

Coleman Creek Consulting, Inc.

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

INTRODUCTION

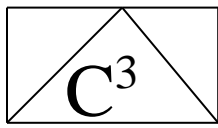
Coleman Creek Consulting, Inc. (CCC) was retained by Klamath County School District (KCS D) to perform radon air sampling as required by State Statute ORS 332.166-167. KCS D is required to perform complete radon air testing of District owned and occupied facility buildings by January 1, 2021. The purpose 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. Bill Schroeder, Stearns Elementary School (SES) Custodian placed radon air test kits in the SES buildings at the beginning of the day, December 7, 2020. A total of 35 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. Schroeder returned to SES 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.



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LABORATORY ANALYSIS RESULTS

The radon air test kit samples collected from SES buildings were reported ranging from <0.3 to 1.1 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

Three duplicate test kits were placed during initial test kit sampling. See duplicate designation on the Radon Air Sample Record Sheet. The three duplicate test kit sets were reported with the following concentration pairs: <0.3/<0.3 pCi/L, 0.6/<0.3 pCi/L, and <0.3/0.6 pCi/L. All pairs were reported with a concentration <2.0 pCi/L, indicating Radon concentrations were too low to apply the Relative Percent Difference test.

BLANK TEST KITS

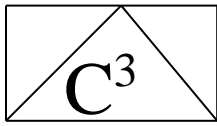
One blank test kit was submitted to Air Chek with the other SES Radon test kits. The blank test kit was reported with <0.3 pCi/L. The blank test kit was reported none detected for Radon.

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 SES Radon test kits. The Spike sample was reported with 15.1 pCi/L. The relative percentage error was calculated to be -41%, 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 #9418806 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.



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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.

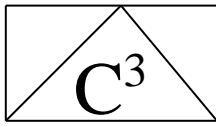
DISCUSSION OF INTIAL RADON SAMPLING RESULTS

The initial Radon short-term sampling in Stearns Elementary School buildings were reported with Radon concentrations ranging from <0.3 to 1.1 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.

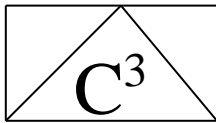
RADON AIR SAMPLE RECORD SHEET

SCHOOL: Stearns Elementary School
ADDRESS: 3641 Crest Street
Klamath Falls, Oregon

DATE: 12-07-20/12-10-20
SAMPLER: Bill Schroeder

SERIAL #	BUILDING	Duplicate	LOCATION	START TIME	STOP TIME
9418772	Main		1 – Room	0724	0713
9418773	Main		2 – Room	0729	0715
9418774	Main		3 – Room	0729	0717
9418775	Main		4 – Room	0732	0719
9418776	Main		5 – Room	0735	0720
9418777	Main		6 – Room	0738	0721
9418778	Main		7 – Room	0740	0722
9418779	Main		8 – Health Room	0742	0724
9418780	Main		9 – Office Reception	0746	0725
9418781	Main		10 – Clark Office	0751	0727
9418782	Main	Yes	10 – Clark Office	0751	0727
9418783	Main		11 – Paschal Office	0753	0728
9418784	Main		12 – Staff Room	0757	0729
9418785	Main		13 – Povell Office	0803	0732
9418786	Main		14 – Copy Room	0804	0733
9418787	Main		15 – Library Office	0809	0735
9418788	Main		16 – Library	0815	0736
9418789	Main		17 – Testing Room	0818	0738
9418790	Main		18 – Marks Office	0821	0740
9418791	Main		19 – Cafeteria	0825	0742
9418792	Main		20 – Gym	0830	0744
9418793	Main	Yes	20 – Gym	0832	0744

Comments: **Spike Sample =**
Blank Sample = 9418794



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RADON AIR SAMPLE RECORD SHEET

SCHOOL: Stearns Elementary School
ADDRESS: 3641 Crest Street
Klamath Falls, Oregon

DATE: 12-07-20/12-10-20
SAMPLER: Bill Schroeder

SERIAL #	BUILDING	Duplicate	LOCATION	START TIME	STOP TIME
9418795	Main		21 – Gym	0840	0746
9418796	Main		22 – Room 10	0848	0748
9418797	Main		23 – Room 10	0850	0748
9418798	Main		24 – Room 9	0852	0750
9418799	Main		25 – Speech Room	0856	0752
9418800	Main		26 – Room 11	0900	0753
9418801	Main		27 – Room 12	0902	0754
9418802	Main		28 – Room 13	0905	0755
9418803	Main		29 – Room 14	0908	0756
9418804	Main		30 – Room 15	0911	0758
9418805	Main	Yes	30 – Room 15	0912	0759
9418807	Main		31 – Room 16	0914	0800
9418808	Portable		32 – Room 18	0922	0802
9418809	Portable		33 – Room 17	0925	0807
9418810	Portable		34 – Room 19	0932	0810
9418811	Portable		35 – Room 20	0940	0813

