MACALESTER

Campus Sustainability: Geothermal Project

Request Amount: $2,570,000

Background: Building a sustainable future for Minnesota requires innovative solutions from communities across the state, and Macalester College is committed to leading this vital work. Through significant investments in conservation efforts, equipment and systems upgrades, and renewable energy initiatives—including on-campus solar arrays and community solar garden partnerships—Macalester has demonstrated its dedication to environmental stewardship. To achieve full carbon neutrality and serve as a model for urban campuses across Minnesota, the college must now transition away from natural gas-powered boilers for campus heating. Following a comprehensive 2020 campus assessment by Evergreen Energy, aquifer-based geothermal pump technology emerged as the most viable solution for our landlocked, urban campus. This sustainable heating and cooling approach, integrated into Macalester's 2022-2023 campus plan, will showcase how institutions can successfully implement large-scale sustainable infrastructure in dense urban environments, providing a blueprint for similar transitions across the state.

Need: The path to carbon neutrality at Macalester College will unfold through a series of projects over the next decade. The first milestone is an interconnected geothermal and solar project supporting a new residence hall and welcome center at the northwest corner of Grand Avenue and Macalester Street in St. Paul. This development will bring 224 students into campus housing while returning 224 housing units back to the surrounding neighborhood. The building will utilize an aquifer-based geothermal system designed for future expansion, eventually serving as a district heating and cooling plant for all campus buildings north of Grand Avenue.

Once the north side of campus has transitioned off the natural gas-powered steam heating plant, the next phase will focus on converting the campus south of Grand Avenue to geothermal-based heating and cooling. The college's comprehensive campus plan envisions a series of aquifer-based geothermal wells in green spaces and under athletic fields. These wells will ultimately connect to a refurbished district heating and cooling plant that supplies utilities to the south side of campus. These investments in core infrastructure will allow the college to attain carbon neutrality by transitioning the campus off of fossil fuel-based heating to electric based heating. The remaining carbon loads will be eliminated through a combination of renewable solar generation on campus and targeted energy purchases from non-carbon emitting sources such as wind and solar energy.

Summary of Project: Macalester will construct a new building on the northwest corner of the Grand Avenue and Macalester Street intersection. The building will be five stories plus a basement, housing 224 students in pod living style. The college's Financial Aid and Admissions offices will be housed on the ground floor along with a new and expanded welcome center that will put Macalester on a more level playing field with other colleges vying for the same students. It’s important to note that these students are from a diverse talent pool from around the world and will help Minnesota

retain a workforce with exceptional talent, as a high percentage of Macalester students stay in Minnesota post-graduation.

The building will be heated and cooled with an aquifer-based heat pump system located in the basement. This plant will be constructed to allow for expansion over time with the eventual goal of providing heating and cooling to all college-owned buildings north of Grand Avenue. This district plant will be 100 percent electric, eventually allowing for zero carbon emitting heating and cooling. The building will also feature a solar array and will be constructed to be at least 30 percent more efficient than code requires.

Macalester's Ability to Provide Community Benefit

Environmental Benefits

- **Carbon Reduction**: The project delivers a carbon-neutral building in an urban environment
- **Energy Efficiency:** The building will be at least 40% more efficient than current code, saving approximately 1,300 kWh annually and up to $175,000
- **Demonstration of Fossil Fuel Transition**: Provides a highly visible example that large-scale transition from fossil fuels is achievable in the Minnesota climate
- **Sustainable Energy Innovation**: Implements revolutionary groundwater-based heat exchanger technology by Darcy Solutions that requires minimal space compared to conventional geothermal systems

Economic Benefits

- **Immediate Job Creation**: Generates economic impact through construction jobs during development
- **Long-term Cost Savings**: Reduces energy costs for the college over time, helping to control student costs; living on campus is more cost effective than off campus
- **Increased Property Values**: Transforms an underutilized section of Grand Avenue, improving a previously blighted block

Urban Planning & Community Development

- **Housing Market Relief**: Reduces pressure on the local market by returning student housing stock to the neighborhood as students move back to campus
- **Improved Parking**: Adds additional neighborhood and commerce parking through a new commercial lot less than a block away
- **Urban Renewal Model**: Serves as a model for urban planning that balances community needs, environmental responsibility, and institutional growth

Technological & Educational Impact

- **Scalable Technology**: Features modular scalability that allows for expansion into the neighborhood and south campus over time
- **District Energy Potential**: Can transform from a single-building solution into a potential district-wide energy network
- **Educational Value**: Serves as a learning opportunity for students, faculty, and the broader community

Accessibility & Replication

- **Forward-Compatible Design**: Allows for gradual expansion of sustainable energy infrastructure without major disruption or large upfront investment
- **Urban Geothermal Model**: Demonstrates how geothermal technology can be successfully implemented in space-constrained urban environments
- **Regional Climate Proof Point**: Shows that innovative geothermal solutions are viable in the Minnesota climate, encouraging adoption throughout the region

Major budget categories

The total project budget is estimated at $100M depending on construction type and other decisions yet to be finalized. The cost breakdown is as follows:

