

Coleman Creek Consulting, Inc.

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

INTRODUCTION

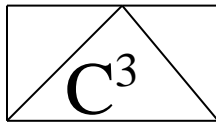
Coleman Creek Consulting, Inc. (CCC) was retained by Klamath County School District (KCSD) to perform radon air sampling as required by State Statute ORS 332.166-167. KCSD is required to perform complete radon air testing of District owned and occupied facility buildings by January 1, 2021. The purpose 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 KCSD employees, including school custodians in radon sampling procedures December 4, 2020. Brandon Gillette, Chiloquin Elementary School (CES) Custodian placed radon air test kits in the CES buildings at the beginning of the day, December 7, 2020. A total of 31 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. Mr. Gillette returned to the CES buildings December 10, 2020, at the beginning of the day, and collected all radon test kits placed for sampling. 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.



LABORATORY ANALYSIS RESULTS

The radon air test kit samples collected from CES buildings were reported ranging from <0.3 to 2.7 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

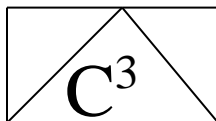
A total of three duplicate test kits were placed during initial test kit sampling. See duplicate designation on the Radon Air Sample Record Sheets. The three duplicate test kit sets were all reported with paired concentrations of 1.1/0.6 pCi/L, 1.2/0.7 pCi/L, and 2.6/2.1 pCi/L. The Relative Percent Difference for each pair was 59%, 53%, and 22%. The last pair was within the expected range of 0-25% Relative Percent Difference, with the other two pairs reported with concentrations <2.0 pCi/L, indicating Radon concentrations were too low to apply the Relative Percent Difference test.

BLANK TEST KITS

The blank test kit submitted to Air Chek with the other CES Radon test kits. The blank test kit was reported with <0.3 pCi/L. The blank test kit was 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 15.9 pCi/L. The relative percentage error was calculated to be -38%, 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 KCSD 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 #9418060 on the Laboratory Analysis Report in Appendix A.



Coleman Creek Consulting, Inc.

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 4.0 pCi/L, Radon concentration in the room should be lowered.

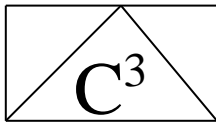
DISCUSSION OF INTIAL RADON SAMPLING RESULTS

The initial Radon short-term sampling in Chiloquin Elementary School buildings were reported with Radon concentrations ranging from <0.3 to 2.7 pCi/L. All Radon test kit samples were reported < 4.0 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.

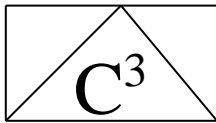
RADON AIR SAMPLE RECORD SHEET

SCHOOL: Chiloquin Elementary School
ADDRESS: 548 South 2nd Street
Chiloquin, Oregon

DATE: 12-07-20/12-10-20
SAMPLER: Brandon Gillette

SERIAL #	BUILDING	Duplicate	LOCATION	START TIME	STOP TIME
9418026	Portable		1 – Portable West	0605	0612
9418027	Portable		2 – Portable SE	0610	0616
9418028	Original		3 – Room 19	0615	0618
9418029	Original		4 – Cafeteria	0619	0621
9418030	Original		5 – Room 18	0626	0623
9418031	Original		6 – Room 17	0629	0625
9418032	Original		7 – Room 16	0634	0628
9418033	Original		8 – Staff Lunch Room	0638	0631
9418034	Original		9 – Custodian Office	0641	0633
9418035	Original		10 – Coach Office	0645	0636
9418036	Original	Yes	10 – Coach Office	0648	0636
9418037	Original		11 – Gym SW	0654	0639
9418038	Original		12 – Gym South	0658	0640
9418039	Original		13 – Room 15	0701	0644
9418040	Original		14 – Room 14	0705	0646
9418041	Original		15 – Back Room	0709	0648
9418042	Original		16 – Title 1 Room	0711	0650
9418043	Original		17 – Staff Work Room	0714	0652
9418044	Original		18 – Principal Office	0717	0654
9418045	Original		19 – Office Reception	0719	0656
9418046	Original		20 – Health Room	0722	0658
9418047	Original	Yes	20 – Health Room	0725	0658
9418049	Original		21 – Library	0727	0701
9418050	Original		22 – Room 9	0735	0703
9418051	Original		23 – Room 10	0737	0705

Comments: **Spike Sample =**
Blank Sample = 9418048



Coleman Creek Consulting, Inc.

