work controls are now incorporated into Activity Plans directly. Incorporates editorial changes
Rev. 2	Feb. 8, 2019	Updated for consistency with Rev. 3.1 of the RPP. Incorporates editorial changes.

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	ALARA PROGRAM	
Document No. RP-10	Rev. 2	Effective date: 2/8/2019
		Page 3


1.0 **PURPOSE**

- 1.1 This procedure establishes the requirements and provides guidance and administrative controls for implementing the Cimarron Environmental Response Trust ALARA program in accordance with License SNM-928. The Cimarron Site radiation protection program uses, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and dose to members of the public that are ALARA. The licensee is committed to providing resources such as personnel, training programs, engineering controls, monitoring devices, activity planning, etc. to achieve the goals of the ALARA principle. This procedure applies to all personnel involved in supervising, planning and/or performing work within the Cimarron Site Restricted Area (RA).

2.0 **RESPONSIBILITY**


- 2.1 Administrator, Cimarron Environmental Response Trust
 - 2.1.1 The ALARA Committee member with managerial and financial responsibility for the Cimarron Environmental Response Trust and decommissioning the site.
 - 2.1.2 Responsible for establishing the ALARA Policy.
 - 2.1.3 Responsible for the supervision of the Project Manager.
 - 2.1.4 Responsible for the corporate oversight of site activities.
- 2.2 Trustee Project Manager is responsible for:
 - 2.2.1 site decommissioning and groundwater remediation.
 - 2.2.2 Ensuring that the ALARA Policy is communicated to all site workers.
 - 2.2.3 Ensuring that the Radiation Safety Officer (RSO) or designee develops annual ALARA goals for the site workers and are submitted to the ALARA Committee.

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	ALARA PROGRAM	
Document No. RP-10	Rev. 2	Effective date: 2/8/2019
		Page 4


- 2.2.4 Approving the site ALARA goals.
- 2.2.5 Ensuring that Radiation Protection Program implementation issues are brought to the attention of the ALARA Committee as necessary.
- 2.2.6 Ensuring that Radiation Protection Program policies as defined by the ALARA Committee are implemented.
- 2.2.7 Ensuring that individuals with appropriate authority and technical expertise, as appropriate, are included in ALARA Committee meetings.
- 2.2.8 Direct support of RSO to achieve ALARA Program goals.
- 2.3 Radiation Safety Officer (RSO) is responsible for:
 - 2.3.1 Chairing the ALARA Committee.
 - 2.3.2 Ensuring conformance with radiation safety and environmental requirements.
 - 2.3.3 Developing annual ALARA goals.
 - 2.3.4 Encouraging and enforcing site worker compliance and participation with radiation protection policies and ALARA principles.
 - 2.3.5 Oversight of the ALARA Program
 - 2.3.6 Scheduling and conducting ALARA Committee meetings.
 - 2.3.7 Providing guidance, recommendations, and solutions for exposure reduction.
 - 2.3.8 Participating in modification/design reviews for facilities and equipment that can affect potential radiation exposures.
 - 2.3.9 Developing and approving training programs related to work in Radiation Areas or involving radioactive materials.

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	ALARA PROGRAM	
Document No. RP-10	Rev. 2	Effective date: 2/8/2019
		Page 5

- 2.3.10 Providing assistance in preparing and approving Activity Plans (APs) and Standard Operating Procedures (SOPs) involving radiological work.
- 2.3.11 Ensuring that individuals receive pre-job ALARA briefings, when required.
- 2.3.12 Developing plans, procedures, and methods for maintaining radiation exposures of site workers ALARA.
- 2.3.13 Identifying locations, operations, and conditions that has the potential for causing significant exposures to radiation.
- 2.3.14 Approving procedures to meet ALARA dose reduction goals.
- 2.3.15 Monitoring work in progress for compliance with AP and ALARA requirements.
- 2.3.16 Recording meeting minutes and routing to the ALARA Committee members.
- 2.3.17 Informing radiation workers of radiological conditions.
- 2.3.18 Presenting the status of all open deficiency reports involving license activities or radiological issues to the ALARA Committee.
- 2.4 ALARA Committee is responsible for
 - 2.4.1 Ensuring that ALARA policy and regulatory compliance are integrated into all site work activities as appropriate.
 - 2.4.2 Reviewing and approving ALARA goals for the Cimarron Site (if individual monitoring is required).
 - 2.4.3 Reviewing the effectiveness of the ALARA Program (if individual monitoring is required).
 - 2.4.4 Reviewing plans for new activities to ensure that ALARA principles have been considered.

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	ALARA PROGRAM	
Document No. RP-10	Rev. 2	Effective date: 2/8/2019
		Page 6

2.4.5 Annual review of the RPP to ensure regulatory compliance and to incorporate any necessary changes.

2.4.6 Evaluate and approve (if appropriate) changes to the Decommissioning Plan or the RPP in accordance with License Condition 27(e).

2.5 Site Workers are responsible for:

2.5.1 Complying with ALARA requirements specified in APs and SOPs .

2.5.2 Applying dose reduction methods whenever possible.

2.5.3 Incorporating good ALARA work practices into job functions and work performance.

2.5.4 Bringing ALARA concerns to the attention of the RSO.

3.0 **PRECAUTIONS**

3.1 Individuals entering Restricted Areas shall be cognizant of all hazards expected within Restricted Areas and shall review and understand the ALARA requirements of APs and SOPs.

4.0 **EQUIPMENT AND MATERIALS**

4.1 None


5.0 **PROCEDURE**

5.1 The ALARA Committee meets quarterly to ensure ALARA objectives are met.

5.2 The ALARA Committee ensures that a formal annual report is provided to the NRC that includes:

5.2.1 A description of all changes, tests, and experiments made or conducted pursuant to License Condition 27(e), including a summary of the safety and environmental evaluation of each action.

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	ALARA PROGRAM	
Document No. RP-10	Rev. 2	Effective date: 2/8/2019
		Page 7

5.2.2 Any DP or RPP pages revised pursuant to License Condition 27(e)

5.2.3 A formal report shall also be submitted to the NRC annually if no changes, tests or experiments were approved by the ALARA Committee.

5.3 ALARA Committee shall:

5.3.1 Review APs, SOPs, and proposed work packages/plans to ensure that ALARA and regulatory requirements are integrated into all appropriate APs, SOPs, and work activities.

5.3.2 Review and approve ALARA goals for Cimarron Site, if individual monitoring is performed.

5.3.3 Review plans for activities to ensure that ALARA considerations are met.

5.3.4 Review audit, surveillance, and inspection reports for license related activities to ensure that work is being performed in accordance with ALARA policy.

5.3.5 Assign corrective actions, as necessary, to ensure accomplishment of ALARA Program objectives and any established goals.


5.3.6 Review proposed changes to the NRC-approved Decommissioning Plan, Radiation Protection Plan and associated procedures in accordance with License SNM-928, Amendment #21, Condition 27(e), as required.

5.3.7 Review deficiency reports involving license activities or radiological issues.

5.3.8 Conduct an annual review of the RPP.

5.4 Program Reviews

5.4.1 The ALARA Committee reviews and assesses the effectiveness of the overall Radiation Protection Program on an ongoing basis.

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	ALARA PROGRAM	
Document No. RP-10	Rev. 2	Effective date: 2/8/2019
		Page 8

5.4.2 The ALARA Committee shall perform in-process reviews of jobs or tasks that meet any of the following criteria:

5.4.2.1 Work scope changes may affect AP or SOP ALARA requirements.

5.4.2.2 Radiological conditions change significantly or unexpected conditions are encountered.

5.5 The ALARA Committee Meeting agenda should include the following topics:

5.5.1 Acceptance of previous meeting minutes

5.5.2 Review of open ALARA Committee action items

5.5.3 Radiological exposures, including personnel and area monitoring results

5.5.4 Active APs and SOPs

5.5.5 Licensing issues, including NRC inspections, license amendment requests, etc.

5.5.6 Radiation Protection Program

5.5.7 Quality System, including Notices of Deficiency, Quality Assurance Program Plan, etc.

5.5.8 Chemical/hazardous materials concerns

5.5.9 Health and safety program


5.5.10 Radiological waste characterization and disposal

5.5.11 Decommissioning Plan

5.5.12 General site management issues

5.5.13 ALARA suggestions

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust Radiation Protection Program	
	ALARA PROGRAM	
Document No. RP-10	Rev. 2	Effective date: 2/8/2019
		Page 9

5.6 Workers are encouraged to suggest measures to the RSO or designee that can reduce exposure to radiation or radioactive material.

5.6.1 All ALARA suggestions shall be brought to the attention of the RSO or designee. If not addressed immediately, the suggestion(s) will be placed on the agenda of the next ALARA Committee meeting.

