Geophysical Study of Warm Mineral Springs Park

Assessing the Impact of Proposed Development

BY: ARDAMAN & ASSOCIATES, INC.

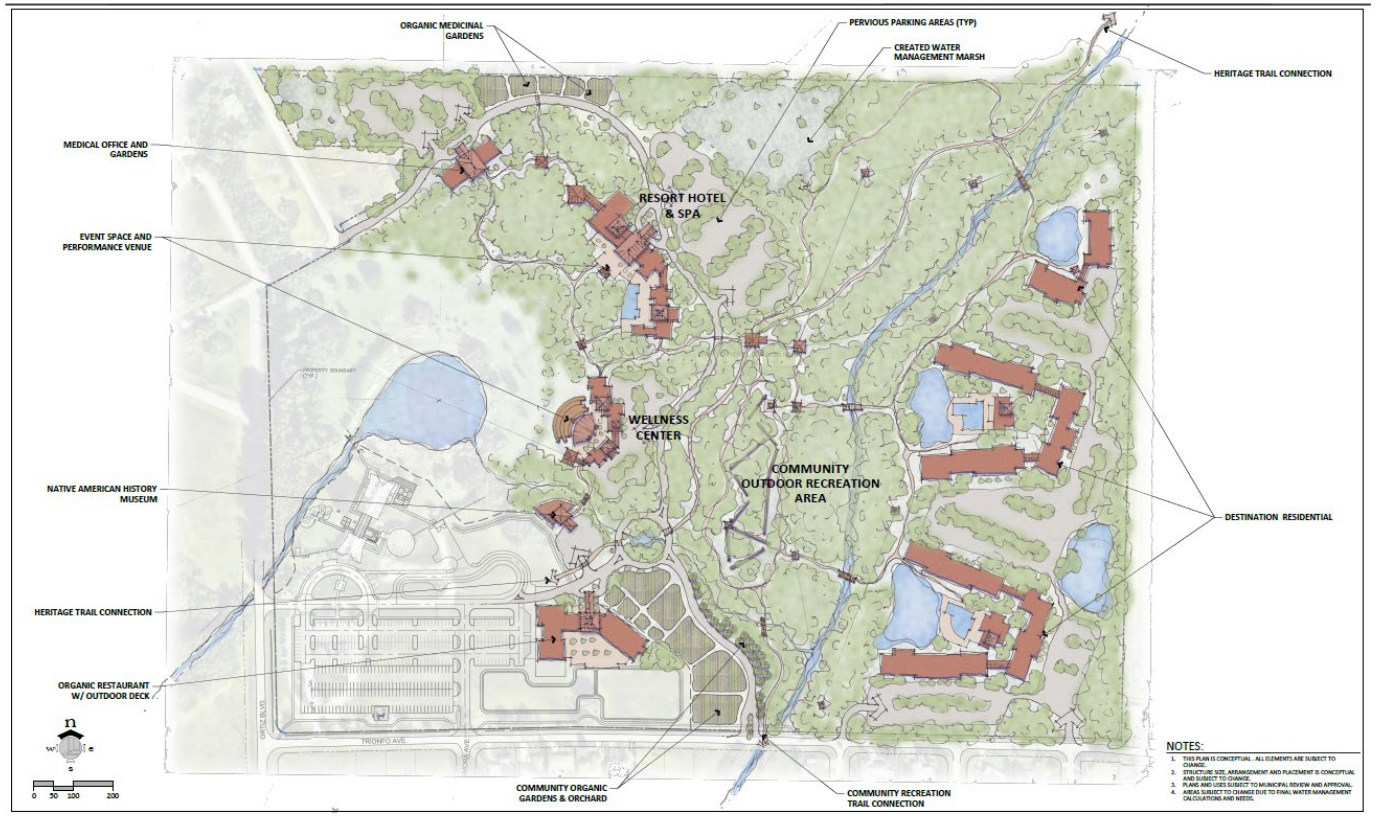
Warm Mineral Springs Park

- Located in the City of North Port
- A destination for visitors from around Florida and worldwide
- A popular recreational park
- A valuable pre-historic archeological site
- Listed in the U.S. National Register of Historic Places

Source: Thomas Bender/Herald-Tribune

Project Objectives

- Determine if development will negatively impact the spring.
- Identify underground features that might be impacted by the development.
- Development of buildings on shallow foundations with on-site stormwater ponds



Warm Mineral Springs Enclave Conceptual Plan

Initial Methodology

Initially, Ardaman proposed to investigate the site using a two-phased approach that combined:

- Phase I: Ground Penetrating Radar (GPR)
- Phase II: Electrical Resistivity (ER)

After developing a plan and schedule for this two-phased approach and discussing it with the Project Team, an alternative investigative survey method was selected: **Microgravity Survey**.

