Oregon TECH
Oregon Institute of Technology

Meeting of the
Oregon Tech Board of Trustees
Finance and Facilities Committee
virtually via Microsoft Teams
Wednesday, October 11, 2023
9:30 am – 11:30 am

Finance and Facilities Committee
Agenda

- **Call to Order/Roll/Declaration of a Quorum** (9:30 am) (5 min) *Chair Vince Jones*

Consent Agenda (9:35 am) (5 min) *Chair Vince Jones*

2.1 **Approve Minutes of the June 2023 meeting.**

- **Reports**

3.1 **Quarterly Finance, Facilities, and Audit Report**

- **3.1.1 FYE 2022-23 Management Report and Financial Dashboard (A & A-2)** (9:40 am) (15 min) *VP John Harman*
- **3.1.2 FY 2023-24 YTD August Management Report (B)** (9:55 am) (5 min) *VP John Harman*
- **3.1.3 Q-4 FY 2022-23 Investments Report (C)** (10:00 am) (5 min) *VP John Harman*
- **3.1.4 Q-1 FY 2023-24 Capital Projects Update (D)** (10:05 am) (10 min) *Director Thom Darrah*
- **3.1.5 Oregon Institute of Technology 2023 Economic, Fiscal and Social Impact Analysis (E)** (10:15 am) (10 min) *VP John Harman*
- **3.1.6 Update on External Auditor's Activities- Administration (F)** (10:40 am) (5 min) *VP John Harman*

4. **Action Items**

4.1 **Recommendation to Full Board for Approval of Technical Update to Board Policy on Resident Undergraduate Tuition and Mandatory Fee Process** (10:45 am) (15 min) *VP Harman*

4.2 **Recommendation to Full Board for Acceptance of $18 million in Series XI-Q Bond Funding and Authorization for President to Proceed with Geothermal System Renovation** (11:00 am) (15 min) *VP Harman*

6 **Discussion Items** (11:15 am) (5 min) *Chair Jones*

5. **Other Business/New Business** (11:20 am) (10 min) *Chair Jones*

6. **Adjournment** (11:30 am)

Meeting of the
Oregon Tech Board of Trustees
Finance and Facilities Committee
Virtually via Microsoft Teams
May 31, 2023
10:30 am – 12:15 pm

Finance and Facilities Committee
DRAFT Minutes

Trustees Present:

Vince Jones, Chair	Michele Vitali	Dr. Nagi Naganathan (*ex officio*)
Stefan Bird	Mason Wichmann	
Mike Starr		

Trustees Not in Attendance:
Kanth Gopalpur

Other Trustees in Attendance:
John Davis
Phong Nguyen

University Staff and Faculty Present in person:
Trever Campbell, KernuttStokes
Thom Darrah, Director-Facilities Management Services
Don DaSaro, President-Fiscal Operations Advisory Council
Ken Fincher, Vice President University Advancement & Interim Board Secretary
Lori Garrard, Executive Assistant to the VP of University Advancement
John Harman, Vice President Finance & Administration
Adria Paschal, Senior Executive Assistant to the President
Bryan Wada, Information Technology Consultant 2

1. **Call to Order/Roll/Declaration of a Quorum** *Chair Vince Jones*
   Chair Jones called the meeting to order at 10:30 am. The Board Secretary called roll and a quorum was declared.

2. **Consent Agenda** *Chair Vince Jones*
   2.1 Approve Minutes of the April 12, 2023 Meeting
   No changes to minutes voiced. Minutes approved as submitted.

3. **Reports**
   3.1 Fiscal Operations Advisory Council *FOAC Professor Don DaSaro (Verbal only)*

- **Professor Don DaSaro** reviewed the last meeting of FOAC regarding the budget. He provided his background as it applies to his knowledge of business and the budget. He commented that Oregon Tech may lose brand equity with the current financial challenges that include decreased enrollment and state funding.

3.2 Quarterly Finance, Facilities, and Audit Report

- **VP Harman** shared his presentation and discussed the YTD performance report.

3.2.1 FY 2022-2023 YTD Management Report (A) V*P John Harman*

- **VP Harman** shared and explained the General Fund Monthly Report with YTD April direct expenditures and net from operations.
- **Chair Jones** asked about the projected use of $9.6 million to balance the budget and if it is to come from reserve funds. **VP Harman** advised where the funds came from to balance the budget.

3.2.2 Q-3 Financial Dashboard(B) *VP John Harman*

- The Q-2 FY 2022-23 Quarterly financial dashboard was shared and explained.

3.2.3 Q-3 Investment report (C) *VP John Harman*

- **VP Harman** stated the Q3 investment report is positive. He shared the Investment Report and Market Commentary.
- **Chair Jones** asked about the performance of the university fund. **VP Harman** confirmed that Oregon Tech's investments are doing well.
- **Trustee Davis** asked about the operating assets and why Oregon Tech invests in the Public University Fund. **VP Harman** provided history on Oregon Tech's investments.
- **Trustee Davis** talked about endowment assets. **VP Harman** encouraged this discussion continue at the board of trustees upcoming retreat and suggested having someone from the state treasury or USSC who manages the portfolio come and talk about options.
- **President Naganathan and Chair Jones** thanked the Oregon Tech community for ending the fiscal year with a balanced budget and overcoming challenges while still producing successful graduates and improving the campus.

3.2.4 Q-4 Capital Projects Update (D) *Director Thom Darrah*

- **Director Thom Darrah** shared the progress of Boivin Hall renovation, the track/stadium renovation and new student housing.
- **Chair Jones** asked for clarification on the budget on the new student housing project as it is projected at being over budget. He asked about how the architects can bring the price down on the project to remain within budget. The project was discussed.

3.2.5 Q-4 Internal Audit Report (E) *Trever Campbell, KernuttStokes*

- **Trever Campbell** stated they tested Procurement and Contracting – Goods and Services with one issue identified during testing and changes had already been made to correct the issue.

- They are currently working on audit lookbacks to identify old issues and make sure the issues have been addressed. That report will be issued at the end of June.
- They are also working on a university wide policy and procedure review.
- **Trever Campbell** provided an update on the Fraud, Waste, and Abuse Ethics Hotline.
- **Trever Campbell** advised that Oregon Tech has decided to contract with a new firm for internal audit services in the upcoming fiscal year. They will work with management to facilitate a smooth transition.

4. Action Items

4.1 FY 24 Budget *VP John Harman*

- **VP Harman** shared the Fiscal Year 2023-24 Oregon Tech All Funds Budget. He explained the budget development including budgeting challenges and strategic budget investments.
- **Chair Jones** asked **VP Harman** to explain why some duties were transferred to other divisions. **VP Harman** talked about the division of duties to realign departments to balance the burden of duties. **Chair Jones** emphasized that the budget has no impact to people.
- **VP Harman** explained the general fund budget, comparing it to previous years.
- **Trustee Davis** asked about salary recapture from the past year. **VP Harman** advised we are not freezing hiring but there are some open funded positions.
- **President Naganathan** stated that student needs are always the first priority and visiting faculty members are used to fill the openings to meet student needs.
- **Trustee Davis** asked about the anticipation of flat enrollment and what effect that has on the budget. **VP Harman** stated it is still early to predict the enrollment trends. A midyear budget adjustment might be needed.
- **Chair Jones** asked about the use of reserve funds to balance the budget. **VP Harman** stated this is a thoughtful use of reserves and gives us the ability to develop a measured and strategic plan. **Chair Jones** advised that the reserve fund is healthy.
- **Chair Jones** asked for clarification on salary recapture which **VP Harman** provided.
- **Trustee Davis** asked **VP Harman** to generally speak to budgeting challenges. **VP Harman** provided a summary of challenges including program review, benefits costs and other aspects.
- **Trustee Davis** asked VP Harman to address budget challenges and why the budget is flat or down even though Oregon Tech has had a drop in enrollment. **VP Harman** addressed some of the changes and finding a balance to continue to offer the unique qualities of Oregon Tech to students. **President Naganathan** added that there are costs that Oregon Tech has no control over, including health care and retirement.

- **Trustee Davis** said that the board needs time to look structurally at the budget and at tuition to plan for the next five to ten years.

<u>Motion:</u>

After review of the proposed FY 2023-24 All-Funds Budget and related documents, staff requests a Motion by the Finance and Facilities Committee to the full Board for approval of the FY 2023-24 All-Funds Budget.

Motion: Trustee Bird

Second: Trustee Vitali

Roll call vote: Trustee Jones aye, Trustee Bird aye, Trustee Star aye, Trustee Vitali aye, Trustee Wichmann aye.

Motion passes.

5. **Discussion Items** *Chair Vince Jones*
   - **Trustee Davis** asked **Chair Jones** for items he would like to see covered at the board retreat.
   - **Chair Jones** asked for an update on the geothermal utility and the status of the funding. **President Naganathan** said he felt good about the prospect of securing the funding and there is bi-partisan support.

6. **Other Business/New Business** *Chair Vince Jones*
   None

7. **Adjournment: 12:34 pm**

REPORT

Agenda Item No. 3.1

Finance, Facilities and Audit: Quarterly Update

Background

The Quarterly Finance, Facilities and Audit Status Report provides information on major responsibility areas under the Finance and Administration Division of Oregon Tech. The Report generally highlights budget performance, financial and enrollment indicators, facilities, equipment, capital projects and invested funds, as well as internal and external audit coordination. Depending on the timing of the quarterly Board meeting, some data may not yet be available for reporting. The information contained in the Report is used by the Office of the Vice President of Finance and Administration to track progress toward achieving the institution's financial and operational goals.

The report is shared with the Finance, Facilities and Audit Committee on a quarterly basis to provide information essential in supporting the Board's governance and fiduciary responsibilities.

Staff Recommendation

No action required. For information and discussion purposes only.

Attachments

Due to the timing of the October 2023 Board meeting and the related document submission deadline, some financial data through the end of the first quarter (September 2023) is not yet available. Finance, Facilities and Audit Status Reports include the following Attachments:

A. FYE 2022-23 Management Report and (A-2) Financial Dashboard (Item 3.1.1)
B. FY 2023-24 YTD August Management Report (Item 3.1.2)
C. Q-4 FY 2022-23 Investment Report (Item 3.1.3)
D. Q-1 FY 2023-24 Capital Projects Report (Item 3.1.4)
E. OIT 2023 Economic, Fiscal and Social Impact Analysis (Item 3.1.5)
F. Update on External Auditor's Activities- Administration (Item 3.1.6)

Attachment A

General Fund Monthly Report

FY 2022-23 June Year End (in thousands)