5.6.2 All responses to suggestions shall be appropriately documented.

6.0 **RECORDS**

6.1 ALARA Committee meeting minutes

6.2 License SNM-928, Condition 27(e) evaluations

6.3 ALARA Job Reviews and ALARA Suggestions should be maintained by the RSO or designee.

7.0 **REFERENCES**

7.1 10 CFR 20, "Standards for Protection Against Radiation"

7.2 Cimarron Quality Assurance Program Plan and Procedures

7.3 NUREG/CR-3254, "Licensee Programs for Maintaining Occupational Exposure to Radiation As Low As is Reasonably Achievable," 6/83


7.4 US NRC Regulatory Guide 8.10, Rev. 1, "Operations Philosophy for Maintaining Occupational Radiation Exposures As Low As is Reasonably Achievable," 9/75

7.5 License SNM-928, Amendment #21, Condition #27(e).

7.6 Cimarron Radiation Protection Plan

8.0 **ATTACHMENTS**

8.1 Attachment 08-01, ALARA Policy

	Cimarron Environmental Response Trust Radiation Protection Program	
	ALARA PROGRAM	
Document No. RP-10	Rev. 2	Effective date: 2/8/2019
		Page 10

ATTACHMENT 08-01

ALARA POLICY

Cimarron Environmental Response Trust operations shall be performed in a manner such that doses are maintained As Low As Reasonably Achievable (ALARA). The basic philosophy of radiation protection is to maintain radiation exposures ALARA below the regulatory requirements. "Reasonable" means that the costs, benefits, and risks are considered in minimizing dose.

In accordance with the Code of Federal Regulations, the Trustee has developed, documented, and implemented a Radiation Protection Program commensurate with the scope and extent of licensed activities. The Radiation Protection Program embraces the ALARA philosophy through its use, to the extent practicable, of procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are ALARA. The Trust is committed to provide all necessary resources, in the form of personnel, training, engineering controls, preparation and planning, design, equipment, monitoring devices, and controls to achieve ALARA doses at its facilities.

Each worker is expected to be knowledgeable of work activities, and to abide by all ALARA requirements such as those found in Activity Plans. In addition to the responsibility for their own dose minimization, each site worker is responsible for minimizing doses to other workers and members of the public. Workers are encouraged to provide comments and suggestions for dose minimization and improving the safety and efficiency of operations.

As Administrator of the Trust, I encourage you to provide any ALARA suggestions to the RSO or Project Manager.




Administrator, Cimarron Environmental Response Trust


January 31, 2012

Date

This document must be verified with Project Manager prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
		Page i

Approvals	
Approved by Quality Assurance Coordinator: Charles Beatty Jr.	
Signature:	Date:
Approved by Radiation Safety Officer: Jay Maisler, CHP	
Signature:	Date:
Approved by Trustee Project Manager: Jeff Lux	
Signature:	Date:
Approved by Administrator, Cimarron Environmental Response Trust: Bill Halliburton	
Signature:	Date:

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
		Page ii

Summary of Changes

Revisions to this document will be identified, and revisions or addenda will be issued as needed. The Project Manager maintains the signed original of this document; no controlled copies are issued. The end user is responsible to verify with the Trustee Project Manager that any hard copy being referenced is the current revision. A summary description of each revision or addenda will be noted in the following table.

Revision Number	Date	Comments
Rev. 0	April 11, 2011	Original
Rev. 1	February 29, 2012	Changes Assigned Leader to Activity Leader, other editorial changes
Rev. 2	September 19, 2013	General review of Plan incorporating editorial changes, Revised Section 2.2 and added Section 2.6.
Rev. 3	April 7, 2016	General revisions per triennial QA program review
Rev 4		Revisions and reorganization throughout in anticipation of expanded project scope.

This document must be verified with a Controlled Copy prior to use



	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
		Page iii

TABLE OF CONTENTS

- 1.0 Quality Assurance Program
 - 1.1 Introduction
 - 1.2 Background
 - 1.3 Purpose and Applicability
 - 1.4 Regulatory Requirements
 - 1.5 Plan Contents
- 2.0 Glossary
- 3.0 Organizational Structure and Responsibilities
 - 3.1 Organization Chart
 - 3.2 Trust Administrator
 - 3.3 Trustee Project Manager
 - 3.4 Project Manager
 - 3.5 Radiation Safety Officer
 - 3.6 Quality Assurance Coordinator
 - 3.7 Subject Matter Expert
 - 3.8 Activity Leader
 - 3.9 Radiation Monitoring Personnel
 - 3.10 All Project Personnel
- 4.0 Qualifications and Training of Personnel
 - 4.1 Personnel Training
 - 4.1.1 Management Personnel
 - 4.1.2 Field Supervisors and Activity Leaders
 - 4.1.3 Technical Personnel
 - 4.1.4 Radiation Protection Personnel
 - 4.1.5 All Site Personnel

This document must be verified with a Controlled Copy prior to use

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
		Page iv

4.1.6 Retraining

4.2 Qualifications

4.2.1 Lead Auditors and Inspectors

4.2.2 Technical Personnel

4.2.3 Radiation Protection Personnel

4.2.4 All Personnel

5.0 Operating Procedures and Instructions

5.1 Radiation Protection Program Procedures

5.2 Health and Safety Plan

5.3 Quality Assurance Program Plan

5.3.1 Project Plans

5.3.2 Sampling and Analysis Plan

5.3.3 Standard Operating Procedures (SOPs)

5.3.4 Activity Plans

5.3.5 Quality Assurance Implementing Procedures (QAIPs)

5.3.6 Construction Execution Specifications

5.3.7 Construction Drawings

5.4 Independent Review

5.5 Plan and Procedure Approval

5.6 Program Change

6.0 Design

6.1 Design Control

6.1.1 Contractor and Subcontractor (Vendor) Design


6.1.2 Design Interfaces

6.1.3 Design Inputs and Objectives

6.1.4 Design Outputs

6.1.5 Design Review

This document must be verified with a Controlled Copy prior to use

	Cimarron Environmental Response Trust	
Document No. QAPP-001	Cimarron Site Quality Assurance Program Plan	
	DRAFT Rev. 4	Effective date:
		Page v

6.1.6 Design Changes

7.0 Procurement and control of materials, equipment, parts, and services

7.1 Control of Purchased Materials, Equipment, Parts, and Services

7.1.1 Procurement of Materials, Equipment, and Parts

7.1.2 Procurement of Services

7.1.3 Requisition

7.1.4 Vendor Qualifications

7.1.5 Periodic Vendor Assessment

7.2 Inspection of Materials, Equipment, and Parts (Items)

7.3 Control of Materials

8.0 Sampling, Analyses, Measurements, and Processes

8.1 Radiation Protection

8.2 Quality Control in Environmental Sampling

8.3 Quality Control for Effluent Monitoring Systems

8.4 Laboratory Quality Control

8.4.1 Verification and Validation (V&V)

8.5 Construction Quality Control

8.5.1 Construction Submittals

8.5.2 Documentation of Construction Controls

8.6 Process Control

8.7 Data Quality Control

8.7.1 On-site Data

8.7.2 Geodetic Data


8.7.3 Radiological Survey Data

8.7.4 Field Measurements

8.7.5 Other Test Data


9.0 Control of Measuring and Test Equipment

This document must be verified with a Controlled Copy prior to use

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
		Page vi

- 9.1 Calibration
- 9.2 Adjustment
- 9.3 Equipment Inventory
- 9.4 Out-of-service Equipment
- 10.0 Handling, Storage, and Shipping
- 11.0 Control of Nonconforming Items and Equipment
- 12.0 Documents and Records
 - 12.1 Quality Assurance Records
 - 12.1.1 Records of Analytical Data
 - 12.2 Quality Assurance Documents
 - 12.3 Document Control
 - 12.4 Document and Record Storage
 - 12.4.1 Hard Copies of Controlled Documents
 - 12.4.2 Electronic Copies of Controlled Documents
 - 12.4.3 Master Document Repository
 - 12.4.4 Redundant Storage
- 13.0 Audits and assessments
 - 13.1 Audits and Surveillances
 - 13.2 Assessments
- 14.0 Corrective Actions
 - 14.1 Notice of Deficiency

This document must be verified with a Controlled Copy prior to use

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 1.0	Quality Assurance Program	Page 1-1

1.0 QUALITY ASSURANCE PROGRAM

1.1 Introduction

As Trustee of the Cimarron Environmental Response Trust (CERT), Environmental Properties Management LLC (EPM) is committed to the decommissioning and remediation of the Cimarron site in accordance with all license and regulatory requirements. EPM requires the development and implementation of a Quality Assurance Program that provides for the assurance of the required level of quality in the planning, execution, and documentation of quality-critical work performed at the site. This Quality Assurance Program Plan (QAPP) documents the program that will be implemented at the Cimarron site.


