

REQUEST FOR IDEAS

Sustainable Heating

City of Ann Arbor

June 9, 2023

PREPARED BY

Rick Humphries, PE
Senior Vice President,
Director of Development
810.955.6217
rick.humphries@salasobrien.com

Salas O'Brien
1111 Deming Way, Suite 202
Madison, WI 53717

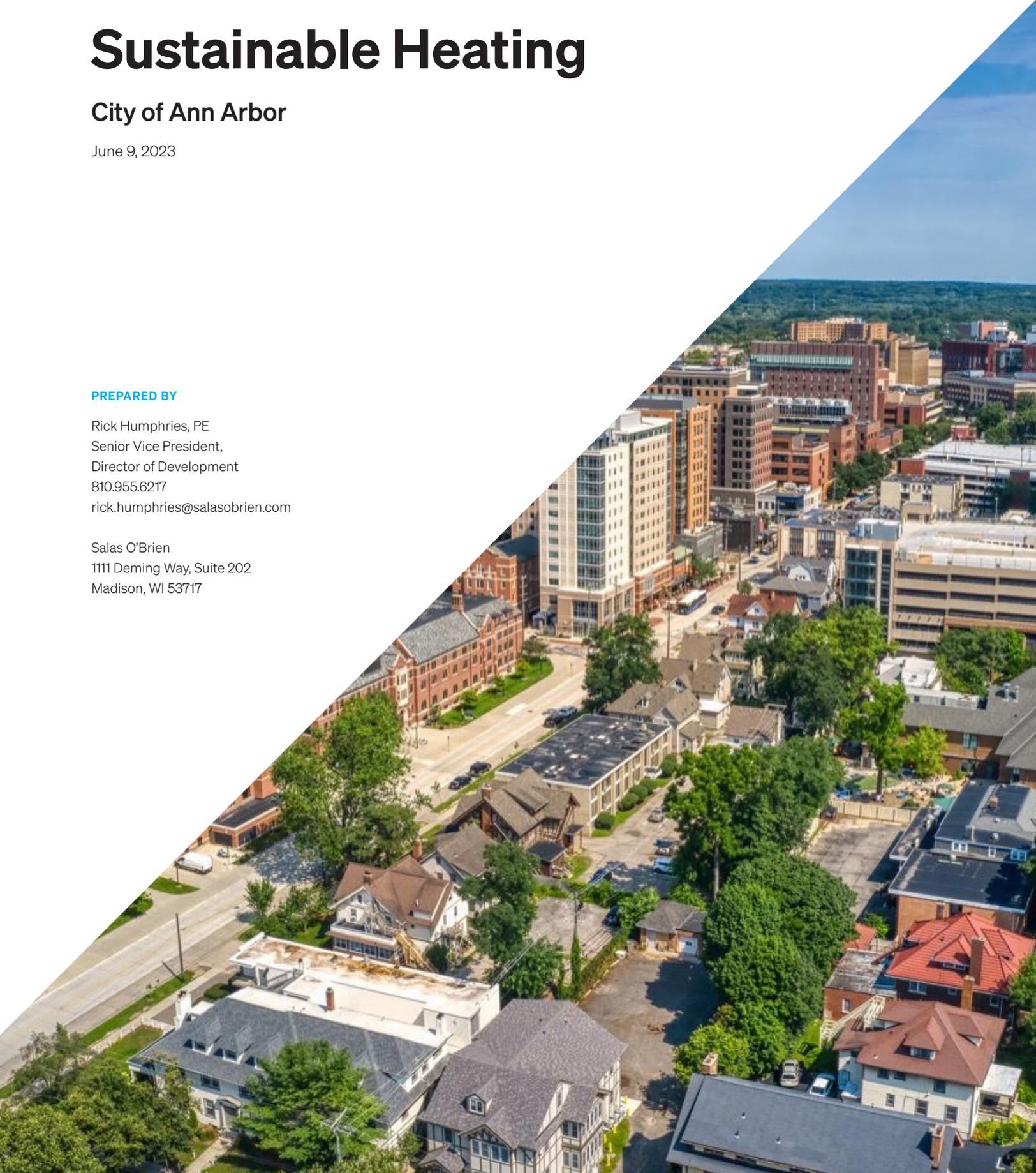


Table of Contents

03	Cover Letter
05	Solution Summary
08	Profile of Firm
10	Qualifications
10	Team Resumes
13	Project Experience & References

