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MADISON, WI 53715

MEMORANDUM

To: City of Madison Board of Park Commissioners

Date: December 5, 2023

RE: Potential Geothermal Field in Brittingham Park

This Memorandum is meant to introduce and describe a potential geothermal field under Brittingham Park for consideration by the Park Commission.

The geothermal field would be a model project that would benefit the redevelopment of the affordable housing properties owned by the City of Madison Community Development Authority (CDA) across West Washington Avenue from the Park in the area known as the Triangle. The CDA has hired New Year Investments (NYI) to assist the CDA in redeveloping its assets within the Triangle. NYI and its team completed the Taking Shape, Our Triangle Development Plan (Taking Shape) in 2023. Part of the specific goals the CDA has for Taking Shape include a commitment to working to support the City of Madison's goals for 100% renewable energy net carbon emissions for city operations by 2030 and community-wide by 2050. Having reviewed numerous options, the team has identified the most efficient way for the CDA to approach carbon-neutral footprint as part of the Taking Shape will be a geothermal field under Brittingham Park to serve the Taking Shape site. We are excited to explore the opportunity for CDA and Parks to collaborate to address some of our community's most pressing issues: housing and sustainability.

Description of the Taking Shape Project

The Taking Shape Plan calls for a significant reinvestment in the underutilized 10-acre site that the CDA owns in the Triangle. The CDA Triangle Properties are home to approximately 350 low-income households many with disabilities. The Taking Shape will improve the lives of existing residents by improving the accessibility and sustainability of their homes. Further, the plan aims to add additional future housing to address Madison's affordable housing and sustainability goals.

Taking Shape, a ten-year redevelopment plan, calls for:

- A multi-phased redevelopment so that no residents are displaced from the Triangle



- Phased replacement of 350 existing units of affordable housing with new units
- Addition of 850 new workforce and affordable units
- Improved accessibility throughout the Triangle site
- Sustainable infrastructure to support the long term needs of the residents and CDA
- Extensive community and supportive service space to support CDA residents
- Completion of the East Campus mall extension to provide a continuous lake-to-lake path
- Removal of bridge over West Washington Avenue
- Enhanced at-grade crossings

Description of Geothermal Systems

A geothermal heating and cooling system is a proven, energy-efficient system that uses the natural stable ground temperature to heat and cool buildings. Geothermal systems have three essential parts: the heat pump system that supplies heated or cooled air to the occupied spaces in a building, the ground heat exchanger that transfers heat to and from the earth, and the geothermal loop that moves heat between the air handling system and the ground heat exchanger through a circulated liquid.

1. **Ground heat exchanger/geothermal field**— A geothermal heat pump system uses the earth as a heat source and sink (thermal storage), using a series of connected pipes buried deep in the ground. The pipes circulate a fluid that absorbs or rejects heat to the surrounding soil, depending on whether the supplied buildings need heating or cooling.
2. **Heat pump**—A geothermal heat pump uses a compressor and refrigerant coils to transfer heat to or from the geothermal loop to provide hot or cold air to the occupied spaces within the buildings of the Triangle area. This heated or cooled air is supplied through ductwork to the occupied spaces, similar to a conventional furnace and air conditioner setup.
3. **Geothermal loop**—A geothermal piping loop connects all the heat pumps within the Triangle buildings to the ground heat exchanger. The geothermal loop circulates water mixed with environmentally friendly antifreeze. The geothermal loop is circulated by set of pumps that speed up and slow down based on how much heating or cooling is needed.



Description of Prospective Geothermal Field within Brittingham Park

The underground heat exchanger/ geothermal field would be located under Brittingham Park and would be designed by Design Engineers as part of the Taking Shape project. Preliminary estimates indicate that the area currently being used as an athletic field would be large enough to support a geothermal field of approximately 610 vertical loops. Each loop would be 500' deep and would be installed in a 6" diameter borehole. The boreholes are sealed with thermally conductive grout to create a stable heat exchanger loop. The individual vertical loops are connected together in circuits of 6 to 8 loops by horizontal piping buried at least 5' below the surface. Several circuits are combined together at buried header vaults. These vaults are completely below the ground level with only a manhole access located at the surface. It is anticipated that four vaults would be needed for the Taking Shape project. The header vaults are connected to the geothermal loop which routes below Washington Avenue to the Triangle buildings. After the geothermal system is installed, the field could be restored with no above-ground impediments interfering with the areas used as athletic fields.

The location of the field and the final design parameters would be determined by the Taking Shape engineers and in consultation with Parks staff. The Taking Shape team envisions a design phase of approximately 4 months, followed by a construction phase of approximately 8 months. Restoration of the field would take place at the conclusion of construction and would take several months to establish.

Description of Maintenance

Geothermal systems are not novel—these systems have been used for several decades. Maintenance of the geothermal field is expected to be minimal, with no routine maintenance required. Occasional access to the buried vaults will be needed primarily for troubleshooting any flow issues that might arise. In a worst-case scenario, a vault would need to be accessed to close off a leaking circuit.

Ownership of Geothermal Field and Maintenance of Field and Park.

It is expected that the geothermal infrastructure would be constructed by, owned by, and maintained by a CDA controlled entity as part of the Taking Shape project. Parks would provide an easement for the infrastructure similar to other underground utilities that lie within the Park.

Next Steps

The CDA and Parks Department Staff have met to discuss the geothermal opportunity on multiple occasions as part of the Taking Shape planning effort. At this time, the Taking Shape Team is seeking the Board's support in the further exploration of the geothermal opportunity. With the Board's support, the CDA will move the prospective geothermal



project forward, as a project cost under the Taking Shape plan. The expectation is that CDA will work with the Taking Shape project engineers, in consultation with Park's staff, to design a geothermal system that allows for more affordable and sustainable housing to be built in the Triangle area and that ensures Brittingham Park is restored and available for our growing community.