



December '24 Energy Cohort

Geothermal Systems for Affordable Housing

Wednesday, December 18, 2024 | 9:00 AM ET

LLSC MASSACHUSETTS

About the Energy Cohort:

- A learning, networking, and collaboration group for affordable housing professionals interested in energy efficiency, decarbonization, climate resiliency, and resident health.
- Co-convended with MACDC and New Ecology
- Topics are sourced through direct partner requests and community field surveys



Today's Session:

What are the different components and types of geothermal systems for multifamily residential mechanical systems?

What factors should be taken into account when considering geothermal for your property??

✦ **Geothermal Heat Pumps for Adaptive Reuse in Affordable Housing**

William Womeldorf, Real Estate Project Manager, Valley CDC

✦ **Geothermal at Boston Housing Authority**

Joel Wool, Dep. Administrator for Sustainability & Capital Transformation, BHA

Geothermal Heat Pumps for Adaptive Reuse into Affordable Housing

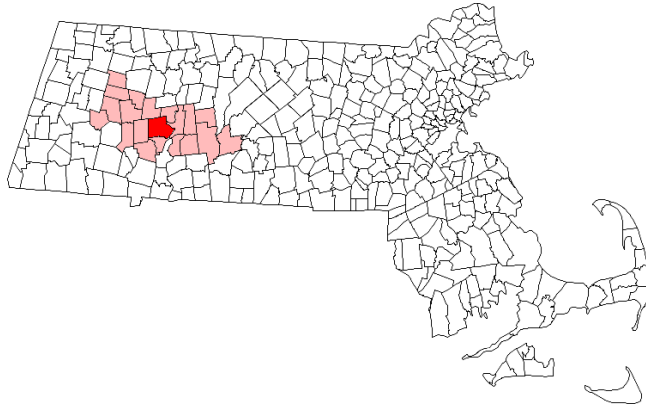


William Womeldorf
Real Estate Project Manager
WW@ValleyCDC.org | 413-586-5855 x 160

Valley
Community
Development



About Valley CDC



Small Non -Profit CDC Located
in Northampton MA

Staff of 11, with 4 in the Real
Estate Housing Development
Department

Also provide Small Business
and Home Ownership
Assistance



10,961

Homeowners
Assisted



3,168

Small Businesses
Helped



419

Affordable Homes
Developed

My Background



**ARCHITECTURE
& DESIGN**

**BUILDING
SCIENCE
& ENERGY
EFFICIENCY**

**CONSTRUCTION
&
PROPERTY
MANAGEMENT**

**REAL ESTATE
DEVELOPMENT
& FINANCE**

“Prospect Place”

