

# OGA Conference 2019

April 3-4 Hilton Mississauga/Meadowvale



## Brian Urlaub

**CGD, Director of Geothermal Operations  
MEP Associates LLC**

Residential Community Geothermal Systems – The  
Hottest Trend in geothermal!



# Residential Community District Geothermal Systems

PRESENTED BY

**Brian Urlaub, CGD**  
Director of Geothermal Operations  
[brianu@mepassociates.com](mailto:brianu@mepassociates.com)



*Engineering Future Focused Solutions*

# Benefits with District Systems

## ➤ #1 Rule: Diversity

- Even in heating dominant or cooling dominant climates, there is some diversity in the thermal load profile due to occupancy living habits.
  - Especially in the potable hot water demand.
- This allows a inter-connected system to have reduced overall size based on block loads.



# Benefits with District Systems

## ➤ #2 Rule: All Piping Has Heat Transfer

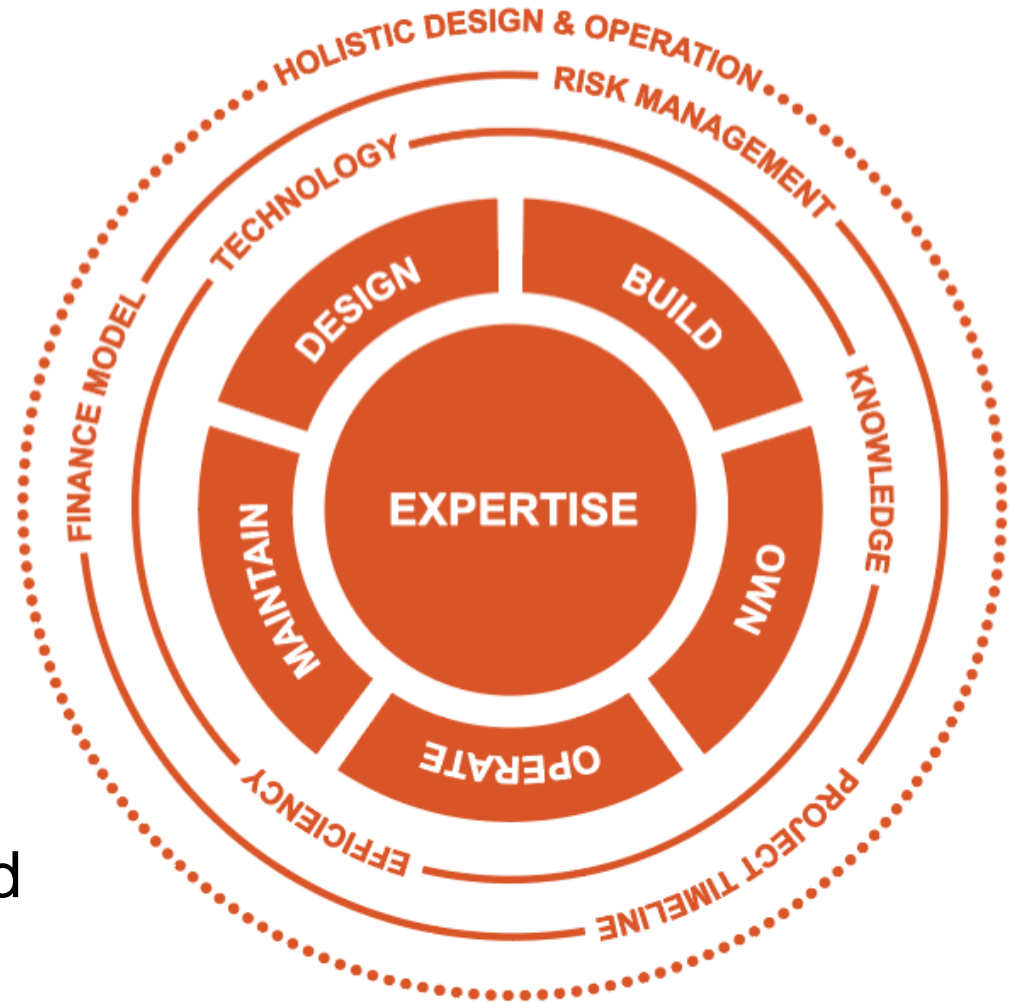
- Lateral loop piping connecting homes to the main heat exchanger also has heat transfer.
  - In small systems energy is not accounted for, as it is minimal, but in large scale systems the lateral piping can be a significant amount of heat transfer and should be accounted for. It can reduce the heat exchanger size.



