



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

Vernon Elementary School

(C-65190)

2044 NE Killingsworth St., Portland, OR 97211

April 19, 2018



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

Purpose

Initial short-term testing was performed March 7, 2016 to March 10, 2016 by PBS Engineering and Environmental Inc. Testing indicated 4.7 pCi/L in the kitchen of the facility. PBS performed additional testing starting in October 2016 to May 2017 as a confirmation long-term test to determine if mitigation was needed. The result of this 7 month test was 14 pCi/L in the kitchen. Cascade Radon was hired to diagnose the kitchen 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.



A Festo AMG Fury model fan is utilized when a system is required to move a high cubic feet per minute of air. The mitigation fan is mounted in a small fenced courtyard adjacent to a storage room where the initial suction point is located. The vent pipe continues up the side of to building to above the roofline.



Initial suction in a storage/kiln room adjacent to the fenced courtyard and exterior fan location. Schedule 80 piping was used at the suction points to withstand accidental impacts.



Vent pipe routing from the kiln room to the custodian closet next to the cafeteria and kitchen.



Vent pipe routing in the custodian closet.



This suction point is located in a custodial closet adjacent to cafeteria. 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.

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

Accurate Concrete Cutting
6816 NE 40th Ave.
Vancouver, WA 98661
lj@accurate-concrete-cut.com
CCB191788
W.A. Contr. License# ACCURCC153M2



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

April 19, 2018
C-65190

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

RE: Vernon Elementary School
2044 NE Killingsworth St.
Portland, OR 97211

Effective: February 23, 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:

Vernon Elementary
2044 NE Killingsworth St
Portland, OR 97211

Portland Public Schools

Test Start Date/Time: Friday, February 16, 2018 // 11:00 AM

Test End Date/Time: Monday, February 19, 2018 // 9:45 AM

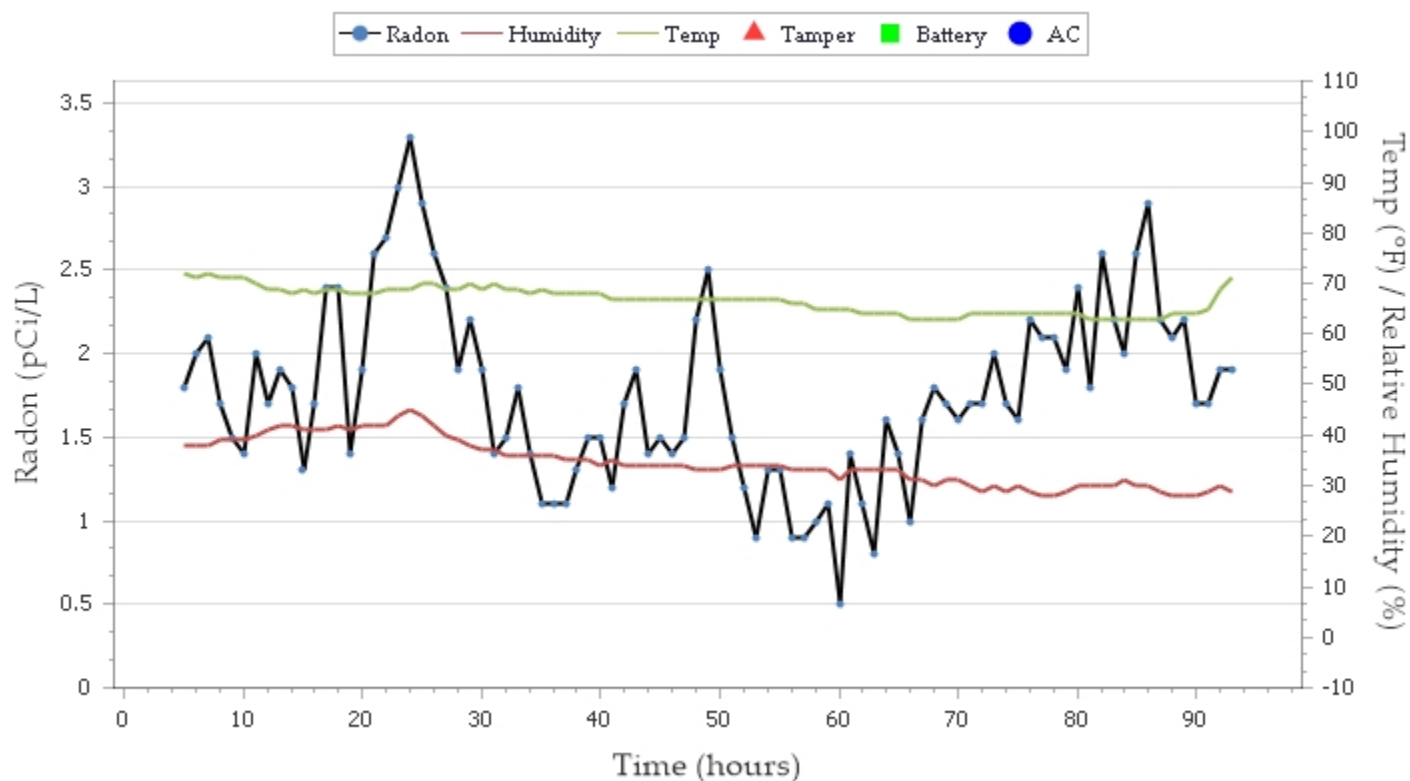
Location of Instrument: Kitchen

Notes:

TEST RESULTS:

Average: 1.7 pCi/L

Test ID# 80046



Tamara C Linde

2/23/18

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	67	48	1
2				0.7	71	42	23
3				1.1	72	39	36
4				0.9	72	39	30
5				1.8	72	38	59
6				2.0	71	38	64
7				2.1	72	38	68
8				1.7	71	39	56
9				1.5	71	39	48
10				1.4	71	39	45
11				2.0	70	40	65
12				1.7	69	41	54
13				1.9	69	42	61
14				1.8	68	42	57
15				1.3	69	41	43
16				1.7	68	41	56
17				2.4	69	41	77
18				2.4	69	42	76
19				1.4	68	41	46
20				1.9	68	42	62
21				2.6	68	42	84
22				2.7	69	42	87
23				3.0	69	44	94
24				3.3	69	45	105
25				2.9	70	44	93
26				2.6	70	42	84
27				2.4	69	40	76
28				1.9	69	39	61
29				2.2	70	38	71
30				1.9	69	37	60
31				1.4	70	37	44
32				1.5	69	36	50
33				1.8	69	36	57
34				1.4	68	36	44
35				1.1	69	36	35
36				1.1	68	36	37
37				1.1	68	35	37
38				1.3	68	35	43
39				1.5	68	35	47
40				1.5	68	34	50
41				1.2	67	35	40
42				1.7	67	34	56
43				1.9	67	34	60
44				1.4	67	34	46
45				1.5	67	34	50
46				1.4	67	34	44
47				1.5	67	34	47
48				2.2	67	33	70
49				2.5	67	33	80
50				1.9	67	33	61
51				1.5	67	34	48
52				1.2	67	34	39
53				0.9	67	34	30
54				1.3	67	34	42
55				1.3	67	34	41
56				0.9	66	33	30
57				0.9	66	33	31



58	1.0	65	33	34
59	1.1	65	33	35
60	0.5	65	31	16
61	1.4	65	33	46
62	1.1	64	33	37
63	0.8	64	33	27
64	1.6	64	33	53
65	1.4	64	33	45
66	1.0	63	31	33
67	1.6	63	31	52
68	1.8	63	30	57
69	1.7	63	31	54
70	1.6	63	31	52
71	1.7	64	30	56
72	1.7	64	29	56
73	2.0	64	30	65
74	1.7	64	29	55
75	1.6	64	30	51
76	2.2	64	29	70
77	2.1	64	28	68
78	2.1	64	28	68
79	1.9	64	29	62
80	2.4	64	30	76
81	1.8	63	30	58
82	2.6	63	30	83
83	2.2	63	30	70
84	2.0	63	31	65
85	2.6	63	30	84
86	2.9	63	30	92
87	2.2	63	29	72
88	2.1	64	28	66
89	2.2	64	28	70
90	1.7	64	28	55
91	1.7	65	29	56
92	1.9	69	30	62
93	1.9	71	29	60

