GRIGGS & MALONEY
INCORPORATED
Engineering & Environmental Consulting

P.O. Box 2968
Murfreesboro, TN 37133-2968
(615) 895-8221
Fax: (615) 895-0632

March 1, 2017

Rutherford County Attorney
c/o Cope, Hudson, Reed & McCreary, PLLC, Attorneys at Law
16 Public Square
Murfreesboro, TN 37130

RE: **OLD BANK BUILDING/RUTHERFORD CIRCUIT COURT CLERK OFFICES RADON SAMPLING**
20 NORTH PUBLIC SQUARE, MURFREESBORO, TENNESSEE
(G&M Project Number 300-66)

Dear Sir or Madam:

As requested by Mr. Ben Mankin representing Rutherford County, Griggs & Maloney, Inc. (G&M) conducted radon sampling in the Old Bank Building which houses portions of the Rutherford Circuit Court Clerk offices and records storage located on the northwest corner of the Public Square in Murfreesboro on February 24-27, 2017. We understand that a Circuit Court Clerk employee stationed in an office in that building has complained of high radon concentrations detected through sampling she conducted in and/or near her work station.

Radon Information:

According to the U.S. Environmental Protection Agency (EPA), radon is a naturally occurring radioactive gas and comes from the natural breakdown (radioactive decay) of uranium. It is usually found in igneous rock and soil, but in some cases, well water may also be a source of radon. EPA indicates that radon is the heaviest of all gases. It is eight times heavier than air. Radon gas therefore accumulates in basements or on lower floors and then, diffuses throughout the building. EPA indicates that during respiration of air containing radon, radioactive particles from radon gas can get trapped in your lungs. EPA indicates that radon poisoning symptoms resemble those of lung cancer: a persistent cough that doesn't get better, difficulty breathing, chest pains, the coughing up of blood, wheezing, hoarseness and recurring respiratory infections such as pneumonia or bronchitis. Over time according to EPA, these radioactive particles increase the risk of lung cancer. EPA indicates that it may take years before health problems appear under these conditions. Regarding radon, the Center for Disease Control (CDC) states "Radon is estimated to be the second leading cause of lung cancer in the United States, responsible for over 20,000 lung cancer deaths each year, according to the Environmental Protection Agency."

Radon originates naturally everywhere, and there is no place on earth you can go to get away from it. Every breath that we all take includes some radon. Background (normal) levels are 1 to 2 picocuries per liter (pCi/l) of air – it is reportedly impossible to achieve lower concentrations in your home

through mitigation. EPA indicates that in homes, generally all floors located at or above the ground level will have background radon concentrations. Regarding exposure-to-the-onset-of-cancer, EPA states "if a person has been exposed to radon, 75 percent of the radon progeny in lungs will become "harmless" lead particles after 44 years. When an alpha particle damages a cell to make it cancerous, the onset of lung cancer takes a minimum of 5 years but most often 15 to 25 years, and even longer." EPA set a recommended threshold for safety at 4.0 pCi/l. Based on computer assessments, EPA found that if a non-smoker was in the affected area for 19 hours per day, for 72 years, then their risk of dying from radon would be about the same as their risk of drowning. These are the conservative assumptions the EPA used to arrive at that risk conclusion.

There are detractors that have published articles in which they explain that the cancer risk from radon exposure is overstated and even antithetical based on published radon studies. Some published information suggests that low dose exposure to radon may in effect be stimulating to the body's capacity to fight off cancer[1][2].

Caoimnin P. Connell, a Forensic Industrial Hygienist, reminds us that "The EPA guideline is not law in the U.S., it pertains only to residential homes, and does not carry force of law (although it is a *de facto* standard upon which litigation may be supported). It is merely one political group's recommended level of reduction. The EPA does not have mandatory limits for radon for other types of buildings and does not prohibit levels of radon in excess of the 4 pCi/l threshold."[3]

The EPA's map of radon occurrence indicates that Rutherford County is in a high radon occurrence zone where the measurement of radon would be expected to typically exceed the 4 pCi/L recommended action threshold for the home has been established by the EPA for radon exposure.

Tested Building Conditions: G&M noted that the basement/crawlspace area under the tested building is open, with shared air throughout the sub-first floor space. The air of the first and second floors of the building are shared and conditioned by roof-mounted equipment that presumably entrains at least a certain percentage of makeup air from above grade outdoor areas. It should be noted that the tested building also shares air with the adjacent eastern, five-story court building on both the first and second floor. The tested building was closed to the public for the weekend during the period of testing.

