Carnow, Conibear & Assoc., Ltd. Environmental Consulting Services 600 W. Van Buren St., Suite 500, Chicago, IL 60607 t: 312.782.4486 f: 312.782.5145 www.ccaltd.com

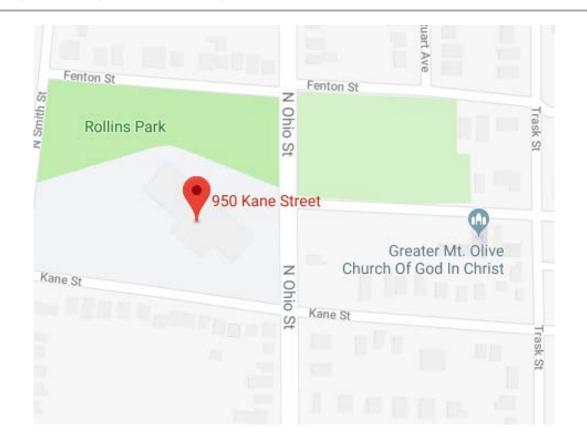


#### **Radon Measurement Survey Report**

Site:

#### Rollins Elementary School 950 Kane Street Aurora, Illinois 60505

Survey Dates: May 15, 2018 thru May 18, 2018



Prepared For:

East Aurora School District 131 417 Fifth Street Aurora, Illinois 60505

Carnow Conibear Project No. A146000137

Carnow, Conibear & Assoc., Ltd. Environmental Consulting Services 600 W. Van Buren St., Suite 500, Chicago, IL 60607 t: 312.782.4486 f: 312.782.5145 www.ccaltd.com



#### **Radon Measurement Survey Report**

Site:

#### Rollins Elementary School 950 Kane Street Aurora, Illinois 60505

Surveyed by:

Sinnett

Nicole Bennett Radon Measurement Professional

Report by:

Mcole Bennett

Nicole Bennett Radon Measurement Professional

Reviewed by:

Derek Lantry Director, Technical Services

Report Issued: July 5, 2018

# **TABLE OF CONTENTS**

1.0	EXECUTIVE SUMMARY	1
2.0	BACKGROUND	2
3.0	SCOPE OF WORK	3
4.0	METHODOLOGY	4
5.0	SUMMARY OF RESULTS	5
6.0	CONCLUSIONS	8
7.0	LIMITATIONS AND CONDITIONS	9

#### APPENDICES

Appendix A	Floor Plans – Radon Sampling Locations
Appendix B	Laboratory Analysis Report
Appendix C	Radon Measurement Professional License

## **1.0 EXECUTIVE SUMMARY**

Carnow, Conibear, & Assoc., Ltd. (Carnow Conibear) was contracted by East Aurora School District 131 to perform a radon measurement survey at the Rollins Elementary School located at 950 Kane Street in Aurora, Illinois. The survey was initiated on May 15, 2018 and completed on May 18, 2018 by Nicole Bennett, an Illinois Emergency Management Agency (IEMA) licensed Radon Measurement Professional (License No. RNI2016213). The scope of work included short term (two to four day) radon measurements in frequently occupied rooms with substantial ground contact. The radon sampling was performed following IEMA and the United States Environmental Protection Agency (USEPA) testing protocols for commercial and school radon measurements, the radon device manufacturer's recommendations, and Carnow Conibear's Quality Assurance Plan.

A total of thirty-five (35) radon test devices were deployed including thirty (30) single devices, three (3) duplicates, and two (2) blanks. Activated radon charcoal devices manufactured by Air Chek Inc. were utilized during the radon survey. The activated charcoal devices are passive devices containing activated carbon to measure radon. Testing was initiated on May 15, 2018 and completed on May 18, 2018.

Radon measurement results ranged from less than (<) 0.3 to 6.5 PicoCuries per liter (pCi/L). The radon measurement results indicate areas tested exceeded the EPA recommended radon action level of 4.0 pCi/L during the time of the test. The average indoor radon concentrations are 1.3 pCi/L nationwide. The average outdoor radon concentration is 0.4 pCi/L.