JUNE 9, 2023

Dr. Missy Stults
Director of the Office
of Sustainability and Innovations
City of Ann Arbor
301 E. Huron St.
Ann Arbor, MI 48104

✓ **City of Ann Arbor Sustainable Heating**

Dear Dr. Stults,

Salas O'Brien is pleased to submit to the City of Ann Arbor's ("City") Request for Ideas regarding Sustainable Heating. Our team has significant experience in providing technical and commercial support to our clients as they investigate decarbonization concepts. As an independent developer and engineer, Salas O'Brien is uniquely qualified to assist the City and its partners with program planning and project development.

In response to the market demand to provide decarbonization insights and tactical planning for our clients, our organization has created Salas O'Brien Development Ventures, a development group within Salas O'Brien, which will bring commercial and technical experience in developing energy projects to bear for the City. We can work with the city and its partners to identify and outline a development pathway including key decision points relative to permitting, financing, contract structuring, implementation, and operations.

One technology worth considering as part of the pathway to decarbonization is district ground-source geothermal heating and cooling. Salas O'Brien has significant experience with district geothermal systems with unmatched experience in this space. Equally important, Salas O'Brien has a long, successful history of decarbonization, electrification, and sustainability planning throughout the U.S. and Canada. These projects have often been transformational for the clients we've collaborated with.

Beyond the Development Ventures team, Salas O'Brien's expertise in geothermal design is extensive. Our work on such exemplar projects as Berczy-Glen, a neighborhood geothermal energy project in Ontario, Canada, have given the Salas O'Brien team valuable experience in delivering projects built for success.

Our team offers:

- ✓ An independent developer who can work with them to determine the most effective project structure and source of capital investment for the project.
- ✓ A highly qualified technical team with direct experience in community geothermal applications.
- ✓ A team capable of coordinating technical requirements at the housing building level to ensure seamless integration.
- ✓ A local presence with one of our key team members in the Ann Arbor area.

We are excited for the opportunity to discuss our expertise with you and to collectively develop a plan to deliver sustainable heating for the City of Ann Arbor. If you have any questions related to the content of this submission, please reach out to me directly at 810.955.6217 or rick.humphries@salasobrien.com.

Sincerely,



Rick Humphries, PE
Senior Vice President, Director of Development
rick.humphries@salasobrien.com

01

Solution Summary



／ Solution Summary

Salas O'Brien is pleased to provide a response to the City of Ann Arbor's Request for Ideas for Sustainable Heating.

Salas O'Brien has long been a leader in the planning, design, and implementation of ground-source geothermal heating and cooling projects. In recent years, more and more entities have expressed an interest in implementing these projects due to inherent decarbonization characteristics and the proven technologies. In response to our clients' need for a greater breadth of support throughout project implementation, Salas O'Brien has created a Development Ventures group to manage all aspects of a project – commercial, technical, and operational – on our clients' behalf.

Conventional thinking is that design and construction are what drive project success. While both are critically important, certain aspects beyond the parameters of design and construction can greatly impact the success of a project. Development, particularly infrastructure development, seeks to identify and manage variables that can both enhance and harm project value. The role of the development team is to take a holistic view of the project, identifying aspects that amplify value and mitigate risk.