BUILDING COST			GEOTHERMAL/SOLAR PROJECT COST			
Total Project Cost	Building Construction	Pre Development	Aquifer / Heat Pump System	Solar Array	Committed to date	Equipment Request
$100M	**$82M**	**$10,550,000**	**$6.9M**	**$550K**	**$2,031,000**	**$2,570,000**

Macalester College Geothermal and Photovoltaic (PV) Commitments to date

Planning, Programming, SD, DD, and CDs - HGA	$1,500,000
Cost Estimating - McGough Construction	$15,000
Expanded Site Scope -HGA and Ten by Ten	$355,000
Additional Engagement (neighbors, businesses, etc) - HGA	$50,000
Energy Modeling,SD, and DD - Emanuelsen Podas	$75,000
Soil testing and assessment - Terracon	$15,000
IRA Incentives and Coordination - Eide Baily	$21,000
Total	**$2,031,000**

Minnesota Legislature Request: $2,570,000 (geothermal)
Macalester College will apply for $3,000,000 in congressionally directed spending allocations through Sen. Smith's office.

The balance of approximately $90 million will be secured through a combination of alumni contributions ($50 million), institutional loans, Program-Related Investments, supplementary private philanthropic donations, and foundation grants ($40 million).

Project Timeline

- **June 2023–February 2024:** Planning, community outreach and input, and building programming
- **January–May 2024:** Schematic design and preliminary budget estimating
- **May–December 2024:** Design development
- **January–May 2025:** Construction document development
- **May–July 2025**: Bidding and award
- **August–November 2025**: Permitting and site preparation
- **March 2026–May 2027:** Building construction
- **August 2027:** Move in

Macalester College is working with the following partners

- EPA
- MPCA
- Ramsey County
- City of St. Paul
- Met Council
- Port Authority
- Xcel Energy
- HGA - Architect
- Emanuelson Podas - Engineering
- Eide Bailly

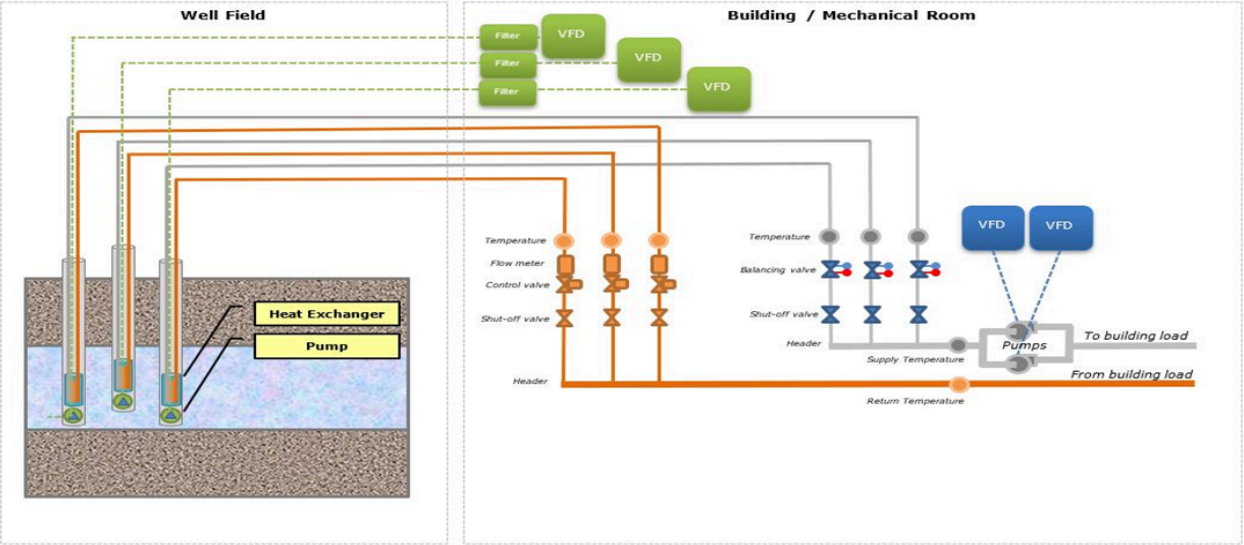
Macalester's Sustainability Commitments

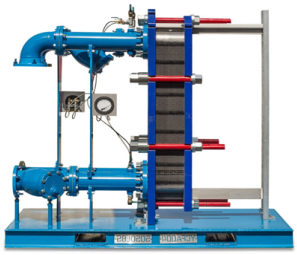
Macalester's long history of commitment to sustainable campus operations includes the following:

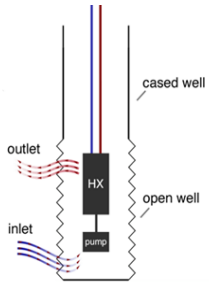
- The college promotes community-focused recycling through its annual student move-out program, collecting and redistributing unwanted garments, food, books, and household goods to community members and local nonprofits at no cost.
- Environmental water management has been addressed through the installation of pervious pavements, rain gardens, and water infiltration basins, which have significantly reduced stormwater runoff on campus.
- Through implementing operational efficiencies, the college has achieved nearly 20 percent reduction in electrical consumption over eight years. This includes building equipment and lighting controls sequences that trim run times and overall consumption, enforcement of temperature guidelines, continuous commissioning of equipment, and calibration of sensors.
- The college has undertaken extensive equipment replacements and upgrades, including adding variable frequency drives (VFDs), replacing motors with high efficiency units, converting to LED lighting, adding and converting to digital controls, retrofitting fixtures with low flow showers, toilets, and faucets, and implementing smart controls for irrigation systems.
- Building envelope improvements have been a priority, with the replacement of single-pane windows with thermal panes in eight buildings over the past 10 years.
- All major retrofits and ground-up new builds adhere to energy-efficient building standards to ensure ongoing sustainability.

