

Coleman Creek Consulting, Inc.

INITIAL RADON AIR SAMPLING OF HENLEY ELEMENTARY SCHOOL FOR KLAMATH COUNTY SCHOOL DISTRICT 2845 GREENSPRINGS DRIVE, KLAMATH FALLS, OREGON

INTRODUCTION

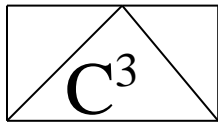
Coleman Creek Consulting, Inc. (CCC) was retained by Klamath County School District (KCS D) to perform radon air sampling as required by State Statute ORS 332.166-167. KCS D is required to perform complete radon air testing of District owned and occupied facility buildings by January 1, 2021. The purpose of the initial radon air sampling was to collect radon air samples from all regularly occupied rooms within school buildings, with the exception of storage, restrooms, kitchen, locker rooms, and compare analytical results with the EPA recommended “Action Level” concentration for radon. Short-term radon air sampling was selected for this project.

RADON INFORMATION AND HEALTH EFFECTS

Radon is a naturally occurring radioactive gas that is produced by natural deposits of uranium in soil, and is found world-wide. Uranium naturally decays into Radium, and Radium can produce Radon gas. Radon gas can travel up through soil and enter buildings in contact with soil. Radon gas entering a building may become concentrated in the lowest part of the building in areas with little fresh air mixing. If radon is inhaled into lungs, particle decay processes can release radiation, potentially damaging lung tissue, and over time leading to lung cancer. The Environmental Protection Agency (EPA) has estimated that Radon is the primary cause of lung cancer among non-smokers. EPA recommends reducing the concentration of Radon in indoor environments to below the Action Level of 4.0 pCi/L (pico-curies per Liter of air).

INITIAL RADON AIR SAMPLING

David W. Fawcett of CCC trained KCS D employees, including school custodians in radon sampling procedures December 4, 2020. Carloyn Hall, Henley Elementary School (HES) Custodian placed radon air test kits in the HES building at the beginning of the day, December 7, 2020. A total of 44 locations were sampled according to guidelines established in the Oregon Health Authority (OHA) “Testing for Elevated Radon in Oregon Schools, A Protocol and Plan”, dated 2016. Ms. Hall returned to HES December 10, 2020, at the beginning of the day, and collected all radon test kits placed for sampling. One of the test kits (Serial #9418405) was not found upon collection. See Radon Air Sample Record Sheets (pages 4-5) for locations of all areas sampled. All samples collected were packaged by Mr. Fawcett, and sent overnight to Air Chek, Inc., in Mills River, North Carolina for analysis.



Coleman Creek Consulting, Inc.

LABORATORY ANALYSIS RESULTS

The radon air test kit samples collected from HES building was reported ranging from <0.3 to 0.7 pCi/L (picocuries per liter of air). A complete listing of laboratory results and locations is found in the Air Chek, Inc. Laboratory Analysis Report in Appendix A.

QUALITY ASSURANCE

To ensure that test results are reliable and accurate, quality assurance samples, including duplicate test kits (placed in same room), blank test kits (not sampled at all), and spike sampling (exposing test kits to a measured amount of radon prior to laboratory submission) were all employed during Radon sampling. The number of duplicate, blank, and spike test kits utilized during sampling followed OHA testing protocol guidelines.

DUPLICATE TEST KITS

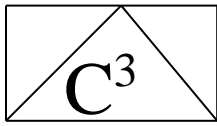
A total of four duplicate test kits were placed during initial test kit sampling. See duplicate designation on the Radon Air Sample Record Sheets. The four duplicate test kit sets were all reported with the following paired concentrations <0.3/<0.3 pCi/L, <0.3/missing pCi/L, <0.3/0.5 pCi/L, and <0.3/0.7 pCi/L. When compared with matched pair or “duplicate” test kits, one was within the expected range of 0-25% Relative Percent Difference, one duplicate set had a missing pair, and the last two were reported <2.0 pCi/L, indicating the results were too low to apply the Relative Percent Difference test.

BLANK TEST KITS

Two blank test kits were submitted to Air Chek with the other HES Radon test kits. Both blank test kits were reported with <0.3 pCi/L. All blank tests were reported none detected for Radon.