Salas O'Brien Development Ventures' ("SODV") approach is pro forma centered. Early in the process we will work with the City to develop a project financial model that can help the team identify key decisions and mitigate risks to keep projects moving forward. As an independent developer, SODV believes we are in a unique position to provide development services to our clients as we do not require a financial investment to participate. The developer can be responsible for all aspects of the project on behalf of the client including:

- ▲ Permitting
- ▲ Business model development
- ▲ Sources and uses of funds for investment
- ▲ Incentive review and coordination
- ▲ Counterparty contracting
- ▲ Creation of special purpose entities (if required)
- ▲ Design from concept through commercial operation
- ▲ Construction and pre-construction support
- ▲ Startup and commissioning
- ▲ Performance testing

- ▲ Coordination of asset management and operation plan
- ▲ Operating procedures
- ▲ Contract management

Our Approach

As the City evaluates the heating needs for its residents, we recommend considering district geothermal as a significant component of the decarbonization pathway. Given the diverse infrastructure available in the City, Salas O'Brien recommends selecting implementations that anchor neighborhood systems to a significant consumer of heating energy. For example, interconnecting a neighborhood school and the surrounding multi and single-family homes.

For your consideration, we are providing the following technical approach for a neighborhood implementation similar to what we've done in other locations. We have found it critical to take a measured approach to the system design to prevent coordination issues resulting in poor system performance.

Energy Modeling

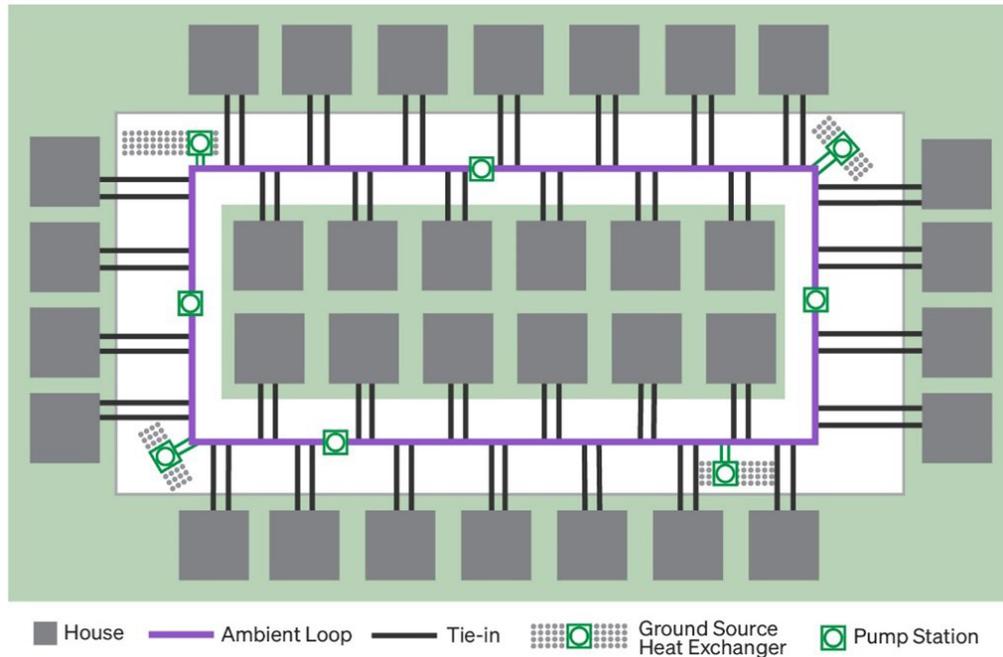
Salas O'Brien will perform thermal energy models for a number of the "typical" homes in a selected geothermal district. The thermal profiles will include different orientations of the homes to represent an average load profile for each type, then scaling those profiles will determine the total aggregate thermal loads of the development. We will also review existing utility consumption data for major users in a district (commercial, school, etc.) and provide all assumptions of the building profiles and reconcile that with all stakeholders. The models will then be broken down into clusters based on phasing and construction, which will be used in TRNSYS modeling software to determine the locations of all thermal energy resources within the system. The modeling software takes all diversity and energy sharing into account when designing thermal resources.

