PRESENTATION OBJECTIVES

- Discuss the diagnostic approach for sourcing the radon pathway in a large building that is over 100 years old.
- Discuss mitigation techniques that were implemented to reduce the radon levels in the building.
- Highlight the challenges of mitigation on a project of this size and scope.

BVQ LOFTS
CLEVELAND OHIO

- Building was former Julius Spang Baking Company building.
- Eastern portion of the building was built in 1911 and the remainder added over the course of the next 25 years.
- Building renovations began in August of 2017 to upscale loft apartments.
- Total treatment area footprint was 20K
- Basement brick walls and concrete in poor condition.
- Radon assessment was a condition of the lender requirements.
- Initial radon assessment was conducted by a third party.

INITIAL RADON ASSESSMENT

28	4306	3	1/14/2020	1/17/2020	9181694	1.7
29	SUB BASEMENT LOWER	0	1/14/2020	1/17/2020	9181695	22.7
30	SUB BASEMENT UPPER	0	1/14/2020	1/17/2020	9181696	14.7
31	MAIN BASEMENT	0	1/14/2020	1/17/2020	9181697	10.4
32	ROOM A BY SUMP ROOM	0	1/14/2020	1/17/2020	9181698	13.1
33	SUMP ROOM	0	1/14/2020	1/17/2020	9181699	10.8
34	ROOM B BY SUMP ROOM	0	1/14/2020	1/17/2020	9181700	9.9
35	BASEMENT ENTRANCE	0	1/14/2020	1/17/2020	9312901	23.2
36	BASEMENT NE SIDE	0	1/14/2020	1/17/2020	9312902	29.1
37	BASEMENT CENTER E	0	1/14/2020	1/17/2020	9312903	27.7
38	BASEMENT SOUTH EAST	0	1/14/2020	1/17/2020	9312904	28.3

PILOT TEST


LEGEND
NEW 5" EXTRACTION POINT
NEW VAPOR PIN MONITORING POINT
MP-1
MP-3
MP-4
MP-5
MP-9
MP-10
MP-11
MP-12
MP-13
MP-14
MP-15
MP-16
MP-19
MP-20
MP-21
MP-22
MP-23
EP-A
EP-B
EP-C
EP-D
EP-E
EP-H
MATCH LINE
STORAGE SUITE A
STORAGE SUITE A-A
STORAGE SUITE B
STORAGE SUITE C
AREA A STORAGE
ELEV. MACHINE
ELEV. 4A
ELEV. 4B
CRAWL SPACE
FIRE PUMP
4.1
4.1.5
4.2
4.3
4.4
4.5
4.6
5.1
5.1.5
5.2
5.3
4.A
4.B
4.C
4.D
SOLUTIONS, INC
VAPOR REMOVAL SPECIALIST
DATE:
EVENT:

BUILDING CHARACTERISTICS

MITIGATION PROCESS-PART 1

- A Pilot Test was conducted to determine PFE and under slab airflow.
- PT results showed decent PFE in the sub-basement and most of the upper basement.
- Large cracks and holes in the floor were causing air flow gaps in the slab.
- Visible cracks were caulked and sealed.
- Floor was very dirty and cluttered so all cracks could not be identified.
- Original System was installed which included 11 Extraction points and one 3 phase 208V 3HP HP4A Cincinnati Fan Motor controlled by a VFD. Moving 450 CFMs at –11.0".
- Clearance assessment results showed the sub-basement as well as the far east wing of the upper basement still had radon levels above the EPA Action Level.
- CRMS were placed in the building – results showed spiking of levels at certain times of day.