Based on the radon measurement results Carnow Conibear recommends:

- Follow-up radon testing in locations exceeding the EPA and IEMA recommended action level of 4.0 pCi/L. Per IEMA, a recommendation to mitigate elevated levels of radon shall not be based on initial measurement results.
- Routine follow-up radon measurement surveys every two (2) years at different seasonal times following IEMA and the USEPA testing protocols and the radon device manufacturer's recommendations.
- Additional testing if significant changes are made to the building's structural or mechanical components.

## 2.0 BACKGROUND

Radon is a naturally occurring, radioactive, colorless, odorless, tasteless gas produced from the decay of uranium and radium found in most soil and rock. Natural soils and rock such as granites, shales, and corals, contaminated soils from uranium processing mills, contaminated building materials, and groundwater water supplies directly from wells are a few common sources of radon. Radon can be found at some level in all indoor and outdoor air. Unlike most airborne contaminants radon is chemically inert, or chemically inactive. As a result, it is not chemically bound or attached to other materials and can move easily through porous materials or void space.

Typically, most radon gas is generated from the surrounding soil or bedrock, pulled through the soil or rock by air pressure differentials and enters the structure. However, radon gas can come from water, outside air, or contaminated building materials. The strength of the radon source has the biggest impact on indoor radon concentrations. The route of entry (i.e. through holes in the foundation), the building's ventilation rate, foundation type and differences in soils beneath the building can affect the indoor radon concentrations.

The primary health effect attributed to radon exposure is lung cancer. The World Health Organization (WHO), the National Academy of Sciences, the US Department of Health and Human Services, and the EPA classify radon as known human carcinogen. The EPA states radon is the largest source of radiation exposure and risk to the general public. When radon and products of radon decay are inhaled, decay can occur while in contact with the lung prior to being expelled. Because radon is chemically inert, most inhaled radon is rapidly exhaled. However, the inhaled decay products are readily deposited in the lungs, release energy in the form of radiation causing lung tissue damage and consequently increase the risk of lung cancer.

Radon concentrations in air are commonly expressed in picoCuries per liter (pCi/L) in the United States. An EPA national residential radon survey completed in 1991, determined the average indoor radon level is 1.3 pCi/L and the average outdoor level is about 0.4 pCi/L. The National Academy of Sciences' (NAS) latest report on radon, the Biological Effects of Ionizing Radiation (BEIR) VI Report (1999) estimates radon in indoor air causes about 21,000 lung cancer deaths each year in the United States. The EPA states that any level of radon carries some risk, there are no safe levels, and has established an action level of 4.0 pCi/L.

## 3.0 SCOPE OF WORK

Carnow, Conibear was contracted by East Aurora School District 131 to perform a radon survey at the Rollins Elementary School located at 950 Kane Street in Aurora, Illinois.

The scope of work included short term radon measurements in frequently occupied rooms with substantial ground contact. The duration of short term measurements can range from two (2) to four (4) days. Prior to placement of the radon measurement devices a Quality Assurance Project Plan (QAPP) was developed and general observations were performed to verify test conditions, identify device placement locations, and determine structural and mechanical building components. The QAPP was created to document and describe the necessary quality assurance procedures, quality control activities, and provide a clear, concise, and complete plan for the radon measurement operations. Observations of test conditions verified closed building conditions were maintained at a minimum of twelve (12) hours prior to testing and throughout the measurement period. Closed building conditions are necessary for short term radon measurements in order to stabilize the radon and radon decay product concentrations and increase the reproducibility of the measurement. Closed building conditions require windows and exterior doors on all levels be kept closed (except for normal entry and exit) during the measurement period. Closed building conditions also require the normal operation of heating, ventilating, and air conditions systems.

