

# **Radon Concentration Isn't Always Highest in Winter**

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**Bowser-Morner, Inc.**  
**Dayton, Ohio**

# Anecdotal Observations

- **Observations led me to believe that in my area indoor radon concentration is highest in late Summer/early Fall.**
- **Lung counts at Mound sometimes high in the morning, normal in afternoon, only in late Summer/early Fall.**

# Anecdotal Observations

- **Outdoor measurements in Mound's monitoring networks around sites in PA, NJ, and NY highest in Summer.**
- **Air filters stored in lab, used for measurements of radon decay products, always had higher backgrounds in late Summer/early Fall but low in Winter.**

# Why Does This Happen? (My Opinions)

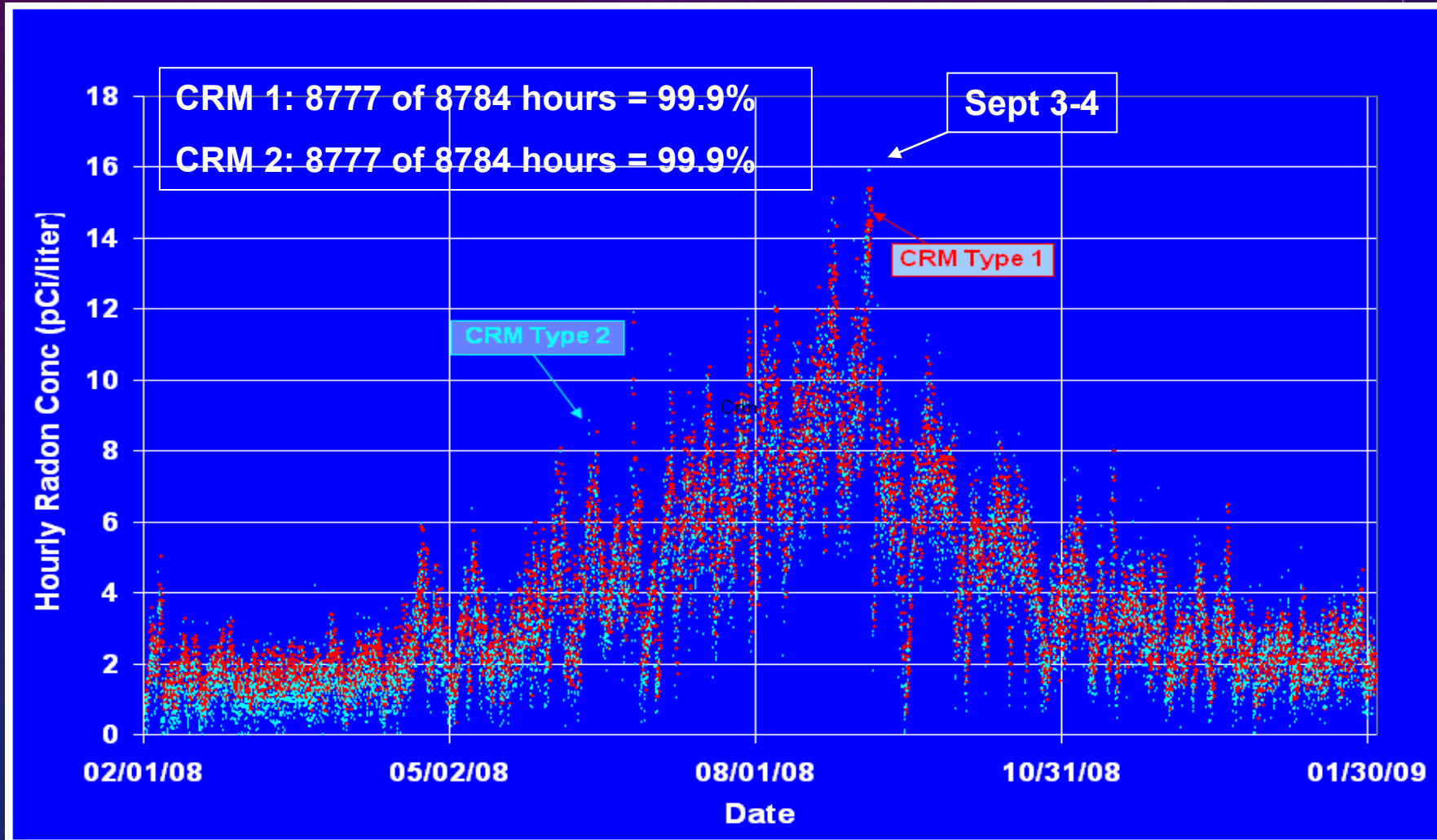
- **Long periods of no rain, calm winds, thermal inversions**
- **Clay soil is hot, dry and cracked**
- **Source of radon and ease of diffusion (diffusion coefficient) is greatest during this time**
- **Around October/November, conditions change and radon goes down**

# Needed Data

- **Because my observations were not based on experiments, hard data, I wanted actual data showing this.**
- **I performed a year-long study in 2008-2009, using CRMs and other devices at Bowser-Morner and in my home office.**
- **I presented results at the Symposium in 2009 in St. Louis.**

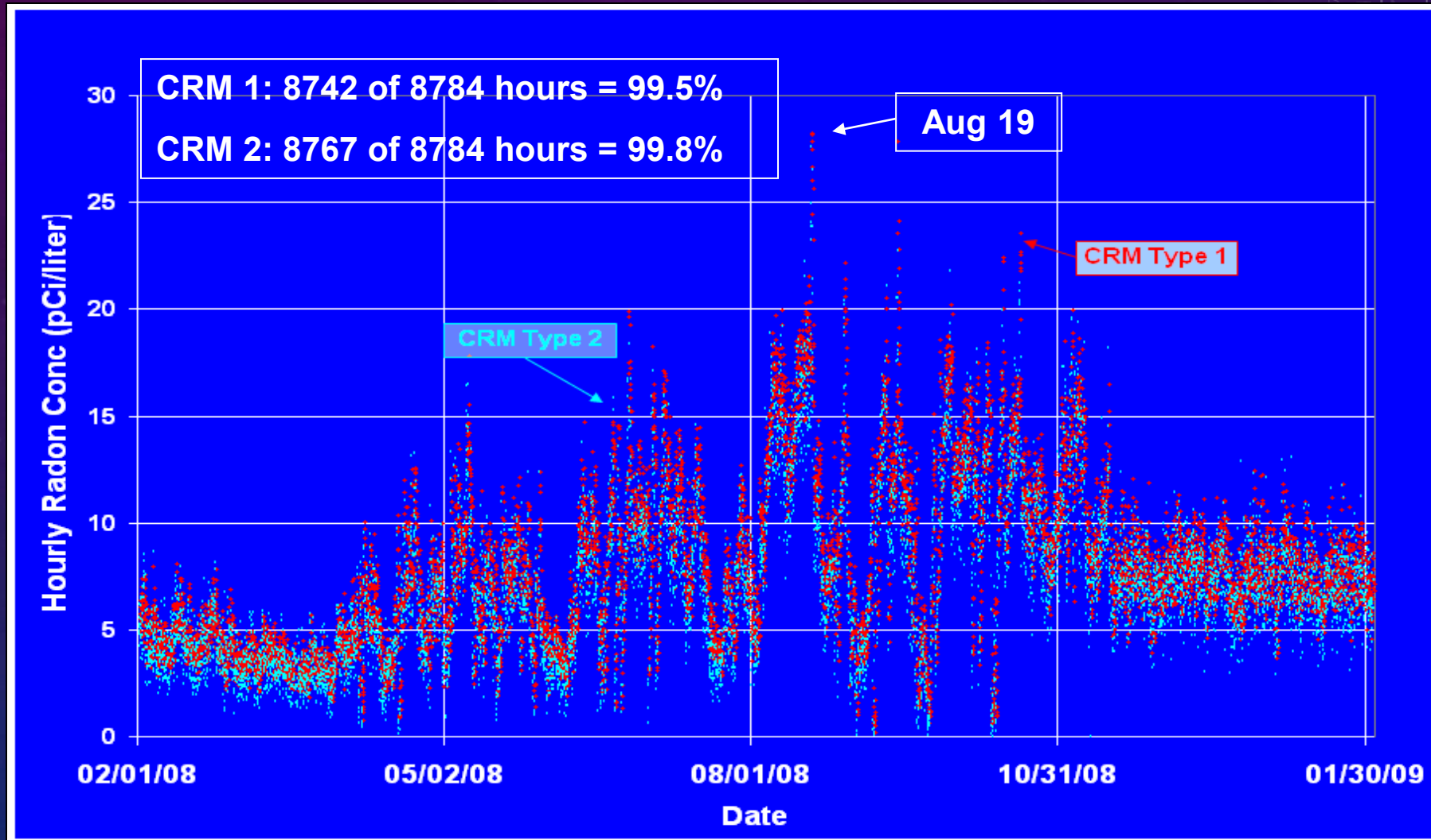
# Hourly Measurements

(BMI-closed conditions-overall average 4 pCi/L)



# Hourly Measurements

(Home-not closed-overall average 8 pCi/L)



# Recommendations

- **Never assume ANYTHING about radon. Generalizations nearly always are proven wrong at least sometimes.**
- **In my area, measure in the Winter but also measure in the dog days of late Summer/early Fall.**



# Why measure at my church?

- **My church had a daycare; concern for the children and daycare staff**
- **The church office area had instances where it was obvious that soil gas was getting into the rooms.**
- **Both of these areas were occupied more than any other areas.**

# Year-long Measurement Study

- **I wanted a year-long study done by a measurement specialist licensed in Ohio so it would be official; David Metzger volunteered his time and services.**
- **Rad-Elec, Inc. provided the devices that David used at no charge.**
- **A huge thanks to both David and Rad-Elec.**

# Many Thanks

- **Thanks again to David Metzger and to Rick Stieff of Rad-Elec.**
- **Thanks again to the companies that donated devices and lab analyses for the year-long study back in 2008-09.**

The background features a dark blue gradient with a subtle pattern of white stars. Overlaid on this are several technical diagrams, including circular gauges with numerical scales (e.g., 150, 160, 170, 180, 190, 200, 210) and arrows, and dashed lines forming circular paths. The text is centered in a bright yellow, serif font.