a.k.a. Former Northampton
Nursing Home

72,000 SF 2 - Stories

6.2-Acre Site

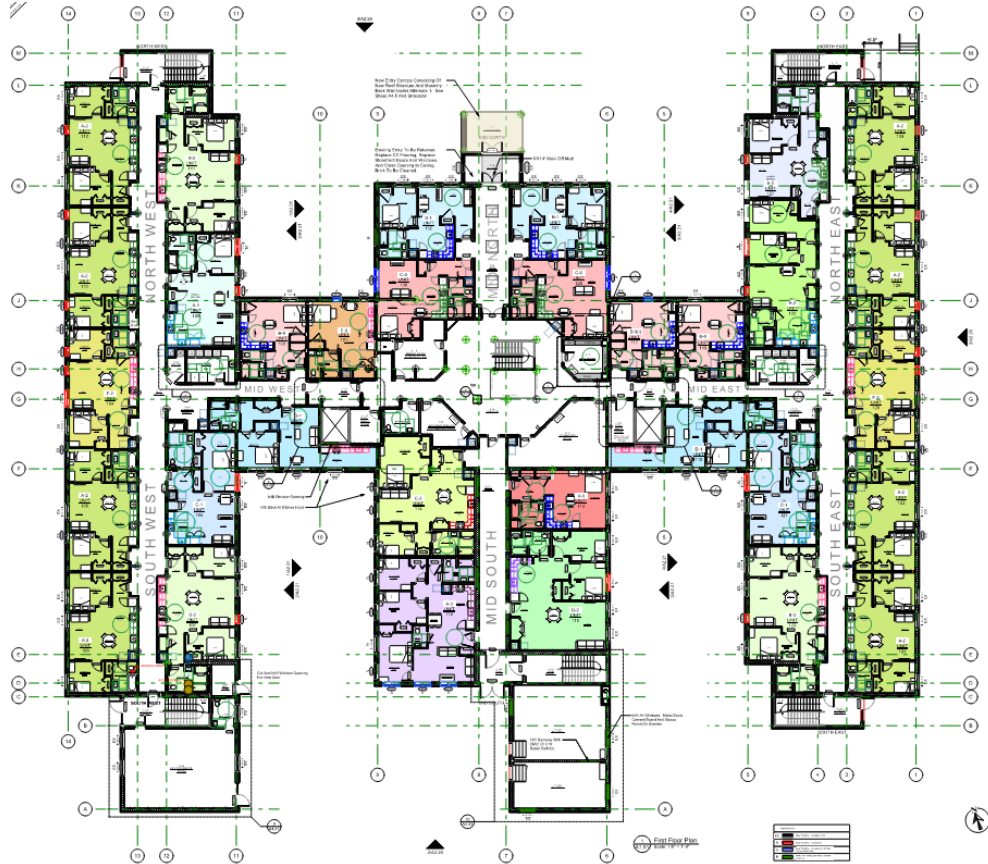
Constructed 1971

Vacant Since 2011

Valley
Community
Development



Adaptive Reuse



60 Affordable Apartments
(mix of 30% to 100% AMI)

Majority 2 -Bed and 3 -Bed
“Family” Apartments

Enhanced Accessibility
throughout Building

Deep Energy Retrofit



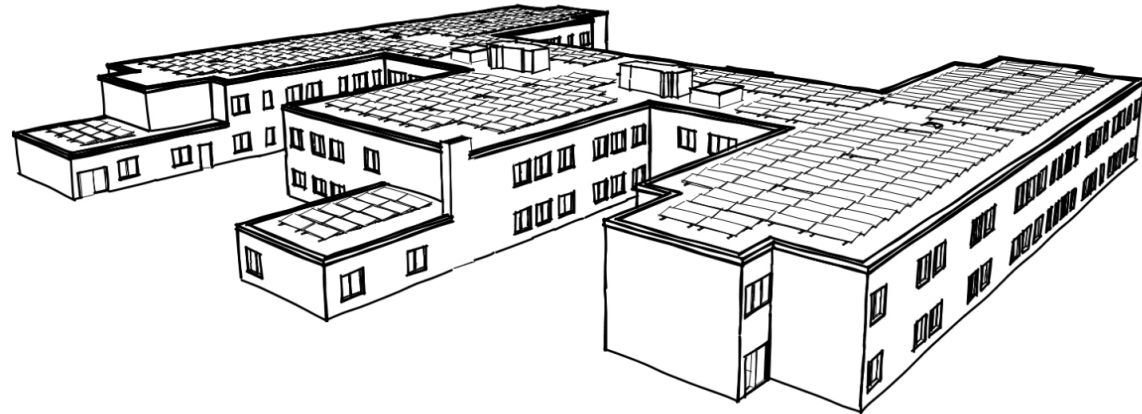