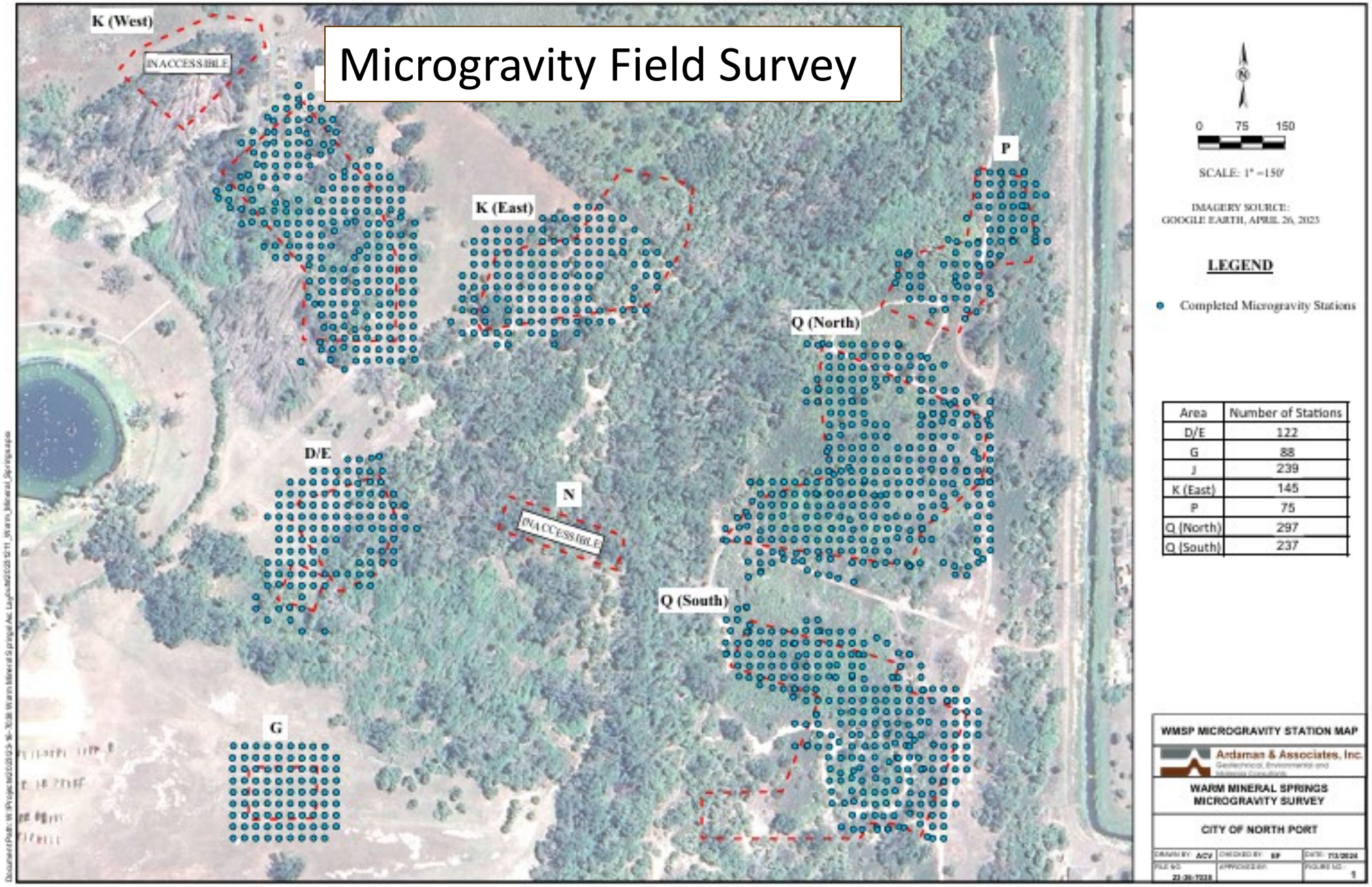
Microgravity Survey Methodology

- Measured changes in gravity, which are related to varying subsurface density.
- Gravity changes map subsurface features (voids versus soil).
- “Low” and “High” gravity are indicated on color-coded maps.
- Readings of about 100 uGals indicate significant anomalies
- We investigated accessible areas, excluding:
  - Provided gopher tortoise mound locations + 25-foot buffer zone
  - Protected trees