Now, David will discuss the Long Term  
Measurement performed in the Church  
and Day Care Facility

# Long Term Testing Reveals Interesting Seasonal Variations

**David Metzger**

1<sup>st</sup> Option Radon Measurement

Amherst, Ohio

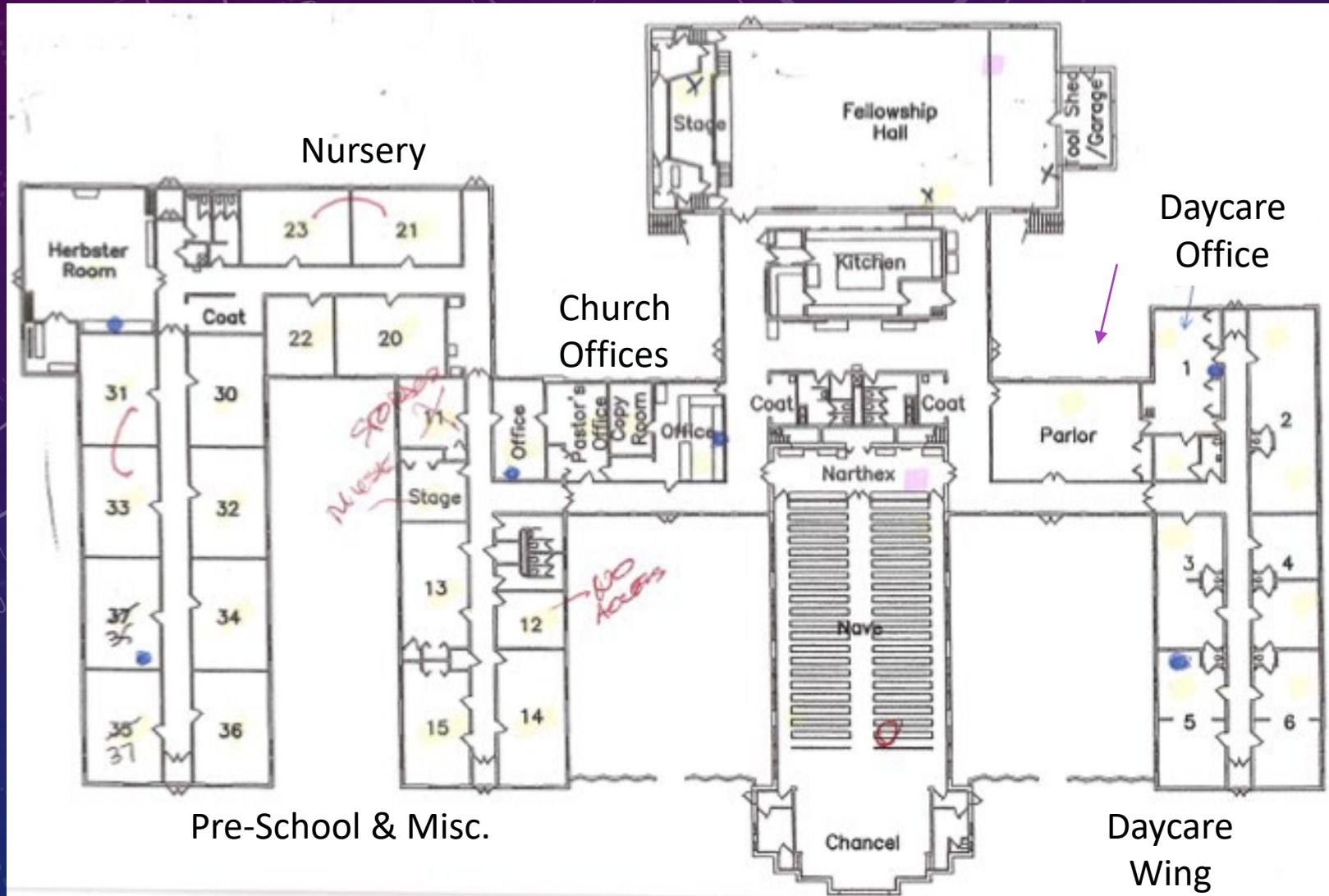
# Case study of a Dayton area church daycare and pre-school center

A look at several testing durations over time at the same site.

The purpose:

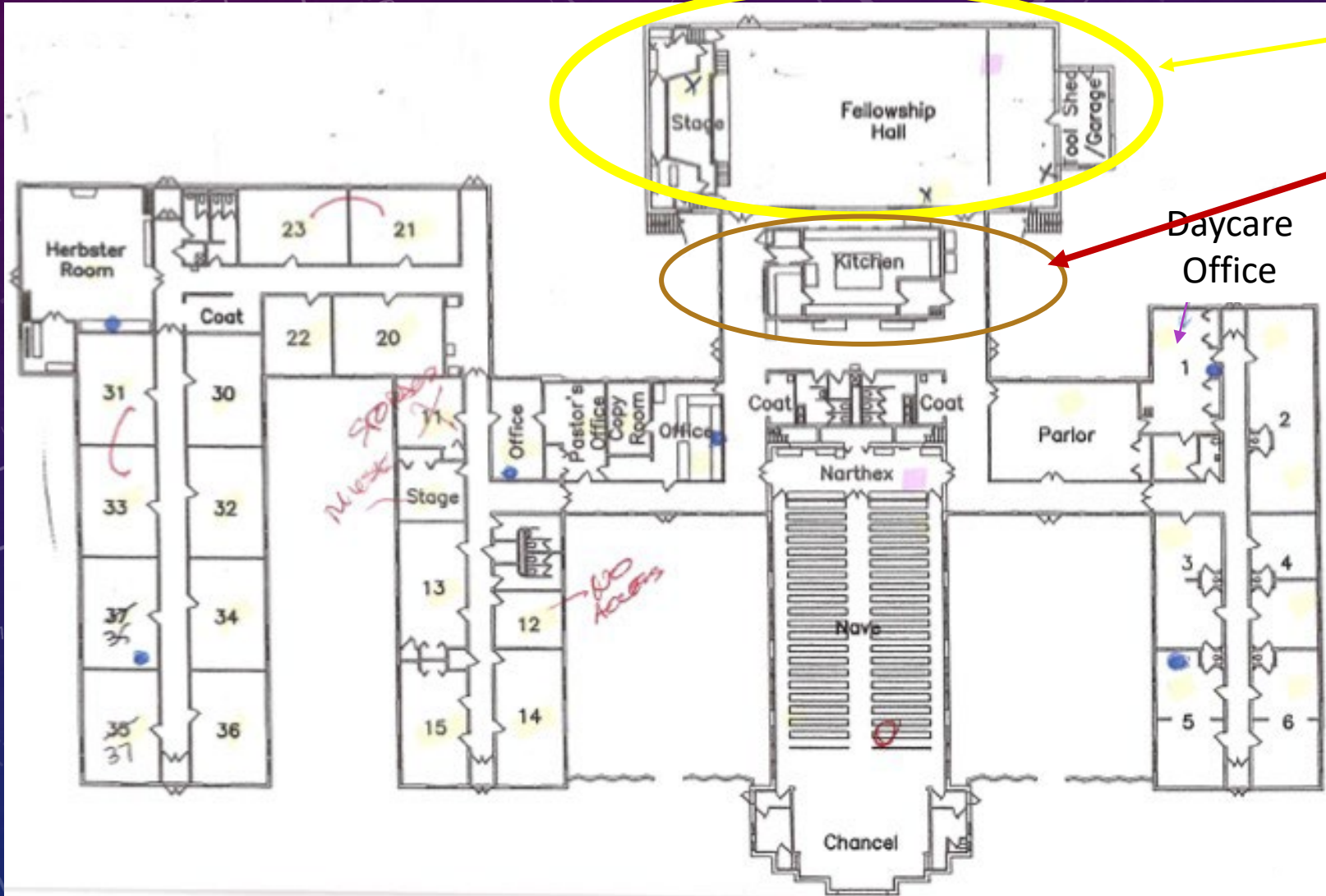
1. Evaluate the potential health risk to the children, staff and other occupants posed by radon concentrations in the facility
2. Gain a better understanding of the seasonal variations in radon concentrations in areas around Dayton.
3. Compare the effectiveness of various test durations within the same facility.

# Building Footprint



# Foundation & Features

1967  
Construction



Slab on Grade

Inaccessible  
basement  
housing  
mechanicals

Daycare  
Office

Inaccessible  
Crawl Space



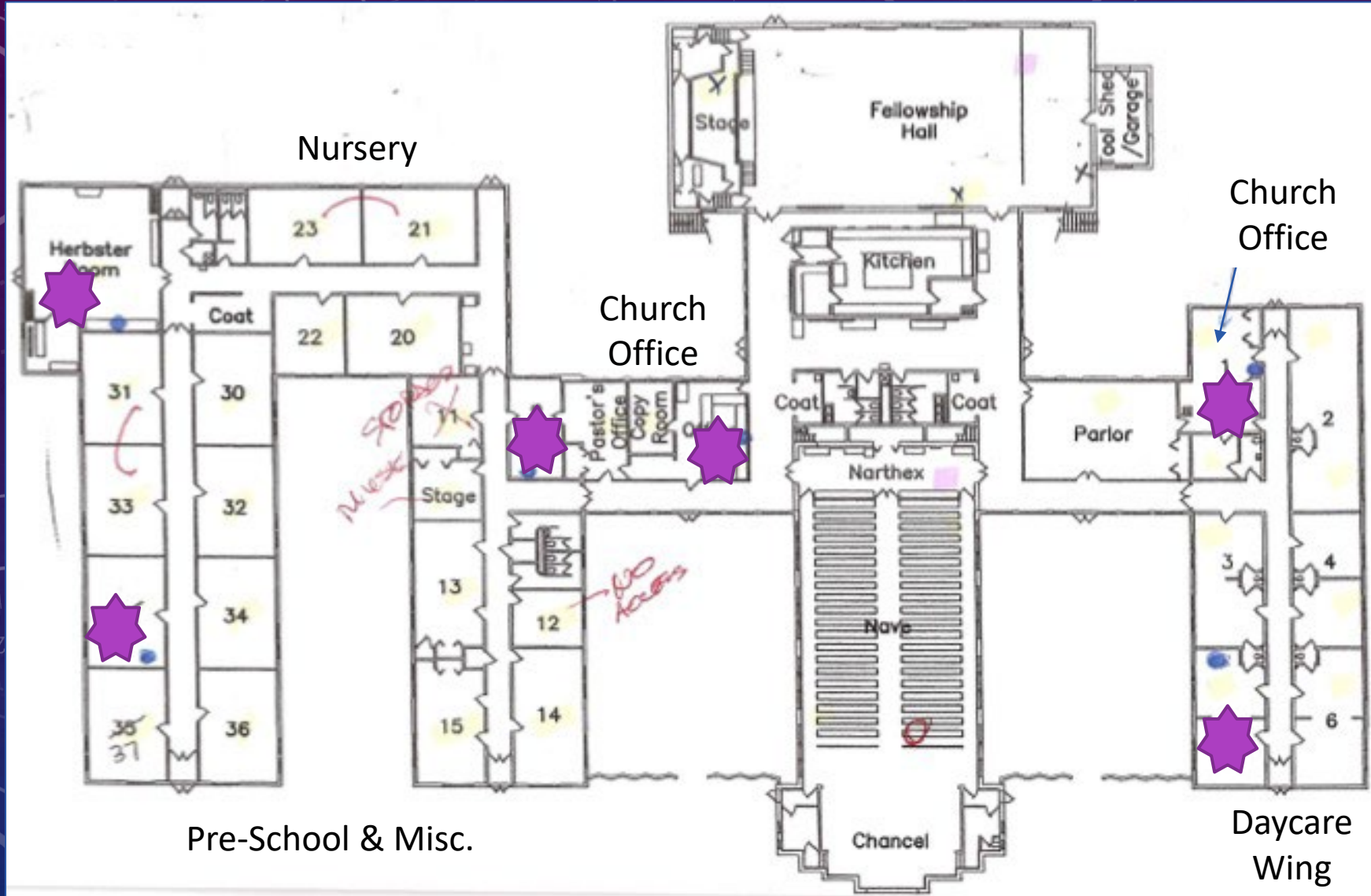
# ***INFO ONLY TESTING!***

*This was **not** a formal measurement.  
MALB protocols were not followed.*

It was decided to test two locations in each regularly occupied area of the facility.  
Six of the potential 34 test locations were tested.