SPIKE TEST KIT ANALYSIS

One test kit was submitted to Bowser-Morner for Radon Spike processing. The test kit was exposed to 25.7 pCi/L for three days from December 4 through December 7, 2020. See Appendix B for the Bowser-Morner Radon Exposure test information. The “Spiked” test kit was submitted to Air Chek for analysis along with the other TES Radon test kits. The Spike sample was reported with 17.3 pCi/L. The relative percentage error was calculated to be -33%, in the out of control range (greater than -30%). The Spike lab Bowser-Moerner was contacted, and did not report any unusual occurrence during Spike activities. The analytical lab (Air Chek) was contacted, and no unusual occurrences were noted during test kit analysis. Spike test kits were shipped twice during cold temperatures, and that may have had an effect on the Spike sample results. In addition, the complete KCS D Spike sample results exhibit a rather uniform grouping, with results ranging from 13.0 to 17.3 pCi/L, all below the Spiked concentration of 25.7 pCi/L. The Spike sample is identified as Serial #9418418 on the Laboratory Analysis Report in Appendix A.



RADON RESULTS AND FUTURE ACTIONS

The 2016 OHA Testing of Elevated Radon in Oregon Schools Protocol and Plan describes future steps to take based on initial Radon sample results. The following is a description of recommended actions based on Radon concentrations reported.

1. If <2.0 pCi/L Radon is reported, ORS 332.166-167 requires Radon re-test every 10 years.
2. If 2.0 pCi/L to 4.0 pCi/L Radon is reported, consider lowering the Radon concentration in the room.
3. If 4.0 pCi/L to 8.0 pCi/L Radon is reported, perform follow-up Radon measurement in the affected room(s) using a long-term test. Conduct over the school year as much as possible. If that result is equal to or greater than 4.0 pCi/L, Radon concentration in the room should be lowered.
4. If equal to or greater than 8.0 pCi/L Radon is reported, conduct a second short-term test and average the result with the initial Radon result. If the average result of the two short-term tests is equal to or greater than equal to or greater than 4.0 pCi/L, Radon concentration in the room should be lowered.

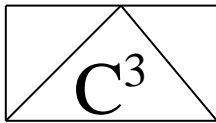
DISCUSSION OF INTIAL RADON SAMPLING RESULTS

The initial Radon short-term sampling in Henley Elementary School building was reported with Radon concentrations ranging from <0.3 to 0.8 pCi/L. All Radon test kit samples were reported < 2.0 pCi/L, indicating that a re-test should be performed in 10 years.

CCC appreciates the opportunity to provide initial radon air testing and consulting to Klamath County School District.

Sincerely,

David W. Fawcett
Director of Consulting Operations



Coleman Creek Consulting, Inc.

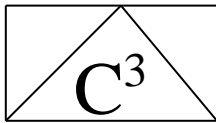
RADON AIR SAMPLE RECORD SHEET

SCHOOL: Henley Elementary School
ADDRESS: 8227 Hwy. 39
Klamath Falls, Oregon

DATE: 12-07-20/12-10-20
SAMPLER: Carolyn Hall

SERIAL #	BUILDING	Duplicate	LOCATION	START TIME	STOP TIME
9418384	Main		1 – Room 102	0640	0605
9418385	Main		2 – Room O115	0644	0607
9418386	Main		3 – Room O103	0646	0609
9418387	Main		4 – Room O104	0649	0609
9418388	Main		5 – Room O105	0651	0614
9418389	Main		6 – Room O108	0655	0615
9418390	Main		7 – Room O114	0656	0616
9418391	Main		8 – Room O113	0658	0617
9418392	Main		9 – Room O116	0701	0619
9418393	Main		10 – Room O106	0704	0623
9418394	Main	Yes	10 – Room O106	0708	0623
9418395	Main		11 – Room W100	0708	0624
9418396	Main		12 – Room W118	0719	0625
9418397	Main		13 – Room W101	0720	0627
9418398	Main		14 – Room W102	0723	0629
9418399	Main		15 – Room W103	0725	0631
9418400	Main		16 – Room W104	0729	0631
9418401	Main		17 – Room W105	0730	0631
9418402	Main		18 – Room J100	0732	0634
9418403	Main		19 – Room J101	0735	0640
9418404	Main		20 – Room J102	0736	0640
9418405	Main	Yes	20 – Room J102	0736	Gone
9418407	Main		21 – Room J103	0740	0640
9418408	Main		22 – Juniper Common	0741	1100

Comments: **Spike Sample =**
Blank Sample = 9418406



Coleman Creek Consulting, Inc.

