UNIVERSITY OF WATERLOO

BUILDING & PROPERTIES COMMITTEE

WEDNESDAY, 17 May 2023
1:00 p.m.-3:00 p.m. EST
Via Zoom Videoconference

Open Session

1:00 p.m.	1. Declaration of Conflicts of Interest		
1:05 p.m.	2. Minutes of the 8 March 2023 Meeting and Business Arising [Chair]	3	Decision
1:10 p.m.	3. Work Plan Update [Willey-Thomas]	Oral	Information
1:15 p.m.	4. Capital Financing Commitments and Construction Status [Reitsma]		
	a. Capital Financing Commitments Report	6	Information
	b. Construction Status Report May 2023	7	Information
	i. Math 4 Building – Award of Construction Manager Contract	13	Decision
	c. Other Approvals		
	i. Chiller in Biology 1	15	Decision
	ii. Easement for Enova Power	16	Decision
	iii. HVAC and Related Roofs in Physical Activities Complex	23	Decision
1:25 p.m.	5. District Energy Study [Thijssen]	24	Discussion
1:40 p.m.	6. Deferred Maintenance Update [Elias, Reitsma]	34	Information
1:55 p.m.	7. President's Advisory Committee on Design (PACOD) Update [Reitsma]	36	Information
2:05 p.m.	8. Statutory Compliance Update [Raynard, Reitsma]	38	Information
2:15 p.m.	9. Building & Properties Committee Priorities for 2023-2024 [Gamble]	Oral	Discussion
2:25 p.m.	10. Other Business	Oral	Information
	11. Proceed to Confidential Session		Information

*to be distributed

swt/mb
10 May 2023

Sarah Willey-Thomas
Associate University Secretary

Upcoming Board and Committee Meetings and Events

11 October 2023	Building & Properties Committee
17 January 2024	Building & Properties Committee
6 March 2024	Building & Properties Committee

If you require assistance or need to convey regrets, please contact the Secretariat at board@uwaterloo.ca.

University of Waterloo
Board of Governors
BUILDING & PROPERTIES COMMITTEE
Minutes of the 8 March 2023 Meeting
[in agenda order]

Attendees: Peter Barr, Carol Cressman, Michael Eubanks, Murray Gamble (chair), Alice Raynard (secretary), Stephanie Ye-Mowe

Administration: Christiana Alkiviades, Stepanka Elias, Vivek Goel, Rob Hunsperger, Andrea Kelman, Jacinda Reitsma, James Rush

Guests: John Saabas, Mike Pereira, Mat Thijssen

Regrets: Naima Samuel

Organization of Meeting: Murray Gamble took the chair and Alice Raynard acted as secretary.

OPEN SESSION

1. DECLARATION OF CONFLICTS OF INTEREST
No conflicts of interest were declared.

2. REMARKS FROM THE CHAIR
The Chair welcomed everyone, noting the presence of the incoming Chair of the Committee, John Saabas, and thanked Peter Barr, Naima Samuel, and Stephanie Ye-Mowe for their service on the Committee as their terms will expire on 30 April 2023. The secretary advised that quorum was present.

3. AGENDA/ADDITIONAL AGENDA ITEMS
There were no additional items. The agenda was approved by consensus as circulated.

4. MEETING NOTES OF THE 18 JANUARY 2023 MEETING
The report was received for information.

5. BUSINESS ARISING FROM THE 18 JANUARY 2023 MEETING NOTES
There was no business arising.

a. **Resolutions by Electronic Vote**
    i. **Minutes of the 5 October 2022 Meeting**
    ii. **Optometry – Budget**
    iii. **Math 4 Building – Updated Recommendation**
    iv. **New Residence – Consultation Fees**

The report was received for information.

6. CAPITAL FINANCING COMMITMENTS AND CONSTRUCTION STATUS
a. **Capital Financing Commitments Report – March 2023.** The report was received for information.
b. **Construction Status Report – March 2023.** Hunsperger spoke to the various projects, noting :ESC, bids closed recently and will be presented later to B&P; Health Innovation Arena is well under construction, supply chain issues being managed; Math 4 design development report is complete and recommendation further to bidding process should be presented in May to B&P; Optometry bidding should be end of year/early next year; New Residence Building: some supply chain issues, discussion on side locations, design advancing and project should be presented at the October meeting.
   Members discussed: sound insulation due to LRT track; project is looked at from sustainability viewpoint, budget, comfort level, and passive house international standard used.

c. **Capital Financing Commitments Schedule – April 30, 2022.** The report was received for information.

7. ESC RENOVATIONS

Reitsma provides overview, noting uncertainty of costs, which have leveled off but are not dropping back, and the project was approved some time ago. Hunsperger spoke to report, noting ESC built in 1964, limited maintenance investments, functional obsolescence. The project will move the building from double-loaded to a single-loaded corridor and will include renovation of the roof and several items added as the building was being gutted.

Chair remarked on: bids were very close to each other; difficulty of budgeting projects depending on complexity and risks involved; some prices are stabilizing but markets remain volatile. Members discussed: contingencies being built into budgets; new project development process will limit such issues; expensive projects are not presented to B&P and returned to the drawing board; motion (2) relates to roofing, portioned to $1.2M that can be recovered and grant money being recovered.

[Action:] Tolerance cap on budget to be included on future budget recommendations.

The Committee heard the following motions:
(1) That the Building & Properties Committee recommend to the Board of Governors a $6.4m (25%) increase to the project budget. Cressman and Barr. Carried.
(2) That the Building & Properties Committee recommend to the Board of Governors the award of a stipulated-price contract (CCDC2) to Harbridge & Cross Limited in the amount of $23,005,000.00 (excluding HST). Eubanks and Cressman. Carried.

8. COMPREHENSIVE SUSTAINABILITY PROGRAM

Thijssen provided an overview of the background of the sustainability program: policies and guidelines for the framework and strategic plan and various plans for planning and direction-setting, noting milestones and progress achieved so far and committment to transparency. Recent projects include: replacement of faucets, showerheads, steam trap repairs; GreenX engagement programs; Sustainability Living Lab – collaborating with students, e.g., through capstone program. Next steps include: strengthening work across key operational practices (grounds, procurement, waste, commuting, air travel); scale and accelerate short-term energy/climate projects; build-out long term planning and more detailed technical roadmap.

Members discussed: number of targets for emissions 2025 and 2030, aligned to international framework; budget; connections with deferred maintenance; impact of ION on commuting considering pandemic; dedicated trails and bike lanes and municipal investments; benchmarking against peer institutions and in Times Higher Ed, internationally and with U6; federal contracts +$25 will need certain requirements to get funding; supply chain and vendors; living labs are a good idea for students.

9. DEFERRED MAINTENACE UPDATE

Reitsma provided background information on deferred maintenance (completed review, FRP funding, additional deferred maintenance funding; appropriations for deferred maintenance and capital needs, decentralized budget model). Background on sustainability projects (separate approval process, strategic initiatives fun). Next steps: procure sustainability projects for 2023/24; procure identified projects for FRP funding; prioritize remaining projects for $6M+ in funding; finalize priority setting process for Faculty input; ensure Integrated Planning and Budget updates address deferred maintenance; report project updates at each B&P meeting.

Members discussed: prioritizing maintenance vs. new buildings; culture change; underutilized space and shedding unused space; shouldn't be lots of new projects; deferred maintenance and modernizing existing facilities; moving the work of the Committee towards; risk matrix used and ERM program; buy-in from Faculties.

[Action:] This item to be on future agenda items to continue the conversation.

10. PROJECT PROCESS GUIDELINE

Reitsma provided an overview of capital project process and overall campus plan designs, which were presented at the President and Vice-President group and at the President's Advisory Committee on Design (PACOD). Reitsma indicated: challenges and opportunities had been identified; overview of current and proposed processes

to ensure meaningful input and approvals; updated PACOD duties and membership, and summary report to B&P; role of procurement team; better clarity of PACOD's involvement; proposed flow similar to other universities; project process of over $5M. engagement of PVP, space Office, Plant Ops, Provost).

Members received favorably proposed changes, noting regular engagement of PACOD is positive and proposed composition looks strong; on the possibility of external members on PACOD, it was noted there were already excellent internal resources.

11. AMENDEMENT OF TERMS OF REFERENCE – QUORUM

The Chair spoke to the report, providing background to the proposed motion. The double quorum doesn't serve its purpose. It might be pertinent in the case of very large capital projects, but rules of conflict of interest would be applied where necessary. Barr and Cressman. Carried.

12. EXECUTION AGAINST THE WORK PLAN

The document was received for information.

13. OTHER BUSINESS

There was no other business.

The Committee is scheduled to meet on Wednesday 17 May 2023, 1:00-3:00 p.m. via Zoom.

5 April 2023

Alice Raynard
Associate University Secretary

Report to the Building & Properties Committee
Capital Financing Commitments
May 2023

The Building & Properties Committee (B&P) reviews the summary of Capital Financing Commitments at each meeting.

Summary:

- Contributions to capital projects made in fiscal 2022/23 total $20.61M
- The University remains well within its approved policy limits and below the 4.0% of annual gross revenue maximum for principal and interest payments.

Highlights during 2022/23:

- The Faculty of Engineering repaid $3M to the DWE C Wing project.
- The Faculty of Health repaid $0.66M to the addition to BMH.
- The ancillary enterprises repaid $3.25M to capital projects as follows:
    - Campus Housing repaid $3.01M to CMH, UWP and MKV residence buildings.
    - Food Services repaid $0.14M to CMH project.
    - Parking Services repaid $0.10M to the EC5 project.
- The University collected $2.17M in student fees:
    - Health Services Addition $0.74M
    - PAC/SLC Addition $1.43M
- The University received donations and grants totaling $1.46M for various capital projects.
- The University allocated $10.07M to capital projects as follows:
    - Field House $4M
    - PAC/SLC $5M
    - Electric Charging Stations $0.07M
    - Innovation Arena furniture $1M.