Infrastructure Design

Our design approach for the development's thermal infrastructure will be based on an "ambient temperature loop" (ATL), a single pipe throughout the development that connects each property/building as well as each thermal resource (e.g., geothermal heat exchangers). A curb stop valve box for each property will facilitate phasing and construction timing by allowing isolation of all properties from the ATL. This also allows the connection of each building without shutting down the ATL. The ATL is filled with water and a small amount of chemical treatment that inhibits corrosion and bacteria growth. Because it is a closed

One-Pipe Ambient Geothermal System

RCES - Ambient Loop



loop, the ATL does not need additional fluid/water once it is filled and operational. One or more pump stations (located above ground or below, subject to site restrictions and space requirements) will provide ATL circulation. Heat-fused High-Density Polyethylene (HDPE) piping of less than 10" diameter will be located with other utilities buried 4-6' below the street right of way (ROW). Salas O'Brien will coordinate and collaborate with civil engineers for location and placement of the ATL system.

Thermal Resources

Salas O'Brien will evaluate and design the most cost effective and efficient set of thermal resources available. A typical system employs geothermal heat exchangers, most commonly vertical loops grouped in locations throughout the development to both optimize energy and accommodate open space and public property. Loops can also be located within the street ROW. We will also evaluate any other potential thermal resources such as water retention ponds or surface water systems. A wastewater energy transfer (WET) system that captures and rejects heat into the community's main sewer line may also be feasible. For energy transfer into and out of the ATL system, any additional thermal resource would require a pump house, located above ground or below, potentially in the street ROW.

The above diagram shows a conceptual ATL using a single circulation pipe and multiple thermal resource locations.

Building Systems

Salas O'Brien will provide stakeholders and building side system implementers with a "basis of design" (BOD) narrative and specifications around which the building systems need to be designed and installed to optimize the thermal network system function. Typically, residential buildings use a Geothermal Heat Pump (GHP) with a ducted air distribution system for heating and cooling. The GHP can also use a desuperheater to assist in making domestic hot water (DHW) when the GHP is heating or cooling the space. The ductwork and DHW systems are no different than a traditional forced air furnace, AC system, and water heater tank system. Each GHP has an independent pump station that circulates fluid from the building to the ATL and back. Salas O'Brien will also evaluate if an energy transfer station (ETS) is recommended to isolate the ATL fluid from the building fluid. We will provide entering ATL temperatures to each structure to help determine the size and type of GHP to use with the system.

02

Profile of Firm



Engineered for Impact™

Salas O'Brien is an engineering and technical services firm focused on advancing the human experience through the built environment. Our team is engineered for impact™, helping clients achieve critical goals, advancing team members through growth and opportunity, and operating at the center of important global issues, including sustainability and decarbonization.

We support government and private sector clients in a variety of industries by applying our specialized expertise in built environment engineering and design, energy and resiliency, process design, and advanced consulting services. Focusing on constant progress and a sustainable future, we are committed to creating the best possible outcomes for our clients and our team members.

Resilient practices and projects

Environmental accountability and sustainability are at the core of our daily operations and, most importantly, engrained in our project delivery. The work we do reduces dependence on natural resources while supporting our clients' goals, which are often linked directly to strategic sustainability goals and climate action pledges, and our designs meet the latest standards for energy, environmental, and human health. Our team delivers safe and resilient projects that drive optimal performance while reducing environmental impact.

Helping clients adapt to a changing world

With more than 2,200 employee owners and 400+ registered professionals operating from locations across North America, we provide a full range of engineering and technical consulting services for government and private sector clients. From quick-turn projects to the most complex systems, our team is dedicated to providing quality solutions that deliver long-term value.



Our Focus

We are national leaders in energy planning and the planning, design, and implementation of geothermal systems, central energy plants, and district energy systems.

400+

Geothermal Projects

200+

Central plant replacements and modernizations

SERVICES

- ▲ 3D Laser Scanning & Modeling
- ▲ Carbon Reduction Planning
- ▲ Central Utility & Energy Plants
- ▲ Chilled Water Distribution
- ▲ Commissioning & Retro-Cx
- ▲ Energy Modeling
- ▲ Geothermal & Radiant Technologies
- ▲ High Temperature Hot Water Distribution
- ▲ Infrastructure Engineering
- ▲ Mechanical & Electrical
- ▲ Plumbing & Fire Protection

03

Qualifications

Team Resumes, Project Experience & References





Mike Walters PE, LEED AP
PRINCIPAL, DISTRICT ENERGY MARKET LEADER

Mike is an experienced Principal with a broad range of experiences and a passionate entrepreneurial spirit. He has demonstrated success in developing projects and implementing plans to increase sustainability and energy-efficiency for clients, both large and small, throughout the United States. Mike’s project experience includes energy master plans, carbon reduction plans, design and construction of central energy plants, and design for an array of high-performance building types.