	YTD Comparison		FY 2022-23 Budget & Forecast					
	FY 2021-22 June Year End Actuals	FY 2022-23 June Year End Actuals	FY 2021-22 Year End Actuals	FY 2022-23 Board Adopted Budget (BAB)	FY 2022-23 Adjusted Budget	FY 2022-23 Forecast	Actuals to Adjusted Budget Variance	Notes
Revenue								
State Allocations	$37,407	$33,744	$37,407	$32,385	$32,385	$ -	$1,360	(1)
Tuition & Fees	38,190	37,487	38,190	39,832	39,973	-	(2,485)	(2)
Remissions	(5,837)	(6,600)	(5,837)	(5,546)	(5,546)	-	(1,054)	
Other	2,259	3,498	2,259	2,302	2,156	-	1,342	
Total Revenue	**$72,019**	**$68,130**	**$72,019**	**$68,972**	**$68,967**	**$ -**	**($837)**	
Expenses								
Administrative Staff Salary	$8,204	$8,468	$8,204	$9,700	$9,575	$ -	($1,108)	
Faculty Salary	12,783	13,008	12,783	14,227	14,193	-	(1,185)	
Adjunct and Admin/Faculty Other Pay	3,727	3,622	3,726	3,457	3,457	-	165	
Classified	5,838	6,092	5,838	6,321	6,323	-	(232)	
Student	755	909	755	1,063	1,058	-	(149)	
GTA	74	94	74	121	121	-	(27)	
OPE	17,207	17,570	17,207	19,252	19,169	-	(1,598)	
Total Labor Expense	**$48,588**	**$49,763**	**$48,588**	**$54,142**	**$53,897**	**$ -**	**($4,134)**	(3)
Service & Supplies	$12,762	$14,560	$12,762	$21,463	$21,037	$ -	($6,477)	(4)
Internal Sales	(1,272)	(1,287)	(1,272)	(1,356)	(1,356)	-	68	
Debt Service	631	1,718	631	1,189	1,191	-	528	(5)
Capital	153	620	153	185	781	-	(161)	
Utilities	1,820	1,686	1,820	1,335	1,335	-	351	
Transfers In	-	-	-	-	-	-	-	
Transfers Out	1,433	1,433	1,433	1,462	1,506	-	(72)	(6)
Total Direct Expense	**$15,527**	**$18,731**	**$15,527**	**$24,279**	**$24,494**	**$ -**	**($5,764)**	
Total All Expense	**$64,115**	**$68,494**	**$64,115**	**$78,421**	**$78,391**	**$ -**	**($9,897)**	
Net from Operations before Other Resources (Uses)	**$7,904**	**($364)**	**$7,904**	**($9,449)**	**($9,424)**	**$ -**		(7)
Other Resources (Uses)								
Transfers In	$78	$180	$78	$8,000	$8,000	$ -		(8)
Transfer Out	(6,059)	(441)	(6,059)	(51)	(158)	-		(9)
Use of Reserve	-	626	-	1,500	1,500	-		
Total Other Resources (Uses)	**($5,981)**	**$364**	**($5,981)**	**$9,449**	**$9,342**	**$ -**		(10)
Total from Operations and Other Resources (Uses)	**$1,923**	**$ -**	**$1,923**	**$ -**	**($82)**	**$ -**		
Beginning Fund Balance	$15,235	$17,218	$15,235	$17,218	$17,218	$ -		
Fund Balance Adjustment	60	(605)	60	(1,500)	(1,500)	-		(11)
Ending Fund Balance	**$17,218**	**$16,613**	**$17,218**	**$15,718**	**$15,636**	**$ -**		
Fund Balance as % Operating Revenues	23.9%	24.4%	23.9%	22.8%	23%			
Ending Cash Balance	$18,536	$19,398	$18,536					

Notes:

(1) **FY 2022-23 State Allocations Variance** - State allocation increased by $1.3M following HECC October 2022 formula corrections and data reconciliation.

(2) **FY 2022-23 Tuition & Fees Variance** - Reflects impact of unexpected 5.9% enrollment decline (excludes ACP). Flat enrollment was budgeted for FY 2022-23.

(3) **FY 2022-23 Total Labor Expense Variance** - Reflects budgeted positions remaining unfilled for all or part of the year (mostly in administrative staff and faculty), and associated savings in other payroll expenses.

(4) **FY 2022-23 Service & Supplies Variance** - $6.5M in reduced spending mostly related to a slower pace of expenditures related to Applied Computing and Rural Health Initiatives. Unexpended Special Item Funds for this initiative were rolled forward from FY 2021-22 and budgeted as a transfer-in for FY 2022-23 as intended from state allocation.

(5) **FY 2022-23 Debt Service YTD Actuals and Variance** - Debt service is higher than prior year due to discontinuation of front-loaded savings from May 2021 state bond refinancing for improved interest rates. Debt service is higher than budgeted due to realized losses in the Public University Fund (PUF).

(6) **FY 2022-23 Transfers Out YTD Actuals** - Transfers out are regular, budgeted support of Athletics and the Shaw Library.

(7) **FY 2022-23 Net from Operations YTD Actuals** - Because of reduced spending, the net loss at year-end is less than budgeted.

(8) **FY 2022-23 Transfer In (Other Resources (Uses)) YTD Actuals** - Transfers in include budgeted use of prior year Applied Computing and Rural Health Initiatives funding and miscellaneous transfers.

(9) **FY 2022-23 Transfer Out (Other Resources (Uses)) YTD Actuals** - Transfers out include institutional support for a new sewer cover and meter, transfer of prior year OMIC state appropriation for OMIC project support, institutional support of sound system upgrades in the gym, and miscellaneous transfers.

(10) **FY 2022-23 Total Other Resources (Uses) YTD Actuals** - Net transfers in from non-operating resources is less than budgeted due to pace of spending in Applied Computing and Rural Health Initiatives and savings in other areas.

(11) **FY 2022-23 Fund Balance Adjustment** - Fund balance adjustment is the net of an offset for Use of Reserve and an accounting adjustment associated with an Athletics interfund loan.

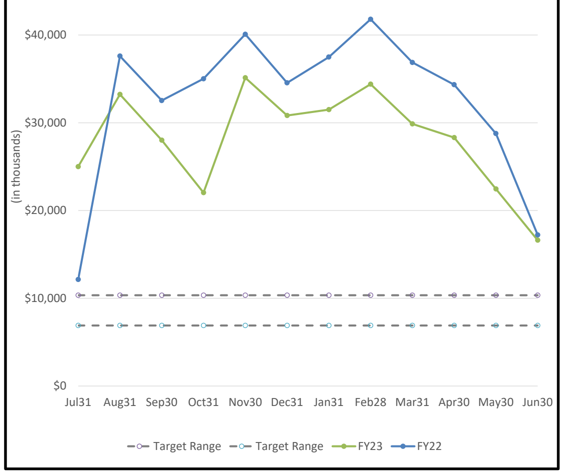
Attachment A-2

Oregon TECH

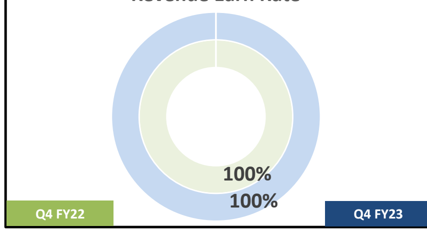
Quarterly Financial Dashboard

As of June 30, 2023

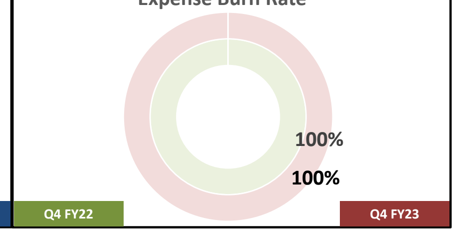
E&G Fund Balance



Revenue Earn Rate

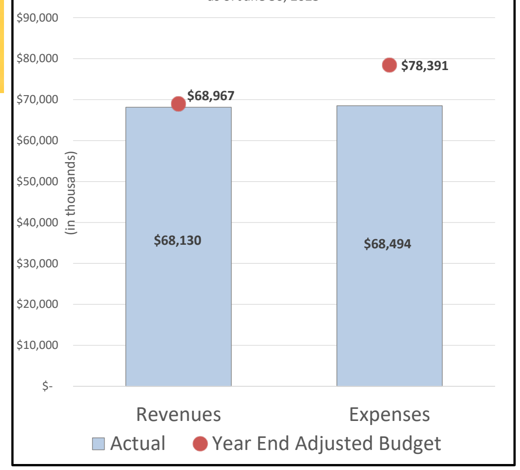


Expense Burn Rate



E&G YTD Revenues & Expenses

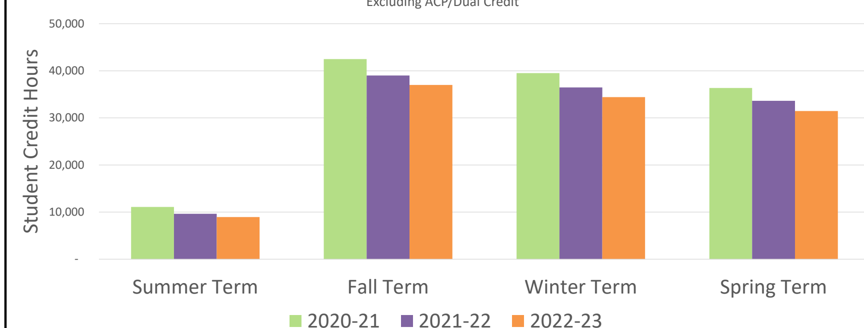
as of June 30, 2023



Key Financial Indicators		
E&G Fund Balance:	$16,613	As of June 30, 2023
Debt Burden Ratio:	3.34%	As of June 30, 2022
Quasi Endowment:	$6,515	As of June 30, 2023
Foundation Assets:	$41,583	As of June 30, 2023

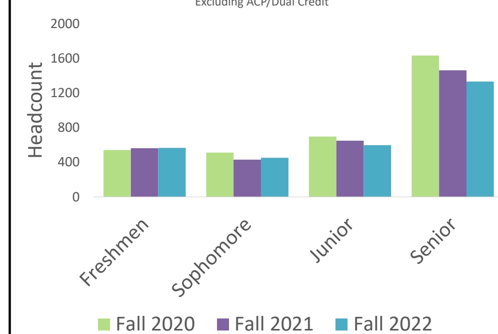
Total Student Credit Hours

Excluding ACP/Dual Credit



Undergraduate Student Pipeline

Excluding ACP/Dual Credit



Student Tuition		
Undergraduate Tuition		
	2022-23	**2021-22**
Resident:	$10,002	$9,572
Non-Resident:	$31,837	$30,466
WUE:	$15,003	$14,357
Online:	$13,230	$12,645
Differential:	37% Premium	37% Premium
Graduate Tuition		
	2022-23	**2021-22**
Resident:	$18,404	$17,612
Non-Resident:	$30,896	$29,565
Online (MS-AH):	$15,048	$14,400
Online (MS-ET):	$21,888	$20,952
Differential:	37% Premium	37% Premium

Degree Completions		2022-23	2021-22	2020-21	3 Year Δ
Undergraduate	Resident:	470	528	522	-10.0%
	Non-Resident:	193	237	244	-20.9%
Graduate	Resident:	17	25	31	-45.2%
	Non-Resident:	20	16	12	66.7%

Notes:

(1) Student tuition rates are shown at 15 credits per term for undergraduates and 12 credits per term for graduates.