- Campus energy generation has been enhanced through four solar arrays that now supply about 3 percent of annual energy consumption.
- The college sources nearly one-third of its electricity from solar gardens, further demonstrating commitment to renewable energy.

VIEW FROM CAMPUS







Heat Exchanger

Well details

HGA
MKC | ARCHITECTS
TENXTEN

MACALESTER COLLEGE
RESIDENCE HALL AND WELCOME CENTER PROJECT

Macalester College is excited to share the plans for a new residence hall and welcome center at the intersection of Grand Avenue and Macalester Street in Saint Paul. The project is one aspect of the college's comprehensive campus plan, which is a flexible framework designed to guide priorities for development and investment in campus spaces. The new building is expected to be completed in 2027.

"The new residence hall and welcome center is an important investment in Macalester's future," said President Suzanne M. Rivera. "The building will serve as a new front door to our college, provide a residential experience to more of our students, and enhance our presence in the neighborhood."

Macalester College

Undergraduate Residential Liberal Arts College

Student Body:

- 2025 Target Student Enrollment
- 22% of our students have citizenship outside the US (including dual)
- 1300 Beds on Campus currently
- 2 most recent residence halls were Grand Cambridge ‘00 and GDD ‘97
- Meet demonstrated need of all our students

Staff and Faculty:

- 430 Staff and 250 Faculty (based on FTE)
- 29% live within the 3 closest zip codes

Imagine, Macalester:

Strategic Plan Outline
Approved by the Macalester
Board of Trustees on Oct. 7, 2022

a signature liberal arts curriculum, grounded in a residential campus experience, focused on our unique location in the vibrant Twin Cities, with an emphasis on citizenship within the wider world

Curriculum

Inspire Current and Future Students

- Create a Developmental Four-Year Experience
- Update and Innovate Academic Pathways
- Redesign the Academic Calendar to Reimagine Our Use of Time
- Amplify Opportunities for Experiential Learning

Culture

Build Meaningful Connections

- Prioritize Student and Employee Well-being, and Foster a Sense of Belonging for All
- Diversify Student, Staff, and Faculty Populations
- Nurture Life-long Connections between the College and its Students, Employees, and Alumni

Campus

Transform our Physical Environment

- Create a Campus that Fosters Innovation, Access, and Connection
- Include the Broader Twin Cities Metro Area as an Extension of Our Living and Learning Environment

Foundational Imperatives:

Academic Distinction, Financial Sustainability, Social Responsibility, Community Well-being

WELCOME CENTER & RESIDENCE HALL

PROJECT VISION

Create a new residence hall and welcome center to expand the capacity of modern residential life on campus and establish a new front door to the college, underscoring Macalester's distinction as a liberal arts college located in a vibrant city, committed to community engagement, global citizenship, and social justice.

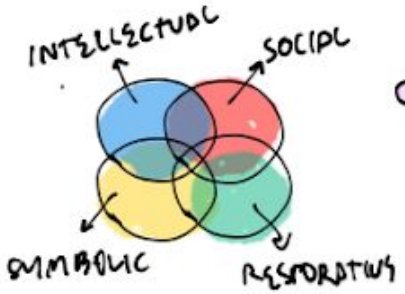
KEY PROJECT ELEMENTS / GOALS

- Modernize residence hall offerings - new residence hall will facilitate ability to also modernize existing residence halls
- 3-year residency capacity
- Define the front door to campus
- Create an identifiable first impression
- Contribute to the vibrancy of Grand Avenue
- High sustainability goals to move campus closer to Carbon Neutrality

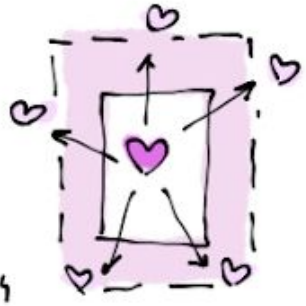
KEY PROJECT ELEMENTS / GOALS

- A significant step towards carbon neutrality for campus with high sustainability goals
  - Establishment of a geothermal plant to serve the campus north of Grand
  - Roof top solar
  - Hybrid CLT/stick frame construction reduces embodied carbon
  - High-performance envelope
  - Landscape with native plantings and roof terrace with area of green roof

