



Cascade Radon, Inc.
Testing, Mitigation,
Systems Design
CCB 180537 / CASCARI927C1
Fed ID 26-1809992

12839 NE Airport Way Bldg. 9
Portland, Oregon 97230
Phone: (503) 421-4813
Fax: (503) 281-6170
Office@CascadeRadon.com

Wilcox Elementary School

(C-65492)

833 NE 74th Ave., Portland, OR 97213

May 24, 2018



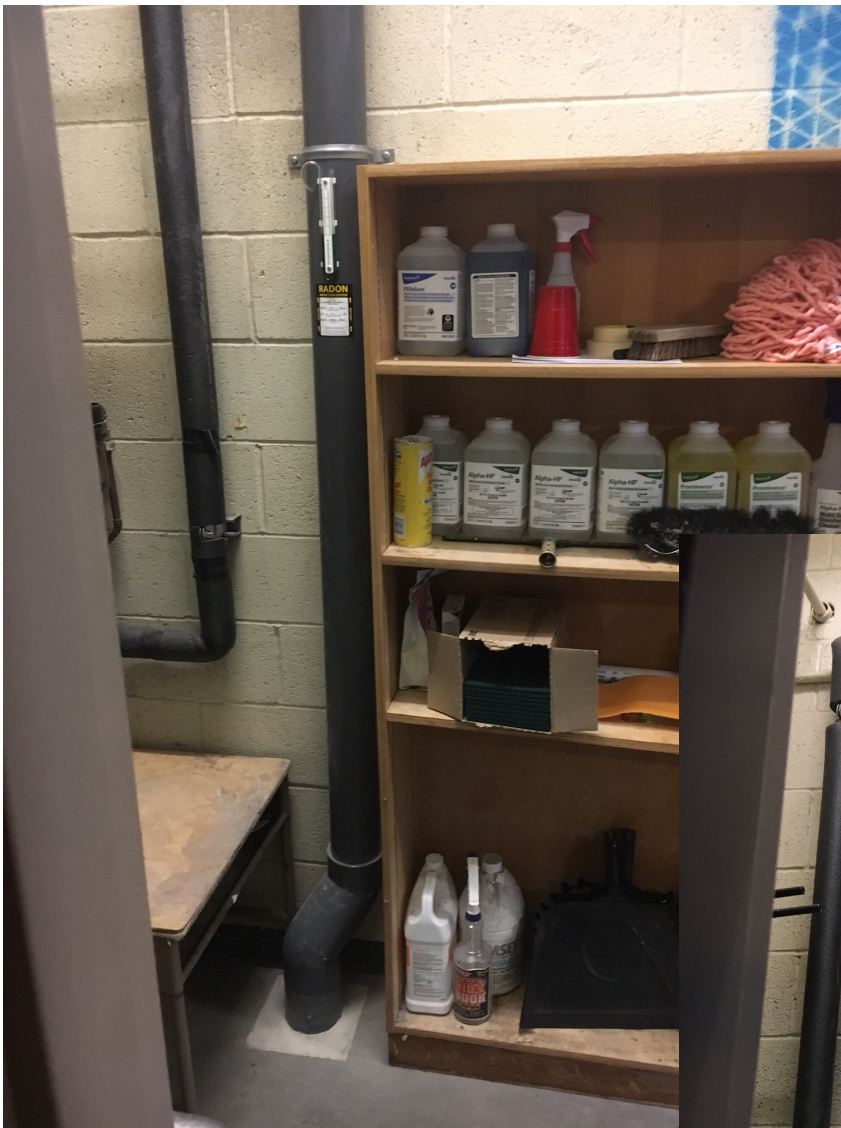
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Purpose

Initial testing was performed throughout the school on March 15, 2016 to March 18, 2016 by PBS Engineering and Environmental Inc. Testing indicated 11 out of the 17 samples exceeded the EPA action level of 4.0 pCi/L. PBS performed additional testing in the 11 areas that tested above the action level starting in October 2016 to May 2017 as a confirmation long-term test to determine if mitigation was needed. The result of this six month test was 5.5 pCi/L in the boiler room, 4.6 pCi/L in room 16 and 4.0 pCi/L in conference room 1. Cascade Radon was hired to diagnose these three rooms and develop a mitigation strategy to reduce the radon levels.