General Fund Monthly Report

FY 2023-24 August (in thousands)

	YTD Comparison		FY 2023-24 Budget & Forecast					
	FY 2022-23 August Actuals	FY 2023-24 August Actuals	FY 2022-23 Year End Actuals	FY 2023-24 Board Adopted Budget (BAB)	FY 2023-24 Adjusted Budget	FY 2023-24 Forecast	Forecast to Budget Variance	Notes
Revenue								
State Allocations	$11,635	$12,911	$33,744	$33,942	$33,942	$ -	$ -	
Tuition & Fees	14,814	14,863	37,487	39,514	39,514	-	-	
Remissions	(65)	(141)	(6,600)	(5,805)	(5,805)	-	-	
Other	307	251	3,498	2,374	2,374	-	-	
Total Revenue	**$26,691**	**$27,884**	**$68,130**	**$70,024**	**$70,024**	**$ -**	**$ -**	
Expenses								
Administrative Staff Salary	$1,393	$1,408	$8,468	$10,234	$10,183	$ -	$ -	
Faculty Salary	418	471	13,008	14,405	14,417	-	-	
Adjunct and Admin/Faculty Other Pay	798	731	3,622	3,649	3,649	-	-	
Classified	1,008	1,008	6,092	6,396	6,407	-	-	
Student	84	119	909	1,041	1,041	-	-	
GTA	9	11	94	121	121	-	-	
OPE	2,417	2,427	17,570	19,841	19,834	-	-	
Total Labor Expense	**$6,128**	**$6,174**	**$49,763**	**$55,687**	**$55,651**	**$ -**	**$ -**	
Service & Supplies	$3,872	$3,982	$14,560	$15,517	$15,553	$ -	$ -	
Internal Sales	(221)	(224)	(1,287)	(1,388)	(1,388)	-	-	
Debt Service	553	940	1,718	1,208	1,208	-	-	
Capital	19	102	620	175	175	-	-	
Utilities	120	205	1,686	1,205	1,205	-	-	
Transfers In	-	-	-	-	-	-	-	
Transfers Out	-	348	1,433	1,406	1,406	-	-	
Total Direct Expense	**$4,344**	**$5,352**	**$18,731**	**$18,123**	**$18,159**	**$ -**	**$ -**	
Total All Expense	**$10,472**	**$11,526**	**$68,494**	**$73,811**	**$73,811**	**$ -**	**$ -**	
Net from Operations before Other Resources (Uses)	**$16,219**	**$16,358**	**($364)**	**($3,787)**	**($3,787)**	**$ -**		
Other Resources (Uses)								
Transfers In	$0	$ -	$180	$887	$887	$ -		
Transfer Out	(200)	-	(441)	(100)	(100)	-		
Use of Reserve	-	-	626	3,000	3,000	-		
Total Other Resources (Uses)	**($200)**	**$ -**	**$364**	**$3,787**	**$3,787**	**$ -**		
Total from Operations and Other Resources (Uses)	**$16,019**	**$16,358**	**$ -**	**$ -**	**$ -**	**$ -**		
Beginning Fund Balance	$17,218	$16,613	$17,218	$16,613	$16,613	$ -		
Fund Balance Adjustment	-	-	(605)	(3,000)	(3,000)	-		
Ending Fund Balance	**$33,237**	**$32,971**	**$16,613**	**$13,613**	**$13,613**	**$ -**		
Fund Balance as % Operating Revenues	124.5%	118.2%	24.4%	19.4%	19.4%			
Ending Cash Balance	$21,931	$22,408	$19,398					

Notes:

Attachment C

FY2023 Q4 Investment Report

BACKGROUND

The Oregon Tech (university) investment report for the fourth quarter (Q4) of FY2023 is presented in the following sections:

- **FY2023 Q4 Oregon Tech Investment Report** – This section includes a report on the investments of the operating and endowment assets of the university. This report reflects the university's operating assets that are invested in the Public University Fund and the university's endowment assets managed by the Oregon State Treasury.

- **FY2023 Q4 Market Commentary** – This section provides a general discussion of the investment markets and related performance data for the fourth quarter of FY2023 (i.e., April 1 – June 30, 2023).

FY2023 Q4 OREGON TECH INVESTMENT REPORT

The schedule of Oregon Tech's investments is shown in the investment summary below.

Public University Fund

(Prepared by the Public University Fund Administrator)

Oregon Tech's operating assets are invested in the Public University Fund (PUF). As of June 30, 2023, OIT had $33.5 million on deposit in the PUF. The PUF decreased 0.1% for the quarter and increased 1.3% for the fiscal year. The PUF's three-year and five-year average returns were 0.1% and 1.9%, respectively.

The Oregon Short-Term Fund returned 1.0% for the quarter, underperforming its benchmark by 20 basis points. The Core Bond Fund decreased 0.8% for the quarter, matching its benchmark. The PUF investment yield was 1.0% for the quarter and 3.4% for the fiscal year.

Based upon internal projections for a recession in coming months, the Oregon State Treasury investment officers maintain a conservative positioning in the Core Bond Fund, favoring U.S. Treasuries over corporate bonds. The portfolio's allocation to corporate credit remains underweight compared to its benchmark (25.5% versus 30.8%).

Oregon Tech Quasi-Endowment Fund

The Oregon Tech Quasi-Endowment assets decreased 0.8% for the quarter and increased 0.4% for the fiscal year. The Oregon Intermediate-Term Pool performed in line with its benchmark for the quarter and outperformed by 50 basis points for the fiscal year. The Endowment assets were valued at $6.5 million, as of June 30,2023.

Attachment C

Oregon Tech
Investment Summary
as of June 30, 2023
(Net of Fees)

	Quarter Ended 6/30/2023	Current Fiscal YTD	Prior Fiscal YTD	3 Yr Avg	5 Yr Avg	10 Yr Avg	Market Value	Actual Asset Allocation	Policy Allocation Target
OIT Operating Assets Invested in Public University Fund									
Oregon Short - Term Fund	1.0%	2.9%	0.6%	1.4%	1.8%	1.4%	$ 10,573,741	31.6%	[1]
Benchmark - 91 day T-Bill	1.2%	3.6%	0.2%	1.3%	1.6%	1.0%			
PUF Core Bond Fund	-0.8%	0.4%	-6.7%	-1.3%	1.7%	N/A	22,895,164	68.4%	[1]
Benchmark - Bloomberg Barclays Intermediate U.S. Gov't./Credit Index[2]	-0.8%	-0.1%	-7.3%	-2.5%	1.2%	1.6%			
Public University Fund Total Return	-0.1%	1.3%	-2.6%	0.1%	1.9%	N/A	$ 33,468,905	100.0%	
Public University Fund Investment Yield[3]	1.0%	3.4%	1.3%	2.2%	2.5%	N/A			
OIT Endowment Assets									
Oregon Intermediate-Term Pool	-0.8%	0.4%	-6.8%	-1.3%	1.6%	N/A	$ 6,515,449	100.0%	
Benchmark - Bloomberg Barclays Intermediate U.S. Gov't./Credit Index[4]	-0.8%	-0.1%	-7.3%	-2.6%	1.0%	1.1%			

[1] The Public University Fund (PUF) policy guidelines define investment allocation targets based upon total participant dollars committed. Core balances in excess of liquidity requirements for the participants are available for investment in the Core Bond Fund. Maximum core investment allocations are determined based upon anticipated average cash balances for all participants during the fiscal year.

[2] 100% Bloomberg Barclays Intermediate U.S. Gov't./Credit Index as of February 1, 2021. From April 1, 2017 to January 31, 2021, the benchmark was 75% Bloomberg Barclay's Aggregate 3-5 Years Index, 25% Bloomberg Barclay's Aggregate 5-7 Years Index.

[3] The reported investment yield for the quarter and fiscal year-to-date represent earned yields for the period and are not annualized rates.

[4] 100% Bloomberg Barclays Intermediate U.S. Gov't./Credit Index as of January 1, 2021. From June 1, 2015 to December 31, 2020 the benchmark was Bloomberg Barclays 3-5 Year U.S. Aggregate Index.

Note: Outlined returns underperfomed their benchmark.

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Oregon Short Term Fund

June 30, 2023

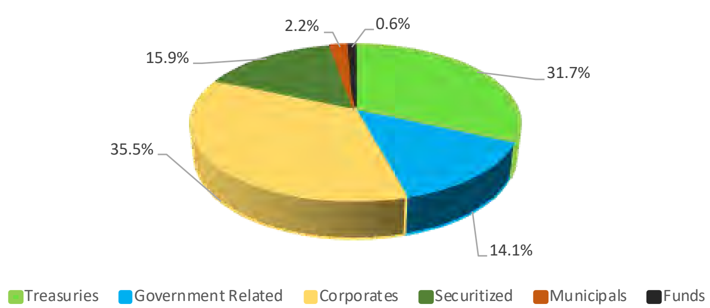
Portfolio Characteristics

Market Value 06/30/2023	$ 175,739,973
Weighted Average Credit Quality	AA
Book Yield (%)	4.43%
Weighted Average Maturity (years)	152 Days
Duration (years)	0.42
Spread Duration (rate)	0.65

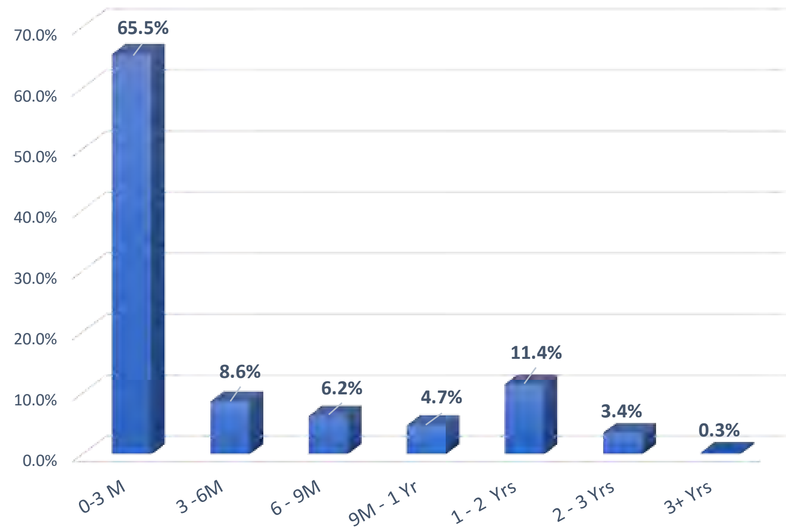
Top 10 Issuers

United States Treasury	31.7%
Federal Home Loan Banks	2.8%
CPPIB Capital Incorporated	2.7%
JPMorgan Chase & Company	2.5%
Royal Bank of Canada	2.3%
Bank of America Corporation	1.9%
Toyota Motor Credit Corporation	1.6%
Bank of Montreal	1.4%
Federal Farm Credit Banks Funding Corporation	1.4%
Morgan Stanley	1.4%
Total	**49.6%**

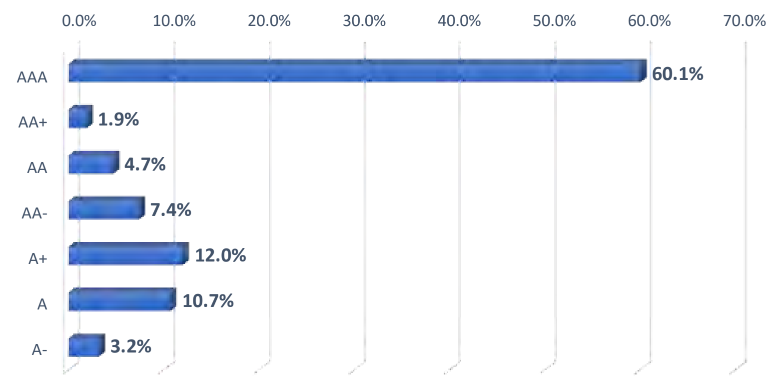
Sector Allocations



Maturity Breakdown



Credit Quality Distribution



Source: Oregon State Treasury

Attachment C

Core Bond Fund

June 30, 2023

Portfolio Characteristics

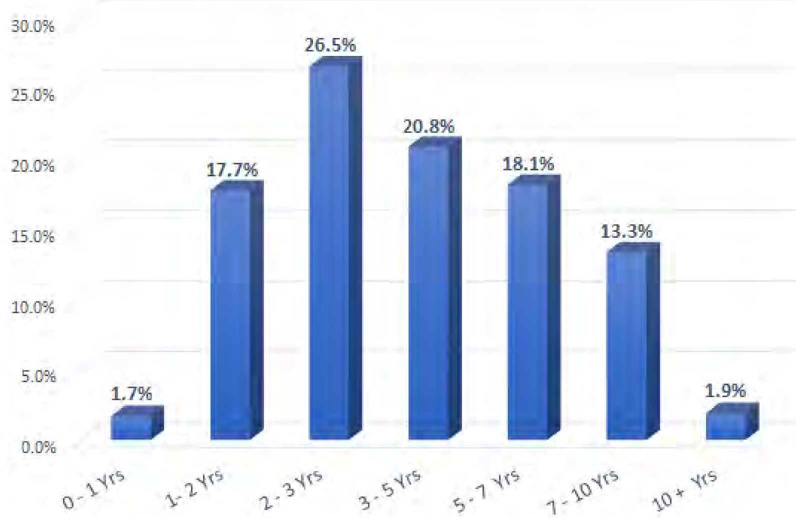
Market Value 06/30/2023	$ 380,527,141
Weighted Average Credit Quality	AA
Book Yield (%)	4.03%
Weighted Average Maturity (years)	4.63
Duration (years)	3.97
Spread Duration (rate)	1.65

