PBS | Engineering + Environmental

December 22, 2016

Joe Crelier
Director of Risk Management
Portland Public Schools
501 N Dixon Street
Portland, Oregon 97227

Via email: jcrelier@pps.net

Regarding: Continuous Radon Monitor Measurement Report
Two Locations at Whitman
Portland, Oregon
PBS Project No. 06500.618, Phase 0002

Dear Mr. Crelier:

From December 19 to December 22, 2016, PBS Engineering and Environmental Inc. (PBS) conducted continuous radon monitor (CRM) measurements at Whitman Elementary School in two unique locations. These measurements were performed in response to elevated radon levels identified during previous short term radon monitoring. Locations tested are identified in the following table:

Site	Building	Room
Whitman	Main	15
Whitman	Main	18

This testing was performed with Sun Nuclear Model 1027 continuous radon monitors, EPA and Industry approved testing devices. CRM monitors were placed on desk or table tops in rooms identified for testing. Devices were placed on the morning of December 19, 2016, and collected the afternoon of December 22, 2016. The devices recorded radon levels and tilts (an anti-tampering indication) data for 74 hours. Closed building conditions were not verified during the course of this testing.

The following table summarizes radon data collected:

Test Location	Start Time	Stop Time	Total Time*	Average Radon Concentration (pCi/L = picocuries per liter)
Whitman - 15	12/19/2016 9:52:00 AM	12/22/2016 12:41:00 PM	74 Hours	1.8 pCi/l
Whitman - 18	12/19/2016 9:50:00 AM	12/22/2016 12:40:00 PM	74 Hours	1.5 pCi/l

For more detail, please see the Report Graph With Detailed Hourly Data for each test location.

4412 SW Corbett Avenue, Portland, OR 97239
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Please feel free to contact me at 503.417.7694 or chris.boyce@pbsenv.com with any questions or comments.

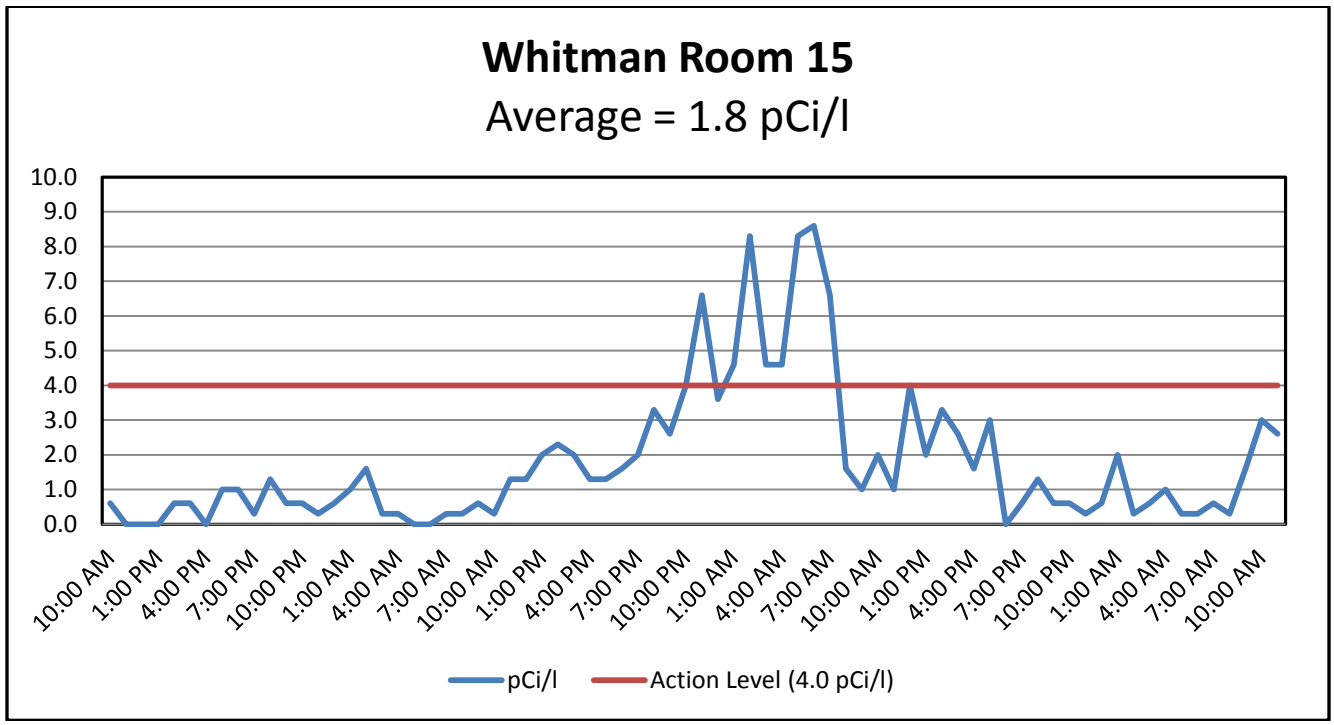
Sincerely,
PBS Engineering and Environmental Inc.

