

Henderson County Schools

South Middle School HVAC Upgrades HVAC System Options



March 7, 2024

HVAC System Options





- Option #1
 - A “like-for-like” equipment replacement with a few exceptions
- Option #2
 - Includes all scope items in Option #1
 - Add dedicated outdoor air system (DOAS)
- Option #3
 - Includes all scope items in Option #2
 - Convert WSHP fluid cooler/boiler system to geothermal

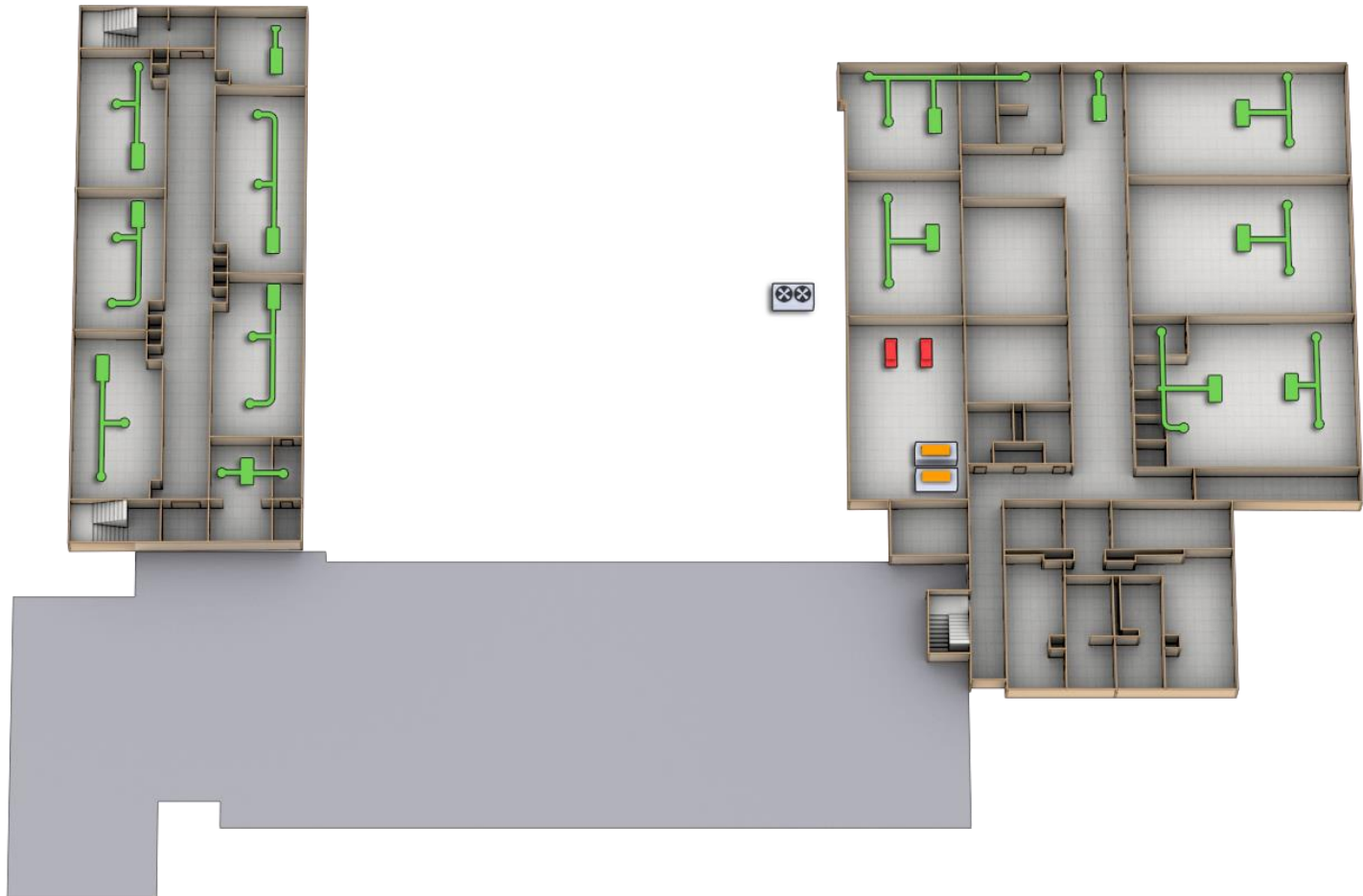
Option #1




This is basically a “like for like” equipment replacement with a few exceptions. The scope included in this option is the following:

- a. Existing classroom water source heat pump (WSHP) unit ventilators will be replaced with new classroom WSHP unit ventilators. Trane no longer manufactures these units so they will need to be sourced from another manufacturer such as Magic Aire. Controls will be field mounted on these units.
- b. Existing above the ceiling horizontal heat pumps will be replaced like for like with new Trane heat pumps.
- c. Cafeteria and Kitchen: The existing split systems and boiler serving these areas will be replaced with new packaged DX/gas heat units located on existing condensing unit pads.
- d. Gym: The large water source heat pumps that serve the gym will be replaced with two new packaged DX/gas heat units.
- e. Auditorium: The existing chiller, fan coils and air handlers serving the auditorium will be replaced with two new packaged DX/gas heat units. There are no existing drawings that show the duct work above the auditorium so this area will require more evaluation during final design to determine if any modifications will need to be made to the existing duct work to handle the new packaged units.
- f. The existing fluid cooler will be replaced with a new fluid cooler.
- g. The existing non-condensing boilers will be replaced with new condensing boilers.
- h. The existing system loop pumps will be replaced with new pumps and VFDs.
- i. All new HVAC equipment will be controlled by new a new Trane building automation system (BAS) and linked to the existing district Trane control system.
- j. The existing WSHP building loop piping will be reused. No new insulation will be installed on existing uninsulated loop pipe.