Key Project Considerations from Comprehensive Campus Plan



FOUR-LEAF CLOVER



ACTIVATING CAMPUS EDGE

FRAMING CAMPUS ENTRY

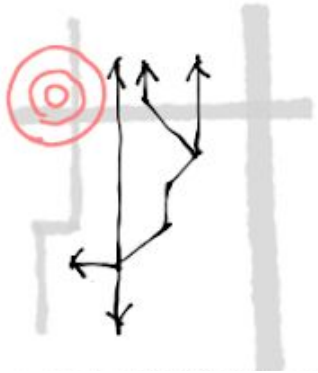
STATEMENT FOR SUSTAINABILITY

MEMORABLE ARCHITECTURE

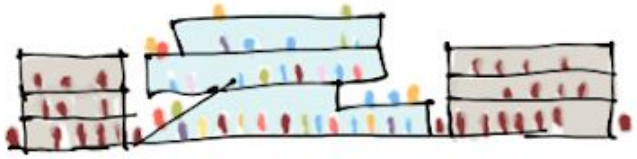
EXTENSION OF COMMUNITY & URBAN LIFE

EXTENDING THE GREEN INTERIOR & EXTERIOR

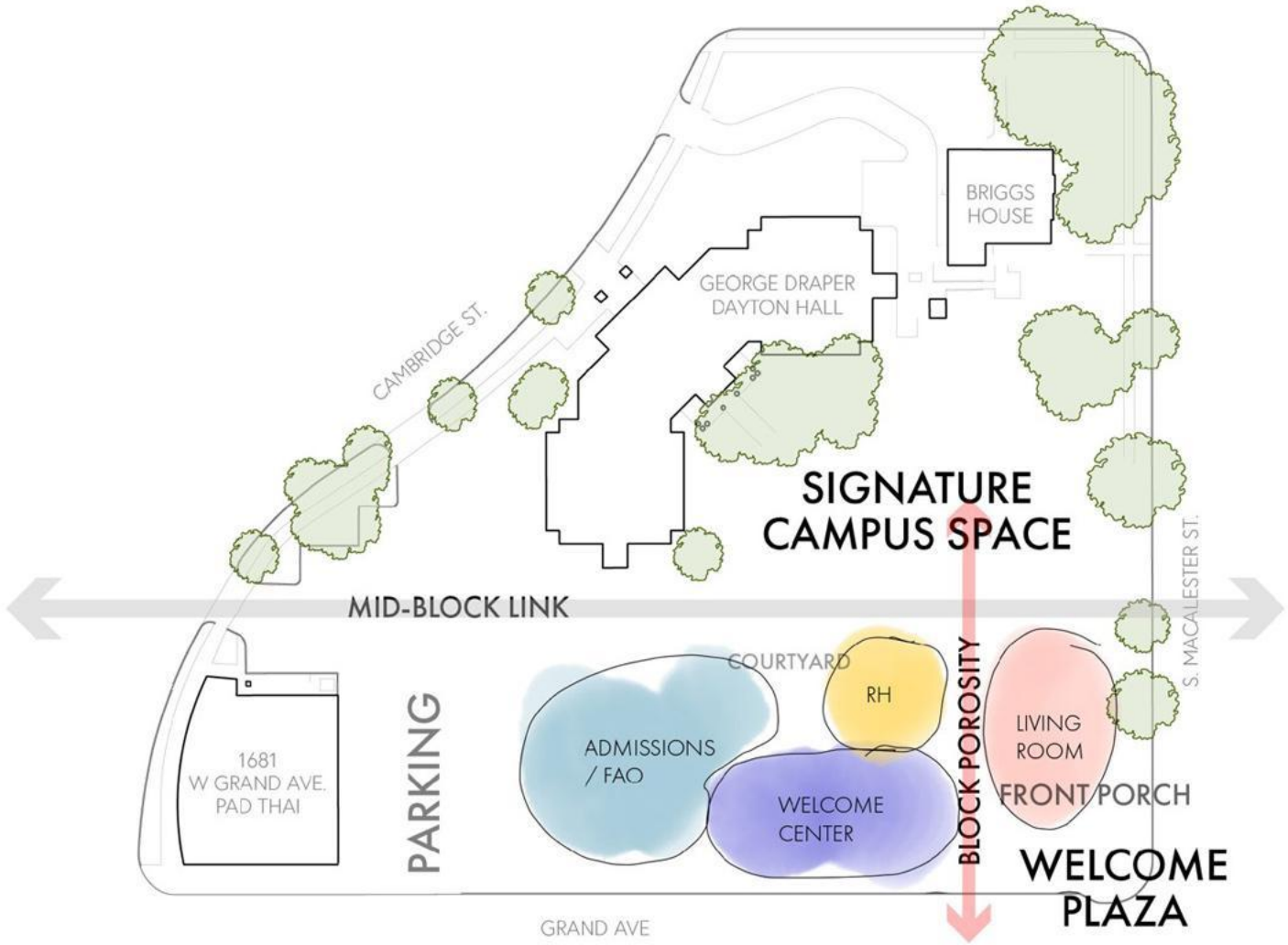