Top 10 Issuers

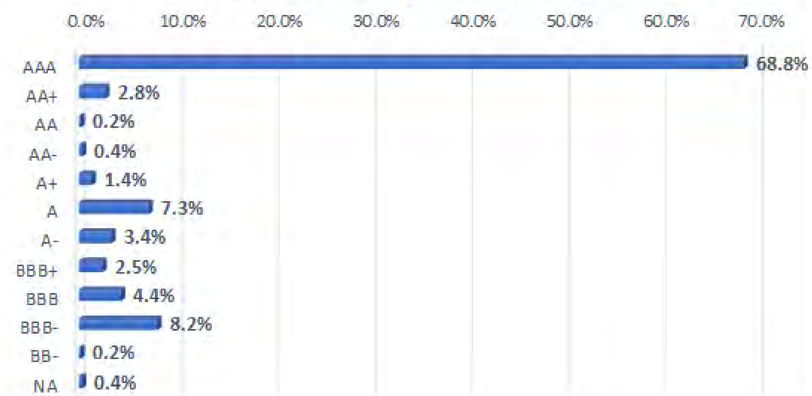
United States Treasury	58.3%
Charles Schwab Corporation (The)	4.1%
Deutsche Telekom AG	3.0%
Federal Home Loan Mortage Corporation	2.7%
F&G Global Funding	2.7%
Agree Realty Corporation	1.9%
Ford Credit Trust 22-C	1.8%
Oscar US Funding Trust	1.6%
Targa Resources Corporation	1.4%
OCI N.V.	1.3%
Total	**78.8%**

Sector Allocations

Maturity Breakdown



Credit Quality Distribution



Source: Oregon State Treasury

Attachment C

FY2023 Q4 MARKET COMMENTARY

(Prepared by Meketa Investment Group, consultants to the Oregon Investment Council)

Report on Investments – as of June 30, 2023

Economic and Market Update

Asset returns were positive for the quarter with U.S. and Non-U.S. equities posting gains, while most fixed income sectors declined on expectations of further interest rate hikes later this year. Except for commodities, most public market asset classes remain in positive territory for the calendar year.

- Although the Federal Reserve skipped a rate-hike in June, Fed comments signaled further rate hikes in the second half of calendar year 2023; the U.S. economy appears to be resilient with continuing domestic demand and low unemployment.
- U.S. equity markets (S&P 500) rose in the second calendar quarter (+8.7%) adding to calendar year-to-date gains (+16.9%). Some of the largest technology names drove positive results. Growth stocks continued to outpace value stocks, particularly in the large cap space.
- Non-U.S. developed equity markets rose in the second calendar quarter ((Morgan Stanley Capital International (MSCI) Europe, Australia, and Far East (EAFE) 3.0%) falling behind U.S. equities in 2023 (+16.2% versus +11.7%). A strengthening U.S. dollar weighed on returns.
- Emerging market equities rose in the second calendar quarter (+3.8%) supported by positive returns in China (+4.0%). Emerging markets trail developed market equities calendar year-to-date returning +4.9%, due partly to rising U.S.-China tensions.
- Interest rates generally rose during the period leading to bond markets declining, with the U.S. bond market (Bloomberg Aggregate) falling 0.8% for the quarter. The index remains positive (+2.1%) calendar year-to-date, though, on declining inflation and expectations for the Fed to end their rate hikes soon.

This year, the paths of inflation and monetary policy, slowing global growth and the war in Ukraine will all be key. After a particularly difficult 2022, most public market assets are up thus far in 2023, building on gains from the fourth calendar quarter of last year. Risk sentiment has been supported by expectations that policy tightening could be ending soon, as inflation continues to fall, and growth has slowed.

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Market Returns[1]
June 30, 2023

	Month	Quarter	YTD	1-Year	3-Year	5-Year	7-Year	10-Year
S&P 500	6.60%	8.70%	16.90%	19.60%	14.60%	12.30%	13.40%	12.90%
MSCI EAFE-ND	4.60%	3.00%	11.70%	18.80%	8.90%	4.40%	6.90%	5.40%
MSCI EM-ND	3.80%	0.90%	4.90%	1.70%	2.30%	0.90%	4.90%	3.00%
MSCI China-ND	4.00%	-9.70%	-5.50%	-16.80%	-10.30%	-5.30%	2.90%	3.00%
Bloomberg US Aggregate	-0.40%	-0.80%	2.10%	-0.90%	-4.00%	0.80%	0.40%	1.50%
Bloomberg US TIPS	-0.30%	-1.40%	1.90%	-1.40%	-0.10%	2.50%	2.00%	2.10%
Bloomberg US Corporate High Yield	1.70%	1.70%	5.40%	9.10%	3.10%	3.40%	4.50%	4.40%
ICE BofAML US 3-Month Treasury Bill	0.50%	1.20%	2.30%	3.60%	1.30%	1.60%	1.40%	1.00%
ICE BofAML 1-3 Year US Treasury	-0.50%	-0.60%	1.00%	0.10%	-1.00%	0.90%	0.70%	0.80%
ICE BofAML 10+ Year US Treasury	-0.10%	-2.30%	3.60%	-7.00%	-11.60%	-0.70%	-1.60%	1.80%

[1]Source: Oregon State Treasury

U.S. Equities: The S&P 500 Index rose 8.7% in the second calendar quarter and 16.9% year-to-date. U.S. stocks rose sharply in the second calendar quarter of 2023. Most of the gains came in the month of June when the Fed kept its target rate unchanged for the first time since early 2022. Investors are expressing optimism that the Fed can tame inflation without widespread disruptions to the equity markets. Except for energy and utilities, each sector of the S&P 500 index appreciated during the second calendar quarter. Technology led all sectors and was driven by enthusiasm for growth stocks, particularly those with exposure to artificial intelligence (e.g., NVIDIA). Large cap stocks continue to outperform small cap stocks, driven by technology and the underperformance of small cap biotechnology stocks. Growth stocks continue to broadly outperform value stocks.

International Equities: Developed international equities (MSCI EAFE) rose 3.0% in the second calendar quarter bringing the calendar year-to-date results to +11.7%. Emerging market equities (MSCI Emerging Markets (EM) rose 0.9% in the quarter, rising 4.9% calendar year-to-date. The European and Japanese equity markets continued their strength in June, wrapping up a strong second calendar quarter. In Europe, financials and information technology led returns whereas energy and communication services lagged. Headline inflation was down in June, although core inflation was up slightly month over month. Energy and materials were the main drivers for falling UK equities, along with Bank of England rate hikes. Optimism continues to build for Japanese investors, while the Yen remains weak, and Bank of Japan remains dovish. Emerging markets were laggards as China equities struggled from weak export demands and rising negative sentiments.

Fixed Income: The Bloomberg U.S. Aggregate Index declined 0.4% in the second calendar quarter as debt yields generally rose. Bonds retained a positive start to the calendar year (+2.1% calendar year-to-date) though inflation continues to decline. U.S. Treasury yields generally rose over the month, with the 1-year to 10-year maturity sector rising the most due to higher policy expectations. The Treasury Inflation-Protected Securities (TIPS) index and the short-term TIPS index posted negative returns for the month as inflation concerns continued to ease. Continued risk appetite drove high yield bond performance (1.7%) and outperformance versus the broad U.S. bond market (Bloomberg Aggregate). Emerging market bonds (3.3%) also performed well on investor risk sentiment.

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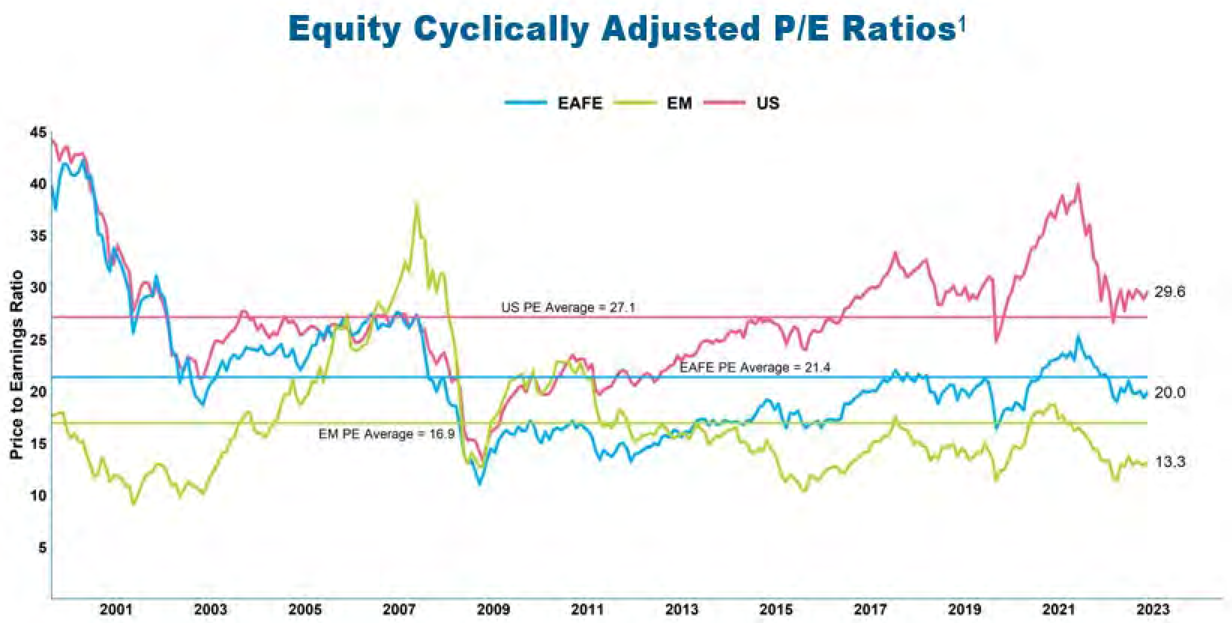
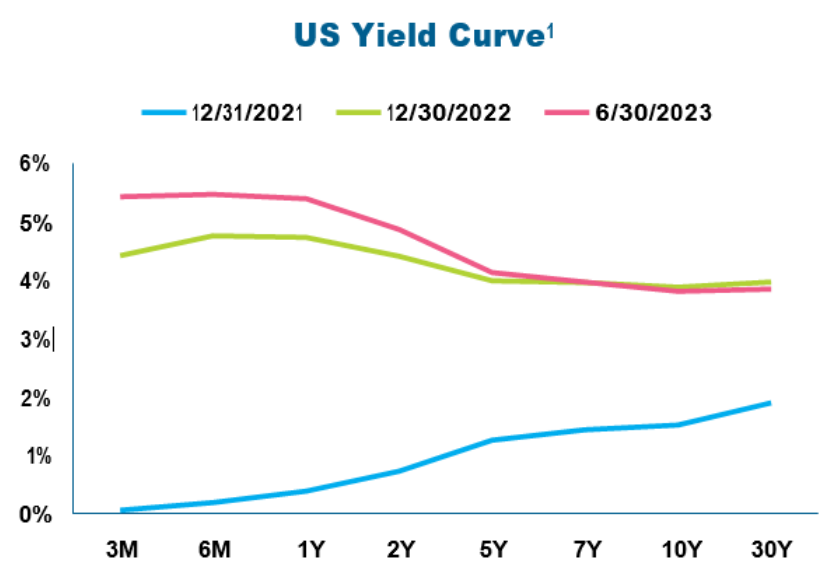
After its dramatic decline last year, the U.S. equity price-to-earnings ratio remains above its long-run (21st century) average. International developed market valuations are below their own long-term average, with those for emerging markets the lowest and well under the long-term average.



