

March 29, 2021

Ryan Craffey
Health Physicist
US Nuclear Regulatory Commission
Materials Inspection Branch, Region III

Re: Event # 55-124/5

Gentlemen:

This letter and attachments are to provide a written report of an event where a tracked earthmover accidentally ran over a Humboldt Model 5001EZ S/N 2498 soil density gauge with RQ Radioactive Materials Cs-137 0.37 GBq (10mCi) and Am-241: Be 1.48 GBq (40mCi).

:

1. This occurred at the main dam of the Sweetwater Mine Tailings Storage Facility located at 1382 Sweetwater Mine Road, Ellington MO 63638, approximate Lat. 37 degrees 22' 16.38" N Long. 91 degrees 08' 28.33" W. Attached is a map of the site and the project site plan onto which we have marked the location of the event.
2. The event occurred at 2:35 PM central time March 4, 2021. The gauge was being operated by Engineering Technician Mr. William Kipp. Mr. Kipp has received all required training in the use of the nuclear sourced soil density gauge. Mr. Kipp was wearing his film dosimeter badge and all appropriate safety equipment including a high visibility vest. The dozer operator was approximately 100 feet away operating back-and-forth when the soil density test commenced. The dozer however then continued to backup and could not be alerted, and the dozer operator reported he did not see the test in progress being conducted. It was later determined that prior to this incident on this particular job the soil technician had normally parked an all-terrain vehicle used for tool transport nearby the test location but that in this incident he had carried tools on foot which may have made him less visible.
3. After the accident occurred, we secured the area from any workers on-site and had the equipment operator stop but stay outside a 15 ft diameter area until it was confirmed no contamination was present. The earthwork contractor also contacted the Sweetwater Mine facility safety officer.
4. Our technician immediately contacted the Brucker Engineering Company RSO and immediately thereafter contacted the manufacturer, Humboldt, and took steps to assure there was no risk of contamination. The top of the source rod, handle and index rod were broken off, but it was confirmed the remainder of the source rod was intact and undamaged and the source rod was raised to the safe position with the bottom port shutter shield closed and in-place. Since the source rod locking mechanism was broken measures were taken to secure the Cesium containing source rod in the safe position by strapping and securing in place using cloth-backed adhesive tape coated with polyethylene ("duct tape"). Care was taken to assure the source rod was in the safe position and immovable. The Americium source cylinder was examined and confirmed to be without damage. The device was placed in its locked travel case. The manufacturer confirmed that with these conditions there would be no risk of contamination and that an on-site radiation survey was not required.
5. We telephoned the NRC Operations Center at 3:16 PM CST to provide an informal verbal report. An Event # 55-124 was assigned. The Operations Center suggested following up with a regional point of contact.
6. We followed up with Region 3 point of contact Mr. Ryan Craffey. Mr. Craffey noted that this incident may be deemed reportable and therefore to assure compliance I called the NRC on March 5 again to make a formal verbal report within 24 hours after the event. An Event # 55-125 was assigned. It is noted both of these Event

March 29, 2021
Page 2 of 2

#'s are in reference to the same incident. I prepared and emailed a preliminary written report. A copy of the email is attached.

7. We had a survey and leak test performed as soon as feasible. Attached is a copy of the report which confirmed the sources to be shielded and with no loose contamination. The readings obtained were found to be in compliance with the manufacturer's specifications.
8. Prior to resuming earthwork with a replacement gauge an on-site safety meeting was held with the contractor, the job-site operators and our soil technician to reconfirm safety protocols to assure there would not be a recurrence of this event.
9. The gauge along with the leak test report was shipped to Humboldt for evaluation and possible repair. Humboldt determined it is unrepairable and will perform disposal pending our decision to acquire a replacement gauge. Attached is a copy of their email.
10. Attached is a copy of our most recent radiation dosimeter report for the period including the event. It is noted Technician Kipp's dosimeter report remains in a safe range.