The QAPP provides for:

- Products and services that comply with license and regulatory requirements.
- Quality management systems and procedures that are documented, communicated, and effectively put into practice.
- Opportunities to identify and improve the organization and the quality, compliance and cost effectiveness of work performed.
- Timely evaluation of personnel resources, needs, skills and performance to stress the importance of, and identify opportunities for, continual quality improvement.
- Data quality needed to support Cimarron decommissioning goals and assure compliance with nuclear and environmental compliance requirements.

EPM retains contractors to perform work at the site. This QAPP establishes a program requiring that quality be incorporated in the planning, performance, and documentation of work. This QAPP also establish a program for the evaluation and qualification of contractors and subcontractors, communication of quality requirements to contractors and subcontractors, and the monitoring of contractor and subcontractor performance and product quality.

1.2 Background

The Cimarron facility operated as a nuclear fuel production facility under Licenses SNM-928 (for uranium processing) and SNM-1174 (for mixed oxides processing) until the

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 1.0	Quality Assurance Program	Page 1-2

facility was closed in 1975. Decommissioning began in 1976. License SNM-1174 was terminated in 1993; decommissioning in accordance with the requirements of NRC License SNM-928 is ongoing. The decommissioning of equipment, structures, and soil is complete.

The current mission at the Cimarron Site (Site) is the remediation of groundwater to criteria established by the US Nuclear Regulatory Commission (NRC) and the Oklahoma Department of Environmental Quality (DEQ). Groundwater remediation requires planning, data collection and management, and decision-making; all of which are subject to NRC- and DEQ- established quality requirements. Quality requirements are met through implementation of the Site Quality Assurance Program (inclusive of the QAPP, implementing procedures, and supporting documents). This quality program is periodically revised to reflect changes associated with the ongoing environmental remediation.

The Cimarron Environmental Response Trust (Trust) was established in accordance with the January 26, 2011 Consent Decree and Environmental Settlement Agreement executed by the former licensee, the Department of Justice (DOJ), the Nuclear Regulatory Commission (NRC) and the State of Oklahoma. The NRC license was transferred to the CERT, which owns the Cimarron Site and manages that accounts that provide the funding for the remediation of the Site. Environmental Properties Management LLC (EPM) is the Trustee for the CERT; because the CERT has no employees, the Trustee functions as the licensee.


1.3 Purpose and Applicability

The Cimarron Quality Assurance (QA) program shall be documented by written policies and procedures. Sufficient records of conduct and performance are required to demonstrate program adherence. Contractors or subcontractors performing support activities (e.g., sampling, analysis, data evaluation, design, and record generation) shall retain records sufficient for the licensee to review to demonstrate compliance with applicable program elements.

The purpose of this QAPP is to document QA Program requirements for the Cimarron Decommissioning Project. Implementation of this QAPP is through written procedures and instructions as described in Section 5.0.

As the governing document defining the quality assurance program implemented at the Cimarron Site, the QAPP describes **what** will be done to provide for acceptable quality.

This document must be verified with a Controlled Copy prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 1.0	Quality Assurance Program	Page 1-3

Quality Assurance procedures implement the program; they describe **how** quality objectives will be identified and quality documented in the performance of quality critical work.

The Quality Assurance Program applies to all quality-critical work performed at the Site, which is work intended to satisfy regulatory and/or license requirements, including, but not limited to:

- Groundwater monitoring well drilling, installation, and development
- Sampling and analysis of environmental media
- Design and evaluation of groundwater characterization and remediation plans
- Design of groundwater treatment processes
- Groundwater remediation activities
- Packaging and transportation of waste
- Other activities directly affecting license termination and site closure decision-making, as determined by the Trustee PM or QAC

The Quality Assurance Program does not apply to activities such as mowing, fence repair, building maintenance, or other activities not related to regulatory requirements.


1.4 Regulatory Requirements

This QAPP establishes a quality assurance program meeting the applicable requirements of the following:

- NRC Regulatory Guide 4.15 (NUREG 4.15), *Quality Assurance for Radiological Monitoring Programs (Inception Through Normal Operations to License Termination) - Effluent Streams and the Environment*
- NRC License SNM-928

In addition, quality requirements not required by NUREG 4.15 were included in this QA program; these were obtained from various sources including NQA-1, *Quality Assurance Requirements for Nuclear Facility Applications* and NUREG 1757, *Consolidated Decommissioning Guidance*.


This document must be verified with a Controlled Copy prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 1.0	Quality Assurance Program	Page 1-4

1.5 Plan Contents

This QAPP includes the following sections:

- 1.0 Quality Assurance Program
- 2.0 Glossary
- 3.0 Organizational Structure and Responsibilities
- 4.0 Qualifications and Training of Personnel
- 5.0 Operating Procedures and Instructions
- 6.0 Design
- 7.0 Procurement and Control of Materials, Equipment, Parts, and Services
- 8.0 Sampling, Analyses, Measurements, and Processes
- 9.0 Control of Measuring and Test Equipment
- 10.0 Handling, Storage, and Shipping
- 11.0 Control of Nonconforming Items and Equipment
- 12.0 Documents and Records
- 13.0 Audits and Assessments
- 14.0 Corrective Actions

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 2.0	Glossary	Page 2-1

2.0 GLOSSARY

Activity Plan: A document that identifies:

- A non-routine quality activity
- The objective of the activity
- Radiological, environmental, and safety hazards associated with the work, and actions to mitigate those hazards
- Quality control and quality assurance requirements
- Measures to address quality control and quality assurance requirements
- Work instructions to be followed to assure successful completion of the activity.

Cimarron Environmental Response Trust (CERT): The Trust was established in accordance with the January 26, 2011 Consent Decree and Environmental Settlement Agreement between the Department of Justice (DOJ), the Nuclear Regulatory Commission (NRC) and the State of Oklahoma. The CERT is the NRC licensee, owns the Cimarron Site, and provides the funding for the remediation of the Site. Environmental Properties Management LLC (EPM) is the Trustee for the CERT and functions as the licensee.

Cimarron Site (Site): The property owned by the CERT.

Contractor: Any organization or individual contracted directly to the Trustee.


Controlled Document: Any document the Trustee Project Manager or Quality Assurance Coordinator determines should be controlled so that the user possesses the most current revision of the document. This includes the QAPP and all implementing procedures.

Decisions Affecting License Termination or Site Closure: Decisions that support characterization and achievement of remediation goals. These includes goals established in accordance with requirements of the NRC and the State of Oklahoma.

Hold Point: A stopping point in a procedure or workplan requiring a signature or initials to verify that data has been recorded or that required actions are complete before proceeding. Hold Points are used as quality assurance measures in Activity Plans.

Quality Activity: Any activity that impacts the characterization or remediation of the site, or which impacts the achievement of license termination or site closure.

Quality Data: Data that directly or indirectly support decisions affecting license termination or site closure. Quality data collection and data management are subject to the requirements of the QAPP.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 2.0	Glossary	Page 2-2

Quality Assurance (QA): Quality Assurance comprises all those planned and systematic evaluations that are necessary to provide adequate confidence in the assessment of monitoring results, such as quality control measures.

Quality Assurance Program Plan (QAPP): The primary quality program document, which describes and govern the Quality Assurance Program.


Quality Assurance Program (QAP): The licensee's program for quality assurance, as described in the Quality Assurance Program Plan (QAPP).

Quality Assurance Records: Records that document that quality-critical work complied with the requirements specified in plans, procedures, drawings, or specifications.

Quality Control (QC): Quality Control (QC) comprises those QA actions that provide a means to measure and control the characteristics of equipment and processes to meet established standards.

Subcontractor: Any organization or individual retained by a contractor.

