Ground Source Heat Pump Monitoring to Ensure Source Water Protection:

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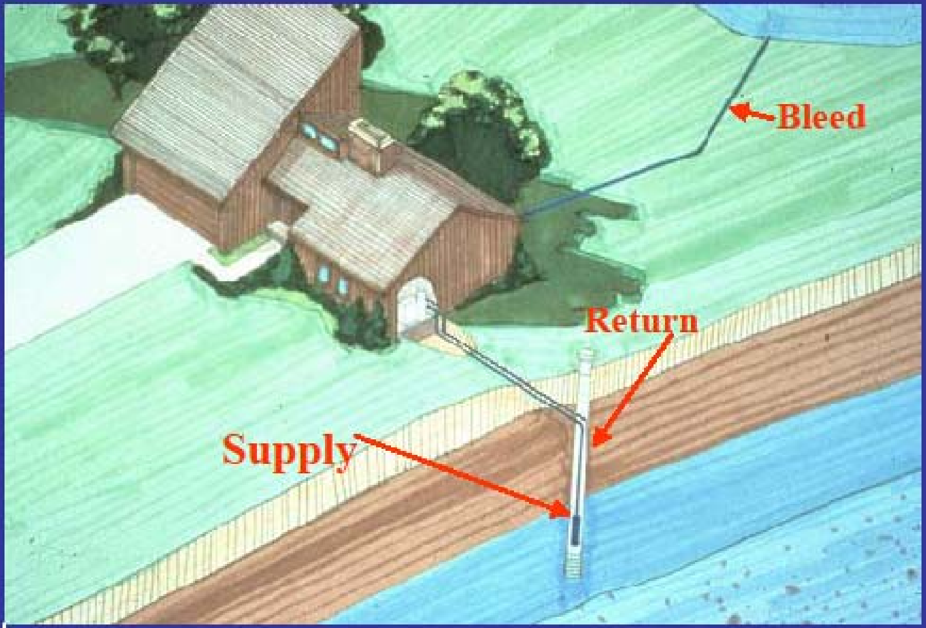
Different GSHP Systems

- Open-loop System
  - water withdrawn from groundwater or surface water and discharged to same
  - Only this kind of system can be used as a potable drinking water source.
- Closed-loop System
  - no direct interaction with surface or groundwater
  - closed-loop contains water or water/antifreeze solution