[1] US Equity Cyclically Adjusted P/E on S&P 500 Index. Source: Robert Shiller, Yale University, and Meketa Investment Group. Developed and Emerging Market Equity (MSCI EAFE and EM Index) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly "as reported" earnings over the previous ten years. Data is as of June 2023. The average line is the long-term average of the US, EM, and EAFE PE values from December 1999 to the recent month-end respectively.

Interest rates have started rising again across the curve given policy maker guidance that policy rates are likely to rise further and potentially stay longer at the terminal rate than market participants expect. The yield curve remains inverted with the spread between two-year and ten-year Treasuries finishing the month at -1.06%.



[1]Source: Bloomberg. Data is as of June 30, 2023

Attachment C

Headline inflation continued to decline in June, with the calendar year-over-year reading falling from 4.0% to 3.0% and coming in slightly below estimates. The month-over-month rate of price increases rose slightly (0.2% versus 0.1%), with food prices ticking up slightly (0.1%) and energy prices rose (0.6%). Core inflation – excluding food and energy - fell (5.3% to 4.9%), coming in slightly above forecasts. It remains stubbornly high driven by shelter costs. Inflation expectations (breakevens) remain well below current inflation as investors continue to expect inflation to track back toward the Fed's 2% average target.

Global Economic Outlook

Global economies are expected to slow this year compared to 2022, with risks of recession as the impacts of policymakers' aggressive tightening to fight inflation flow through economies. The delicate balancing act of central banks trying to reduce inflation without dramatically depressing growth will remain key.

In 2022, many central banks aggressively reduced pandemic-era policy support in the face of high inflation, with the U.S. taking the most aggressive approach. Slowing inflation and growth have led to expectations for reductions in policy tightening going forward. In May the Fed raised rates another 25 basis points to a range of 5.0% to 5.25%. After the month-end, the FOMC paused its tightening campaign but hinted that one or two additional rate hikes could come later this calendar year. In China, the central bank has continued to cut interest rates and inject liquidity into the banking system, as weaker than expected economic data appears to indicate a widespread slowdown. Looking ahead, risks remain for a policy error as central banks attempt to balance multiple goals, bringing down inflation, maintaining financial stability, and supporting growth.

[1] Source: Bloomberg. Data is as of June 30, 2023. The most recent data for Japan and China is as of May 2023.

Inflation pressures continued to decline globally due to the easing of supply chain issues from the pandemic, declining energy prices, and tighter monetary policy. In the U.S., inflation fell to 3.0% at month-end, while eurozone inflation also fell (6.1% from 7.0%) to a level well off its peak. Despite 2023's significant declines in the U.S. and Europe, inflation levels remain elevated compared to central bank targets. Inflation remains lower in China and Japan. In

Attachment C

China, inflation levels were only slightly above 0% at month-end as the reopening of their economy has led to an uneven economic recovery.

Despite slowing growth and high inflation, the U.S. labor market still shows signs of resiliency. Unemployment in the U.S., which experienced the steepest rise, recently returned to pre-pandemic levels. Broader measures of unemployment (U-6) remain higher at 6.9% but also declined dramatically from their peak. The strong labor market and higher wages, although beneficial for workers, motivates the Fed's efforts to fight inflation, leading to higher unemployment. Unemployment in Europe has also declined but remains higher than the U.S., while levels in Japan have been flat through the pandemic given less layoffs.

The dollar finished 2022 much higher than it started, due to the increased pace of policy tightening, stronger relative growth, and safe-haven flows. Late last calendar year and into this year, the dollar declined, as weaker economic data and lower inflation led to investors anticipating the end of Fed tightening. In June, we did see a slight decline in the dollar though. This year, the track of inflation across economies and the corresponding monetary policies will be key drivers of currency moves.

Summary - Key Trends:

- The impacts of still relatively high inflation will remain key, with bond market volatility likely to stay high.
- Recent issues related to the banking sector seem to have subsided for now but are a reminder that there is a delicate balance for central banks to continue to fight inflation but also to try to maintain financial stability.
- Global monetary policies could diverge in 2023. The risk of policy errors remains elevated as central banks try to reduce persistent inflation while not tipping their economies into recession.
- Growth is expected to slow globally this calendar year, with many economies forecast to tip into recession. Inflation, monetary policy, and the war in Ukraine will all be key.
- In the U.S., consumers could feel pressure as certain components of inflation remain high (e.g., shelter), borrowing costs are elevated, and the job market may weaken.
- The key for U.S. equities going forward will be whether earnings can remain resilient if growth continues to slow.
- Equity valuations remain lower in both emerging and developed markets, but risks remain, including potential continued strength in the U.S. dollar, higher inflation weighing particularly on Europe, and China's sluggish economic reopening and on-going weakness in the real estate sector.

BOARD OF TRUSTEES / 4.12.2023

Oregon Tech's - Capital Projects Update

Thom Darrah | Director of Facilities & Capital Planning

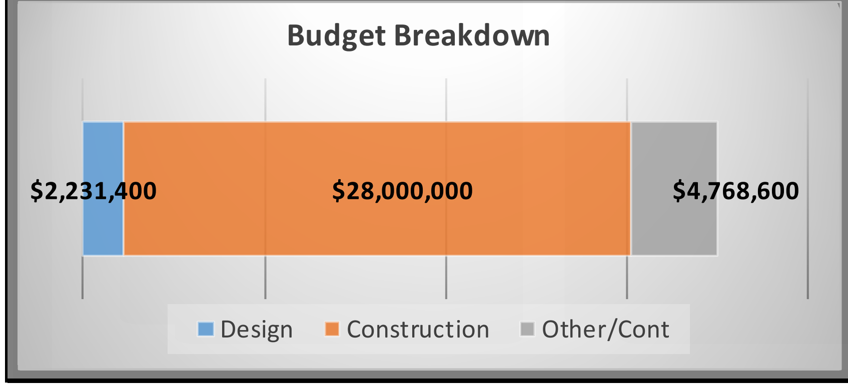
Presentation Outline

Capital Projects – Upcoming and Underway

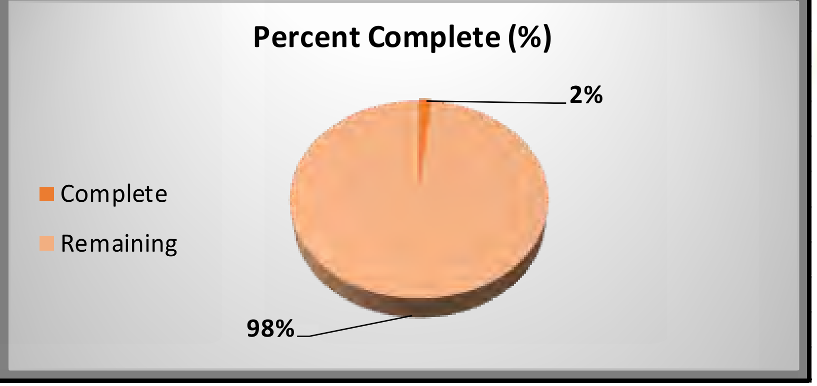
- New Student Housing
- Geothermal Systems Emergency Renovation
- Boivin Hall Traffic Improvements
- DPT Research Lab Renovation

New Student Housing

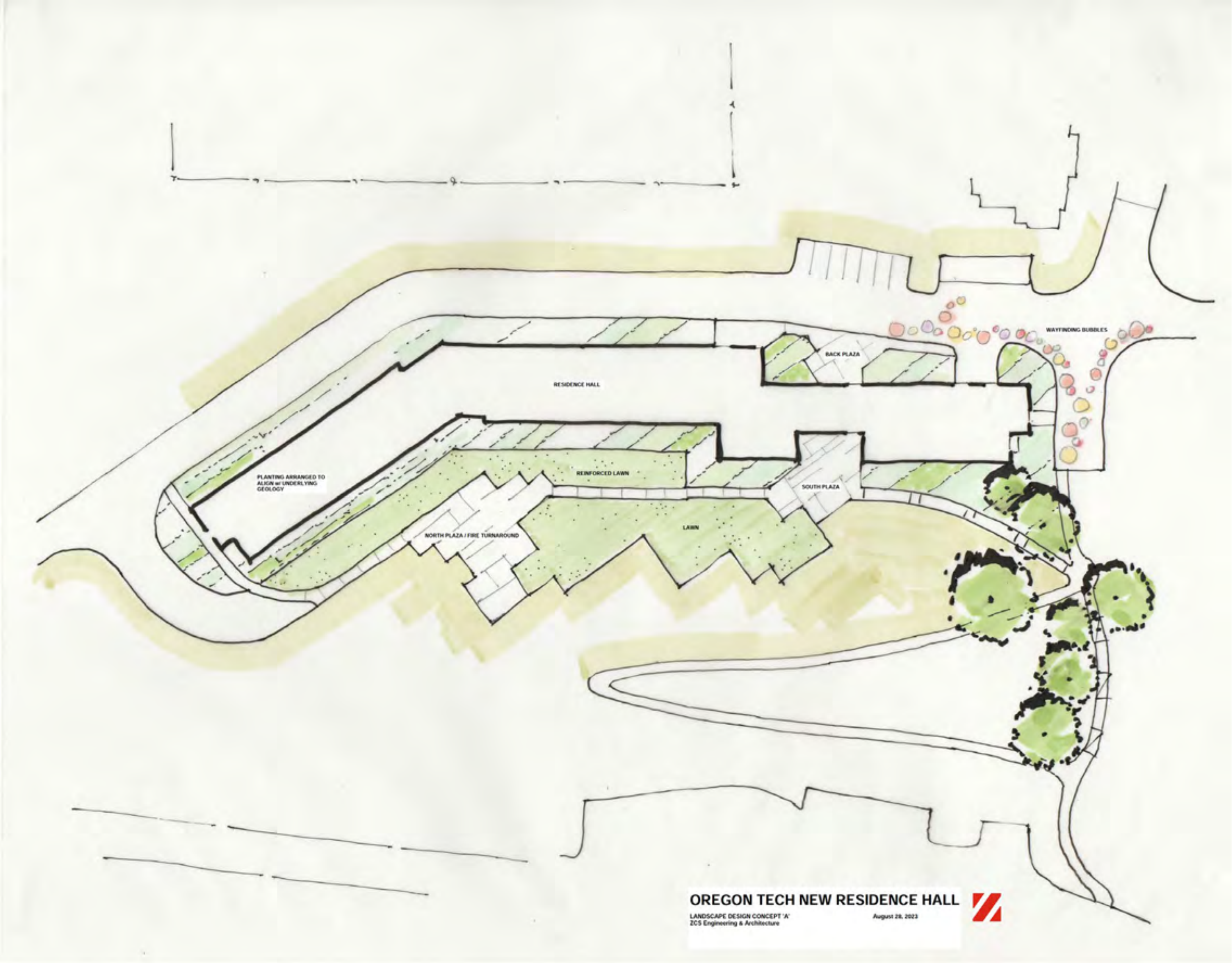
New Student Housing (85,000 sq ft)							
Project Start: 4.01.2023				Project Completion: 8.30.2025			
Project	**Progress Highlights**	**Cost Breakdown**	**Orig. Budget**	**Rev. Budget**	**Cost To Date**	**%**	**Balance**
UPE822 / FNRESH	Visioning: January 2023 - February 2023						
Bond Type: XI-F 2023	Design: March 2023 - April 2024						
	Construction: May 2024 - August 2025	Visioning/Design (6%):	$ 2,231,400	$ 2,231,400	$ 543,296	24%	$ 1,688,104
	Project underway.	Construction (80%):	$ 28,000,000	$ 28,000,000	$ -	0%	$ 28,000,000
Design: Mahlum Architects		Other (14%):	$ 4,768,600	$ 4,768,600	$ 35,134	1%	$ 4,733,466
CM/GC: Bogatay Const.	Plan / **Design** / Bid / Build / Closeout	Project Totals:	$ 35,000,000	$ 35,000,000	$ 578,430	2%	$ 34,421,570



