



greenough environmental consulting

June 19, 2018

GEC Project No.: 29458

Standing Offer 15-038

Ottawa-Carleton District School Board
1224 Stittsville Main Street
Ottawa, ON K2S 0E3

Attn: Mr. Dan Fournier
Project Officer / Architectural & Engineering

Re: Long Term Radon Sampling Program – **Following Mitigation**
Specified Areas of Jack Donohue E.S. - 101 Penith Street, Kanata, Ontario

INTRODUCTION

Greenough Environmental Consulting Inc. (GEC) was commissioned by the Ottawa-Carleton District School Board (OCDSB), hereinafter referred to as the “Client”, to complete radon analysis for samples collected within specified areas of **Jack Donohue Elementary School** located at 101 Penith Street in Kanata, Ontario.

SCOPE & METHODOLOGY

The scope of work was completed in accordance with the current standing offer between GEC and the OCDSB (15-038) and instructions provided by Mr. Fournier.

As directed by the OCDSB fifty-two (52) “Alpha Track” radon sampling cassettes were installed in the school by Ms. Amy Dean, Project Consultant for GEC, on March 2nd, 2018. The samples were retrieved by Ms. Amy Dean, Project Consultant for GEC, on June 1st, 2018 following approximately 92 days and were submitted for laboratory analysis.

Alpha-track radon gas detectors contain a detector element, called a foil. When radon atoms decay inside the detector, they release alpha particles. If the alpha particles strike the foil, they make microscopic tracks in the surface of the foil. When the detector is analyzed, the foil is chemically treated to enlarge the alpha tracks, which are counted on an automated system. The average radon level is calculated from the number of tracks and the number of days the detector was exposed. This level is reported in Becquerel per cubic metre (Bq/m³).

The sample cassettes were submitted by GEC to Radiation Safety Services Inc. (RSSI) for analysis.

BACKGROUND

What is Radon?

As stated by the Health Canada Guideline, Radon is a radioactive gas that is formed naturally by the breakdown of uranium in soil, rock and water. It cannot be detected by the senses; i.e., you cannot see, smell, or taste it. However, it can be detected easily with radon measurement devices. When radon escapes from the ground to the outdoors, it mixes with fresh air, resulting in concentrations too low to be of concern. When radon enters an enclosed space, such as a building, it can accumulate to high concentrations and become a health concern. Radon can enter a building any place it finds an opening where the building contacts the soil: cracks in foundation walls and in floor slabs, construction joints, gaps around service pipes, support posts, window wells, floor drains, sumps or cavities inside walls. The only known health risk associated with long-term exposure to radon is an increased risk of developing lung cancer. The level of risk depends on the concentration of radon and duration of exposure.

Radon in Schools

Because children spend considerable time at school, minimizing radon levels in schools can significantly reduce their potential lifetime radon exposure.

Schools represent special cases for radon testing in that they may only be occupied for part of the year (approximately 10 months), and the heating and ventilation systems may operate differently at different times throughout the day and night. All of these conditions can affect radon levels during a measurement period. Therefore, obtaining a representative estimate of student exposure requires measurements to be made only while the school is in session, i.e., during the school year.

Health Canada recommends that radon testing in schools begin with a long-term test, as described for other public buildings, carried out for a minimum of 3 months during the school year. Ideally, this will be done during the heating season. Depending on the results, follow-up testing may be required to support a more precise estimate of actual radon exposure.

How Does Radon Get Into The School?

Radon gas is present in the soil and enters buildings from underground, through cracks and openings in the foundation. Air pressure inside a building is sometimes lower than pressure in the soil under the foundation. Because of this difference in pressure, a building acts like a vacuum, drawing radon inside from the soil. Typical entry points include joints where the floor meets the wall, expansion joints in the floor, openings in the floor for pipes and wires, and hollow masonry walls that penetrate the floor.

Health Canada Guideline for Acceptable Levels of Radon

Although there is currently no regulation that governs an acceptable level of radon in Canadian homes or public buildings, Health Canada, in partnership with the provinces and territories, has developed a guideline. The current Canadian guideline for radon in indoor air for dwellings is 200 becquerels per cubic metre (200 Bq/m³). This guideline provides Canadians with guidance on when remedial action should be taken to reduce radon levels.