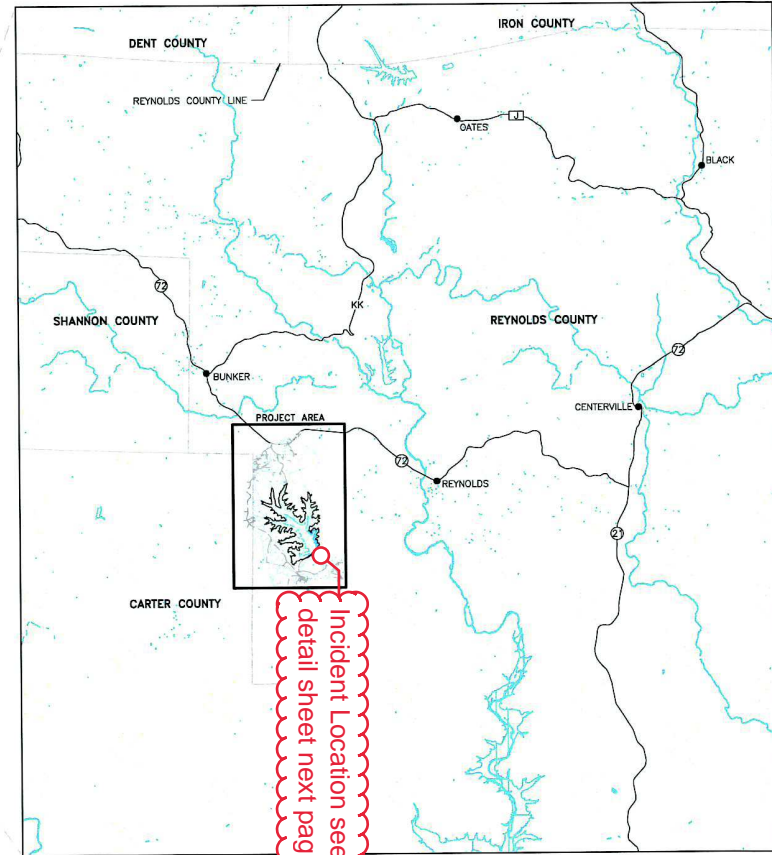
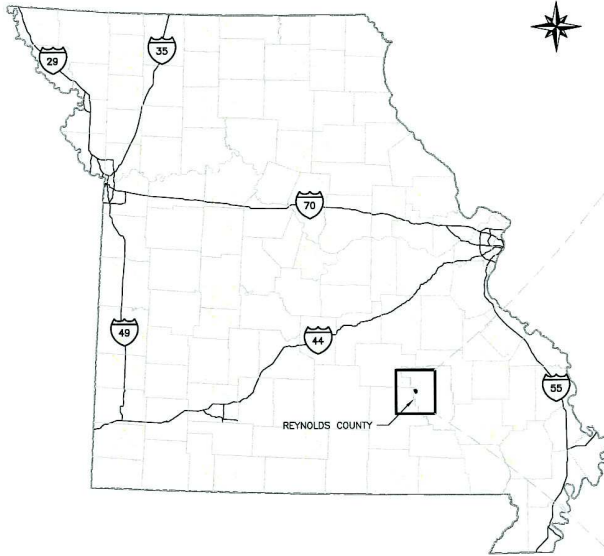
This completes our report of this incident. If you have any questions, please contact me.

