

Geothermal at the Campus Instructional Facility

Presented to CEE 190 Project Based Learning class
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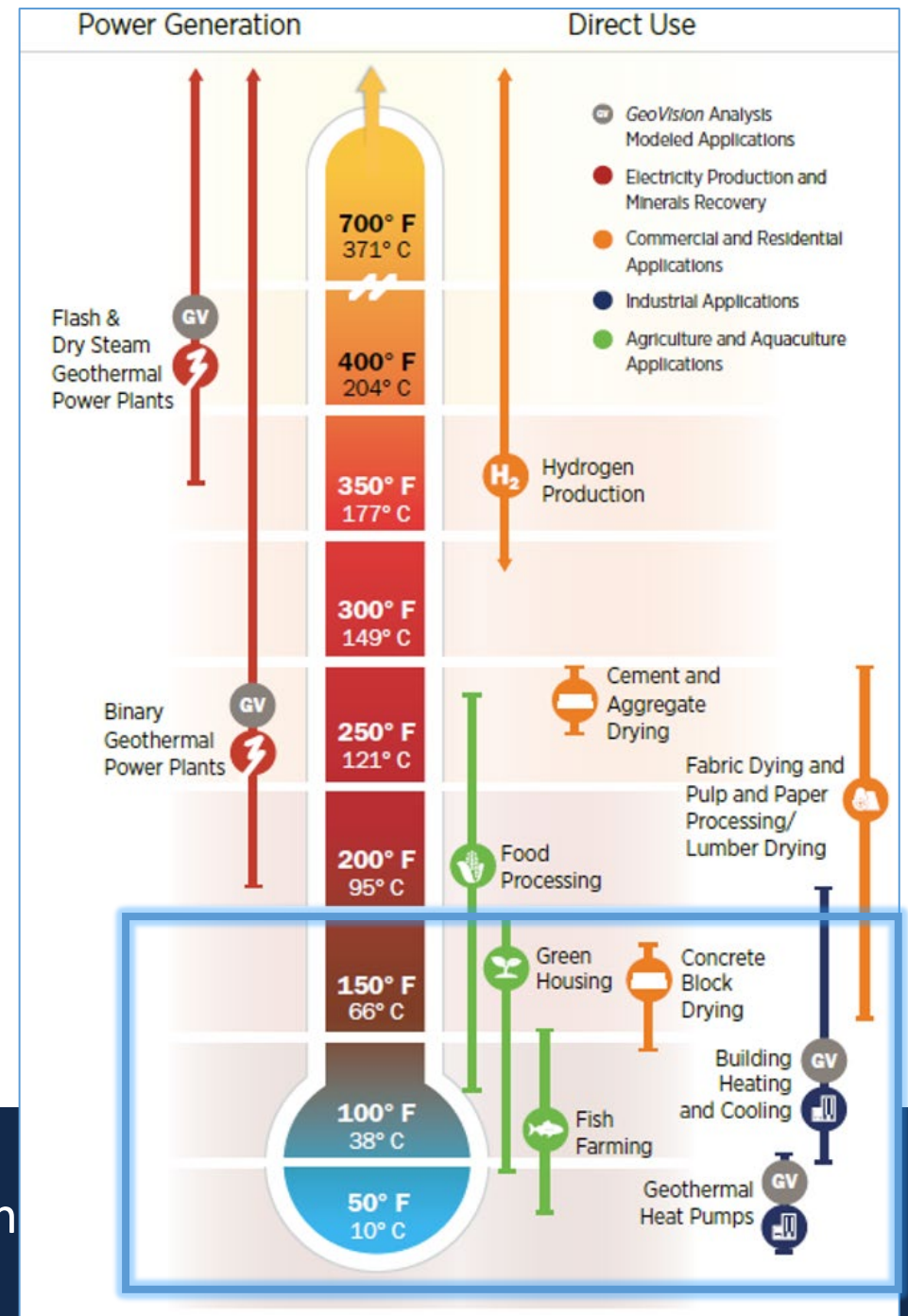
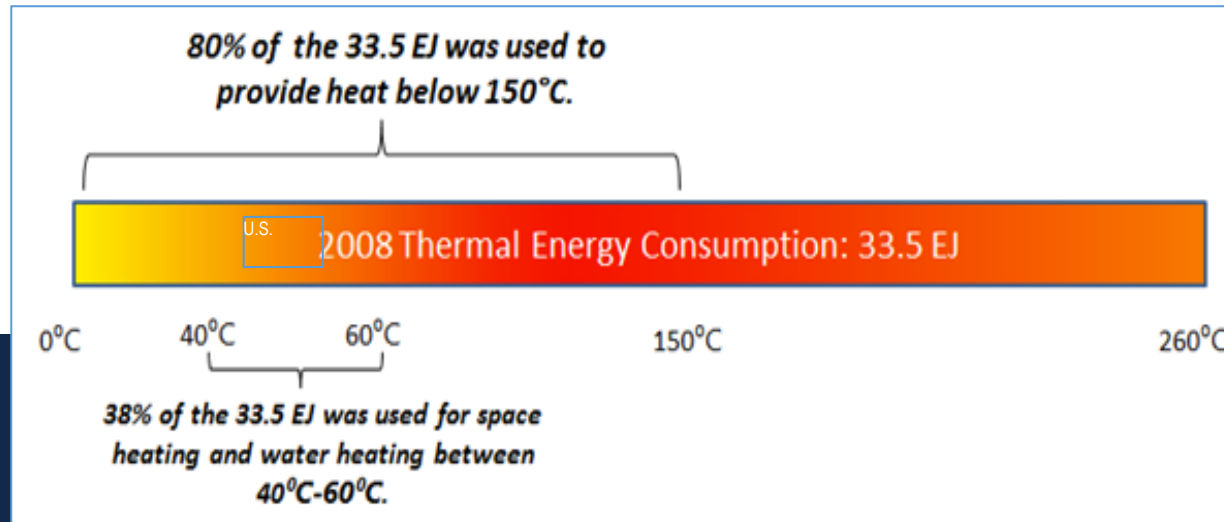