# Initial Short Term Testing

★ Performed in November, 2019 in 6 selected areas



Herbster Room

Rm 35


Daycare Office

Church Office

Assoc. Pastor

Room 5

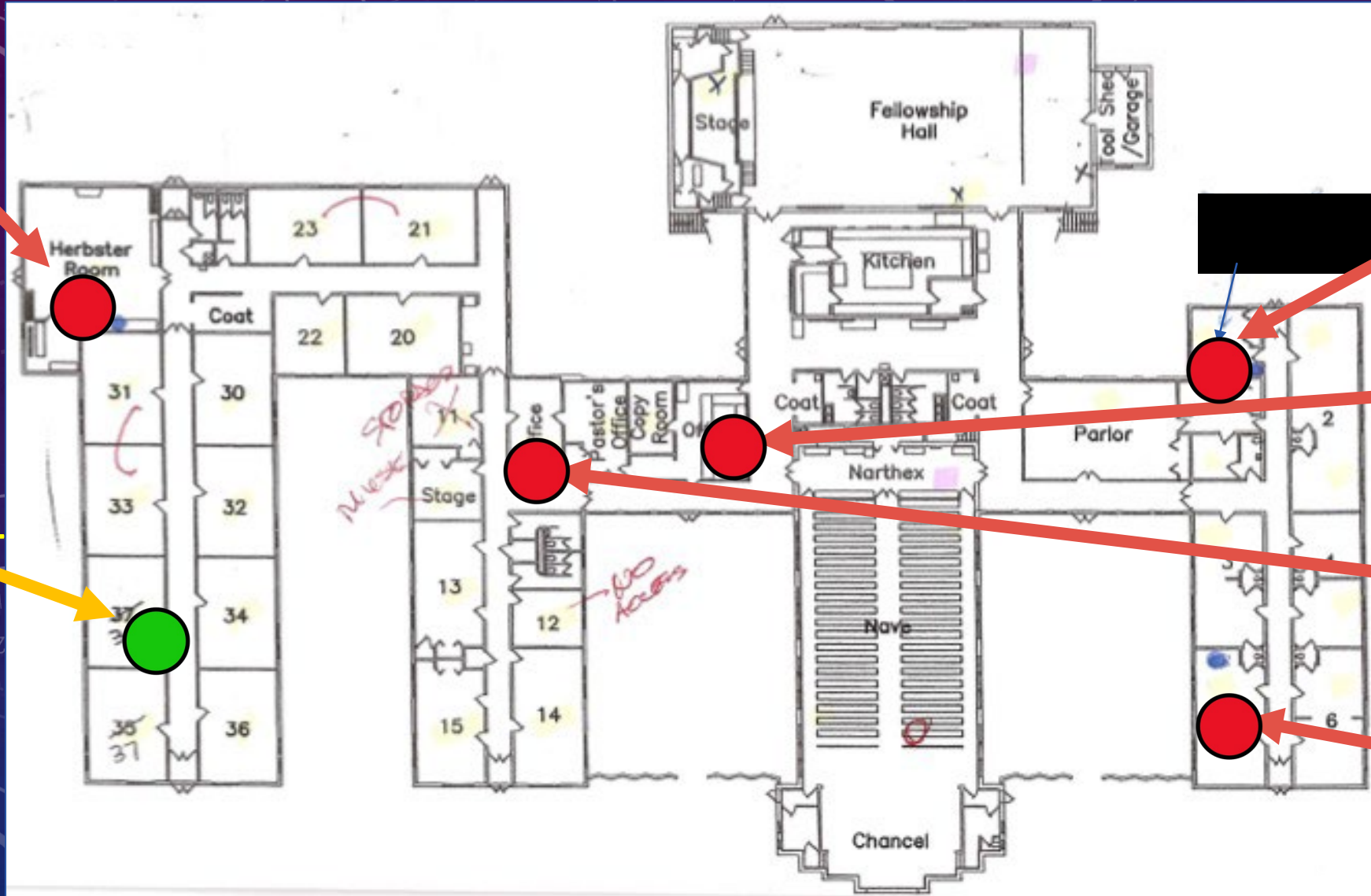
# RESULTS OF THE INITIAL MEASUREMENT

		Radon Calculation Dayton Area Church Pre-school & Daycare													
		V4.2 (16 May 2018)													
					US/SI Units	US									
Device Location	Electret Serial Number	Start Date/Time	End Date/Time	Total Days Exposure	Initial Voltage	Final Voltage	EIC CF	EIC Config	Elevation Feet	CF	$\gamma$ $\mu$ R/h	Radon in Air pCi/L	$\pm$ pCi/L	Error %	
Daycare Office, Desk	SKG990	2019-11-07 10:42	2019-11-21 09:47	13.96	501	358	1.8945	SST	1007	1.00	7.4	<b>4.7</b>	$\pm 0.3$	6%	
Room 5 Top Shelf	SKG982	2019-11-07 10:45	2019-11-21 09:50	13.96	505	373	1.9002	SST	1007	1.00	7.4	<b>4.3</b>	$\pm 0.2$	6%	
Church Office, Credenz	SKG823	2019-11-07 10:57	2019-11-21 09:53	13.96	548	247	1.8743	SST	1007	1.00	7.4	<b>10.8</b>	$\pm 0.6$	5%	
Assoc. Pastor, Bookshe	SKG826	2019-11-07 11:04	2019-11-21 09:56	13.95	558	233	1.8730	SST	1007	1.00	7.4	<b>11.8</b>	$\pm 0.6$	5%	
Herbster Room Nook	SKG997	2019-11-07 10:51	2019-11-21 09:58	13.96	429	289	1.8478	SST	1007	1.00	7.4	<b>4.7</b>	$\pm 0.3$	6%	
Room 35, Shelves	SKJ762	2019-11-07 10:53	2019-11-21 10:00	13.96	471	397	1.8972	SST	1007	1.00	7.4	<b>2.1</b>	$\pm 0.2$	7%	