Sampling Activities:

G&M placed twelve (12) radon test canisters in compliance with manufacturer's instructions in the building in the breathing zone (three feet to six feet above the floor) on February 24, 2017 after the building had generally been cleared of occupants. In that the building is a public building, it was

[1] Lehr, Good News About Radon: The Linear Nonthreshold Model Is Wrong, http://www.junkscience.com/news/lehr.html, May 1996
[2] Haslem, Radon risk: Real or ruse, https://www.ksl.com/?sid=23930910, Feb. 5, 2013
[3] Connell, Radon – A Brief Discussion, Forensic Applications Consulting Technologies, Inc., http://www.forensic-applications.com/radon/radon.html

relatively secured from entry until after G&M collected the test canisters on the morning of February 27, 2017, prior to normal business hour occupation. The collected test canisters were sealed and transported by common carrier to Radon Lab in Medway, Massachusetts for radon analysis. The analytical results are attached.

The following table presents the sample location and exposure times along with analytical results for each test location.

Table 1. Sample Data and Analytical Results
(Feb. 24-27, 2017)

Building Floor	Test No.	Canister No.	Location	Time (hrs./min.)	Analytical Result (pCi/L)
Basement	1	576090	Basement grinder room	63/40	21.5
	2	576091	Crawlspace front room	63/38	44.5
First	3	576088	File cabinet room, north end, second floor near stairs	63/28	10.5
	4	576096	Open files room northeast, second floor	63/26	11.2
	5	576094	Front (south) center file room, second floor	63/24	9.2
	6	576089	Middle west file room, second floor	63/22	11.3
Second	7	576095	Office outside north vault, first floor	63/13	9.9
	8	576097	North vault/break room, first floor	63/13	10.7
	9	576093	Front (south) Kitchen	63/08	10.4
	10	576092	Front table by stairs (SE corner area), first floor	63/07	12.0
	11	576099	West computer station room, first floor	63/06	11.3
	12	576098	West-central office (Betty's Office), first floor	63/06	11.7

Results:

The expected analytical results based on the heavier-than-air characteristic of radon and the test locations by floor (basement, first floor, second floor) would be that higher concentrations of radon would be lower in the building. The attached analytical data indicates that the average radon concentration in the basement was 33 pCi/L, the average in the first floor was 11 pCi/L and the average on the second floor was 10.55 pCi/L. These test results appear to follow the anticipated results. Each reading in the test event exceeded the EPA recommended action threshold of 4 pCi/L

with the lowest result being 9.2 pCi/L (second floor) and the highest being 44.5 pCi/L in the basement.

Discussion: Given that the staff of the tested building is going to be moved relatively soon to a multi-story building now under construction nearby and the EPA action recommendations, it seems reasonable to mitigate the existing radon conditions through a temporary measure such as evacuating the unconditioned air from the basement by exhausting it outdoors. The removal of the more radon laden air from the basement of the building would be expected to nominally reduce the radon concentrations in occupied spaces on the first and second floor, potentially to levels below the EPA recommended action concentration, though those reductions may be difficult to achieve under any conditions. The only method by which the effectiveness of this type of mitigation action can be determined is to conduct another testing event after the mitigation measure has been installed.

Before reoccupation of the tested building and presuming that renovation to some extent would take place before reoccupation, it would seem reasonable to consider installation of a more permanent radon mitigation system during renovation.

We understand that the Rutherford Court Clerk's staff will be moved to a multi-story building comprising at least one basement level now under construction and located two blocks north of the tested building. It may be wise to consider the potential for radon to become a concern of employees in the new building.

Consideration should also be given to the conditions in which the five-story court building adjacent to and east of the tested building shares common air through several ports with the tested building. There is no reason to expect anything but similar concentrations of radon on corresponding floors of the five-story building when compared to the tested building. The five-story building was not subject to this round of testing based on instructions from the client.

If you have any questions, or need additional information, please call me at 895-8221.

Sincerely,
GRIGGS & MALONEY, INC.

Kerry Given
Sr. Environmental Scientist

Attachments

AccuStar
Professional Radon Laboratory Services Since 1984

Radon in Air

NELAC NY 11769
NRPP 101193 AL
NRSB ARL0017

EPA Method #402-R-92-004
Charcoal Canister
NRPP Device Code 1017, 1159
NRSB Device Code 10302,10320

Laboratory Report for:

Mr. Kerry Given
PO Box 2968
Murfreesboro TN 37133

Property Tested:

Bank Building
Public Square
Murfreesboro TN 37130

Log Number	Device Number	Test Exposure Duration:		Area Tested	Result (pCi/L)
2053539	576090	02/24/2017 4:47 pm	02/27/2017 7:27 am	Basement Grinder Room	21.5
2053540	576091	02/24/2017 4:50 pm	02/27/2017 7:28 am	Basement Front Room	44.5
2053541	576088	02/24/2017 4:57 pm	02/27/2017 7:25 am	Second Floor File Cabinet Room	10.5
2053542	576096	02/24/2017 4:58 pm	02/27/2017 7:24 am	Second Floor Open Files Room NE	11.2
2053543	576094	02/24/2017 4:59 pm	02/27/2017 7:23 am	Second Floor Front Open Files Room	9.2
2053544	576089	02/24/2017 5:00 pm	02/27/2017 7:22 am	Second Floor Mid-West Open Files Room	11.3
2053545	576095	02/24/2017 5:02 pm	02/27/2017 7:15 am	First Floor NE Office	9.9
2053546	576097	02/24/2017 5:03 pm	02/27/2017 7:16 am	First Floor Vault/Break Room	10.7
2053547	576093	02/24/2017 5:09 pm	02/27/2017 7:17 am	First Floor Front Kitchen	10.4
2053548	576092	02/24/2017 5:11 pm	02/27/2017 7:18 am	First Floor Front Office by Stairs	12.0

Comment: Dates assumed as 2/24/2017 and 2/27/2017 for Device numbers 576095, 576097, 576093, 276092, 576099, 576098. Customer wrote 7/24/2017 and 7/27/2017. If incorrect please contact the lab. A copy of this report was emailed to kgiven@griggsandmaloney.com.

Distributed by: National Safety Products

Date Received: 02/28/2017 Date Logged: 02/28/2017 Date Analyzed: 02/28/2017 Date Reported: 02/28/2017

Report Reviewed By: _____ Report Approved By: _____

Carolyn D. Koke, President, AccuStar Labs

Disclaimer:

The uncertainty of this radon measurement is ~+/- 10 %. Factors contributing to uncertainty include statistical variations, daily and seasonal variations in radon concentrations, sample collection techniques and operation of the dwelling. Interference with test conditions may influence the test results.

This report may only be transferred to a third party in its entirety. Analytical results relate to the samples AS RECEIVED BY THE LABORATORY. Results shown on this report represent levels of radon gas measured between the dates shown in the room or area of the site identified above as "Property Tested". Incorrect information will affect results. The results may not be construed as either predictive or supportive of measurements conducted in any area of this structure at any other time. AccuStar Labs, its employees and agents are not responsible for the consequences of any action taken or not taken based upon the results reported or any verbal or written interpretation of the results.

11 Awl Street Medway MA 02053 888-480-8812 FAX 508-533-8831

AccuStar
Professional Radon Laboratory Services Since 1984

Radon in Air

NELAC NY 11769
NRPP 101193 AL
NRSB ARL0017

EPA Method #402-R-92-004
Charcoal Canister
NRPP Device Code 1017, 1159
NRSB Device Code 10302,10320

Laboratory Report for:

Mr. Kerry Given
PO Box 2968
Murfreesboro TN 37133

Property Tested:

Bank Building
Public Square
Murfreesboro TN 37130

Log Number	Device Number	Test Exposure Duration:		Area Tested	Result (pCi/L)
2053549	576099	02/24/2017 5:13 pm	02/27/2017 7:19 am	First Floor Computer Station Room NW	11.3
2053550	576098	02/24/2017 5:15 pm	02/27/2017 7:20 am	First Floor West Office- Betty	11.7

Comment: Dates assumed as 2/24/2017 and 2/27/2017 for Device numbers 576095, 576097, 576093, 276092, 576099, 576098. Customer wrote 7/24/2017 and 7/27/2017. If incorrect please contact the lab. A copy of this report was emailed to kgiven@griggsandmaloney.com.

Distributed by: National Safety Products

Date Received: 02/28/2017 Date Logged: 02/28/2017 Date Analyzed: 02/28/2017 Date Reported: 02/28/2017

Report Reviewed By: _____ Report Approved By: _____

Carolyn D. Koke, President, AccuStar Labs

Disclaimer:

The uncertainty of this radon measurement is ~+/- 10 %. Factors contributing to uncertainty include statistical variations, daily and seasonal variations in radon concentrations, sample collection techniques and operation of the dwelling. Interference with test conditions may influence the test results.

This report may only be transferred to a third party in its entirety. Analytical results relate to the samples AS RECEIVED BY THE LABORATORY. Results shown on this report represent levels of radon gas measured between the dates shown in the room or area of the site identified above as "Property Tested". Incorrect information will affect results. The results may not be construed as either predictive or supportive of measurements conducted in any area of this structure at any other time. AccuStar Labs, its employees and agents are not responsible for the consequences of any action taken or not taken based upon the results reported or any verbal or written interpretation of the results.

11 Awl Street Medway MA 02053 888-480-8812 FAX 508-533-8831