

Sustainability or Greenwashing?

It pays off to do the right thing – constantly pushing for improvement

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BACKGROUND

- Thermal is for source zones
- Energy usage range from 100-800 kWh per cubic yard
- Wells and heaters cover the treatment volume
- Specialized heating and treatment equipment is needed
- Operations last 100-300 days
- Water and vapor treatment may involve GAC or thermal oxidation

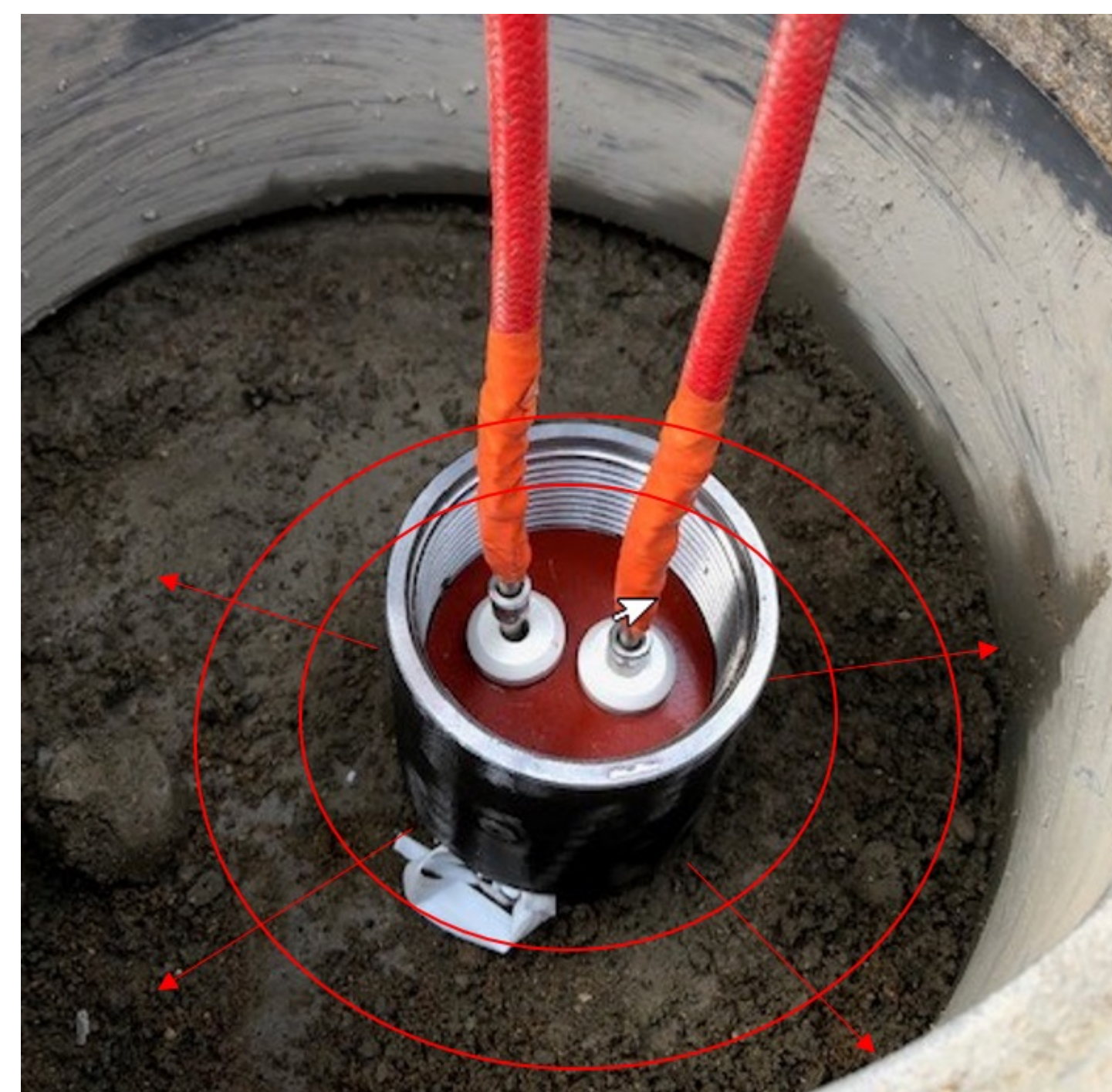
We must work hard to reduce the environmental footprint of remedies

BIGGEST IMPACTS

Lemming et al. (2013) analyzed thermal technologies and their environmental foot-prints. Largest impacts are:

- Energy usage (electricity, fuel)
- Cement (grout, vapor covers)
- Metals (stainless steel, nickel, copper)
- GAC usage and disposal

For PFAS water treatment it is important to minimize energy usage (kWh per gallon treated) and the amount of GAC used.