Jacinda Reitsma
Vice-President, Administration & Finance

UNIVERSITY OF WATERLOO

DESIGN & CONSTRUCTION STATUS REPORT
April 2023

PROJECT	ESTIMATED COMPLETION	APPROVED BUDGET	CONSULTANT(S)	CONTRACTOR	PROJECT STATUS
Earth Sciences & Chemistry (ESC) Main campus (Third floor renovations)	Dec-2024	$28.75M	McCallum Sather (Architects, Mech.) Stantec (Electrical) Blackwell (Structural)	Harbridge + Cross Ltd.	• Bids closed February 16, 2023 • Total project budget increase approved by Faculty of Science • Building & Properties recommendation completed March 8, 2023 • Construction Contract preparation in progress following approval from Board of Governors on April 4, 2023 • Still awaiting substantial completion of ESC First Floor "enabling project" to decant Third Floor researchers
Innovation Arena Kitchener campus	Jan-2024	$36.19M	Diamond Schmitt (Architects), Smith + Andersen (M&E), RJC (Structural, MTE (Civil), SHIFT (Landscape)	Melloul Blamey Construction	• Tier 2 Risk Assessment and Record of Site Condition application to MECP complete. Awaiting Ministry Approval • Interior abatement and demolition complete • Underground utility connections to city infrastructure ongoing (ahead of schedule due to favourable winter conditions) • Interior mechanical and plumbing work ongoing • New exterior window openings underway • Revised schedule to be provided by Contractor (latest indicates March 2024 however looking to expedite the schedule i.e., change order for a different brick with shorter lead-time) • City of Kitchener Small Business Centre approval pending • Structural steel reinforcing at new second floor openings complete • Press/publicity event with Ontario Premier scheduled for April 13, 2023 • Velocity team has contingency plan in place to address possible delays, in collaboration with Space Planning

PROJECT	ESTIMATED COMPLETION	APPROVED BUDGET	CONSULTANT(S)	CONTRACTOR	PROJECT STATUS
Math 4 Main campus	Aug-2025	$110M	Moriyama & Teshima + Two Row (Architects), Blackwell (Structural), Introba, formerly Integral (M&E), RDH (Building Science)	TBD	• 60% Contract Document submission due April 6, 2023 for UW review • Anticipated building permit application: July 2023 • Construction to commence in late 2023/early 2024, pending approvals • Construction Manager Request for Proposal Bid Call was issued February 24, and closed March 30. Will be analyzed, scored and ready for May 2023 B&P recommendation
New Residence Building (NRB2026) Main campus	Aug-2026	TBD	Diamond Schmitt (Architects), Smith + Andersen (M&E), RJC (Structural, MTE (Civil), GSP (Landscape)	TBD	• Proceeding with Schematic Design for 510+ bed, 10 story residence with supporting student experience/amenity space, site design, and Shift Neutral sustainability design strategy, ready for costing and subsequent budgetary approvals. Discussion with City ongoing regarding holding provisions for proposed bridge to CMH (crossing LRT)
Optometry – Waterloo Eye Institute Main campus	Oct-2025	$50.34M	HOK (Architects), MCW (M&E), RJC (Structural), MTE (Civil), GSP, (Landscape)	TBD	• Design Development 100% complete • Design of program updates ongoing (in area formerly designated for surgical suites) • Schedule revisions in progress - waiting for consultant updates

Photo below – construction progress at Innovation Arena, Kitchener Campus

Rendering below – Math 4, view looking westward along Willian Tutte Way

Rendering below – New Residence Building (NRB2026), view looking westward along University Ave.

Rendering below – Faculty of Science, School of Optometry, Waterloo Eye Institute (WEI), view looking westward along Columbia Street

Report to the Building & Properties Committee
Proposed Math 4 Project
May 17, 2023

Recommendation:
That the Building & Properties Committee recommend the Board of Governors approve the award of a construction management contract (CCDC-5B) to Gillam Construction Group Ltd in the amount of $1,958,000 (excluding HST) plus reimbursable expenses, inclusive of a preconstruction fixed fee of $118,000 plus a 2.30% construction management fee (expressed as a percentage of the construction cost), and that the construction management contract will be converted to a stipulated price option once the construction phasing and logistics have been finalized and all bidding for the trade packages is complete.

Background:
At its September 2022 meeting, the B&P Committee approved the recommendation to the Board of Governors to construct the proposed Math 4 building with a total revised project budget of $110 million. At its January 2023 meeting, the B&P Committee further recommended to the Board to construct Math 4 using a construction management form of contract. Both recommendations were approved.

Moriyama & Teshima Architects are the prime consultants for the project.

During the initial phases of the design, both the design team and the independent cost consultant identified the rapid and volatile price increases being experienced within the construction industry. In order to address this situation, multiple cost estimates have been undertaken following an extensive value engineering exercise. The total building floor area remains unchanged at approximately 140,000 gross square feet. The recommended $110 million budget is based on 35% design development completion and assumes a Q3 2023 tender award which includes a 10% escalation contingency between August 2022 and Q3 2023.

The project currently has financial commitments totaling $75 million: (a) the Faculty of Mathematics has transferred $57.5 million to the project's capital account, and (b) the Provost has committed $17.5 million of institutional funding toward the project. The Faculty of Mathematics has made this project a priority in its ongoing fundraising activities. Any funding shortfalls related to the remaining $35 million will be funded by the Faculty over a 7-8 year period following building completion.

Building Specifics:
At approximately 140,000 gross square feet, the proposed building is planned to be 5 storeys including a mechanical penthouse at level 5 and is designed to seamlessly connect the Math & Computer Building with the Davis Centre while maintaining the integrity of the existing outdoor quad.

This new, state-of-the-art building will host research institutes in vital fields such as fintech, data science, and cryptography. Specifically, the building will accommodate Combinatorics and Optimization. Mathematics Business and Financial Technology, as well as the Centre for Education in Mathematics and Computing which plays a key role in the Faculty's extensive outreach program. The building is designed

to support enriched student experience by creating new social and collaboration spaces. It features classrooms and collision spaces to encourage interaction and collaboration among faculty, students, staff and external partners. It will accelerate leading-edge math and computer science research as well as foster a culture of innovation and collaboration. By creating a vibrant and singular environment, the building will support the Faculty attract more of the world's top math and computer science talent.

Procurement Summary:
University of Waterloo, Plant Operations issued the request for proposal for construction management services in February 2023 for the Math 4 construction project, using the 100% Design Development construction drawing package from the consulting team. More than 40 contractors downloaded the opportunity. Five bids were received.

Scoring was based on a combination of construction management fees, the submitted CCDC 11, (Contractor's Qualification Statement), the submitted construction management strategy, and a review of the resumes of the proposed staff assigned to the project.

Pomerleau, Ellis Don and Gillam Group were shortlisted and interviewed as the top 3 proponents. The interview panel included the Executive Director - Facilities, Senior Director - Planning, Design & Construction, Senior Construction Coordinator - Major Projects and 2 principles from Moriyama & Teshima Architects. Gillam was identified as the top scoring bidder.

Senior Director, Planning,
Design & Construction
VP, Administration & Finance

REPLACE CHILLER PLANT – B1

Biology 1, WR#51777
May 9, 2023

Recommendation:

The Buildings and Properties Committee approves the estimated project value of $6,731,446.57 for replacement of chillers at Biology 1 based on the Class B cost estimate from WalterFedy.

Background:

The chillers at Biology 1 provide chilled water to the campus district cooling system. One of the chillers has failed, and the other is running at 75% capacity. The design of a replacement chiller was competitively bid in January 2022. WalterFedy was the successful proponent and has completed the design and class B estimate. The design comprises replacing the existing chillers and their associated mechanical equipment. The new installation will also be capable of free cooling in the winter months, reducing our energy consumption.

The proposed project budget, including full HST, is:

	Estimated
Construction Costing Estimate	$5,435,314.69
Consultant Fees	$454,131.88
Construction Contingency (15%, rounded up)	$842,000.00
TOTAL	**$6,731,446.57**

The project will be partially funded through the 2023/24 FRP budget, with the majority of funding required in the 2024/2025 fiscal year. We are anticipating completing the majority of the construction during summer 2024.

ENOVA EASEMENT REQUEST

Report to Jacinda Reitsma, Vice-President, Administration, and Finance
Proposed easement to Enova Power
April, 20th, 2023

Recommendation:

The Building and Properties Committee recommends to the Board of Governors the granting of an easement to Enova Power of approximately 335.1m2 (0.083 acres) required for the replacement of the Hydro pole line along Bearinger Road.

Background:

To accommodate the new road work being managed by the Region, Enova Power intends to re-build the pole line along Bearinger Road. This new pole line is designed to accommodate future load growth for both the UWaterloo and the surrounding community.

Pending approval, Enova intends to commence their work in Q3-Q4 of 2023, prior to the Region beginning its road work in 2024.

We have reviewed the terms and conditions to ensure conformance with previous easements. Attached for your consideration is the following;

1) Easement request letter from Enova
2) Easement agreement form
3) Terms and conditions
4) Legal survey of the easement
5) Construction drawings

Jonathan D. Hyde Associate Director, Infrastructure Development

Location of Easement:

(Easement highlighted in red)

January 27, 2023

File:WA-O14-OH-W35

Attention: Jacinda Reitsma, Vice-President, Administration, and Finance
University of Waterloo
200 University Avenue West
Waterloo, Ontario

RE: Request of Easement - Pole Line Rebuild Bearinger Road, Westmount Drive to Pineridge Road

Dear Jacinda,

Enova Power is looking to rebuild the pole line along the subject location with additional feeders to accommodate system requirement due to future load growth. As shown in the enclosed A1-2245 we would require a 4.78m wide by 70.1m long blanket easement to be able to build infrastructure on north sides of the road.

Attached are drawing A1-2445, the Easement Agreement and the Terms and Conditions for review. If you are in agreement with the request, please kindly sign the agreement. If you have further questions I would be happy to provide answers.

Sincerely,

Eddie Richter
Engineering Technologist I
eddie.richter@enovapower.com
519-888-5154

Enclosed: Drawing A1-2245
Easement Agreement
Term & Condition

CC: Jonathan D. Hyde, Associate Director, Infrastructure Development
Stepanka Elias, Executive Director Facilities

Hydro Easement Agreement

Date: April 17 2023

Owner(s) Name(s): _____

Owner Address: _____

Phone Number: _____

Solicitor Information: _____

Email Address: _____

Description of Easement Requested at Owner's Address:

A roughly 4.78m wide by 70.1m long strip easement as shown in A1-2445 and 58R21687.

Attached Drawing Number: A1-2245, 58R21687 W.R. Number: 14481

Print Name(s): _____ Owner(s) Signature: _____

_____ _____

Eng File Number: WA-O14-OH-W35 Date: _____

The Owner agrees that the work of Enova Power Corp. will commence forthwith and this is your irrevocable authorization for us to register the easement against your property in the Land Registry Office; as consideration, Enova Power Corp. will pay for the survey costs, the preparation and registration of the reference plan and the reasonable legal costs of your solicitor in assisting you to provide the easement to us. In the event that you default on your agreement to grant the easement to us, we reserve the right to commence legal action against you to enforce the agreement. You also agree to have your solicitor obtain and register a postponement agreement for each mortgage/charge that is registered against your property so that easement will have priority over the mortgage/charge. If you have any questions or concerns, please call the Engineering Department at 519-888-5552.

Sincerely,

_____

Enova Power Corp

File Copy: ☐

Owner Copy: ☐

_____

Print Name

TERMS AND CONDITIONS OF THE EASEMENT

1. The Transferor doth grant, convey and confirm unto the Transferee, its successors and assigns, and anyone authorized by the Transferee, in perpetuity, the right and easement at any time to enter upon the lands herein described for the purposes of constructing, laying down and installing hydro and communication wires, cables, anchors, fixtures and equipment together with all appurtenances thereto in, over, under, upon and along the said lands, but excluding hydro poles and/or overhead wires/cables, with the further and continuing right to the said Transferee, its successors and assigns and its servants, agents and workmen and anyone authorized by the Transferee, to enter upon the said lands at any time to inspect, repair, alter, correct, operate, replace and keep and maintain at all times in good condition and repair the said hydro and communication wires, cables, anchors, fixtures and equipment and all appurtenances thereto, and for every such purpose the Transferee shall have access to the said lands and/or lands adjacent to the said lands, at all times by its agents, servants, employees, workmen and anyone authorized by the Transferee.