GLOWING WITH ACTIVITY AT NIGHT



IMPROVING PATTERNS OF MOVEMENT



FOSTERS SENSE OF INCLUSION AND BELONGING FOR ALL

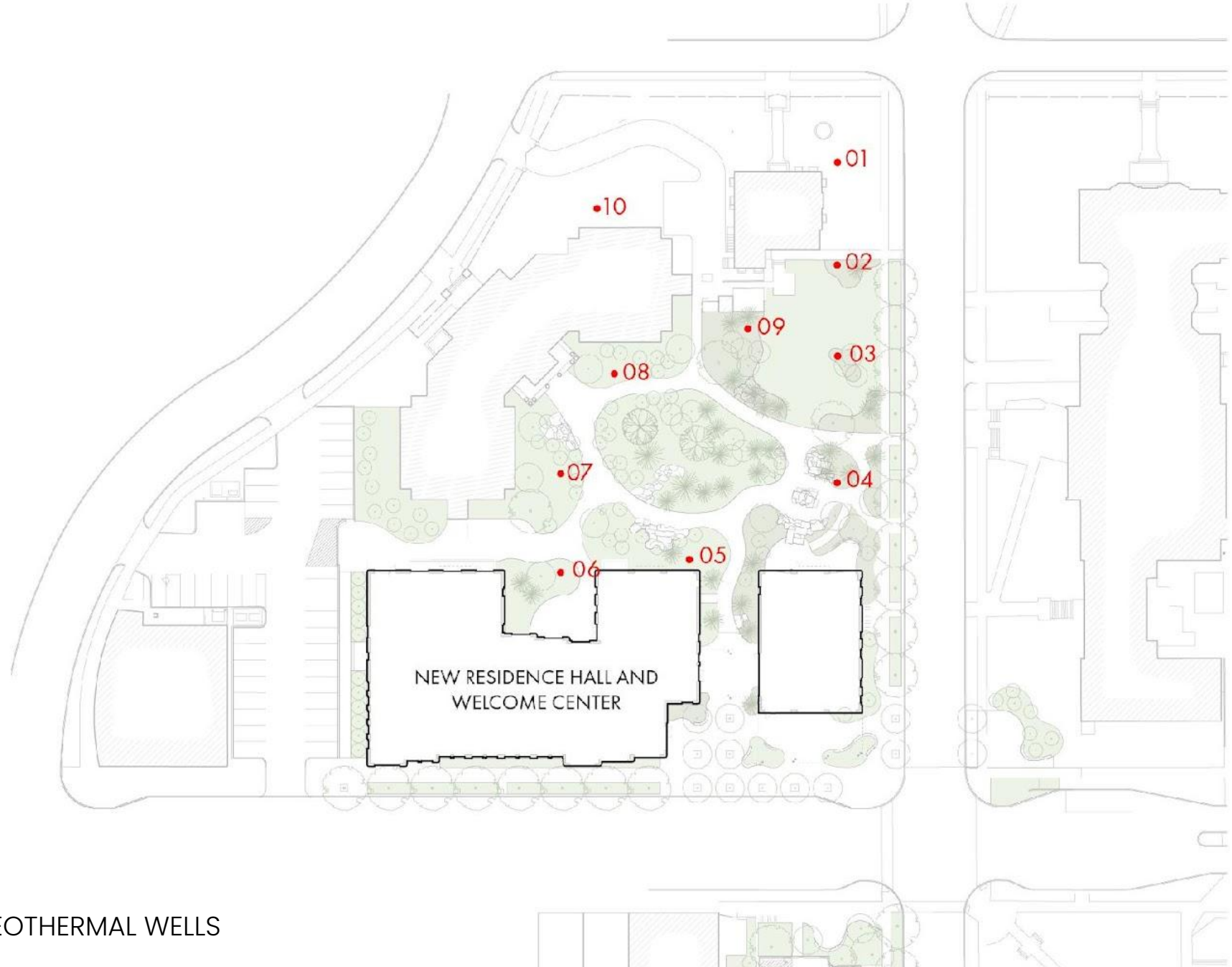


SITE DIAGRAM

VIEW FROM CAMPUS


SUMMIT AVENUE
CAMBRIDGE AVENUE
MACALESTER STREET
BRIGGS LAWN
NEW TRASH
NEW PARKING LOT
NEW RESIDENCE HALL AND WELCOME CENTER
CAFE
ENTRY PLAZA
GRAND AVENUE
POCKET PARK
NEW PARKING LOT
MACALESTER STREET