  - Eco Cabin area, restaurant, and southernmost residential building (due to above reasons)

Advantages of Microgravity

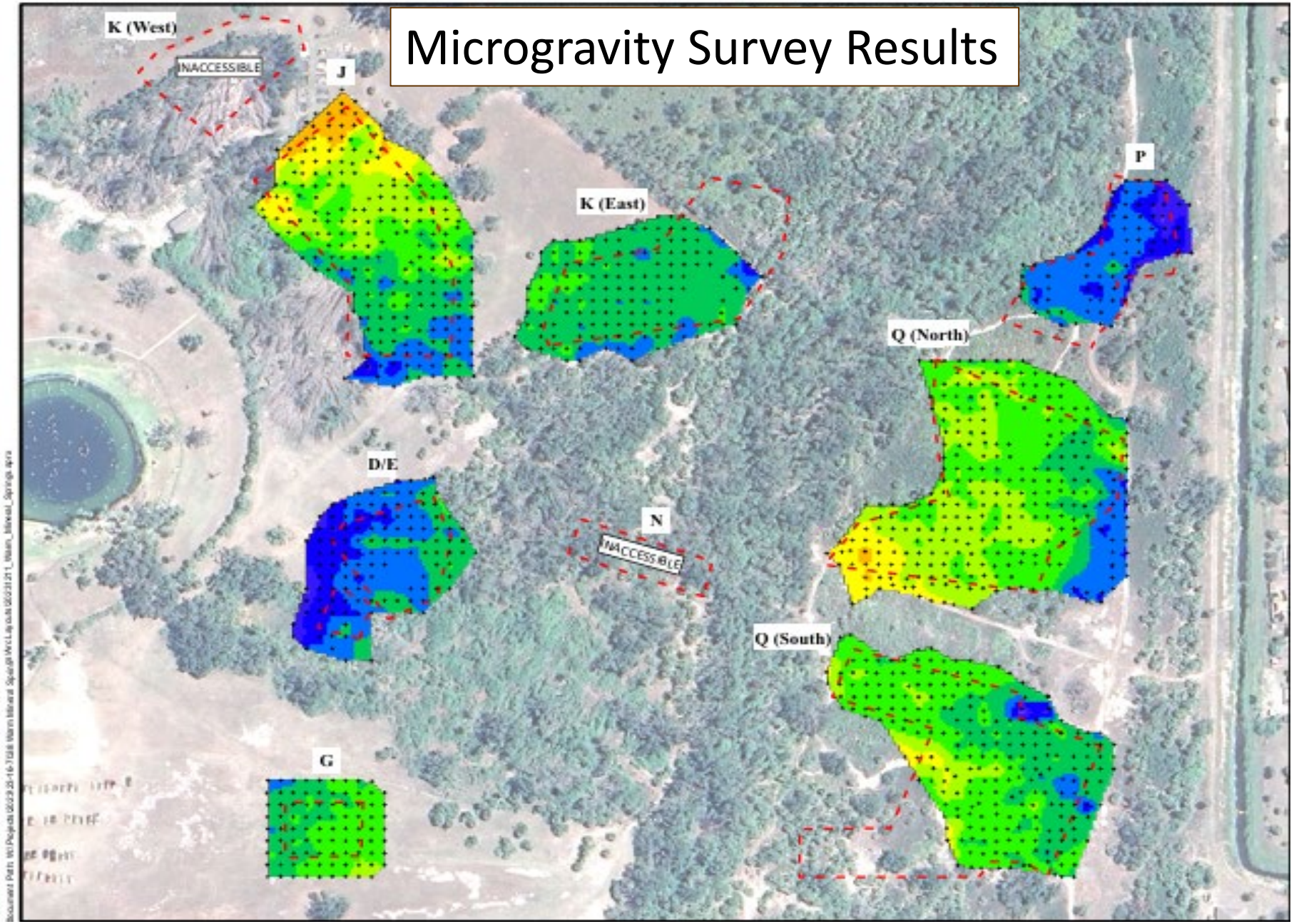
- Innovative technology that identifies subsurface anomalies
- Higher quality data and shorter time frame than GPR and ER.
- Specifically,
  - Initial two-phase approach included 10 GPR days and 55 ER days
  - Microgravity could cover the same area in 30 days
- Successful demonstration confirmed higher quality data.