5 of the 6 test locations proved to have elevated radon concentrations

# Initial Short Term Testing

- Performed in November, 2019 in 6 selected areas



Herbster Room  
4.7 pCi/L

Rm 35  
2.1 pCi/L

Daycare Office  
4.7 pCi/L

Church Office  
10.8 pCi/L

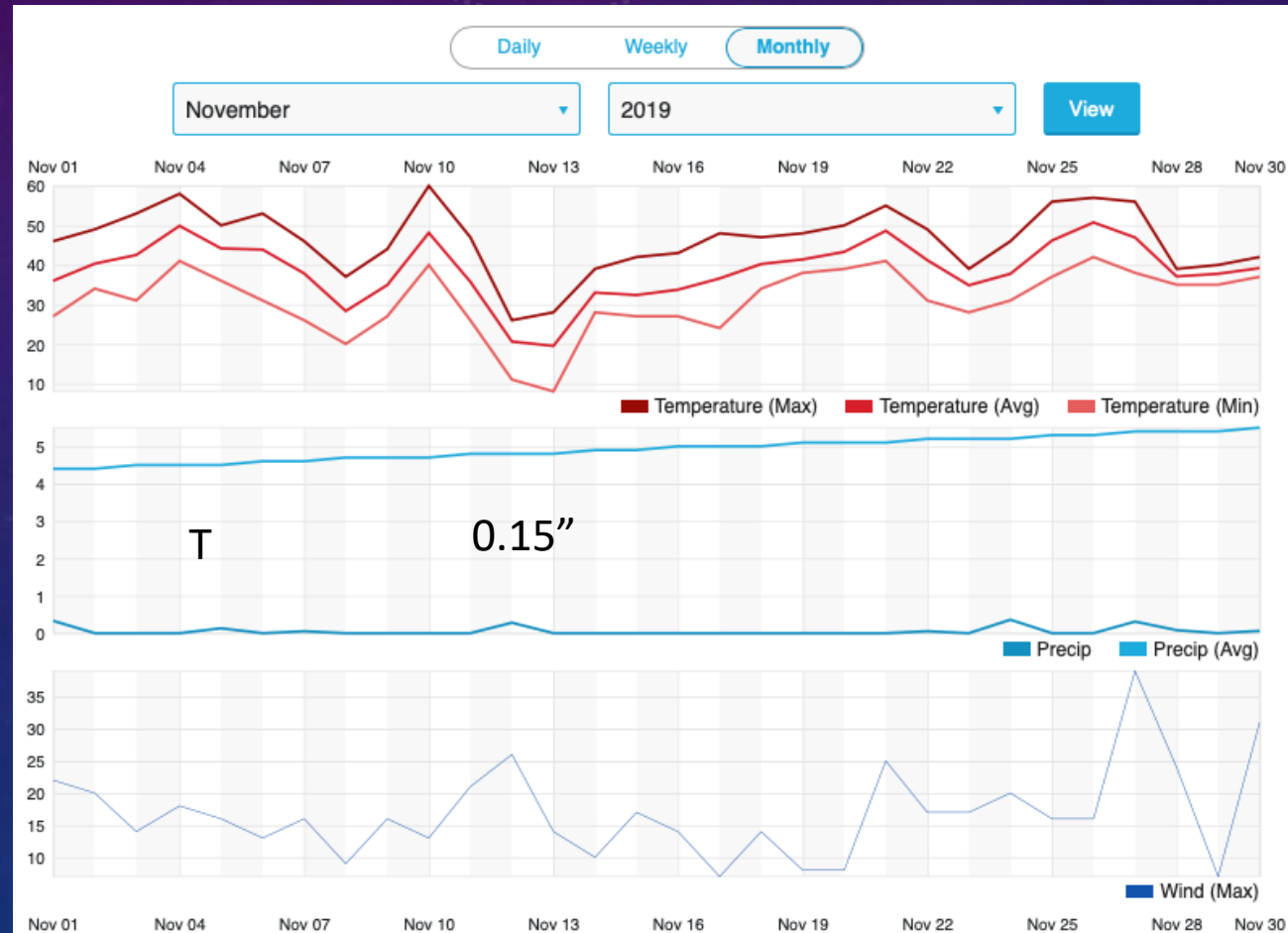
Assoc. Pastor  
11.8 pCi/L

Room 5  
4.3 pCi/L

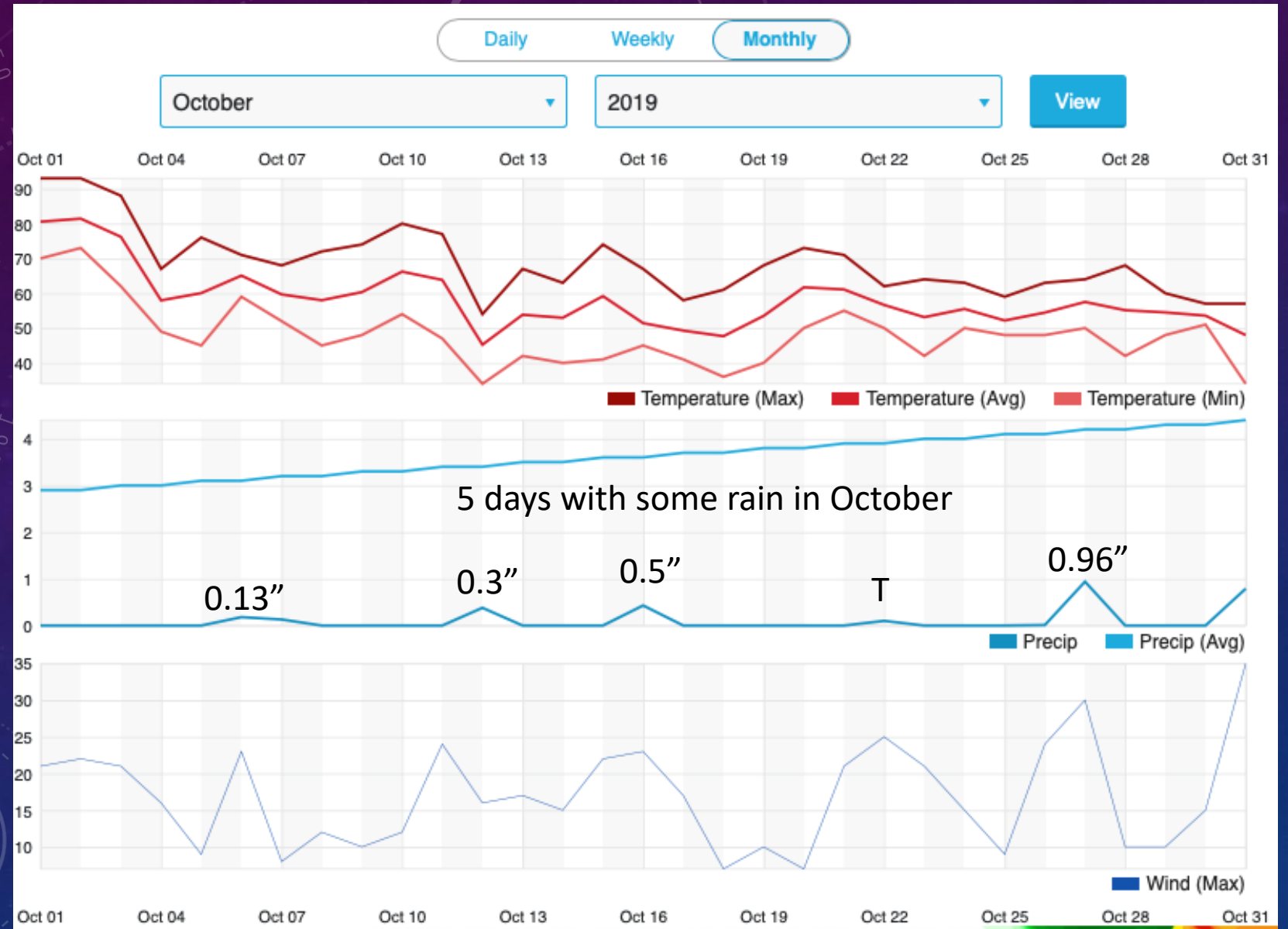
# Certainly, The Weather Has An Impact.

*When drought like conditions occur, the heavy clay soil in many areas around Dayton cracks deeply as it dries. Those cracks will go down hundreds of feet creating radon pathways.*

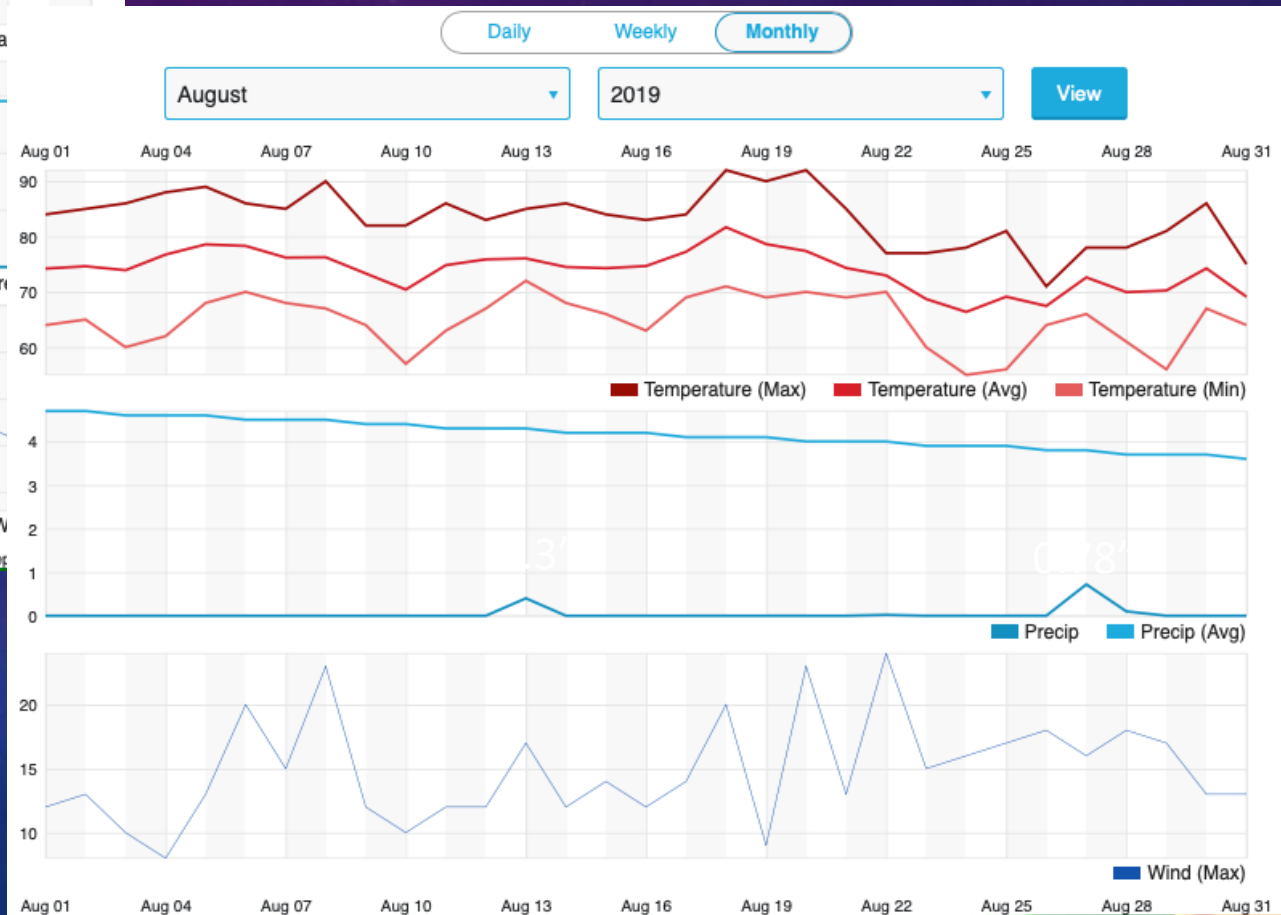
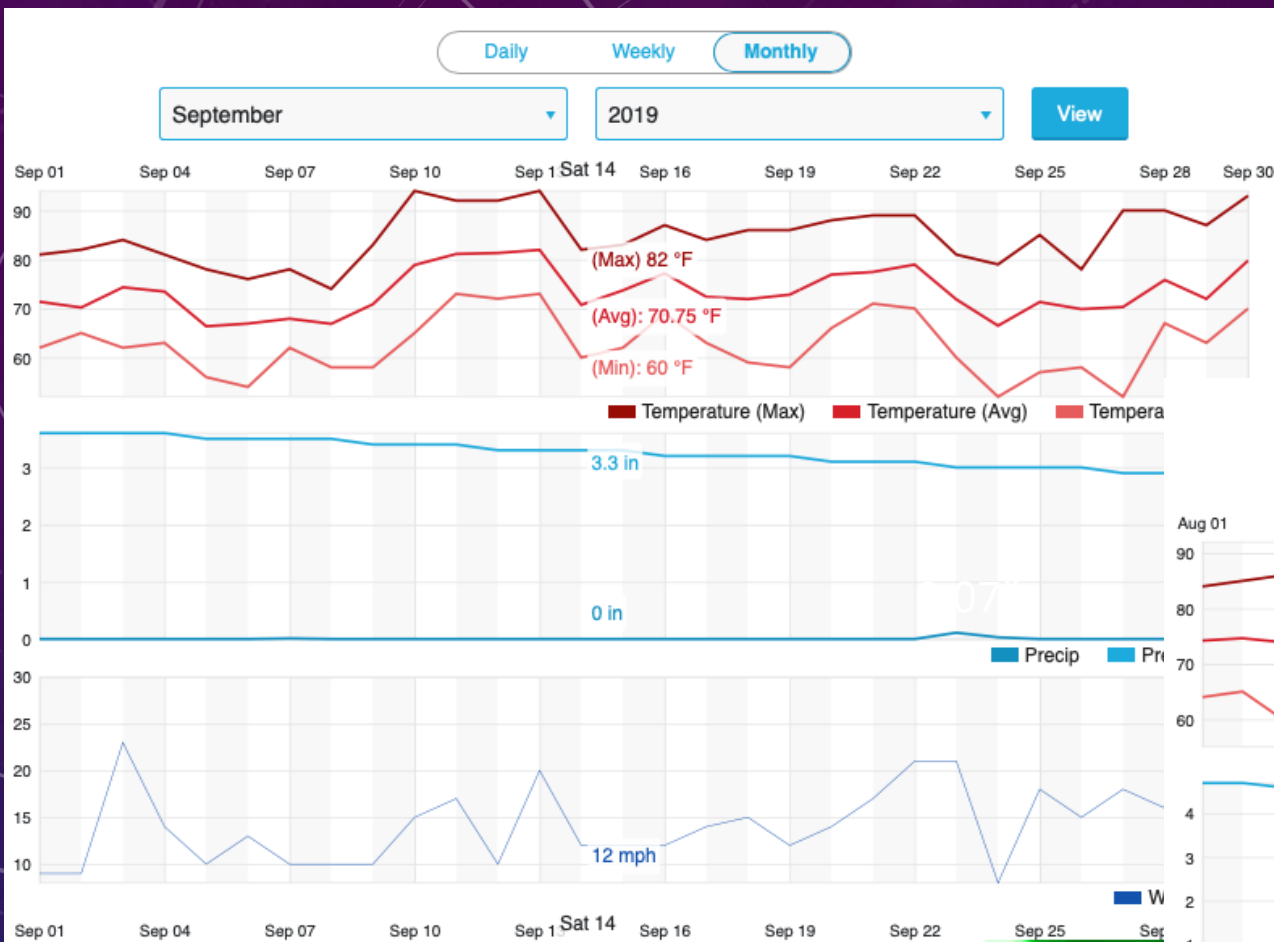
Note the extremely low amounts of precipitation in November. This graph looks virtually the same as Precipitation charts in the previous 4 months.