Respectfully submitted,
Brucker Engineering Company

Julian Leo Turek

Owner, RSO

SWEETWATER TAILINGS STORAGE FACILITY 1138 DAM RAISE SWEETWATER MINE



VICINITY MAP
NOT TO SCALE

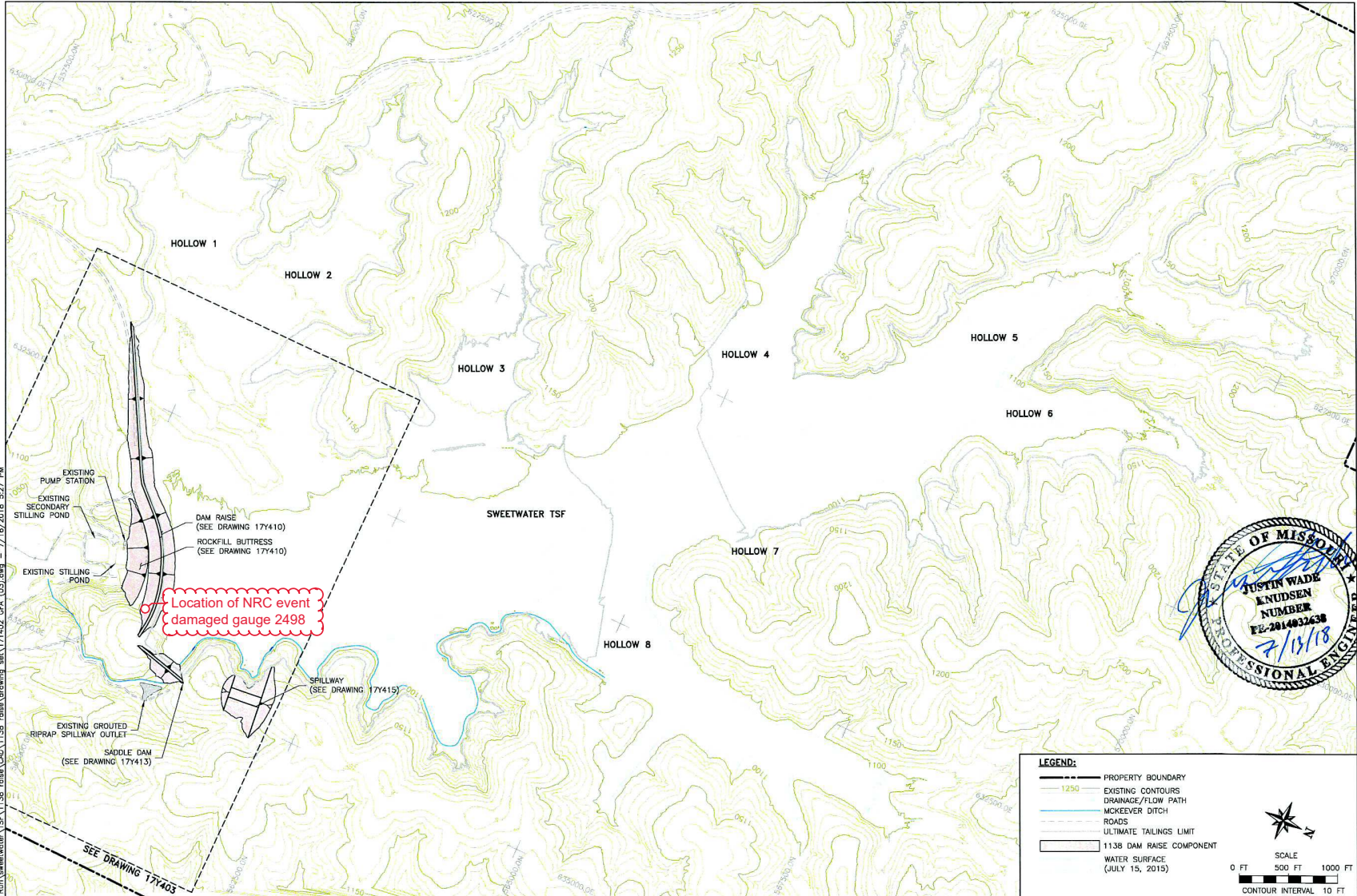


Incident Location see
detail sheet next page

PROJECT AREA MAP
NOT TO SCALE

Scan: Robinson; R:\msw\water\TSF\1138 raise\CAD\1138 raise\Drawing set\174400 TITLE SHEET (C).dwg - 7/16/2018 5:42 PM