2. The Transferee covenants and agrees that, upon completion of any such work referred to aforesaid and undertaken hereunder, the Transferee will repair any damage done to the lands herein described and restore the surface of the lands and/or the Transferor's adjoining lands, to the same conditions as prior to the commencement of such work.

3. The Transferee acknowledges that there is no commitment from the Transferor to grant an additional easement for future connections to this easement.

4. The Transferee hereby indemnifies and saves the Transferor harmless from any and all direct costs, losses, damages and claims arising from the negligence or willful misconduct of the Transferee in the use of the easement lands.

5. The Transferor covenants with the Transferee to keep the lands herein described free and clear of any trees, buildings, including building projections such as window sills, chimney breasts, cornices, eaves and other architectural features, swimming pools, structures or obstructions as may be necessary for the use, operation, repair, replacement or maintenance of the easement and to use the lands herein described only in a manner and for purposes not inconsistent with the exercise of the rights created by this indenture and, without limiting the generality of the foregoing, only as a yard, lawn, garden, flowerbed, roadway, driveway or parking area and the Transferor agrees to not do or suffer to be done anything which might injure any of the works of the Transferee thereon. Notwithstanding the foregoing, the Transferor shall have the right to use the said lands to install and/or construct dwellings and garages provided that the location and design of any future installations and/or construction of facilities will be approved in writing by the Transferee (at no cost to the Transferor) prior to construction of such facilities, which approval shall not be unreasonably withheld or delayed.

6. The Transferee, by the acceptance and registration of the within Easement, agrees to be bound by the terms and provisions contained herein.

7. The burden and benefit of this Agreement shall run with the lands herein described and shall extend to and be binding upon and enure to the benefit of the parties hereto and their respective heirs, executors, administrators, successors and assigns.

8. This is an easement in gross.

SCHEDULE				
PART	LOT	TRACT	PIN	AREA m²
1	PART OF 26	GERMAN COMPANY TRACT	PART OF 22257-0013 (LT)	331.5

PLAN 58R-21687

Received and deposited

April 17th, 2023

Carolyn Adsett

Representative for the Land Registrar for the Land Titles Division of Waterloo (No.58)

PLAN OF SURVEY OF

PART OF LOT 26
GERMAN COMPANY TRACT

GEOGRAPHIC TOWNSHIP OF WATERLOO

CITY OF WATERLOO
REGIONAL MUNICIPALITY OF WATERLOO

SCALE 1 : 400

0 5 10 20 30 metres

VAN HARTEN SURVEYING INC.

THE INTENDED PLOT SIZE OF THIS PLAN IS 610 mm IN WIDTH BY 457 mm IN HEIGHT WHEN PLOTTED AT A SCALE OF 1:400

LEGEND:

—□—	DENOTES SURVEY MONUMENT SET
—■—	DENOTES SURVEY MONUMENT FOUND
CP	DENOTES CONCRETE PIN
IB	DENOTES .015 X .015 X 0.60 IRON BAR
SIB	DENOTES .025 X .025 X 1.20 STANDARD IRON BAR
SSIB	DENOTES .025 X .025 X 0.60 SHORT STANDARD IRON BAR
MTE	DENOTES MTE ONTARIO LAND SURVEYORS LTD.
1508	DENOTES STEWART McKECHNIE SURVEYING LTD.
P1	DENOTES DEPOSITED PLAN 58R-14517

BEARING AND COORDINATE NOTE:

1. BEARINGS ARE GRID BEARINGS AND ARE DERIVED FROM GPS OBSERVATIONS AND ARE REFERRED TO THE UTM PROJECTION, ZONE 17, NAD 83 (CSRS-2010) ADJUSTMENT.
2. DISTANCES SHOWN ON THIS PLAN ARE ADJUSTED GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY AN AVERAGED COMBINED SCALE FACTOR OF 0.999567
3. COORDINATES ON THIS PLAN ARE UTM, ZONE 17, NAD83 (CSRS-2010) ADJUSTMENT AND ARE BASED ON GPS OBSERVATIONS FROM A NETWORK OF PERMANENT GPS REFERENCE STATIONS.

UTM COORDINATES (METRES)		
POINT ID	NORTHING	EASTING
A	4 814 709.55	535 103.08
B	4 814 625.69	535 174.62
C	4 814 674.04	535 229.65

THESE COORDINATE VALUES COMPLY WITH SECTION 14(2) O.REG 216/10. THESE COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH THE CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

METRIC:

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT, THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THIS SURVEY WAS COMPLETED ON THE 28th DAY OF MARCH, 2023.

DATE: MARCH 30, 2023

RONALD MAK
ONTARIO LAND SURVEYOR

THIS PLAN OF SURVEY RELATES TO AOLS PLAN SUBMISSION FORM NUMBER 2203982.

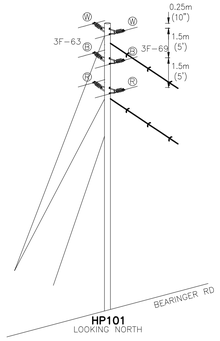
Van Harten
LAND SURVEYORS - ENGINEERS

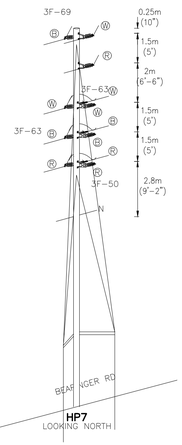
Kitchener/Waterloo	Guelph	Orangeville
Ph: 519-742-8371	Ph: 519-821-2763	Ph: 519-940-4110

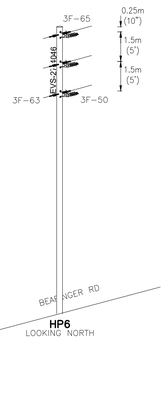
www.vanharten.com info@vanharten.com

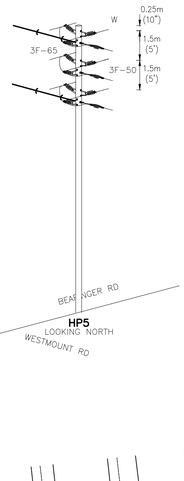
DRAWN BY: PJ | CHECKED BY: MS | PROJECT No. 32231-23

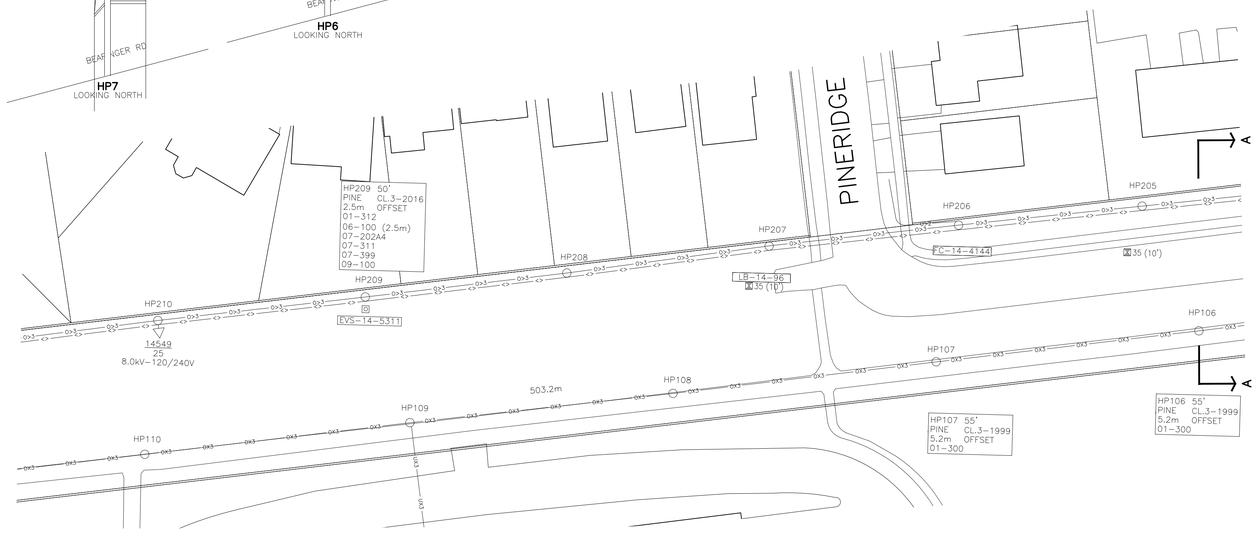
Mar 30, 2023-2:55:22 PM
M:\Geographic(KW)\WaterlooTWP\GCT 26\ACAD\R PLAN LT 26 GCT (32231-23) (UTM2010).dwg