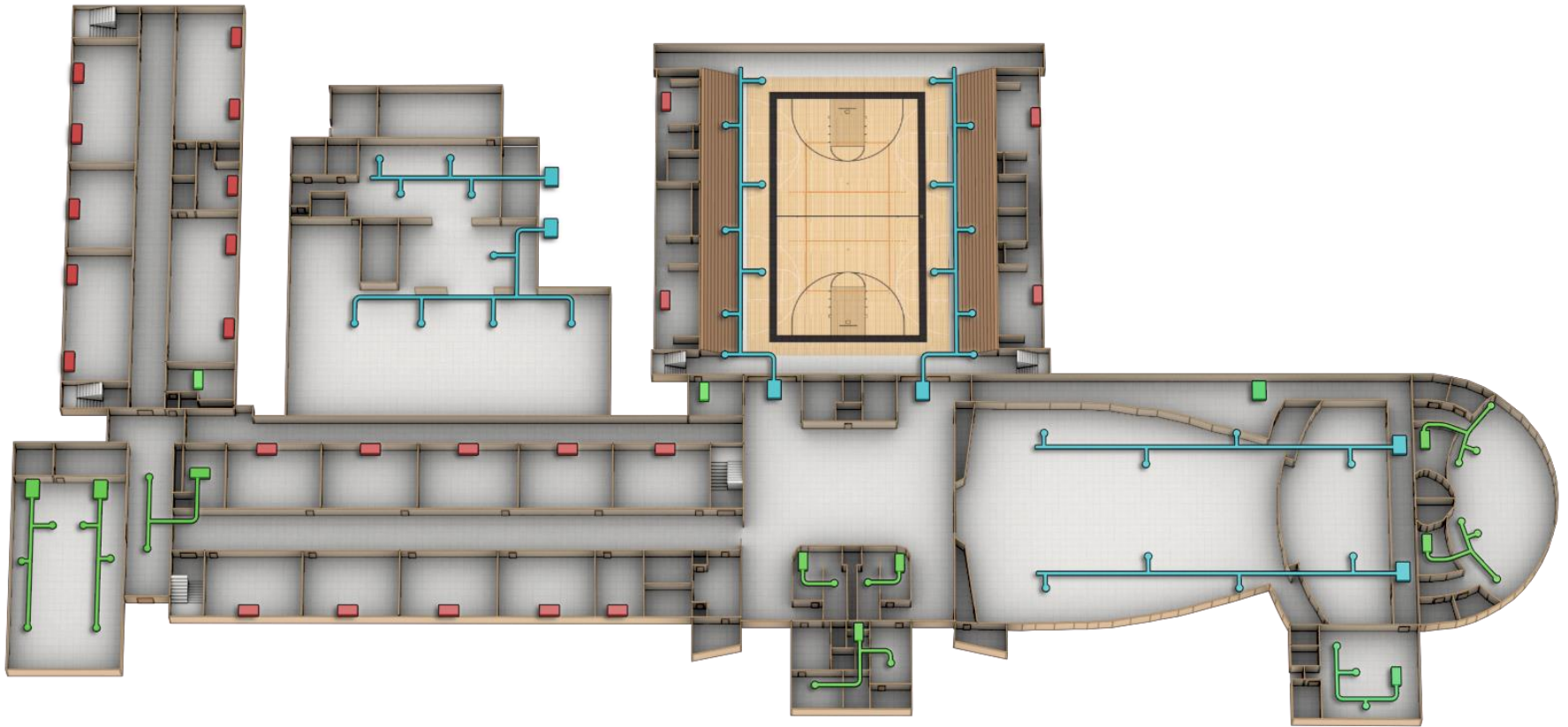
Option #1 – Lower Level

-  Horizontal Heat Pumps
-  New Fluid Cooler
-  New Boilers
-  New Pumps

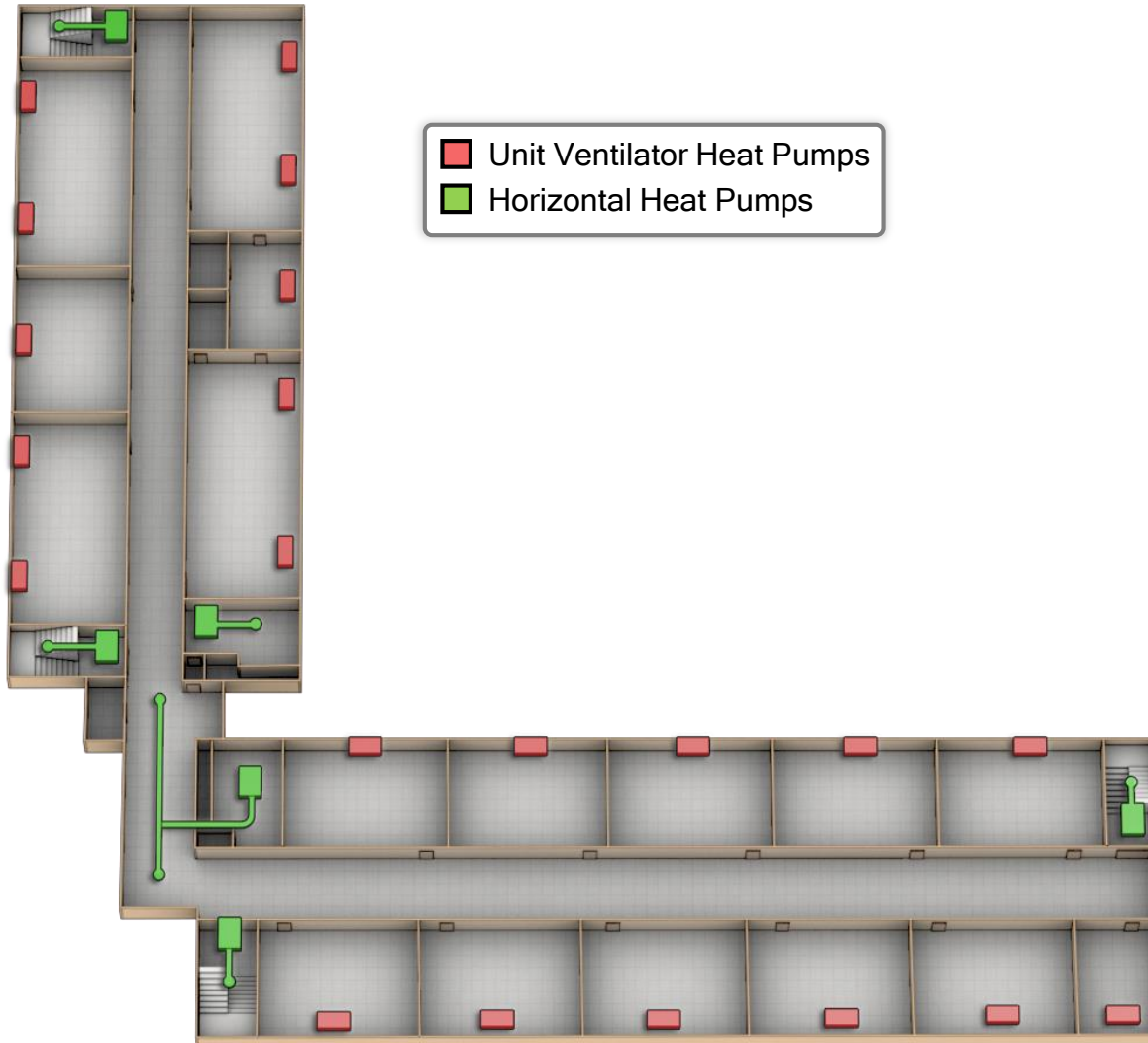


-  Unit Ventilator Heat Pumps
-  Horizontal Heat Pumps
-  Packaged DX/Gas Heat Units