The following guideline was approved by the Federal Provincial Territorial Radiation Protection Committee in October 2006 and adopted by the Government of Canada on June 9, 2007:

"Remedial measures should be undertaken in a dwelling whenever the average annual radon concentration exceeds 200 Bq/m³ in the normal occupancy area.

The higher the radon concentration, the sooner remedial measures should be undertaken. When remedial action is taken, the radon level should be reduced to a value as low as practicable.

The construction of new dwellings should employ techniques that will minimize radon entry and will facilitate post-construction radon removal, should this subsequently prove necessary."

Health Canada Recommendations for Remedial Actions

1. **Remediate within 2 years:** Results between 200 and 600 Bq/m³, Health Canada recommends taking steps to reduce the radon level within 2 years.
2. **Remediate within 1 year:** Results greater than 600 Bq/m³, Health Canada recommends taking steps to reduce the level within 1 year.

While the health risk from radon exposure below the Canadian Guideline is small, there is no safe level of radon. It is the choice of each building owner or manager to decide what level of radon exposure they are willing to accept.

FINDINGS

As indicated on the attached laboratory report in **Appendix 1**, the analytical results are as follows:

JACK DONOHUE E.S., KANATA, ONTARIO					
RADON SAMPLING – 92 DAY COLLECTION (LONG-TERM)					
Sample ID	Location	Length of Test	Results	Comparison to Health Canada Standard	
				between 200 and 600 Bq/m ³	greater than 600 Bq/m ³
136-R01	Administration	92 Days	67 ± 6% Bq/m ³	No	No
136-R02	Vice Principal	92 Days	104 ± 5% Bq/m ³	No	No
136-R03	Principal Office	92 Days	67 ± 6% Bq/m ³	No	No
136-R04	Staff Room 120	92 Days	96 ± 5% Bq/m ³	No	No
136-R05	Literacy Room 115	92 Days	41 ± 8% Bq/m ³	No	No
136-R06	LST & SELC 116	92 Days	30 ± 9% Bq/m ³	No	No
136-R07	Quiet Zone 117	92 Days	30 ± 9% Bq/m ³	No	No
136-R08	Classroom 118	92 Days	30 ± 9% Bq/m ³	No	No
136-R09	Classroom 120	92 Days	30 ± 8% Bq/m ³	No	No
136-R10	Classroom 122	92 Days	33 ± 8% Bq/m ³	No	No
136-R11	Classroom 124	92 Days	37 ± 8% Bq/m ³	No	No

JACK DONOHUE E.S., KANATA, ONTARIO					
RADON SAMPLING – 92 DAY COLLECTION (LONG-TERM)					
Sample ID	Location	Length of Test	Results	Comparison to Health Canada Standard	
				between 200 and 600 Bq/m ³	greater than 600 Bq/m ³
136-R12	Classroom 124 (Duplicate)	92 Days	30 ± 9% Bq/m ³	No	No
136-R13	Computer Lab 126A	92 Days	22 ± 9% Bq/m ³	No	No
136-R14	Design Tech Shop 126	92 Days	22 ± 9% Bq/m ³	No	No
136-R15	Science 130	92 Days	26 ± 9% Bq/m ³	No	No
136-R16	Multi-purpose Room 131	92 Days	26 ± 9% Bq/m ³	No	No
136-R17	Classroom N103	92 Days	59 ± 6% Bq/m ³	No	No
136-R18	Classroom N102	92 Days	44 ± 7% Bq/m ³	No	No
136-R19	Classroom N101	92 Days	52 ± 7% Bq/m ³	No	No
136-R20	Classroom N100	92 Days	44 ± 7% Bq/m ³	No	No
136-R21	Classroom N113	92 Days	100 ± 5% Bq/m ³	No	No
136-R22	Classroom N113 (Duplicate)	92 Days	100 ± 5% Bq/m ³	No	No
136-R23	Classroom N112	92 Days	118 ± 5% Bq/m ³	No	No
136-R24	Music 132	92 Days	30 ± 4% Bq/m ³	No	No
136-R25	Portable #C311	92 Days	15 ± 11% Bq/m ³	No	No
136-R26	Classroom 129	92 Days	44 ± 7% Bq/m ³	No	No
136-R27	Classroom 128	92 Days	26 ± 9% Bq/m ³	No	No
136-R28	Teachers 127	92 Days	26 ± 9% Bq/m ³	No	No
136-R29	Classroom 125	92 Days	22 ± 10% Bq/m ³	No	No
136-R30	Classroom 123	92 Days	26 ± 9% Bq/m ³	No	No
136-R31	Classroom 121	92 Days	26 ± 9% Bq/m ³	No	No
136-R32	Classroom 119	92 Days	26 ± 9% Bq/m ³	No	No
136-R33	Work Room	92 Days	48 ± 7% Bq/m ³	No	No