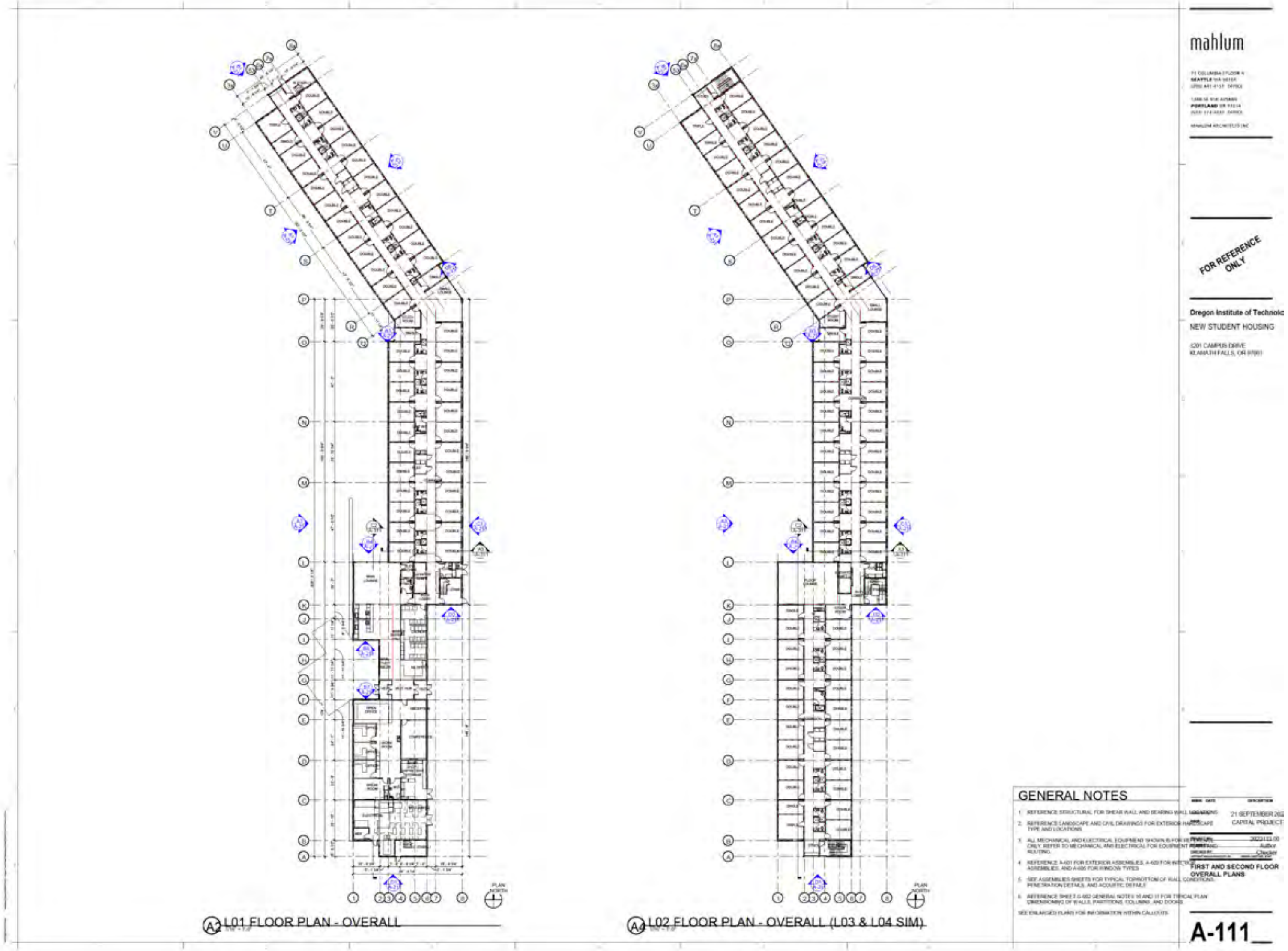
CO's / Amendments	
	$ -
	$ -
	$ -
	$ -
	$ -
	$ -
	$ -
	$ -
	$ -
Total:	$ -



New Student Housing



New Student Housing

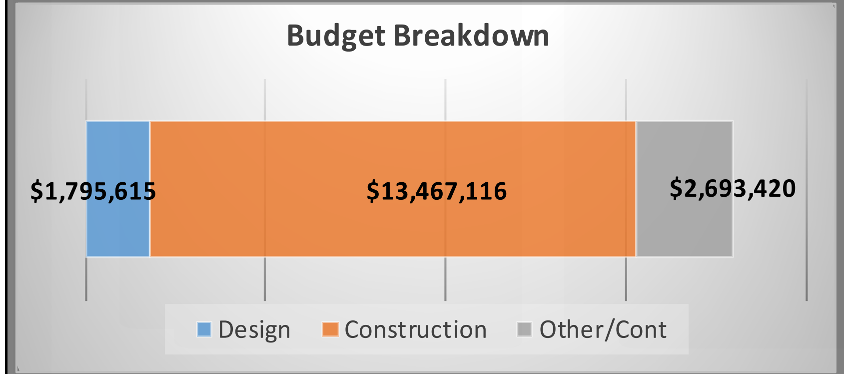


New Student Housing

New Student Housing

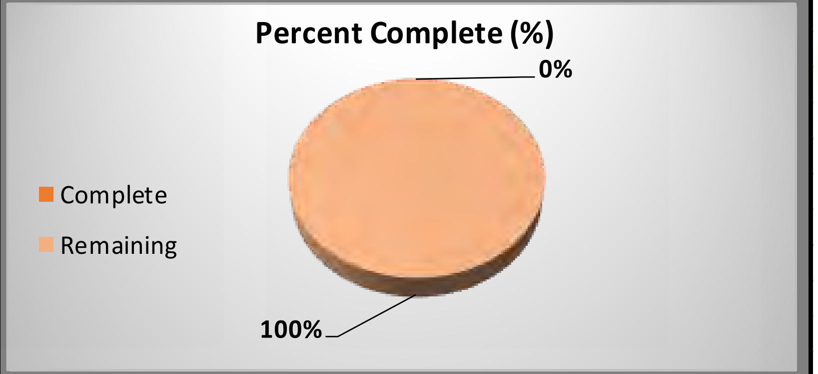
Geothermal Systems Emergency Renovation

Geothermal Systems Emergency Renovation							
Project Start: 11.06.23		Project Completion: TBD					
Project	**Progress Highlights**	**Cost Breakdown**	**Orig. Budget**	**Rev. Budget**	**Cost To Date**	**%**	**Balance**
UPE: TBD	Design: TBD						
	Construction: TBD						
		Design (10%):	$ 1,795,615	$ 1,795,615	$ -	0%	$ 1,795,615
	Design underway.	Construction (75%):	$ 13,467,116	$ 13,467,116	$ -	0%	$ 13,467,116
Design: AES		Other (15%):	$ 2,693,420	$ 2,693,420	$ -	0%	$ 2,693,420
Build: TBD	Plan / **Design** / Bid / Build / Closeout	Project Totals:	$ 17,956,151	$ 17,956,151	$ -	0%	$ 17,956,151