<p>REFERENCE: DATUM: NAD83 MISSOURI STATE PLANE (EAST), US FOOT (MOB3-EF) EXISTING TOPOGRAPHY: SANBORN, 2011 MAP OF MISSOURI: USDA GEOSPATIAL DATA, 2014 SEE DRAWING 171401 FOR DETAILED REFERENCES</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>REV</th> <th>DESCRIPTION</th> <th>BY</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>ISSUED FOR REVIEW</td> <td>JWK</td> <td>09/17</td> </tr> <tr> <td>B</td> <td>ISSUED FOR PERMITTING</td> <td>JWK</td> <td>03/18</td> </tr> <tr> <td>C</td> <td>ISSUED FOR PERMITTING</td> <td>JWK</td> <td>07/18</td> </tr> </tbody> </table>	REV	DESCRIPTION	BY	DATE	A	ISSUED FOR REVIEW	JWK	09/17	B	ISSUED FOR PERMITTING	JWK	03/18	C	ISSUED FOR PERMITTING	JWK	07/18	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>DESIGNED BY: JWK</td> <td>PREPARED FOR:</td> </tr> <tr> <td>DRAWN BY: SMR</td> <td rowspan="3" style="text-align: center;"> </td> </tr> <tr> <td>CHECKED BY: AKB</td> </tr> <tr> <td>APPROVED BY: JWK</td> </tr> </table>	DESIGNED BY: JWK	PREPARED FOR:	DRAWN BY: SMR		CHECKED BY: AKB	APPROVED BY: JWK	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>PREPARED BY:</td> <td rowspan="2" style="text-align: center;"> </td> </tr> <tr> <td>TITLE: TITLE SHEET</td> </tr> <tr> <td>PROJECT: SWEETWATER TSF 1138 DAM RAISE</td> <td>PROJECT #: 271</td> <td>DOE RUN JOB #: 1292-F</td> <td>DRAWING #: 17Y400</td> </tr> <tr> <td>LOCATION: REYNOLDS COUNTY, MO</td> <td>DATE: JULY 2018</td> <td>SHEET: 01 OF 20</td> <td></td> </tr> </table>	PREPARED BY:		TITLE: TITLE SHEET	PROJECT: SWEETWATER TSF 1138 DAM RAISE	PROJECT #: 271	DOE RUN JOB #: 1292-F	DRAWING #: 17Y400	LOCATION: REYNOLDS COUNTY, MO	DATE: JULY 2018	SHEET: 01 OF 20	
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Run Sweetwater TSE 1138.mxd 7/15/2018 5:27 PM

REFERENCE:
 DATUM: NAD83 MISSOURI STATE PLANE (EAST),
 US FOOT (MG3-EF)
 EXISTING TOPOGRAPHY: SANBORN, 2011
 SEE DRAWING 17Y401 FOR DETAILED REFERENCES

ENGINEER'S SEAL

REV	DESCRIPTION	BY	DATE	DESIGNED BY: JWK	SWR
A	ISSUED FOR REVIEW	JWK	09/17	DRAWN BY: AKG	
B	ISSUED FOR PERMITTING	JWK	03/18	CHECKED BY: AKG	
C	ISSUED FOR PERMITTING	JWK	07/18	APPROVED BY: JWK	

PREPARED FOR:

THE DOE RUN COMPANY

PREPARED BY:
TIERRA GROUP INTERNATIONAL, LTD.