RADON AIR SAMPLE RECORD SHEET

SCHOOL: Henley Elementary School
ADDRESS: 8227 Hwy. 39
Klamath Falls, Oregon

DATE: 12-07-20/12-10-20
SAMPLER: Carolyn Hall

SERIAL #	BUILDING	Duplicate	LOCATION	START TIME	STOP TIME
9418409	Main		23 – Room J104	0743	0645
9418410	Main		24 – Room J105	0744	0645
9418411	Main		25 – Room J106	0746	0645
9418412	Main		26 – Room W107	0748	0648
9418413	Main		27 – Room W108	0750	0648
9418414	Main		28 – Room O106	0755	0650
9418415	Main		29 – Room O107	0857	0650
9418416	Main		30 – Room A106	0800	0650
9418417	Main	Yes	30 – Room A106	0800	0650
9418419	Main		31 – Room A105	0802	0658
9418420	Main		32 – Room A104	0805	0658
9418421	Main		33 – Room A103	0806	0659
9418422	Main		34 – Aspen Common	0807	1100
9418423	Main		35 – Room A100	08009	0659
9418424	Main		36 – Room A101	0811	0659
9418425	Main		37 – Room A102	0812	0659
9418426	Main		38 – Room P102	0816	0708
9418427	Main		39 – Gym	0820	0708
9418428	Main		40 – Gym	0840	0709
9418429	Main	Yes	40 – Gym	0840	0709
9418431	Main		41 – Gym	0846	0710
9418432	Main		42 – Room	0855	0710
9418433	Main		43 – Room	0855	0710
9418434	Main		44 – Custodial Office	0856	0710

Comments: **Spike Sample = 9418418**
Blank Sample = 9418430

APPENDIX A

AIR CHEK LABORATORY ANALYSIS REPORT

Radon test result report for:**HENLEY ES****20570600**

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418384	I02	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418385	O115	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	0.5 ± 0.4	2020-12-15
9418386	O103	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418387	O104	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418388	O105	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418389	O108	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418390	O114	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418391	O113	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	0.6 ± 0.4	2020-12-15
9418392	O116	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	0.7 ± 0.4	2020-12-15
9418393	O106	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418394	O106	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418395	W100	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418396	W118	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418397	W101	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418398	W102	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418399	W103	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418400	W104	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418401	W105	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418402	J100	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.5 ± 0.4	2020-12-15
9418403	J101	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418404	J102	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418406	J102	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418407	J103	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.7 ± 0.4	2020-12-15
9418408	J-COMMON	2020-12-07 @ 8:00 am	2020-12-10 @ 11:00 am	< 0.3	2020-12-15
9418409	J104	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.7 ± 0.4	2020-12-15
9418410	J105	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.6 ± 0.5	2020-12-15
9418411	J106	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418412	W107	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418413	W108	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418414	O106	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418415	O107	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418416	A106	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418417	A106	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.5 ± 0.4	2020-12-15
9418418	A106	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	17.3 ± 1.1	2020-12-15
9418419	A105	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.7 ± 0.4	2020-12-15
9418420	A104	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418421	A103	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15

December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:

HENLEY ES

20570600

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418422	A-COMMON	2020-12-07 @ 8:00 am	2020-12-10 @ 11:00 am	< 0.3	2020-12-15
9418423	A100	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418424	A101	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418425	A102	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418426	P102	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.6 ± 0.4	2020-12-15
9418427	GYM	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418428	GYM	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418429	GYM	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	0.7 ± 0.4	2020-12-15
9418430	GYM	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418431	GYM	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418432	CAFETERIA	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418433	CAFETERIA	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	0.5 ± 0.4	2020-12-15
9418434	CUSTODIAN	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15

Air Chek 1936 Butler Bridge Rd, Mills River, NC 28759-3892 Phone: (828) 684-0893 Fax: (828) 684-8498

APPENDIX B

BOWSER-MORNER RADON SPIKE EXPOSURE

EXPOSURE IN BOWSER-MORNER RADON CHAMBER

CLIENT Coleman Creek Consulting, Inc. Job Number 198582

NOMINAL Conditions: Radon Conc 25.7 pCi/L Rel. Hum 59.0 % Temp. 70.3 F

Date Start: 12/4/20 Date Stop: 12/7/20 Date Start: _____ Date Stop: _____

Time Start: 0923 Time Stop: 0923 Time Start: _____ Time Stop: _____

(Group 1)

Device No.'s: (12) Char Bags -

9417935, 9417970, 9418007,

9418060, 9418096, 9418127,

9418163, 9418190, 9418226,

9418250, 9418286, 9418321

Device No.'s: _____

R5 Left

Date Start: ^{rem} 12/4/20 Date Stop: 12/7/20 Date Start: _____ Date Stop: _____

Time Start: 0927 Time Stop: 0927 Time Start: _____ Time Stop: _____

(Group 2)

