Coleman Creek Consulting, Inc.

INITIAL RADON AIR SAMPLING
OF
GREAT BASIN HOMESCHOOL
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. Fred Ginestar, Great Basin Homeschool (GBH) Custodian placed radon air test kits in the Great Basin Homeschool buildings at the beginning of the day, December 7, 2020. A total of 16 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. Ginestar returned to GBH December 10, 2020, at the beginning of the day, and collected all radon test kits placed for sampling. See Radon Air Sample Record Sheet (page 4) 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 GBH buildings were all reported with <0.3 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 single duplicate test kit was placed during initial test kit sampling. See duplicate designation on the Radon Air Sample Record Sheet. The duplicate test kit set was reported with <0.3 pCi/L. When compared with matched pair or "duplicate" test kits, the duplicate pair were well within the expected range of 0-25% Relative Percent Difference, with identical reported <0.3 pCi/L Radon concentrations.

BLANK TEST KITS

One blank test kit was submitted to Air Chek with the other GBH 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 16.6 pCi/L. The relative percentage error was calculated to be -35%, 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 17.0 pCi/L, all below the Spiked concentration of 25.7 pCi/L. The Spike sample is identified as Serial #9418127 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 Great Basin Homeschool buildings were all reported with Radon concentrations of <0.3 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: Great Basin Homeschool
ADDRESS: 8205 Hwy. 39
Klamath Falls, Oregon

DATE: 12-07-20/12-10-20
SAMPLER: Fred Ginestar

SERIAL #	BUILDING	Duplicate	LOCATION	START TIME	STOP TIME
9418110	Portable		**1 – Office East**	0700	0600
9418111	Portable		**2 – Office West**	0700	0600
9418112	Portable		**3 – Home School Laurie**	0700	0600
9418113	Portable		**4 – Home School**	0700	0600
9418114	Portable		**5 – Pine**	0700	0600
9418115	Portable		**6 – Library Amos**	0700	0600
9418116	Portable		**7 – Daycare**	0700	0600
9418117	Portable		**8 – TAG**	0700	0700
9418118	Portable		**9 – Stark**	0700	0700
9418119	Portable		**10 – Jr. High**	0700	0700
9418120	Portable	Yes	**10 – Jr. High**	0700	0700
9418121	Portable		**11 – Heather Wright**	0700	0700
9418122	Portable		**12 – Katrina**	0700	0700
9418123	Portable		**13 – Jana**	0700	0700
9418124	Portable		**14 – Don**	0700	0700
9418125	Portable		**15 – Brad**	0700	0700
9418126	Portable		**16 – Booie**	0700	0700

Comments: **Spike Sample = 9418127**
Blank Sample = 9418128

APPENDIX A

AIR CHEK LABORATORY ANALYSIS REPORT

December 24, 2020 **** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
GREAT BASIN
20572200

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418110	PORT 1	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418111	PORT 1	2020-12-07 @ 7:00 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

December 24, 2020 **** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
GREAT BASIN
20572201

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418112	PORT 2	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418113	PORT 2	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15

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December 24, 2020 **** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
GREAT BASIN
20572202

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418114	PORT 3	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418115	PORT 3	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15

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December 24, 2020 **** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
GREAT BASIN
20572203

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418116	PORT 4	2020-12-07 @ 7:00 am	2020-12-10 @ 6:00 am	< 0.3	2020-12-15
9418117	PORT 4	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418118	PORT 5	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15

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December 24, 2020 **** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
GREAT BASIN
20572204

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418119	PORT 5	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418120	PORT 5	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15

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December 24, 2020 **** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
GREAT BASIN
20572205

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418121	PORT 6	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418122	PORT 6	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15

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December 24, 2020 **** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
GREAT BASIN
20572206

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418123	PORT 7	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418124	PORT 7	2020-12-07 @ 7:00 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

December 24, 2020 **** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
GREAT BASIN
20572207

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418125	PORT 8	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418126	PORT 8	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418127	PORT 8	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	16.6 ± 1.0	2020-12-15
9418128	PORT 8	2020-12-07 @ 7:00 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 59.2 % Temp. 70.3 F