Trustee: Environmental Properties Management (EPM), the Trustee identified in the January 26, 2011 Consent Decree and Environmental Settlement Agreement with the Department of Justice (DOJ), the Nuclear Regulatory Commission (NRC) and the State of Oklahoma.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 3.0	Organizational Structure and Responsibilities	Page 3-1

3.0 ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

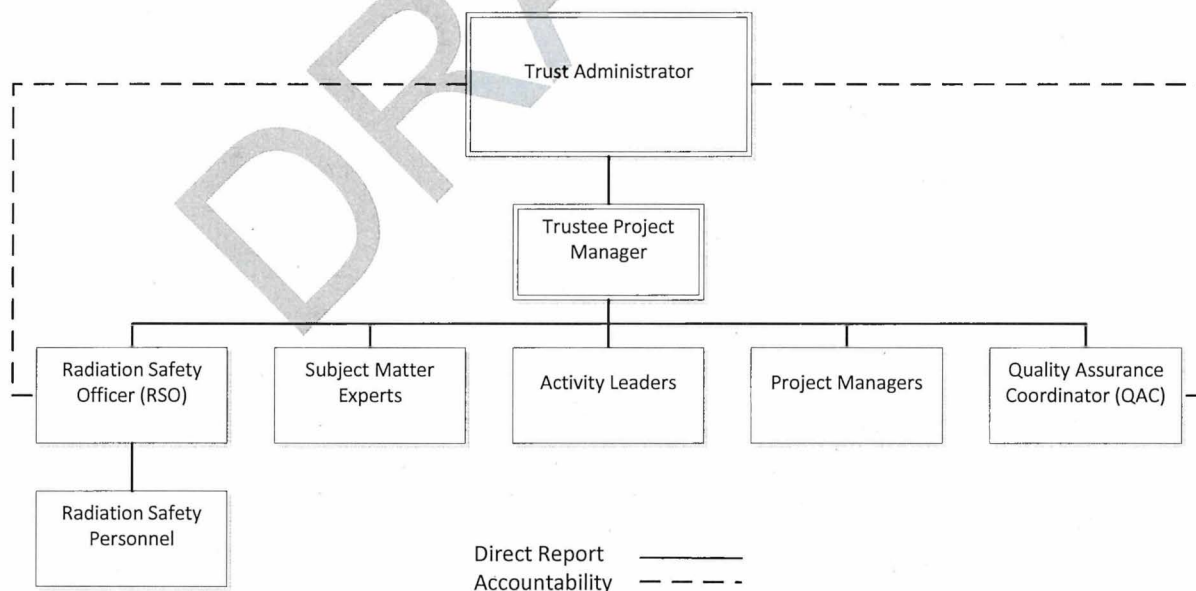
This section provides the structure of the organization as it relates to the Quality Assurance Program. The authorities, duties, and responsibilities of the positions within this organization, down to the first-line supervisory level, are described. These include (where applicable) responsibilities for review and approval of written procedures and the preparation, review, and evaluation of monitoring data and reports.

3.1 Organization Chart

The Organization Chart for the CERT is presented below:


Figure 3-1

The Cimarron Environmental Response Trust Organization



3.2 Trust Administrator

The CERT Trust Administrator has overall responsibility for the administration of the Trust. This includes providing support for quality assurance and radiation safety

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 3.0	Organizational Structure and Responsibilities	Page 3-2

functions at the Site. The Trust Administrator is also responsible for the review and approval of the QAAP and RPP.

3.3 Trustee Project Manager

The Trustee Project Manager (PM) is responsible for physical and financial management of remediation and compliance activities at the Site. This includes direct responsibility for the implementation and maintenance of the Quality Assurance Program Plan. The Trustee PM is responsible to communicate to all site personnel and contractors the requirements of the QAPP. The Trustee PM is responsible to include applicable quality performance requirements in procurement documents.

The Trustee Project Manager also is responsible for review and approval of quality-critical plans.

3.4 Project Manager


Project Managers are responsible for the planning and execution of individual quality-critical activities performed under separate contract with the Trust. Project Managers are responsible for individual aspects of the decommissioning program, such as remediation system design, groundwater treatment system design, and radiation protection.

3.5 Radiation Safety Officer

The RSO is responsible for maintenance and implementation of the radiation protection program. The RSO is responsible to review plans for all activities, provide guidance regarding compliance with NRC license and regulatory requirements, and to manage the health physics staff. The RSO chairs the As Low As Reasonably Achievable (ALARA) Committee and is responsible for bringing radiation protection and safety issues to the attention of the ALARA Committee.

The RSO is also responsible for review and revision of the RPP and related procedures, radiation exposure monitoring, dose reporting, the radiological instrument program, and all levels of radiation safety training. The RSO has authority to go directly to the Trustee PM or the Trust Administrator to resolve radiation protection issues if needed.

3.6 Quality Assurance Coordinator

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 3.0	Organizational Structure and Responsibilities	Page 3-3


The QAC has the following responsibilities:

- Approves and/or reviews all plans and procedures for the Project.
- Maintains the Quality Assurance Program Plan, develops implementing procedures and instructions, and monitors their implementation.
- Schedules and performs QA audits and assessments on a periodic basis to assess QA Program effectiveness, and to evaluate the compliance of work performed with quality program requirements. The QAC also makes updates and improvements to the plan and procedures as needed.
- Coordinates issuance of deficiency reports, identifies non-conformances and approves corrective actions required to achieve the required quality for activities/items.
- Verifies and approves corrective actions initiated to address deficiencies or non-conformances.
- Reviews and accepts QA programs of contractors and/or subcontractors supplying quality related services.
- Provides QA training to personnel (including contractor and subcontractor personnel) who manage or perform activities affecting quality.
- Maintains a list of subject matter experts and their area of expertise.
- The QAC can assign a designee to perform specified functions assigned to the QAC. Throughout this QAPP, references to QAC responsibilities or functions also apply to a designee as specified by the QAC. The QAC has authority to go directly to the Trustee PM or the Trust Administrator to resolve quality issues if needed. The QAC has authority to go directly to the Trustee PM or the Trust Administrator to resolve quality issues if needed.

3.7 Subject Matter Expert

A subject matter expert (SME) is a knowledgeable and experienced individual who uses his or her expertise in a specific discipline to review and approve plans for quality-critical work from a technical perspective and to determine the qualification of personnel to perform quality-critical work. The SME assists in identifying and applying critical

This document must be verified with a Controlled Copy prior to use

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 3.0	Organizational Structure and Responsibilities	Page 3-4

knowledge relevant to the project, works to ensure that project objectives are relevant and valid, works to refresh and expand the knowledge base.


SMEs will determine and document personnel task qualification as related to specific procedures (e.g. sampling and analysis procedures, construction oversight, reporting).

The SME participates in meetings, reviews project member contributions to ensure quality and relevancy of material, provides process analysis expertise, and participates in the project as a member of the decommissioning team.

3.8 Activity Leader

The Activity Leader is the person to whom the Trustee Project Manager assigns to direct work described in an Activity Plan. Activity Leader has the following responsibilities:

- Reviews and approves Activity Plans (and generates the plan if assigned).
- Performs pre-job briefs and post-job debriefs as necessary for purposes of incorporating worker suggestions and lessons learned.
- Ensures that personnel under their direction are trained on the Activity Plan and comply with the Activity Plan requirements.
- Ensures that personnel under their direction are aware of the radiological and non-radiological conditions (i.e. industrial health & safety and environmental hazards) in the work area.
- Provides information on projected radiological work activities to the Radiation Safety Officer or designee.
- For radiological work, informs the Health Physics Technician of any changes or anticipated changes in work scope.
- Informs the Radiation Safety Officer or designee when radiological work performed under an Activity Plan is completed.
- Ensures that all required documentation listed in the Activity Plan is compiled in the site paper files and electronic copies are provided to the Trustee PM.
- Close-out approval of the Activity Plan.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 3.0	Organizational Structure and Responsibilities	Page 3-5

3.9 Radiation Monitoring Personnel


The qualifications of personnel needed to perform radiation monitoring functions are defined and documented in the Cimarron Radiation Protection Plan.

3.10 All Project Personnel

All personnel are encouraged to be diligent in the performance of their work to maintain the level of quality required by plans, procedures, and instructions. In addition, personnel are encouraged to be attentive to any quality issues that may exist in the work of their peers, suppliers, contractors, and subcontractors; because a consistent and exemplary level of quality can only be obtained through vigilant attention to the whole of the work; not just the pieces for which an individual is immediately responsible.

All personnel are responsible to:

- Maintain familiarity with the applicable requirements of the QA Program, and maintaining a personal commitment to implementing the QA Program requirements in their everyday work.
- Identify opportunities for quality improvement.
- Conscientiously use stop work authority as needed to mitigate risks to safety, security, or quality.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 4.0	Qualifications and Training of Personnel	Page 4-1

4.0 QUALIFICATIONS AND TRAINING OF PERSONNEL

Individuals with responsibility for performing quality-related activities will be trained and qualified to perform quality-critical activities. These individuals will maintain proficiency by retraining, reexamining, and recertifying, or by periodic performance reviews, as appropriate. Continual training will be conducted as needed to ensure that personnel maintain awareness of events and issues that could affect quality.

Certain training will also be provided to site personnel who perform non-quality-critical work at the site (e.g. site maintenance).

Training and qualification records will be maintained by the QAC.

4.1 Personnel Training

Guidance for the content and frequency of QAPP training is provided in QAIP 4.3. All training will be documented.

4.1.1 Management Personnel

Management Personnel will receive, at a minimum, training on the QAPP.