Option #1 – 1st Floor



Option #1 – 2nd Floor



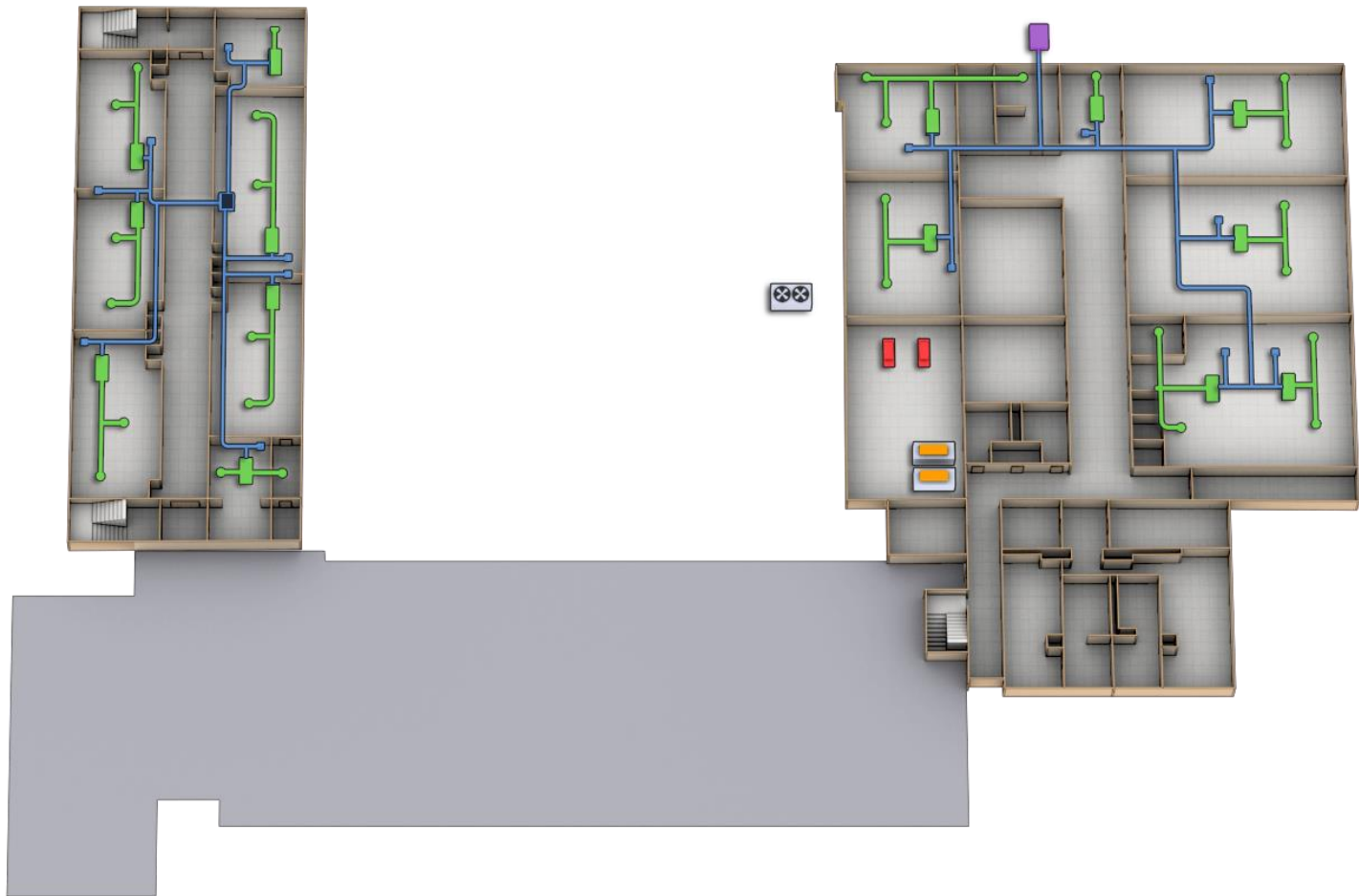
Option #2

This option includes all the scope items of Option #1 with following additions:

- a. New dedicated outdoor air system units “DOAS units” (approximately 4 units) will be added to provide ventilation air direct to the classroom spaces. The spaces included are the rooms located in the 2-story wing, 3-story wing and the lower-level classrooms located beneath the gym.