Chris Boyce
Project Manager

Attachments: Report Graph With Detailed Hourly Data (x2)
CRM Statement of Calibration (x2)
(Serial No.: 1407187, 1407188)

PBS | Engineering + Environmental

Unit Type: Sun Nuclear Model 1027
Serial Number: 1407188



Date:	Time:	Radon (pCi/l)
December 19, 2016	10:00 AM	0.6
December 19, 2016	11:00 AM	0.0
December 19, 2016	12:00 PM	0.0
December 19, 2016	1:00 PM	0.0
December 19, 2016	2:00 PM	0.6
December 19, 2016	3:00 PM	0.6
December 19, 2016	4:00 PM	0.0
December 19, 2016	5:00 PM	1.0
December 19, 2016	6:00 PM	1.0
December 19, 2016	7:00 PM	0.3
December 19, 2016	8:00 PM	1.3
December 19, 2016	9:00 PM	0.6
December 19, 2016	10:00 PM	0.6

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December 19, 2016	11:00 PM	0.3
December 20, 2016	12:00 AM	0.6
December 20, 2016	1:00 AM	1.0
December 20, 2016	2:00 AM	1.6
December 20, 2016	3:00 AM	0.3
December 20, 2016	4:00 AM	0.3
December 20, 2016	5:00 AM	0.0
December 20, 2016	6:00 AM	0.0
December 20, 2016	7:00 AM	0.3
December 20, 2016	8:00 AM	0.3
December 20, 2016	9:00 AM	0.6
December 20, 2016	10:00 AM	0.3
December 20, 2016	11:00 AM	1.3
December 20, 2016	12:00 PM	1.3
December 20, 2016	1:00 PM	2.0
December 20, 2016	2:00 PM	2.3
December 20, 2016	3:00 PM	2.0
December 20, 2016	4:00 PM	1.3
December 20, 2016	5:00 PM	1.3
December 20, 2016	6:00 PM	1.6
December 20, 2016	7:00 PM	2.0
December 20, 2016	8:00 PM	3.3
December 20, 2016	9:00 PM	2.6
December 20, 2016	10:00 PM	4.0
December 20, 2016	11:00 PM	6.6
December 21, 2016	12:00 AM	3.6
December 21, 2016	1:00 AM	4.6
December 21, 2016	2:00 AM	8.3
December 21, 2016	3:00 AM	4.6
December 21, 2016	4:00 AM	4.6
December 21, 2016	5:00 AM	8.3
December 21, 2016	6:00 AM	8.6
December 21, 2016	7:00 AM	6.6
December 21, 2016	8:00 AM	1.6
December 21, 2016	9:00 AM	1.0
December 21, 2016	10:00 AM	2.0
December 21, 2016	11:00 AM	1.0
December 21, 2016	12:00 PM	4.0
December 21, 2016	1:00 PM	2.0
December 21, 2016	2:00 PM	3.3
December 21, 2016	3:00 PM	2.6

December 21, 2016	4:00 PM	1.6
December 21, 2016	5:00 PM	3.0
December 21, 2016	6:00 PM	0.0
December 21, 2016	7:00 PM	0.6
December 21, 2016	8:00 PM	1.3
December 21, 2016	9:00 PM	0.6
December 21, 2016	10:00 PM	0.6
December 21, 2016	11:00 PM	0.3
December 22, 2016	12:00 AM	0.6
December 22, 2016	1:00 AM	2.0
December 22, 2016	2:00 AM	0.3
December 22, 2016	3:00 AM	0.6
December 22, 2016	4:00 AM	1.0
December 22, 2016	5:00 AM	0.3
December 22, 2016	6:00 AM	0.3
December 22, 2016	7:00 AM	0.6
December 22, 2016	8:00 AM	0.3
December 22, 2016	9:00 AM	1.6
December 22, 2016	10:00 AM	3.0
December 22, 2016	11:00 AM	2.6