The installation of a sub-slab depressurization system was used to reduce the radon below the EPA action level of 4 pCi/L. See attached pages for a description of the system components and post-mitigation testing.



The suction point is located in the boiler room of the facility. Schedule 80 vent piping was used to protect against accidental impacts. Vent piping continues up and through the cinder block wall and then to fan location in the attic. The system includes a manometer (pressure gauge), which is a simple means of seeing the system is working mechanically. A manometer also shows how much negative pressure (depressurization) the system is creating. It is understood such a pressure gauge DOES NOT monitor radon levels.



This system required a Festa AMG Eagle model fan, which is designed for less porous soil found beneath the concrete slab. If left to operate continuously the lifespan of this fan typically is 10 to 15 years.

Vent piping continues from the top of the mitigation fan to the southern end of the building and vents through the gable.





Vent pipe exiting the southern gable end of the building

Credentials

Cascade Radon, Inc.
12839 NE Airport Way Bldg. 9
Portland, OR 97230
(503)421-4813
office@cascaderadon.com
CCB180537
CASCARI977C1
NEHA/NRPP# 104815RMT
NRSB# 1G0008

Christensen Electric, Inc.
17201 NE Sacramento Street
Portland, OR 97230
(503)419-3300
info@christenson.com
CCB458



CASCADE RADON, INC.

Testing, Mitigation,
Systems Design
CCB 180537 / CASCARI927C1

12839 NE Airport Way
Portland, OR 97230
Phone: (503) 421-4813
Fax: (503) 281-6170
Office@CascadeRadon.com

May 24, 2018
C-65492

To: Portland Public Schools
501 N. Dixon Street
Portland, OR 97227

RE: Wilcox Elementary School
833 NE 74th Ave.
Portland, OR 97213

Effective: May 3, 2018

Cascade Radon, Inc. warrants that all work has been performed in a workmanlike manner and according to the best standard practices. All materials and equipment are new, unless otherwise specified, and of first quality.

Cascade Radon, Inc. guarantees that the installation will maintain average, long-term, indoor radon levels, based upon approved 9 month duration Alpha-Track testing at or below 4 pCi/L for a period of 10 years.

With the exception of the exhaust fan unit(s), Cascade Radon, Inc. warrants that all labor, work, materials and equipment will be free from faults in material or workmanship for period of ten (10) years from the date of substantial completion.

Includes 5-year manufactures replacement warranty on exhaust fan unit(s), beginning at time of initial activation, with any related work and materials provided at no cost to the Client.

All warranties and guarantees are transferable to future owners of the same property.

Warranty or service inquires, please call (503) 421-4813

Sincerely,
Wade Gervais
Division Manager
Cascade Radon, Inc.



TEST DETAILS:

Wilcox Elementary
 833 NE 74th Ave
 Portland, OR 97213

Portland Public Schools

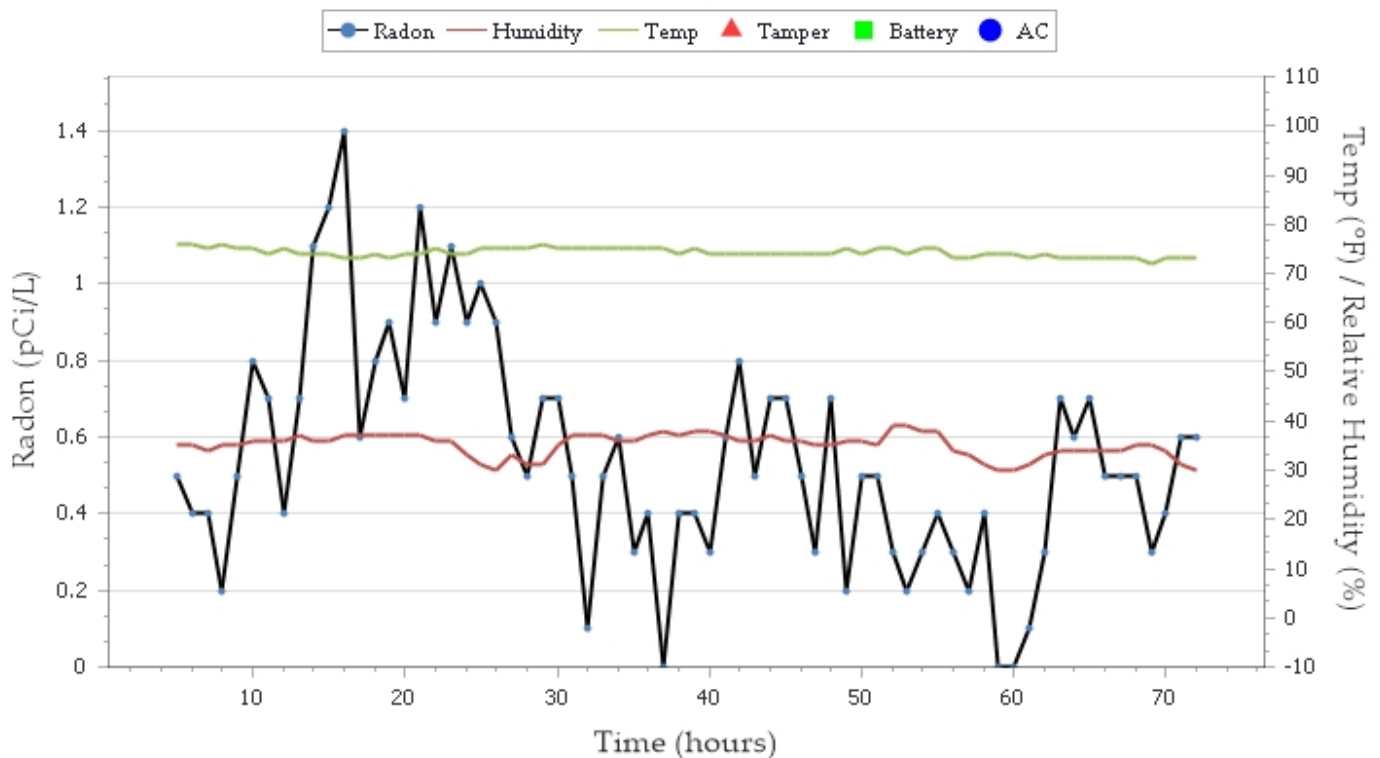
Test Start Date/Time: Friday, April 27, 2018 // 12:00 PM
Test End Date/Time: Monday, April 30, 2018 // 1:30 PM
Location of Instrument: Boiler Room

Notes:

TEST RESULTS:

Average: 0.5 pCi/L

Test ID# 80066



Tamara C Linde

5/3/18

Tamara Linde

Date

Certification #:

License 1:

CCB 180537/ CASCARI927C1

License 2:

NRPP 108946RT, 108953RT



INTERVAL REPORT:

Hour	T	B	AC	pCi/L	Temp	Humd	Alpha
1				0.0	75	36	3
2				0.3	76	36	12
3				0.7	76	35	23
4				0.5	75	36	16
5				0.5	76	35	18
6				0.4	76	35	14
7				0.4	75	34	13
8				0.2	76	35	8
9				0.5	75	35	18
10				0.8	75	36	26
11				0.7	74	36	25
12				0.4	75	36	14
13				0.7	74	37	23
14				1.1	74	36	35
15				1.2	74	36	39
16				1.4	73	37	45
17				0.6	73	37	21
18				0.8	74	37	28
19				0.9	73	37	29
20				0.7	74	37	23
21				1.2	74	37	40
22				0.9	75	36	31
23				1.1	74	36	36
24				0.9	74	33	29
25				1.0	75	31	34
26				0.9	75	30	29
27				0.6	75	33	19
28				0.5	75	31	18
29				0.7	76	31	22
30				0.7	75	35	22
31				0.5	75	37	16
32				0.1	75	37	6
33				0.5	75	37	17
34				0.6	75	36	19
35				0.3	75	36	12
36				0.4	75	37	13
37				0.0	75	38	3
38				0.4	74	37	14
39				0.4	75	38	14
40				0.3	74	38	12
41				0.6	74	37	19
42				0.8	74	36	27
43				0.5	74	36	18
44				0.7	74	37	24
45				0.7	74	36	25
46				0.5	74	36	16
47				0.3	74	35	12
48				0.7	74	35	23
49				0.2	75	36	8
50				0.5	74	36	16
51				0.5	75	35	16
52				0.3	75	39	10
53				0.2	74	39	9
54				0.3	75	38	12
55				0.4	75	38	14
56				0.3	73	34	11
57				0.2	73	33	9