Radon test devices were deployed in thirty (30) locations. In addition, three (3) duplicates, and two (2) blanks, were utilized to measure precision and bias, and ensure quality data. Radon test devices were documented in a permanent log noting the address of the building measured, a diagram of the test area noting the exact locations of all measurement devices deployed, exact start and stop times of the measurement period, a description of the device used and serial number, and the name and IEMA license number of the Radon Measurement Professional. At the end of the measurement period the radon test devices were retrieved, resealed, and mailed to the laboratory for analysis.

The radon measurement results are reported in picoCurie per liter. A picoCurie per liter is 2.22 atomic radon disintegrations per minute for each liter of air. The results of the radon measurements are interpreted to determine the need for additional testing and assess the quality and confidence of the measurement data. Typically, follow-up measurements will be recommended in every room with results greater than 4.0 pCi/L. The recommendation to mitigate elevated levels of radon shall not be based on the initial measurement results.

### 4.0 METHODOLOGY

The radon testing was performed following requirements set forth by the IEMA, USEPA, and Carnow Conibear's Quality Assurance Plan. The radon measurement survey consisted of several phases. The initial phase consisted of preliminary testing protocol, including an explanation of services, instructions to comply with closed building conditions, the development of the Quality Assurance Project Plan, and determination of the testing period. Next, general observations of the building were performed to verify test conditions, identify device placement locations, and determine structural and mechanical building components.

The measurement phase included the radon testing device placement and retrieval. Activated radon charcoal devices manufactured by Air Chek Inc. were utilized during this radon survey. The activated charcoal devices are passive devices containing activated carbon to measure radon. Radon test devices were placed in such a way to limit unintentional interference from building occupants. The measurement devices were placed at least three feet from doors, windows to the outside, at least one foot from exterior walls, at least four feet from heat sources, out of the direct flow of ventilation ducts and sunlight, and suspended in the general breathing zone. Duplicate tests were conducted for a minimum of 10% of the total radon test devices deployed to measure precision. Field blanks were submitted for a minimum of 5% of the total number of radon test devices deployed to measure background gamma radiation. Spike tests were not submitted for this survey but are submitted for a minimum of three per 100 radon test devices or a minimum of three per year to measure laboratory accuracy. A total of thirty-five (35) radon test devices were deployed including thirty (30) single devices, three (3) duplicates, and two (2) blanks. At the end of the measurement period the radon measurement devices were retrieved, resealed, and shipped overnight to Air Chek Inc. for analysis. Air Chek Inc. calculates the radon concentration after measuring the gamma activity by the radon decay products produced from the random decay of the collected radon. The final phase consisted of interpreting the results and an assessment of the quality and confidence of the measurement data.

## 5.0 SUMMARY OF RESULTS

Table 1.0 Radon Measurement Device Results identify all the radon measurement devices deployed and the reported radon results. The radon measurement results are reported in picoCurie per liter (pCi/L).

The radon measurement results indicate areas tested exceeded the EPA and IEMA recommended radon action level of 4.0 pCi/L during the time of the test. No radon mitigation systems were observed in the building. Additionally, the following testing abnormalities were noted during the radon measurement interval.

 The device (serial #9045230) placed in Classroom 33 was inaccessible at the time of retrieval