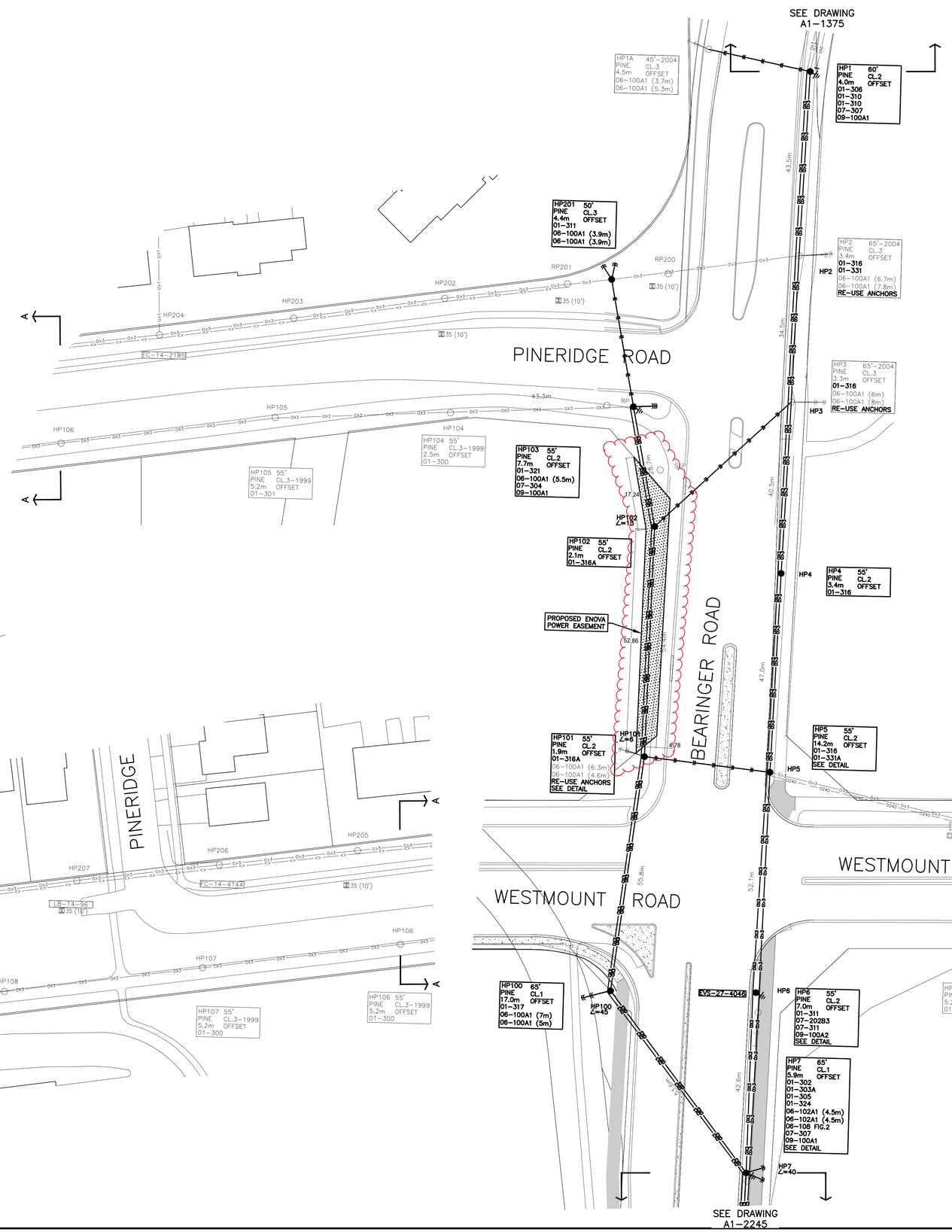


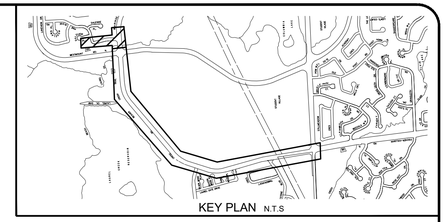












LEGEND

GND	GROUNDED CIRCUIT (EXISTING)
0×3	3ø 13.8/8.0kV OVERHEAD PRIMARY (EXISTING)
0×3	3ø 13.8/8.0kV OVERHEAD PRIMARY (NEW)
0×3	3ø 27.6/16.0kV OVERHEAD PRIMARY (EXISTING)
0×3	3ø 27.6/16.0kV OVERHEAD PRIMARY (NEW)
0×0	120V STREET LIGHT FEED (NEW)
0240	120/240V OVERHEAD SECONDARY (EXISTING)
	UTILITY POLE (NEW)
	UTILITY POLE (EXISTING)
	UTILITY POLE (REMOVE)
HP	HYDRO POLE
SLP	STREET LIGHT POLE
222	ADDRESS
	METER
WATTAGE/LENGTH	STREETLIGHT
	STREETLIGHT BREAKER
	POLE MOUNT TRANSFORMER (EXISTING)
	POLE MOUNT TRANSFORMER (REMOVE)
	GROUND ELECTRODE (NEW)
	GROUND ELECTRODE (EXISTING)
	SINGLE GUY AND ANCHOR (NEW)
	SINGLE GUY AND ANCHOR (EXISTING)
	SINGLE GUY AND ANCHOR (REMOVE)
	DOUBLE GUY AND ANCHOR (NEW)
	DOUBLE GUY AND ANCHOR (EXISTING)
	DOUBLE GUY AND ANCHOR (REMOVE)
	TRIPLE GUY AND ANCHOR (NEW)
	DOUBLE SPAN GUY (EXISTING)
	DOUBLE SPAN GUY (NEW)

Enova Power Corp.
Engineering Department

ISSUED
for

☐ approval ☑ review
☐ construction ☐ as built

signed: Eddie Richter
date: January 24, 2023

☐ Return to Eng ☐ Site Copy

No.	REVISION	DATE	INT.
1	REBUILD POLE LINE IN CONJUNCTION WITH REGION OF WATERLOO ROAD REBUILD AS PER WR#14481.	Jan. 24 2023	ER

REFERENCE DRAWINGS

- A1–1348 CONSERVATION DRIVE, ERBSVILLE ROAD TO SNOWCREST PL, WATERLOO
- A1–1375 ERBSVILLE ROAD, WIDEMAN ROAD TO CONSERVATION DRIVE, WATERLOO
- A1–1460 SCHNARR STREET, WEST OF ERBSVILLE ROAD, WATERLOO
- A1–2270 CONSERVATION DR, ERBSVILLE RD TO COMMUNITY FELLOWSHIP CHURCH, WATERLOO
- A1–2717 ERBSVILLE ROAD, CONSERVATION DRIVE TO KRESSLER ROAD, WATERLOO

PRELIMINARY

CERTIFICATE OF APPROVAL

THE INSTALLATION WORK COVERED BY THIS DOCUMENT MEETS THE SAFETY REQUIREMENTS OF SECTION 4 OF REGULATION 22/04.

Enova

ENOVA POWER CORP.

ERBSVILLE ROAD
WIDEMAN ROAD TO CONSERVATION DRIVE
WATERLOO

SCALE = 1:500

DESIGNED:	EDDIE RICHTER	2023.01.24
DRAWN:	EDDIE RICHTER	2023.01.24
CHECKED:	ROCKET WEI	
FILE NO.:	WA–014–OH–88	

DRAWING NO:
A1–2245

HVAC REPLACEMENT - PAC

Physical Activities Complex, WR#51739
May 9, 2023

Recommendation:

The Buildings and Properties Committee approves the estimated project value of $6,325,869.95 for replacement of air handling units at the Physical Activities Complex and related roofs, based on the Class D cost estimate from Englobe Corp and WalterFedy.

Background:

Englobe Corp. and WalterFedy were engaged to assess and design replacements for air handling units (AHUs) at the Physical Activities Complex and related roofs. All reached the end of their effective service life. The mechanical equipment is estimated to be original to the building circa 1966 and has begun to fail.

In line with our sustainability commitments, it was decided to replace the existing steam coil units with hot water coils and a heat exchanger in the basement to prepare for a shift away from steam in the future.

After reviewing the existing structure, the structural engineer reported that the existing sloped roofs do not meet building code – current and/or at the time of construction in 1965 – and recommended structural repairs at each.

The consultant was asked to provide a Class 'D' cost estimate for the project as part of the design process. The proposed project budget, including full HST, is:

		Estimated
Construction Costing Estimate		$5,151,693
Consultant Fees		$386,377
Construction Contingency (15%, rounded up)		$787,800
	TOTAL	**$6,325,869.95**

The project will be partially funded through the 2023/24 budget year, with most of the work being funded through 2024/2025. We anticipate completing the design and tender this summer, with construction starting next year.

DISTRICT ENERGY SYSTEM DECARBONISATION STUDY

OVERVIEW FOR BUILDING & PROPERTIES COMMITTEE

1. EXECUTIVE SUMMARY

- Waterloo's District Energy System (DES) is a core feature of campus development, but is aging and is the primary source of direct greenhouse gas emissions for the University of Waterloo
- For the past six months, Plant Operations and the Sustainability Office worked with Doherty Engineering to develop a preliminary analysis and series of scenarios on how the DES can develop:
    - **A business as usual scenario** – renewing systems largely like-for-like
    - **An electrification scenario** – renewing systems and replacing with electric steam boilers
    - **A heat pump scenario** – converting the DES from steam to hot water, integrating air and ground-source heat pumps, and undertaking significant building-level retrofits
- In all scenarios, Waterloo will need to make significant investment into the DES, to renew existing infrastructure and enable a future-ready campus
- Each scenario comes with benefits and risks, and there are possibilities of hybrids between the approaches to optimize those benefits and minimize risks
- Plant Operations and the Sustainability Office are continuing to iterate on the technical assessments and costs of each scenario, and are combining with other building-side deferred maintenance needs
- This update is to provide preliminary findings for PVP, and to seek PVP's guidance on next steps.

2. BACKGROUND

The DES Decarbonisation Study was undertaken to provide an understanding of the technical pathways to decarbonise the University's DES. The DES supports about 75% of Waterloo's heating and cooling needs, and commensurate energy consumption and emissions. It utilizes gas-fired steam boilers for heating needs across connected buildings, and various electric chillers for space cooling.

The study was motivated by actions 24 and 25 of the *Shift:*Neutral climate action plan, which call for such a study to assess feasibility of various options as part of a larger utility planning process. *Shift:*Neutral emphasizes investments in building-related efficiency and renewal projects to reduce final energy demand. However, even with deep energy retrofits, the campus cannot fully decarbonize until its energy supply also reduces its emissions intensity.

It is also timely to explore this long-term planning of the DES in light of its age and condition. As many of the system components require renewal in the coming decades, it will be important to ensure that these investments do not become sunk costs, that they enable long-term campus development consistent with stated emission reduction goals, and that they are coordinated and managed to reduce risk. The project connects with several other plans and preliminary studies, including:

- Energy Audits of campus buildings, which were completed in 2020/21
- Condition assessments of campus buildings, which have been completed over 2021/22
- Condition assessment of the DES distribution system, which was completed in 2022
- Future assessments on feasibility for renewables integration, which would connect to this study, and
- Future redevelopment of the Campus Master Plan, which should be informed by infrastructure needs.

Waterloo selected Doherty Engineering through a competitive process to complete the study. Doherty brings considerable experience working on district energy systems within the public and private sectors, with higher education campus experience on highly comparable projects. A core project team from Plant Operations and the Sustainability Office led the University's participation and facilitated 3 input sessions that included the President's Advisory Committee on Environmental Sustainability and its Climate and Energy Working Group, as well as faculty administrative representatives, key academic support units, and students. The team also hosted an open house for faculty members with specific research expertise in energy and climate change, to gain insight from on-campus expertise.

3. APPROACH

Over a period of approximately seven months, Doherty worked through several phases to develop the final project report, including:

- Reviewing existing documentation, site walkthroughs, and interviews with key personnel to gain an understanding of the DES.
- Identifying major current technology options that could be integrated in the DES over time. This included gas and electric boilers, chillers, solar thermal and solar PV, cogeneration, air and ground-source heat pumps, wastewater heat recovery, hydrogen fuel cells, small modular reactors, renewable natural gas, carbon capture and storage, and battery and thermal energy storage. Design concepts were narrowed to those technologies which were commercially viable and practical.
- Designing three conceptually distinct scenarios using combinations of these technologies and various distribution approaches, as well as a business-as-usual scenario. These scenarios were:
    - **Option 1**: Electric steam boilers replacing gas boilers over time
    - **Option 2**: A transition from steam to hot water, and phased integration of electric hot water boilers and air/ground source heat pumps
    - **Option 3**: Development of a passive campus thermal energy loop, with heat pumps exchanging energy at each building. In a greenfield development, this has tremendous potential, but working with existing infrastructure makes this option very difficult, and it was decided not to proceed to design concept.
- Order of magnitude cost, energy, and emissions estimates for options 1 and 2, as well as potential phasing strategies to align with climate targets and DES needs and other recommendations and opportunities/challenges assessments.