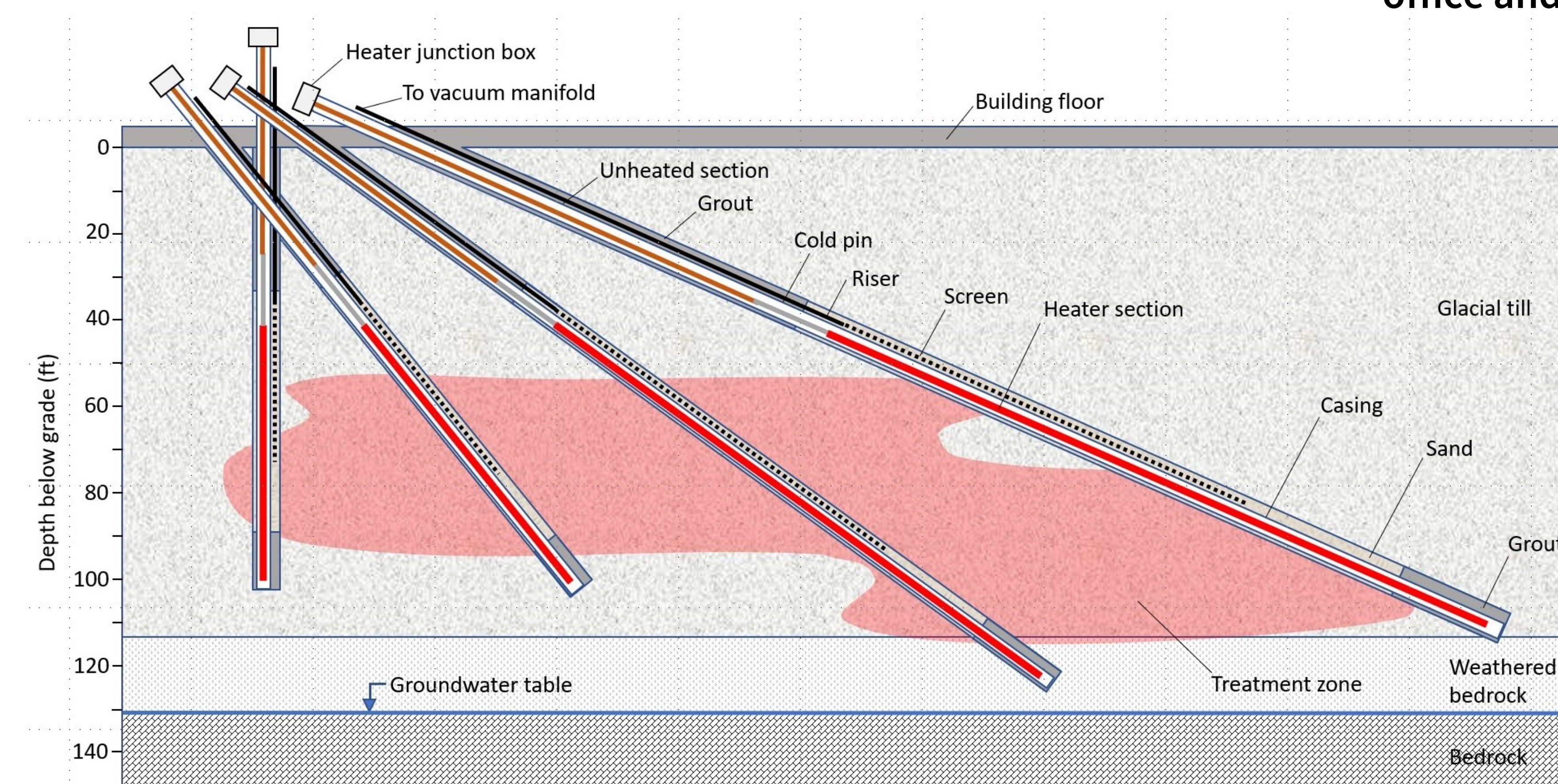


Field test of compact TCH heater that reduces drilling efforts and material usage.



In-place treatment of PFAS-impacted stockpiles to avoid transportation and destruction.

Real
sustainability
improvements
also make us
more cost-
effective



Custom angled TCH installation below a building to minimize material and energy usage.



Standardized equipment used for 10+ sites before it reaches end-of-life.

TRS FOCUS AREAS

- **Development of less intensive ISTR options** – including in situ options of PFAS and AFFF-impacted spill zones.
- **PFAS water treatment using minimal energy and GAC** – PerfluorAd flocculation based on biodegradable, plant-derived ingredients.
- **Use as little energy as possible** to treat the sources and meet the goals. This is done by careful selection of heating approach and rapid heating to shorten the time for heat losses.
- **Use replenishable energy** whenever possible, even when it costs more. Minimize use of gas and petroleum-based fuels.
- **Minimize transportation:** Source materials locally to job sites, package equipment and materials for mobilization, utilize staff that lives close to the site.
- **Greener materials:** Minimize use of cement (high CO₂ impact), nickel alloys (human toxic equivalents), and coal-based granular activated charcoal (CO₂ impact).
- **Don't overheat:** Careful sampling and analysis that allows us to turn heating off in areas as the goals are met.
- **Reuse of equipment and materials:** Our sites are built mostly with equipment and materials which travel to 10+ sites before their end of life is reached.
- **TRS is a virtual company** – we have eliminated the need for a central office and all the resources that entails.