YEARS OF EXPERIENCE

23 Years

EDUCATION

Bachelor of Science, Architectural Engineering,
 Milwaukee School of Engineering

REGISTRATIONS

Professional Engineer; WI

LEED Accredited Professional
 (LEED AP)

PROFESSIONAL AFFILIATIONS

Member - Consulting Specifying Engineer
 Editorial Advisory Board (2009 to Present)

Adjunct Faculty; University of Wisconsin,
 Madison - College of Engineering

RELEVANT EXPERIENCE

- ▲ **Ford Motor Company** Dearborn, MI
 Central Energy Plant & Campus Distribution
 Systems; Energy Master Plan
- ▲ **Roche Diagnostics** Branchburg, NJ
 Central Energy Plant Expansion &
 Geothermal System
- ▲ **Appalachian State University** Boone, NC
 Innovation District DES
- ▲ **Michigan State University** East Lansing, MI
 Geothermal Feasibility Study
- ▲ **Smith College** Northampton, MA
 Energy Master Plan; Geothermal Conversion
 Phase 1; Geothermal Conversion Schematic
 Design Phases 2-4



Rick Humphries PE
DIRECTOR OF DEVELOPMENT

Rick is a mechanical engineer with a background in thermal systems design. Over the past decade he has focused on the creation of project companies to serve specific energy needs. Rick approaches projects in a holistic way, considering the application of technology, market drivers, and economic incentives to produce an outcome that meets the client’s needs.

YEARS OF EXPERIENCE

17 Years

EDUCATION

Bachelor of Science, Mechanical Engineering,
 Michigan State University

REGISTRATIONS

Professional Engineer – Mechanical;
 MI #6201058524

CERTIFICATIONS

Project Management Institute – Body of
 Knowledge

PROFESSIONAL AFFILIATIONS

POWER Magazine Editorial Board

RELEVANT EXPERIENCE

- ▲ **Ford Motor Company** Dearborn, MI
 Central Energy Plant & Campus Distribution
 Systems*
- ▲ **DTE Energy** Woodland, CA
 Biomass Energy Carbon Capture Project*
- ▲ **DTE Energy** Sylmar, CA
 Landfill Gas to Energy: Renewable Natural
 Gas Production*
- ▲ **DTE Energy**
 Decarbonization Strategic Framework*
- ▲ **Michigan State University** East Lansing, MI
 University Switch House and Interconnect
 Switchgear*; University Continuing Services
 Contract*

Local presence in Ann Arbor area

*work completed with previous firm



Jeff Urlaub PE
PRINCIPAL, GEO EXCHANGE EXPERT

Jeff has been responsible for the design and implementation of innovative, environmentally responsible solutions for clients across the United States. Jeff has more than 20 years of professional engineer experience in HVAC design, project management, design of engineered systems and mechanical services, with an emphasis in renewable energy, energy analysis and geothermal design.

YEARS OF EXPERIENCE

25 Years

EDUCATION

Bachelor of Science, Engineering, University of Florida

REGISTRATIONS

Professional Engineer – Mechanical; Over 40 States; MI #6201050801

PROFESSIONAL AFFILIATIONS

American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

International District Energy Association (IDEA)

International Ground Source Heat Pump Association (IGSHPA)

RELEVANT EXPERIENCE

- ▲ **Berczy-Glen** Toronto, ON
Residential Geothermal District Community Design & Build
- ▲ **Hunters Point Shipyard** San Francisco, CA
Eco-District Campus Design
- ▲ **Ann Arbor Public Schools** Ann Arbor, MI
Forsythe Middle School Geothermal Test Bore & Design
- ▲ **Alafia Development, Spring Creek Landing** Brooklyn, NY
Residential Mid-Rise Complex Geothermal Feasibility & Design Services, Phase 1 & 2
- ▲ **Arverne East** Rockaways, NY
Mixed-Use Development Geothermal & Solar Feasibility Study



Brian Urlaub CGD
DIRECTOR OF GEOTHERMAL OPERATIONS

Brian oversees Salas O'Brien's geothermal projects and is involved in procurement, design, and project management. He has 22 years of experience in the geothermal industry, beginning with installation and servicing in the field, then transitioning to design and sales. He is adept at working with clients to develop solutions that meet their goals while responding to site conditions, as well as schedule and budget expectations.