Although the final report articulates two distinct design scenarios through Option 1 and Option 2, these are not mutually exclusive, and there exists opportunity for hybrid approaches and modifications to the phasing that can be further developed.

4. LIMITATIONS

The following are limitations that should be noted in the study design and its outcomes, as well as assumptions and approaches that were used to deal with limitations:

- **Building-level energy data:** Existing data is limited or of poor accuracy, which can lead to over/underestimation of building loads in some areas. Analysis was based on aggregate campus intensities while considering estimates from the 2021/22 Energy Audit.
- **Peak demand profiles:** Regression analyses were used to model thermal peak loads, which is critical for understanding peak capacity needs.
- **Growth trajectories:** The Campus Master Plan (CMP) requires updating, especially given changes from the pandemic and other demographic and sector-wide shifts. To model campus growth, we scaled back to 50% of the growth projections of the CMP.
- **Demolitions:** The current CMP identifies certain buildings that should be considered for demolition, but this has not advanced. All UW space is currently assigned and continues to undertake occupant-driven renovations. The study assumes all current buildings would remain in place, which may overestimate long-term demand.
- **Focus on DES:** For logistical reasons, the building energy audit and DES study were completed independently, but in practice the findings are highly interactive. Changes at the building level (envelope or HVAC) could dramatically decrease DES loads, while changes to the configuration of the DES would require building-level changes. For this study, Doherty assumed “no changes” to building-level energy performance.
- **Cost of buildings:** For the reason above, this study does not include the cost of building upgrades and integration that will be needed to transition the DES system. Nor does it include the Deferred Maintenance work that will be required for buildings even in the BAU Scenario.

- **Geotechnical information:** Waterloo Region restricts the use of closed-loop geo-exchange systems to protect groundwater. Open-loop systems are possible, but they require geotechnical assessment to assess hydrogeological characteristics and energy exchange potential.
- **Load balancing and renewables:** The study did not model the introduction of batteries, renewables, or thermal energy storage technologies. Use of these technologies will be important as they can significantly reduce energy peak demands in all scenarios, but particularly in Options 1 and 2. Further study will be needed to determine integration potential and financial impact.

5. SCENARIO DEVELOPMENT

Given these assumptions, Table 1 provides a high-level description of the potential options explored.

Table 1: Description of BAU and Option 1/2

	BAU	OPTION 1	OPTION 2
General description	Largely replaces like-for-current at lifecycle, on both steam and chilled water	Electrifies the boilers within the Central Plant but remains on steam, with gas backup The chilled water system remains largely the same	Converts in phases from steam to hot water, and divides the campus into 3 proposed nodal systems, integrating GSHP/ASHP, electric boilers, and potentially other technologies
What happens to the distribution network	This largely remains as-is, with incremental refurbishment and replacement over time	This largely remains as-is, with incremental refurbishment and replacement over time	The distribution network would convert in phases to hot water, and would divide the distribution into 3 nodes, with a south, central/east, and north/west division, each with an energy plant servicing the needs of that node/area; generally, moving from the south "up" the campus
Where is energy coming from	**Heat:** Steam will continue to come from the Central Plant, distributed through the existing steam network **Cool:** Chilled water will continue to come from the existing nodal chilled water network	**Heat:** Steam will continue to come from the Central Plant, distributed through the existing steam network **Cool:** Chilled water will continue to come from the existing nodal chilled water network	**Heat:** Heat would come from a mix of gradually phased-in electric hot water boilers and ground & air-sourced heat pumps **Cool:** Would phase-in ground and air-source heat pumps alongside chillers
What needs to happen at the building level	No additional work is needed at the building level, but ECMs would still reduce overall energy requirements	No additional work is needed at the building level for compatibility, but ECM projects and deep retrofits would have major impact on electricity demand reductions	Buildings will need to convert in phases to have heating systems that can accept lower-temperature hot water. These will need to be coupled with deep retrofits to reduce demand and heating loads.
Phase 1 (2023-2033)	**Cool:** Refurbishment of chillers in B1, CSB, HH	**Heat:** New electric steam boiler in CSB **Cool**: Refurbishment of chillers in B1, CSB, HH **Elec:** Additional electrical capacity connected to support boiler	**Heat**: New electric steam boiler in CSB **Cool:** Refurbishment of B1 and CSB chiller plants **Elec:** additional electrical capacity to support steam boiler **Phase 1.5:** South Energy Plant **Heat:** New GSHP and electric hot water boiler for south campus loop **Cool:** Replacement of HH chiller at end of life **Elec:** Additional capacity to support the south energy plant **Dist**: Conversion of steam to hot water for South Energy Plant
Phase 2 (2034-2043)	**Heat:** Refurbishment of CSB boilers **Cool:** Refurbishment of PHY chiller	**Heat:** Replacement of 1 gas steam boiler in CSB for backup heat; New electric steam boiler in CSB **Cool:** Refurbishment of PHY chiller **Elec:** Additional electrical capacity connected	Central/East Energy Plant **Heat:** Replacement with 1 gas hot water boiler for backup heat in CSB, 1 new electric hot water boiler for supplemental load, and GSHPs in CSB **Cool:** Refurbishment of PHY Chiller **Elec:** Additional capacity needed for CSB **Dist**: Conversion of steam to hot water for Central/East Plant
Phase 3 (2044-2052)	**Cool:** Refurbishment of B1 chiller plant	**Heat:** New electric steam boiler in CSB **Cool:** Refurbishment of B1 chiller **Elec:** Additional electrical capacity connected	West Energy Plant **Heat:** New west Energy Plant with GSHPs & ASHPs, 1 new electric hot water boiler for supplemental load, refurbishing of electric steam boiler from Phase 1 to hot water **Cool:** Refurbishment of B1 chiller plant and ASHPs **Elec:** Additional capacity needed for West Plant **Dist:** Conversion of steam to hot water for West Plant

6. FINDINGS AND OUTPUTS

Reflecting on these designs, Doherty provided order of magnitude assessments on key KPIs and on other considerations and challenges/opportunities for each scenario. These are summarized in **Table 2**, and include Waterloo's interpretations on some of the study findings.

Table 2: Scenario Outcomes and Challenges/Opportunities

	BAU	OPTION 1	OPTION 2
Annual emissions – end state (OOM)*	Very slight decrease from baseline but would remain over 26,800 tCO_2-e in 2050s	100% reduction in Scope 1 emissions by 2050s, approximately 10,500t CO_2-e in Scope 2 by 2050s (60% reduction from BAU)	100% reduction in Scope 1 emissions by 2050s, approximately 8,800t CO_2-e in Scope 2 by 2050s (67% reduction from BAU)
Annual energy consumption – end state(OOM)	146M ekWh Combined heating and cooling (141M gas, 5.5M electrical)	117M ekWh Electrical	98M ekWh Electrical
Energy supply risks & opportunities	In the short term, there is sufficient capacity. There is long-term risk that an effective global and local decarbonisation transition could leave Waterloo with stranded gas-based assets where dwindling numbers of ratepayers are responsible for fixed system costs.	There is substantial need for new electrical power, almost doubling current annualized consumption and requiring increased capacity for peak demand. This will be difficult to achieve and the local power company might not be able to provide sufficient electrical power. The campus would still require high-grade energy inputs to generate steam.	There is substantial need for new electrical power. Although the total annual consumption is lower than option 1, peak needs will remain high and will be very difficult to supply. However, the hot water could allow integration over time of a mix of other technologies and energy sources that cannot provide high-grade heat.
Reputational risks & opportunities	Waterloo will be unable to hit medium-long term GHG targets. Demand-side changes can *reduce* emissions, but will not reach long-term goals. Waterloo's brand of innovation would be at significant risk.	Waterloo would substantively reduce emissions, and with Provincial grid improvements, the University could decarbonize. There would be medium reputational benefit beyond emissions, as the technology isn't necessarily innovative.	Waterloo would substantively reduce emissions, and with Provincial grid improvements, the University could decarbonize. There would be high reputational benefit for a mix of innovative technologies, and ability to connect more easily with a range of possible future technologies.
Operational risks & opportunities	The system would operate per current, which enables centralized simplicity. Running a legacy system, there is already increasing pressure to find qualified operating engineers, steamfitters, and other key personnel to maintain the Plant over time, as well as difficulty finding replacement components.	The system would operate per current, which enables centralized simplicity. The same staffing pressures for the steam system would remain. There would remain limited ability to manage demand, for example through Thermal Energy Storage, due to high temperatures, and distribution losses would remain relatively high.	The system would have very different operating needs, requiring new training and expertise on heat pumps and increased complexity of systems. However, as this is a design trajectory for many emergent community DESs, staff skill sets, training, and system components are likely to have increasing supply (and demand) in coming years. Compared to BAU and Option 1, it is more efficient on electricity consumption, with lower distribution losses and ability to integrate Thermal Energy Storage.
Planning and coordination risks & opportunities	There would not need to be substantial planning and coordination at the DES level, although deferred infrastructure-related retrofits and replacements would need to be managed.	There would not need to be substantial planning and coordination at the DES level, although deferred infrastructure-related retrofits and replacements would need to be managed. Very substantial planning with Enova would be necessary.	There would need to be substantial coordination with capital planning, space/end users, system operators, and Enova, at both the DES and the building level.

**Scope 2 assumes the forecasted carbon intensities of the IESO through the 2040s, which have an over 400% increase in carbon intensity of electricity. There is increasing pressure for development of low-carbon grids that could substantially reduce Scope 2 emissions.*

As can be seen, there are a number of different considerations that need to be integrated. In general, the BAU and Option 1 have low complexity, but BAU is incompatible with Waterloo's climate targets and risks leaving stranded assets and skill gaps as broader energy systems approach decarbonisation. Option 1 remains low-complexity and has low change requirements to the buildings, but has limited energy efficiency gains and the high thermal energy density would restrict the type of future technologies that could be integrated. Option 2 is much more complex, with significant change involved in both buildings and the DES, but offers efficiency gains and flexibility in other thermal energy technologies over time.