TITLE: GENERAL FACILITY ARRANGEMENT				 REVISION
PROJECT: SWEETWATER TSF 1138 DAM RAISE	PROJECT #: 271	DOE RUN JOB #: 1292-F	DRAWING #: 17Y402	
LOCATION: REYNOLDS COUNTY, MO	DATE: JULY 2018	SHEET: 03 OF 20		

LEGEND:

- PROPERTY BOUNDARY
- 1250 EXISTING CONTOURS
- DRAINAGE/FLOW PATH
- MCKEEVER DITCH
- ROADS
- ULTIMATE TAILINGS LIMIT
- 1138 DAM RAISE COMPONENT
- WATER SURFACE (JULY 15, 2015)

SCALE
 0 FT 500 FT 1000 FT
 CONTOUR INTERVAL 10 FT

RADIOACTIVE SEALED SOURCE LEAK TEST REPORT

Test Date: March 5, 2021

Analytical Date: March 5, 2021

Source Identification:

Manufacturer: Humboldt

Model No.: 5001EZ

Mach S/N: 2498

Radionuclide: Cs-137

Activity: 10.0 mCi

Source S/N: 324GH

Radionuclide: Am-241/Be

Activity: 40.0 mCi

Source S/N: NJ01034

Sample Submitted By: Aidyl Galafa-Colon

Facility: Brucker Engineering Co.

Address: 7266 Devonshire Ave

St. Louis, MO 63119

The identified sealed source listed above has been tested for leakage of radioactive materials as required by the United States Nuclear Regulatory Commission. The analysis of the wipe material used in testing the sealed source reveals the presence of $\leq 7.63 \times 10^{-5}$ μ Ci of loose contamination for Cs-137 and $\leq 5.26 \times 10^{-5}$ μ Ci of loose contamination for Am-241.

- (X) This source is acceptable for continued use.
- () This source has been found to have a level of loose contamination greater than 0.005 μ Ci of removable radioactive materials, and should be removed from service immediately.

(N/A) Operational and performance check of shutter mechanism satisfactory.

Next Leak Test Date: September 5, 2021

Analysis By: Aidyl Galafa-Colon

Reviewed By: 

"Specializing In Your Radiation Safety Needs"

R. M. WESTER *and ASSOCIATES, INC*

215 Indacom Drive
St. Peters, MO 63376
(636) 928-9628
www.rmwest.com

Readings at contact: 2.9 mR/hr, top 2.3 mR/hr, bottom 1.69 mR/hr, back 1.2 mR/hr, source hole at bottom 2.1 mR/hr

Reading at 3 feet with gauge in case: 0.27 mR/hr. Sources are considered to be shielded and no loose contamination was found.

From: Turek Leo <leo@bruckerengineering.com>
Sent: Friday, March 5, 2021 2:39 PM
To: Craffey, Ryan
Subject: Fwd: License No. 24-32076-01 Event #55125
Attachments: brucker 2498 leak test report.pdf

----- Original Message -----

From: Turek Leo <leo@bruckerengineering.com>
To: "hoo.hoc@nrc.gov" <hoo.hoc@nrc.gov>
Date: 03/05/2021 2:38 PM
Subject: License No. 24-32076-01 Event #55125

To NRC:

This is to provide initial reporting of an event where a tracked earthmover ran over a Humboldt 5001EZ soil density gauge:

1. This occurred at the main dam of the Sweetwater Mine Tailings Storage Facility Lat. 37 degrees 22' 16.38" N Long. 91 degrees 08' 28.33" W.
2. The site address is 1382 Sweetwater Mine Road, Ellington MO 63638T
3. The event occurred at 2:35 PM central time March 4 2021.
4. After the accident occurred we secured the area from outside the area workers and had the equipment operator stop and stay outside a 15 ft diameter area until it was confirmed no contamination was present. The contractor contacted the Facility safety officer
5. Our technician immediately contacted the manufacturer and took steps to assure there was no risk of contamination. The top of the source rod , handle and index rod were broken off but it was confirmed the remainder of (majority of) the source rod was intact and the source rod was raised to the safe position with the bottom port shutter shield closed and in-place. Since the source rod locking mechanism was broken measures were taken to secure the Cesium containing source rod in the safe position. The Americium source cylinder was examined and confirmed to be without damage. The device was placed in its locked travel case. The manufacturer confirmed with these conditions there should be no risk of contamination. Our technician notified our RSO.
6. We telephoned the NRC Operations Center at 3:16 PM CST to provide a verbal report.
7. We followed up with Region 3 point of contact Mr. Ryan Craffey.
8. We made arrangements for a survey and leak test to be performed as soon as feasible. Attached is a copy of the report which confirmed the sources to be shielded and with no loose contamination. The readings obtained were noted to be in compliance with the manufacturer's specifications.
9. The gauge is out of service in locked storage pending shipment to Humboldt.