This weather was pretty typical of the precipitation Dayton had received for months



*That is barely 3" of rain  
in the last 4 months*



Weather data: Compliments of [www.WeatherUnderground.com](http://www.WeatherUnderground.com)

# **This initial testing created two issues:**

- 1. An awareness of the radon situation, and*
- 2. Realization that funds for professional testing and, if necessary, mitigation were not available in the church budget.*

*Issue #2 was resolved by donations from a licensed/NRPP certified measurement professional and the generosity of the device manufacturer.*



# Long Term Testing

*Performing long term testing to gain a better understanding of the annual radon exposure left 2 options:*

*Alpha Tracks*

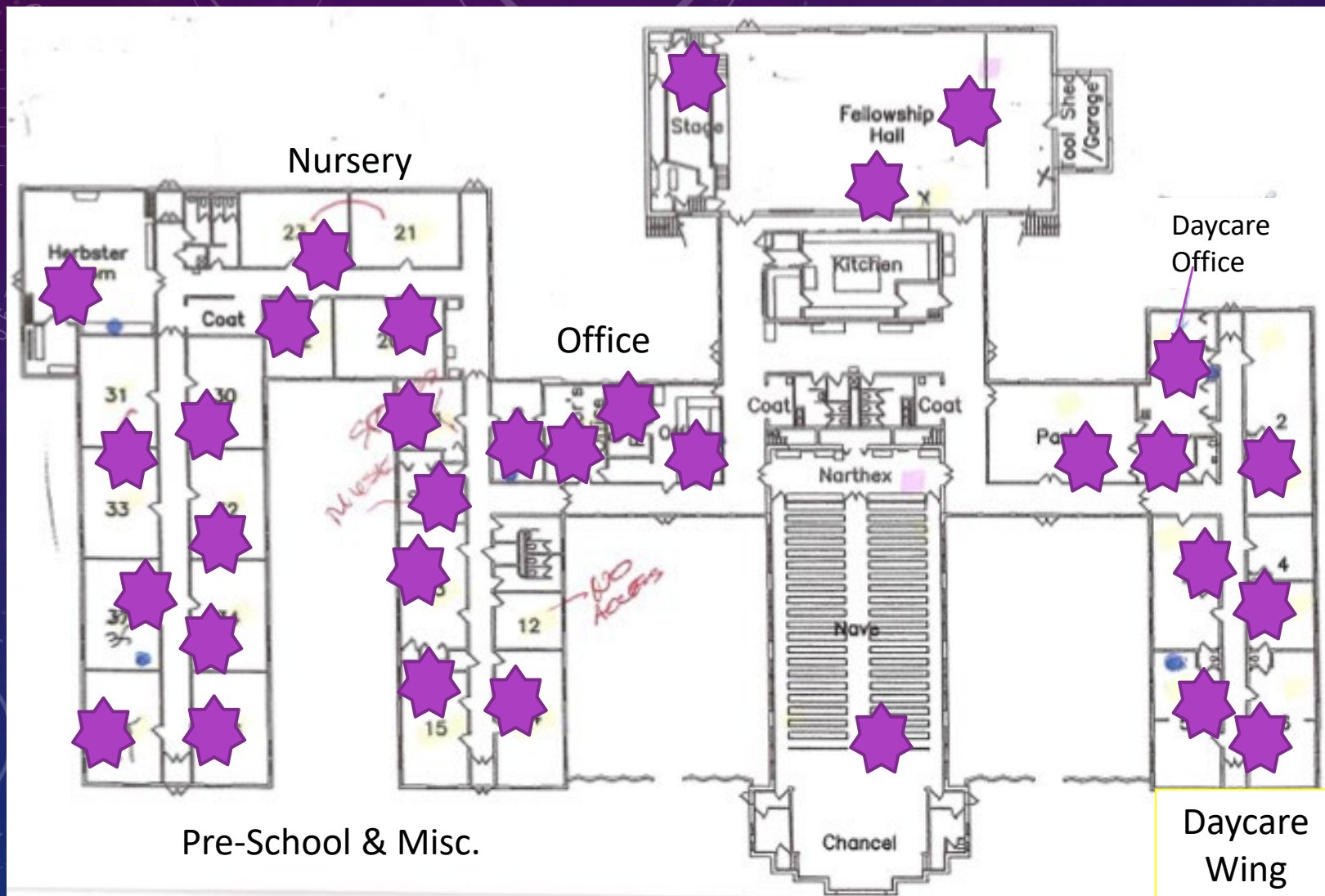
*Electret Ion Chambers.*

Rick Stieff of Rad Elec, Inc. offered to provide enough long term EPERM® devices for duplicate device deployment for a full year.

So, we were in business!  
(The business of saving lives)...

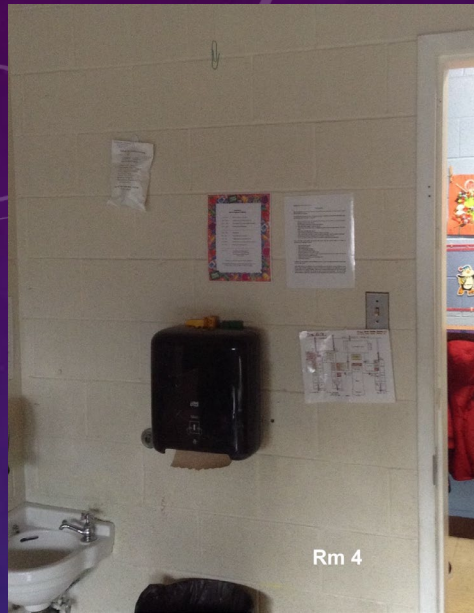
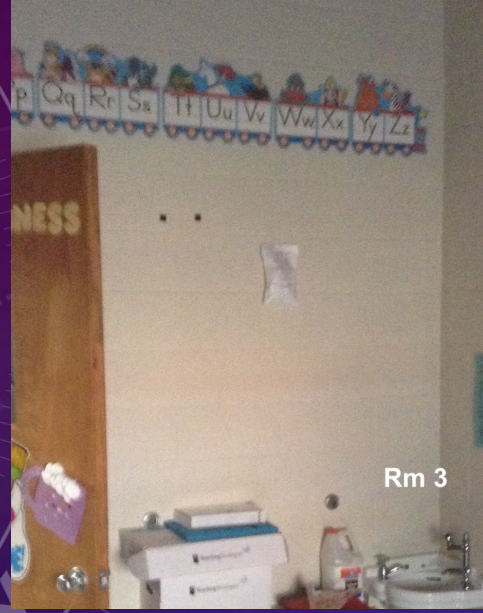
# January 9, 2020 - Device Deployment