Minimum: 0.5 pCi/L **Maximum:** 3.3 pCi/L **Average:** 1.7 pCi/L

Tamara C Linde

2/23/18

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: 2396 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</u> <u>2173</u> <u>2178</u>	
Chamber Temperature: <u>69.0</u> °F	Chamber Humidity: <u>31.7</u> %RH
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 12 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

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



TEST DETAILS:

Vernon Elementary
2044 NE Killingsworth St
Portland, OR 97211

Portland Public Schools
503-916-6345

Test Start Date/Time: Friday, February 16, 2018 // 11:00 AM

Test End Date/Time: Monday, February 19, 2018 // 9:45 AM

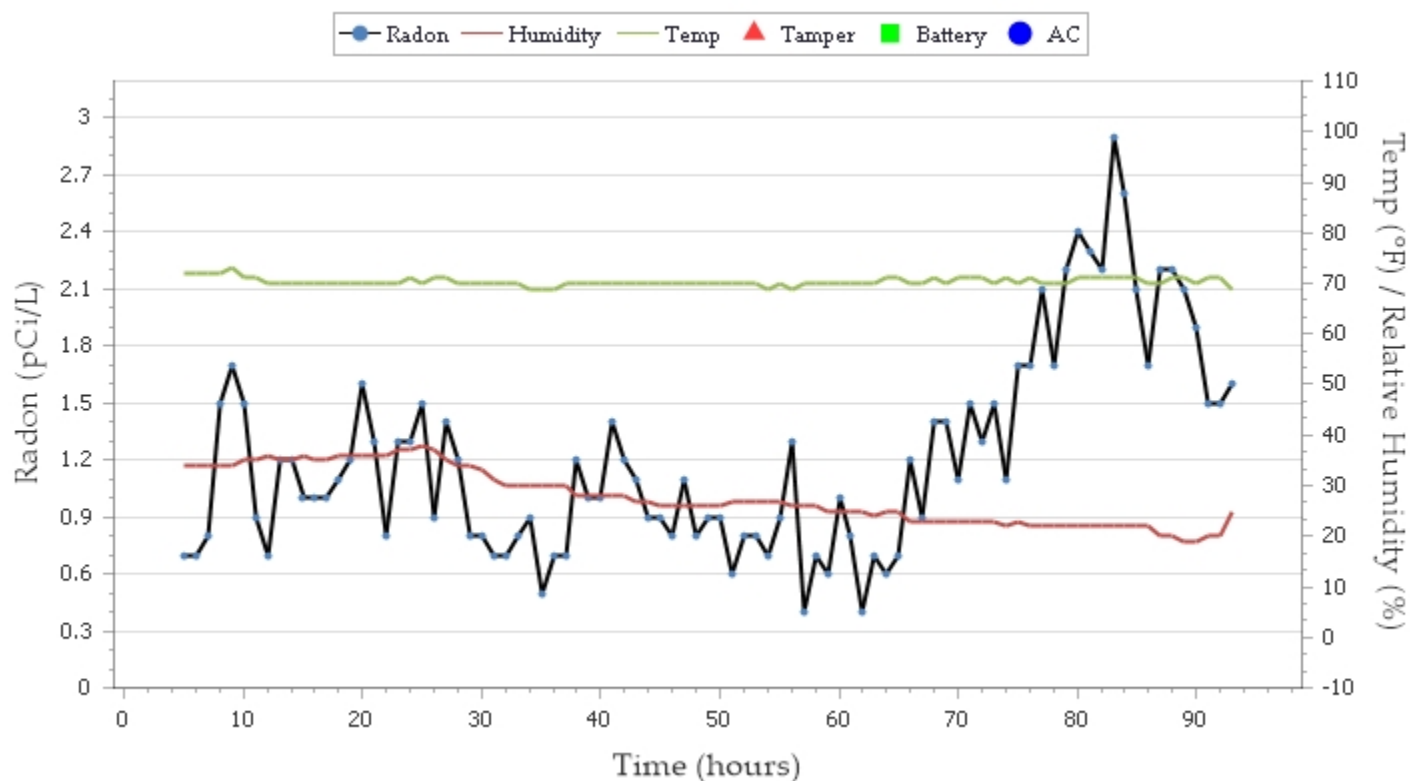
Location of Instrument: Cafeteria

Notes:

TEST RESULTS:

Average: 1.2 pCi/L

Test ID# 80039



Tamara C Linde

2/23/18

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				0.4	69	44	14
2				0.4	70	38	15
3				0.6	71	35	19
4				0.7	72	35	25
5				0.7	72	34	23
6				0.7	72	34	22
7				0.8	72	34	26
8				1.5	72	34	49
9				1.7	73	34	54
10				1.5	71	35	48
11				0.9	71	35	31
12				0.7	70	36	22
13				1.2	70	35	38
14				1.2	70	35	38
15				1.0	70	36	34
16				1.0	70	35	32
17				1.0	70	35	32
18				1.1	70	36	37
19				1.2	70	36	40
20				1.6	70	36	51
21				1.3	70	36	42
22				0.8	70	36	28
23				1.3	70	37	41
24				1.3	71	37	43
25				1.5	70	38	49
26				0.9	71	37	31
27				1.4	71	35	45
28				1.2	70	34	40
29				0.8	70	34	28
30				0.8	70	33	27
31				0.7	70	31	22
32				0.7	70	30	22
33				0.8	70	30	28
34				0.9	69	30	30
35				0.5	69	30	16
36				0.7	69	30	24
37				0.7	70	30	22
38				1.2	70	28	40
39				1.0	70	28	33
40				1.0	70	28	34
41				1.4	70	28	44
42				1.2	70	28	40
43				1.1	70	27	37
44				0.9	70	27	30
45				0.9	70	26	31
46				0.8	70	26	26
47				1.1	70	26	35
48				0.8	70	26	27
49				0.9	70	26	30
50				0.9	70	26	31
51				0.6	70	27	20
52				0.8	70	27	28
53				0.8	70	27	26
54				0.7	69	27	25
55				0.9	70	27	31
56				1.3	69	26	41
57				0.4	70	26	15



58	0.7	70	26	22
59	0.6	70	25	19
60	1.0	70	25	34
61	0.8	70	25	26
62	0.4	70	25	14
63	0.7	70	24	22
64	0.6	71	25	20
65	0.7	71	25	23
66	1.2	70	23	39
67	0.9	70	23	29
68	1.4	71	23	45
69	1.4	70	23	44
70	1.1	71	23	36
71	1.5	71	23	47
72	1.3	71	23	42
73	1.5	70	23	50
74	1.1	71	22	36
75	1.7	70	23	54
76	1.7	71	22	55
77	2.1	70	22	68
78	1.7	70	22	55
79	2.2	70	22	71
80	2.4	71	22	77
81	2.3	71	22	74
82	2.2	71	22	69
83	2.9	71	22	93
84	2.6	71	22	83
85	2.1	71	22	68
86	1.7	70	22	55
87	2.2	70	20	69
88	2.2	71	20	69
89	2.1	71	19	67
90	1.9	70	19	60
91	1.5	71	20	48
92	1.5	71	20	47
93	1.6	69	25	51

Minimum: 0.4 pCi/L **Maximum:** 2.9 pCi/L **Average:** 1.2 pCi/L

Tamara C Linde

2/23/18

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: 5-5-17 Last Cal Date: _____ Next Cal Date: 5-5-18
Device Serial Number: 2368 Device Type: RS800
Device Status: Passed ☒ Failed ☐

NRPP Chamber#TC103	Radon Gas Concentration: <u>20.1 pCi/l</u>
Rad7 Serial Numbers: <u>0356</u> <u>0352</u>	
Chamber Temperature: <u>70.6</u> °F	Chamber Humidity: <u>48.1</u> %RH
Start Chamber Exposure: <u>08/15/16 09:00</u>	Stop Chamber Exposure: <u>08/17/16 09:00</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 0.0 pCi/l 6 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