RADON TEST RESULTS

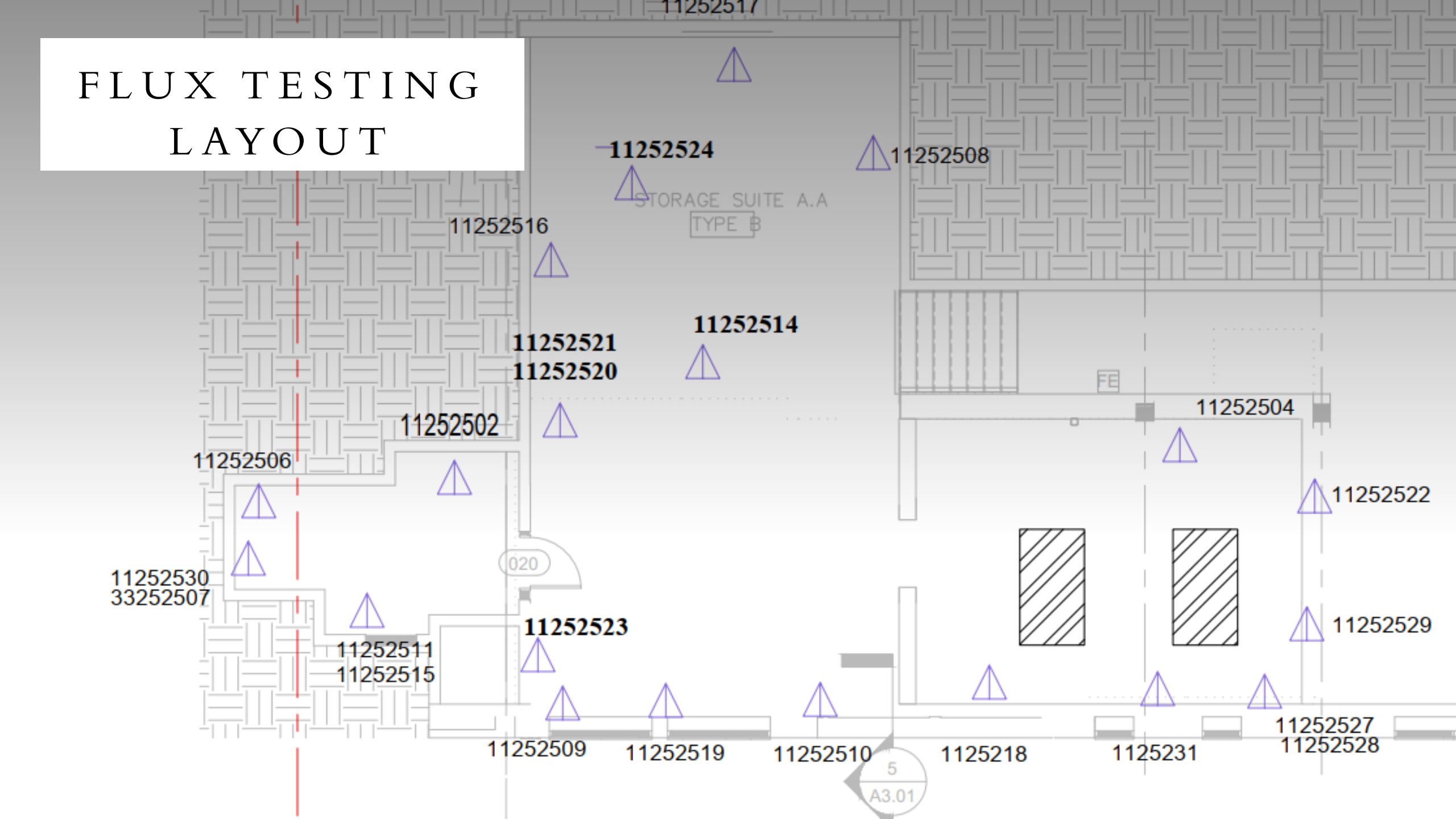
POSSIBLE REASONS FOR ELEVATED LEVELS

- Two decommissioned boilers in sub basement.
  1. Visual inspection.
  2. Grab sampler used in boiler.
  3. Boilers wrapped in Vapor barrier and a CRM placed inside to take readings.
- Duct work no longer in use.
  1. Monitoring devices placed in ducts.
  2. Duct work removed and sealed by a third-party contractor.
- 200 ft Chimney
  1. chimney sealed (2 openings).
- Cracks and small patches of missing concrete.
  1. Cracks caulked, and missing concrete patched by owner.
- Plumbing line running into basement from parking garage.