All - Electric
(Eliminate Gas Into Building)

Save Embodied Carbon

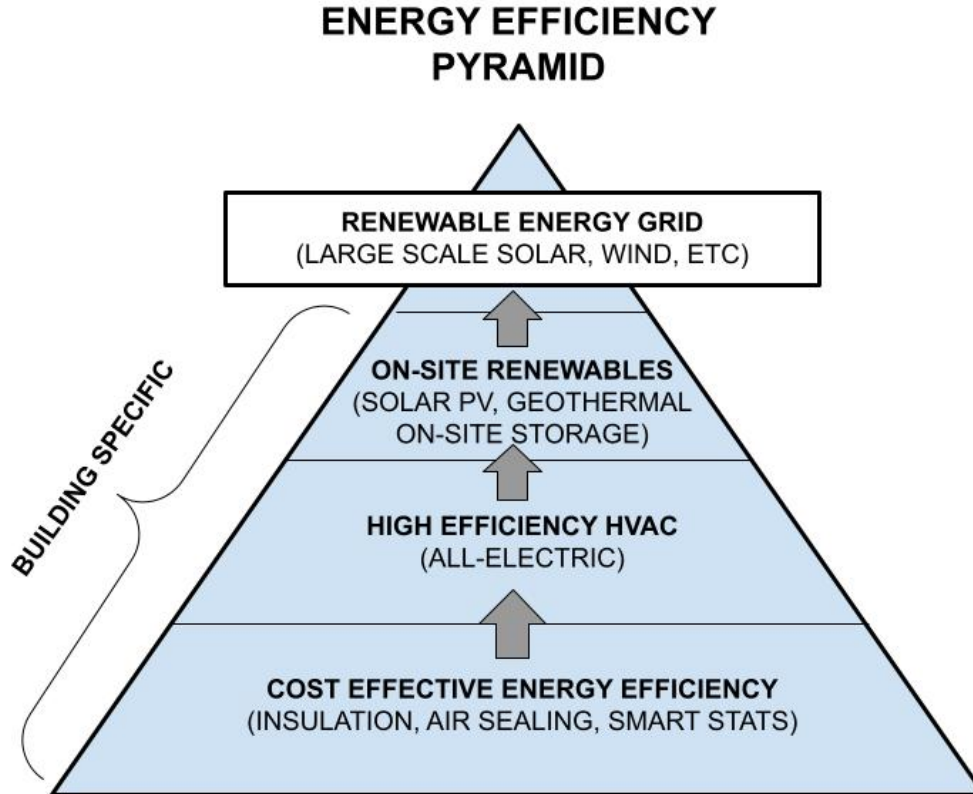
Geothermal Heat Pumps
(as opposed to traditional ASHPs)

- Heating
- Cooling
- Domestic HW
- Ventilation Re -Heat

307 kW Solar PV Array



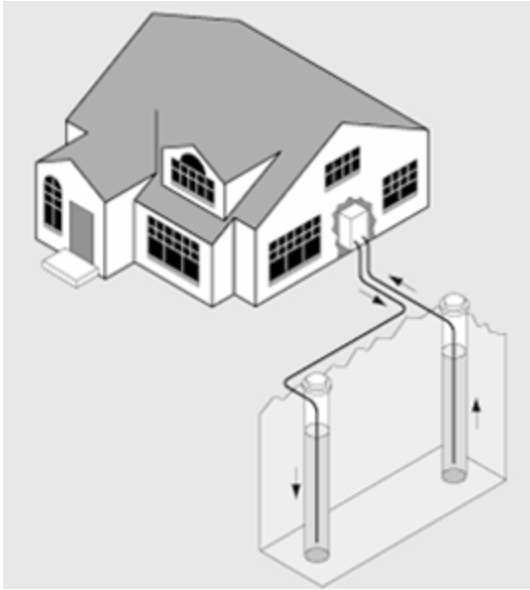
Hierarchy of Energy Needs



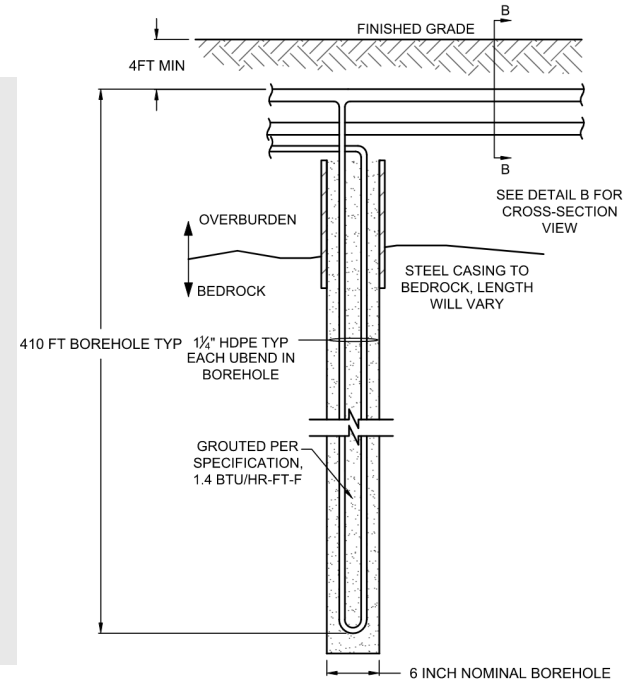
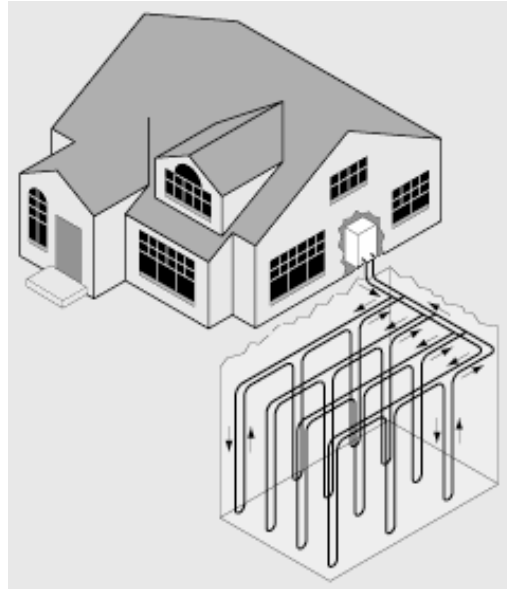
Open vs. Closed Loop