YEARS OF EXPERIENCE

30 Years

EDUCATION

Associate of Science Degree in Heating, Cooling, Refrigeration Technology, Chippewa Valley Technical College, Eau Claire, WI

REGISTRATIONS

Certified Geothermal Designer (CGD)

PROFESSIONAL AFFILIATIONS

International Ground Source Heat Pump Association (IGSHPA)

Wisconsin Geothermal Association

Minnesota Geothermal Heat Pump Association

RELEVANT EXPERIENCE

- ▲ **Berczy-Glen** Toronto, ON
Residential Geothermal District Community Design & Build
- ▲ **Alafia Development, Spring Creek Landing** Brooklyn, NY
Residential Mid-Rise Complex Geothermal Feasibility & Design Services, Phase 1 & 2
- ▲ **Arverne East** Rockaways, NY
Mixed-Use Development Geothermal & Solar Feasibility Study
- ▲ **Pleasant Farms** Middleton, WI
Mixed-Use Geothermal District Feasibility Study



Rob McKenna

SENIOR VICE PRESIDENT, DIRECTOR OF PLANNING

Rob has over 16 years of experience advising institutions navigating the complexities of strategic decision making, climate action planning, and utility business planning. He is an expert in statistical analysis and decisions systems and is recognized as a go-to resource for discussing complex topics at a detailed level with business managers, financial leaders, and technical engineers.

YEARS OF EXPERIENCE

16 Years

EDUCATION

Bachelor of Arts, Finance, Utah State University

Master of Business Administration, Finance,
Indiana University

PROFESSIONAL AFFILIATIONS

Speaker at the International District Energy Association (IDEA)

Served as Energy and Decarbonization Advisor at more than 40 of the top 100 U.S. Colleges and Universities

Co-author author of The West's Renewable Energy Future: A Contribution by National Grid

RELEVANT EXPERIENCE

- ▲ **Michigan State University** East Lansing, MI
Energy Transition, Reliability and Framework Planning*; Alternative Energy Analysis*; Utility Rate Design*
- ▲ **Ford Motor Company** Dearborn, MI
Energy Master Plan*
- ▲ **Miami University** Oxford, OH
Geothermal Feasibility Study*; Decarbonization Master Plan Update
- ▲ **Smith College** Northampton, MA
District Energy Master Plan*; Energy and Financial Modeling*
- ▲ **Wellesley College** Wellesley, MA
District Energy Master Plan*; Energy and Financial Modeling*



Scalable single-family neighborhood geothermal

Mattamy Homes, Berczy Glen **MARKHAM, ON, CANADA**

Upon completion, Ontario’s 327-home Berczy Glen development will be the first residential neighborhood in Canada to have its heating and cooling needs met by a central geothermal system. Salas O’Brien designed a net zero carbon system, 3.5 to 4 times more efficient than the conventional natural gas alternatives. Homeowners are expected to see 30-50% reduction in monthly utility bills.

The geothermal system consists of 170 vertical loop boreholes, 850’ deep, distributed entirely under neighborhood streets in twelve pods, connected by a two-mile ambient water loop. Circulation pumps serving the loop and individual pods are housed in subgrade vaults, eliminating visible infrastructure.

The system will be maintained by Enwave Energy Corporation, demonstrating the feasibility of community-scale geothermal systems for Berczy Glen developers, Mattamy Homes.