Thanks
Leo Turek

Leo Turek, PE

Brucker Engineering Company

www.BruckerEngineering.com

7266 Devonshire Avenue

St. Louis, MO 63119

314-781-0126 office

314-781-0245 fax

Leo Turek, PE

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Seana Hogan <seana@humboldtmg.com>

3/25/2021 2:29 PM

Humboldt Scientific, Inc. Quote # 4561

To leo@bruckerengineering.com <leo@bruckerengineering.com> Copy
Tamla Warren <tamla@humboldtmg.com>

Hi Leo,

We've received and evaluated your Gauge SN: 2498 at our factory and determined that unfortunately, the damage to the gauge is too significant and is unrepairable.

Please find Quote # 4561 attached and let us know how you want to proceed or if you have any questions. Thank you and take care.

Best Regards,

Seana Hogan
Sales Support

Humboldt Scientific, Inc.

2525 Atlantic Ave, Raleigh, NC 27604 USA

Toll Free 1-800-537-4183 Ext 7473 | Direct 1-919-278-7473 | Fax 1-919-833-5283

Email: Seana@Humboldtmg.com | Web Page www.HumboldtScientific.com



Construction Materials Testing Equipment



-
- Quote # 4561.pdf (115 KB)
 - image001.jpg (15 KB)
 - image002.png (589 Byte)
 - image003.png (969 Byte)
 - image004.png (757 Byte)
 - image005.png (738 Byte)
 - image006.jpg (4 KB)

BRUCKER ENGINEERING LTD
7266 DEVONSHIRE DRIVE
ST LOUIS, MO 63119

Received Date / Reported Date	2021-03-16 / 2021-03-19
Page	1 of 1
Analytical Work Order / QC Release	2107500742 / LAH
Copy / Version	0 / 1



LANDAUER®
LANDAUER, Inc., 2 Science Road
Glenwood, Illinois 60425-1586
landauer.com
Telephone: (708) 755-7000
Facsimile: (708) 755-7016
Customer Service: (800) 323-8830
Technical: (800) 438-3241

Radiation Dosimetry Report

Account : 158254

**No NVLAP accreditation is available from NVLAP for thermal neutron or X type dosimeters. When exposure results are reported for thermal neutrons or X type dosimeters, this report contains data that are not covered by the NVLAP accreditation.

Participant Number	Name		Dosimeter	Use	Rad. Type	Rad. Quality	Dose Equivalent (mrem) for Periods Shown Below									Inception Date	Serial Number			
							DDE-Deep Dose Equivalent			LDE-Lens Dose Equivalent			SDE-Shallow Dose Equivalent							
	Period Shown Below						Quarter to Date			Year to Date			Lifetime to Date							
	DDE	LDE					SDE	DDE	LDE	SDE	DDE	LDE	SDE	DDE	LDE			SDE		
For Monitoring Period:							2021-02-10 to 2021-03-09			QUARTER 1			2021			LIFETIME				
00000	CONTROL Control Dose Used		Pa Pa	CNTRL			12	12	12									8922448K		
00001	CARTWRIGHT, DENNIS R 158254-00001		Pa	CHEST			M	M	M	M	M	M	M	M	M	77	79	87	1998/05	8922449K
00009	FOX, D. MATTHEW 158254-00009		Pa	CHEST			M	M	M	M	M	M	M	M	M	95	95	102	1999/03	8922450K
00019	STURDEVANT, MICHAEL		Pa	CHEST						M	M	M	M	M	M	210	211	202	2011/10	8922451K
				NOTE			Unused													
00020	STEIN, LEONARD		Pa	CHEST			M	M	M	M	M	M	M	M	M	M	M	M	2012/06	8922452K
00023	KIPP, WILLIAM		Pa	CHEST	P		3	3	3	11	11	10	11	11	10	65	66	65	2017/10	8922453K