#### **Table 1.0 Radon Measurement Device Results**

Rollins Elementary School -950 Kane Street Aurora, Illinois 60505

Device Location	Device Serial #	Start Date	Start Time	Stop Date	Stop Time	Result (pCi/L)	Comments
Gym 15	9045252	5/15/2018	3:53 PM	5/17/2018	4:11 PM	1.6	
Gym 15	9045253	5/15/2018	3:54 PM	5/17/2018	4:11 PM	1.6	
Stage 15D	9045251	5/15/2018	3:55 PM	5/17/2018	4:11 PM	1.4	
Stage 15E	9045250	5/15/2018	3:57 PM	5/17/2018	4:12 PM	0.9	
P.E. Office 15B	9045249	5/15/2018	3:58 PM	5/17/2018	4:10 PM	1.0	
Gym Mech. Room	9045248	5/15/2018	3:59 PM	5/17/2018	4:11 PM	0.6	
Music Storage Room 13	9045247	5/15/2018	4:01 PM	5/17/2018	4:18 PM	1.3	
Janitor Closet 14C	9045246	5/15/2018	4:02 PM	5/17/2018	4:18 PM	0.8	
Boiler Room 14	9045245	5/15/2018	4:03 PM	5/17/2018	4:16 PM	< 0.3	
Classroom 12	9045244	5/15/2018	4:04 PM	5/17/2018	4:15 PM	1.1	
Classroom 11	9045243	5/15/2018	4:05 PM	5/17/2018	4:16 PM	< 0.3	
Classroom 11	9045242	5/15/2018	4:05 PM	5/17/2018	4:16 PM	0.9	Duplicate RPD = 66.7%
Room 10	9045241	5/15/2018	4:07 PM	5/17/2018	4:17 PM	1.0	
Storage Room 21	9045240	5/15/2018	4:07 PM	5/17/2018	4:15 PM	0.9	
Classroom 22	9045239	5/15/2018	4:08 PM	5/17/2018	4:15 PM	< 0.3	
Classroom 9	9045238	5/15/2018	4:08 PM	5/17/2018	4:31 PM	0.5	
Classroom 8	9045237	5/15/2018	4:09 PM	5/17/2018	4:29 PM	0.9	
Classroom 6	9045236	5/15/2018	4:11 PM	5/17/2018	4:31 PM	0.9	
Classroom 5	9045235	5/15/2018	4:12 PM	5/17/2018	4:32 PM	0.9	
Classroom 2	9045234	5/15/2018	4:14 PM	5/17/2018	4:30 PM	1.0	

#### **Table 1.0 Radon Measurement Device Results**

#### Rollins Elementary School -950 Kane Street Aurora, Illinois 60505

Device Location	Device Serial #	Start Date	Start Time	Stop Date	Stop Time	Result (pCi/L)	Comments
Classroom 28	9045233	5/15/2018	4:15 PM	5/17/2018	4:30 PM	0.9	
Classroom 28	9045232	5/15/2018	4:15 PM	5/17/2018	4:30 PM	1.0	Duplicate RPD = 10.5%
Classroom 29	9045231	5/15/2018	4:17 PM	5/17/2018	4:31 PM	1.2	
Classroom 33	9045230	5/15/2018	4:19 PM	5/17/2018			Device Missing
Classroom 30	9045229	5/15/2018	4:22 PM	5/17/2018	4:32 PM	6.5	
Classroom 32	9045228	5/15/2018	4:23 PM	5/17/2018	4:33 PM	0.8	
Classroom 31	9045227	5/15/2018	4:24 PM	5/17/2018	4:30 PM	1.9	
Room 133A	9045226	5/15/2018	4:26 PM	5/17/2018	4:37 PM	< 0.3	
Room 121A	9045225	5/15/2018	4:30 PM	5/17/2018	4:44 PM	0.6	
Classroom 111	9045224	5/15/2018	4:35 PM	5/17/2018	4:41 PM	< 0.3	
Classroom 111	9045223	5/15/2018	4:35 PM	5/17/2018	4:40 PM	< 0.3	Duplicate RPD = 0.0%
Classroom 112	9045222	5/15/2018	4:38 PM	5/17/2018	4:41 PM	< 0.3	
Classroom 114	9045221	5/15/2018	4:40 PM	5/17/2018	4:40 PM	0.7	
Classroom 115	9045220	5/15/2018	4:41 PM	5/17/2018	4:41 PM	0.8	
Hallway	9045219	5/15/2018	4:42 PM	5/17/2018	4:42 PM	< 0.3	Blank
Hallway	9045218	5/15/2018	4:42 PM	5/17/2018	4:42 PM	< 0.3	Blank

RPD - Relative Percent Difference = difference divided by the average of simultaneous results times 100. Results less than 4.0 pCi/L shall agree with a RPD of less than 67 percent. Results greater than 4.0 pCi/l shall agree with a RDP of less than 36 percent.