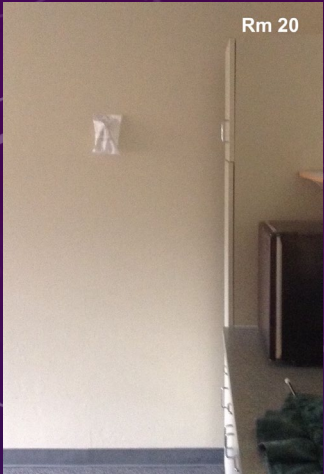
32 accessible  
test locations



# Copy Room W/Dupl







Rm 20



Rm 22



Rm 30



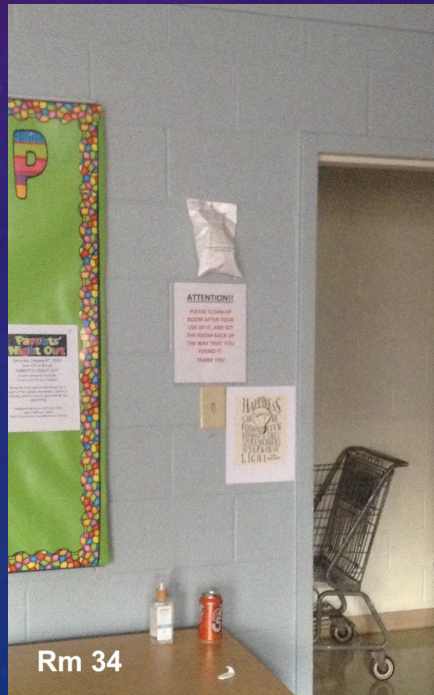
Rm 32



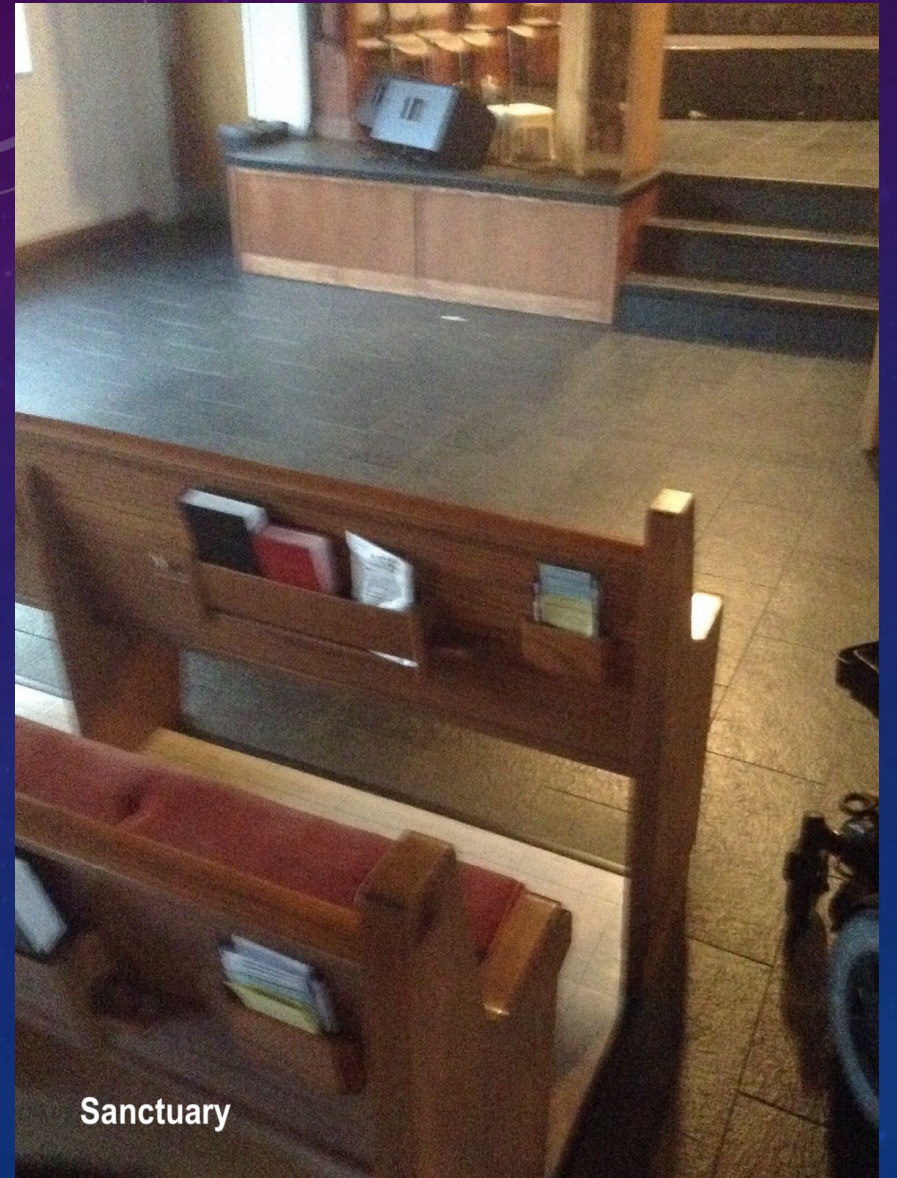
Rm 23



Rm 33



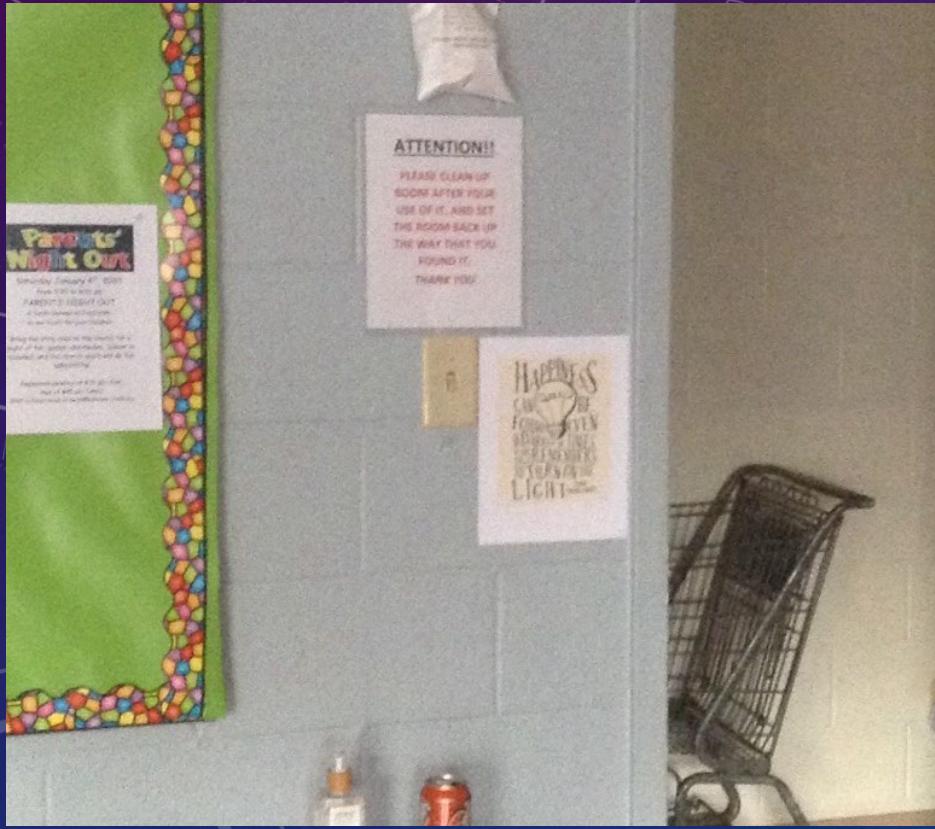
Rm 34



Sanctuary



Rm 35



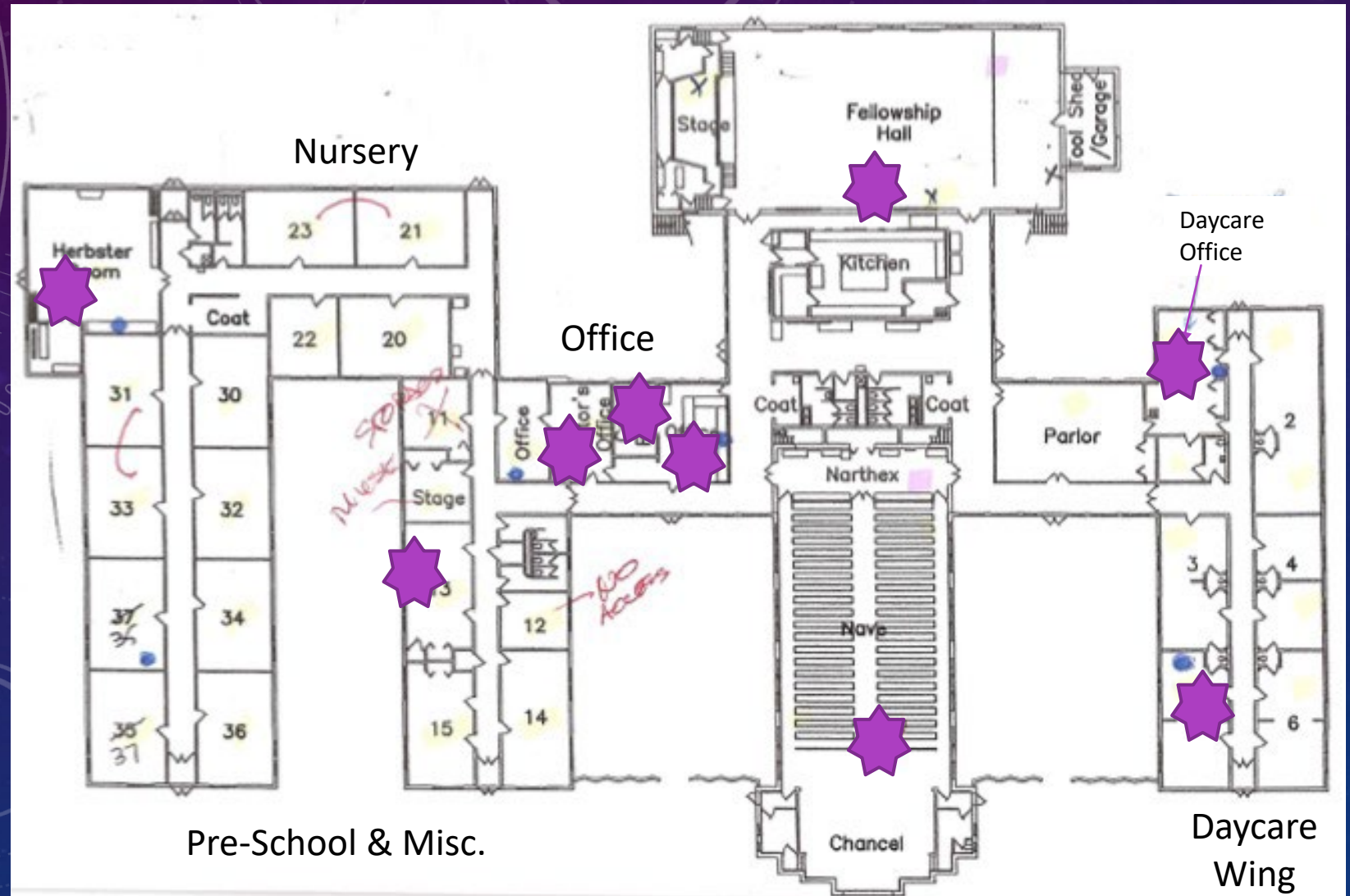
Rm 33



Rm 37

*After 6 months we analyzed 9 of those locations*

*32 accessible  
test locations*






# 6 month long term measurement

In June we analyzed 9 selected test locations for future comparison to the full year deployment

Here is what we found:



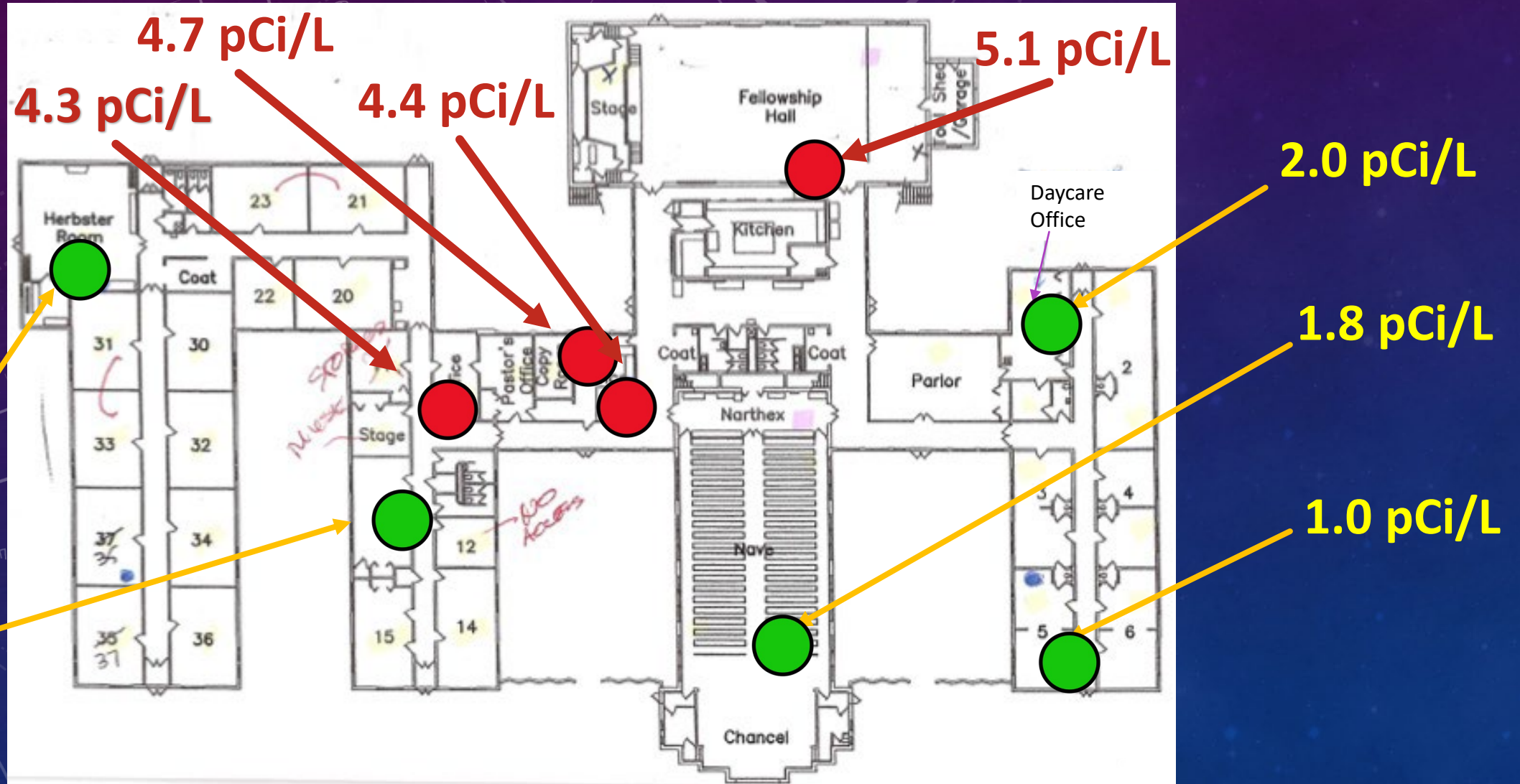
**Radon Calculation** Mid-test Spike and Sample Testing - Dayton Area Church & Pre-school  
V4.2 (16 May 2018)

US/SI Units **US**

Location	Electret Serial Number	Start Date/Time	End Date/Time	Total Days Exposure	Initial Voltage	Final Voltage	EIC CF	EIC Config	Elevation Feet	CF	Radon in Air pCi/L	± pCi/L	Error %	TARGET RN	RELATIVE % ERROR
Spike @ B-M	MAG547	2020-02-20 10:15	2020-05-20 10:15	90.00	710	510	0.0937	LMT-OO	790	1.04	23.0	±1.2	5%	26.0	-11.5
Spike @ B-M	MAG450	2020-02-20 10:15	2020-05-20 10:15	90.00	701	495	0.0934	LMT-OO	790	1.04	23.9	±1.2	5%	26.0	-8.1
Spike @ B-M	MAG485	2020-02-20 10:15	2020-05-20 10:15	90.00	634	429	0.0919	LMT-OO	790	1.04	24.1	±1.2	5%	26.0	-7.3
Spike @ B-M	MAG398	2020-02-20 10:15	2020-05-20 10:15	90.00	639	435	0.0921	LMT-OO	790	1.04	24.0	±1.2	5%	26.0	-7.7
June Measurements:											DPE between hightst and lowest measurement is 4.7%				
Day Care Office	MAF888	2020-01-09 16:30	2020-06-25 13:45	167.89	702	660	0.0950	LMT-OO	790	1.04	2.0	±0.2	8%		
Cay Care Rm 5	MAF467	2020-01-09 16:30	2020-06-25 13:45	167.89	739	713	0.0958	LMT-OO	790	1.04	1.0	±0.1	12%		
Church Office	MAF601	2020-01-09 16:30	2020-06-25 13:45	167.89	742	663	0.0954	LMT-OO	790	1.04	4.4	±0.3	6%		
Church Office	MAF977	2020-01-09 16:30	2020-06-25 13:45	167.89	634	552	0.0933	LMT-OO	790	1.04	4.7	±0.3	6%		
Assoc Pastor	MAF786	2020-01-09 16:30	2020-06-25 13:45	167.89	701	624	0.0947	LMT-OO	790	1.04	4.3	±0.2	6%		
Herbster Rm	MAF173	2020-01-09 16:30	2020-06-25 13:45	167.89	650	620	0.0942	LMT-OO	790	1.04	1.2	±0.1	11%		
Room 13	MAF885	2020-01-09 16:30	2020-06-25 13:45	167.89	670	638	0.0945	LMT-OO	790	1.04	1.4	±0.1	10%		
Fellowship Hall	MAF304	2020-01-09 16:30	2020-06-25 13:45	167.89	739	635	0.0951	LMT-OO	790	1.04	5.1	±0.3	6%		
Sanctuary	MAG188	2020-01-09 16:30	2020-06-25 13:45	167.89	689	651	0.0948	LMT-OO	790	1.04	1.8	±0.1	8%		