Tamara Linde
 Cascade Radon
 12839 NE Airport Way
 Portland, OR 97230
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 office@cascaderadon.com



58	0.4	74	31	14	
59	0.0	74	30	3	
60	0.0	74	30	2	
61	0.1	73	31	6	
62	0.3	74	33	12	
63	0.7	73	34	25	
64	0.6	73	34	19	
65	0.7	73	34	25	
66	0.5	73	34	17	
67	0.5	73	34	18	
68	0.5	73	35	16	
69	0.3	72	35	12	
70	0.4	73	34	15	
71	0.6	73	31	21	
72	0.6	73	30	19	
Minimum:	0.0 pCi/L	Maximum:	1.4 pCi/L	Average:	0.5 pCi/L

Tamara C Linde

5/3/18

Tamara Linde

Date

Certification #:

License 1:

CCB 180537/ CASCARI927C1

License 2:

NRPP 108946RT, 108953RT



**CERTIFICATE OF CALIBRATION
RadStar RS800 Continuous Monitor**

This instrument has been calibrated in accordance with the procedures set forth by the manufacturer.
Please retain this certificate for your records

Cal Date: 5-12-17 Last Cal Date: _____ Next Cal Date: 5-12-18
Device Serial Number: 2395 Device Type: RS800
Device Status: Passed Failed Radon Chamber: TC 103 B

NRPP Chamber#TC103	Radon Gas Concentration: <u>16.6 pCi/l</u>
CRM Serial Numbers: <u>4183 2173 2178</u>	
Chamber Temperature: <u>69.0 °F</u>	Chamber Humidity: <u>31.7 %RH</u>
Start Chamber Exposure: <u>02/09/17 11:00</u>	Stop Chamber Exposure: <u>02/13/17 08:00</u>

Calibration Number (as found, if applicable) _____ Calib#=(10240/(Hourly Counts/pCi/l))
Calibration Number (Final) 327 Calibrated By: [Signature]

RadonAway 3 Saber Way Ward Hill, Massachusetts 01835 978-521-3703

This RadStar Continuous Radon Monitor has been calibrated by the Manufacturer using a standard operating procedure for the calibration of the RS800, TP010 Rev E. This procedure provides for the following performance checks:

- System Functional Checks
- Battery Check
- Back Ground Check in Nitrogen 0.1 pCi/l 10 cph
- Chamber Exposure in known Radon Gas Concentration
- Adjustment to Calibration Number, if necessary
- Adjustment to Background, if necessary
- Verification Chamber Exposure, if necessary

(As Tested Background is Integrated into Instrument Calculation Program, Do Not Adjust Readings by Background)
The manufacturer, RadonAway performs quarterly inter-comparisons with a Secondary Chamber

NRPP Device Code 476 Device group 18 USEPA Verified

Radon Measurement Specialist:
NRSB #6SS0002, NRPP #100842RT [Signature]

The RadStar RS800 is distributed by Accustar Labs 888-580-9596



TEST DETAILS:

Wilcox Elementary
 833 NE 74th Ave
 Portland, OR 97213

Portland Public Schools

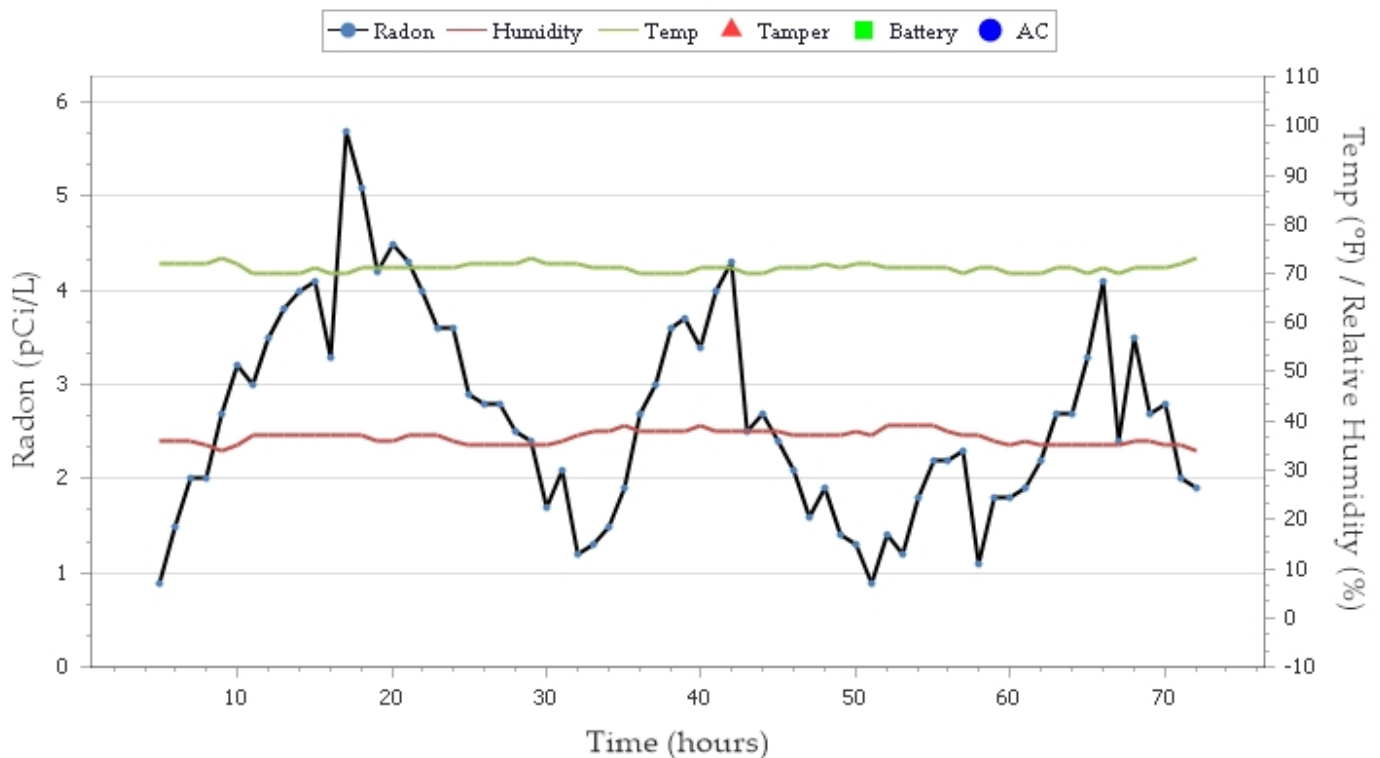
Test Start Date/Time: Friday, April 27, 2018 // 12:15 PM
Test End Date/Time: Monday, April 30, 2018 // 1:40 PM
Location of Instrument: Room 16

Notes:

TEST RESULTS:

Average: 2.6 pCi/L

Test ID# 80014



Tamara C Linde

5/3/18

Tamara Linde

Date

Certification #:

License 1:

CCB 180537/ CASCARI927C1

License 2:

NRPP 108946RT, 108953RT



INTERVAL REPORT:

Hour	T	B	AC	pCi/L	Temp	Humd	Alpha
1				1.6	73	36	49
2				1.7	73	36	52
3				1.2	73	36	38
4				1.3	72	36	39
5				0.9	72	36	29
6				1.5	72	36	46
7				2.0	72	36	62
8				2.0	72	35	60
9				2.7	73	34	83
10				3.2	72	35	98
11				3.0	70	37	91
12				3.5	70	37	105
13				3.8	70	37	115
14				4.0	70	37	121
15				4.1	71	37	124
16				3.3	70	37	101
17				5.7	70	37	172
18				5.1	71	37	153
19				4.2	71	36	127
20				4.5	71	36	137
21				4.3	71	37	131
22				4.0	71	37	122
23				3.6	71	37	110
24				3.6	71	36	109
25				2.9	72	35	88
26				2.8	72	35	86
27				2.8	72	35	86
28				2.5	72	35	75
29				2.4	73	35	73
30				1.7	72	35	53
31				2.1	72	36	63
32				1.2	72	37	37
33				1.3	71	38	41
34				1.5	71	38	45
35				1.9	71	39	57
36				2.7	70	38	81
37				3.0	70	38	90
38				3.6	70	38	110
39				3.7	70	38	111
40				3.4	71	39	104
41				4.0	71	38	120
42				4.3	71	38	129
43				2.5	70	38	76
44				2.7	70	38	83
45				2.4	71	38	74
46				2.1	71	37	65
47				1.6	71	37	49
48				1.9	72	37	58
49				1.4	71	37	42
50				1.3	72	38	41
51				0.9	72	37	29
52				1.4	71	39	44
53				1.2	71	39	38
54				1.8	71	39	54
55				2.2	71	39	67
56				2.2	71	38	68
57				2.3	70	37	70

Tamara Linde
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58	1.1	71	37	34
59	1.8	71	36	56
60	1.8	70	35	56
61	1.9	70	36	58
62	2.2	70	35	67
63	2.7	71	35	83
64	2.7	71	35	82
65	3.3	70	35	100
66	4.1	71	35	125
67	2.4	70	35	74
68	3.5	71	36	106
69	2.7	71	36	82
70	2.8	71	35	86
71	2.0	72	35	60
72	1.9	73	34	58

Minimum: 0.9 pCi/L **Maximum:** 5.7 pCi/L **Average:** 2.6 pCi/L

Tamara C Linde

5/3/18

Tamara Linde

Date

Certification #:

License 1:

CCB 180537/ CASCARI927C1

License 2:

NRPP 108946RT, 108953RT



**CERTIFICATE OF CALIBRATION
RadStar RS800 Continuous Monitor**

This instrument has been calibrated in accordance with the procedures set forth by the manufacturer.
Please retain this certificate for your records

Cal Date: 3.30.18 Last Cal Date: 04/27/17 Next Cal Date: 3.30.19
Device Serial Number: 2327 Device Type: RS800
Device Status: Passed X Failed Radon Chamber: TC 103 B

NRPP Chamber#TC103	Radon Gas Concentration: <u>20.5 pCi/l</u>
CRM Serial Numbers: <u>4183 2173 2178</u>	
Chamber Temperature: <u>72.5 °F</u>	Chamber Humidity: <u>45.8 %RH</u>
Start Chamber Exposure: <u>10/11/17 09:00</u>	Stop Chamber Exposure: <u>10/13/17 09:00</u>

Calibration Number (as found, if applicable) 327 Calib#=(10240/(Hourly Counts/pCi/l))
Calibration Number (Final) 342 Calibrated By: [Signature]

RadonAway 3 Saber Way Ward Hill, Massachusetts 01835 978-521-3703

This RadStar Continuous Radon Monitor has been calibrated by the Manufacturer using a standard operating procedure for the calibration of the RS800, TP010 Rev F. This procedure provides for the following performance checks:

- System Functional Checks
- Battery Check
- Back Ground Check in Nitrogen 0.1 pCi/l 10 cph
- Chamber Exposure in known Radon Gas Concentration
- Adjustment to Calibration Number, if necessary
- Adjustment to Background, if necessary
- Verification Chamber Exposure, if necessary

(As Tested Background is Integrated into Instrument Calculation Program, Do Not Adjust Readings by Background)

The manufacturer, RadonAway performs quarterly inter-comparisons with a Secondary Chamber

NRPP Device Code 476 Device group 18 USEPA Verified

Radon Measurement Specialist:

NRSB #6SS0002, NRPP #100842RT

[Signature]

The RadStar RS800 is distributed by Accustar Labs 888-580-9596



TEST DETAILS:

Wilcox Elementary
 833 NE 74th Ave
 Portland, OR 97213

Portland Public Schools

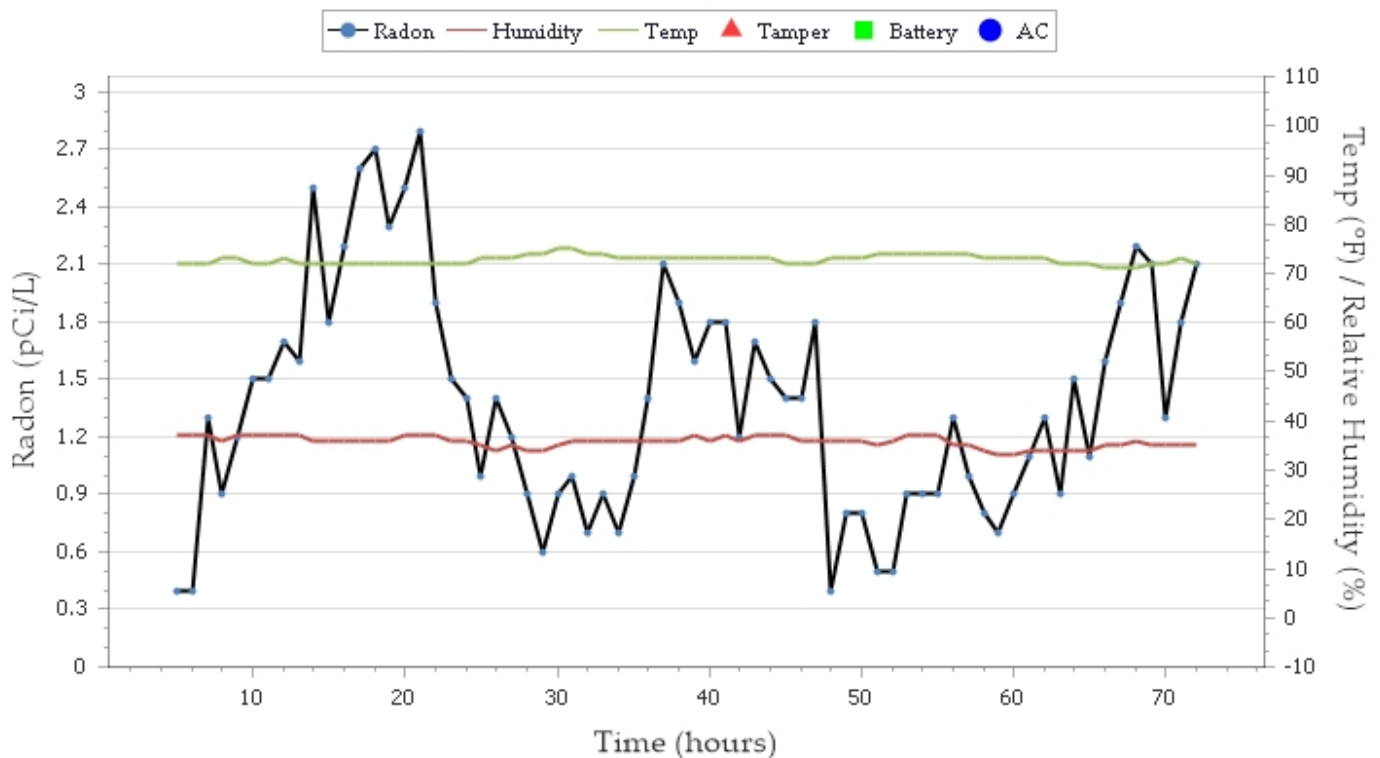
Test Start Date/Time: Friday, April 27, 2018 // 12:00 PM
Test End Date/Time: Monday, April 30, 2018 // 1:30 AM
Location of Instrument: Room 1

Notes:

TEST RESULTS:

Average: 1.3 pCi/L

Test ID# 80022



Tamara C Linde

5/3/18

Tamara Linde

Date

Certification #:

License 1:

CCB 180537/ CASCARI927C1

License 2:

NRPP 108946RT, 108953RT



INTERVAL REPORT:

Hour	T	B	AC	pCi/L	Temp	Humd	Alpha
1				0.8	72	38	26
2				1.0	72	38	32
3				0.7	72	38	24
4				0.1	72	38	6
5				0.4	72	37	15
6				0.4	72	37	15
7				1.3	72	37	41
8				0.9	73	36	28
9				1.2	73	37	40
10				1.5	72	37	48
11				1.5	72	37	49
12				1.7	73	37	53
13				1.6	72	37	50
14				2.5	72	36	78
15				1.8	72	36	57
16				2.2	72	36	71
17				2.6	72	36	81
18				2.7	72	36	86
19				2.3	72	36	73
20				2.5	72	37	78
21				2.8	72	37	87
22				1.9	72	37	61
23				1.5	72	36	49
24				1.4	72	36	44
25				1.0	73	35	34
26				1.4	73	34	46
27				1.2	73	35	38
28				0.9	74	34	30
29				0.6	74	34	21
30				0.9	75	35	28
31				1.0	75	36	32
32				0.7	74	36	23
33				0.9	74	36	31
34				0.7	73	36	23
35				1.0	73	36	32
36				1.4	73	36	44
37				2.1	73	36	68
38				1.9	73	36	59
39				1.6	73	37	50
40				1.8	73	36	56
41				1.8	73	37	57
42				1.2	73	36	40
43				1.7	73	37	55
44				1.5	73	37	48
45				1.4	72	37	46
46				1.4	72	36	44
47				1.8	72	36	57
48				0.4	73	36	15
49				0.8	73	36	27
50				0.8	73	36	26
51				0.5	74	35	16
52				0.5	74	36	17
53				0.9	74	37	31
54				0.9	74	37	28
55				0.9	74	37	30
56				1.3	74	35	43
57				1.0	74	35	32

Tamara Linde
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Fax: 503-281-6170



58	0.8	73	34	25	
59	0.7	73	33	24	
60	0.9	73	33	31	
61	1.1	73	34	35	
62	1.3	73	34	41	
63	0.9	72	34	31	
64	1.5	72	34	49	
65	1.1	72	34	37	
66	1.6	71	35	52	
67	1.9	71	35	60	
68	2.2	71	36	69	
69	2.1	72	35	68	
70	1.3	72	35	43	
71	1.8	73	35	58	
72	2.1	72	35	67	
Minimum:	0.4 pCi/L	Maximum:	2.8 pCi/L	Average:	1.3 pCi/L

Tamara C Linde

5/3/18

Tamara Linde

Date

Certification #:

License 1:

CCB 180537/ CASCARI927C1

License 2:

NRPP 108946RT, 108953RT



**CERTIFICATE OF CALIBRATION
RadStar RS800 Continuous Monitor**

This instrument has been calibrated in accordance with the procedures set forth by the manufacturer.
Please retain this certificate for your records

Cal Date: 3-30-18 Last Cal Date: 04/27/17 Next Cal Date: 3-30-19
Device Serial Number: 2306 Device Type: RS800
Device Status: Passed X Failed Radon Chamber: TC 103 B

NRPP Chamber#TC103	Radon Gas Concentration: <u>20.5 pCi/l</u>
CRM Serial Numbers: <u>4183 2173 2178</u>	
Chamber Temperature: <u>72.5 °F</u>	Chamber Humidity: <u>45.8 %RH</u>
Start Chamber Exposure: <u>10/11/17 09:00</u>	Stop Chamber Exposure: <u>10/13/17 09:00</u>

Calibration Number (as found, if applicable) 330 Calib#=(10240/(Hourly Counts/pCi/l))

Calibration Number (Final) 330 Calibrated By: [Signature]

RadonAway 3 Saber Way Ward Hill, Massachusetts 01835 978-521-3703

This RadStar Continuous Radon Monitor has been calibrated by the Manufacturer using a standard operating procedure for the calibration of the RS800, TP010 Rev F. This procedure provides for the following performance checks:

- System Functional Checks
- Battery Check
- Back Ground Check in Nitrogen 0.1 pCi/l 15 cph
- Chamber Exposure in known Radon Gas Concentration
- Adjustment to Calibration Number, if necessary
- Adjustment to Background, if necessary
- Verification Chamber Exposure, if necessary

(As Tested Background is Integrated into Instrument Calculation Program, Do Not Adjust Readings by Background)

The manufacturer, RadonAway performs quarterly inter-comparisons with a Secondary Chamber

NRPP Device Code 476 Device group 18 USEPA Verified

Radon Measurement Specialist:

NRSB #6SS0002, NRPP #100842RT

[Signature]

The RadStar RS800 is distributed by Accustar Labs 888-580-9596