OPEN LOOP

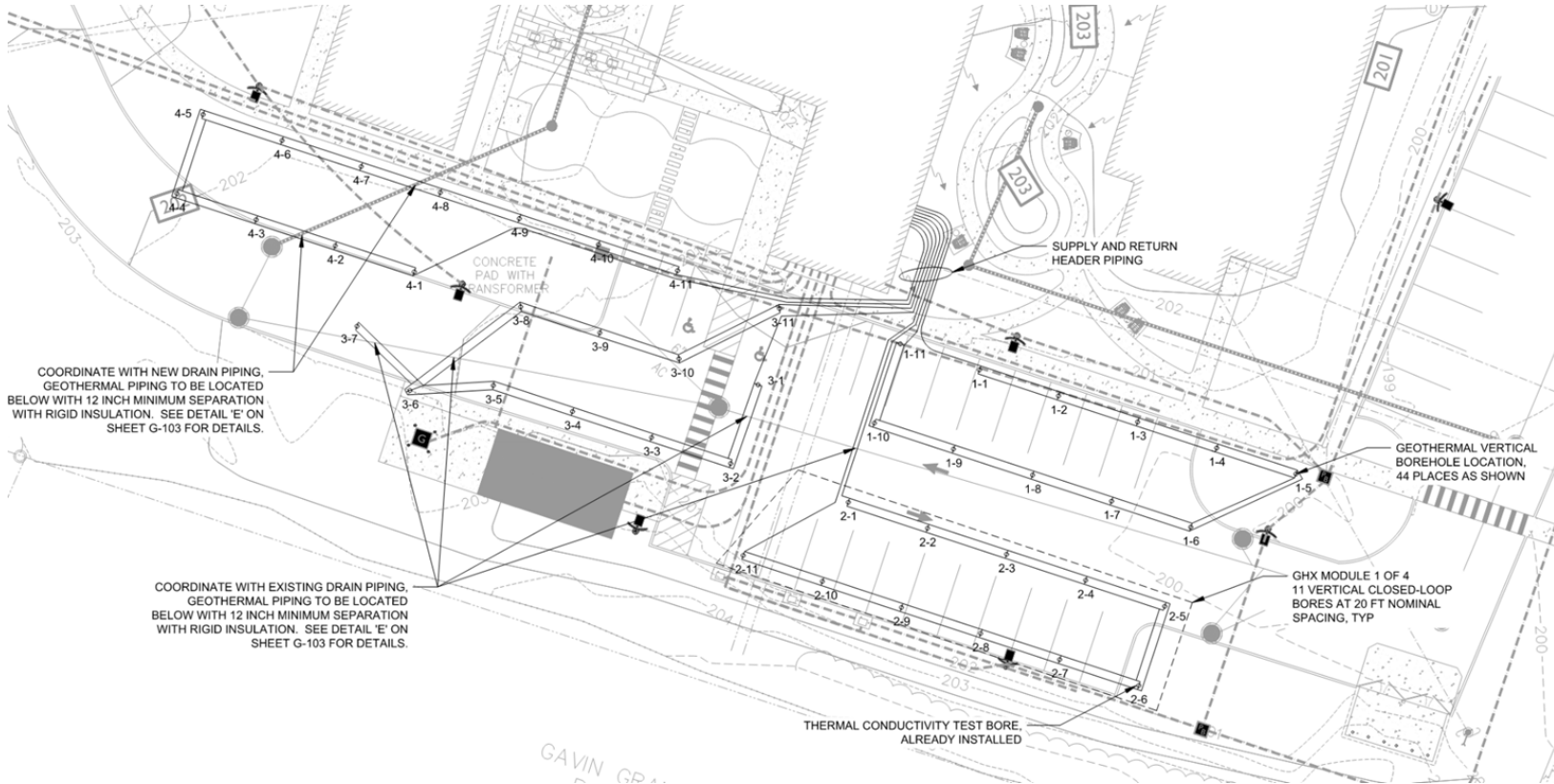


CLOSED LOOP

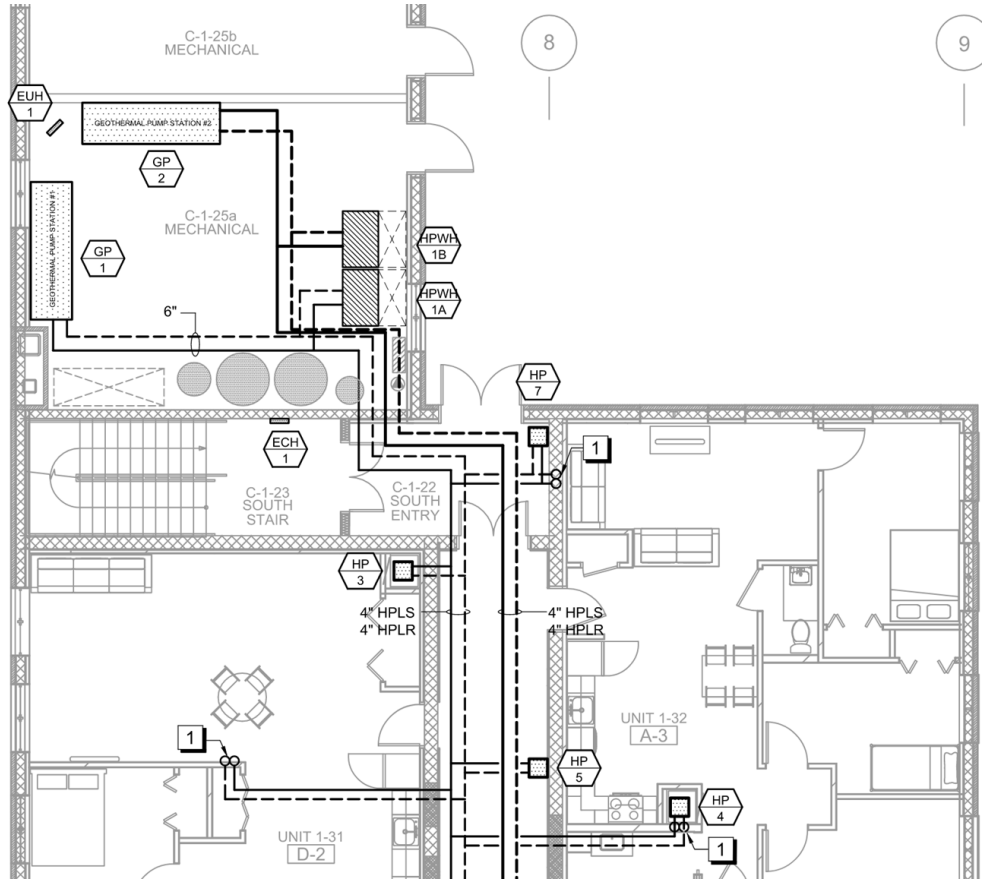


44 TOTAL BORES
TYP. 11 PLACES FOR
EACH OF 4 GHX MODULES

Open vs. Closed Loop



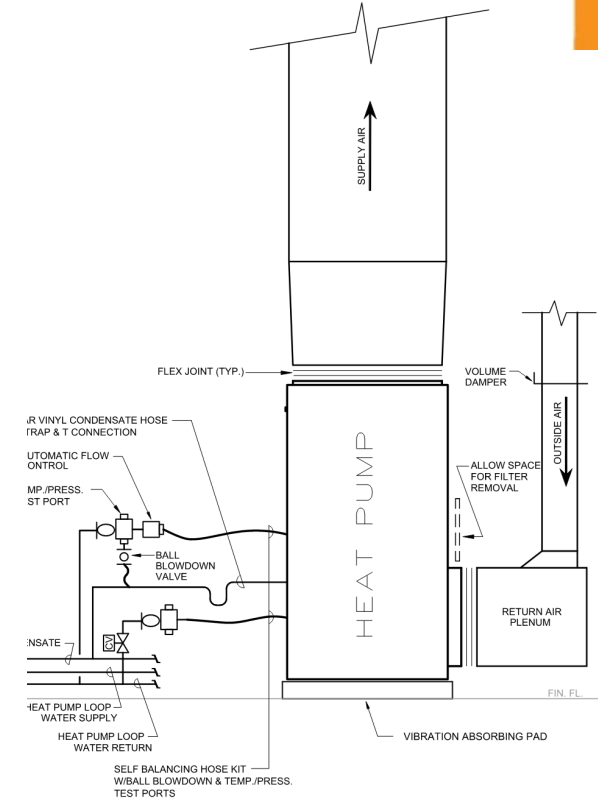
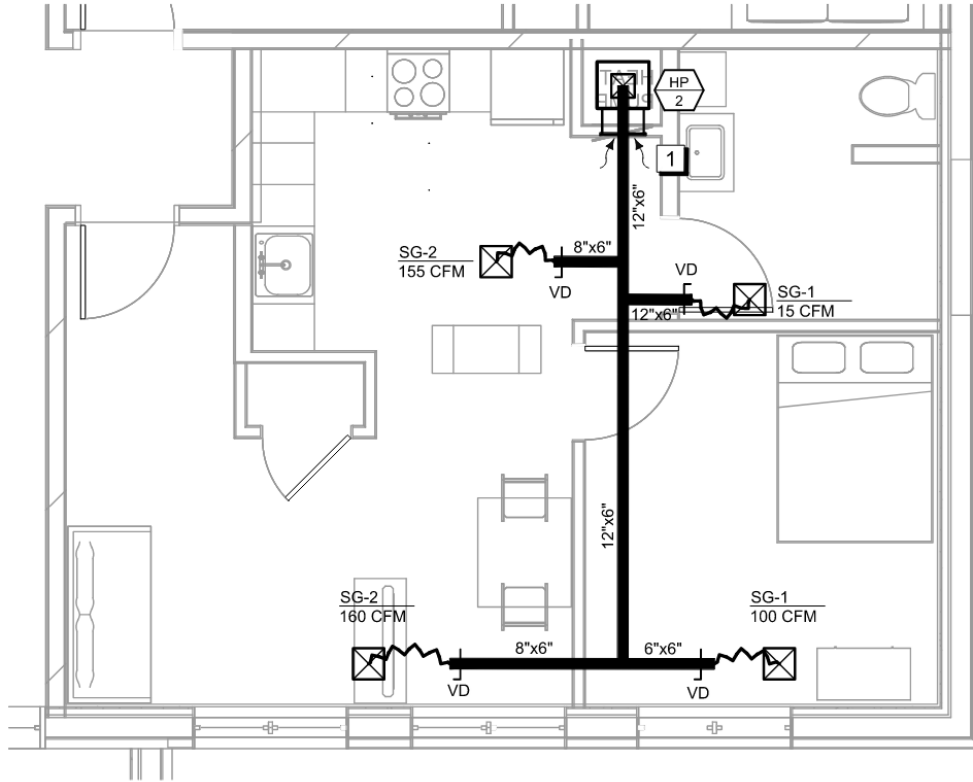
Interior Configurations