- b. New ventilation duct will be installed to distribute the outdoor air to individual rooms.
- c. The new DOAS units will be air cooled DX with gas heat.
- d. New electrical service and gas pipe will be run to each unit.

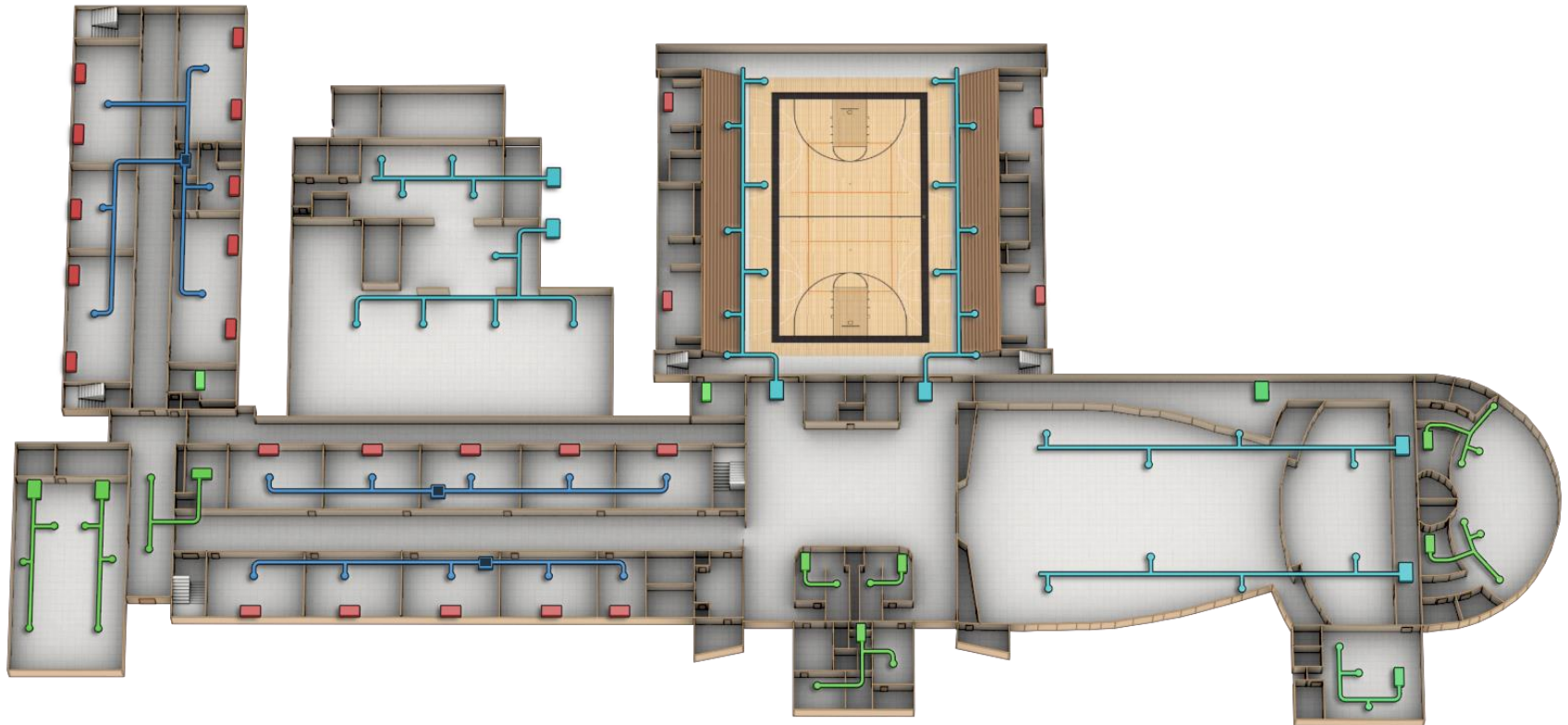
Option #2 – Lower Level

- Dedicated Outdoor Air Systems “DOAS”
- Horizontal Heat Pumps
- New Ventilation Duct Work