The EPA and IEMA recommended radon action level is 4.0 pCi/L.

**Bold** – indicated result exceeded radon action level.

## 6.0 CONCLUSIONS

Carnow, Conibear, & Assoc., Ltd. (Carnow Conibear) was contracted by East Aurora School District 131 to perform a radon survey at the Rollins Elementary School located at 950 Kane Street in Aurora, Illinois. The survey was initiated on May 15, 2018 and completed on May 18, 2018 by Nicole Bennett, an Illinois Emergency Management Agency (IEMA) licensed Radon Measurement Professional (License No. RNI2016213). The scope of work included short term (two to four day) radon measurements in frequently occupied rooms with substantial ground contact. The radon survey was performed in following the IEMA and the USEPA testing protocols for commercial and school radon measurements, the radon device manufacturer's recommendations, and the Carnow Conibear Quality Assurance Plan.

Radon measurement results ranged from less than (<) 0.3 to 6.5 pCi/L. The radon measurement results indicate areas tested exceeded the EPA and IEMA recommended action level of 4.0 pCi/L during the time of the test. The average indoor radon concentrations are 1.3 pCi/L nationwide. The average outdoor radon concentration is 0.4 pCi/L.

Based on the radon measurement results Carnow Conibear recommends the following:

- Follow-up radon testing in locations exceeding the EPA recommended radon action level of 4.0 pCi/L. Per IEMA, a recommendation to mitigate elevated levels of radon shall not be based on initial measurement results. Follow-up radon testing is also recommended in locations with invalid test results.
- Routine follow-up radon measurement surveys every two (2) years at different seasonal times following IEMA and the USEPA testing protocols and the radon device manufacturer's recommendations.
- Additional testing if significant changes are made to the building's structural or mechanical components.