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Radiation Dosimetry Report

Annual Radiation Exposure Limits (mrem) :

Whole body, blood forming organs, gonads	5,000
Lens of Eye	15,000
Extremities and Skin	50,000
Fetal (Gestation period)	500
General Public	100

Based on the US NRC Regulations, Title 10, Part 20, Code of Federal Regulations and adopted by many states. Certain state and other regulatory agencies may adhere to different limits.

Control Dosimeter: A control dosimeter is included with each shipment of dosimeters for monitoring radiation exposure received during transit. At the customer's facility, store the control in a radiation free area during the wear period.

Minimal Dose Equivalent Reported: Dose equivalents below the minimum measurable quantity for the current monitoring period are recorded as "M." The minimal reporting levels vary by the dosimeter type and radiation quality. "SL" is an elective option for the minimal dose equivalent reported where exposures less than 10 mrem report as "SL" (excludes fetal dosimeters), and/or exposures at or more than 10 mrem begin reporting at 10 mrem and report in increments of 10 mrem.

Dosimeter Type	M (DDE,LDE,SDE)	M (SDE Only)	SL
Luxel+ [®]	1	-	10
InLight [®]	5	-	10
Whole Body Beta	-	10	10
U Ring	-	30	-
Neutrak [®] Neutron Fast	20	-	-
Neutrak [®] Neutron Thermal/Fast	10	-	-
Saturn Ring	-	10	10

Special Calculations: Special dose calculations can be applied to radiation workers who wear lead aprons.

EDE 1 - two dosimeters: one worn at the waist level under lead apron and one worn at the collar level outside lead apron. 1.5 (Waist DDE) + 0.04 (Collar DDE) = Assigned Deep Dose Equivalent.

EDE 2 - one dosimeter: one worn at the collar level outside lead apron. 0.3 (Collar DDE) = Assigned Deep Dose Equivalent.

EDE 122 - one dosimeter: one worn at the collar level outside lead apron. Collar DDE / 5.6 = Assigned Deep Dose Equivalent.

Calc3 - Lens of Eye dosimeter. 0.5 (Lens of Eye LDE) = Assigned Lens of Eye Dose Equivalent.

Lens. 175 - Lens of Eye dosimeter. 0.175 (Lens of Eye LDE) = Assigned Lens of Eye Dose Equivalent.

EDE1-NTC EDE1 without Thyroid Collar assigned deep dose equivalent = 0.06 x (collar dose - waist dose) + waist dose

EDE1-TC EDE1 with Thyroid Collar assigned deep dose equivalent = 0.02 x (collar dose - waist dose) + waist dose

The "ASSIGNED" line follows all of the original whole body dosimeter doses with the EDE 1 or EDE 2 calculation results or LANDAUER's standard Dose Assessment Protocol (deep and shallow whole body dose from the highest reading whole body dosimeter, lens dose from dosimeter closest to the eye).

Ring Dosimeter Reading: Ring dosimeter readings report as a shallow dose.

Fetal Dosimeter: A declared pregnant worker will possess a fetal exposure on an extra page of the report based upon the whole body dosimeter worn closest to the fetus. The fetal dose is reported for the current wear period, plus the estimated dose from conception to declaration (if provided by customer), and the total dose from declaration to present.