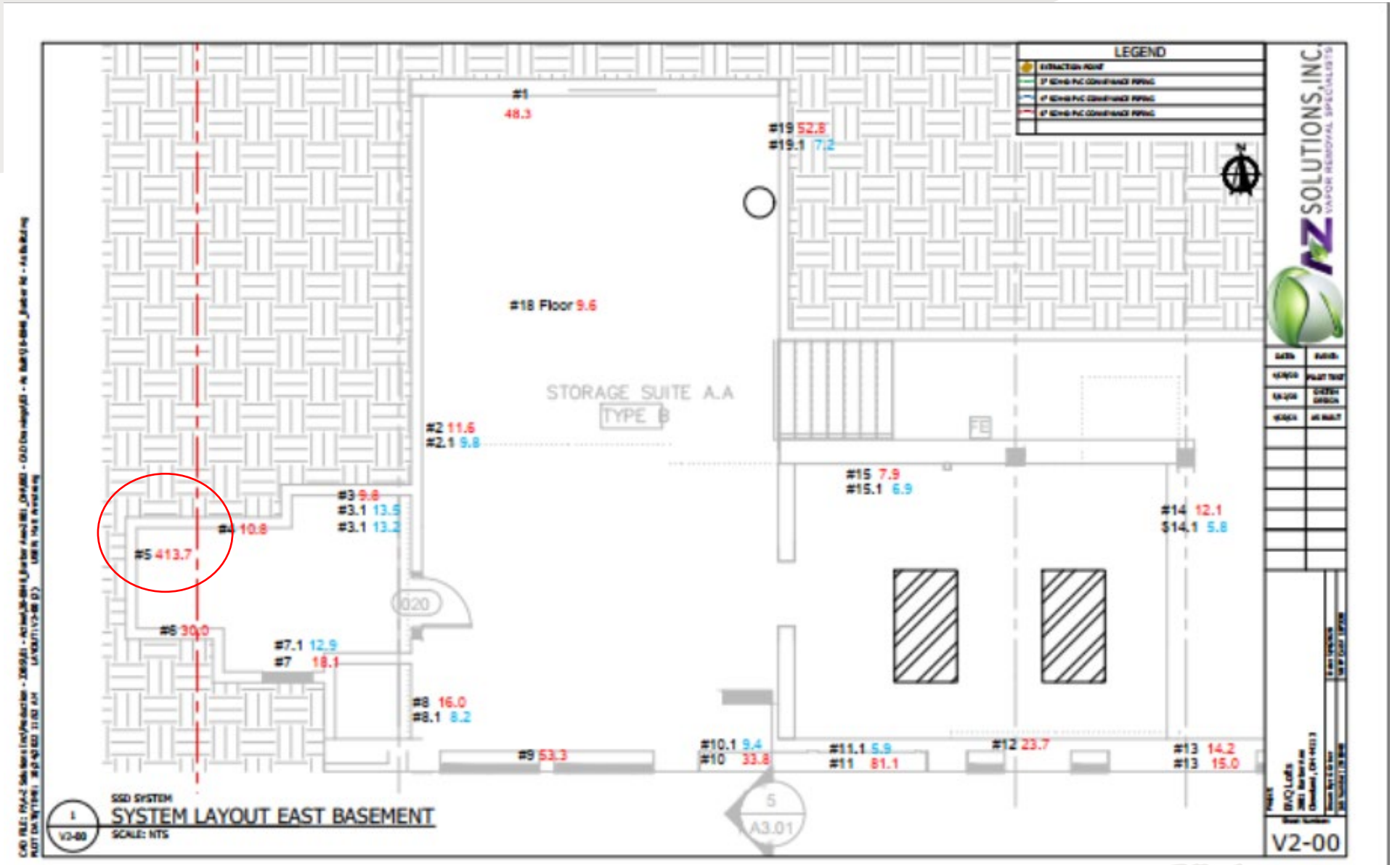
FLUX TESTING

- Flux testing was determined to be the best course of action to source the radon pathway.
- Flux testing was conducted on 10/19/2022.
- Diagnostic test to diagnose radon pathways.
- Important to seal suspected area with Vapor Barrier and Butyl Tape Sealant
- Air Chek charcoal envelopes deployed for 48 hrs.

FLUX TESTING LAYOUT



FLUX TESTING RESULTS

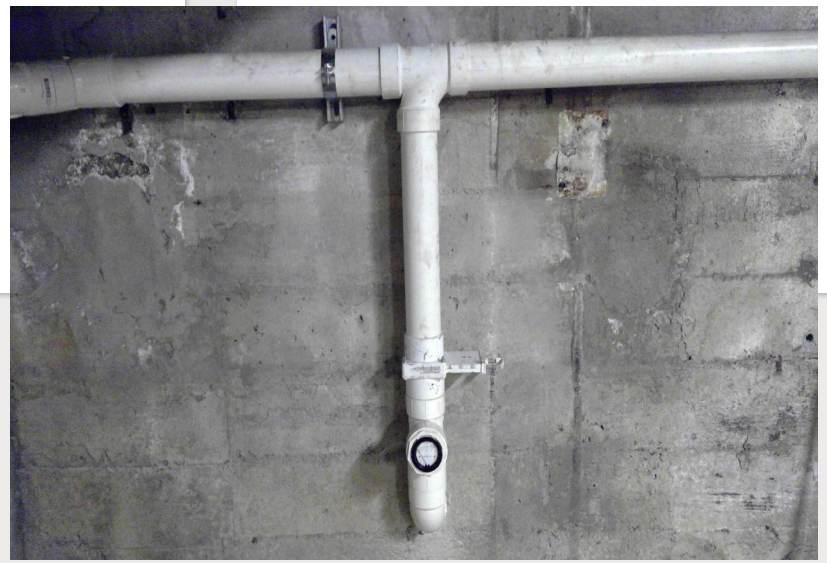


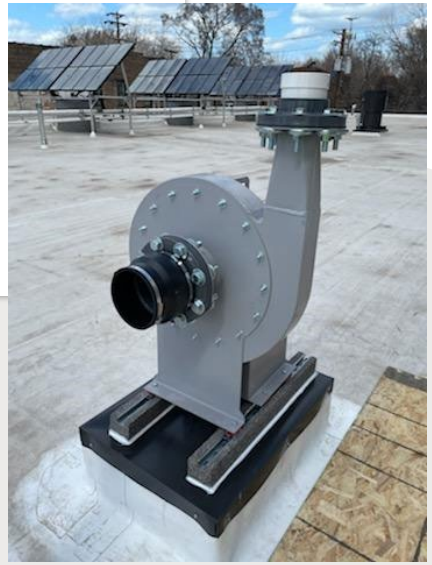
MITIGATION PROCESS- PART 2

- An additional system was needed based on the flux testing results. System 1 was at max capacity and was needed to just depressurize the upper basement.
- EP 1.1, 1.2 and 1.3 as well as an additional EP installed in the western wall of the sub-basement were reconnected to a fan assembly consisting of (3) RN4 fan motors.
- Vapor barrier was applied to encapsulate the walls of the area with highest levels.
- Visual inspection of the sub-basement was conducted, and floors were sealed and there were no visible cracks in floors or walls.
- System 2 was energized.
- Additional PFE measurements and system balancing for both systems were conducted along with the placement of CRMS in the basement to ensure radon levels remain below the EPA Action Level.
- Clearance assessment was conducted from March 6 – 8, 2023.