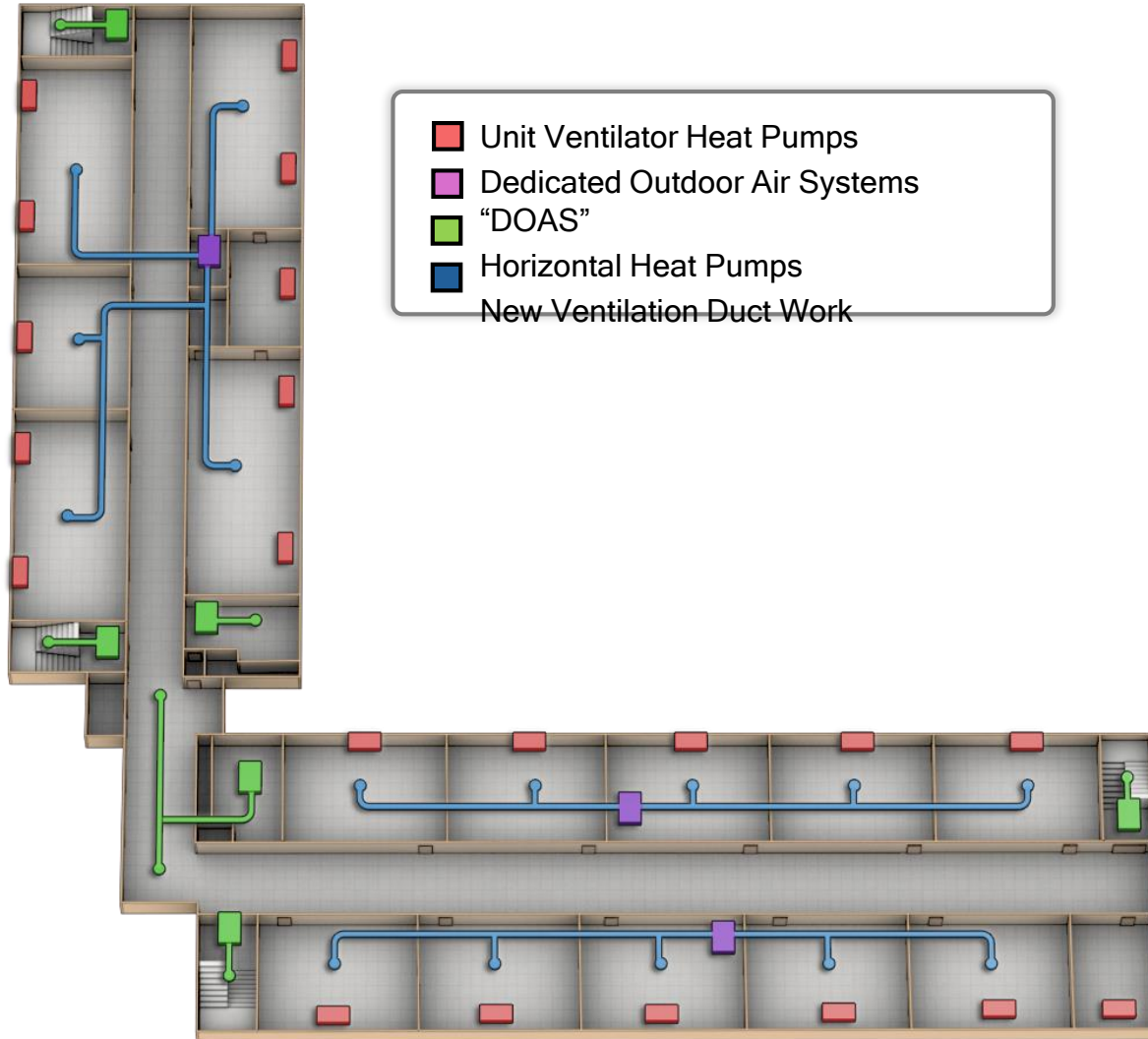


Option #2 – 1st Floor

- Unit Ventilator Heat Pumps
- Horizontal Heat Pumps
- Packaged DX/Gas Heat Units
- New Ventilation Duct Work