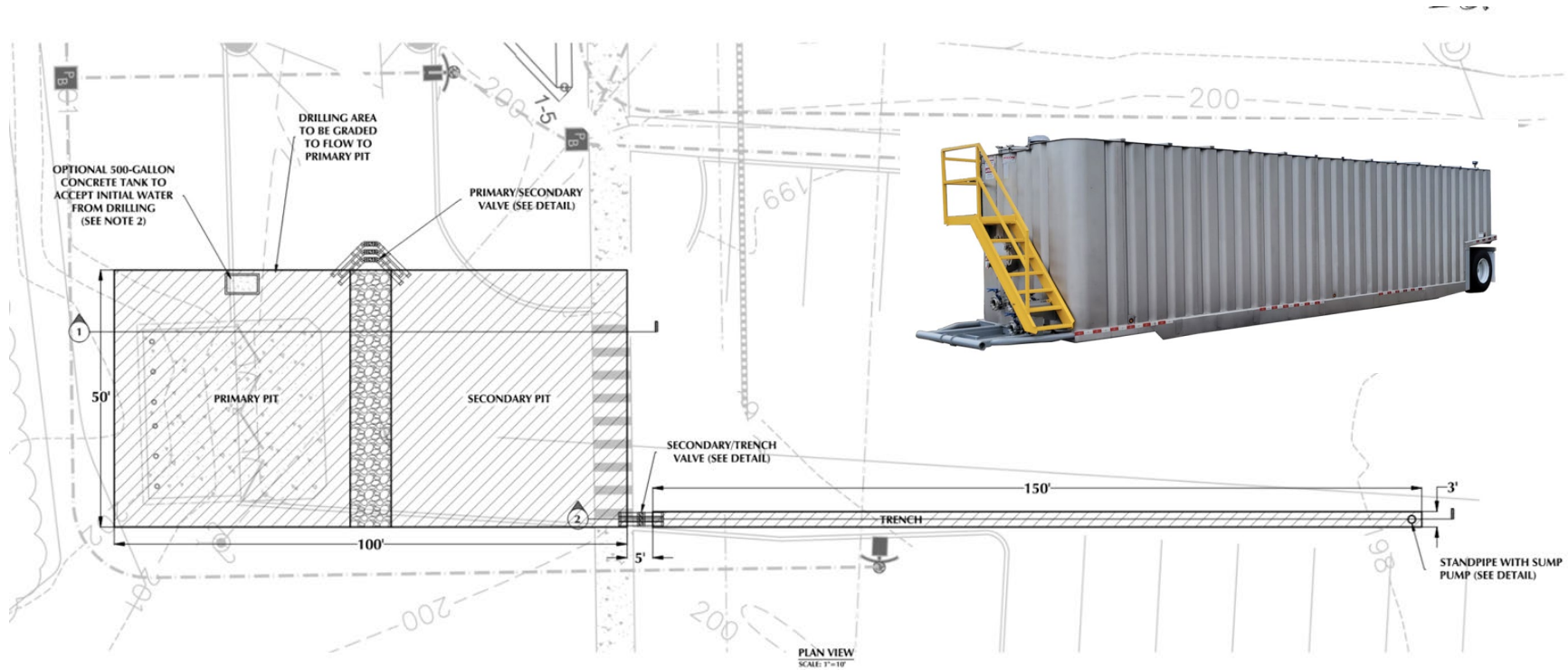
GP = Ground Source Heat Pump
Station (manifold)

HP = Heat Pump Unit

Interior Configurations



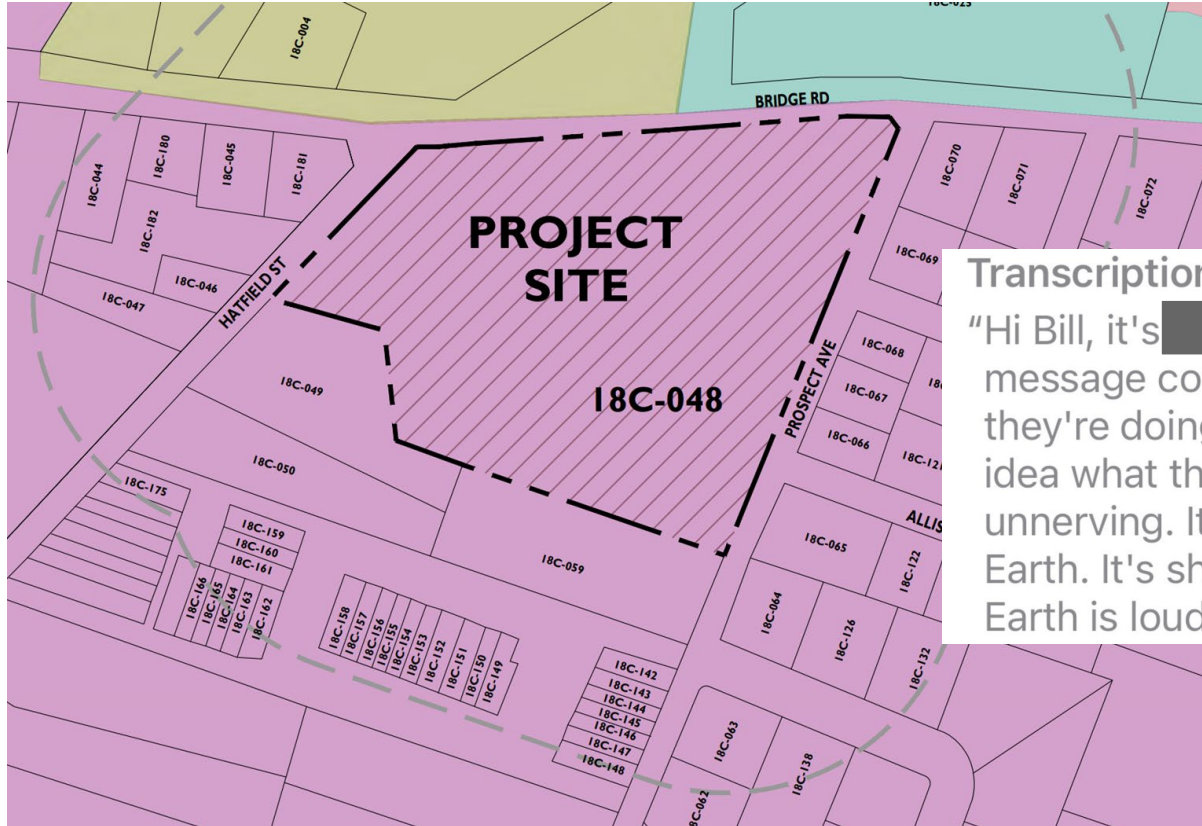
Dewatering Process



Dewatering Process



Noise & Vibrations



Transcription

"Hi Bill, it's [REDACTED] When you leave me a message could you please tell me what they're doing over there because if I had an idea what the heck this was it would be less unnerving. It feels like they're drilling the Earth. It's shaking the building it shaking the Earth is loud."