SERVICES

Geothermal and Renewables

COMPLETION YEAR

2024

SIZE

500,000 square feet;
312 Homes

REFERENCE

Catherine Thorn
Senior Director
Enwave Energy Corp.
416.338.8920
catherine.thorn@
enwave.com

80% reduction

in system carbon emissions

100% reduction

in household carbon emissions



Image: Arverne East

Long Island waterfront, fossil fuel-free.

L+M, Arverne East **NEW YORK, NY, USA**

Salas O'Brien provided geothermal district system and solar PV feasibility studies and master plan for the project. We based our feasibility study of energy and carbon reduction measures on proposed building drawings, typical building type schedules, scalable metrics to calculate aggregate loads, site weather data sets, and fluctuations in occupancy, ventilation, and internal loads. Comparing a geothermal HVAC system to a base case HVAC system, we created energy model alternatives to represent each of the design options. We profiled site geological conditions to assess geothermal heat exchange performance, determined bore counts necessary to achieve design capacity, and mapped approximate area requirements. Our modeling included capacity, annual generation, and projected share of building electrical loads by rooftop solar PV layouts, as well as thermal hot water.

Prioritizing health and wellness, along with economic development and cultural diversity, the Arverne East project will be built in phases that began in 2021.

SERVICES

Energy Model, Design, Master Planning

SIZE

1,650 housing units; 277,000 million square feet commercial and community space

COMPLETION YEAR

Expected 2024

REFERENCE

Sara Levenson
L+M Development
212.233.0495 x 148
slevenson@
lmdevpartners.com

With the objective of transforming a vacant 116-acre oceanfront site into a fossil fuel-free, publicly accessible mixed-use development, Arverne East will provide extensive new mixed-income housing and space for local business, retail, and services, while creating a recreational destination for metropolitan New York.



✓ New eco-district campus design

Candlestick Point-Hunters Point Shipyard [SAN FRANCISCO, CA, USA](#)

Salas O'Brien was hired to help with the sustainable mechanical infrastructure ideas, onsite power technologies, and emerging technologies of the Candlestick Point-Hunters Point Shipyard development which will serve as a model for modern sustainable city planning. This 702-acre area will house R&D facilities, commercial spaces, multi-use buildings and retail spaces. Parks, trails, and open spaces will be additional features that will attract and enhance the community.

To meet the Eco-Districts phase 1 heating and cooling needs, we proposed a hybrid open-loop water-sourced system, directly utilizing San Francisco bay water as thermal energy source and sink, by using a supply and discharge system coupled with high efficiency heat exchangers and heat recovery chillers. The main components of the system include two Titanium heat exchangers with a seawater filtration system to minimize the maintenance. The system also includes pumps designed for seawater applications to increase reliability and operational longevity.

SERVICES

Mechanical, Design,
Utility Master Planning

SIZE

700+ acres;
4.3 million square feet

COMPLETION YEAR

2016

The new development will add over 10,000 new residential units in the form of condominiums and low-, mid- and high-rise buildings, over a million square feet of commercial space made available, over three million square feet for Research and Development, as well as over 300,000 square feet of property devoted to community activities. A hotel, artist studios and art center, a marina, and a performance venue/ arena will be included.



Performance Company Model, with Geothermal Loop.

Clonmore Urban Towns Core Development **TORONTO, ON, CANADA**

Salas O'Brien designed the ground loop heat exchanger accessing renewable energy for the cooling and heating of this stacked townhouse development in Toronto's Birch Cliff neighborhood. Financed through a performance company model, the project consists of 118 open-concept units grouped in seven structures of varied sizes.

Our geothermal system design includes size and layout of the ground loop exchanger, with pressure drop and flushing requirements, and materials and installation specifications. The layout and location of the bore fields and building penetrations were coordinated with site/civil and structural engineers; sizing, header piping, and building interior terminations points were coordinated with the foundation plan and HVAC engineer.

SERVICES

Geothermal, Energy Model, Design
Concept, Mechanical Design, Construction Administration

SIZE

128,000 square feet

COMPLETION YEAR

2022



✓ Vast corporate campus, vast geothermal system

Epic Systems Corporation Geothermal Campus System [VERONA, WI, USA](#)

SERVICES

Geothermal and Renewables

SIZE

8 million square feet

COMPLETION YEAR

2021

Over half of America has its health records on Epic software. Epic's 10,000+ employees work across 8 million square feet on a 1,100-acre property divided into five campuses.