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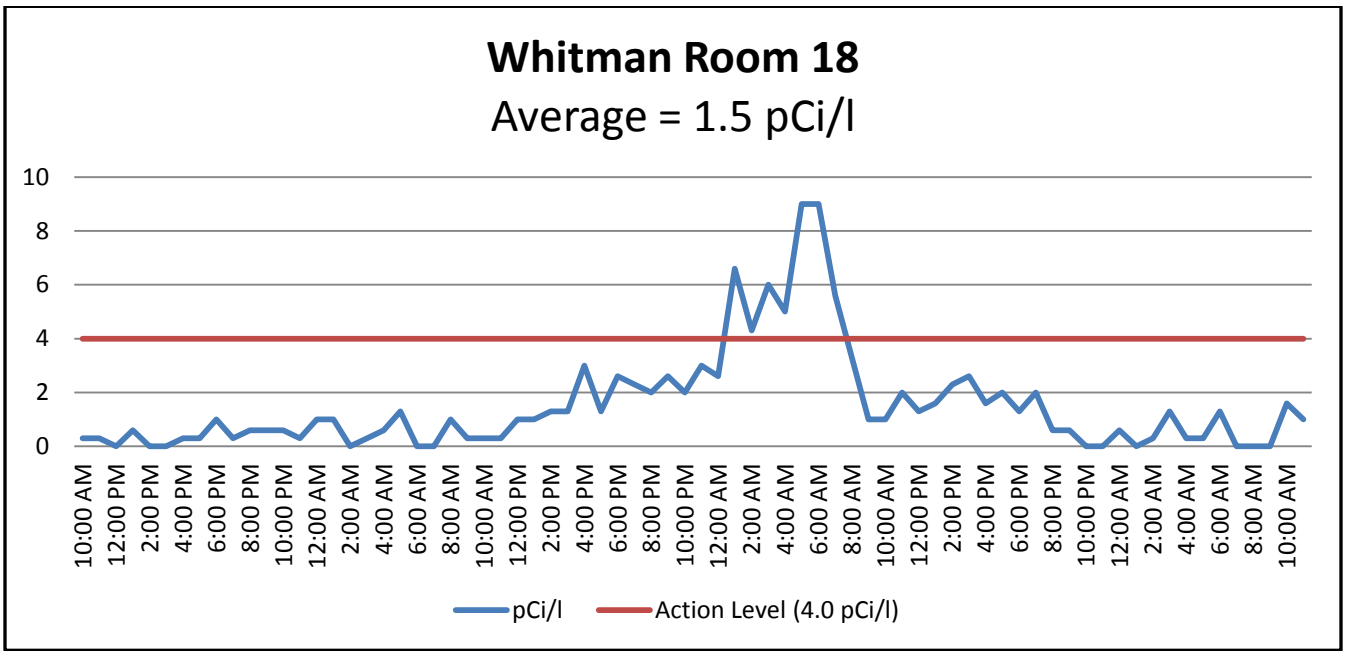
Unit Type: Sun Nuclear Model 1027
Serial Number: 1407187



Date:	Time:	Radon (pCi/l)
December 19, 2016	10:00 AM	0.3
December 19, 2016	11:00 AM	0.3
December 19, 2016	12:00 PM	0
December 19, 2016	1:00 PM	0.6
December 19, 2016	2:00 PM	0
December 19, 2016	3:00 PM	0
December 19, 2016	4:00 PM	0.3
December 19, 2016	5:00 PM	0.3
December 19, 2016	6:00 PM	1
December 19, 2016	7:00 PM	0.3
December 19, 2016	8:00 PM	0.6
December 19, 2016	9:00 PM	0.6
December 19, 2016	10:00 PM	0.6
December 19, 2016	11:00 PM	0.3

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December 20, 2016	12:00 AM	1
December 20, 2016	1:00 AM	1
December 20, 2016	2:00 AM	0
December 20, 2016	3:00 AM	0.3
December 20, 2016	4:00 AM	0.6
December 20, 2016	5:00 AM	1.3
December 20, 2016	6:00 AM	0
December 20, 2016	7:00 AM	0
December 20, 2016	8:00 AM	1
December 20, 2016	9:00 AM	0.3
December 20, 2016	10:00 AM	0.3
December 20, 2016	11:00 AM	0.3
December 20, 2016	12:00 PM	1
December 20, 2016	1:00 PM	1
December 20, 2016	2:00 PM	1.3
December 20, 2016	3:00 PM	1.3
December 20, 2016	4:00 PM	3
December 20, 2016	5:00 PM	1.3
December 20, 2016	6:00 PM	2.6
December 20, 2016	7:00 PM	2.3
December 20, 2016	8:00 PM	2
December 20, 2016	9:00 PM	2.6
December 20, 2016	10:00 PM	2
December 20, 2016	11:00 PM	3
December 21, 2016	12:00 AM	2.6
December 21, 2016	1:00 AM	6.6
December 21, 2016	2:00 AM	4.3
December 21, 2016	3:00 AM	6
December 21, 2016	4:00 AM	5
December 21, 2016	5:00 AM	9
December 21, 2016	6:00 AM	9
December 21, 2016	7:00 AM	5.6
December 21, 2016	8:00 AM	3.3
December 21, 2016	9:00 AM	1
December 21, 2016	10:00 AM	1
December 21, 2016	11:00 AM	2
December 21, 2016	12:00 PM	1.3
December 21, 2016	1:00 PM	1.6
December 21, 2016	2:00 PM	2.3
December 21, 2016	3:00 PM	2.6
December 21, 2016	4:00 PM	1.6