JACK DONOHUE E.S., KANATA, ONTARIO					
RADON SAMPLING – 92 DAY COLLECTION (LONG-TERM)					
Sample ID	Location	Length of Test	Results	Comparison to Health Canada Standard	
				between 200 and 600 Bq/m ³	greater than 600 Bq/m ³
136-R34	Work Room (Duplicate)	92 Days	41 ± 7% Bq/m ³	No	No
136-R35	Office 114	92 Days	92 ± 5% Bq/m ³	No	No
136-R36	Kitchen	92 Days	78 ± 6% Bq/m ³	No	No
136-R37	Seminar 112	92 Days	67 ± 6% Bq/m ³	No	No
136-R38	Resource Library 111	92 Days	81 ± 5% Bq/m ³	No	No
136-R39	Gym Office	92 Days	85 ± 5% Bq/m ³	No	No
136-R40	Computer Lab 110	92 Days	63 ± 6% Bq/m ³	No	No
136-R41	Classroom 109	92 Days	85 ± 5% Bq/m ³	No	No
136-R42	Classroom 106	92 Days	67 ± 6% Bq/m ³	No	No
136-R43	Jr./Sr. Kindergarten 107	92 Days	59 ± 6% Bq/m ³	No	No
136-R44	Classroom 105	92 Days	67 ± 6% Bq/m ³	No	No
136-R45	Classroom 105 (Duplicate)	92 Days	81 ± 5% Bq/m ³	No	No
136-R46	Classroom 103	92 Days	48 ± 7% Bq/m ³	No	No
136-R47	Classroom 101	92 Days	44 ± 7% Bq/m ³	No	No
136-R48	Chief Custodian	92 Days	56 ± 7% Bq/m ³	No	No
136-R49	Jr. Kindergarten #2 100	92 Days	37 ± 8% Bq/m ³	No	No
136-R50	Sr. Kindergarten #1 102	92 Days	41 ± 8% Bq/m ³	No	No
136-R51	Jr. Kindergarten 104	92 Days	30 ± 8% Bq/m ³	No	No
136-R52	Sr. Kindergarten 106	92 Days	48 ± 7% Bq/m ³	No	No

- Health Canada's recommended action limit is 200 Bq/m³.
- Health Canada suggests that if the radon concentrations are found to be between 200 Bq/m³ and 600 Bq/m³, the remedial actions should be completed in less than two years.
- ± % = Analytical procedure variance.

CONCLUSIONS & RECOMMENDATIONS

The following conclusions are made with regards to the long term Radon sampling program:

- All samples were identified to have radon concentrations well below the Health Canada Action Limit of 200 Bq/m³.

The following recommendations are made with regards to the long term Radon sampling program:

- As the results are below the Health Canada Action Limit, no recommendations are warranted at this time.

CLOSURE

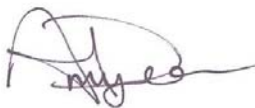
This report has been prepared for the sole benefit of the Client and their intended use. The report may not be relied upon by any other person or entity without the written consent of Greenough Environmental Consulting Inc. (GEC), and the Client.

GEC accepts no responsibility for any use that an outside party makes of this report and any reliance on decisions made based on it, are the responsibility of such parties.

Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Yours Truly,

GREENOUGH ENVIRONMENTAL CONSULTING INC.



Amy E. Dean
Project Consultant



Derek R. Stashick, B.Ed, WRT, CMI, C-NRPP
Project Manager

APPENDIX 1 – RADON LABORATORY CERTIFICATE



6312 West Oakton Street
Morton Grove, IL 60053-2723
847-965-1999
Fax 847-965-1991

June 15, 2018

Greenough Environmental Consulting
Amy Dean
29 Capital Drive
Ottawa, Ontario K2G 0E7
Canada

Alpha Track Radon Test Results

Detector Number	Bq/m ³	Test Location	Test Address	Start Date	End Date	Note*
363218	104 ± 5%	R02	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363227	96 ± 5%	R04	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363341	67 ± 6%	R03	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363344	41 ± 8%	R05	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363401	26 ± 9%	R32	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363405	26 ± 9%	R31	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363406	78 ± 6%	R36	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363409	85 ± 5%	R39	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	

Analytical results showing the radon concentration relate only to the device(s) tested in the condition as received by RSSI. Results were calculated based on information provided by the client.