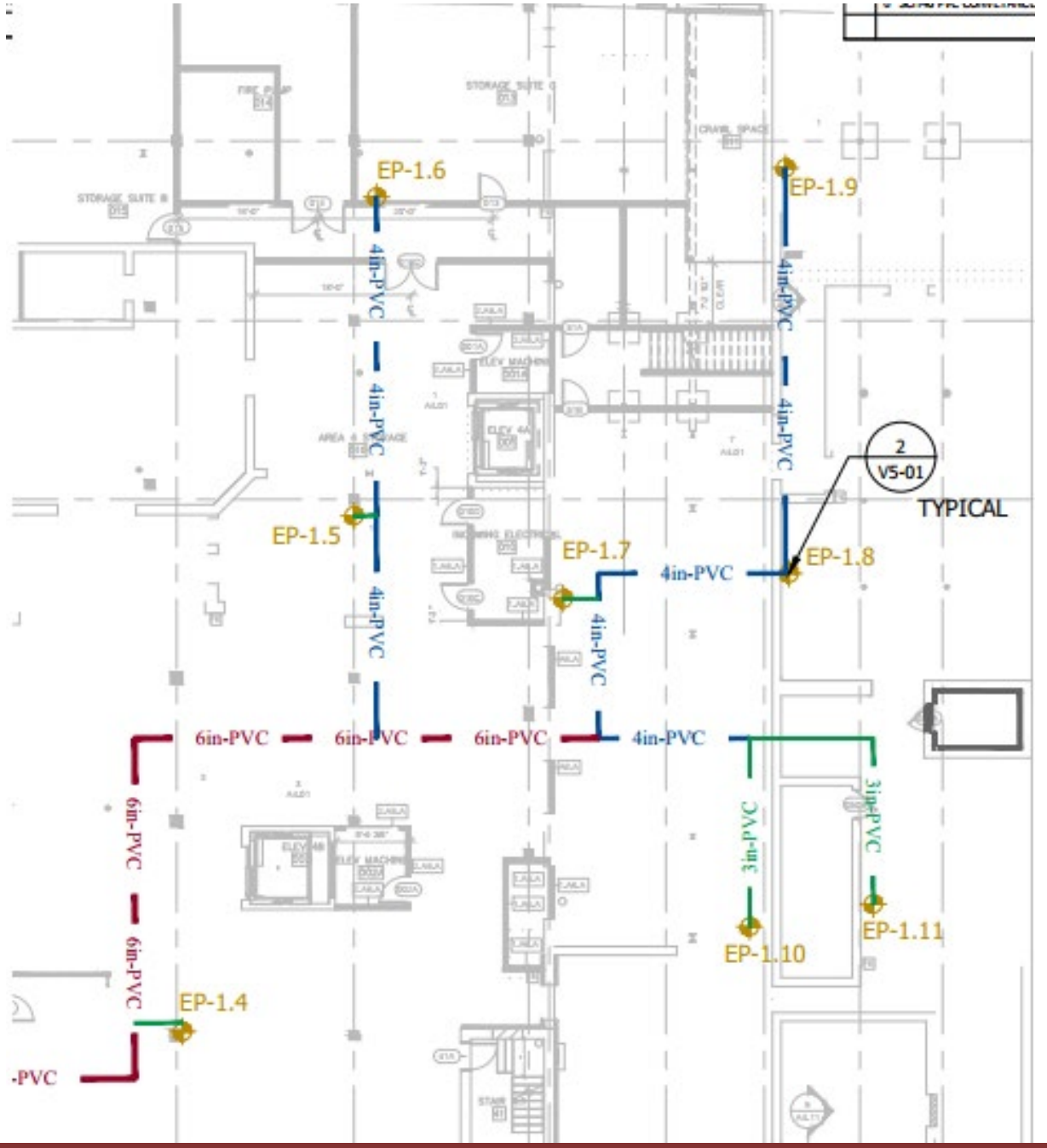




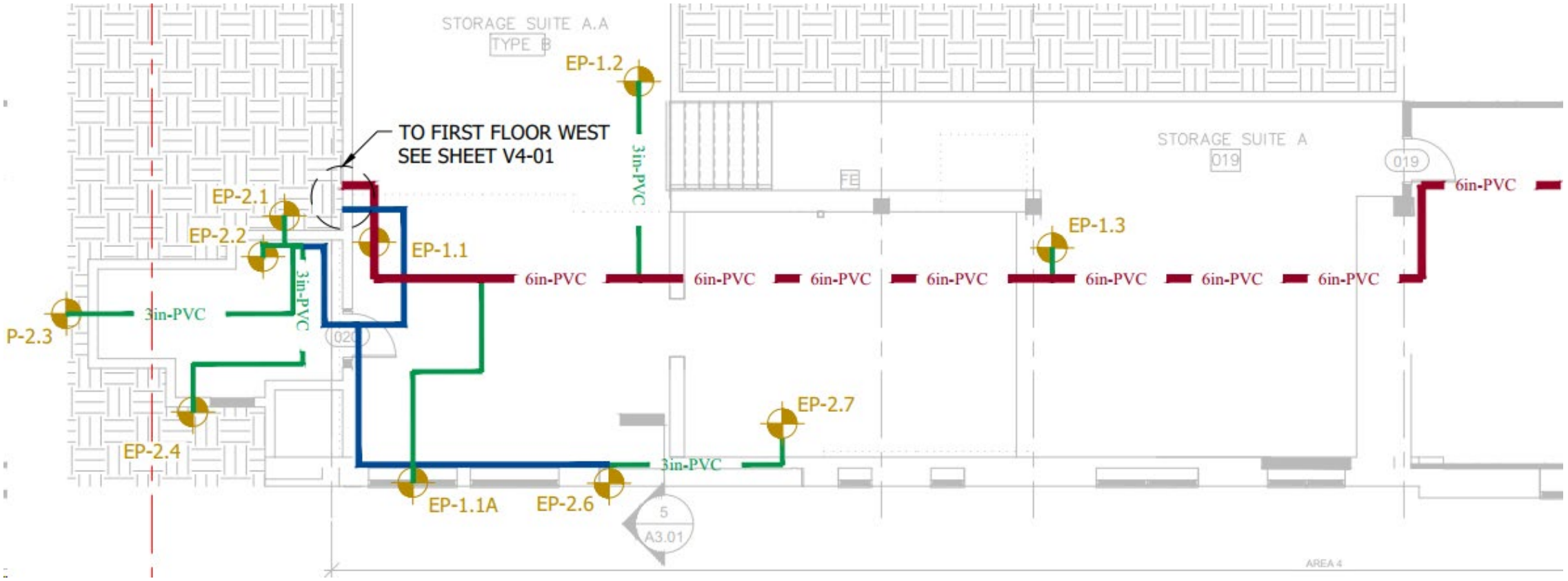


SYSTEM INSTALLATION

SYSTEM LAYOUT- UPPER BASEMENT



SYSTEM LAYOUT – LOWER BASEMENT



FINAL CLEARANCE ASSESSMENT

- All areas of the sub-basement and upper basement were below the EPA Action Level.
- Highest level reported was 3.1 pCi/L.
- All residential units located on floors 1 through 4 were at < 0.3 pCi/L.

LESSONS LEARNED

Follow the Data….The data doesn't lie!

Proper diagnostics including Pilot Testing and advanced measurement diagnostics can make a difference in the success or failure of a project.

Finding the radon pathway is critical to project success.

Caulking and sealing can make a huge difference in overall PFE and system performance.

Patience….Frustration will be your enemy and lead to bad decisions.

QUESTIONS?

Thank you for listening!

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