Summary



Learning Lessons:

- Plan for Dewatering Early
- Share your Soil Report
- Consider a 3rd Party QA/ QC Reviewer to avoid miscoordination between MEP & Geo Engineers
- IRA can in fact help bump up tax credits

My Recommendations:

- Consider Decentralized Internal Systems
- Consider Closed Well Systems if budget allows

Thank you !





**Geothermal @ Boston
Housing Authority**

We're about to discuss...

- 3 Ownership Models
- 2 Geothermal Projects
- 1 Tax Guidance
- (And 10,000 units of Public Housing)

Public Housing, From Condos to High Rise Apartments



Carbon-Intensive Heating Drives BHA Emissions

Portfolio emissions by end use

Key Stats

Over half of all portfolio emissions are associated with providing space heating.



Space heating 54% of total portfolio emissions
93% of which are Scope 1



Hot water 13% of total portfolio emissions
93% of which are Scope 1



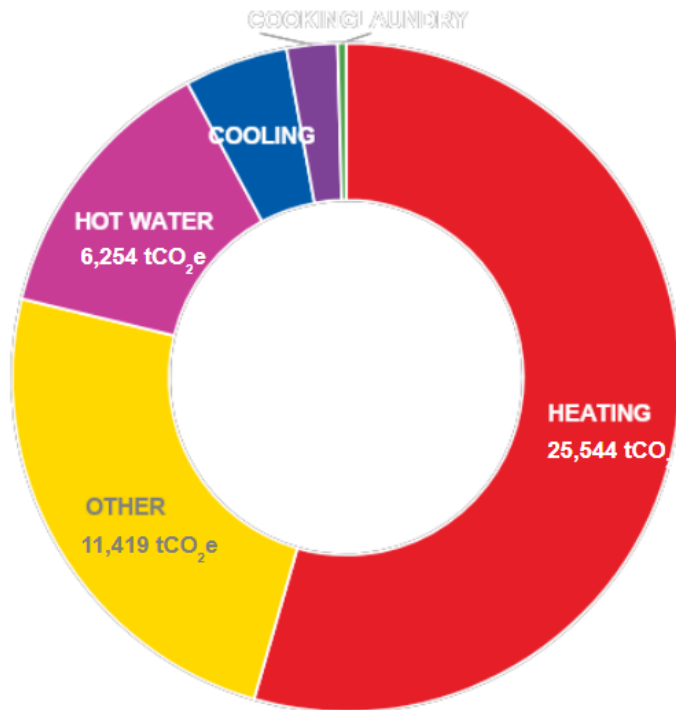
Cooking 3% of total portfolio emissions
59% of which are Scope 1



Laundry <1% of total portfolio emissions
10% of which are Scope 1

Cooling 5% of total portfolio emissions
0% of which are Scope 1

Other 24% of total portfolio emissions
0% of which are Scope 1



Heating	25,544 t CO ₂ e
Hot water	6,254 t CO ₂ e
Cooking	1,153 t CO ₂ e
Laundry	192 t CO ₂ e
Cooling	2,351 t CO ₂ e
Other	11,419 t CO ₂ e

Who Owns It?

- Heating systems are typically owned by building owners...
- High capital cost of borefield/drilling and ability to scale decarb has led to other models

Three of many models:

- Property Owner - Whole System
- Owner(s) + Utility - Networked Geothermal
- Public Private real estate partnership (i.e. BHA owns land, private developer builds)



Franklin Field Geothermal Project



Boston Housing Authority, National Grid team up on geothermal project in Dorchester

The project could be a test case for other sites in Boston, and elsewhere in the state

By [Jon Chesto](#) Globe Staff, Updated January 25, 2024, 11:01 a.m.

