

INITIAL RADON AIR SAMPLING OF GILCHRIST SCHOOL FOR

KLAMATH COUNTY SCHOOL DISTRICT

2845 GREENSPRINGS DRIVE, KLAMATH FALLS, OREGON

INTRODUCTION

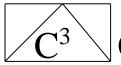
Coleman Creek Consulting, Inc. (CCC) was retained by Klamath County School District (KCSD) to perform radon air sampling as required by State Statute ORS 332.166-167. KCSD is required to perform complete radon air testing of District owned and occupied facility buildings by January 1, 2021. The purpose 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. Rodney Ingram, Gilchrist School (GS) Custodian placed radon air test kits in the GS buildings at the beginning of the day, December 7, 2020. A total of 51 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. Ingram returned to GS 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 4-6) 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 GS buildings were reported ranging from <0.3 to 2.2 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

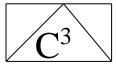
A total of five duplicate test kits were placed during initial test kit sampling. See duplicate designation on the Radon Air Sample Record Sheets. The five duplicate test kit sets were reported with paired concentrations of <0.3/<0.3 pCi/L, 0.7/0.6 pCi/L, 0.8/0.7 pCi/L, <0.3/<0.3 pCi/L, and 0.7/0.5 pCi/L. The Relative Percent Difference for each pair was 0%, 15%, 13%, 0%, and 33%. Four of the pairs were within the expected range of 0-25% Relative Percent Difference, with the other pair reported with a concentration <2.0 pCi/L, indicating Radon concentrations 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 GS 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

Two test kits were submitted to Bowser-Morner for Radon Spike processing. The test kits were 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 kits were submitted to Air Chek for analysis along with the other GS Radon test kits. The Spike samples were reported with 14.9 pCi/L and 13.0 pCi/L. The relative percentage error was calculated to be -42% and 49%, both 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 samples are identified as Serial #9418226 and Serial #9418250 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 Gilchrist School buildings were reported with Radon concentrations ranging from <0.3 to 0.9 pCi/L. All Radon test kit samples were reported < 4.0 pCi/L, indicating that a re-test should be performed in 10 years.

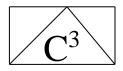
CCC appreciates the opportunity to provide initial radon air testing and consulting to Klamath County School District.

Sincerely,

David W. Fawcett

Director of Consulting Operations

TW, Fancett



RADON AIR SAMPLE RECORD SHEET

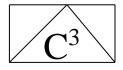
SCHOOL: Gilchrist School DATE: 12-07-20/12-10-20 ADDRESS: 201 Mountain View Drive SAMPLER: Rodney Ingram

Gilchrist, Oregon

				START	STOP
SERIAL#	BUILDING	Duplicate	LOCATION	TIME	TIME
9418192	Elementary		1 – Elementary Office	0655	0615
9418193	Elementary		2 – Principal Office	0658	0616
9418194	Elementary		3 – Back Office	0659	0617
9418195	Elementary		4 – Room 2	0700	Destroyed
9418196	Elementary		5 – Room 4	0702	0620
9418197	Elementary		6 – Room 3	0705	0624
9418198	Elementary		7 – Room 5 Office	0708	0626
9418199	Elementary		8 – Room 5	0710	0627
9418200	Elementary		9 – Room 6	0712	0630
9418201	Elementary		10 – Room 5	0715	0631
9418202	Elementary	Yes	10 – Room 5	0715	0631
9418203	Elementary		11 – Room 8	0721	0634
9418204	Elementary		12 – Room 7	0723	0635
9418205	Elementary		13 – Room 10	0726	0640
9418206	Elementary		14 – Room 12	0738	0643
9418207	Elementary		15 – Room 14	0740	0644
9418208	Elementary		16 – Multipurpose Room	0733	0645
9418209	Elementary		17 – Room 9	0734	0650
9418210	Elementary		18 – Room 11	0736	0651
9418211	Elementary		19 – Room 11 Office	0738	0652
9418212	Elementary		20 – Room 13	0740	0654
9418213	Elementary	Yes	20 – Room 13	0741	0655

Comments: **Spike Sample =**

Blank Sample = 9418214



RADON AIR SAMPLE RECORD SHEET

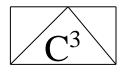
SCHOOL: Gilchrist School DATE: 12-07-20/12-10-20 ADDRESS: 201 Mountain View Drive SAMPLER: Rodney Ingram