Use	Description	Use	Description
AREA	Area Monitor	OEXTRM	Other Extremity
CHEST	Chest	OWHBDY	Other Whole Body
CNTRL	Control	RANKLE	Right Ankle
COLLAR	Collar	RFINGR	Right Hand Ring
EYE	Eye	RUARM	Right Upper Arm
FETAL	Fetal	RULEG	Right Upper Leg
LANKLE	Left Ankle	RWRIST	Right Wrist
LFINGR	Left Hand Ring	SPCPUR	Special Purpose
LUARM	Left Upper Arm	UPBACK	Upper Back
LULEG	Left Upper Leg	WAIST	Waist
LWBACK	Lower Back	WHBODY	Whole Body
LWRIST	Left Wrist		

Code	Radiation Quality Description (Type and/or Energy)
B	beta
BH	beta high energy, e.g. Strontium, Phosphorus
BL	beta low energy e.g. Thallium, Krypton
BS	Strontium beta
BT	Thallium beta
BU	Uranium beta
BN	beta, neutron mixture
NF	neutron fast
NT	neutron thermal
P	photon (x or gamma ray)
PB	photon, beta mixture
PBN	photon, beta, neutron mixture
PH	photon high energy greater than 200 keV
PL	photon low energy less than 40 keV
PM	photon medium energy 40 keV to 200 keV
PN	photon, neutron mixture

First Line Explanation

Participant Number: Unique number assigned by LANDAUER.

Name: Participant to whom the dosimeter is assigned.

Dosimeter: Badge type according to radiation monitoring needs.

Dosimeter	Code	Type of Radiation Monitored				
		Photons		Beta	Neutrons	
		X	Gamma		Fast	Thermal
InLight Model 2	L02NN	Yes	Yes	Yes		
InLight Model 2J	L02JN	Yes	Yes	Yes	Yes	
InLight Model 2T	L02TN	Yes	Yes	Yes	Yes	Yes
Luxel+	Pa	Yes	Yes	Yes		
Luxel+	Ja	Yes	Yes	Yes	Yes	
Luxel+	Ta	Yes	Yes	Yes	Yes	Yes
Luxel+ Escort	Pa	Yes	Yes			
Neutrak	N				Yes	
Neutrak	E				Yes	Yes
Ring, Single TLD	U or S	Yes	Yes	Yes		

Deep, Eye and Shallow Dose Equivalents: Deep dose equivalent (DDE) applies to external whole body exposure at a tissue depth of 1 cm (1000 mg/cm²).

Eye dose equivalent (LDE) applies to external exposure of the lens at a tissue depth of 0.3 cm (300 mg/cm²).

Shallow dose equivalent (SDE) applies to the external exposure of the skin or extremity at a tissue depth of 0.007 cm (7 mg/cm²) averaged over an area 1 cm².

Deep, eye and shallow dose equivalents report for the time frame indicated by "For Monitoring Period." These doses represent the dose received only for the account/subaccount specified. Individual radiation component results and combined totals report in separate lines.

Quarterly accumulated results reflect total dose received within a calendar 3-months time frame and the customer defined start day. (Note: Quarterly accumulated columns are eliminated for bimonthly service or display "Not applicable.") Year to date accumulation totals dose received from the beginning of the current year to report date. Lifetime accumulation totals all dose received from inception date of dosimeter service to report date, and could include earlier dose history if supplied by customer. Reported quarterly, annual and lifetime dose accumulations represent the doses totaling from all account/subaccount dosimeters to be reported at the customer level.

Inception Date: The date LANDAUER began keeping dosimeter records for a given dosimeter for a badging participant on the current customer.

Serial Number: Dosimeter serial number.

Second Line Explanation

Participant's personal information consisting of ID number and birth date. This information can be suppressed on "Duplicate and Original Reports" for privacy and/or posting needs.

Notes: Text messages explaining any abnormalities or comments. The notes with message appears on a separate line below all dosimeter exposure information.

U.S. Patents

6,316,702; 6,127,685; 5,892,234