RADON AIR SAMPLE RECORD SHEET

SCHOOL: Chiloquin Elementary School
ADDRESS: 548 South 2nd Street
Chiloquin, Oregon

DATE: 12-07-20/12-10-20
SAMPLER: Brandon Gillette

SERIAL #	BUILDING	Duplicate	LOCATION	START TIME	STOP TIME
9418052	Original		24	0740	0707
9418053	Original		25	0742	0709
9418054	Original		26	0744	0711
9418055	Quad		27	0747	0714
9418056	Quad		28	0750	0716
9418057	Quad		29	0753	0718
9418058	Quad		30	0756	0720
9418059	Quad		30	0758	0720
9418061	Shop		31	0801	0725

Comments: **Spike Sample = 9418060**
Blank Sample =

APPENDIX A

AIR CHEK LABORATORY ANALYSIS REPORT

December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:

CHILOQUIN ES

20570201

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418026	PORT. 1	2020-12-07 @ 6:00 am	2020-12-10 @ 6:00 am	0.5 ± 0.4	2020-12-15

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

December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:

CHILOQUIN ES

20570202

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418027	PORT. 2	2020-12-07 @ 6:00 am	2020-12-10 @ 6:00 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

Radon test result report for:**CHILOQUIN ES****20570200**

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418028	14	2020-12-07 @ 6:00 am	2020-12-10 @ 6:00 am	1.0 ± 0.5	2020-12-15
9418029	CAFETERIA	2020-12-07 @ 6:00 am	2020-12-10 @ 6:00 am	0.7 ± 0.4	2020-12-15
9418030	18	2020-12-07 @ 6:00 am	2020-12-10 @ 6:00 am	0.8 ± 0.4	2020-12-15
9418031	17	2020-12-07 @ 6:00 am	2020-12-10 @ 6:00 am	0.6 ± 0.4	2020-12-15
9418032	16	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	0.9 ± 0.5	2020-12-15
9418033	STAFF	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	1.1 ± 0.5	2020-12-15
9418034	CUSTODIAN	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	1.0 ± 0.5	2020-12-15
9418035	COACH	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	1.1 ± 0.4	2020-12-15
9418036	COACH	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	0.6 ± 0.4	2020-12-15
9418037	GYM SW	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	0.5 ± 0.4	2020-12-15
9418038	GYM W	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	1.1 ± 0.4	2020-12-15
9418039	15	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	1.0 ± 0.4	2020-12-15
9418040	14	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	0.6 ± 0.4	2020-12-15
9418041	LAUNDRY	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	0.6 ± 0.4	2020-12-15
9418042	TITLE 1	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	1.1 ± 0.4	2020-12-15
9418043	WORK RM	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	0.7 ± 0.4	2020-12-15
9418044	PRINCIPAL	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	0.9 ± 0.4	2020-12-15
9418045	OFFICE	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	0.9 ± 0.4	2020-12-15
9418046	HEALTH	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	1.2 ± 0.4	2020-12-15
9418047	HEALTH	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	0.7 ± 0.4	2020-12-15
9418048	HEALTH	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418049	LIBRARY	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418050	9	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.5 ± 0.4	2020-12-15
9418051	10	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	1.5 ± 0.5	2020-12-15
9418052	WORK OFF.	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.9 ± 0.4	2020-12-15
9418053	6	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.8 ± 0.4	2020-12-15
9418054	5	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	1.4 ± 0.5	2020-12-15

December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:

CHILOQUIN ES

20570203

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418055	4	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	2.7 ± 0.5	2020-12-15
9418056	3	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	1.6 ± 0.5	2020-12-15
9418057	1	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	1.4 ± 0.5	2020-12-15
9418058	2	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	2.6 ± 0.5	2020-12-15
9418059	2	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	2.1 ± 0.5	2020-12-15
9418060	2	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	15.9 ± 1.0	2020-12-15

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December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:

CHILOQUIN ES

20570200

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418061	STAGE	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.6 ± 0.4	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 50.0 % 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 -

Device No.'s: _____

9417935, 9417970, 9418007,

9418060, 9418096, 9418127,

9418163, 9418190, 9418226,

9418250, 9418286, 9418321

R5 Left

^{rem}
Date Start: 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 -

Device No.'s: _____

9418370, 9418418, 9418465, 9418500,

9418566, 9418601, 9418660,

9418695, 9418771, 9418747,

9418806, 9418846, 9418875

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

CHILOQUIN ELEMENTARY SCHOOL Radon Sample Locations