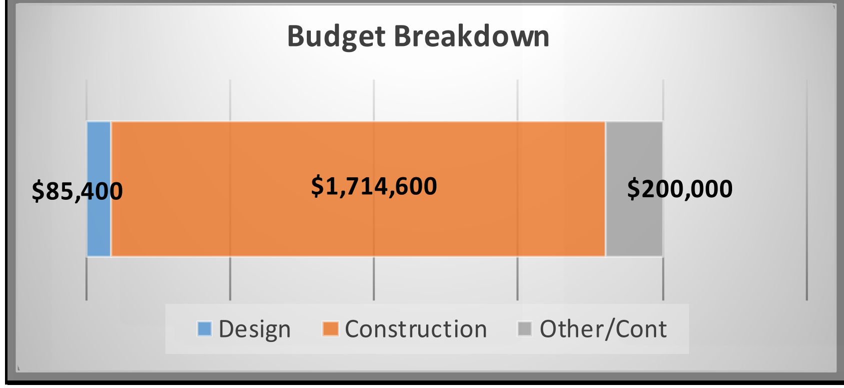
CO's / Amendments

	$ -
Total:	$ -

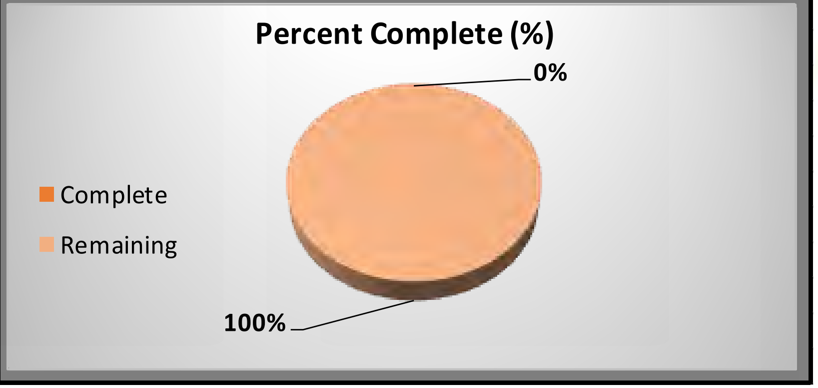


Boivin Hall Traffic Improvements

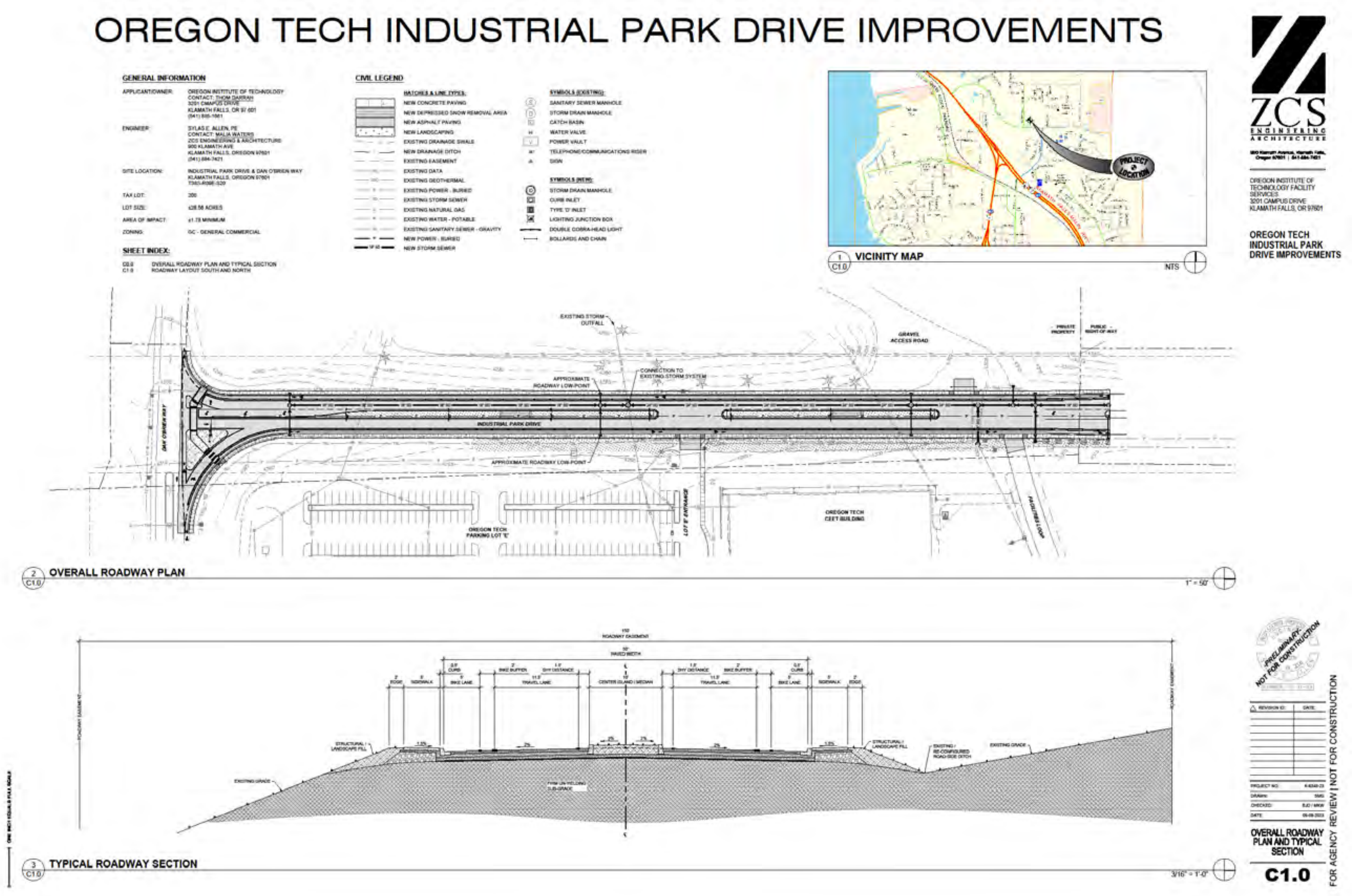
Boivin Hall Traffic Improvements							
Project Start: 5.01.24		Project Completion: 8.31.24					
Project	**Progress Highlights**	**Cost Breakdown**	**Orig. Budget**	**Rev. Budget**	**Cost To Date**	**%**	**Balance**
UPE	Design: Underway						
UPE	Construction: May 2024 - Aug. 2024						
		Design (5%):	$ 85,400	$ 85,400	$ -	0%	$ 85,400
	Project underway.	Construction (85%):	$ 1,714,600	$ 1,714,600	$ -	0%	$ 1,714,600
Design: ZCS		Other (10%):	$ 200,000	$ 200,000	$ -	0%	$ 200,000
Build: TBD	Plan / **Design** / Bid / Build / Closeout	Project Totals:	$ 2,000,000	$ 2,000,000	$ -	0%	$ 2,000,000



CO's / Amendments	
	$ -
Total:	$ -

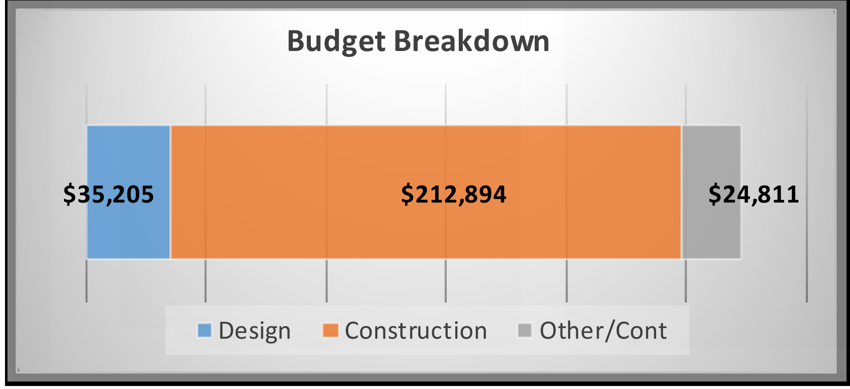


Bovin Hall Traffic Improvements



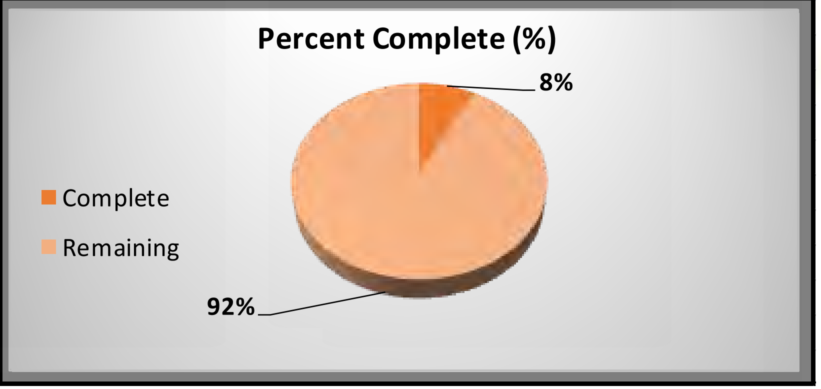
DPT Research Lab Renovation

DPT Research Lab Renovation (1,000 sq ft)							
Project Start: 9.1.23		Project Completion: 12.31.23					
Project	Progress Highlights	Cost Breakdown	Orig. Budget	Rev. Budget	Cost To Date	%	Balance
DPT430-DPT-FDN Gifts	Design: 100% Complete						
	Construction: Sept. 2023 - Dec. 2023						
		Design (13%):	$ 35,205	$ 35,205	$ 21,103	60%	$ 14,102
	Project underway.	Construction (78%):	$ 212,894	$ 212,894	$ -	0%	$ 212,894
Design: ORW		Other (9%):	$ 24,811	$ 24,811	$ -	0%	$ 24,811
Build: DCI	Plan / Design / Bid / **Build** / Closeout	Project Totals:	$ 272,910	$ 272,910	$ 21,103	8%	$ 251,807

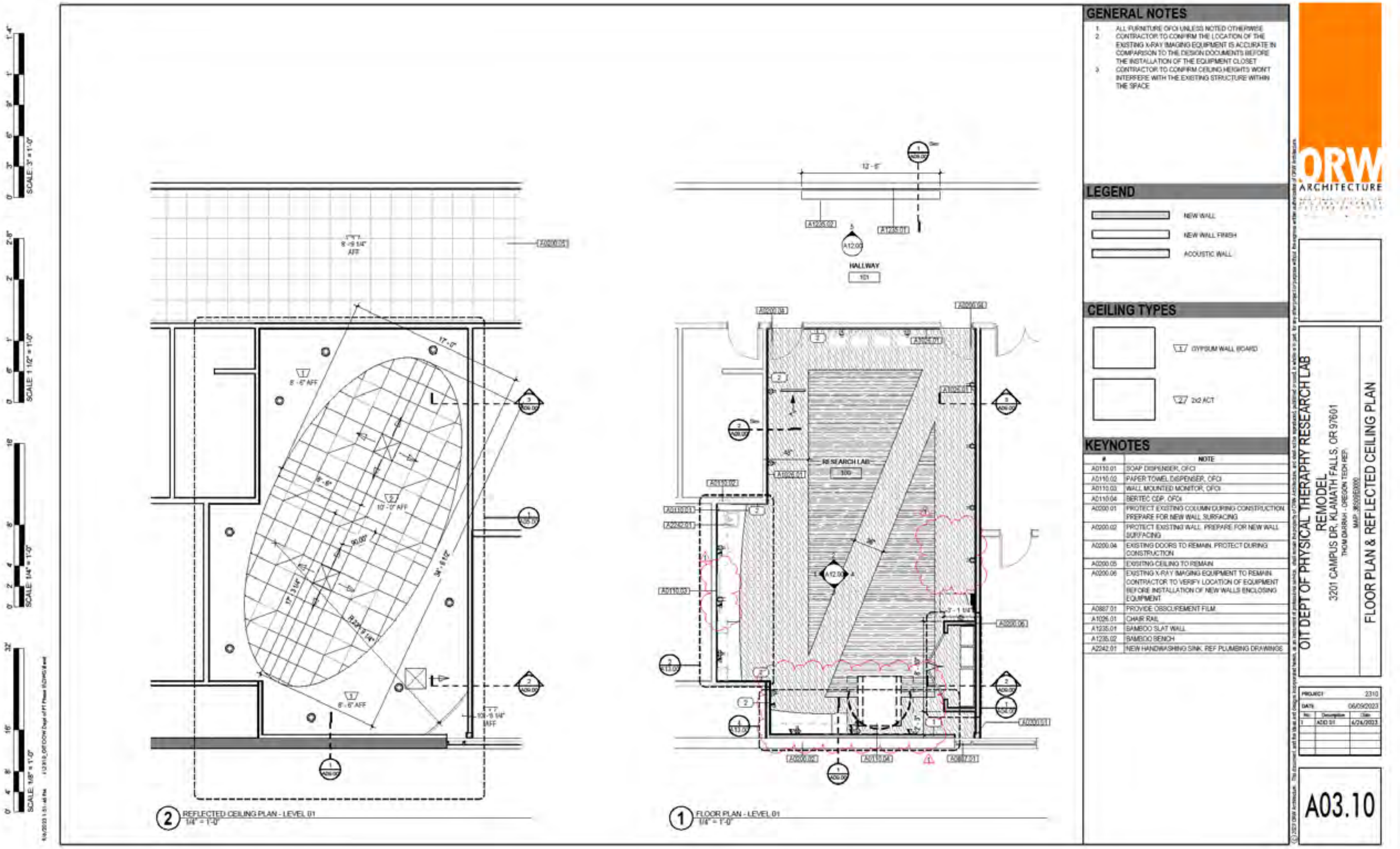


CO's / Amendments

	$ -
Total:	$ -



DPT Research Lab Renovation



Contact Information

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Email: Thom.Darrah@oit.edu

Oregon Institute of Technology 2023 Economic, Fiscal, and Social Impact Analysis

July 2023

Beacon Economics

Oregon TECH
Oregon Institute of Technology

Fact Sheet:

The Economic and Fiscal Value of Oregon Tech
Analysis of Fiscal Year 2021-22

Oregon TECH
Oregon Institute of Technology

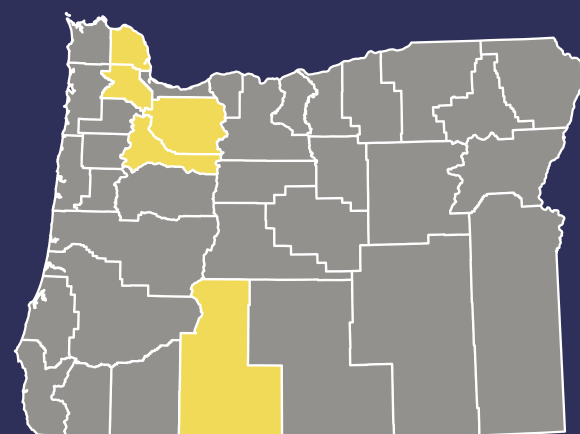
Oregon Tech is a public education and applied research university located in the state of Oregon. Nearly 5,000 students are enrolled across its campuses, including non-degree-seeking, undergraduate, and graduate students. The University makes substantial contributions that significantly benefit the state of Oregon and its communities in a highly impactful manner.