# SIX MONTH ANALYSIS - JUNE 25, 2020

## OF 9 TEST LOCATIONS



# TWELVE MONTH LONG TERM MEASUREMENT

AFTER 12 MONTHS,  
THERE WERE NO TEST  
LOCATIONS ABOVE  
4.0 pCi/L



## Radon Calculation Spike Testing - Dayton Area Church & Pre-school

V4.2 (16 May 2018)

US/SI  
Units  
**US**

Location	Electret Serial Number	Start Date/Time	End Date/Time	Total Days Exposure	Initial Voltage	Final Voltage	EIC CF	EIC Config	Elevation Feet	CF	Y $\mu$ R/h	Radon in Air pCi/L	Radon Average	$\pm$ pCi/L	Error %	TARGET RN	RELATIVE % ERROR
Spike @ B-M	MAG547	11/27/2020 11:45	1/22/2021 11:45	56.00	509	381	0.0897	LMT-OO	790	1.04	7.3	24.8		$\pm$ 1.3	5%	26.0	-4.6
Spike @ B-M	MAG450	11/27/2020 11:45	1/22/2021 11:45	56.00	493	363	0.0892	LMT-OO	790	1.04	7.3	25.4		$\pm$ 1.3	5%	26.0	-2.3
Spike @ B-M	MAG485	11/27/2020 11:45	1/22/2021 11:45	56.00	427	298	0.0872	LMT-OO	790	1.04	7.3	25.8		$\pm$ 1.3	5%	26.0	-0.8
Spike @ B-M	MAG398	11/27/2020 11:45	1/22/2021 11:45	56.00	433	306	0.0874	LMT-OO	790	1.04	7.3	25.3		$\pm$ 1.3	5%	26.0	-2.7

### Long Term (1 Year) Measurements - Dayton Area Church & Pre-school

1/21/21 Measurements:															RPD	
01 Day Care Office	MAF529	1/9/2020 14:42	1/21/2021 14:30	377.99	696	584	0.0943	LMT-OO	790	1.04	7.3	1.6	1.7	$\pm$ 0.1	8%	6.06
	MAF888	1/9/2020 14:42	1/21/2021 14:30	377.99	702	589	0.0944	LMT-OO	790	1.04	7.3	1.7		$\pm$ 0.1	8%	
01 - Blank	MAA416	1/9/2020 14:42	1/21/2021 14:30	377.99	767	757	0.0964	LMT-OO	790	1.04	7.3	0.4*		BLANK	<LLD	
2	MAF375	1/9/2020 14:51	1/21/2021 14:30	377.99	700	570	0.0942	LMT-OO	790	1.04	7.3	2.2	2.6	$\pm$ 0.2	7%	30.77
	MAG530	1/9/2020 14:51	1/21/2021 14:30	377.99	745	585	0.0947	LMT-OO	790	1.04	7.3	3.0		$\pm$ 0.2	6%	
3	MAG749	1/9/2020 15:03	1/21/2021 14:30	377.98	744	655	0.0954	LMT-OO	790	1.04	7.3	0.9	0.9	$\pm$ 0.1	12%	0.00
	MAG590	1/9/2020 15:03	1/21/2021 14:30	377.98	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
4	MAF322	1/9/2020 14:53	1/21/2021 14:30	377.98	711	624	0.0948	LMT-OO	790	1.04	7.3	0.9	0.9	$\pm$ 0.1	12%	0.00
	MAG590	1/9/2020 14:53	1/21/2021 14:30	377.98	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
5	MAF467	1/9/2020 14:59	1/21/2021 14:30	377.98	739	649	0.0953	LMT-OO	790	1.04	7.3	1.0	1.0	$\pm$ 0.1	11%	-10.53
	MAG590	1/9/2020 14:59	1/21/2021 14:30	377.98	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
6	MAG610	1/9/2020 14:56	1/21/2021 14:30	377.98	692	608	0.0945	LMT-OO	790	1.04	7.3	0.8	0.9	$\pm$ 0.1	14%	11.76
	MAG590	1/9/2020 14:56	1/21/2021 14:30	377.98	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
Bride Rm	MAF269	1/9/2020 16:50	1/21/2021 14:30	377.90	734	557	0.0944	LMT-OO	790	1.04	7.3	3.5	3.8	$\pm$ 0.2	6%	15.79
	MAG590	1/9/2020 16:50	1/21/2021 14:30	377.90	732	535	0.0941	LMT-OO	790	1.04	7.3	4.1		$\pm$ 0.2	6%	
Bride Rm - Blank	MAE328	1/9/2020 14:42	1/21/2021 14:30	377.99	669	657	0.0947	LMT-OO	790	1.04	7.3	0.4*		BLANK	<LLD	
13	MAF885	1/9/2020 15:20	1/21/2021 14:30	377.97	670	584	0.0938	LMT-OO	790	1.04	7.3	1.5	1.2	$\pm$ 0.1	8%	-50.00
	MAG590	1/9/2020 15:20	1/21/2021 14:30	377.97	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
14	MAF974	1/9/2020 15:09	1/21/2021 14:30	377.97	666	575	0.0939	LMT-OO	790	1.04	7.3	1.0	1.0	$\pm$ 0.1	11%	-10.53
	MAG590	1/9/2020 15:09	1/21/2021 14:30	377.97	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
15	MAG512	1/9/2020 15:07	1/21/2021 14:30	377.97	636	544	0.0932	LMT-OO	790	1.04	7.3	1.1	1.0	$\pm$ 0.1	10%	-20.00
	MAG590	1/9/2020 15:07	1/21/2021 14:30	377.97	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
20	MAF992	1/9/2020 15:31	1/21/2021 14:30	377.96	712	620	0.0948	LMT-OO	790	1.04	7.3	1.0	1.0	$\pm$ 0.1	11%	-10.53
	MAG590	1/9/2020 15:31	1/21/2021 14:30	377.96	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
22	MAF958	1/9/2020 15:35	1/21/2021 14:30	377.95	660	587	0.0939	LMT-OO	790	1.04	7.3	0.5	0.7	$\pm$ 0.1	21%	57.14
	MAG590	1/9/2020 15:35	1/21/2021 14:30	377.95	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
23	MAF389	1/9/2020 15:14	1/21/2021 14:30	377.97	702	622	0.0947	LMT-OO	790	1.04	7.3	0.7	0.8	$\pm$ 0.1	15%	25.00
	MAG590	1/9/2020 15:14	1/21/2021 14:30	377.97	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
30	MAG112	1/9/2020 17:23	1/21/2021 14:30	377.88	691	613	0.0945	LMT-OO	790	1.04	7.3	0.6	0.8	$\pm$ 0.1	17%	40.00
	MAG590	1/9/2020 17:23	1/21/2021 14:30	377.88	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
32	MAF503	1/9/2020 17:25	1/21/2021 14:30	377.88	750	669	0.0955	LMT-OO	790	1.04	7.3	0.7	0.8	$\pm$ 0.1	15%	25.00
	MAG590	1/9/2020 17:25	1/21/2021 14:30	377.88	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
33	MAG593	1/9/2020 15:50	1/21/2021 14:30	377.94	690	616	0.0945	LMT-OO	790	1.04	7.3	0.5	0.7	$\pm$ 0.1	21%	57.14
	MAG590	1/9/2020 15:50	1/21/2021 14:30	377.94	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
34	MAF288	1/9/2020 15:55	1/21/2021 14:30	377.94	722	649	0.0951	LMT-OO	790	1.04	7.3	0.5	0.7	$\pm$ 0.1	21%	57.14
	MAG590	1/9/2020 15:55	1/21/2021 14:30	377.94	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	
35	MAG001	1/9/2020 15:52	1/21/2021 14:30	377.94	751	668	0.0955	LMT-OO	790	1.04	7.3	0.8	0.9	$\pm$ 0.1	14%	11.76
	MAG590	1/9/2020 15:52	1/21/2021 14:30	377.94	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		$\pm$ 0.1	12%	



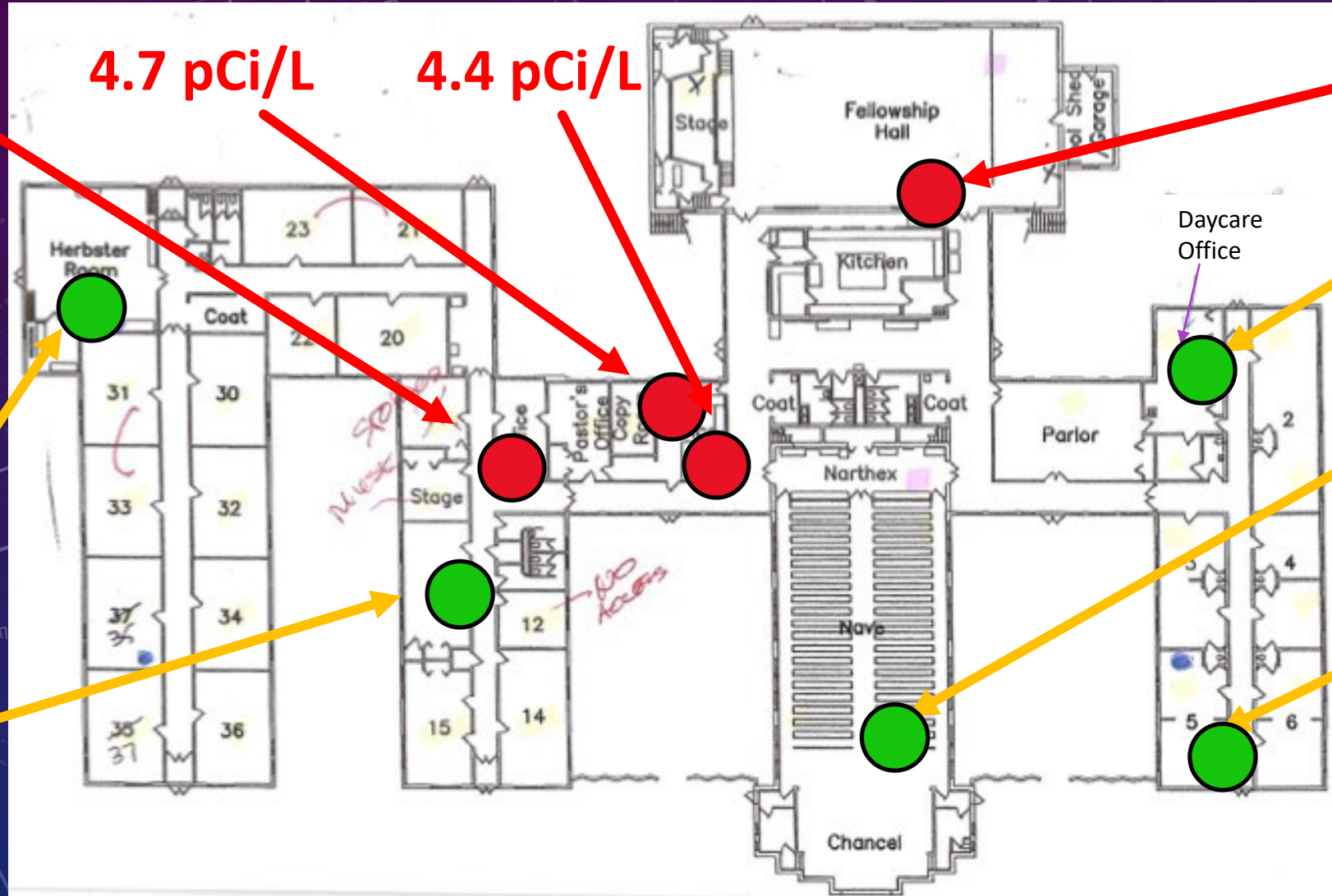
# Radon Calculation Spike Testing - Dayton Area Church & Pre-school