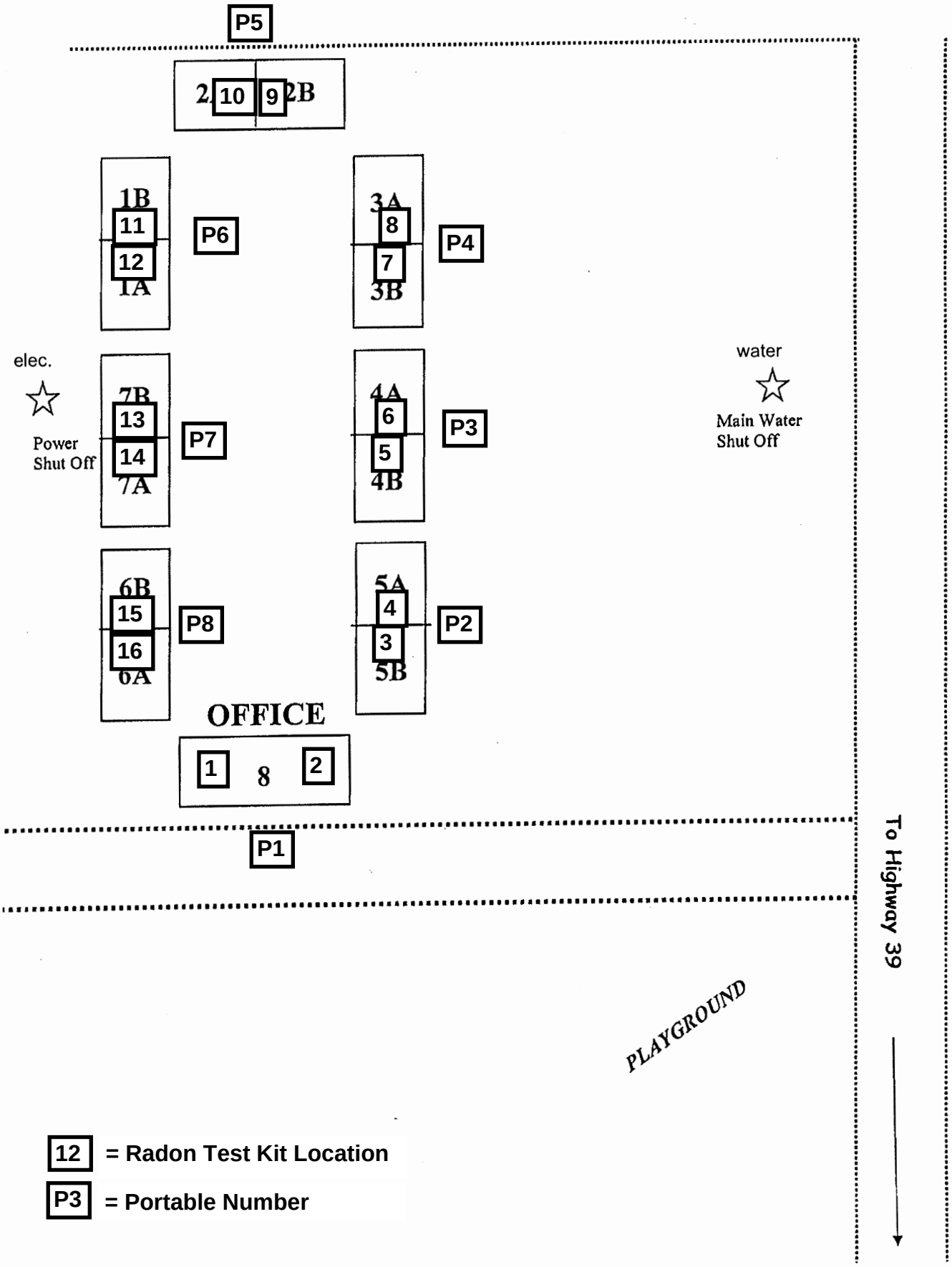
Date Start: 12/4/20 Date Stop: 12/7/20	Date Start: _____ Date Stop: _____
Time Start: 0923 Time Stop: 0923	Time Start: _____ Time Stop: _____
(Group 1)	
Device No.'s: (12) Char Bags - 9417935, 9417970, 9418007, 9418060, 9418096, 9418127, 9418163, 9418190, 9418226, 9418250, 9418286, 9418321	Device No.'s: _____
R5 Left	
Date Start: dem 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 µR/h Elevation = 820 ft

APPENDIX C

RADON SAMPLING LOCATION DIAGRAM

GREAT BASIN HOMESCHOOL CENTER
Radon Sample Locations



12 = Radon Test Kit Location

P3 = Portable Number