Gilchrist, Oregon

			START	STOP
BUILDING	Duplicate	LOCATION	TIME	TIME
Cafeteria		21 – Cafeteria	0749	0700
Music		22 – Music Room	0751	0702
Music		23 – Room 1	0754	0704
Music		24 – Room 2	0756	0705
Original		25 – Room 3	0802	0710
Original		26 – Library	0805	0711
Original		27 – Copy Room	0807	0712
Original		28 – Room 5	0809	0713
Original		29 – Room 7	0810	0716
Original		30 – Custodial Office	0812	0719
Original	Yes	30 – Custodial Office	0813	0719
Original		31 – Office Reception	0814	0720
Original		32 – Principal Office	0816	0721
Original		33 – Office	0818	0725
Original		34 – Office	0820	0730
Original		35 – Room 15	0823	0731
Original		36 – Room 17	0826	0732
Original		37 – Room 26	0827	0733
Original		38 – Room 19	0830	0734
		39 – Room 28	0831	0736
		40 – Room 30	0835	0740
Original	Yes	40 – Room 30	0836	0740
	Music Music Original	Cafeteria Music Music Music Original	Cafeteria 21 – Cafeteria Music 22 – Music Room Music 23 – Room 1 Music 24 – Room 2 Original 25 – Room 3 Original 26 – Library Original 27 – Copy Room Original 28 – Room 5 Original 30 – Custodial Office Original 31 – Office Reception Original 32 – Principal Office Original 33 – Office Original 34 – Office Original 35 – Room 15 Original 36 – Room 17 Original 37 – Room 26 Original 38 – Room 19 Original 39 – Room 28 Original 40 – Room 30	BUILDING Duplicate LOCATION TIME Cafeteria 21 - Cafeteria 0749 Music 22 - Music Room 0751 Music 23 - Room 1 0754 Music 24 - Room 2 0756 Original 25 - Room 3 0802 Original 26 - Library 0805 Original 27 - Copy Room 0807 Original 28 - Room 5 0809 Original 29 - Room 7 0810 Original 30 - Custodial Office 0812 Original 31 - Office Reception 0814 Original 32 - Principal Office 0816 Original 33 - Office 0818 Original 35 - Room 15 0823 Original 36 - Room 17 0826 Original 37 - Room 26 0827 Original 39 - Room 28 0831 Original 40 - Room 30 0835

Comments: Spike Sample = 9418226

Blank Sample = 9418238



RADON AIR SAMPLE RECORD SHEET

SCHOOL: Gilchrist School DATE: 12-07-20/12-10-20 ADDRESS: 201 Mountain View Drive SAMPLER: Rodney Ingram

Gilchrist, Oregon

				START	STOP
SERIAL#	BUILDING	Duplicate	LOCATION	TIME	TIME
9418239	Original		41 – Room 30 Office	0838	0742
9418240	Original		42 – Room 32	0840	0744
9418241	Original		43 – Weight Room	0844	0745
9418242	Original		44 – Gym	0846	0750
9418243	Original		45 – Gym Stage	0847	0751
9418244	Clinic		46 – Reception	1030	0800
9418245	Clinic		47 – Exam 1	1032	0802
9418246	Clinic		48 – Exam 2	1033	0803
9418247	Clinic		49 – Office	1035	0804
9418248	Shop		50 – Classroom	1045	0806
9418249	Shop	Yes	50 – Classroom	1046	0806
9418251	Shop		51 – Shop	1048	0807

Comments: **Spike Sample = 9418250**

Blank Sample =

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APPENDIX A AIR CHEK LABORATORY ANALYSIS REPORT

Radon test result report for: GILCHRIST SCHOOL 20570500

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418192	EL OFFICE	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418193	ES PRIN.	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418194		2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	0.7 ± 0.4	2020-12-15
9418196	ES 4	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	1.1 ± 0.4	2020-12-15
9418197	ES 9	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	0.8 ± 0.4	2020-12-15
9418198	LIBRARY	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	0.7 ± 0.4	2020-12-15
9418199	LIB OFFICE	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	0.5 ± 0.4	2020-12-15
9418200	ES 6	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418201	ES 5	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418202	ES 5	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418203	ES 8	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418204	ES 7	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418205	ES 10	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418206	ES 12	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418207	ES 14	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418208	ES MULTI	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418209	ES 9	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.5 ± 0.4	2020-12-15
9418210	ES 11	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.7 ± 0.4	2020-12-15
9418211		2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	1.2 ± 0.5	2020-12-15
9418212	ES 13	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.7 ± 0.4	2020-12-15
9418213	ES 13	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.6 ± 0.4	2020-12-15
9418213	ES 13	2020-12-07 @ 8:00 am	2020-12-10 @ 7:	00 am	00 am 0.6 ± 0.4

** LABORATORY ANALYSIS REPORT **

Radon test result report for: GILCHRIST SCHOOL 20570501

Kit#	Room Id	Started	Ended	pCi/L	Analyzed
9418214	ES 13	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418215	CAFETERIA	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15