V4.2 (16 May 2018)

US/SI  
Units  
**US**

Location	Electret Serial Number	Start Date/Time	End Date/Time	Total Days Exposure	Initial Voltage	Final Voltage	EIC CF	EIC Config	Elevation Feet	CF	γ μR/h	Radon in Air pCi/L	Average	± pCi/L	Error %	RPD
36	MAG165	1/9/2020 15:58	1/21/2021 14:30	377.94	509	381	0.0897	LMT-OO	790	1.04	7.3	2.2	2.3	±0.2	7%	-0.04
	MAG590	1/9/2020 15:58	1/21/2021 14:30	377.94	493	363	0.0892	LMT-OO	790	1.04	7.3	2.3		±0.2	7%	
37	MAG011	1/9/2020 16:12	1/21/2021 14:30	377.93	427	298	0.0872	LMT-OO	790	1.04	7.3	2.4	2.4	±0.2	7%	0.04
	MAG590	1/9/2020 16:12	1/21/2021 14:30	377.93	433	306	0.0874	LMT-OO	790	1.04	7.3	2.3		±0.2	7%	
Herbster Room	MAG173	1/9/2020 15:43	1/21/2021 14:30	377.95	696	584	0.0943	LMT-OO	790	1.04	7.3	1.6	1.7	±0.1	8%	-0.06
	MAG590	1/9/2020 15:43	1/21/2021 14:30	377.95	702	589	0.0944	LMT-OO	790	1.04	7.3	1.7		±0.1	8%	
Music office	MAG371	1/9/2020 15:26	1/21/2021 14:30	377.96	700	600	0.0945	LMT-OO	790	1.04	7.3	1.3	2.4	±0.1	9%	-0.92
	MAG590	1/9/2020 15:26	1/21/2021 14:30	377.96	745	567	0.0946	LMT-OO	790	1.04	7.3	3.5		±0.2	6%	
Storage	MAF575	1/9/2020 14:46	1/21/2021 14:30	377.99	744	655	0.0954	LMT-OO	790	1.04	7.3	0.9	0.9	±0.1	12%	0.00
	MAF553	1/9/2020 14:46	1/21/2021 14:30	377.99	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		±0.1	12%	
Fellowship Hall back wall	MAF810	1/9/2020 17:07	1/21/2021 14:30	377.89	711	624	0.0948	LMT-OO	790	1.04	7.3	0.9	0.9	±0.1	12%	0.00
	MAF553	1/9/2020 17:07	1/21/2021 14:30	377.89	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		±0.1	12%	
Fellowship Hall West Wall	MAF304	1/9/2020 17:04	1/21/2021 14:30	377.89	739	585	0.0947	LMT-OO	790	1.04	7.3	2.8	2.3	±0.2	6%	0.43
	MAF553	1/9/2020 17:04	1/21/2021 14:30	377.89	732	615	0.0949	LMT-OO	790	1.04	7.3	1.8		±0.1	8%	
Stage in Fellowship Hall	MAF694	1/9/2020 17:13	1/21/2021 14:30	377.89	692	684	0.0952	LMT-OO	790	1.04	7.3	0.0	Blank	< LLD		
	MAG042	1/9/2020 17:13	1/21/2021 14:30	377.89	636	628	0.0941	LMT-OO	790	1.04	7.3	0.0				
Assoc Pastor Office	MAF786	1/9/2020 16:31	1/21/2021 14:30	377.92	701	545	0.0939	LMT-OO	790	1.04	7.3	2.9	2.7	±0.2	6%	0.19
	MAG899	1/9/2020 16:31	1/21/2021 14:30	377.92	732	594	0.0947	LMT-OO	790	1.04	7.3	2.4		±0.2	7%	
Copy arm	MAG159	1/9/2020 17:22	1/21/2021 14:30	377.88	670	564	0.0938	LMT-OO	790	1.04	7.3	1.5	1.2	±0.1	8%	0.50
	MAG312	1/9/2020 17:22	1/21/2021 14:30	377.88	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		±0.1	12%	
Copy Room	MAF439	1/9/2020 16:43	1/21/2021 14:30	377.91	666	575	0.0939	LMT-OO	790	1.04	7.3	1.0	1.0	±0.1	11%	0.11
	MAG018	1/9/2020 16:43	1/21/2021 14:30	377.91	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		±0.1	12%	
Library's	MAF745	1/9/2020 16:48	1/21/2021 14:30	377.90	636	544	0.0932	LMT-OO	790	1.04	7.3	1.1	1.0	±0.1	10%	0.20
	MAF313	1/9/2020 16:48	1/21/2021 14:30	377.90	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		±0.1	12%	
Office	MAF601	1/9/2020 16:23	1/21/2021 14:30	377.92	742	620	0.0950	LMT-OO	790	1.04	7.3	1.9	1.9	±0.1	7%	0.00
	MAF977	1/9/2020 16:23	1/21/2021 14:30	377.92	634	514	0.0929	LMT-OO	790	1.04	7.3	1.9		±0.1	7%	
Sactuary	MAG571	1/9/2020 16:58	1/21/2021 14:30	377.90	660	587	0.0939	LMT-OO	790	1.04	7.3	0.5	0.7	±0.1	21%	-0.46
	MAG188	1/9/2020 16:58	1/21/2021 14:30	377.90	689	605	0.0944	LMT-OO	790	1.04	7.3	0.8		±0.1	14%	
Sr. Pastor Office	MAG157	1/9/2020 16:26	1/21/2021 14:30	377.92	702	622	0.0947	LMT-OO	790	1.04	7.3	0.7	0.8	±0.1	15%	-0.25
	MAF333	1/9/2020 16:26	1/21/2021 14:30	377.92	732	645	0.0952	LMT-OO	790	1.04	7.3	0.9		±0.1	12%	

# SIX MONTH ANALYSIS - JUNE 25, 2020 OF 9 TEST LOCATIONS



4.3 pCi/L

4.7 pCi/L

4.4 pCi/L

5.1 pCi/L

2.0 pCi/L

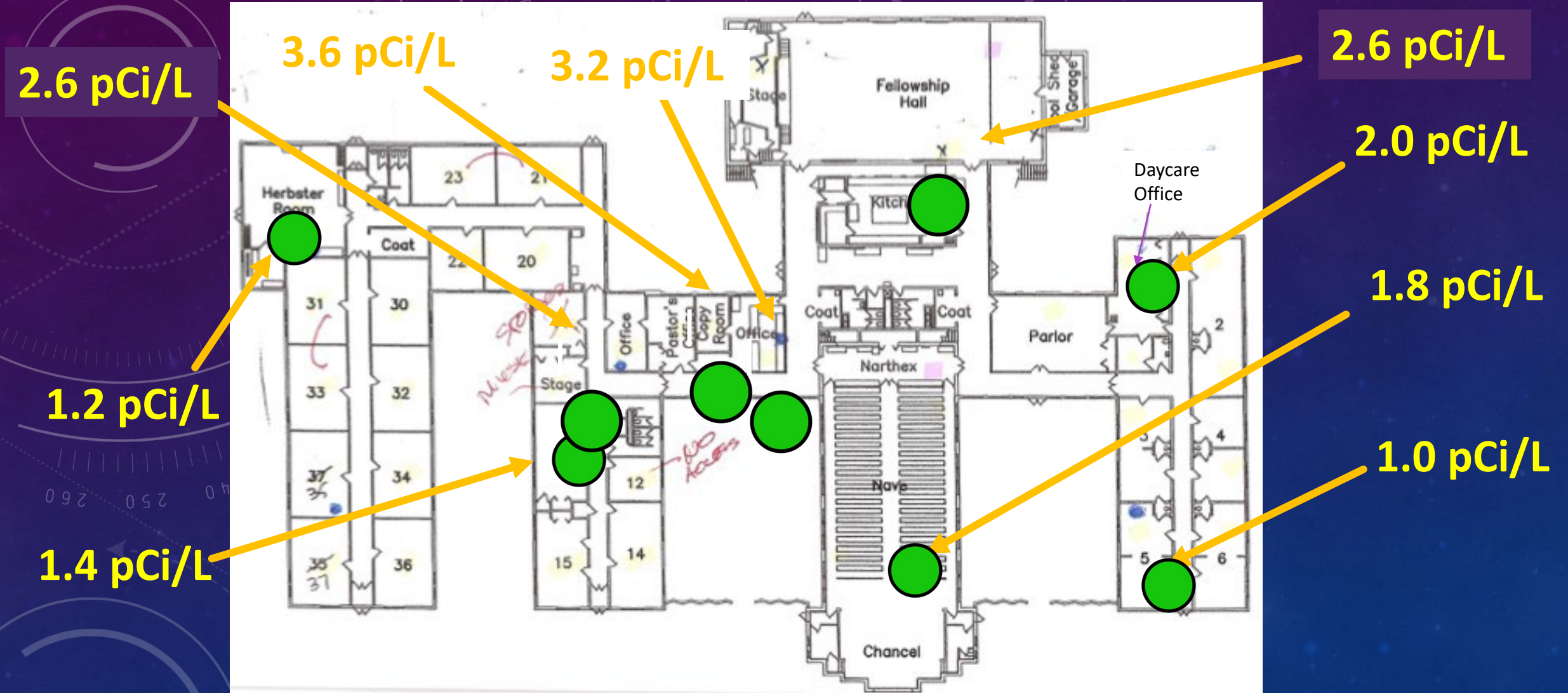
1.8 pCi/L

1.2 pCi/L

1.4 pCi/L

1.0 pCi/L

# TWELVE MONTH ANALYSIS – JANUARY 21, 2021 OF 9 TEST LOCATIONS



# *Assumptions and Generalizations*

- In Ohio, it is generally understood that radon concentrations are higher in winter months than during the summer months.
- Long Term Tests lasting for 6 months, containing at least 2 HVAC cycles that are typical of annual conditions provide a good representation of annual radon exposure.

One thing we all know: **Radon does the darndest things!**

Phil pointed out that *“Generalizations are nearly always are proven wrong – at least sometimes.”*

As Bruce Sneed reminds us:

*The answer to all radon questions is:*

**“It Depends ...”**