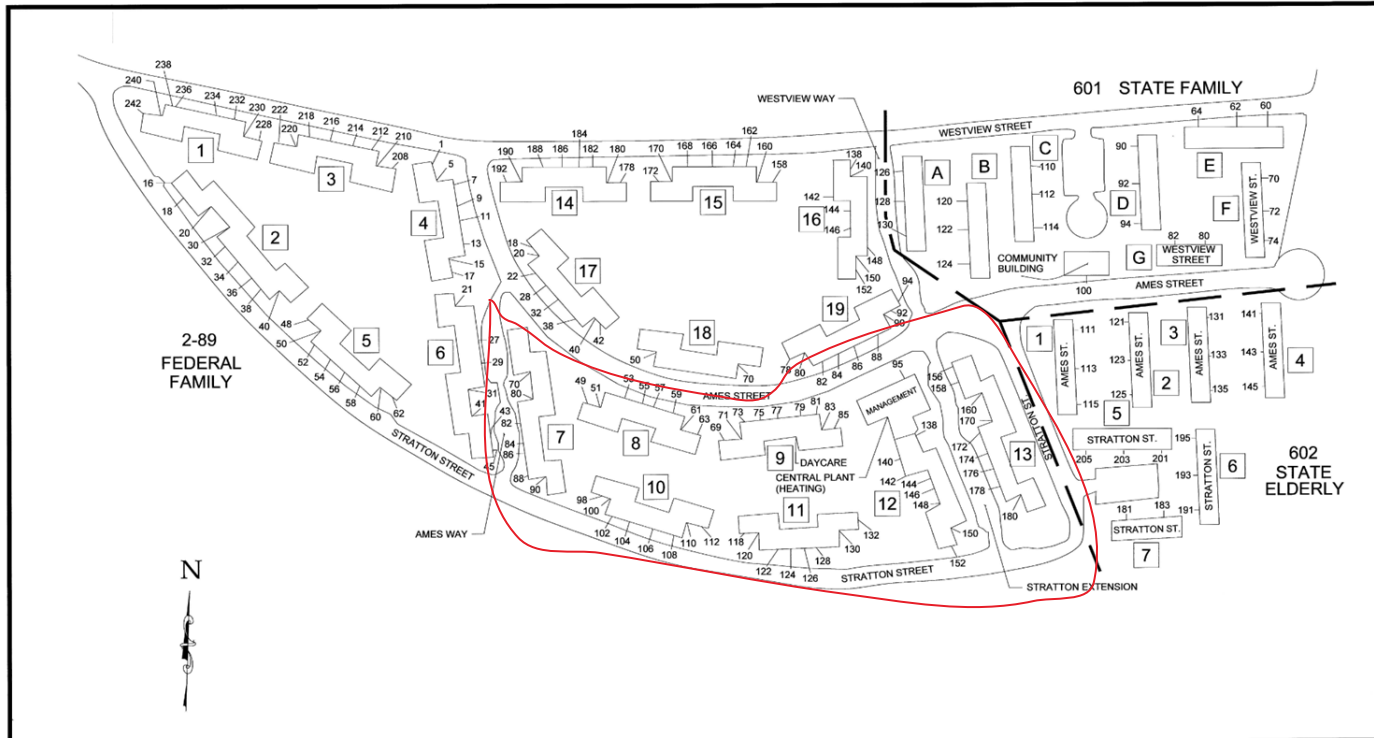


Franklin Field Apartments

- Constructed in 1950s-1960s
- About 450 units, most subsidized by federal government
- Historically, housed many families of World War II veterans
- Most units are “townhouse style”, brick, 3 stories tall
- Converted from oil to gas heat in early 2000s
- Gas “decentralization” was in progress before geo project



Franklin Field Apartments - Site Plan

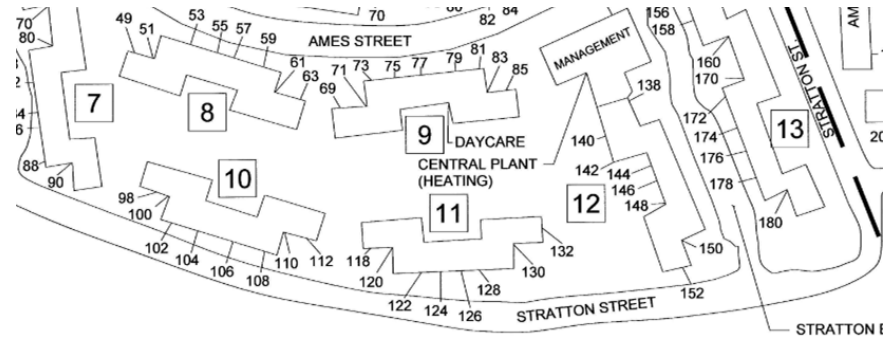


<p>LEGEND</p> <p>□ BUILDING NUMBER</p>	<p>SITE PLAN</p> <p>FRANKLIN FIELD APARTMENTS HOUSING PROJECTS MA 2-89, 601, 602 DORCHESTER, MASSACHUSETTS</p>	<p>PROJECT NUMBER: 60.01476.0021</p> <p>SCALE: N.T.S.</p> <p>DRAWN BY: SO</p> <p>DRAWING FILE: SITE</p>	<p>FIGURE NUMBER: 2</p> <p>CHECKED BY: GD</p> <p>REVISED BY:</p>	<p>VATC ASSOCIATES INC.</p> <p>600 West Cummings Park, Suite 5500 Woburn, Massachusetts 01801-6350 Tel: (781) 932-9400 Fax: (781) 932-6211</p>
-----------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------



Franklin Field Apartments - Geothermal Project

- 7 Buildings
- 129 Units
- Currently heated by centralized gas system
- Previously oil heat
- Scalability!
- BHA handling (10's of millions) of interior work
- Utility will handle drilling, build pumping station inside BHA bldg

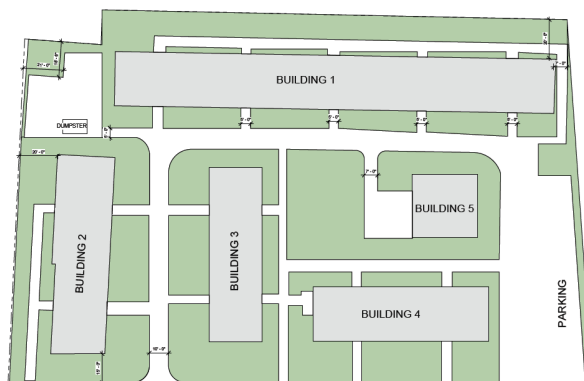
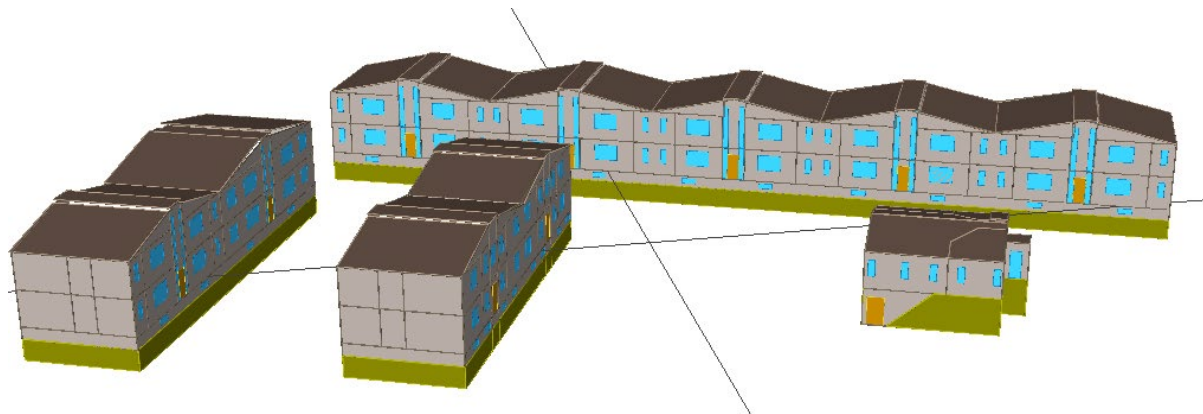