4.1.2 Field Supervisors and Activity Leaders

Field Supervisors and Activity Leader will be required to have the following training:

- QAPP
- Quality Assurance Implementing Procedures (QAIPs) (as applicable)
- Radiation Safety as required by the Radiation Safety Program
- Site Orientation
- Site-specific Health and Safety Program
- Sampling and Analysis Plan and Procedures (as applicable)
- OSHA Construction Safety (as applicable)

4.1.3 Technical Personnel

Persons performing technical work on quality-critical activities (e.g. sampling, data analysis, design) are consider Technical Personnel. Technical Personnel will receive

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 4.0	Qualifications and Training of Personnel	Page 4-2

training on the QAPP as well as any other specific instructions determined by the Trustee PM, RSO, or QAC.

4.1.4 Radiation Protection Personnel

Training for individuals needed to carry out assigned radiological monitoring functions will be defined and documented in the RPP.

4.1.5 All Site Personnel

All personnel who work on the Cimarron Site will receive a site orientation and applicable health and safety training as determined by the Trustee PM.

4.1.6 Retraining

Retraining will be required as follows:

- Radiation Protection Plan – minimum annually; when plan is revised; or more frequent as determined by the RSO.
- Quality Assurance Program Plan - minimum annually; when plan is revised; or more frequent as determined by the Trustee PM or QAC.
- Health and Safety Plan - minimum annually; when plan is revised; or more frequent as determined by the Trustee PM or QAC.
- Retraining requirements for other plans, procedures and instructions will be determined by the Trustee PM, QAC, RSO, or SME.


4.2 Qualifications

The following sections define personnel qualification requirements. Section 7.1.1 of this QAPP establishes a program for the evaluation and qualifications of contractors and subcontractors (i.e. Vendor Qualifications).

4.2.1 Lead Auditors and Inspectors

Auditors for internal audits and assessments, as well as for external audits of laboratories and other service providers whose work is critical to quality, must be approved by the QAC or designee. The Trustee PM may designate personnel for these functions with a written justification of their qualifications for an audit or assessment.

This document must be verified with a Controlled Copy prior to use

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 4.0	Qualifications and Training of Personnel	Page 4-3

Personnel performing inspections need not be approved Auditors, and may be qualified based on their skills, experience, or task specific training, as approved by the QAC and/or the Trustee PM.

4.2.2 Technical Personnel

Qualification requirements for Technical Personnel who work on quality activities may be determined by:


- Trustee Project Manager
- Quality Assurance Coordinator
- Subject Matter Expert
- Activity Leader

4.2.3 Radiation Protection Personnel

The qualifications for radiation protection personnel will be defined and documented in accordance with the RPP.

4.2.4 All Personnel

Qualification requirements for any personnel working on the Cimarron Project will be determined by their supervisors. Other personnel qualification requirements may be provided in procurement documents (Section 7.0).

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 5.0	Operating Procedures and Instructions	Page 5-1

5.0 OPERATING PROCEDURES AND INSTRUCTIONS

As described in this section, requirements for Cimarron project activities are provided in written operating procedures and instructions as well as the NRC License. The Trustee PM is responsible to determine when activities require specific procedures or other documentation to control the activity and maintain quality.

Monitoring for compliance with quality documents may be conducted at any time by the QAC (or designee).

5.1 Radiation Protection Program Procedures

Radiation Protection Procedures and desk instructions provide the procedures and instructions for performing activities associated with the radiation safety program. Procedures address categories of tasks (e.g., contamination surveys), whereas desk instructions contain more detailed information on the use of specific instruments (e.g., operating the frisker).

5.2 Health and Safety Plan


The Site Health and Safety Plan (HASP) provides requirements for non-radiological activities associated with the Cimarron Site.

5.3 Quality Assurance Program Plan

This Quality Assurance Program Plan (QAPP) provides the Quality Assurance Program requirements for the Cimarron Project. Implementation of this QAPP is through written Operating Procedures and Instructions as described below.

For routine activities, Project Plans (e.g., Sampling and Analysis Plan) describe *what* routine activities are performed. Their related procedures and instructions (e.g., Sampling and Analysis Procedures), as well as standard operating procedures (SOPs), describe *how* routine activities are performed.

Whether an activity is considered routine or non-routine will be determined by the Trustee PM. Quality requirements for non-routine activities will usually be defined in Activity Plans.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 5.0	Operating Procedures and Instructions	Page 5-2

5.3.1 Project Plans

Project Plans identify requirements related to radiation protection, quality assurance, health and safety, and sampling and analysis of environmental media. These plans identify work performed to comply with those requirements.

5.3.2 Sampling and Analysis Plan

The Sampling and Analysis Plan (SAP) specifies sample collection requirements for environmental media and includes sampling requirements for quality assurance quality control (QA/QC) programs. It also specifies sampling equipment decontamination, documentation, sample preparation and shipment, and laboratory analytical methods. Finally, it specifies requirements for groundwater monitoring well installation and abandonment.

5.3.2.4 Sampling and Analysis Procedures (SAPs)

Quality requirements for repetitive routine sampling and analysis activities will be provided in Sampling and Analysis Procedures. This will include a procedure for discharge sampling.


5.3.3 Standard Operating Procedures (SOPs)

Where practicable, Standard Operating Procedures will provide quality and other requirements for routine activities such as sampling and analysis and system operation.

5.3.4 Activity Plans

Quality requirements for non-routine activities not subject to specific contracts with contractors or subcontractors will be defined in Activity Plans. Activity Plans will identify:

- The name of the non-routine quality-related activity
- The objective of the activity
- Radiological, environmental, and safety hazards associated with the work, and actions to mitigate those hazards

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 5.0	Operating Procedures and Instructions	Page 5-3

- Quality control and quality assurance requirements, and measures to address quality control and quality assurance requirements, including Hold Points
- Work instructions to be followed to assure successful completion of the activity.

5.3.5 Quality Assurance Implementing Procedures (QAIPs)

Quality Assurance Implementing Procedures (QAIPs) will provide instructions needed to implement the Quality Assurance Program. A list of QAIPs will be maintained by the QAC.

5.3.6 Construction Execution Specifications

In some instances, quality control requirements for contracted work, such as construction (i.e. method), will be provided in standard format such as MasterFormat, or referenced to industry-specific Standard Specifications. These requirements will be identified by the Trustee PM, QAC, or Subject Matter Experts and communicated through Activity Plans or other written instructions.

5.3.7 Construction Drawings

Quality control requirements may be included on Construction Drawings. These requirements will be identified by the Trustee PM, QAC, or Subject Matter Experts and communicated through Activity Plans or other written instructions.

5.4 Independent Review


All instructions, procedures, and drawings must show evidence of independent review and approval. These documents must also bear a unique identifying number, date, and revision number.

Drawings must also identify the name of the preparer as well as the name of the independent reviewer and the date of the independent review.

5.5 Plan and Procedure Approval

The following table provides the requirements for approval of plans and procedures:

This document must be verified with a Controlled Copy prior to use

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 5.0	Operating Procedures and Instructions	Page 5-4


**Table 5-5
Plan and Procedure Approval Responsibility**

Document Description	Trustee Administrator	Trustee PM	RSO	QAC	Health & Safety Manager	Subject Matter Expert
Radiation Protection Plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Radiation Protection Procedure			<input type="checkbox"/>			
Desk Instruction			<input type="checkbox"/>			
HASP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
QAPP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Standard Operating Procedure		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Sampling and Analysis Procedure						<input type="checkbox"/>
Activity Plan		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
QAIP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>


5.6 Program Change

Condition 27(e) of NRC License SNM-928 provides flexibility for the licensee to make changes to the NRC-approved Decommissioning Plan (DP) and the Radiation Protection Plan (RPP), provided certain constraints are met. A Quality Procedure entitled "Program

This document must be verified with a Controlled Copy prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 5.0	Operating Procedures and Instructions	Page 5-5

Change Evaluation Process”, provides the process for the review and implementation of such changes to ensure that the license condition requirements have been met.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 6.0	Design	Page 6-1

6.0 DESIGN

For the Cimarron Quality Assurance Program, design is defined as the process of devising a system, structure, component, or process to meet desired needs. Design examples include:

- Radiation protection control and measurement
- Sampling and analytical requirements
- Data review requirements
- Groundwater remediation system installation and operation
- Groundwater treatment system installation and operation

The purpose of this section is to provide the quality requirements for design control.

6.1 Design Control

Applicable regulatory and design requirements for quality-related systems, structures, components, or processes must be provided for through specifications, drawings, procedures, and/or instructions. Deviations from such standards are controlled through the review and approval of qualified individuals, and the approval of deviations shall be documented.

6.1.1 Contractor and Subcontractor (Vendor) Design


EPM uses contractors and subcontractors to complete most design activities. These vendors are approved in accordance with Section 7.0 of this QAPP. The quality assurance program of the individual vendor may be reviewed and approved by the Trust. The vendor's compliance with its quality assurance program will then constitute compliance with this quality assurance program.

6.1.2 Design Interfaces

The Trustee PM will provide a vehicle for the identification and control of design interfaces and for coordination among participating design teams.