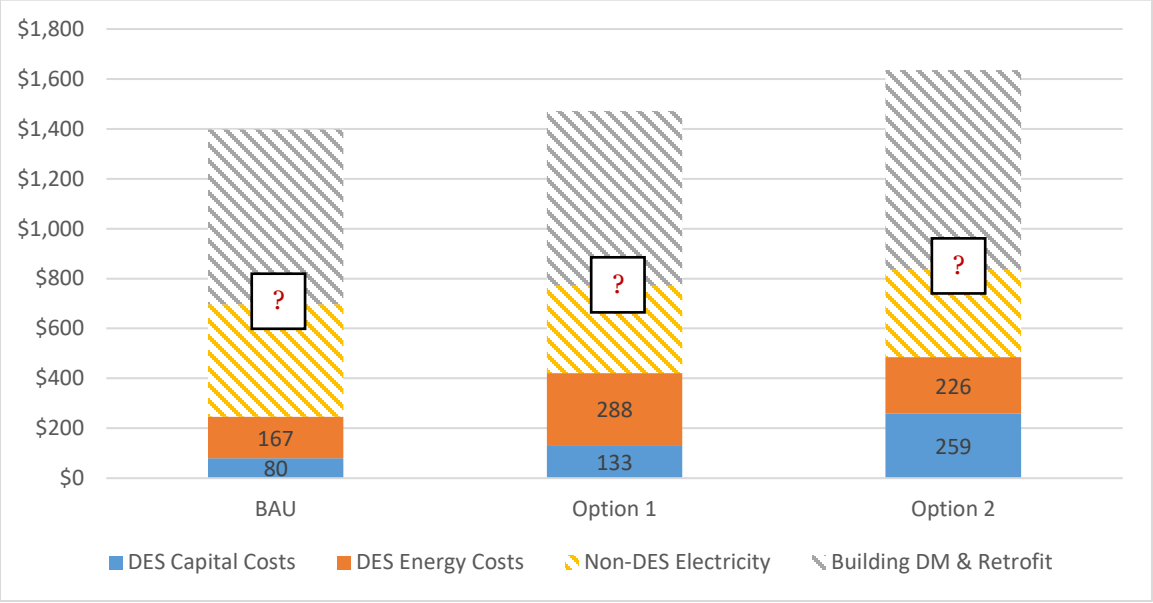
Finally, Doherty presented order-of-magnitude cost estimates for each of the three scenarios, including capital costs, operating costs, and energy costs. While the project team is including these for transparency,

it is extremely important to note that these are very preliminary estimates, and are not inclusive of all building-related changes. The DES cost estimates will be subject to much more rigorous design, as well as deeper integrated modelling with building-side changes. It should also be reinforced again that as concept scenarios, it is very possible to iterate additional options that explore hybrids of other technologies and distribution strategies.

While BAU had the lowest present value cost, and Option 2 the highest, the Sustainability Office and Plant Operations wanted to present this in **Figure 1** to place them in the context of other system-wide changes that would be needed. This includes building retrofits and deferred maintenance, and other energy costs not strictly related to heating/cooling which would be influenced by retrofits. The representations here are not to scale, and additional modelling and estimation of the interaction between these cost profiles is being undertaken. More accurate Scenario development would need to be iterated as better building data and other study limitations are addressed in the coming years (See section 8 on next steps).

An important takeaway is that in all scenarios, including BAU, there will need to be significantly scaled investments in the DES and buildings.

Figure 1: Cost Profiles for Scenarios ($Millions)



Finally, it should be noted that the BAU costs for natural gas were based on historical prices, which have had high volatility (increases and decreases) on global markets during the second half of 2022 due to the war in Ukraine and resulting energy cost spikes. While the study assumed an increase in gas prices marginally ahead of the historical rate of inflation, this may be severely underestimating price and associated cost risks. Electrification pathways explored in Option 1 and Option 2 are also subject to electricity price fluctuations, particularly as the electricity market structure shifts toward demand-based pricing (when energy is used) rather than strictly consumption (per kWh), but there are opportunities to insulate costs through energy storage, renewables, and a generally more regulated market.

7. OTHER KEY RECOMMENDATINS

Finally, Doherty provided additional 25 additional recommendations for Waterloo to take next steps based on the findings of this study. The completed report will highlight those in greater detail, some of which are highly technical. The most important recommendations include the following:

- More stringent guidelines for building retrofits will need to be created to ensure compatibility with future systems – similar to new building guidelines
- The short-term (2025) target will need to prioritize demand-side building changes
- Additional data collection – from buildings and better understanding of DES loads – will be important to increase the accuracy of planning
- Conversations with local utility companies will need to begin to ensure capacity planning
- Additional feasibility studies will be necessary for solar PV and open-loop geo-exchange borehole testing
- An electric boiler in CSB will be highly important to reach the 2030 target, regardless of what other DES changes are implemented
- Planning directions will need to be stashed in the short-term on whether the campus will undertake a conversion to hot water

8. NEXT STEPS

Recognizing the above findings and remaining uncertainties, the project team and other staff are undertaking the following next steps:

1. **Continuing implementation of early projects** – consistent with recommendations 1-5, 10, 12, and 13 there is already work underway on immediate action items
2. **Data improvement** – particularly on energy use at the building level through submetering, which is already underway
3. **Modeling of DES + building changes** – work is being done to develop a model of the interactions between building-side demand changes, such as energy conservation projects and deep retrofits, and the findings of the DES. This will be iterative and will become an ongoing project, with reliability improving as data quality and project experience increases.
4. **Linking deferred maintenance** – as part of the energy modelling, work is underway to identify overlap with key building systems (electrical, mechanical, and envelope, for example) that have renewal needs, now and over time, in order to better understand phasing opportunities and total system costs.

7. WHAT WE NEED FROM PVP

Reflecting on the above, we would be looking for the following input today:

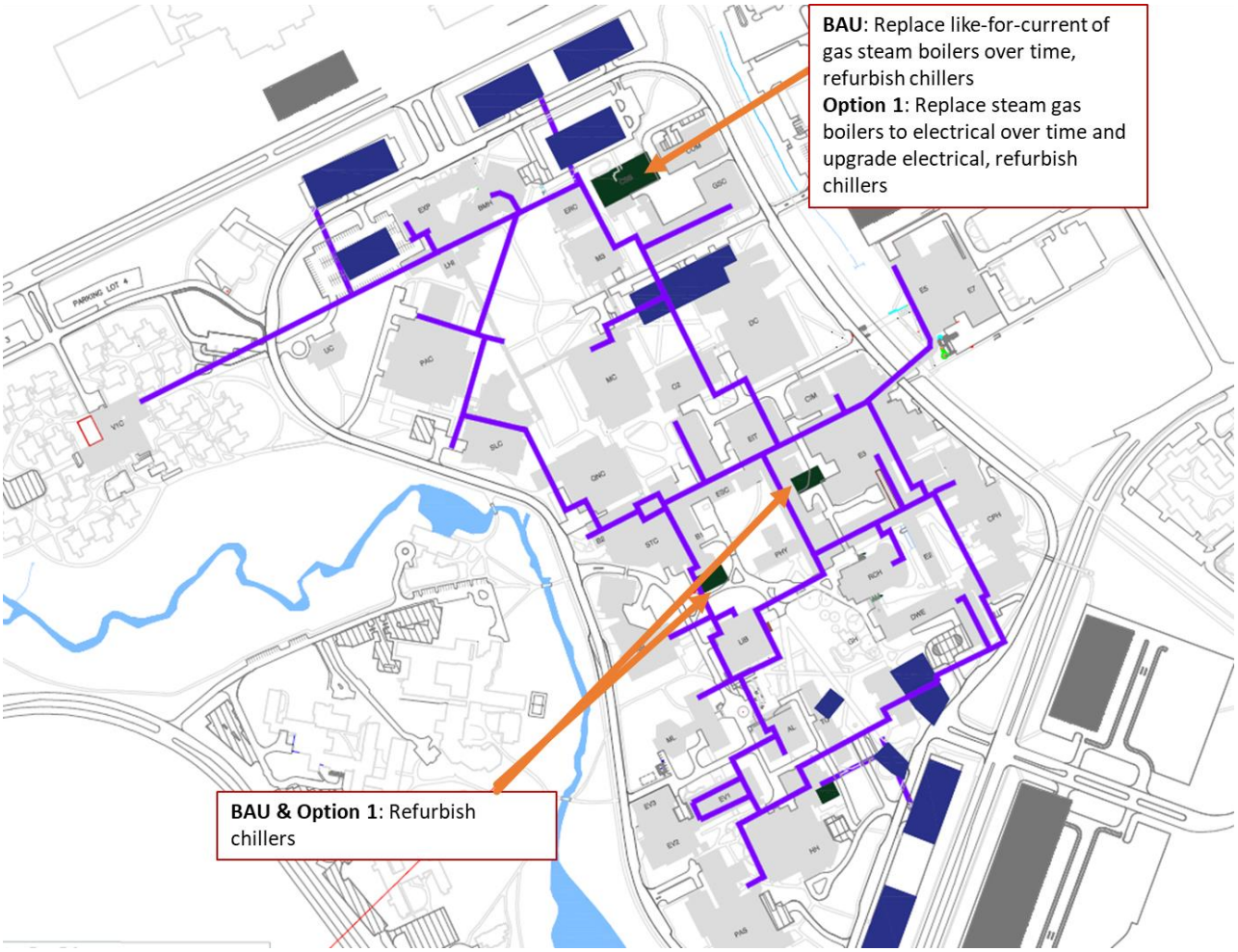
- What questions does PVP have, and what additional level of detail is desired?
- What are initial thoughts and reactions to various scenarios that have been developed?
- Is there additional context or considerations that we should include in our next steps?

We anticipate that as we complete additional modeling, we would return to PVP with an update in the short term that has additional detail. With this subsequent analysis, we would need:

- Endorsement of key elements of proposed scenarios as the basis of future planning (for example in the conversion of steam to hot water), and to bring forward to relevant governance committees for the same
- Endorsement to integrate elements of preferred approaches or directions into Campus Master Planning discussions – for example on usage of space and energy infrastructure needs
- Approval for initiation of follow-up recommendations, and associated resources (some of which, as noted, is already underway and has received budget approval)