# Benefits with District Systems

## ➤ #3 Rule: 3<sup>rd</sup> Party Ownership

- Most 3<sup>rd</sup> party owner/operator/financing companies have capital investment thresholds that need to be met to be a viable project.
- District Energy systems already have infrastructure precedents and utility models that have been used and are easier to replicate.
- One-at-a-time per home loop systems do not offer the same type of financial agreements that a community system offers. They become harder to setup and establish community wide.



# Challenges to District Systems

## ➤ #1 Rule: Cost

- The lateral piping connecting the homes to the heat exchanger location add cost to the total project vs. individual loops per home.
- Large pump stations to move the fluid from the heat exchanger location to the homes.
- More volume of fluid and potentially more antifreeze and chemical treatment.
- Piping within the network of streets with regulated utility infrastructure can be complex and difficult to work through with city, developer, etc.



# Challenges to District Systems

## ➤ #2 Rule: Space

- If you have only one common heat exchanger does the site have enough green space to place the heat exchanger
- Right of way space for infrastructure, lateral piping throughout the streets
- Yard boxes for shut off/service valves for each home
- Pump station locations



# Challenges to District Systems

## ➤ #3 Rule: Logistics/Operations

- Working through all the **red tape** with city, developer, civil, etc. for all infrastructure details.
  - Serviceability of assets if any is needed
  - Removal or abandonment process after life cycle (if there is one)
  - Right of way access agreements
  - If any streets, etc. need to be repaired due to service how it is handled





# Two Primary District System Designs



# Typical Design Practices

## Option #1 = Central Heat Exchanger with 2-pipe distribution system

Benefits	Negatives
Similar to standard building with common geo heat exchanger and multiple heat pumps	Large pump stations to distribute energy throughout development
	Need location for large pump stations between heat exchanger and development (may need multiple)
	Redundancy and resiliency is more difficult with this design