Comments: **Spike Sample = 9418806**
Blank Sample =

APPENDIX A

AIR CHEK LABORATORY ANALYSIS REPORT

Radon test result report for:
STEARNS ES
20571200

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418772	1	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418773	3	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418774	4	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418775	5	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418776	6	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418777	7	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.6 ± 0.4	2020-12-15
9418778	8	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	1.0 ± 0.4	2020-12-15
9418779	HEALTH	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418780	RECEPTION	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418781	CLARK	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418782	CLARK	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418783	PACHAL	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418784	STAFF	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418785	POWELL	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418786	COPIER	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418787	LIB OFFICE	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418788	LIBRARY	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418789	TESTING	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418790	MARKS	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	0.7 ± 0.4	2020-12-15
9418791	CAFETERIA	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418792	GYM	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	0.6 ± 0.4	2020-12-15
9418793	GYM	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418794	GYM	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418795	GYM	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418796	10	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418797	10 TIMEOUT	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	0.5 ± 0.4	2020-12-15
9418798	9	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	0.9 ± 0.5	2020-12-15
9418799	SPEECH	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	1.1 ± 0.4	2020-12-15
9418800	11	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	0.8 ± 0.4	2020-12-15
9418801	12	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418802	13	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	0.5 ± 0.4	2020-12-15
9418803	14	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	0.7 ± 0.4	2020-12-15
9418804	15	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418805	15	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	0.6 ± 0.4	2020-12-15
9418806	15	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	15.1 ± 0.9	2020-12-15
9418807	16	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15

December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
STEARNS ES
20571201

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418808	18	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 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

December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
STEARNS ES
20571202

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418809	17	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 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

December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
STEARNS ES
20571203

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418810	19	2020-12-07 @ 10:00 am	2020-12-10 @ 8:00 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

December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
STEARNS ES
20571204

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418811	20	2020-12-07 @ 10:00 am	2020-12-10 @ 8:00 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: _____

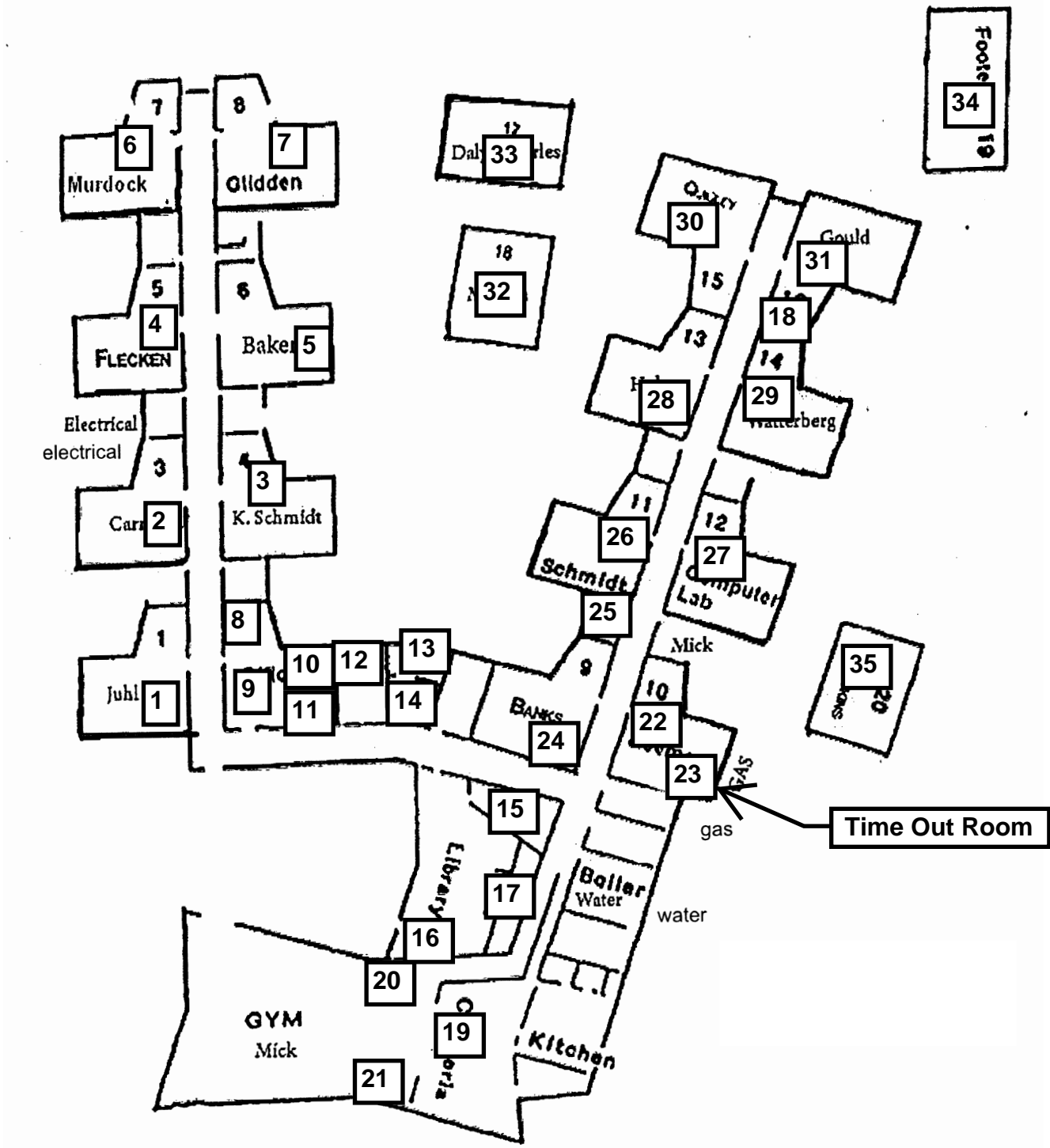
Note: All times are in 24-hour (military) notation, Eastern Standard Time (EST)
Background = 7 μ R/h Elevation = 820 ft

APPENDIX C

RADON SAMPLING LOCATION DIAGRAM

STEARNS ELEMENTARY SCHOOL

Radon Sample Locations



12 = Radon Test Kit Location