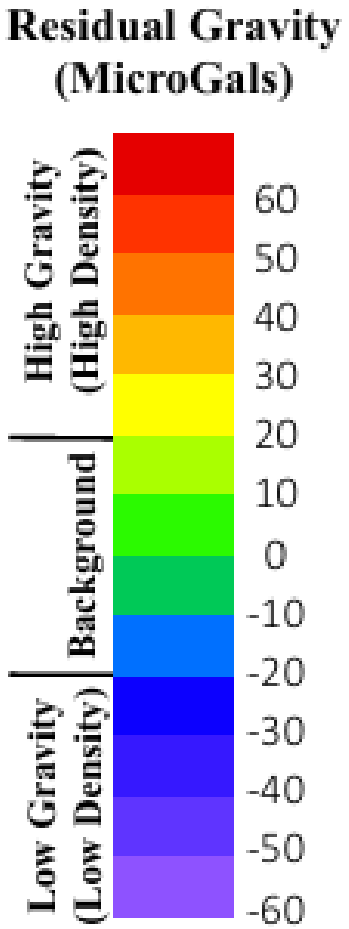
Microgravity Field Survey



Area	Number of Stations
D/E	122
G	88
J	239
K (East)	145
P	75
Q (North)	297
Q (South)	237

Microgravity Survey Results





Microgravity Findings

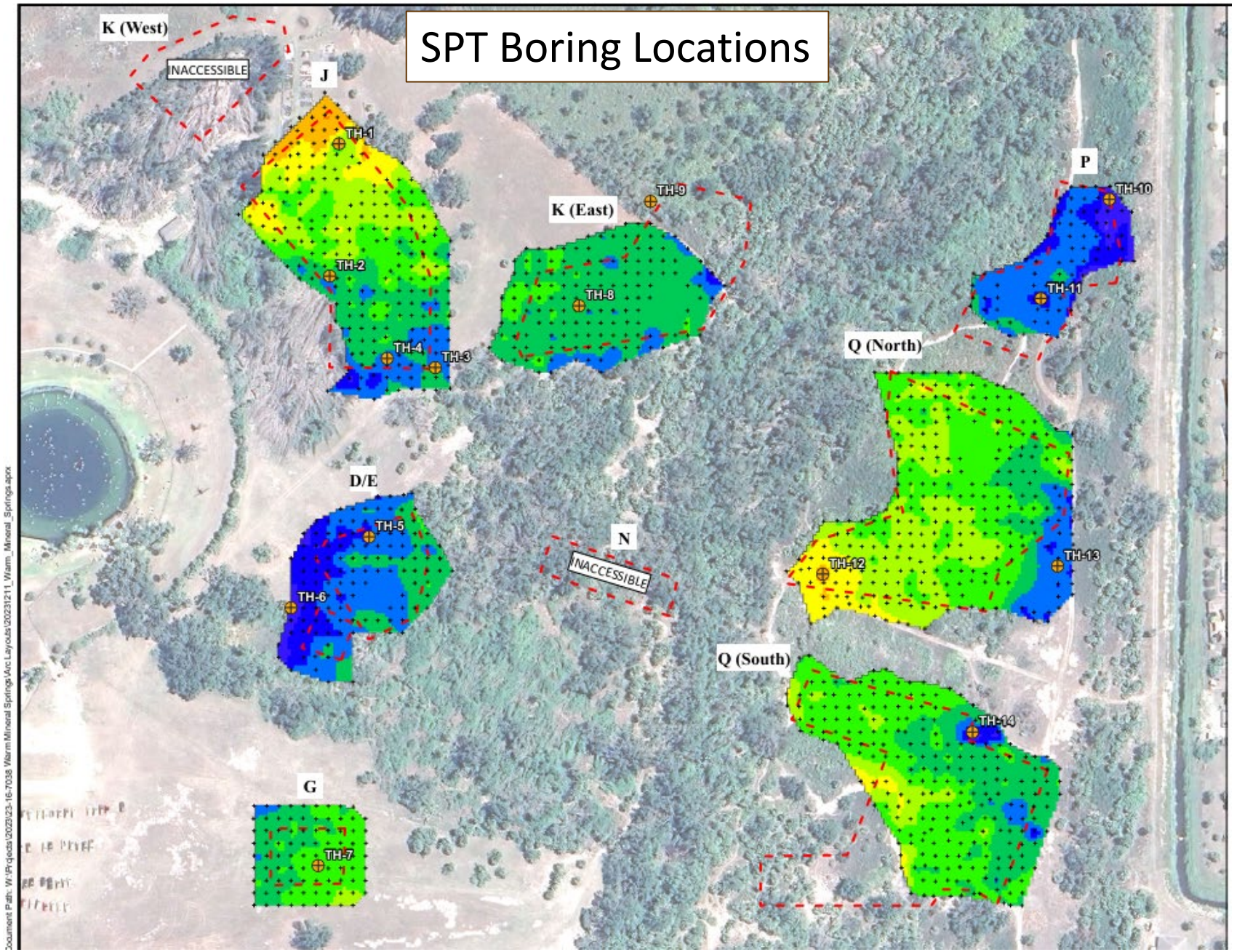
Measured Residual Gravity Values:

- “High” (Yellow to Dark Orange) = +20 to +42 µGal
- “Background” (Light Blue to Green) = -20 to +20 µGal
- “Low” (Violet to Dark Blue)= -53 to -20 µGal

Confirmatory Soil Borings

- Standard Penetration Test (SPT) borings,
  - Correlate SPT test results with soil properties such as density
  - Recover soil samples for analysis and classification
- Borings were placed in “low”, “high,” and “background” gravity areas
- Borings used to explore the cause of gravity variations (feeder veins, erosion features, Karst features, large voids, or differences in soil types and density).

SPT Boring Locations



“Low”	“Background”	“High”