SITE PLAN



SITE PLAN WITH POTENTIAL GEOTHERMAL WELLS

STREET LEVEL PLAN

TYPICAL RESIDENCE HALL PLAN

MACALESTER STREET ELEVATION

VIEW FROM BRIGGS HOUSE LAWN

FROM GRAND & CAMBRIDGE


STUDENT TERRACE
PORTAL
PAD THAI
ADMISSIONS ENTRANCE
WELCOME CENTER
COFFEE SHOP ENTRANCE
BIGELOW

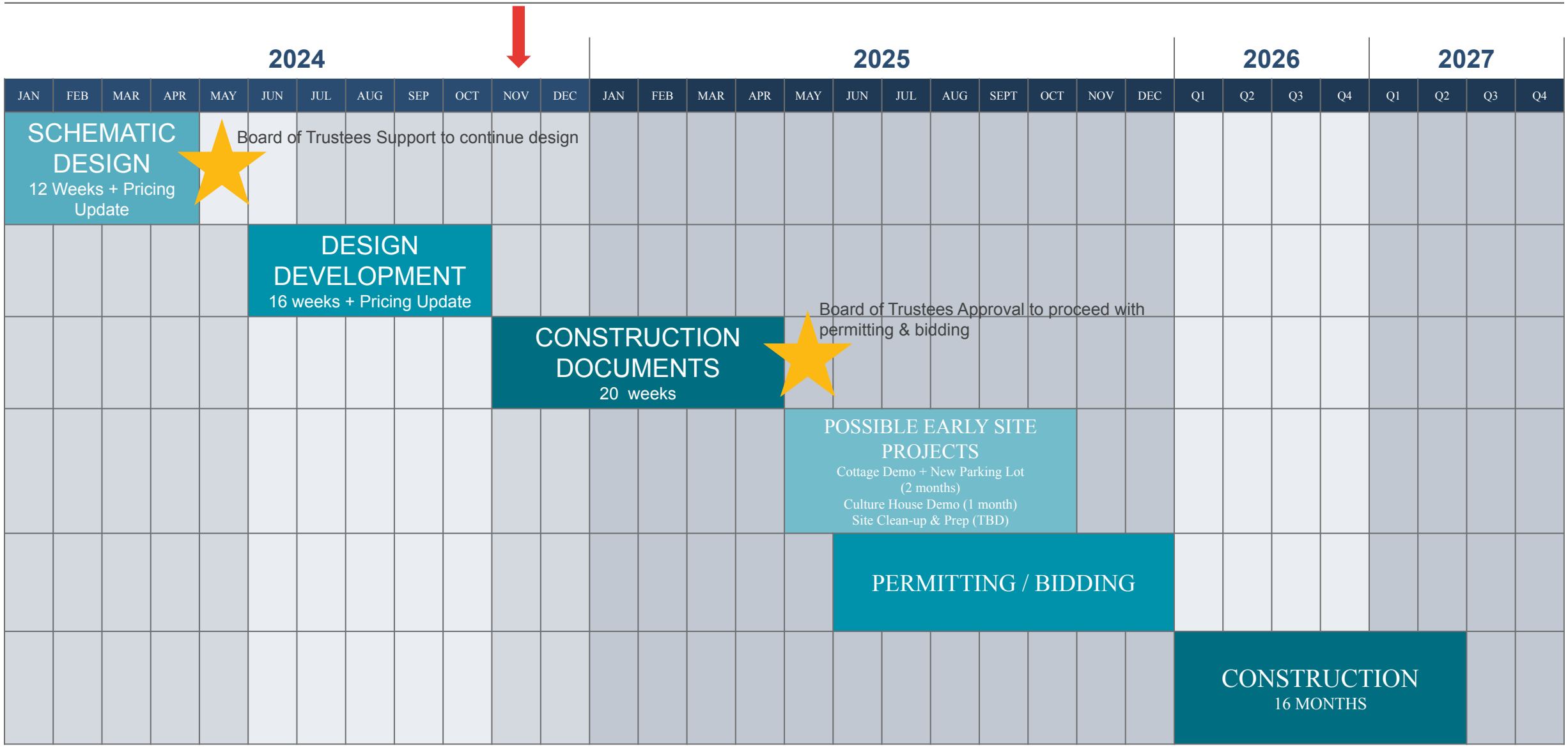
VIEW TOWARDS WELCOME CENTER

VIEW FROM CORNER

PROJECT SCHEDULE & CITY PROCESS

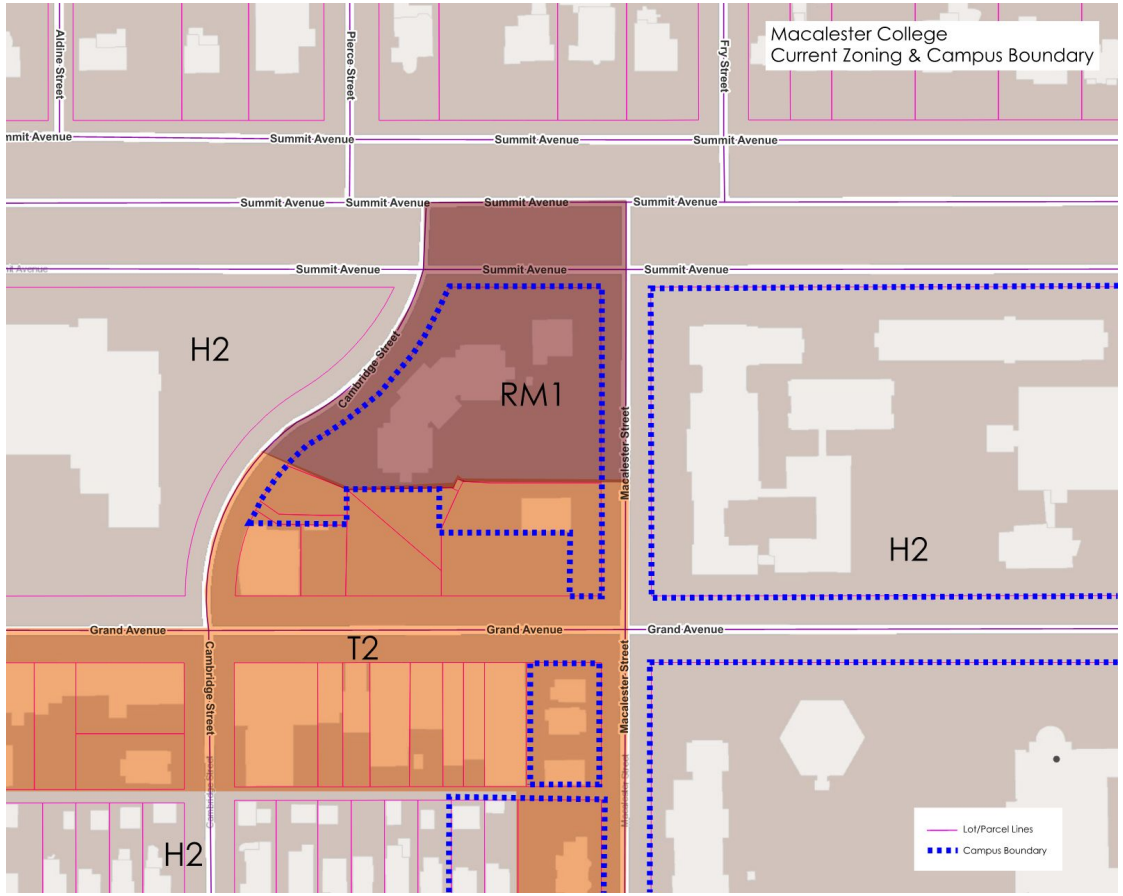
PROJECT SCHEDULE

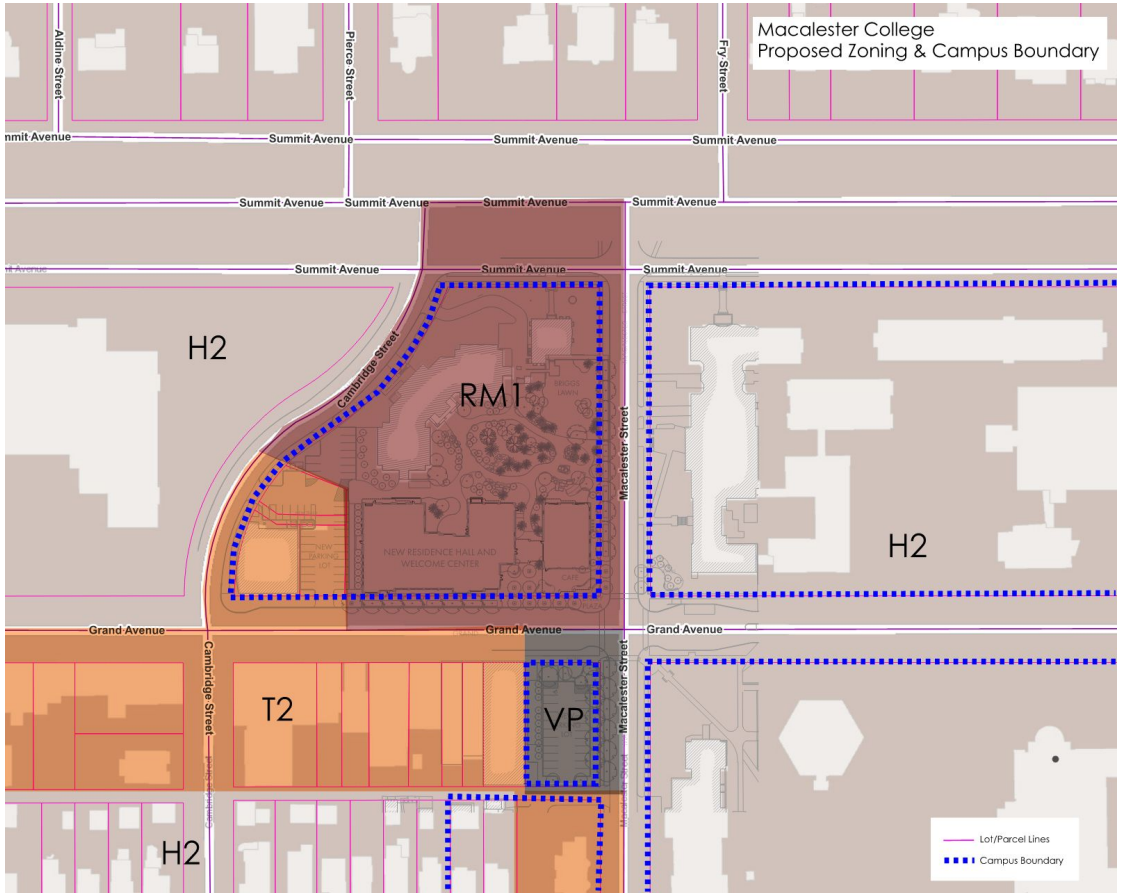
SCHEMATIC DESIGN THROUGH CONSTRUCTION START