Facilities & Services

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

What is Geothermal?

- GeoVision from the Dept. of Energy describes 11 applications of geothermal
- 7 of these are viable in Illinois
- Low temperature is the prevalent demand in the US (80%)



Illinois Geothermal Coalition

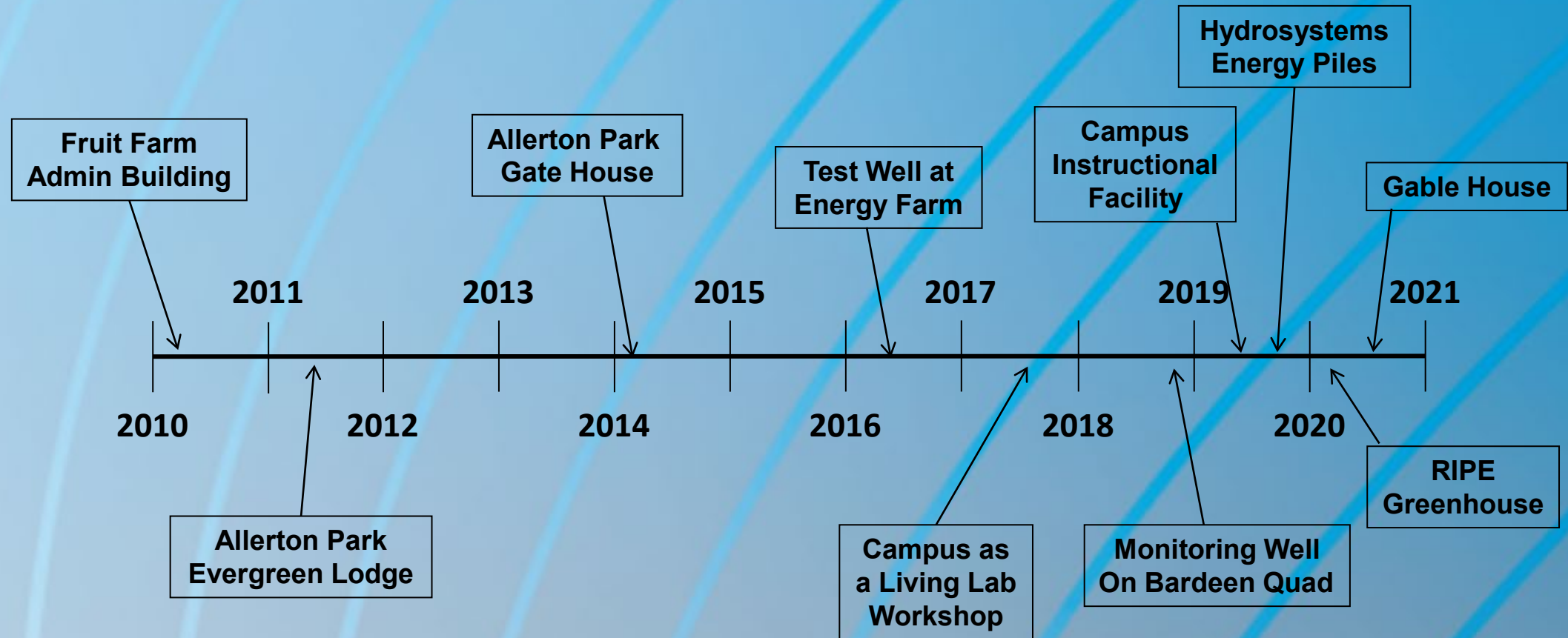
- The University of Illinois is building a coalition of corporations, non-profits, and researchers to establish Illinois as a leader in geothermal energy.
- This coalition will work together to strengthen and advance the implementation and design of geothermal energy systems in the Midwest.
- Sign up online at: https://go.illinois.edu/geothermal_coalition