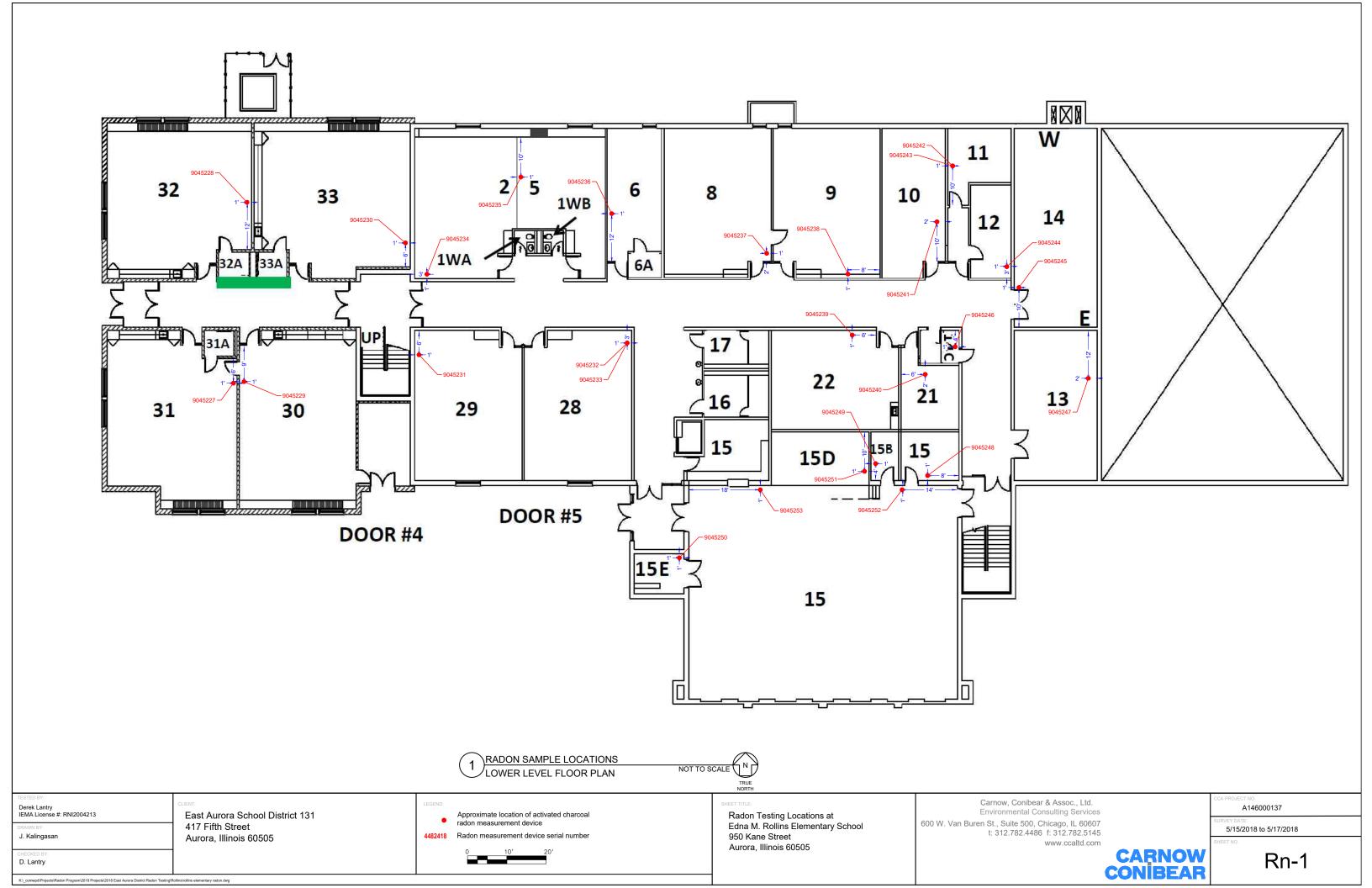
## 7.0 LIMITATIONS AND CONDITIONS

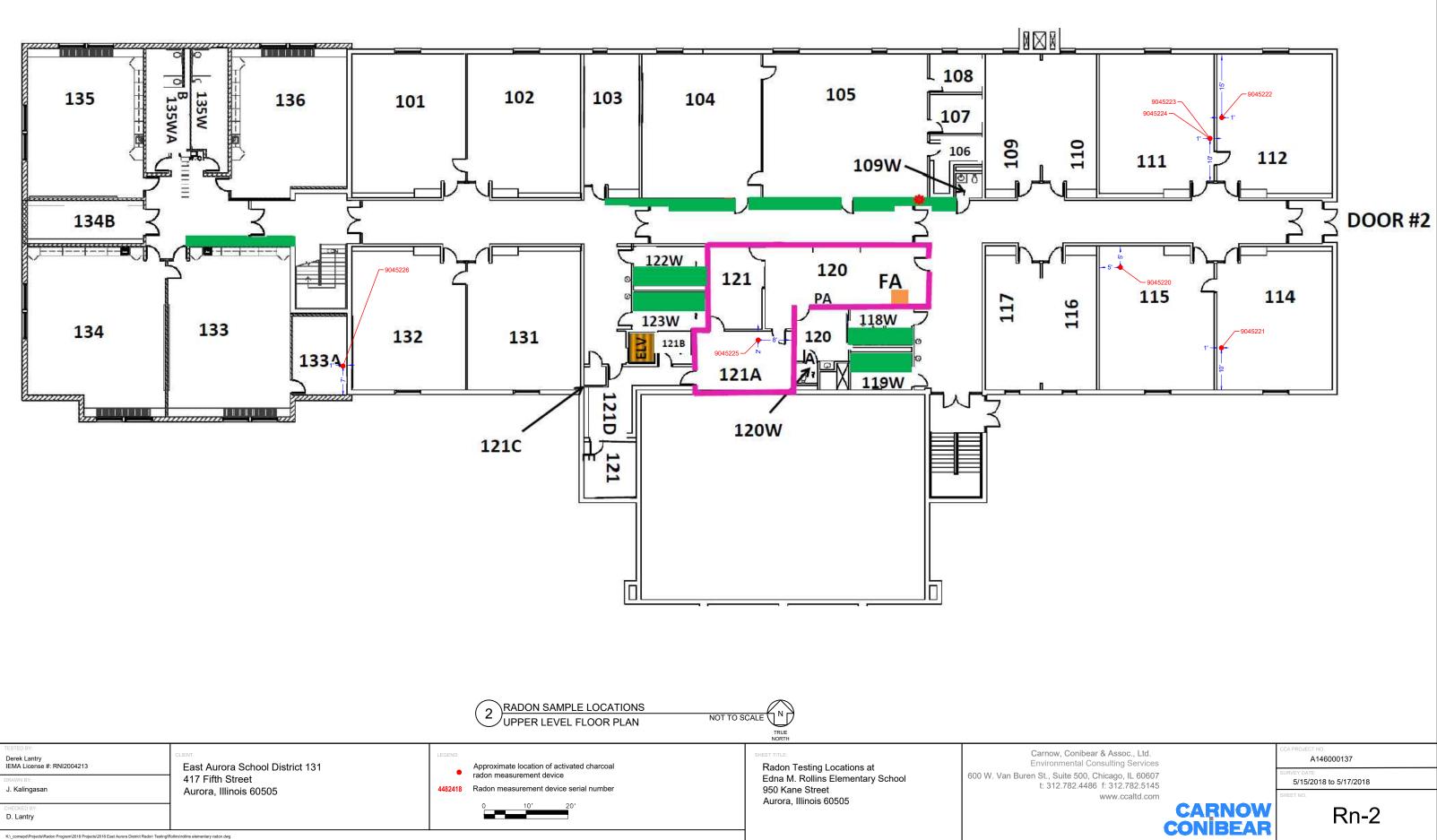
The information contained in this report was prepared for the exclusive use and reliance of East Aurora School District 131 and Carnow Conibear. This information is based on the specific parameters of the scope of work for this project and the regulations in force at the time of the report.

Carnow Conibear has applied prevailing industry standards and reasonable judgment and effort within the scope of work, while conducting the radon measurement survey. The standards, judgment, and effort used by Carnow Conibear personnel to investigate, assess, and determine the presence of potential environmental hazards and liabilities associated with the radon survey at the Rollins Elementary School, Aurora, Illinois are consistent with requirements outlined in federal and state guidelines. Carnow Conibear makes no warranty, express or implied, that the findings and interpretations in this report are a complete representation of the environmental hazards and liabilities, associated with the Rollins Elementary School, Aurora, Illinois.