December 21, 2016	5:00 PM	2
December 21, 2016	6:00 PM	1.3
December 21, 2016	7:00 PM	2
December 21, 2016	8:00 PM	0.6
December 21, 2016	9:00 PM	0.6
December 21, 2016	10:00 PM	0
December 21, 2016	11:00 PM	0
December 22, 2016	12:00 AM	0.6
December 22, 2016	1:00 AM	0
December 22, 2016	2:00 AM	0.3
December 22, 2016	3:00 AM	1.3
December 22, 2016	4:00 AM	0.3
December 22, 2016	5:00 AM	0.3
December 22, 2016	6:00 AM	1.3
December 22, 2016	7:00 AM	0
December 22, 2016	8:00 AM	0
December 22, 2016	9:00 AM	0
December 22, 2016	10:00 AM	1.6
December 22, 2016	11:00 AM	1

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STATEMENT OF CALIBRATION

Client Information:
PBS Engineering & Environmental Inc.
4412 Southwest Corbett Avenue
Portland, Oregon 97239
Attn: Chris Boyce

BMI Control Information:
Statement No.: 17581707
Issue Date: July 25, 2016
Calibrated on: July 25, 2016
Calibrated by: JPN
Calibration site: BMI Dayton

Description of Continuous Radon Monitor:
Manufacturer: Sun Nuclear **Model:** 1027 **Serial No.:** 1407187

The monitor was found to be in good physical condition.

Initial Checks:

Visual Inspection	Batteries	Power Adapter	High Voltage	Software Version
Ok	Replaced	11.1 VDC (Ok)	1130 VDC (Ok)	N5A

Result of Background Exposure (16 hr): 0.0 pCi/liter

Radon Chamber Conditions:

Exposure Duration	Radon Concentration	Relative Humidity	Temperature
48 hr	25.8 ± 0.5 pCi/liter	49.9 ± 0.5 %	70.0 ± 0.1 °F

The values listed above for the radon concentration, relative humidity and temperature are the means and standard deviations of the hourly average measurements of these parameters. The calibration of Bowser-Morner's Radon Monitoring System is maintained through comparisons with the USEPA radon laboratory in Las Vegas using a NIST traceable radium standard. The estimated total uncertainty of Bowser-Morner's average chamber concentration is ± 6.4% at the 95% confidence level.

Results of Calibration:

Average Monitor Reading	Relative Error As Received	Relative Error After Change of Calibration Factor
28.6 pCi/liter	10.9%	0.8%

Based on the results of the calibration, the monitor's internal calibration factor was changed to the most accurate available setting. The radon measurement should be multiplied by the correction factor of 0.992.

The calibration was performed using BMI procedure number 42-001.

Authorized Signature Jill P. Newton, Manager Radon Reference Lab

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RADON REFERENCE LABORATORY

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STATEMENT OF CALIBRATION

Client Information:
PBS Engineering & Environmental Inc.
4412 Southwest Corbett Avenue
Portland, Oregon 97239
Attn: Chris Boyce

BMI Control Information:
Statement No.: 17581703
Issue Date: July 25, 2016
Calibrated on: July 25, 2016
Calibrated by: JPN
Calibration site: BMI Dayton

Description of Continuous Radon Monitor:
Manufacturer: Sun Nuclear **Model:** 1027 **Serial No.:** 1407188

The monitor was found to be in good physical condition.

Initial Checks:

Visual Inspection	Batteries	Power Adapter	High Voltage	Software Version
Ok	Replaced	11.1 VDC (Ok)	1103 VDC (Ok)	N5A

Result of Background Exposure (16 hr): 0.1 pCi/liter

Radon Chamber Conditions:

Exposure Duration	Radon Concentration	Relative Humidity	Temperature
48 hr	25.8 ± 0.5 pCi/liter	49.9 ± 0.5 %	70.0 ± 0.1 °F

The values listed above for the radon concentration, relative humidity and temperature are the means and standard deviations of the hourly average measurements of these parameters. The calibration of Bowser-Morner's Radon Monitoring System is maintained through comparisons with the USEPA radon laboratory in Las Vegas using a NIST traceable radium standard. The estimated total uncertainty of Bowser-Morner's average chamber concentration is ± 6.4% at the 95% confidence level.

Results of Calibration:

Average Monitor Reading	Relative Error As Received	Relative Error After Change of Calibration Factor
27.9 pCi/liter	7.8%	-2.1%

Based on the results of the calibration, the monitor's internal calibration factor was changed to the most accurate available setting. The background value listed above should be subtracted from the radon measurement and the result multiplied by the correction factor of 1.021.

The calibration was performed using BMI procedure number 42-001.

Authorized Signature Jill P. Newton, Manager Radon Reference Lab

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