APPENDIX 1 – BAU & OPTION 1 VISUALIZATION

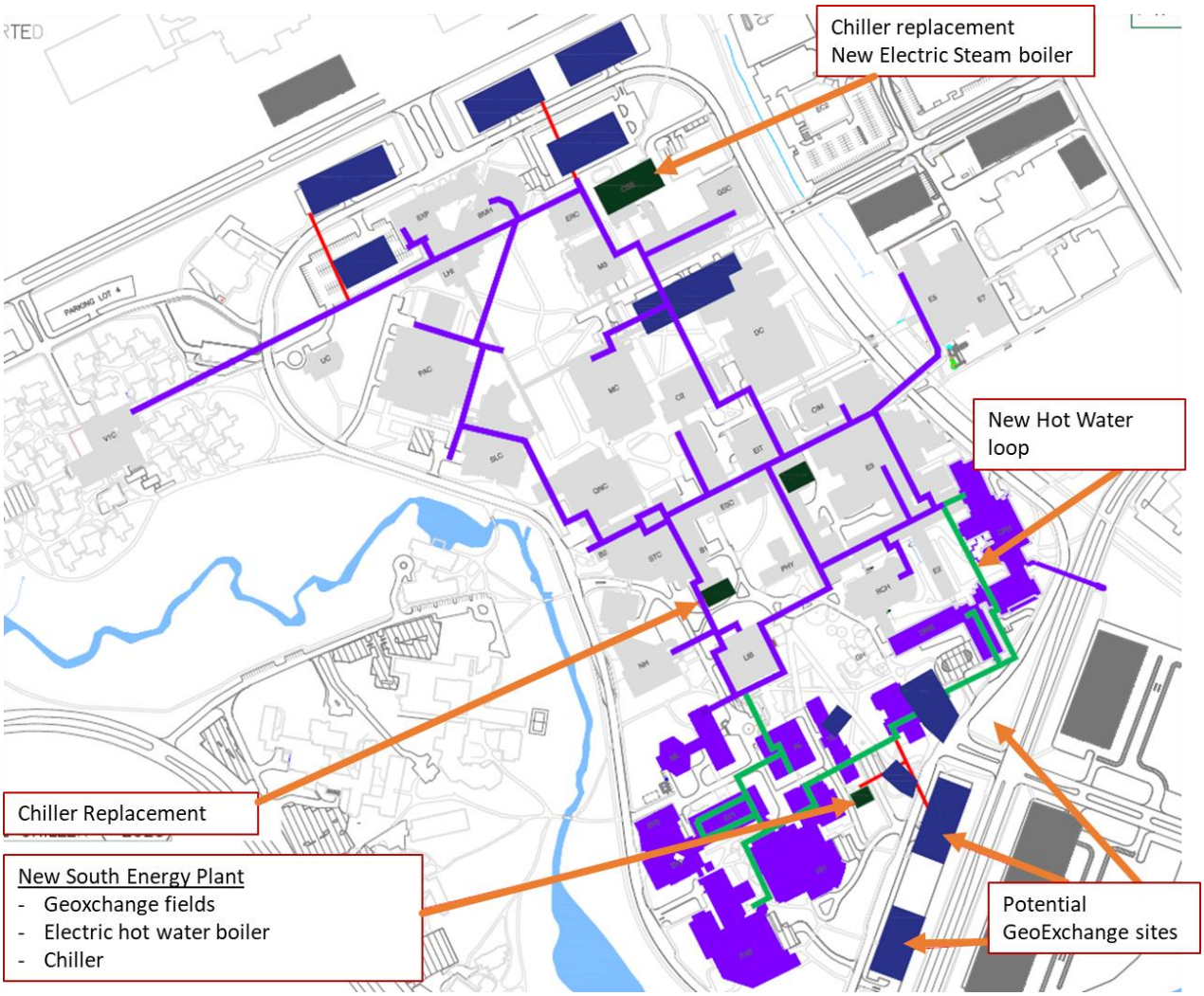
The following is a drawing file provided by Doherty Engineering. Because BAU and Option 1 involve no changes to the distribution network, they are merged onto a single map. Annotations are added by Waterloo for explanatory purposes and to make it easier to view the original diagram.



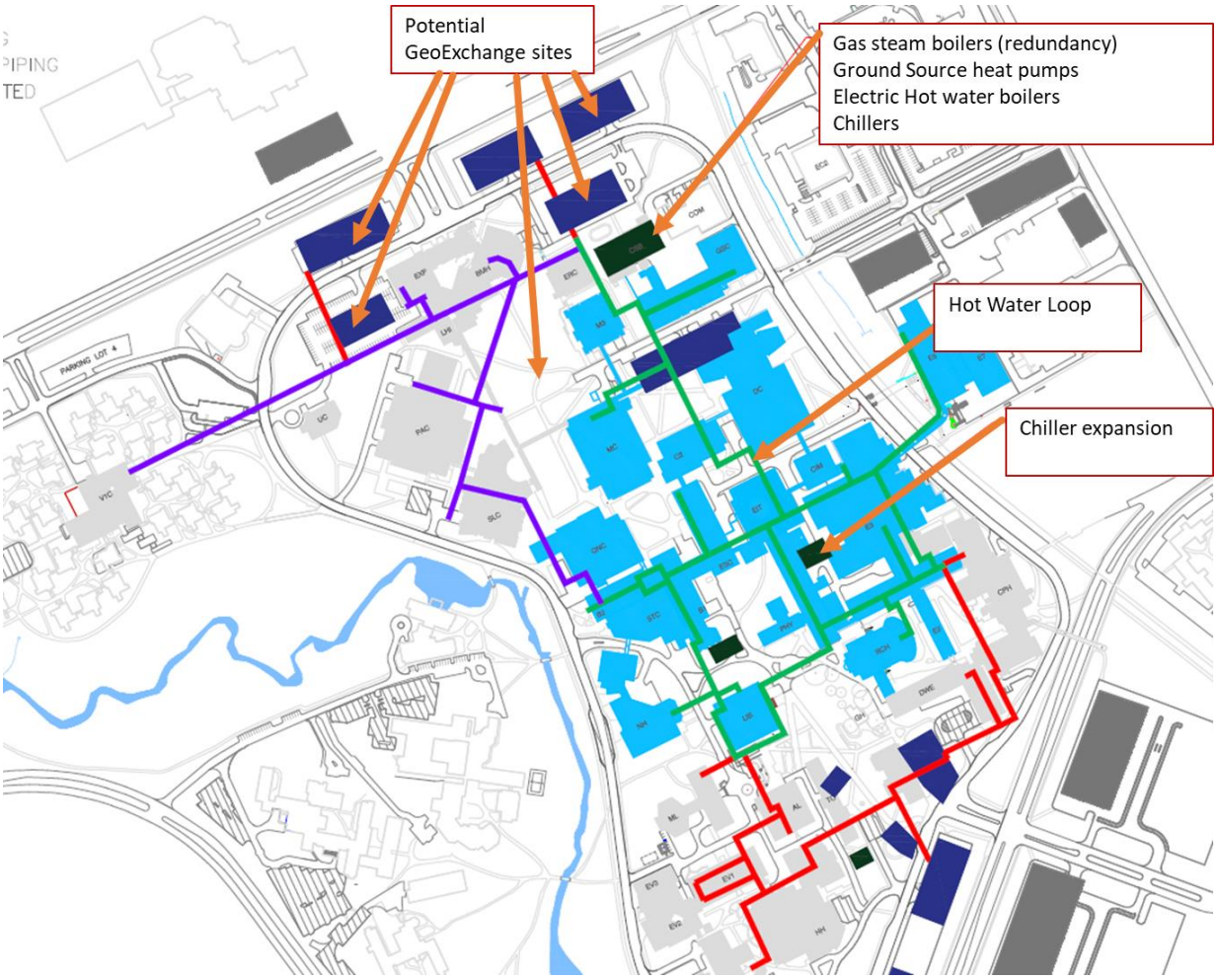
APPENDIX B – OPTION 2 VISUALIZATION

The following are drawing files provided by Doherty Engineering representing Option 2. The distinctions between the phases are much sharper, so these are provided as a visual for each phase. Annotations are added by Waterloo for explanatory purposes and to make it easier to view the original diagrams.

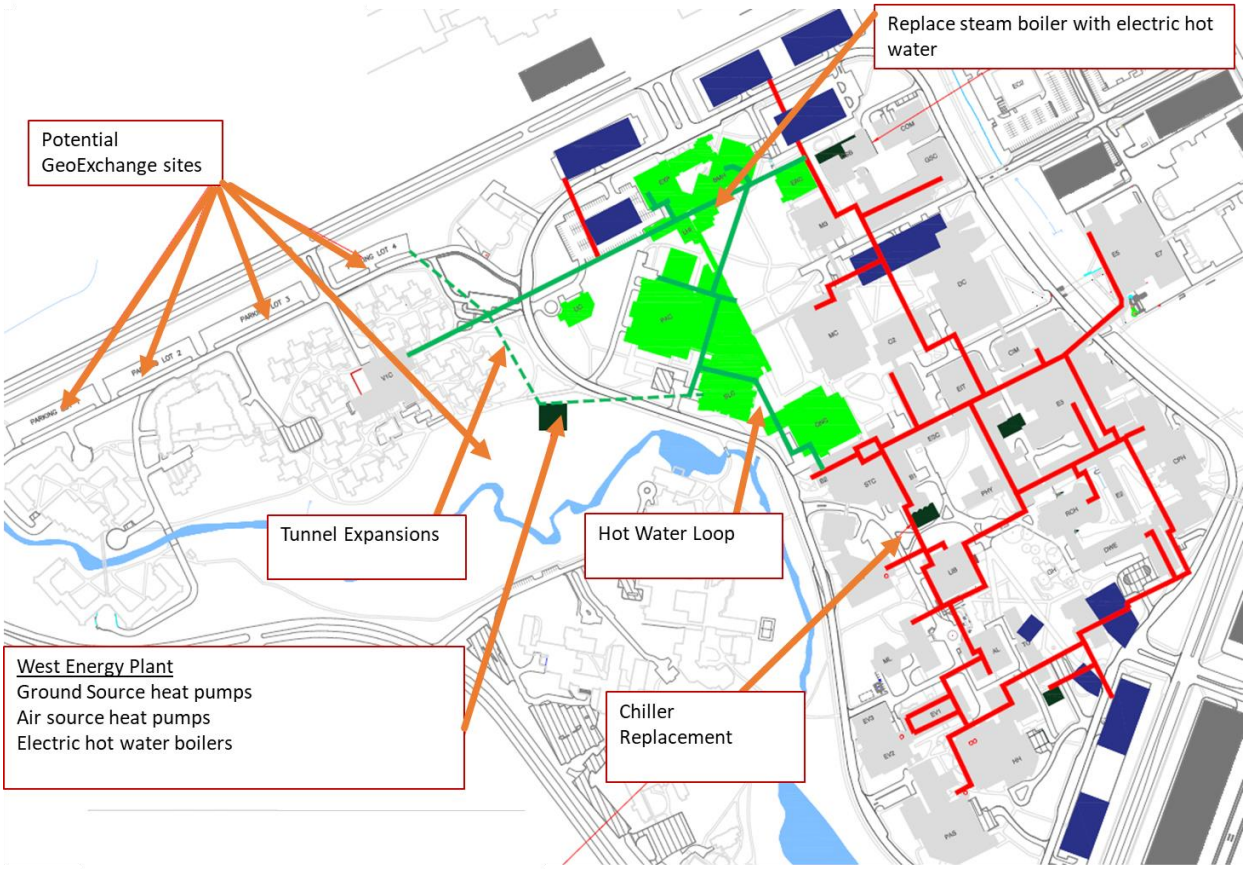
PHASE 1 (through 2033)



PHASE 2 (2034-2043)



PHASE 3 (2044-2052)



DEFERRED MAINTENANCE UPDATE

Introduction:

Historically, infrastructure renewal projects have been funded primarily by the Faciliites Renewal Program (FRP) grants from the Provincial Government. The grant value ranged from $2M to $6M per year and has been insufficient to address campus renewal needs.

With the increasing awareness of infrastructure needs, Plant Operations is developing a multi-year infrastructure renewal plan. The plan's primary focus is core infrastructure supporting our academic mission. In 2022/23 the University committed $6M to a deferred maintenance fund through the operating budget with an additional $6M committed in 2023/24. These committed funds and grants will allow the University to set aside over $20M for infrastructure projects comprising of FRP, Deferred Maintenance, and approved sustainability projects. This increase in funding will provide an urgently needed shift to infrastructure renewal. With continuing funding, the goal is to shift from critical repairs to facilities improvement by reducing the Facility condition index (FCI)/Deferred Maintenance backlog.