Option #2 – 2nd Floor



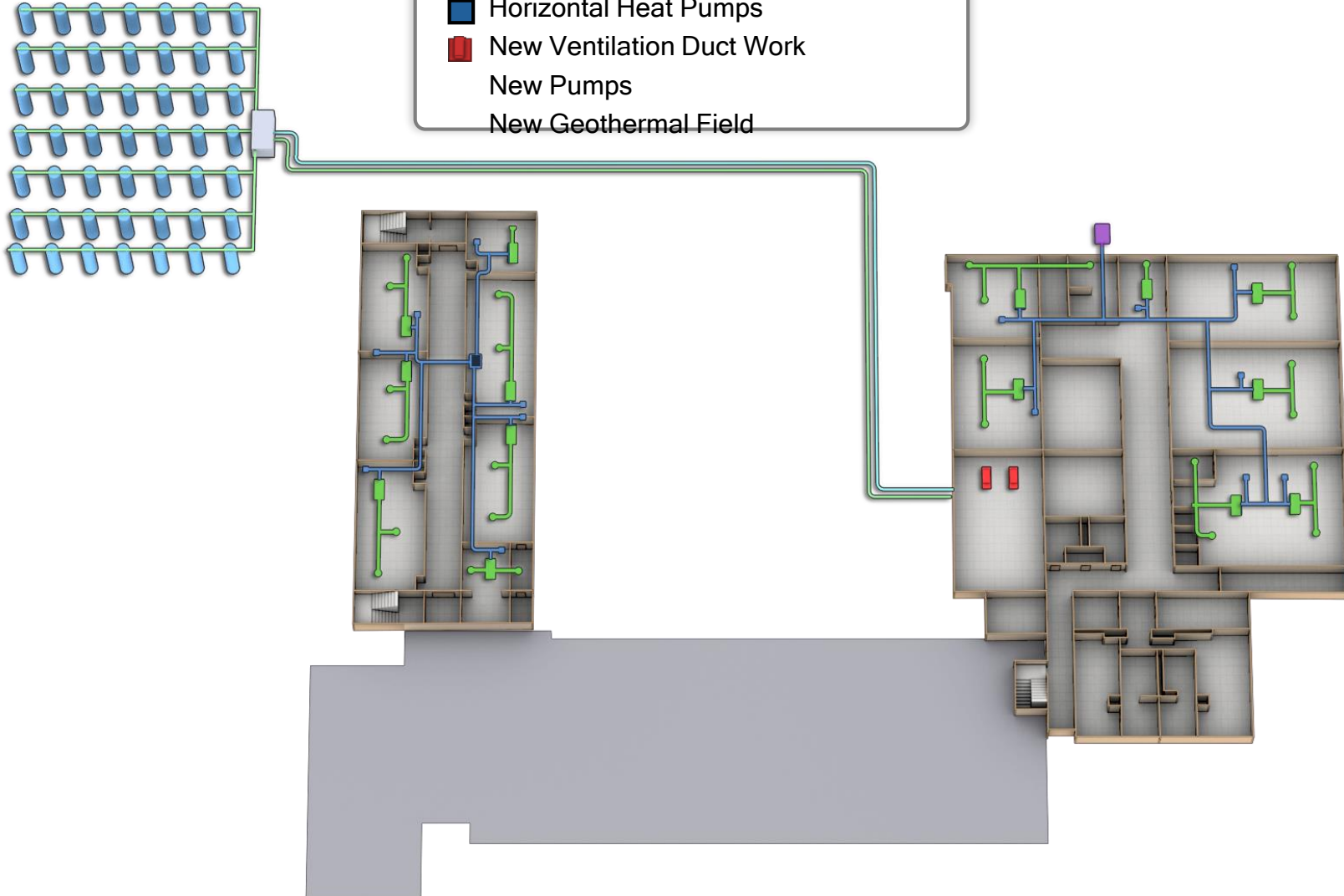
Option #3

This option includes all scope items of Option #2 with the following modifications:





- a. In lieu of a new fluid cooler and condensing boilers to serve the heat pump loop, new geothermal wells will be drilled to serve the new heat pump units.
- b. The existing heat pump loop will be insulated to prevent any condensation issues.

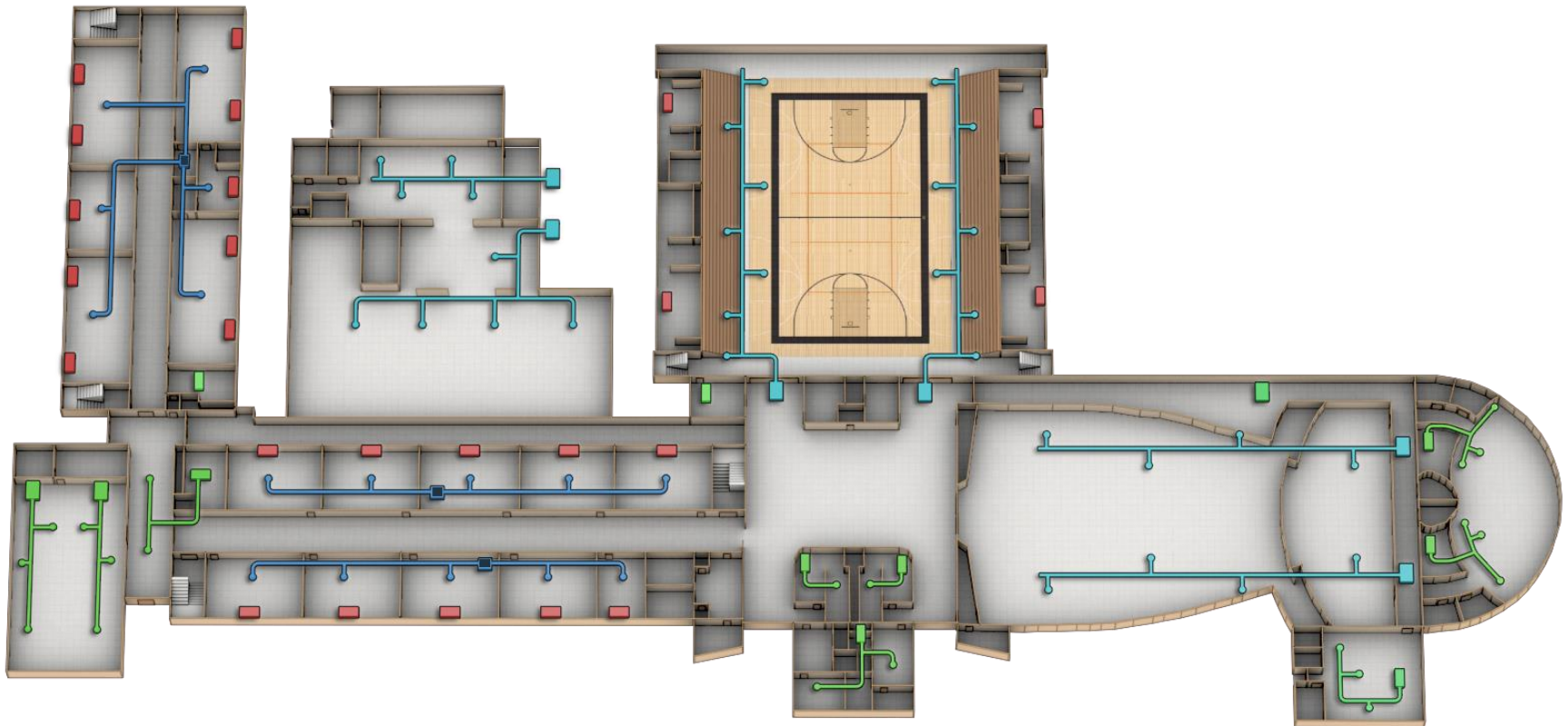
Option #3 – Lower Level

- Dedicated Outdoor Air Systems
- "DOAS"
- Horizontal Heat Pumps
- New Ventilation Duct Work
- New Pumps
- New Geothermal Field