6.1.3 Design Inputs and Objectives

The first step in design control is the identification of design inputs (i.e., those inputs which must be known to develop a design that achieves the desired outcome). The

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 6.0	Design	Page 6-2

identification of design inputs and objectives are captured in a Basis of Design generated by the contractor or subcontractor preparing the design.

The Trustee PM will provide for the review of quality requirements for design inputs and evaluate the Basis of Design against the requirements of SNM-928, commitments to the NRC and ODEQ, and other applicable requirements and regulations.

6.1.4 Design Outputs

Design outputs may be plans, permit applications, drawings, or specifications.

6.1.5 Design Review

All designs for Quality Activities are subject to a documented independent review. This review will verify or check the adequacy of the design using alternate or simplified calculation methods, or by performance of a suitable testing program.


The verifying or checking process shall be performed by individuals or groups other than those who performed the original design, but who may be from the same organization. Design documents must be signed by the preparer and the person who performed the independent review.

The Trustee PM (or a designated SME) must approve all designs.

Contractors or subcontractors used for design or design review must be approved in accordance with Section 7.0 of this QAPP.

6.1.6 Design Changes

Design changes, including field changes, shall be subject to the same requirements for review and approval as those applied to the original.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 7.0	Procurement and control of materials, equipment, parts, and services	Page 7-1

7.0 PROCUREMENT AND CONTROL OF MATERIALS, EQUIPMENT, PARTS, AND SERVICES

This section provides the quality requirements for procurement and control of materials, equipment, parts, and services.

7.1 Control of Purchased Materials, Equipment, Parts, and Services

Measures shall be established to ensure that purchased material, equipment, parts, and services, whether purchased directly or through contractors and subcontractors, conform to procurement documents.

7.1.1 Procurement of Materials, Equipment, and Parts

Procurement of quality-related materials, equipment, and parts from approved vendors will require inclusion of design and quality requirements in procurement documents.


7.1.2 Procurement of Services

Procurement of quality-related contractors such as laboratory or engineering design may include adoption of the contractor's quality assurance program.

7.1.3 Requisition

The technical, quality, regulatory, and administrative requirements applicable to procurement of materials for the Cimarron Site are established by the requisitioner and specified in the purchase requisition.

Material potentially affecting quality must not be requisitioned until it is determined that the supplier can ensure an appropriate level of quality. Depending on the nature of the material, the procurement process may include requiring evidence of the supplier's quality assurance program, third party audits, assessments, or certifications of the supplier's capabilities. When this evidence is required, it will be reviewed by the QAC or designee. Satisfactory review of the supplier's documentation (and a physical audit of the supplier's facilities, if appropriate) will be documented and records will be maintained in the document repository (reference Section 12.0 of this QAPP).

 environmental properties management, LLC	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 7.0	Procurement and control of materials, equipment, parts, and services	Page 7-2

If a procured material is an “off the shelf” item of commercial grade, but has performance characteristics deemed important to quality, those characteristics must be specifically listed on the requisition. The requisitioner will also note on the requisition whether receipt inspection or testing is required prior to acceptance of the item (inspection should be required at a minimum to verify that quality requirements established by the purchase requisition have been met). Cut sheets or specifications used to select the item, and any specifications or instructions delivered with the equipment, should become part of the procurement file and distributed to the end user as necessary.

7.1.4 Vendor Qualifications

Vendors are qualified on an as-needed basis when products or services are required to complete quality related work. Qualification may be based on the vendors submitted statement of qualifications, third party audits, reference referrals, professional certifications or licensure, or by the review of other information deemed relevant to establish the vendor’s qualifications to perform a required scope of work. This may include contract-related requirements (e.g. required minimum insurance or EMR rating).

Once completed, a record of vendor qualification is maintained by the QAC. Vendor qualification records are maintained electronically in a central location.


A Trustee representative may access vendor facilities to perform assessments and inspections. Specific procurement requirements established by the requisitioner may also require the vendor to submit documentation and records that demonstrate the acceptability of the service or equipment provided.

7.1.5 Periodic Vendor Assessment

Each approved vendor’s performance is assessed periodically to maintain the vendor’s qualification status. Documented vendor reviews are valid for up to three years.

Assessments of the vendors may include reviewing assessment reports conducted by regulatory agencies or other customers. Internally, the assessment may be based on vendor performance, or by physical audit or receipt of a vendor performance questionnaire. Approved vendors may also be re-evaluated when:

This document must be verified with a Controlled Copy prior to use

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 7.0	Procurement and control of materials, equipment, parts, and services	Page 7-3

- A vendor's performance is considered unacceptable by the Trustee PM or QAC.
- At the discretion of the Trustee PM or QAC, based on a trend of non-conformances, prolonged periods of inactivity, or significant and documented problems with other clients or regulators.
- At the discretion of the Trustee PM or QAC, vendors whose performance is unacceptable may be disqualified or maintained on hold pending successful implementation of corrective action.

7.2 Inspection of Materials, Equipment, and Parts (Items)

The level of inspection required for an item is specified in procurement documents or an Activity Plan. The QAPP does not establish specific inspection or assessment requirements or frequencies, but all items at the Site are subject to inspection or assessment by the Trustee PM or QAC (or personnel designated by either individual).


Acceptance requirements for inspection, or for test records that verify that an item is acceptable, must be clearly stated in procurement documents. A vendor may provide the required documentation, or independent inspections may be performed to verify conformance with procurement requirements. When inspection evaluates conformance of an item to specified requirements, the inspection must be documented. Inspection records contain at a minimum, the item inspected, date of inspection, inspector, type of observation, results, and either acceptability or, if not acceptable, a description of its nonconformance.

7.3 Control of Materials

Control of quality critical materials is required. These materials include, but are not limited to, resin and chemicals used in the remediation process, partially processed and processed resin and/or biomass, contaminated equipment or waste, and contaminated material being stored prior to shipping.

Where possible, quality critical materials must be properly labeled and easily identifiable. The status of such materials must be designated. For instance, spent resin must be identified as such and must be segregated from unused resin to prevent its misuse.


This document must be verified with a Controlled Copy prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 7.0	Procurement and control of materials, equipment, parts, and services	Page 7-4

Drums of dewatered biomass that has not yet been blended with absorbent must be identified as such so it is not stored for shipment prior to blending.

Additionally, all materials should be stored properly in designated locations appropriate for that material. Storage areas should be clearly demarcated and labeled to prevent inadvertent misplacement and/or misuse of quality critical materials.

DRAFT

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 8.0	Sampling, Analyses, Measurements, and Processes	Page 8-1

8.0 SAMPLING, ANALYSES, MEASUREMENTS, AND PROCESSES

The purpose of this section is to provide quality requirements for control of sampling, analyses, measurements, and processes. Monitoring for compliance with these quality requirements may be conducted at any time by the QAC (or designee).

8.1 Radiation Protection

Radiation control requirements are included in the Radiation Protection Program.


8.2 Quality Control in Environmental Sampling

The quality requirements (i.e. sample masses, flow rates, or volumes) for instruments or containers used for environmental sampling of solids, liquids, or gases will be determined in design and specified in design documents, applicable Sampling and Analysis Procedure(s), and/or Activity Plans.

8.3 Quality Control for Effluent Monitoring Systems

Quality control procedures for effluent monitoring systems shall address the following, as applicable:

- The frequency of duplicates and replicates should be established based on time (for continuous discharges) or number of batches (for batch discharges).
- Sample integrity should be maintained through chain of custody procedures.
- Procedures for continuous sampling should use methods that are designed to ensure that the sample is representative of the volumes being discharged.
- Sampling should be performed using calibrated instruments and equipment when taking a composite sample.
- Collection efficiencies based on the physical configuration of the sampling point and the type of collector should be documented. Vendor-supplied data may be used where adequate documentation exists to ensure the reliability and accuracy of data.

 environmental properties management, LLC	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 8.0	Sampling, Analyses, Measurements, and Processes	Page 8-2

- Volumes of tanks and containers should be established during initial installation and should be verified again following any physical changes that could alter the system configuration.

8.4 Laboratory Quality Control

Laboratories used by the Trustee will be subject to vendor qualification requirements provided in Section 7.0 of the QAPP.

Analytical laboratory qualifications will include the following:

- Quality Assurance Program approved by the QAC
- Accreditation by the Oklahoma Department of Environmental Quality
- Certification by National Environmental Laboratory Accreditation Program (NELAP) (or equivalent)

Quality requirements for other laboratories, such as instrument calibration or dosimetry, will be determined by the RSO.


8.4.1 Verification and Validation (V&V)

The V&V of certain aspects and support activities related to radiological or environmental measurements monitoring are essential to the QA program.

- V&V requirements for standard analytical methods will be included in the contracted analytical laboratory's Quality Assurance Program.
- V&V requirements for non-standard on-site measurements will be determined by the Trustee PM and QAC.