Boring Number:	TH-6	TH-8	TH-12
Date Drilled:	6/5/24	6/19/24	6/19/24

Typical SPT Soil Boring Logs

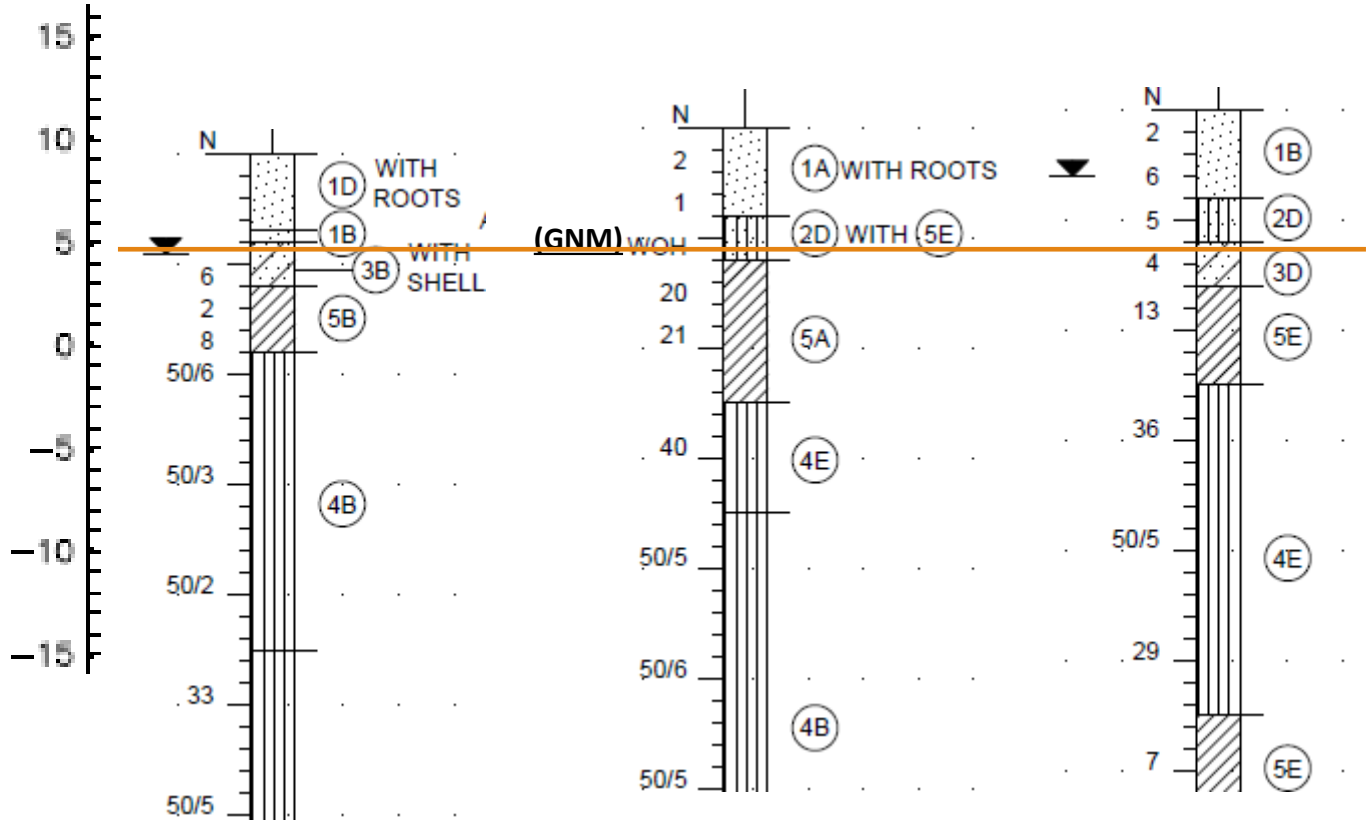
Legend

▼ GROUNDWATER LEVEL MEASURED ON DATE DRILLED

GNM GROUNDWATER NOT MEASURED (i.e., NOT ENCOUNTERED IN THE TOP 5 FEET AND NOT MEASURED BELOW 5 FEET DUE TO THE MUDDED CONDITION OF THE BOREHOLE OR SLOW RECOVERY IN THE CLAYEY/SILTY SOILS).

Average Water Table Elevation in “Low” and “Background” Typical Profiles

SOIL DESCRIPTIONS		COLORS	
1	FINE SAND (SP)	A	LIGHT BROWN TO BROWN
2	SILTY FINE SAND (SM)	B	LIGHT GRAY TO GRAY
3	CLAYEY FINE SAND (SC)	C	ORANGE-BROWN
4	PARTIALLY CEMENTED TO CEMENTED SILT (ML/MH), CALCAREOUS	D	DARK BROWN OR DARK GRAY
5	SANDY CLAY TO CLAY (CL/CH), CALCAREOUS	E	GREENISH GRAY



Summary of Confirmation Borings

- SPT borings conducted in each gravity area type found that the soils were consistent across the study areas.
- The only appreciable difference between borings conducted in different residual gravity areas was the water table – low residual gravity boring locations encountered lower water table elevations.
- SPT borings did not encounter conditions indicating a subsurface anomaly or discontinuity.

Conclusions

- No significant subsurface anomalies (voids, caverns, feeder veins) were encountered within the zone of influence of the proposed development.
- The proposed development of buildings on shallow foundations and of shallow wet stormwater ponds would not negatively impact the Warm Mineral Springs.
- If any of the below items are planned or being considered, further exploration and evaluation would be required
  - Drain fields/septic tanks
  - Deep (i.e. pile) foundations
  - Deep water wells
  - Any development closer to the spring than what is currently proposed

Questions and Discussions

Thank You