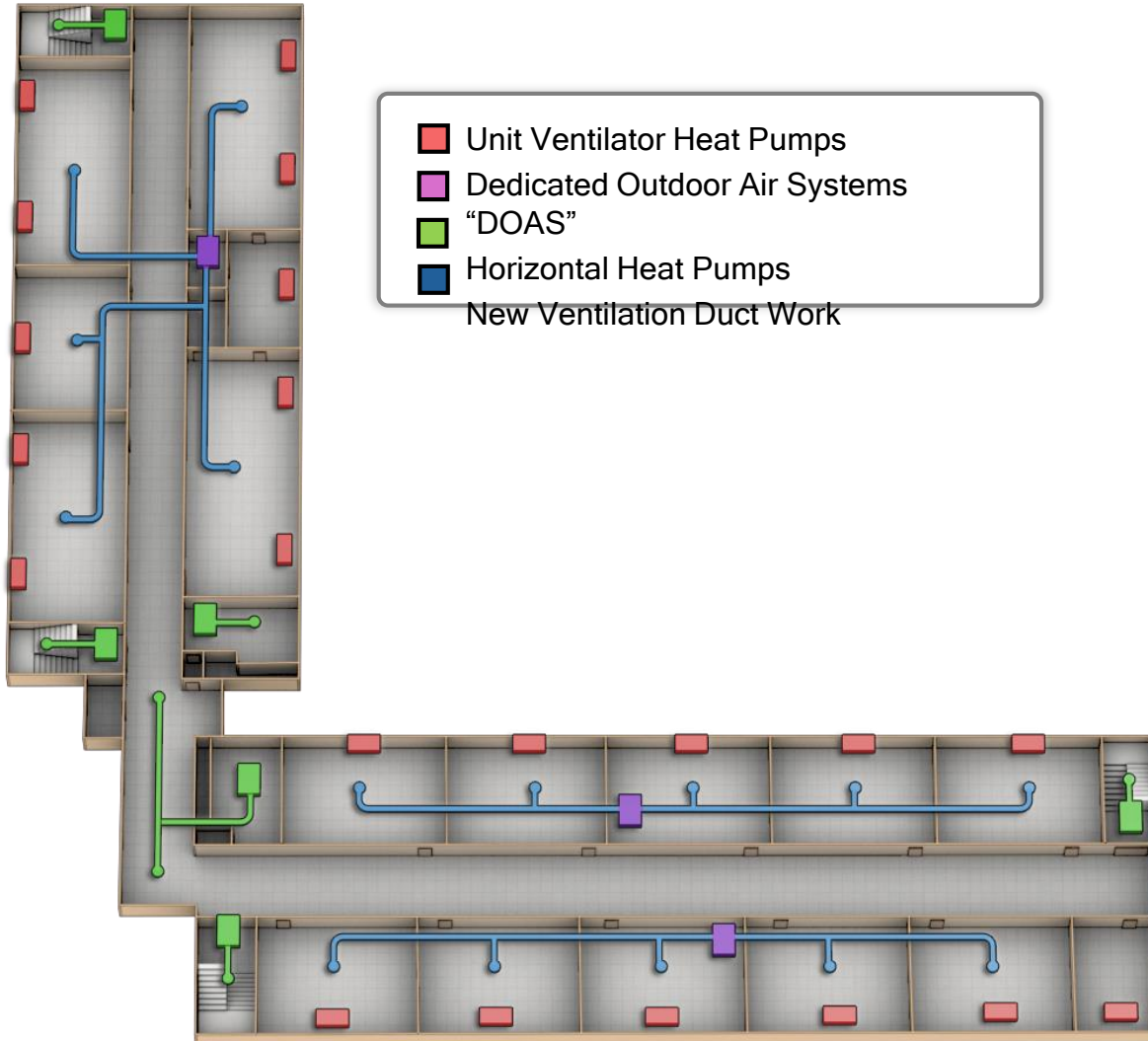


Option #3 – 1st Floor

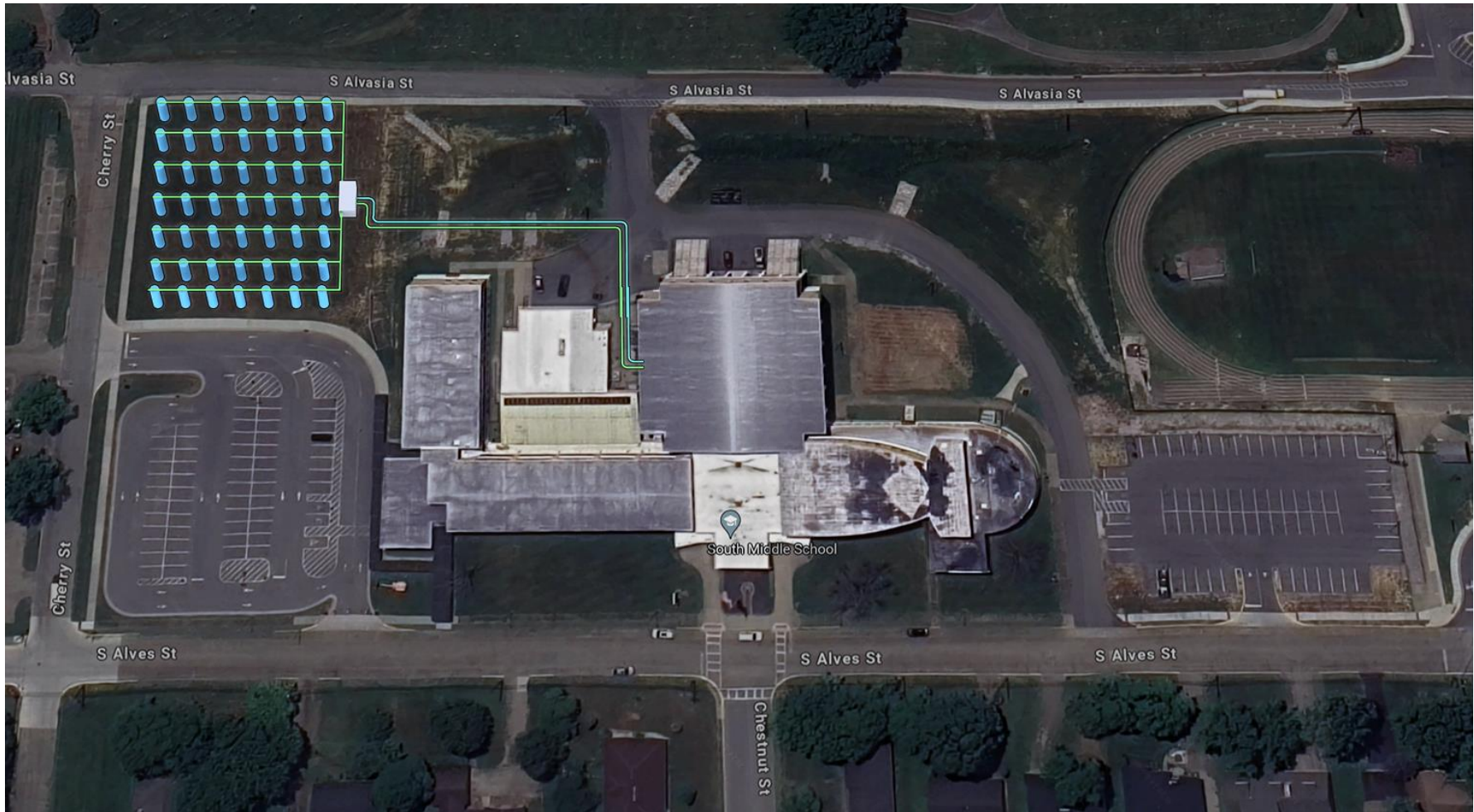
-  Unit Ventilator Heat Pumps
-  Horizontal Heat Pumps
-  Packaged DX/Gas Heat Units
-  New Ventilation Duct Work



Option #3 – 2nd Floor



Option #3 – Geothermal Field Location



How did we get here?

- 20-year relationship: Energy Efficiency, Controls integration, and efficiency through standardization
- Customized system training
- Integrated support (Trane University)
- Unmatched knowledge base of your facilities

Henderson County Performance Report



Calculations for South Middle School system change			
South Middle School Current	Outdoor air heat pumps with fluid cooler and boiler. Dedicated CHW loops and RTUs.	Square footage:	122,699
		Current state EUI pre-solar:	60
		Energy spend pre-solar:	\$106,000
		Energy spend post-solar:	\$80,000
South Middle School Future State	Multiple Options	EUI	50
		Annual energy Spend	\$89,000
		Annual Savings	\$17,000
		EUI	40
		Annual energy Spend	\$71,000
		Annual Savings	\$35,000
		EUI	30
		Annual energy Spend	\$53,000
Annual Savings	\$53,000		
Comparison Metrics			