RE-ZONING & CONDITIONAL USE PERMIT UPDATE

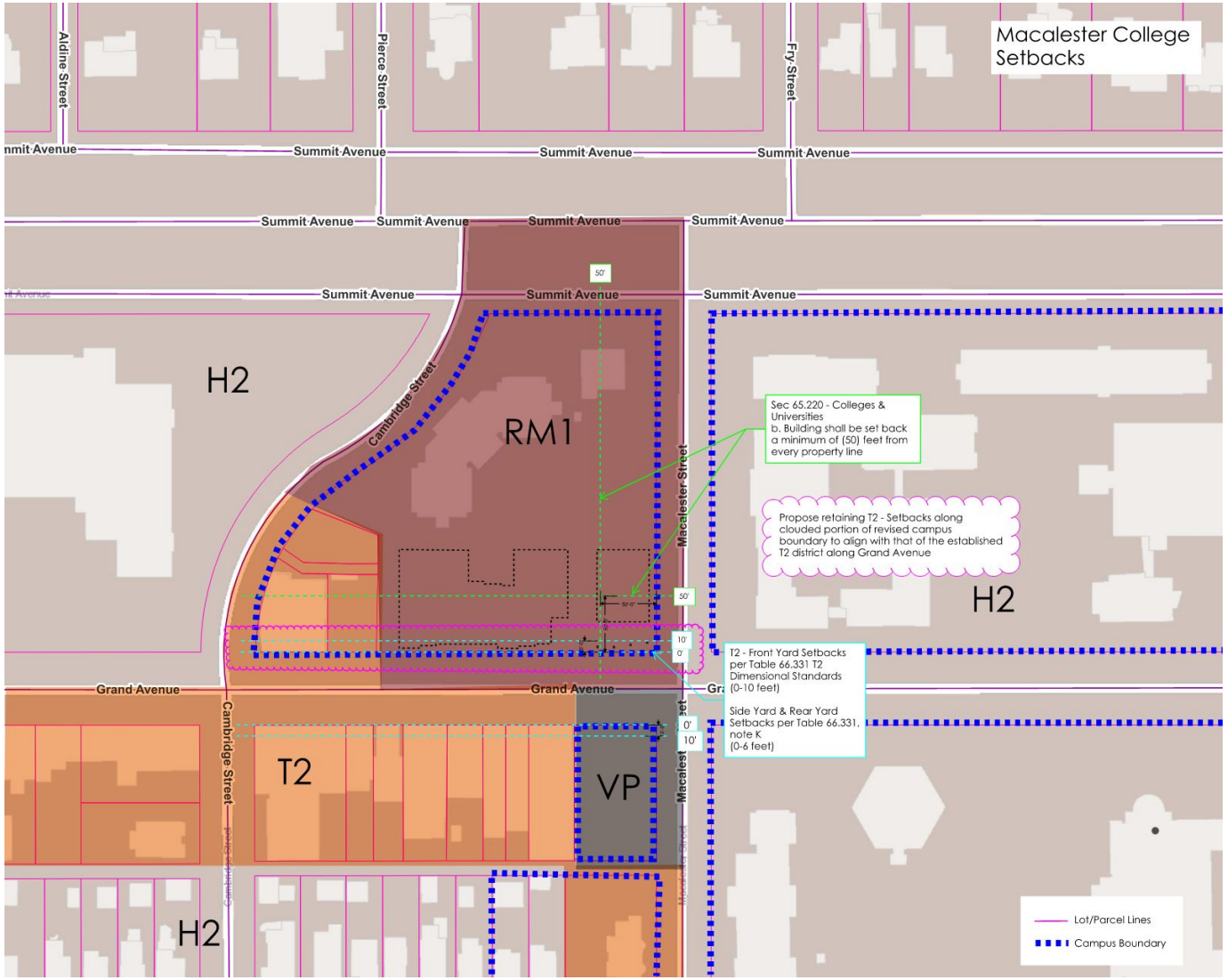
- Re-zone parcel for project from T2 to RM1 (to create one parcel for all residential uses on that block)
- Re-zone parcel for new parking lot from T2 to VP (to allow parking use)
- Update campus boundary to include all campus owned property on block north of Grand between Macalester & Cambridge





CONDITIONAL USE PERMIT UPDATE – SET BACKS

- Modify set back requirements for Grand frontage to align with T2 setback requirements that apply to the Pad Thai/Grand Cambridge parcel as well as the properties on the south side of Grand to maintain the character of the business district established along Grand – specifically front yard set back of 0 – 10 feet.
  - The intent of the new building is to align with the south face of the Pad Thai/Grand Cambridge building to create a consistent, urban street edge along Grand.



Geothermal Cut out of Budget from Detailed Estimate provided by McGough Contracting, Page 14 Item 11				
Mechanical	All in	For project		
Plumbing	$3,150,000	$730,139		
HVAC				
HVAC Ductwork/Sheet metal	$3,875,000	$796,953		
HVAC Piping	$4,300,000	$649,579		
HVAC Temperature Controls	$1,695,750	$368,450		
Darcy System well system	$4,437,000	$4,347,000		
Plumbing and HVAC Geothermal Total		$6,892,121		