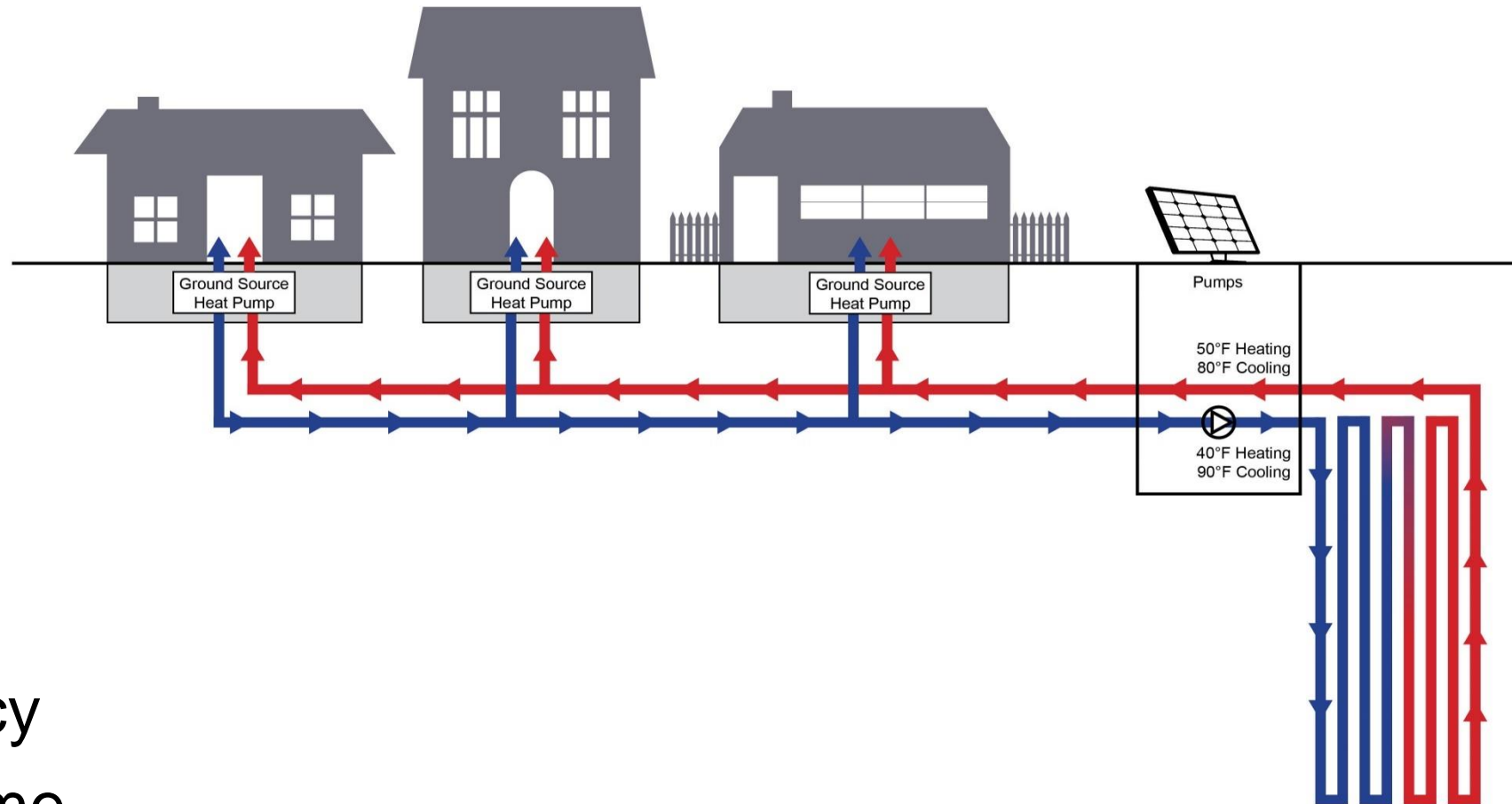
# Typical Design Practices

## Option #1 = Central Heat Exchanger with 2-pipe distribution system

- Can use a single pipe or a two pipe for the lateral piping to the homes.
  - Single pipe the flow rate increases as well as pipe size.
  - Single pipe is very difficult to get within a +/-5F DeltaT from the first home to the last home within that network of homes.
  - Two pipe the flow rate decreases as well as the pipe size, but the pump power increases.
  - Two pipe system adds more space needed to the right of way area for infrastructure