Pond Street

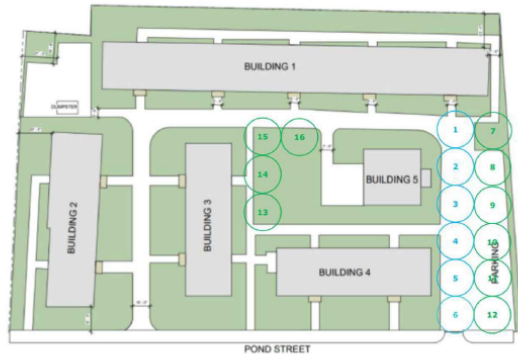
- “Garden-style” elderly development in Jamaica Plain
- 5 Buildings, Federal Public Housing
- 44 units
- 32,330 SF (Gross) or 29,016 SF (Living Area)
- Existing heat + DHW: Gas
- Design evolution:
 - Gas replacement -> ASHP -> GSHP
- Project includes roof, windows, heat, hot water, solar PV



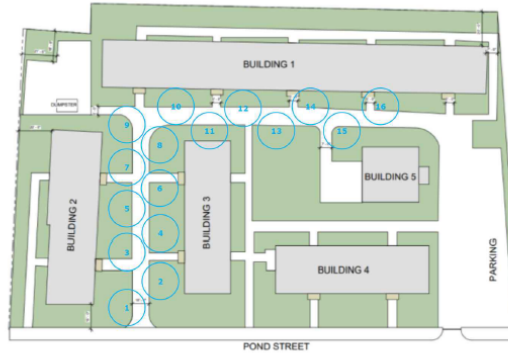
Pond Street



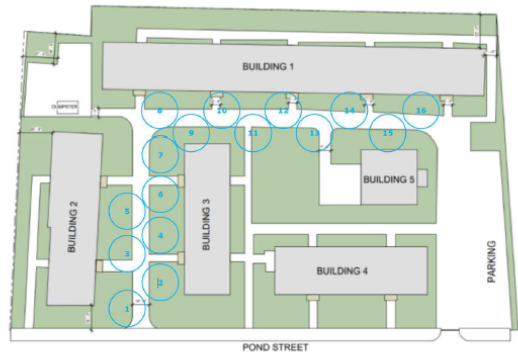
Pond Street, DD Phase, Early Geo Layouts



1 GEO WELL LAYOUT OPTION #1



2 GEO WELL LAYOUT OPTION #2



3 GEO WELL LAYOUT OPTION #2

NOTE:

1. THESE OPTIONS ARE PRELIMINARY. A SURVEY OF ALL ONSITE UTILITIES WILL NEED TO BE DONE IN ORDER TO FINALIZE ANY PROPOSED WELL LAYOUT.
2. THE PROPOSED SYSTEM IS BASED ON THE LOADS THAT INCORPORATE HEATING, COOLING AND DOMESTIC HOT WATER. THE RESULTING SYSTEM WILL BE COMPRISED OF 16 VERTICAL WELLS AT A DEPTH OF 600', SPACED 20' APART.
3. THE BLUE CIRCLES SURROUNDING EACH NUMBERED WELL IN THE IMAGES DEMARCATTE THE NECESSARY SPACING BETWEEN WELLS. THE ACTUAL SIZE OF EACH WELL IS ROUGHLY 6" IN DIAMETER.
4. THE DRILLING RIG AND SUPPORT EQUIPMENT WILL TRAVEL IN A GROUP FROM HOLE TO HOLE TILL ALL DRILLING IS FINISHED. THUS THE DAILY IMPACT TO THE SITE WILL BE LOCALIZED AND NOT SPANNING THE ENTIRE AREA OF THE PROPOSED WELLS.
5. OPTION #1 ALLOWS MOST OF THE DRILLING TO TAKE PLACE AWAY FROM THE RESIDENCES. WHILE THIS REDUCES THE IMPACT OF NOISE AND ACCESS TO THE RESIDENCES IT DOES REQUIRE THE ENTIRE PARKING LOT TO BE TORN UP DUE NOT ONLY TO DRILLING BUT THE NECESSARY TRENCHING AS WELL.
6. OPTIONS #2 & #3 ARE MORE INVASIVE INTO THE RESIDENCE AREAS, BUT ACCESS RESTRICTIONS SHOULD BE MINIMAL AND LOCALIZED. THESE TWO OPTIONS GREATLY REDUCE DISRUPTIONS TO THE SITE AS HARD SURFACES CAN REMAIN INTACT WHICH WILL BE MUCH LESS COSTLY.

You Never Know Until You Dig...



Pond Street Test Bore:

More water than anticipated!

Drill depth now anticipated around 300' instead of 600'

Still determining best design for DHW

So, about the US Treasury

- Large federal tax credit available for geothermal (30-50%)
- Eligible for “elective pay”
- Final guidance issued in December 2024
- Major implications for ownership:
 - Owner of borefield + at least one heat pump can claim credit
 - Owner of just the heat pumps cannot claim credit
 - IRA allows “fractional ownership” of property - perhaps a pathway?

*** THIS IS NOT
FINANCIAL
ADVICE.**

THANK YOU



Resources:

Funding/Resources for Building-Level Measures:		
Name	Type	Funds
MassCEC's BETA Project Planning	No-Cost Technical Assistance	Building Decarbonization Assessment
Affordable Housing Decarbonization TA Hub	No-Cost Technical Assistance	Building Decarbonization Assessment (Q1 2025)
Climate Ready Housing	Project Financing	Comprehensive Energy Retrofit
LEAN DER	Project Financing	Comprehensive Energy Retrofit
Affordable Housing Decarbonization Grant	Project Financing	Comprehensive Energy Retrofit
Tax Credits, Incentives, and Technical Assistance for Geothermal Heat Pumps	Federal Tax Incentive	U.S. Dept. of Energy
International Ground Source Heat Pump Association certified installers	Directory	IGSHPA

Vendors:			
Name	Role	Contact	Email
Engineering Services of Vermont	QA/QC engineer for Prospect Place	Daniel Dupras	Daniel.Dupras@esvtllc.com
Wellspring Geothermal	Geothermal Consultant for Prospect Place	Timothy Roos	tim@wellspringgeo.com
Aztech Geothermal	Geothermal Consultant to BHA		

Thank you for joining us!

If you have any questions, would like more resources, or have suggestions/requests for future energy cohort topics, please reach out to:



Joe De Larauze
Program Officer, Green Homes
E: jdelarauze@liscorg



Emily Jones
Deputy Director
E: ejone@liscorg