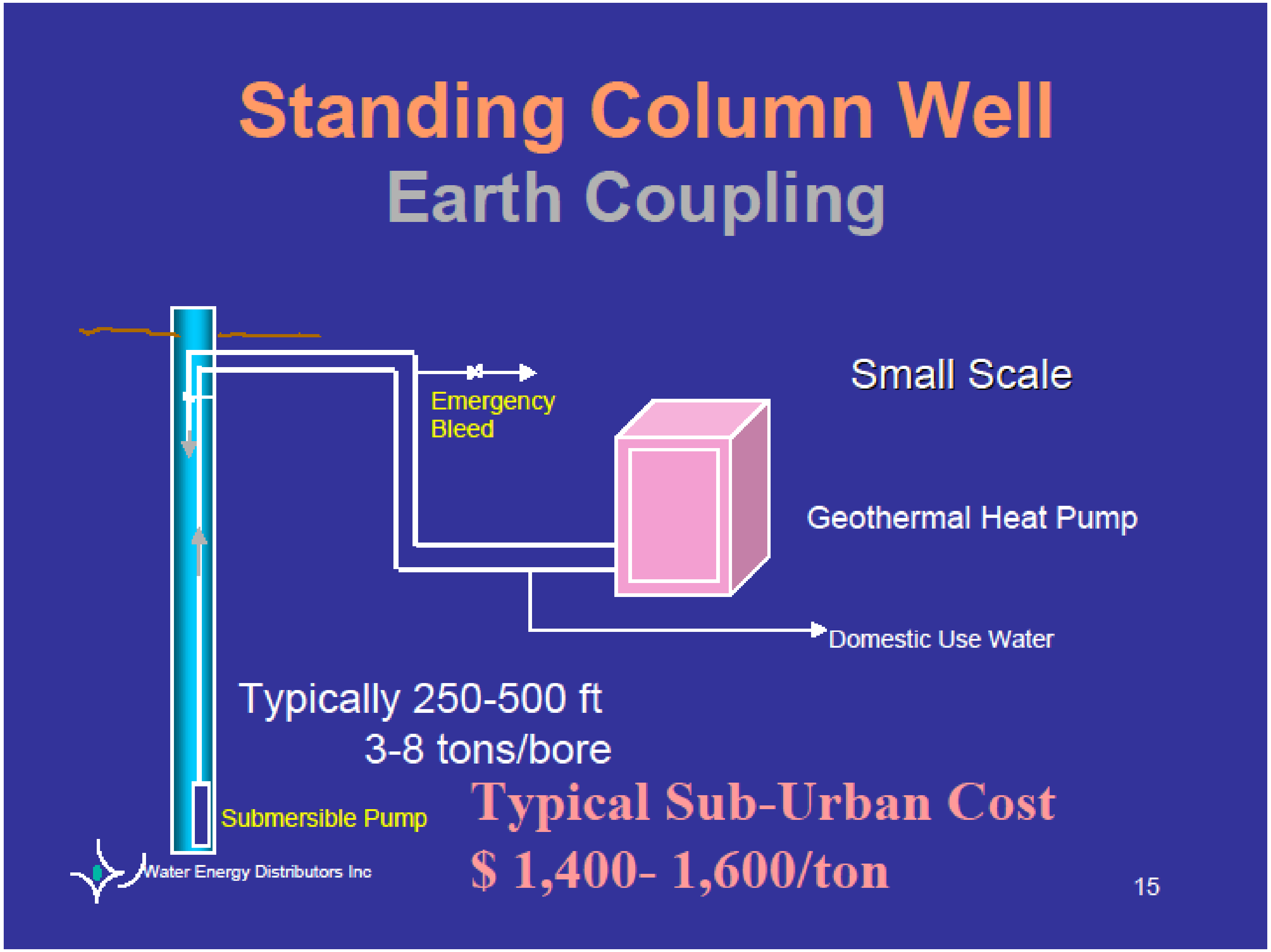
STANDING COLUMN WELL



Use Domestic Well

60-80 ft/ton

Bleed line



Standing Column Well
Earth Coupling
Small Scale
Emergency
Bleed
Geothermal Heat Pump
Domestic Use Water
Typically 250-500 ft
3-8 tons/bore
Submersible Pump
Typical Sub-Urban Cost
$ 1,400- 1,600/ton
Water Energy Distributors Inc
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Why Are We Concerned About Water Quality?

- These systems are being used for both geothermal heating and cooling and potable drinking water sources.
- There is potential for certain contaminates to enter the water that is being consumed leading to potential health related issues
- Many states do not require monitoring and if they do it is limited, only tested once, or not for residential wells.

Potential Contaminants of Concern:

- Metal byproducts (copper and lead)
- Oils and refrigerants
- Potential of increased water temperatures that may result in the loss of disinfectant residual and the potential for increased bacterial growth.

MA State Responsibilities

- Owner/Operator - properly operate and maintain system and notify UIC Program of changes to registration information
- Designer – MA PE or certified by International Ground Source Heat Pump Association (IGSHPA), Canadian Geoexchange Coalition (CGC), or the equipment manufacturer
- Installer - certified by IGSHPA, CGC, or manufacturer
- Well Driller - regardless of well type must be a Massachusetts Registered Well Driller

Massachusetts Regulation

- MassDEP requires extensive initial sampling of the raw water and discharge water, but does not require monitoring on a regular basis after start-up.
- MassDEP does not test residential dual use wells annually.
- MassDEP requirements for dual use as a private drinking water well :
  - cross connection device prior to the heat pump
  - BOH approval for Private Drinking Water Well
  - Requires local plumbing inspector approval (currently some will not approve dual use wells)

New Hampshire Regulation

- NHDES requires open loop commercial systems to sample water quality annually for only metals they do not sample residential systems at all.
- NHDES asks on the well registration form if this well is also being used as a potable drinking water source, and they capture that information in their database.
- NHDES also requires large scale open loop wells to sample for metals and uranium in order to follow groundwater discharge permit and registration rules
- In 2009, they had 282 open loop-duel use systems register

Suggested Monitoring Parameters

- Needs to be developed by someone qualified to do so
- Need to distinguish what we would monitor for
- Depends on what support and financial assistance we can get from states and state labs and possibly GIS
- Who could collect samples? State, volunteers?
- Time frame
- Budget/Cost/Grants

Where Would the Data Go?

- Data would go into a system created by GWPC
- GIS interface
- Monitoring results could be available for each well tested
- An interstate system could be created to track and monitor duel-use GSHP systems
- This system could be used as a model for other states and might encourage them to get involved with the importance of monitoring their duel-use systems.