Site 1 MS	Geo source HPs w/ ERUs - electric only	Square footage:	99,554
		Current state EUI:	23
		Current energy spend annual:	\$82,500
Site 2 MS	Geo + Fluid cooler HP loop w/ MAUs - Electric Only	Square footage:	68,659
		Current state EUI:	28
		Current energy spend annual:	\$93,300
Site 3 MS	Fluid cooler / Boiler OA HPs - Electric, Demand, and Gas	Square footage:	89,403
		Current state EUI:	30
		Current energy spend annual:	\$101,500
Site 4 HS	Geo HP loop with RTUs on the gym - Electric, Demand, and Gas	Square footage:	144,787
		Current state EUI:	31
		Current energy spend annual:	\$140,000

Henderson County Asset Management											
Facility	Construction	Renovations			Energy System Type	Quantity	Year Installed	System Age	ASHRAE Median Expected Life	Building Controller	Enterprise
South Middle	1953/1954	1957	1971	1999	WSHP	69	1991	33	19	BCU with SC+ for Meter	Site Supported Ensemble
					Loop Pumps	2	1991	33	20		
					Cooling Tower (Fans)	2	2018	6	20		
					Cooling Tower	1	1991	33			
					Lighting Partial		2018	6			
					RTU	4	1991	33	15		
					Chiller Auditorium						
					Boiler	3	1991	33	25		

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