

Geothermal Pencil-Out Calculator for Alabama Homes

Real payback math for ground-source heat pumps in Birmingham -- install cost ranges, energy savings, federal tax credit, and the soil-condition reality.

WHO IT IS FOR

Premium-tier homeowners in Gardendale, Fultondale, Mountain Brook, Vestavia, and the upscale Birmingham metro considering geothermal as a long-horizon investment.

WHAT IS INSIDE

Birmingham soil-condition realities, vertical-loop vs horizontal-loop cost ranges, energy savings math vs air-source heat pumps, federal IRA tax credit application, and the payback worksheet.

Written by John, 25-year HVAC technician

AL HVAC Licensed - Bonded - Insured - EPA 608 Universal Certified

Published 2026-05-12 -- Last reviewed 2026-05-12

Read online: <https://lockwellhvac.com/downloads/geothermal-pencil-out-calculator/>

What geothermal actually is

A geothermal (ground-source) heat pump uses the constant temperature of the earth below frost line (~55-65 deg F in Alabama) as a thermal reservoir. In summer, it dumps heat into the ground. In winter, it pulls heat from the ground. Result: refrigerant cycle works against a stable temperature instead of fighting outside air. That delivers 35-50% lower energy use compared to air-source heat pumps and 50-70% lower vs older AC + gas furnace combinations.

Birmingham soil conditions

The deciding factor on geothermal cost is your lot and soil:

- * Birmingham metro sits on red clay soil with limestone and shale bedrock at varying depths
- * North Birmingham (Gardendale, Fultondale, Mountain Brook) -- typically 8-40 ft to bedrock; some lots 60+ ft
- * South / west Birmingham -- typically deeper clay before bedrock
- * Horizontal loop (trench, 4-6 ft deep) -- requires ~1/4 to 1/2 acre of usable lot. Cheapest option when feasible
- * Vertical loop (boreholes, 200-400 ft deep) -- works on small lots. More expensive due to drilling
- * Bedrock-shallow lots = vertical-only and higher drilling cost
- * Slope, mature trees, septic systems, existing utilities all narrow installation options

Install cost ranges (mid-2026 Alabama)

Observed market ranges (not guarantees) for a 3-5 ton geothermal install in Alabama:

- * Horizontal loop install on a suitable lot -- \$25,000-\$38,000
- * Vertical loop install -- \$32,000-\$50,000
- * Add for premium tier equipment (variable-speed compressor, variable-speed circulator pump) -- \$4,000-\$7,000
- * Add for ductwork modifications -- \$2,000-\$6,000
- * Add for desuperheater (water heating tied to geothermal) -- \$1,500-\$2,500
- * Premium 5-ton variable-speed geothermal install on bedrock-shallow lot: ~\$45,000-\$55,000

Federal tax credit (IRA)

The Inflation Reduction Act's Residential Clean Energy Credit covers geothermal heat pump installations:

- * 30% federal income tax credit on total install cost -- equipment, labor, loop field
- * No cap on the credit value
- * Available through 2032 at full 30%, declining thereafter
- * On a \$40,000 install: \$12,000 tax credit
- * Effective net cost: \$28,000
- * Note: this is a non-refundable credit, must have tax liability to absorb. Confirm with your CPA

Energy savings math

For a typical 3,500 sq ft north Birmingham home with current 13 SEER + gas furnace:

- * Current annual energy cost (cooling + heating): ~\$2,400-\$3,200
- * After geothermal: ~\$900-\$1,400
- * Annual savings: ~\$1,500-\$1,800
- * Plus: water heating savings if desuperheater added -- additional ~\$300-\$500/year
- * Plus: maintenance savings -- geothermal indoor equipment is simpler and lasts longer

Payback worksheet

Fill in:

- * Installed geothermal cost: \$_____
- * Federal tax credit (30%): \$_____
- * Net out-of-pocket: \$_____
- * Current annual cooling + heating energy cost: \$_____
- * Estimated geothermal annual cost: \$_____
- * Annual savings: \$_____
- * Simple payback (net cost annual savings): _____ years
- * Plus comfort and resale benefits not captured in simple payback

Equipment life and warranty reality

Geothermal lasts longer than air-source equipment:

- * Indoor equipment (heat pump unit) -- 22-25 year design life
- * Loop field (the buried pipe) -- 50+ year design life (the pipe is the long-life part)
- * Compressor warranties -- typically 10 years registered, 5 years unregistered
- * Loop field warranties -- typically 30-50 years from major manufacturers
- * Net: most geothermal systems pay for themselves twice over the loop's lifetime

When geothermal is the right move

- * Home is 2,500+ sq ft
- * You plan to stay 10+ years (let the savings compound)
- * Current system is at or near end-of-life (otherwise you're paying twice)
- * Lot supports either horizontal loop OR vertical loop drilling
- * You have tax liability to absorb the 30% federal credit
- * You value low maintenance and long equipment life
- * You want the highest-comfort HVAC available

When geothermal is the wrong move

- * Plan to sell in under 8 years
- * Lot doesn't support either loop configuration
- * Current HVAC is mid-life (under 8 years) -- replace later when payback resets
- * Home is under 1,800 sq ft -- smaller homes have smaller savings, payback weakens
- * No tax liability to absorb the 30% credit -- payback math suffers significantly
- * Cash-tight purchase with no financing tolerance -- install cost is unavoidably high

Contractor vetting for geothermal

Geothermal install requires specific expertise. Verify any quote includes:

- * IGSHPA accreditation (International Ground Source Heat Pump Association) -- installer or designer
- * Manual J load calculation specific to ground-source heat pump
- * Loop sizing calculation (typically Loopster or comparable software output)
- * Drilling subcontractor licensed and bonded for boreholes (vertical loop) or excavation insured (horizontal loop)
- * Manufacturer-authorized installer (WaterFurnace, Bosch, Climatemaster, Geocomfort)
- * Multi-year track record with documented Alabama installs

Sources

- * U.S. Department of Energy -- Geothermal Heat Pumps -- energy.gov/energysaver/geothermal-heat-pumps
- * IRS -- Residential Clean Energy Credit (Form 5695) -- irs.gov
- * IGSHPA -- International Ground Source Heat Pump Association -- igshpa.org
- * Energy Star -- Geothermal Heat Pumps -- energystar.gov
- * NREL -- Geothermal heat pump research -- nrel.gov
- * Alabama Cooperative Extension System -- soil composition data

Disclaimer

This guide is informational. It is not a substitute for licensed HVAC inspection, diagnosis, or service. Conditions vary by home and equipment. Refrigerant work, gas-line work, and high-voltage electrical work require an EPA Section 608 certified technician and a licensed HVAC contractor under Alabama law. When in doubt, call.

No pricing on this site is a quote. No response time is a guarantee. All ranges shown are observed market data, not promises.

About the author

John -- 25-year HVAC tech

AL HVAC Licensed - Bonded - Insured - EPA 608 Universal Certified

John has been turning wrenches on Birmingham HVAC systems for 25 years. Alabama HVAC contractor licensed, bonded, and insured. EPA Section 608 Universal certified. He has walked roofs, attics, crawlspaces, and condenser pads across every neighborhood in this metro and has written every guide on this site from the working tech's perspective -- not the salesman's.

More guides at:

<https://lockwellhvac.com/downloads/>

Lockwell HVAC

(205) 206-7030 -- Birmingham, AL metro -- Gardendale, Fultondale, Center Point, Irondale, Bessemer, Hueytown, Pleasant Grove, Helena