**“Geoscientists don’t typically study the thermal properties of rock formations, and design and mechanical engineers don’t study geology, so you can see the gap in knowledge.”
~ Dr. Yu-Feng Forrest Lin.**



Geothermal Timeline



2018 Monitoring Well on Bardeen Quad

- When considering geothermal for the Campus Instructional Facility, F&S encouraged the design team to utilize the new optimization process developed at UIUC.
- To provide input data, F&S and iSEE funded \$65,610 for installation of a Monitoring Well on the Bardeen Quad.
- The monitoring well is instrumented with fiber-optic cable connected to a Distributed Temperature System (DTS) to detect changes in the subsurface thermal profile.
- Studies output utilized in designing and optimizing the geothermal bore-field for the geothermal system in the new CIF building.



Monitoring Well



Leadership • Perseverance • Agility

Assembly Hall



ISGS

Illinois State Geological Survey



YOU ARE
HERE



Green St.

Springfield Ave.

Beckman Institute



University Ave.

Northeast

South

0

50

Depth below
ground
(feet)

150

250

350

Loess

Silt and clay

Silt and sand

Till

Till

Till, silt & clay, and sand

Silt and clay

Silt and clay

Till

Till

Till

Silt and clay

Till

Silt and clay

Bedrock - Shale, coal, and limestone

present

15,000

20,000

60,000

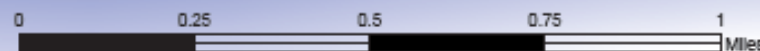
200,000

425,000

1 Million

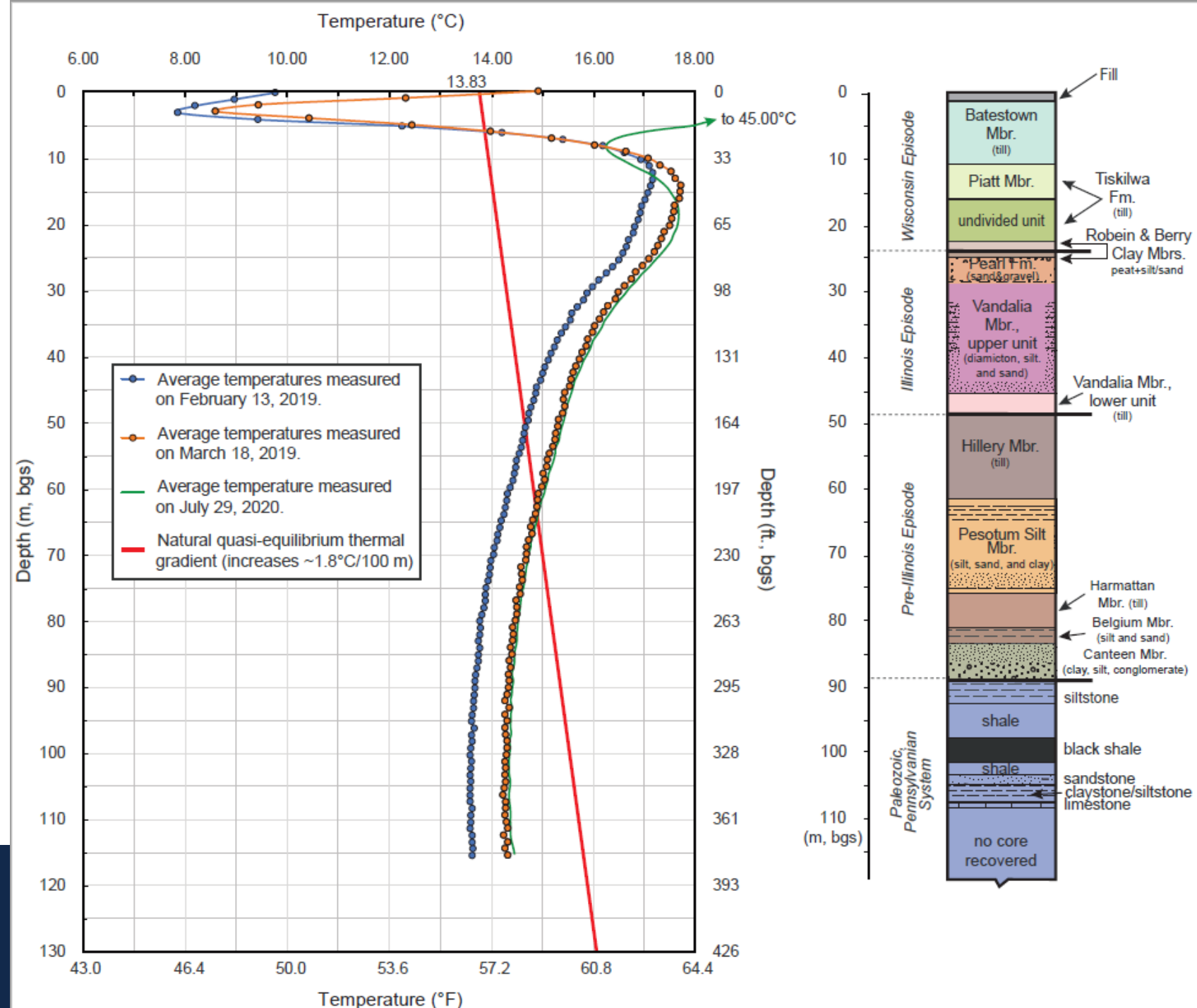
299 Million

303 Million
years

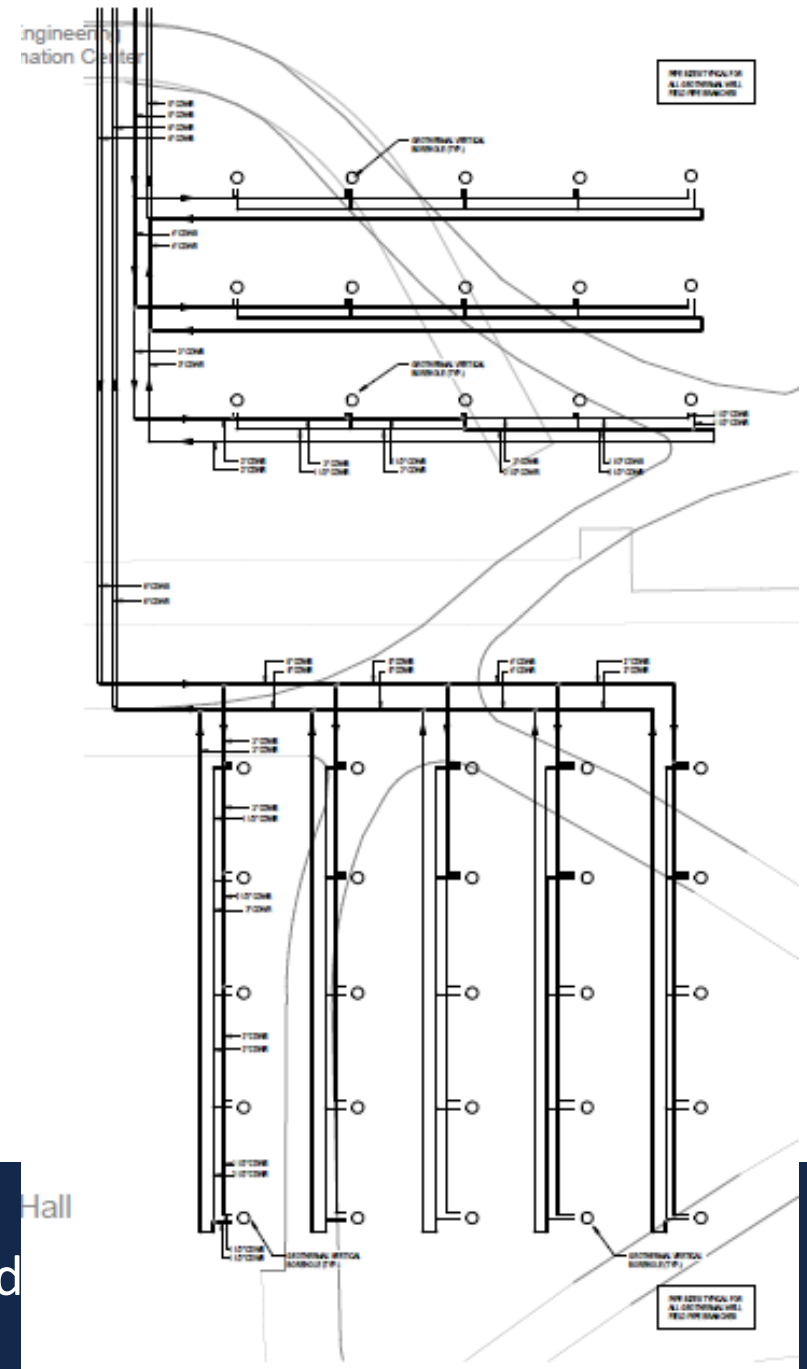
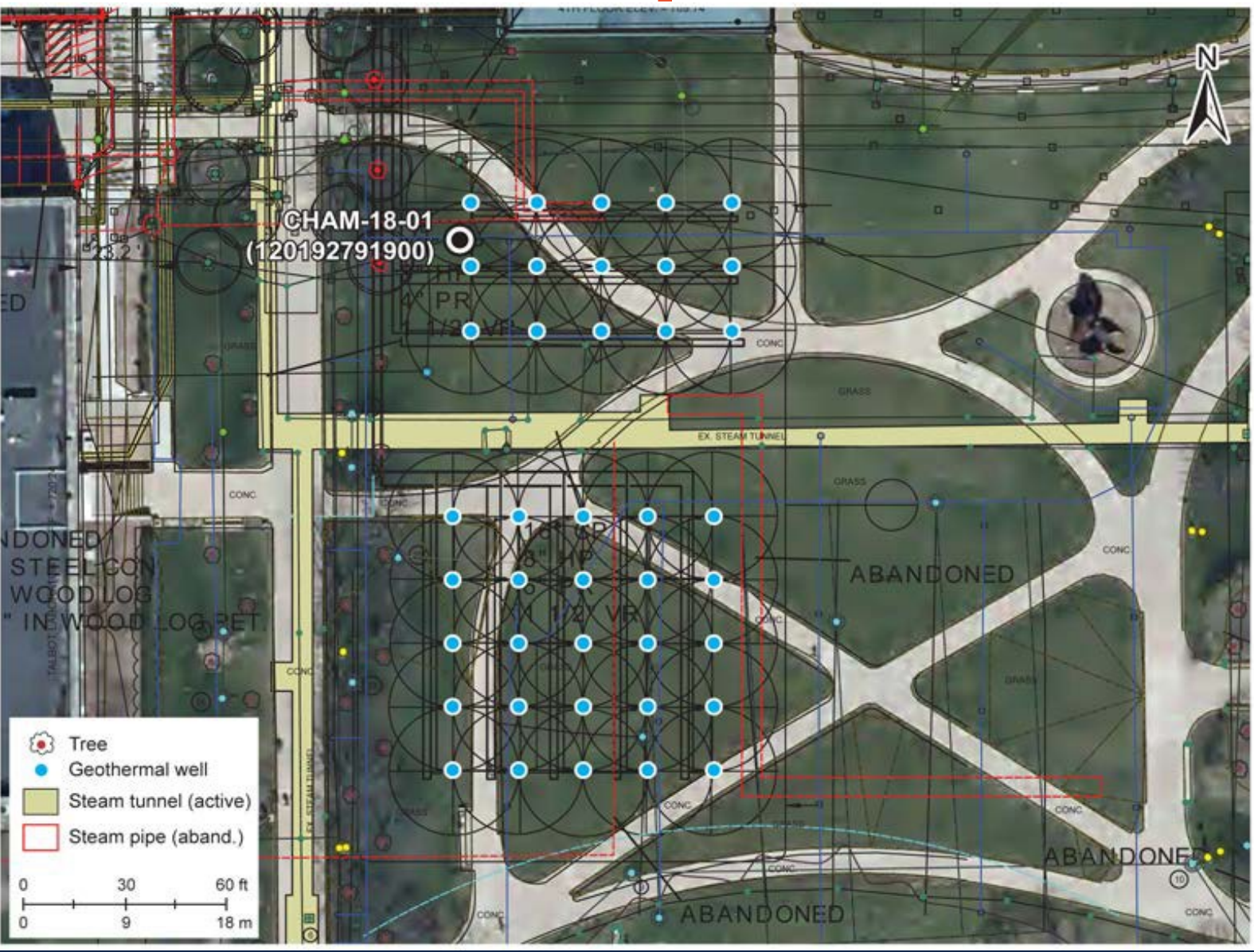