When the geothermal system supporting Epic's first buildings needed troubleshooting, Salas O'Brien came on board, subsequently completing master plan work and, to date, designing and implementing a renewable energy system that includes: four borefields totaling 6,200 bores at depths from 300 to 500 feet; a 5.8-acre pond of 1,296 loops averaging 600 ft; an 18,000 GPM open loop system; and, a central pump station that transfers energy among buildings, distribution energy plants, ponds, and borefields. Renewable energy sources include 1.5 MW solar PV and 10 MW wind generation. Our engineers are onsite full-time as an integral part of Epic's energy and engineering team.

✓ 15,000

Tons Cooling

✓ 95

MMBTU/hr Heating



✓ The largest US higher ed geothermal conversion

Ball State University **MUNCIE, IN, USA**

Salas O'Brien planned, designed, and implemented all stages of this phased conversion project. creating the largest geothermal system on a higher ed campus in the US. Ball State also became the nation's first fully electric campus. The system heats and cools 47 buildings. Since its startup in 2014, the University has cut its carbon footprint in half and realized over \$2 million in annual energy savings.

Salas O'Brien coordinated all design disciplines, executed LEED Certification, acted as Owner's Representative during construction, and provided commissioning services. The system includes two district energy stations, two vertical loop fields totaling 3,383 bores containing 1,000 miles of high-density polyethylene pipe, four 2,500-ton heat pump chillers, and 10 miles of buried distribution piping.

Eliminating four plants that burned 36,000 tons of coal annually, Ball State annually eliminates 85,000 tons of carbon dioxide emissions, 240 tons of nitrogen oxide, 200 tons of particulate matter, 80 tons of carbon monoxide, 1,400 tons of sulfur dioxide, and 3,400 tons of coal ash.

SERVICES

Geothermal and Renewables, Mechanical, Electrical, Plumbing, Fire Protection

REFERENCE

Jim Lowe
 Director of Engineering, Const. & Operations
 765.285.2805
 jlowe@bsu.edu

COMPLETION YEAR

2017

SIZE

5.6 million square feet

✓ \$2 million

annual energy savings

✓ 10 miles

buried distribution piping



Dividends on the Path to Carbon Neutrality

Miami University Geothermal Campus Conversion [OXFORD, OH, USA](#)

Salas O'Brien's work with Miami University over the last decade has contributed to dramatic reductions in energy use, cost, and carbon footprint, cutting campus-wide energy use by 39 percent and carbon emissions by 45 percent, all while Miami increased campus square footage by 25 percent.

The west campus geothermal plant, completed in two phases, includes a 700 bore vertical and a 133-loop pond-based heat exchanger. Conversion of the south campus chiller plant included installation of a 1.6 million-gallon thermal energy storage tank. We converted over half the campus square footage to electric-based heating and cooling, and our north campus feasibility study is leading to conversion of the north plant to geothermal and installation of vertical heat exchangers in 2026, completing the elimination of steam from the campus. Providing 2,350 tons of cooling and 26mmBTU/HR heating, the west campus geothermal system has an annual COP of 5.0. As an outcome of Salas O'Brien's work, Miami's campus-wide EUI is 87.87 kBtu/GSF, representing a 48 percent decrease.

SERVICES

Geothermal and Renewables, Mechanical, Electrical, Plumbing, Fire Protection

REFERENCE

Cody Powell
Associate VP Facilities
513.529.7000
powellcj@miamioh.edu

COMPLETION YEAR

96% complete

SIZE

3.2 million square feet
2,138 Acres, 121 Buildings,
44 Buildings Converted

39 percent

Reduction in campus-wide energy use

45 percent

Reduction in carbon emissions

Contact Us

Rick Humphries, PE
Senior Vice President,
Director of Development
810.955.6217
rick.humphries@salasobrien.com

Salas O'Brien
1111 Deming Way, Suite 202
Madison, WI 53717