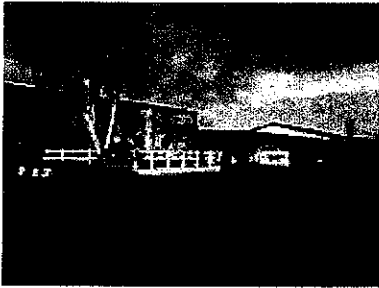


## 5 Gardnerville Elementary School

### 5.1 Description



Short-term radon measurements were conducted in this school from March 16-19, 2009. The results obtained from these tests reflect the conditions that existed within this school and within these dates.

Tests were conducted in accordance with the US EPA's Guidance Document Radon Measurements in Schools, Revised Edition, EPA 402-R-92-014, July 1993.

These tests included all frequently occupied ground floor rooms within all structures on the campus, including the satellite training area. Additional details on the methodology of these tests as well as room selection can be found in Section 1.2 of this report.

Locations tested:	64
Locations where devices retrieved:	64
Locations with short-term results at or above 4.0 pCi/L:	1
Rooms at or above 4.0 pCi/L:	Room 3
Survey anomalies:	None observed

Quality control and quality assurance measures that were taken for this school, which are detailed in Section 13, indicate that confidence can be placed in the survey results for this facility.

### 5.2 Results

The results provided below in both tabular and pictorial form represent the radon levels within these locations that were present at the time of the survey and under the condition in which the building was being operated, including its HVAC system. Locations determined to have short-term radon levels at or above 4.0 pCi/L are shown in "bold" within the table and in red on the diagram.

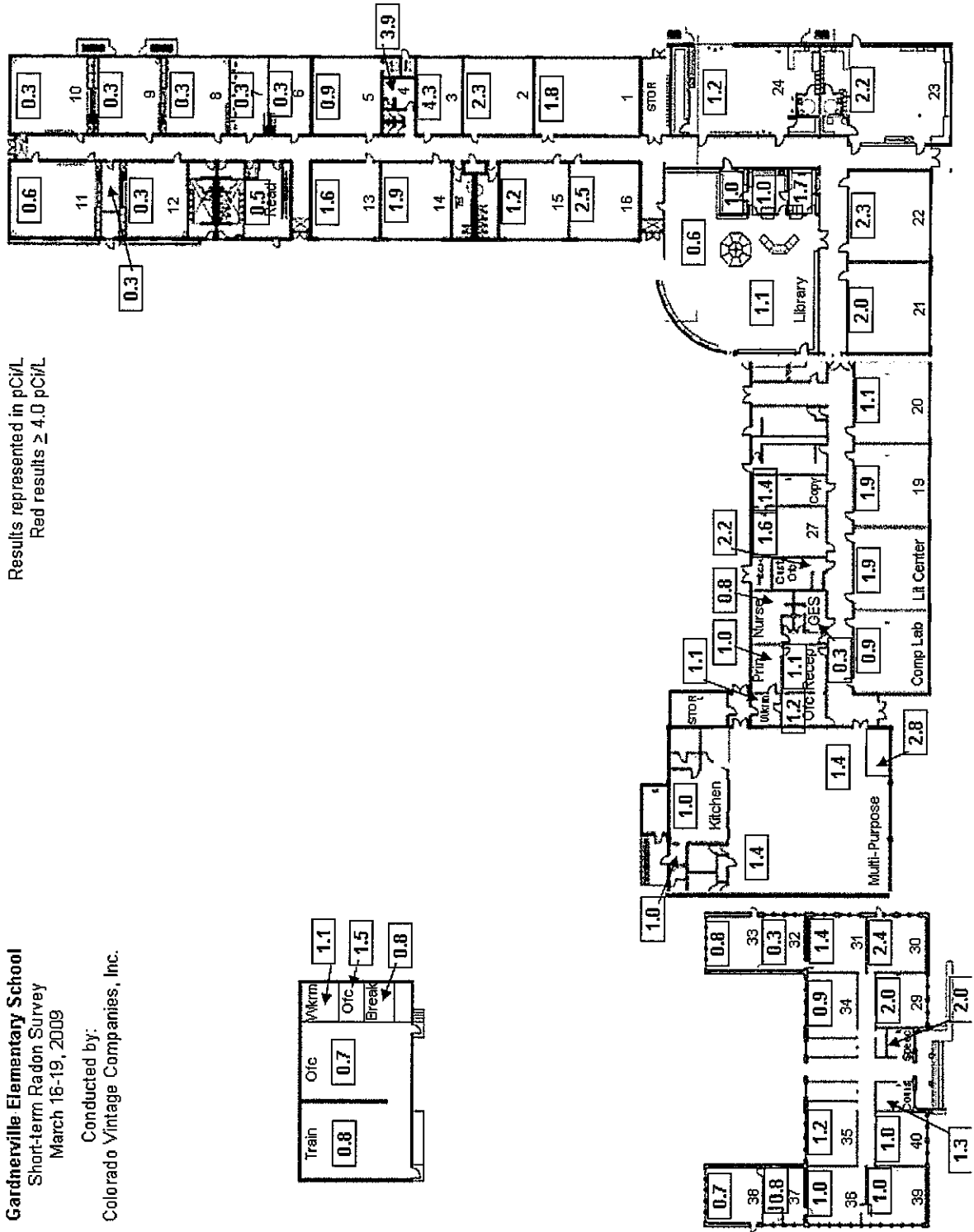
All times indicated are Eastern Daylight Savings Time. Results indicated as <0.3 pCi/L are at the lower level of detection for the devices.