8.5 Construction Quality Control

Construction quality will be controlled using the three-phase quality system described below. The purpose of the three-phase system is to require the contractor to plan and schedule special process work to ensure that he is prepared to start each definable feature of work.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 8.0	Sampling, Analyses, Measurements, and Processes	Page 8-3

8.5.1 Construction Submittals

Submittals are required by the contractor to regulate the timely flow of materials to be incorporated into construction work. They are necessary to demonstrate that the proposed materials, etc., follow the drawings and specifications. All required submittals must be submitted by the contractor in time to allow for the review, approval, procurement, delivery, and performance of the preparatory phase of the Three Phases of Control for an item before it is needed for construction.

First Phase – Pre-Construction Meeting

The Pre-Construction Meeting will be performed prior to any construction work, as determined by the EPM Project Manager or the QAC. The following topics will be reviewed:


- Contract plans and specifications.
- Status of submittal approvals.
- Physical examination of materials.
- Status of preliminary work.
- Procedure/plan for accomplishing work.
- Safety hazard assessment.
- Radiation protection assessment.
- Testing – number of tests; when; where; and nature of recording.
- Identify individuals with QA/QC responsibility.

Second Phase – Initial Inspection

The Initial Inspection will be conducted at the beginning of any phase of construction work and will include the following:

- Check preliminary work (e.g. from previous phase) – verify full compliance.
- Establish level of workmanship.

This document must be verified with a Controlled Copy prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 8.0	Sampling, Analyses, Measurements, and Processes	Page 8-4

- Resolve all differences.
- Check safety compliance.
- Check radiation protection compliance.

Third Phase – Follow-up Inspections

Follow-up inspections will be performed daily to ensure that controls continue to provide work which conforms to the drawings and specifications.

8.5.2 Documentation of Construction Controls

All construction quality control activities will be documented as follows:

- Submittals will be classified as: Approved; Approved, except as noted; or Disapproved;
- Pre-Construction Meetings will be documented with an agenda and meeting minutes.
- Initial Inspections will be documented on the Daily Construction Quality Control Form.
- Follow-up inspections will be documented on the Daily Construction Quality Control Form.

8.6 Process Control


Processes, such as the groundwater remediation and treatment systems, will be controlled through Standard Operating Procedures.

8.7 Data Quality Control

Data quality control typically applies to off-site testing of samples, material, etc. However, data quality control may also apply to the on-site generation of data, or installation of equipment. Control of tests will be included in Sampling and Analysis Procedures and Activity Plans, or other quality control documents.

Requirements for off-site laboratories are discussed in Section 8.4 above.

This document must be verified with a Controlled Copy prior to use

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 8.0	Sampling, Analyses, Measurements, and Processes	Page 8-5

8.7.1 On-site Data

Two main categories of laboratory analytical data are collected at the Site: geotechnical and chemical/radiological. Geotechnical data, when received, is stored in the electronic data repository (EDR).

Chemical/radiological data may receive two types of review following receipt. The first is a standard data review of analytical results. The second, as applicable, is a "reasonableness" review consisting of comparison with historical results from the same location (if applicable). For radiological analytical data, reasonableness review may also consist of comparison with other laboratory analytical results. For example, isotopic concentration data may be compared to isotopic activity to evaluate data acceptability.

Following review, analytical data is uploaded to an EQUIS database. Review-assigned data qualifiers are manually entered in addition to laboratory-assigned data qualifiers.

8.7.2 Geodetic Data


Geodetic data is collected by a licensed surveyor. New data points should tie in with existing locations, as determined by the licensed surveyor. For example, a survey of new monitoring wells should include surveys for one or more existing monitoring wells. New survey data is included in the Electronic Data Repository (EDR). A monitoring well inventory and the ArcGIS database are updated based on the new data in the EDR.

8.7.3 Radiological Survey Data

Radiological survey data collected on site is managed in accordance with the Cimarron Radiation Protection Program. Electronic copies of radiological survey forms are maintained on the site computer and are uploaded monthly to the EDR. Paper copies are maintained on site.

8.7.4 Field Measurements


Field measurements collected on site include ground water sampling field parameters and lithologic data obtained during drilling operations. Ground water field parameters are recorded on field parameter forms. Where applicable, all field

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 8.0	Sampling, Analyses, Measurements, and Processes	Page 8-6

parameters are collected with instruments that are calibrated daily during field work. Boring logs and monitoring well completion diagrams are prepared by task-qualified personnel who are familiar with Site geology.

8.7.5 Other Test Data

All other test data, such as equipment installation or construction materials installation, will be managed as described above and determined by the EPM Project Manager or QAC.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 9.0	Control of Measuring and Test Equipment	Page 9-1

9.0 CONTROL OF MEASURING AND TEST EQUIPMENT

The purpose of this section is to assure that tools, gauges, instruments, and other measuring and testing devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specified periods to maintain accuracy within necessary limits.

9.1 Calibration

Measuring and test equipment requiring calibration must not be used unless the calibration is current. Plans, procedures, and/or designs require verification and documentation of calibration. The adequacy of supplier controls on measuring and test equipment is subject to assessment.

9.2 Adjustment


Calibrated measuring and test equipment, subject to operation checks, may be adjusted by qualified personnel in accordance with Desk Instructions or other procedures.

9.3 Equipment Inventory

Equipment which impacts Quality Activities or Quality Data (e.g. calibrated instruments) must be marked with a unique identifier, such as a serial number. An inventory of equipment owned or controlled by the Trustee must be maintained on site, along with records of calibration.

9.4 Out-of-service Equipment

When equipment is found to need calibration or repair, it must be taken out of service. Out-of-service equipment must be visibly marked and physically separated from in service equipment. If the equipment is owned or controlled by the Trustee, the equipment inventory must be updated to reflect the status of the equipment and to maintain control of its use.

 environmental properties management, LLC	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 10.0	Handling, Storage, and Shipping	Page 10-1

10.0 HANDLING, STORAGE, AND SHIPPING


The purpose of this section is to establish measures to control the handling, storage, shipping, cleaning and preservation of material and equipment in accordance with procedures and instructions to prevent damage or deterioration.

Handling, storage, and shipping activities also includes the proper containerization, preservation, and shipping of environmental samples for analysis. These efforts are controlled through detailed work instructions in plans or procedures.

Qualified contractors and/or subcontractors will provide handling, storage and shipping services for low level radioactive waste (LLRW), contaminated materials, and some solid waste. Such contractors and/or subcontractors will be qualified as described in Section 7.0 of this QAPP.

Contaminated materials being shipped for disposal must comply with DOT regulations and Disposal Facility Waste Acceptance Criteria (WAC). Manifests, and/or bills of lading must document the appropriate packaging and transportation of such materials. A QAIP will be developed to provide instruction for classification and shipping papers for LLRW.

Handling and storage requirements also apply to materials which possess hazardous characteristics, or which have specific requirements for their handling or storage. For instance, flammable materials must be stored in fire-rated vented cabinets, and liquids which may spontaneously produce vapors may require the use of personnel protective equipment. Materials requiring special handling and/or storage requirements will be identified and labeled, and procedures or other instructions for their handling and/or storage must specify those requirements.

 environmental properties management, LLC	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 11.0	Control of Nonconforming Items and Equipment	Page 11-1

11.0 CONTROL OF NONCONFORMING ITEMS AND EQUIPMENT


Section 9.0 describes measures to assure that tools, gages, instruments, and other measuring and testing devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specified periods to maintain accuracy within necessary limits.

When items or equipment are evaluated and determined not to comply with quality requirements, they are designated as “nonconforming”. Nonconforming items or equipment must be controlled to prevent inadvertent installation or use.

When procedures are not properly followed, that incorrect “performance” is considered a nonconformance. When errors are identified in documentation, those documents are considered nonconforming.

A nonconformance is defined as any deficiency in characteristic, documentation, performance, or documentation that renders the quality of an item or deliverable unacceptable or indeterminate. This includes data that is considered deficient or suspect through failure of sampling, analysis, or data processing procedures.

When any non-conformance affecting quality is identified, the non-conformance shall be documented on the Notice of Deficiency form. Section 14.0 provides requirements for corrective actions regarding identified program deficiencies. An example of a deficiency would be the inadvertent use of nonconforming equipment.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 12.0	Documents and Records	Page 12-1

12.0 DOCUMENTS AND RECORDS

This QAPP requires maintenance of a system that produces unequivocal, accurate records that document all monitoring and quality related activities. The purpose of this section is to provide quality requirements for the management of Project records and documents.

The Trustee PM is responsible for the maintenance of quality records relevant to license termination and site closure. Quality records include any documentation of activity that produces data or otherwise supports decisions related to license termination and site closure.