The 5-year plan process:

In the upcoming months, plant operations will finalize a five-year plan for approval. The plan will be flexible and will identify projects that have high risk and high impact of failure based on working knowledge of our campus infrastructure and comprehensive building condition surveys. Coordination and collaboration with the faculties will be completed to ensure appropriate prioritization.

Many projects are phased over several years due to funding requirements, size, complexity, and lead time requirements. Some projects are disruptive to campus and will require careful planning and other projects will require additional investigation and design needs to fully understand the scope of the work.

Based on preliminary estimates, projects will require between $20M and $50M per year over the next five years. These plans will need to be coordinated with budget requests, future operating surpluses or deficits, the campus master plan, and sustainability initiatives.

Table 1 summarizes projects that will proceed immediately subject to final budget approval. Additional projects have been identified should funding become available (progress delays, low bid prices, increased urgency to proceed, etc.). The following projects will be funded through FRP, deferred maintenance and sustainability funding approved through the 2022/23 and 2023/24 budget process. Due to lead time and projects timing requirements, the University expects that approximately $14M will be spent in the year ending April 30, 2024, with the remainder carried forward to the 2024/25 fiscal year.

(includes full HST and contingency)

TABLE 1

Infrastructure renewal plan - year one 2023/24

Project Identifiers					Project budget		Estimated yearly spend
Category	Project Name	WR#	Location	Status	Fund Source	Estimated	2023/24
1. Elec	Replace High Voltage Switches	50518	CSB	1	FRP	$ 1,460,000	$ 162,000
1. Elec	Replace High Voltage distribution cables	51773	SCG	1	FRP	$ 5,548,690	$ 3,250,000
1. Elec	Emergency Generator replacement	51775	CSB	1	FRP	$ 2,866,390	$ 2,293,112
1. Elec	Replace Primary Electrical feed	51776	CSB	1	FRP	$ 5,110,000	$ 600,000
1. Elec	CPH/DWE Fire alarm	51959	CPH/DWE	1.5	Infra	$ 180,000	$ 20,000
1. Elec	CSB Submetering Phase	52490	CGB	5	Sus	$ 6,000,000	$ 1,065,000
1. Elec	PV Instalation	52496	CIF	5	Sus	$ 1,000,000	$ 130,000
1. Elec	Ring Road lighting	TBD	SCG	2	Infra	$ 350,000	$ 20,000
1. Elec	Exit light upgrades	TBD	SCG	1.5	Infra	$ 500,000	$ 50,000
2. Mech	Remove oil tank	51783	CSB	1	FRP	$ 1,141,000	$ 134,152
2. Mech	Boiler update	50205	CSB	1	FRP	$ 1,249,132	$ 136,719
2. Mech	Building Automation Systems upgrade	50399	SCG	1.5	FRP	$ 2,400,000	$ 120,000
2. Mech	Replace failing chilled water piping	50519	CSB	1	FRP	$ 3,228,663	$ 400,000
2. Mech	Elevators	50521	LIB	1	FRP	$ 1,419,418	$ 123,221
2. Mech	Back flow preventers	50529	PHY	1	FRP	$ 910,000	$ 25,665
2. Mech	HVAC Replacement	51739	PAC	1.5	Infra	$ 6,325,869	$ 600,000
2. Mech	Replace Chiller Plant	51777	B1	1.5	FRP	$ 6,731,447	$ 1,306,451
2. Mech	Sanitary	51884	SCH	1.5	Infra	$ 135,262	$ 30,000
2. Mech	Glycol system	52053	DC	1.5	Infra	$ 481,000	$ 451,032
2. Mech	CW and heating pipe replacement	52054	ESC	1	Infra	$ 329,650	$ 294,834
2. Mech	AHU Replacement	52253	EC1	2	Infra	$ 2,829,661	$ 2,122,246
2. Mech	Exhaust Fans	52387	E7	1.5	Infra	$ 200,000	$ 176,000
2. Mech	Heat Recovery Project	52488	MC/QNC	5	Sus	$ 2,500,000	$ 300,000
2. Mech	Steam Traps	52489	CGB	5	Sus	$ 4,000,000	$ 1,600,000
2. Mech	Re-Retro Commissioning Pilot	52491	CGB	5	Sus	$ 300,000	$ 300,000
2. Mech	Demand Ctrl Ventilation	52492	PAS	5	Sus	$ 400,000	$ 48,000
2. Mech	Boiler and distribution replacement	52023	CIF	1.5	Infra	$ 1,489,409	$ 1,117,057
2. Mech	Humidity control	TBD	GSC	2	Infra	$ 60,000	$ 60,000
2. Mech	Repair Chiller Plant	TBD	HH	1	Infra	$ 104,548	$ 104,548
2. Mech	Back flow preventers	TBD	CLV		housing	$ 300,000	$ 30,000
3. Arch	Roof replacement	51746	CIF	1	Infra	$ 785,127	$ 157,925
3. Arch	Green house demolition and refurbishment	51771	COG	2	Infra	$ 1,000,000	$ 350,000
3. Arch	Failing Doors	51791	MC/E2	2	Infra	$ 200,000	$ 100,000
3. Arch	Failing Cladding	51953	ARC	2	Infra	$ 671,715	$ 661,301
3. Arch	Control room renovation	52237	CSB	2	Infra	$ 200,000	$ 26,000
3. Arch	Failing ceiling system	52270	CPH	2	Infra	$ 22,676	$ 22,676
3. Arch	Abatement (22/23/24)	52340	SCG	1	Infra	$ 119,837	$ 99,898
3. Arch	Door/Window sealing project	52493	CGB	5	Sus	$ 200,000	$ 200,000
3. Arch	Roof Replacement	TBD	ESC	1.5	FRP	$ 1,300,000	$ 650,000
3.2 Struc	Repair tunnels	41528	SCG	1	Infra	$ 20,000,000	$ 300,000
3.2 Struc	Failing brine tanks	45119	CSB	1	FRP	$ 3,844,130	$ 1,275,019
3.2 Struc	Stairs	51877	MC	2	Infra	$ 179,461	$ 170,986
3.2 Struc	Slab voids	51922	PHY	2	Infra	$ 57,371	$ 54,598
3.2 Struc	Stairs	TBD	HH/AL	2	Infra	$ 120,000	$ 12,000
4. Info	Arc Flash Report	TBD	CGB	1.5	Infra	$ 400,000	$ 100,000
4. Info	PV feasibility study	52495	CGB	5	Sus	$ 30,000	$ 30,000
4. Info	Net Zero Design Study	TBD	TC	5	Sus	$ 20,000	$ 20,000
							$ 21,300,441

University of Waterloo
Board of Governors
BUILDING & PROPERTIES COMMITTEE
17 May 2023

FOR INFORMATION

President's Advisory Committee on Design (PACOD)

The President's Advisory Committee on Design has been in place for many years and was recently updated to take into consideration the future plans and needs of the University.

The Committee will meet nine times per year with a focus on reviewing proposed construction, renovation, landscape, interior design, and public art projects. In this role, the committee's responsibility lies in the consideration of a project's design merits and its impact on the existing campus environment. Committee members will also advise on campus master plans and have representation during the procurement phase when appointing architects, landscape architects, urban designers, and the design review process. As an advisory committee, the committee will consider the mandate of the university; the Waterloo at 100 strategic vision, the evolution of campus planning, design, architecture, Indigenous design, equity, inclusion, transportation and sustainability goals and the master planning process.

The revitalization of the campus master plan will be a major focus of the committee moving forward. Any significant new construction and renovation projects will be considered in conjunction with the campus master plan process.

Committee membership has been updated to include the following members:

- Vice-President, Administration and Finance (Chair)
- President and Vice-Chancellor (ex-officio)
- Sr. Director, Planning, Design & Construction (Vice-Chair)
- Executive Director, Facilities
- O'Donovan Director, School of Architecture
- Associate Vice-President, Academic Operations
- One member representing the Sustainability Office
- One member representing the Equity Office
- One member representing Indigenous Design
- Undergraduate student representative
- Graduate student representative
- Up to two members from the university community having expertise in design, appointed by the President

PACOD meeting March 2023:

The committee completed introductions and reviewed the existing terms of reference for PACOD. The monthly major construction report was reviewed for information and members discussed the existing procurement and design process on major projects. Members were provided with updates on deferred maintenance project plans, and current sustainability

initiatives. Members were informed that a new campus master planning process is planned as priorities and layouts have changed since the last plan was finalized in 2009.

PACOD meeting April 2023:

The committee considered suggested updates to the terms of reference to better align with the purpose of PACOD. The required changes are not significant but better align with the future plans for the committee. The process to identify two student members is in place with plans to have them attend the May 2023 meeting. The Campus Housing leadership team provided a presentation to the committee members regarding the recently completed Campus Housing masterplan.

Jacinda Reitsma
Vice-President, Administration and Finance
Chair, President's Advisory Committee on Design

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Statutory Compliance
Terms of reference provide for the Building & Properties Committee "To ensure that the university complies with all building codes, fire codes, safety regulations and statutory and regulatory provisions, as appropriate, in its building and properties program, and to review compliance annually."

The following provincial statutes and municipal bylaws have been identified by the Secretariat as those which would pose the greatest potential risk for the university in the event of non-compliance.

Assessment Act
Building Code Act
Commercial Tenancies Act
Construction Act
Environmental Protection Act
Fire Protection and Prevention Act
Green Energy Act
Occupational Health and Safety Act
Ontario Water Resources Act
Residential Tenancies Act

Bylaws in force in the various municipalities in which the university owns real property

Staff responsible for institutional compliance have reviewed these statutes, bylaws and regulations, and each has signed a declaration indicating that there are no issues of material non-compliance related to their areas of responsibility as at the date of their signature. Copies of the declarations of staff are kept in the Secretariat and are available for inspection upon request.

Managers sign off statutory compliance declarations to the extent of their responsibility and to the best of their knowledge.

Plant Operations:

In 2022, it was noted that in two areas Plant Operations had only partial authority and that other areas should be added to accurately reflect accountability and compliance.

- Environmental Protection Act, R.S.O. 1990, c. E.19 - the use and discharge of contaminants used in teaching and research are controlled by academic divisions;
- Fire Protection and Prevention Act, 1997, S.O. 1997, c. 4 - Residence maintains their own inspection as related to means of egress, materials, and decorations.

Additional items in 2023:

- Ontario Water Resources Act, R.S.O. 1990, c. O.4 – Use and discharge of contaminants used in teaching and research are controlled by academic divisions.
- Technical Standards and Safety act, 2000, S.O. 2000, c. 16 – The University does not have a licensed 1st class Stationary Engineer working in the capacity of a Chief Stationary Engineer.

Management will follow up on the implementation of these suggestions.

Occupational Health and Safety Act:

It was noted that not all employees have completed legislated mandatory training courses. Mitigation plans are being developed by management and the primary risk owner (VPAF) has been advised.

Jacinda Reitsma
Vice-President, Finance and Administration

Alice Raynard
Associate University Secretary