Device No.'s: (13) Char Bags -

9418370, 9418418, 9418465, 9418500,

9418566, 9418601, 9418660,

9418695, 9418771, 9418747,

9418806, 9418846, 9418875

Device No.'s: _____

R5 Right

Date Start: _____ Date Stop: _____ Date Start: _____ Date Stop: _____

Time Start: _____ Time Stop: _____ Time Start: _____ Time Stop: _____

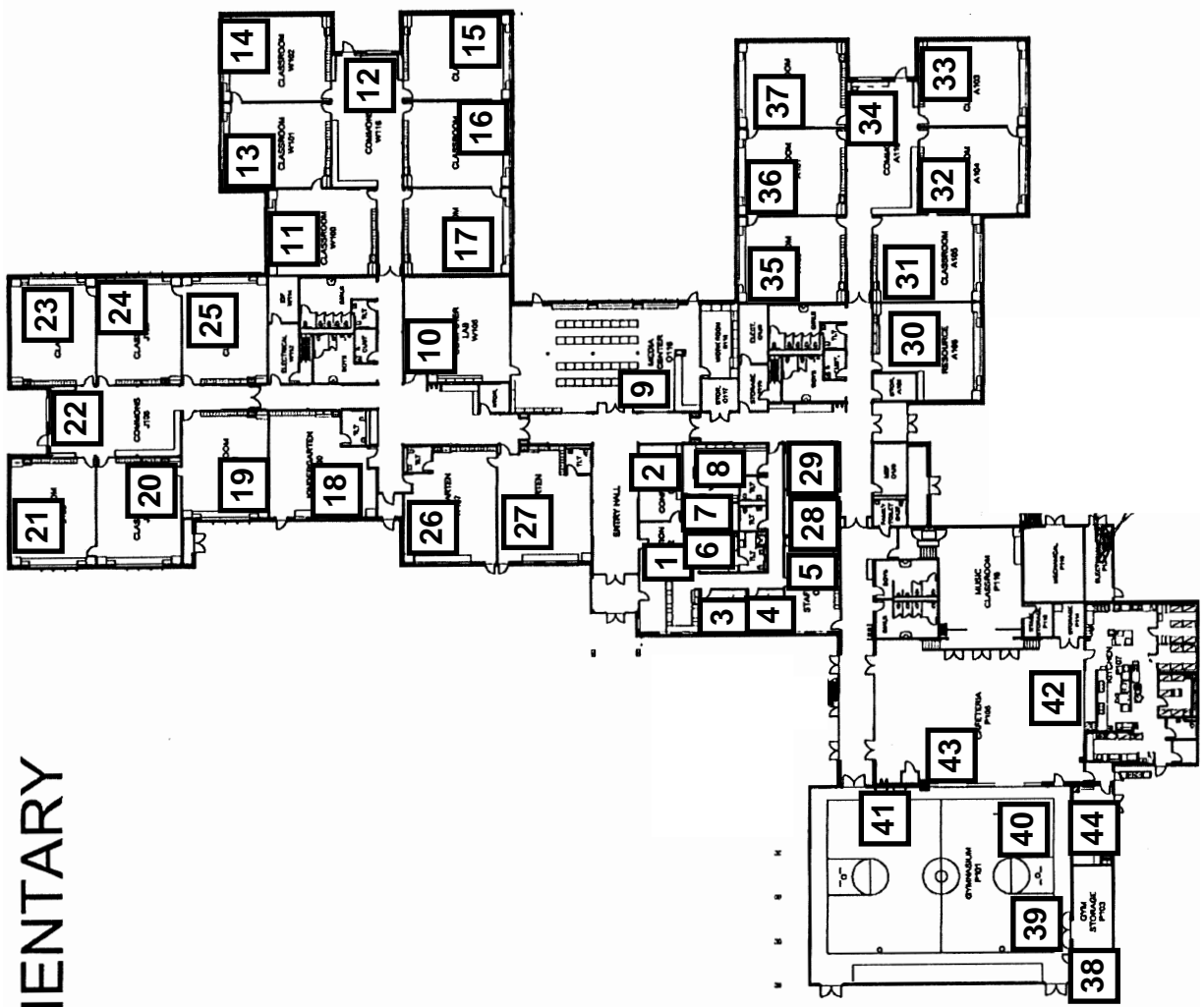
Device No.'s: _____ Device No.'s: _____

Note: All times are in 24-hour (military) notation, Eastern Standard Time (EST)
Background = 7 μ R/h Elevation = 820 ft

APPENDIX C

RADON SAMPLING LOCATION DIAGRAM

HENLEY ELEMENTARY SCHOOL



12 = Radon Test Kit Location