**Table 6: Gardnerville Elementary School Radon Survey Results**

Room	Device	Start Date	Start Time	End Date	End Time	Result (pCi/L)
1	4328236	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.8
2	4328245	2009-03-16	11:00 pm	2009-03-19	8:00 pm	2.3
3	<b>4328220</b>	<b>2009-03-16</b>	<b>11:00 pm</b>	<b>2009-03-19</b>	<b>8:00 pm</b>	<b>4.3</b>
4	4328244	2009-03-16	11:00 pm	2009-03-19	8:00 pm	3.9
5	4328227	2009-03-16	11:00 pm	2009-03-19	8:00 pm	0.9
6	4328247	2009-03-16	11:00 pm	2009-03-19	8:00 pm	< 0.3
7	4328254	2009-03-16	11:00 pm	2009-03-19	8:00 pm	< 0.3
8	4328252	2009-03-16	11:00 pm	2009-03-19	8:00 pm	< 0.3
9	4328256	2009-03-16	11:00 pm	2009-03-19	8:00 pm	< 0.3
10	4328218	2009-03-16	11:00 pm	2009-03-19	8:00 pm	< 0.3
11	4328217	2009-03-16	11:00 pm	2009-03-19	8:00 pm	0.6
12	4328255	2009-03-16	11:00 pm	2009-03-19	8:00 pm	< 0.3
13	4328243	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.6
14	4328219	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.9
15	4328237	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.2
16	4328235	2009-03-16	11:00 pm	2009-03-19	8:00 pm	2.5
19	4328216	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.9
20	4328222	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.1
21	4328221	2009-03-16	11:00 pm	2009-03-19	8:00 pm	2.0
22	4328223	2009-03-16	11:00 pm	2009-03-19	8:00 pm	2.3
23	4328238	2009-03-16	11:00 pm	2009-03-19	8:00 pm	2.2
24	4328240	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.2
25A	4328231	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.0
25B	4328232	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.0
25C	4328230	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.7
27	4328213	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.6
29	4328262	2009-03-17	12:00 am	2009-03-19	8:00 pm	2.0
30	4328241	2009-03-17	12:00 am	2009-03-19	8:00 pm	2.4
31	4328242	2009-03-17	12:00 am	2009-03-19	8:00 pm	1.4
32	4328260	2009-03-17	12:00 am	2009-03-19	8:00 pm	< 0.3
33	4328210	2009-03-17	12:00 am	2009-03-19	8:00 pm	0.8
34	4328233	2009-03-17	12:00 am	2009-03-19	8:00 pm	0.9
35	4328250	2009-03-17	12:00 am	2009-03-19	8:00 pm	1.2
36	4328249	2009-03-17	12:00 am	2009-03-19	8:00 pm	1.0
37	4328261	2009-03-17	12:00 am	2009-03-19	8:00 pm	0.8
38	4328259	2009-03-17	12:00 am	2009-03-19	8:00 pm	0.7
39	4328251	2009-03-17	12:00 am	2009-03-19	8:00 pm	1.0
40	4328234	2009-03-17	12:00 am	2009-03-19	8:00 pm	1.0
Class	4328246	2009-03-16	11:00 pm	2009-03-19	8:00 pm	< 0.3
Computer Lab	4328202	2009-03-16	11:00 pm	2009-03-19	8:00 pm	0.9
Copy Room	4328207	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.4
Counselor	4328226	2009-03-17	12:00 am	2009-03-19	8:00 pm	1.3
Custodian Ofc	4328588	2009-03-16	11:00 pm	2009-03-19	8:00 pm	2.2
GES	4328203	2009-03-16	11:00 pm	2009-03-19	8:00 pm	< 0.3
Kitchen	4328600	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.0
Kitchen Office	4328599	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.0