Report shall not be reproduced except in its entirety without the approval of RSSI.

Detector Number	Bq/m ³	Test Location	Test Address	Start Date	End Date	Note*
363412	67 ± 6%	R42	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363414	41 ± 8%	R50	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363416	59 ± 6%	R43	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363418	37 ± 8%	R49	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363424	30 ± 8%	R51	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363526	26 ± 9%	R30	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363527	26 ± 9%	R27	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363528	15 ± 11%	R25	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363529	22 ± 10%	R29	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363532	30 ± 9%	R24	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363535	26 ± 9%	R16	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363537	100 ± 5%	R21	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	

Analytical results showing the radon concentration relate only to the device(s) tested in the condition as received by RSSI. Results were calculated based on information provided by the client.

Report shall not be reproduced except in its entirety without the approval of RSSI.

Detector Number	Bq/m ³	Test Location	Test Address	Start Date	End Date	Note*
363538	22 ± 9%	R14	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363540	22 ± 9%	R13	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363541	26 ± 9%	R15	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363542	59 ± 6%	R17	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363545	37 ± 8%	R11	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363546	30 ± 9%	R07	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363548	30 ± 8%	R09	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	

Analyzed By:



Jeremy Kieser
Radon Analyst

06/14/ 2018

Analysis Date

END REPORT

* 1-Broken Seal, 2-Damaged Filter, 3-Loose Test Material, 4-Missing Test Material, 5-Missing End Date, 6-Missing Start Date, 7-Less Than 8 Days, 8-Past Expiration Date, 9-Missing Both Dates, NA-No applicable notes

Analytical results showing the radon concentration relate only to the device(s) tested in the condition as received by RSSI. Results were calculated based on information provided by the client.

Report shall not be reproduced except in its entirety without the approval of RSSI.

Detector Number	Bq/m ³	Test Location	Test Address	Start Date	End Date	Note*
363322	67 ± 6%	R01	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363402	41 ± 7%	R34	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363403	92 ± 5%	R35	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363404	48 ± 7%	R33	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363407	67 ± 6%	R37	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363408	81 ± 5%	R38	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363410	85 ± 5%	R41	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363411	63 ± 6%	R40	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363413	81 ± 5%	R45	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363415	56 ± 7%	R48	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363417	48 ± 7%	R46	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363419	48 ± 7%	R52	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	

Analytical results showing the radon concentration relate only to the device(s) tested in the condition as received by RSSI. Results were calculated based on information provided by the client.


Report shall not be reproduced except in its entirety without the approval of RSSI.

Detector Number	Bq/m ³	Test Location	Test Address	Start Date	End Date	Note*
363422	67 ± 6%	R44	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363423	44 ± 7%	R47	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363530	26 ± 9%	R28	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363531	44 ± 7%	R26	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363533	118 ± 5%	R23	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363534	44 ± 7%	R20	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363536	100 ± 5%	R22	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363539	44 ± 7%	R18	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363543	52 ± 7%	R19	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363544	30 ± 9%	R12	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363547	33 ± 8%	R10	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	
363549	30 ± 9%	R08	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	

Analytical results showing the radon concentration relate only to the device(s) tested in the condition as received by RSSI. Results were calculated based on information provided by the client.

Report shall not be reproduced except in its entirety without the approval of RSSI.

Detector Number	Bq/m ³	Test Location	Test Address	Start Date	End Date	Note*
363550	30 ± 9%	R06	101 Penrith Street Ottawa, Ontario	3/2/2018	6/1/2018	

Analyzed By: 

Jeremy Kieser
 Radon Analyst

06/15/ 2018
 Analysis Date

*****END REPORT*****

* 1-Broken Seal, 2-Damaged Filter, 3-Loose Test Material, 4-Missing Test Material, 5-Missing End Date, 6-Missing Start Date, 7-Less Than 8 Days, 8-Past Expiration Date, 9-Missing Both Dates, NA-No applicable notes

Analytical results showing the radon concentration relate only to the device(s) tested in the condition as received by RSSI. Results were calculated based on information provided by the client.

Report shall not be reproduced except in its entirety without the approval of RSSI.