# Common Geothermal HX System 2-Pipe



## Benefits

- Diversity
- Redundancy
- Mass/Volume



# Typical Design Practices

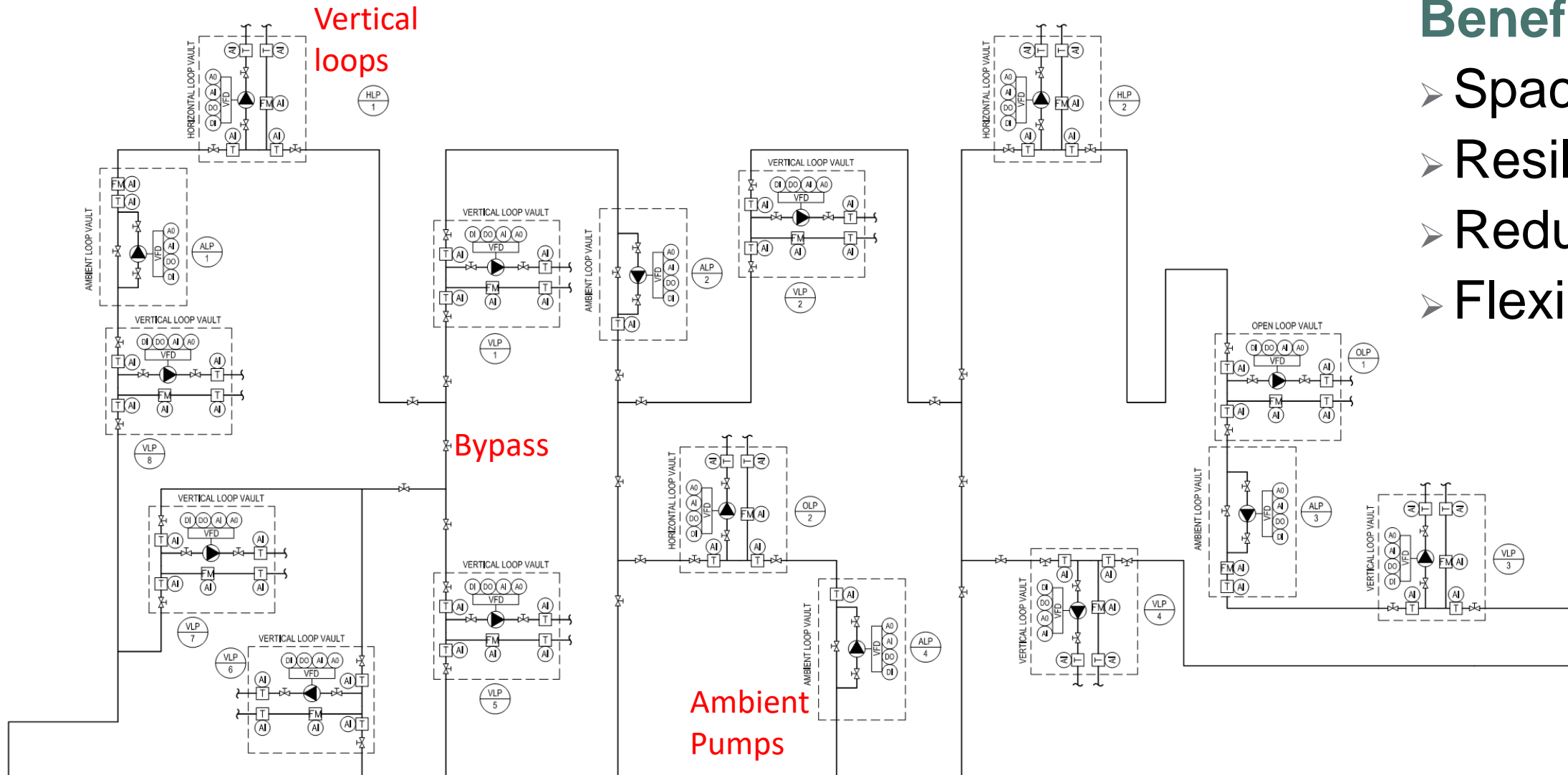
## Option #2 = Distributed Heat Exchangers with 1-pipe distribution system (Ambient)

- Smaller heat exchangers strategically placed throughout the development injecting into the main ambient loop connecting all the homes.
- Smaller pump stations to distribute the energy throughout development, possibly even under ground in vaults.
- Ambient loop pumping is easy to design around N+1
- If one small heat exchanger goes down, the entire system is still running at near full capacity.
- Single lateral pipe takes less room for right of way infrastructure access
- Potentially use multiple styles of heat exchangers for best use of site
  - Water retention ponds, horizontals and verticals
- Vertical loops could be located within the street right of way under the lateral pipe right of way so it reduces space constraints
- Easiest method to provide all the homes within a +/-5F DeltaT from the first home to the last home.