### **APPENDIX A**

Floor Plans – Radon Sampling Locations





#### **APPENDIX B**

Laboratory Analysis Report

#### Radon test result report for: EDNA M. ROLLINS 950 KANE STREET, AURORA, IL

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9045245	<b>BOILER ROOM 14</b>	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	< 0.3	2018-05-21
9045242	CLASSROOM 11	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	$0.9 \pm 0.3$	2018-05-21
9045243	CLASSROOM 11	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	< 0.3	2018-05-21
9045223	CLASSROOM 111	2018-05-15 @ 5:00 pm	2018-05-17 @ 5:00 pm	< 0.3	2018-05-2
9045224	CLASSROOM 111	2018-05-15 @ 5:00 pm	2018-05-17 @ 5:00 pm	< 0.3	2018-05-2
9045222	CLASSROOM 112	2018-05-15 @ 5:00 pm	2018-05-17 @ 5:00 pm	< 0.3	2018-05-2
9045221	CLASSROOM 114	2018-05-15 @ 5:00 pm	2018-05-17 @ 5:00 pm	$0.7 \pm 0.3$	2018-05-2
9045220	CLASSROOM 115	2018-05-15 @ 5:00 pm	2018-05-17 @ 5:00 pm	$0.8 \pm 0.3$	2018-05-2
9045244	CLASSROOM 12	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	$1.1 \pm 0.3$	2018-05-2
9045234	CLASSROOM 2	2018-05-15 @ 4:00 pm	2018-05-17 @ 5:00 pm	$1.0 \pm 0.3$	2018-05-2
9045239	CLASSROOM 22	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	< 0.3	2018-05-2
9045233	CLASSROOM 28	2018-05-15 @ 4:00 pm	2018-05-17 @ 5:00 pm	$0.9 \pm 0.3$	2018-05-2
9045232	CLASSROOM 28	2018-05-15 @ 4:00 pm	2018-05-17 @ 5:00 pm	$1.0 \pm 0.3$	2018-05-2
9045231	CLASSROOM 29	2018-05-15 @ 4:00 pm	2018-05-17 @ 5:00 pm	$1.2 \pm 0.3$	2018-05-2
9045229	CLASSROOM 30	2018-05-15 @ 4:00 pm	2018-05-17 @ 5:00 pm	$6.5 \pm 0.5$	2018-05-2
9045227	CLASSROOM 31	2018-05-15 @ 4:00 pm	2018-05-17 @ 5:00 pm	$1.9 \pm 0.3$	2018-05-2
9045228	CLASSROOM 32	2018-05-15 @ 4:00 pm	2018-05-17 @ 5:00 pm	$0.8 \pm 0.3$	2018-05-2
9045235	CLASSROOM 5	2018-05-15 @ 4:00 pm	2018-05-17 @ 5:00 pm	$0.9 \pm 0.3$	2018-05-2
9045236	CLASSROOM 6	2018-05-15 @ 4:00 pm	2018-05-17 @ 5:00 pm	$0.9 \pm 0.3$	2018-05-2
9045237	CLASSROOM 8	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	$0.9 \pm 0.3$	2018-05-2
9045238	CLASSROOM 9	2018-05-15 @ 4:00 pm	2018-05-17 @ 5:00 pm	$0.5 \pm 0.3$	2018-05-2
9045252	GYM 15	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	$1.6 \pm 0.3$	2018-05-2
9045253	GYM 15	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	$1.6 \pm 0.4$	2018-05-2
9045248	GYM MECH. ROOM	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	$0.6 \pm 0.3$	2018-05-2
9045219	HALLWAY	2018-05-15 @ 5:00 pm	2018-05-17 @ 5:00 pm	< 0.3	2018-05-2
9045218	HALLWAY	2018-05-15 @ 5:00 pm	2018-05-17 @ 5:00 pm	< 0.3	2018-05-2
9045246	JANITOR CLOSSET 14C	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	$0.8 \pm 0.3$	2018-05-2
9045247	MUSIC STORAGE ROOM 13	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	$1.3 \pm 0.3$	2018-05-2
9045249	P.E. OFFICE 15B	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	$1.0 \pm 0.3$	2018-05-2
9045241	<b>ROOM</b> 10	•	2018-05-17 @ 4:00 pm	$1.0 \pm 0.3$	2018-05-2
9045225	ROOM 121A	•	2018-05-17 @ 5:00 pm	$0.6 \pm 0.3$	2018-05-2
9045226	ROOM 133A	•	2018-05-17 @ 5:00 pm	< 0.3	2018-05-2
9045251	STAGE 15D	•	2018-05-17 @ 4:00 pm	$1.4 \pm 0.4$	2018-05-2
9045250	STAGE 15E	2018-05-15 @ 4:00 pm	2018-05-17 @ 4:00 pm	$0.9 \pm 0.3$	2018-05-2
9045240	STORAGE ROOM 21	1	2018-05-17 @ 4:00 pm	$0.9 \pm 0.3$	2018-05-2

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

## **APPENDIX C**

Radon Measurement Professional License