Quality records also include records of personnel qualification, training, and radiation exposure. Records fitting this description are classed as Lifetime Records, and must be maintained for until license termination, except that the retention for exposure records is indefinite.

12.1 Quality Assurance Records

A system that produces unequivocal, accurate records that document all monitoring activities will be maintained. Records of implementation or ongoing activities will be maintained, such as the following:

- Plan or procedure revision
- Deficiency Reports and Corrective Actions
- QA Inspections, Assessments, Surveillances, and Audits
- Completed Activity Plans
- Personnel training and qualification records
- Reports of analytical results
- Procurement documents containing quality requirements and specifications, including laboratory analytical services
- Formal Regulatory Communications, Submittals, Permits, License documents
- Equipment Inventory and Calibration Records
- Uranium Inventory Logs
- Accident Reports
- Corrective actions

This document must be verified with a Controlled Copy prior to use

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 12.0	Documents and Records	Page 12-2

- Intermediate activities or calculations (as may be needed to validate or substantiate results)
- Records of tracking and control (chain of custody) throughout all processes from sample collection through analysis and reporting of results, including unique identifiers, descriptions, sources, dates/times, packaging/preparation/shipping, and required analyses
- Field logs with sufficient information describing environmental conditions and recording related information and data documenting the nature of the sample and where and how it was taken
- Laboratory notebooks recording related information and data, observations of analysts, and laboratory or other conditions potentially affecting the measurement process
- Electronic data collection and algorithms and QA documentation
- Calculations (including data reduction, analysis, and verification)
- Other records as determined by the Trustee PM or QAC

12.1.1 Records of Analytical Data

Data obtained from laboratory analysis of collected samples affects decisions related to license termination and site closure. The control and archiving of this data is implemented through the Cimarron Data Management Procedure. The procedure establishes standards for electronic data deliverable (EDD) formats from the laboratory, and for data archiving. Reference the Data Management Procedure

12.2 Quality Assurance Documents

The latest (i.e. current) version of a plan, procedure, or instruction which stipulate requirements which must be met, or which address Quality Activities are considered Quality Assurance Documents.


Documents are also "records".

12.3 Document Control

Documents specifically required to be controlled by this QAPP include:

- The Quality Assurance Program Plan and implementing procedures

This document must be verified with a Controlled Copy prior to use

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 12.0	Documents and Records	Page 12-3

- Radiation Protection Plan and implementing procedures
- Sampling and Analysis Plan and implementing procedures
- Health and Safety Plan and implementing procedures
- Standard operating procedures
- Activity Plans
- Other documents as determined by the Trustee PM or QAC

Logs of current revisions for plans, procedures, and instructions will be maintained.

End users are required to verify with the Trustee PM or QAC that the latest approved version of a document is used.

Users rely on the revision number on the cover page of the controlled document to verify their printed version. Consequently, revision of individual pages within a document are not permitted. As a good practice, document revisions should be announced to likely users when they become available.

12.4 Document and Record Storage

12.4.1 Hard Copies of Controlled Documents

A single hardcopy of controlled documents will be maintained at the Cimarron Site.


12.4.2 Electronic Copies of Controlled Documents

Electronic copies of controlled documents are maintained on a SharePoint site with limited access as determined by the Trustee. Editable versions of electronic documents are electronically stored with limited access as determined by the Trustee PM and the QAC.

12.4.3 Master Document Repository


The master document repository contains electronic copies of documents. The repository is maintained in a central location; files are in .pdf format so the document cannot be inadvertently changed by a user. An electronic copy of each controlled document must be stored in the master document repository.

This document must be verified with a Controlled Copy prior to use

 environmental properties management, LLC	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 12.0	Documents and Records	Page 12-4

12.4.4 Redundant Storage

Redundant storage of records is required. This can take the form of remote electronic storage combined with onsite hardcopy storage. Records that do not need to be immediately accessible may be archived for storage at a remote location as determined by the Trustee PM or QAC.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 13.0	Audits and assessments	Page 13-1

13.0 AUDITS AND ASSESSMENTS

Assessments and audits will be used to evaluate the effectiveness of the Cimarron Quality Assurance Program. The Quality Assurance Coordinator (QAC) is responsible for the planning and execution of internal and external audits and assessments for the CERT Trustee.

13.1 Audits and Surveillances

Planned and periodic audits will be conducted to verify compliance and determine effectiveness of the entire Quality Assurance Program. The Trustee PM or the QAC will perform or schedule an audit of the Quality Assurance Program at least once every three years.

Radiation Protection Surveillances may be initiated by the RSO or Quality Assurance Coordinator.


The QAC will identify internal and external candidates for audits and will plan and schedule audits and surveillances on an annual basis. Audits are performed in general accordance with NQA-1, and an audit report is issued to the Trustee PM (for internal audits) or to the supplier quality representative. The report will be transmitted with a request to identify corrective actions for reported findings.

The QAC will schedule a return visit or review documentation to verify corrective actions are complete, after which the audit is closed out. Desk-top audits may be substituted for on-site audits depending on the complexity of the products and services being supplied.

Third party audits or independent certifications may also be reviewed in lieu of direct auditing.

13.2 Assessments

Periodic assessments will be conducted to evaluate the implementation of specific components of the Quality Assurance Program. An example would be an assessment of the quality compliance and effectiveness of the record control program.

	Cimarron Environmental Response Trust	
	Cimarron Site Quality Assurance Program Plan	
Document No. QAPP-001	DRAFT Rev. 4	Effective date:
Section 14.0	Corrective Actions	Page 14-1

14.0 CORRECTIVE ACTIONS

Integral components of the Cimarron QA program include identifying areas for improvement, defining performance or programmatic deficiencies, and initiating appropriate corrective or preventive actions.

14.1 Notice of Deficiency

Corrective action for non-conformances and incidents is implemented through the "Notice of Deficiency" reporting process. The Notice of Deficiency (NOD) is used to report conditions adverse to safety, and to report accidents that occur. NODs document stop-work actions initiated by anyone working at the Site, deficiencies in procured items or services, documents, procedure content, or adherence to procedures in the performance of work. NODs document failure to comply with specified requirements.

The adoption of this single reporting mechanism simplifies deficiency reporting and the resolution of issues that impact quality at the site.

This process provides for the prompt identification of conditions adverse to quality, determination of their cause, and resolution of the specific conditions adverse to quality. A log of deficiencies and corrective actions is maintained to permit trending analysis if appropriate. The trend analysis can be used to identify timely corrective actions to prevent recurring problems and improve performance. Deficiency reporting and the corrective action process are controlled by QA Procedure QAIP 15.1.

Cimarron Environmental Response Trust
Dosimetry Data - 2013 Through 2018

Year	Quarter	Start Date	Lunchroom (Control)	Sample prep room (Location 1)		LLRW storage area (Location 2)		Lunchroom (Location 3)		HP store room (Location 4)		Comments
				Gross (mR)	Net (mR)	Gross (mR)	Net (mR)	Gross (mR)	Net (mR)	Gross (mR)	Net (mR)	
2013	Q3	7/1/2013	20	23	3	**		20	0	23	3	** No value reported
	Q4	10/1/2013	24	21	-3	22	-2	20	-4	22	-2	
2014	Q1	1/1/2014	18	19	1	20	2	21	3	19	1	
	Q2	4/1/2014	21	21	0	20	-1	21	0	21	0	
	Q3	7/1/2014	26	25	-1	25	-1	25	-1	24	-2	
	Q4	10/1/2014	22	17	-5	23	1	19	-3	19	-3	
2015	Q1	1/1/2015	16	17	1	18	2	17	1	17	1	
	Q2	4/1/2015	**	25		28		25		24		** No value reported
	Q3	7/1/2015	22	21	-1	18	-4	20	-2	20	-2	
	Q4	10/1/2015	29	28	-1	32	3	30	1	30	1	
2016	Q1	1/1/2016	18	18	0	20	2	18	0	18	0	
	Q2	4/1/2016	24	20	-4	23	-1	22	-2	20	-4	
	Q3	7/1/2016	26	22	-4	25	-1	24	-2	24	-2	
	Q4											Dosimeters lost in return shipment
2017	Q1	1/1/2017	27	24	-3	25	-2	24	-3	24	-3	
	Q2	4/1/2017	26	22	-4	25	-1	25	-1	26	0	
	Q3	7/1/2017	24	21	-3	25	1	25	1	26	2	
	Q4	10/1/2017	23	22	-1	22	-1	24	1	24	1	
2018	Q1	1/1/2018	22	23	1	22	0	21	-1	22	0	
	Q2	4/1/2018	23	20	-3	23	0	22	-1	22	-1	
	Q3	7/1/2018	24	23	-1	23	-1	22	-2	24	0	
	Q4	10/1/2018	21	24	3	24	3	22	1	24	3	