# Distributed Geothermal HX System 1-Pipe

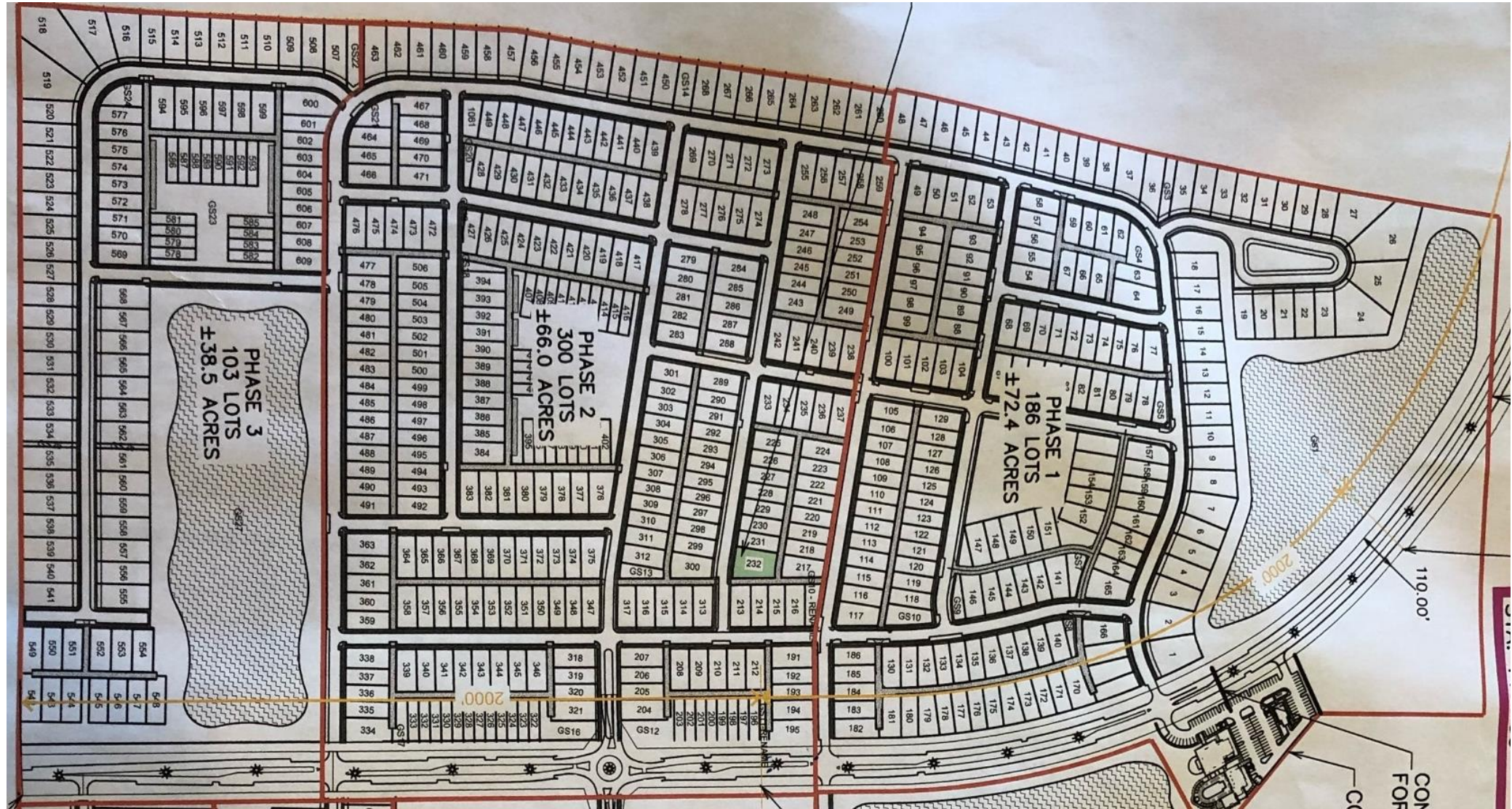


## Benefits

- Space
- Resiliency
- Redundancy
- Flexibility



# Example Site Plan





**Thank you!**

## **QUESTIONS?**

CONTACT US AT:

**860 Blue Gentian Rd  
Suite 175  
Eagan, MN 55121**

**651.379.9120**