Temperature by Depth

- Results from monitoring well show temperature along full depth of borehole.
- Quarterly tests are planned

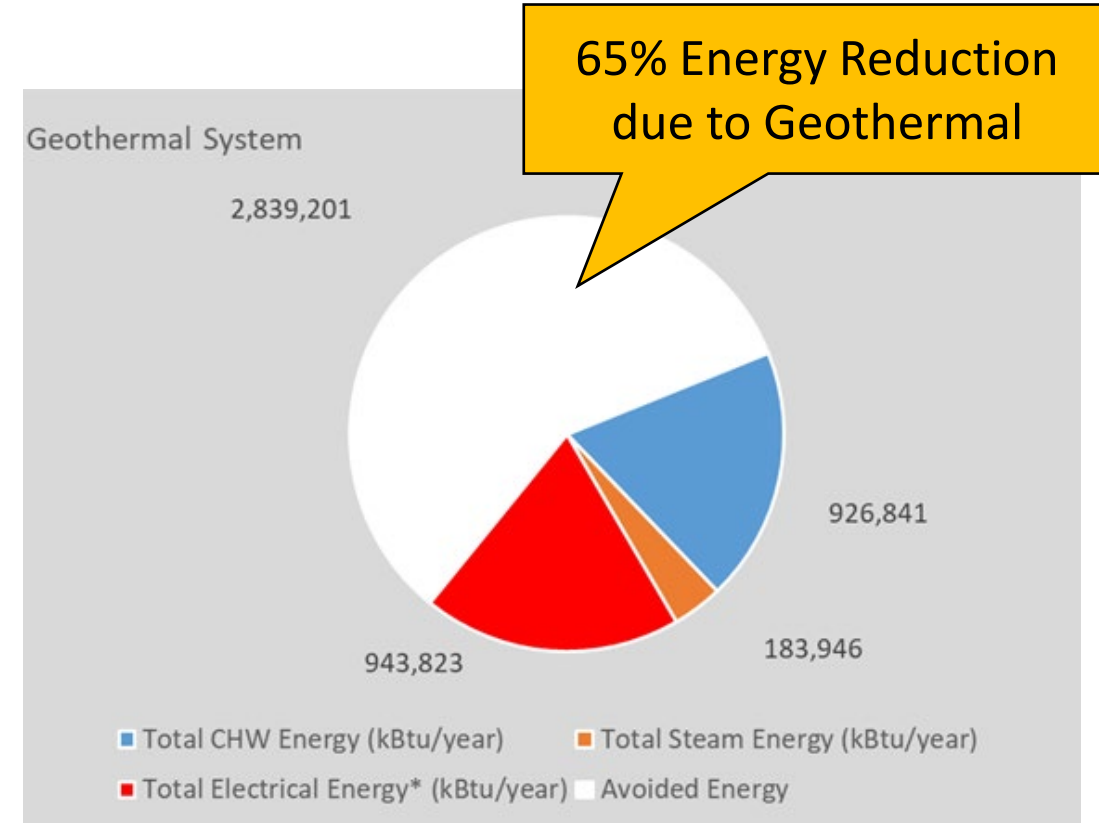


Borehole Map



2019 Campus Instructional Facility

- This geothermal system will supply 135 tons of heating and cooling capacity with 450 foot deep boreholes.
- Adding geothermal will save \$45,000/year, and is projected to save \$1.35 Million over 30 year life.
- Results of monitoring well study reduced boreholes needed from 60 to 40 and reduced the payback period from 40 to 28 years.
- Research adds significant value to optimize design and enhances the efficiency of geothermal projects.



Mechanical Room

Geothermal Heat Pump