Room	Device	Start Date	Start Time	End Date	End Time	Result (pCi/L)
Library - 1	4328229	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.1
Library - 2	4328224	2009-03-16	11:00 pm	2009-03-19	8:00 pm	0.6
Literacy	4328586	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.9
Multi-Purp 1	4328592	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.4
Multi-Purp 2	4328597	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.4
Multi-Purp Ofc	4328589	2009-03-16	11:00 pm	2009-03-19	8:00 pm	2.8
Nurse	4328205	2009-03-16	11:00 pm	2009-03-19	8:00 pm	0.8
Office	4328594	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.2
Office Wkroom	4328593	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.1
PDC	4328269	2009-03-17	12:00 am	2009-03-19	8:00 pm	0.7
PDC Break	4328257	2009-03-17	12:00 am	2009-03-19	8:00 pm	0.8
PDC Office	4328258	2009-03-17	12:00 am	2009-03-19	8:00 pm	1.5
PDC Train	4328263	2009-03-17	12:00 am	2009-03-19	8:00 pm	0.8
PDC Wkroom	4328264	2009-03-17	12:00 am	2009-03-19	8:00 pm	1.1
Principal	4328598	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.0
Reading	4328248	2009-03-16	11:00 pm	2009-03-19	8:00 pm	0.5
Reception	4328591	2009-03-16	11:00 pm	2009-03-19	8:00 pm	1.1
Speech	4328225	2009-03-17	12:00 am	2009-03-19	8:00 pm	2.0

Figure 5: Gardnerville Elementary School Radon Survey Results



Gardnerville Elementary School  
 Short-term Radon Survey  
 March 16-19, 2009  
 Conducted by:  
 Colorado Vintage Companies, Inc.

### 5.3 Discussion

Room 3 within this building was found to have a reported reading in excess of 4.0 pCi/L. Adjacent to Room 3, Room 4 had a reading of 3.9 pCi/L which, within the variance of the measurement, is essentially at the guidance level and should be reviewed at the same time that Room 3 is addressed.

Given the consistency of the measurements in Room 3 and 4, it is probable that a common HVAC system is impacting both locations. This is particularly evident from the pictorial representation of the results, where one can see other rooms around these two that are significantly lower. It is possible that there is an exhaust system operating in these two rooms without the benefit of sufficient make-up air.

### 5.4 Recommendations

- Confirm elevated radon levels within Room 3 with the use of a continuous radon monitor that, in addition to providing a confirmatory integrated measurement, it would also provide a more informative indication of the daytime to nighttime averages of radon exposure.
- Review HVAC system for the area within which these Rooms 3 and 4 are located.
  - Insure both the presence and capacity of air supply to these rooms
  - Adjust supply to maintain a 0.010 inch of water column positive pressurization within these rooms relative to the sub-grade.
    - Verify that positive pressure is maintained in all other rooms that are served by the air handler that serves Rooms 3 and 4. If not, increase capacity of the air handler to insure positive pressure through adjustments to fresh air make-up and/or fan speed.
- After adequate HVAC adjustments have been accomplished, conduct short-term confirmatory measurements in all rooms served by the HVAC system that serves Rooms 3 and 4.

### Maintenance

Given the potential for this school to have elevated radon levels, a program should be instituted that:

1. Retests Rooms 3 and 4, once every year as recommended by US EPA protocols
2. Retests rooms after renovations, which would affect air flow and air supply, occur. This would include but not be limited to situations when:
  - HVAC system is modified, (Retest rooms affected by HVAC that is modified)
  - Partition walls are added within a room,
    - Insure that renovations include provisions for balanced air supply and return from newly created room.
  - Additions occur at this campus, whether they are new buildings or portable classrooms.

3. Maintain fresh air make-up in conformance with ASHRAE standards and state codes for schools and to insure an interior positive building pressure during occupied hours.
4. Develop a database either specifically for this school or district wide for all schools that allows for the retention of future test results that clearly delineate:
  1. Location
  2. Date of test
  3. Purpose of test (routine, post-mitigation or post renovation, etc.)
  4. Method by which room nomenclature is maintained or a clear means of determining when names are changed or rooms added.