** LABORATORY ANALYSIS REPORT **

Radon test result report for: GILCHRIST SCHOOL 20570502

9418216 MUSIC 2020-12-07 @ 8:00 am 2020-12-10 @ 7:00 am 0.8 ± 0.4 9418217 HS 1 2020-12-07 @ 8:00 am 2020-12-10 @ 7:00 am 0.9 ± 0.4	Analyzed	pCi/L	Ended	Started	Room Id	Kit#
9418217 HS 1 2020-12-07 @ 8:00 am 2020-12-10 @ 7:00 am 0.9 ± 0.4	2020-12-15	0.8 ± 0.4	2020-12-10 @ 7:00 am	2020-12-07 @ 8:00 am	MUSIC	9418216
	2020-12-15	0.9 ± 0.4	2020-12-10 @ 7:00 am	2020-12-07 @ 8:00 am	HS 1	9418217
9418218 HS 2 2020-12-07 @ 8:00 am 2020-12-10 @ 7:00 am 0.7 ± 0.4	2020-12-15	0.7 ± 0.4	2020-12-10 @ 7:00 am	2020-12-07 @ 8:00 am	HS 2	9418218

December 24, 2020

Radon test result report for: GILCHRIST SCHOOL 20570700

9418219		Started	Ended	pCi/L	Analyzed
	HS 3	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.5 ± 0.4	2020-12-15
9418220	HS LIBRARY	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418221	COPY RM	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418222	HS 5	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418223	HS 7	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418224	CUSTODIAL	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.8 ± 0.4	2020-12-15
9418225	CUSTODIAL	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.7 ± 0.4	2020-12-15
9418226	CUSTODIAL	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	14.9 ± 1.0	2020-12-15
9418227	HS OFFICE	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418228	HS PRIN.	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418229	OFFICE	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418230	OFFICE	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418231	HS 15	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	1.0 ± 0.4	2020-12-15
9418232	HS 17	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418233	HS 26	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418234	HS 19	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418235	HS 28	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418236	HS 31	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418237	HS 31	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418238	HS 31	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418239	HS 30	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418240	HS 32	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418241	WEIGHT	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	0.9 ± 0.4	2020-12-15
9418242	GYM	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	1.3 ± 0.4	2020-12-15
9418243	STAGE	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	2.2 ± 0.5	2020-12-15

** LABORATORY ANALYSIS REPORT **

Radon test result report for: GILCHRIST SCHOOL

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418244	CLINIC R	2020-12-07 @ 11:00 am	2020-12-10 @ 8:00 am	0.8 ± 0.4	2020-12-15
9418245	CLINIC E1	2020-12-07 @ 11:00 am	2020-12-10 @ 8:00 am	0.7 ± 0.4	2020-12-15
9418246	CLINIC E2	2020-12-07 @ 11:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418247	CLINIC 01	2020-12-07 @ 11:00 am	2020-12-10 @ 8:00 am	0.5 ± 0.4	2020-12-15

** LABORATORY ANALYSIS REPORT **

Radon test result report for: GILCHRIST SCHOOL 20570700

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418248	CLINIC O2	2020-12-07 @ 11:00 am	2020-12-10 @ 8:00 am	0.7 ± 0.4	2020-12-15

** LABORATORY ANALYSIS REPORT **

Radon test result report for: GILCHRIST SCHOOL 20570701

Kit#	Room Id	Started	Ended	pCi/L	Analyzed
9418249	SHOP CLASS	2020-12-07 @ 11:00 am	2020-12-10 @ 8:00 am	0.5 ± 0.4	2020-12-15
9418250	SHOP CLASS	2020-12-07 @ 11:00 am	2020-12-10 @ 8:00 am	13.0 ± 0.9	2020-12-15
9418251	SHOP	2020-12-07 @ 11:00 am	2020-12-10 @ 8:00 am	0.7 ± 0.4	2020-12-15

APPENDIX B BOWSER-MORNER RADON SPIKE EXPOSURE

EXPOSURE IN BOWSER-MORNER RADON CHAMBER

CLIENT Coleman Creek Cons	hlting Inc. Job Number 198582
NOMINAL Conditions: Radon Conc 25.7	pCi/L Rel. Hum <u>5Q.Q</u> % Temp. <u>7Q. 3</u> F
Date Start: 12 4 20 Date Stop: 12 7 29	Date Start: Date Stop:
Time Start: <u>0923</u> Time Stop: <u>0923</u> (Group 1)	Time Start: Time Stop:
Device No.'s: (12) Char Bags- 9417935, 9417970, 9418007, 941801, 0, 9418091, 9418127	Device No.'s:
9418060,9418096,9418127, 9418163,9418190,9418226, 9418250,9418286,9418321	
R5 Coff	
Date Start: Date Stop: 12/7/20	Date Start: Date Stop:
Time Start: <u>0927</u> Time Stop: <u>0927</u>	Time Start: Time Stop:
(Group 2) Device No.'s: (13) Char Bags- 9418370, 9418418, 9418465, 9418500,	Device No.'s:
9418566, 9418601, 9418660, 9418660, 941866, 9418771, 9418747, 9418806, 9418846, 9418875	
25 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 = $7 \mu R/h$ Elevation = 820 ft

APPENDIX C RADON SAMPLING LOCATION DIAGRAM

GILCHRIST SCHOOL BUILDINGS Radon Sample Locations