47
Majors and Degrees

16:1
Student:Faculty Ratio

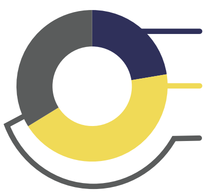
$67,200
Avg. Starting Salary

Studied Geographies Throughout Oregon



Expenditures

Expenditure by type



Capital: $31.7 Million
Operations $61.1 Million
Student/Visitor: $47.7 Million

$140 Million Statewide Expenditures

Economic Impact

2,555
Jobs Supported Annually

$124.5M
Labor Income Generated

$286.4M
Output Created

Fiscal Impact

$37.9M Statewide Fiscal Impact

$18.7M
State and Local Tax Rev.

$19.2M
Federal Tax Rev.

Beacon Economics

Oregon Institute of Technology 75 1947-2022 Per Cognitionem, Lux

Key Terms

Term	Definition
Direct Effect	The output of goods or services resulting from immediate spending by Oregon Tech and its entities, students, faculty, staff and/or visitors. These expenditures include construction spending, operations spending (including employee compensation), and non-tuition-related student spending on goods and services in the region.
Indirect Effect	The additional output of goods or services generated by Oregon Tech's supply chain. The indirect effect supports the outputs produced by the direct effect.
Induced Effect	As businesses increase productivity from the direct and indirect effects, their payroll expenditures grow through more hiring or increased salaries. As a result, household spending expands. These new personal market transactions, which generate additional outputs of goods and/or services, are the induced effect.
Secondary Effect	Sum of indirect and induced effects.
Total Impact	The sum of the direct, indirect, and induced effects.
Employment, Jobs	The number of jobs supported through spending by Oregon Tech's students, faculty, staff, and/or visitors (Oregon Tech's spending).
Labor Income	The value of all forms of employment income paid through Oregon Tech's spending, including health care and other employee benefits.
Output	The total value of production generated through Oregon Tech's spending, including the value of intermediate inputs – the goods and services used in the production of equipment, raw materials, energy, and other production inputs.
Value Added	Oregon Tech's contribution to GDP, which is equal to output minus the value of intermediate inputs. Value added represents the total market value of final goods and services produced.
Tax Revenue	Money collected to support federal, state, and local governments.

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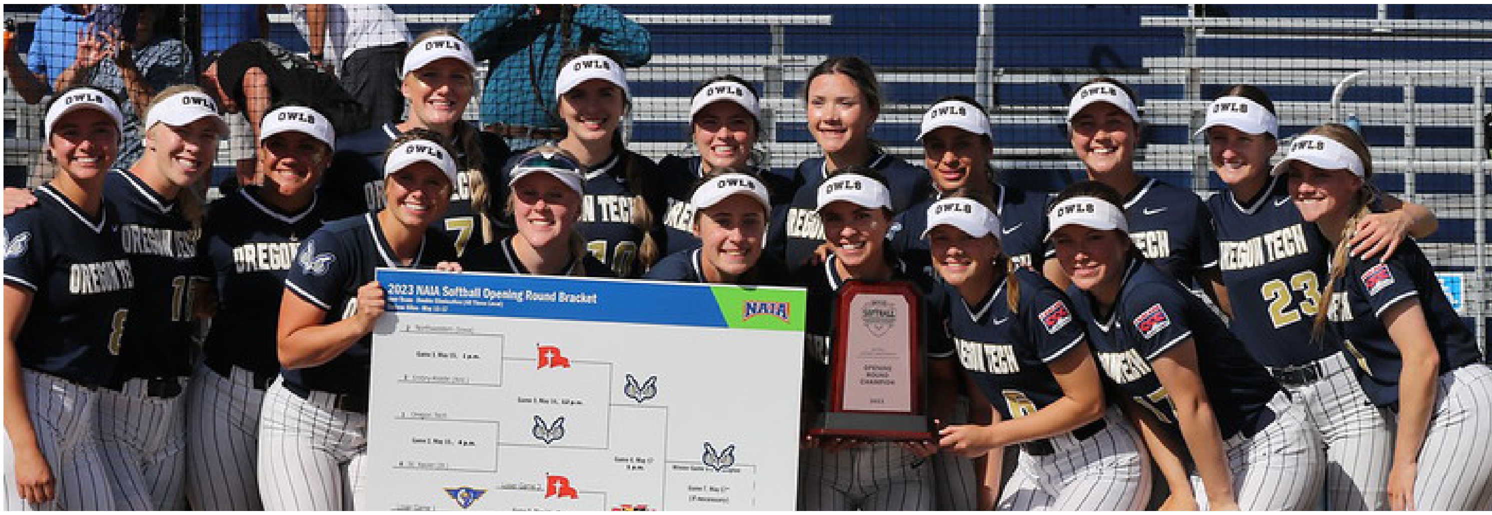
Attachment E

Executive Summary

Oregon Tech (Oregon Institute of Technology, or the University) is a public education and applied research university that offers a wide array of bachelor's degrees and master's degree, and a new doctorate program in physical therapy at its five campuses across Oregon and Washington. Oregon Tech is Oregon's only polytechnic university. The university offers innovative, professionally-focused undergraduate and graduate degree programs in the areas of engineering, health, business, technology, and applied arts and sciences. These programs are conducted at a residential campus in Klamath Falls, Oregon; the OMIC research innovation center in Scappoose, Oregon; an urban campus in Wilsonville, Oregon; and two additional campuses in Salem, Oregon and Seattle, Washington. In academic year 2022-23, Oregon Tech enrolled nearly 5,000 students across its campuses: 4,800 as undergraduate and non-degree-seeking students and over 100 master's students.

Oregon Tech Mission Statement:

> *Oregon Institute of Technology (Oregon Tech), Oregon's public polytechnic university, offers innovative, professionally-focused undergraduate and graduate degree programs in the areas of engineering, health, business, technology, and applied arts and sciences. To foster student and graduate success, the university provides a hands-on, project-based learning environment and emphasizes innovation, scholarship, and applied research. With a commitment to diversity and leadership development, Oregon Tech offers statewide educational opportunities and technical expertise to meet current and emerging needs of Oregonians as well as other national and international constituents.*



Oregon Tech takes pride in offering its students an education that provides them with real tools to conquer real challenges in the workforce. The University is consistently well-ranked in many fields of study. The educational opportunities offered by the school are also exceptionally affordable, particularly for in-state students; Oregon Tech provides high quality educational opportunities at a relatively low price, earning it the distinction of 15th in the western US for Social Mobility.[1] Amongst all degree programs, Oregon Tech specializes in engineering, health sciences, and business technology. Based on its consistent innovation and improvements to curriculum, faculty, campus life, and more, the University ranks in the top 30 nationally for "Best Engineering Programs".[1] Oregon Tech students earn the highest starting postgrad salary of any Oregon school.[2]

Aside from providing a valuable education, one of Oregon Tech's most important tasks is continuing to strengthen the relationship between itself and the local community. The University provides a pipeline of talent to the local community, with over 60% of degree-receiving alumni staying in the state of Oregon after graduation. These alumni allow Oregon Tech to continue to have a long-lasting regional impact as they build companies, fill skilled jobs, and contribute to the greater social and cultural life of Oregon.

This report seeks to assess the economic, fiscal, and social impacts of Oregon Tech across five regional geographies. The regions analyzed in the economic and fiscal impact sections of this report include Klamath County, Clackamas & Washington Counties (bundled together as one region), Marion County, Columbia County, and the overall State of Oregon. These geographies correspond to the Oregon Tech Klamath Falls, Wilsonville, Salem, and OMIC-Scappoose campus locations, respectively.

4,900	60%	+8%
Students Enrolled	of Alums Stay in Oregon	Start Salary vs Avg. OR University

1 "Oregon Institute of Technology Overall Rankings | US News Best Colleges." US News, https://www.usnews.com/best-colleges/oregon-institute-of-technology-3211/overall-rankings.

2 "Oregon Tech Graduates Have Starting Salaries 8% Higher than the Oregon Average, According to SmartAsset." Oregon Tech, 11 July 2022, www.oit.edu/news/oregon-tech-graduates-have-starting-salaries-8-higher-oregon-average-according-smartasset#

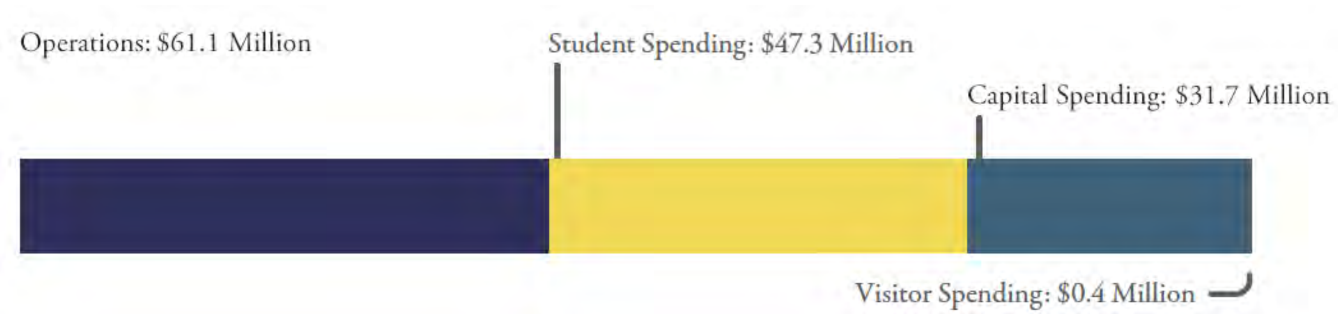
In fiscal year 2021-22, spending associated with Oregon Tech in Oregon was approximately $140.5 million. This figure included wages and employee benefits, university operations (vendors and other necessary goods and services), student spending, and visitor spending. Across the same period, the University generated roughly $286.4 million in economic impacts across Oregon, with over $204 million in output generated in Klamath County alone. The University's economic activities have also supported thousands of jobs locally and generated millions of dollars in wages. Of equal importance are the University's social services, which are designed to improve and aid the nearby community and help enhance the lives of students and non-students alike. This report will evaluate the social impacts that the University generates, including Community Efforts, Diversity and Inclusion, Academics and Research, and social impacts of the Oregon Tech Foundation,

Key Findings

Expenditures

Throughout the fiscal year 2021-22, statewide expenditures associated with Oregon Tech totaled roughly $140 million, including university-related spending allocated to capital expenditures, operational costs (including employee compensation, vendor payments, other non-wage expenses, etc.), and student and visitor spending across the state of Oregon. By far the largest source of expenditures for Oregon Tech in Fiscal Year 2021-22 was operational spending at $61.1 million (44% of total expenditures). Student spending was the second largest category at over $47 million, or 34% of total spending. Klamath County benefitted from a significant portion of the University's statewide expenditures, with roughly $103.3 million (approximately 73% of the University associated spending in Oregon as a whole) spent in the county.

Figure A.1: FY 2021 - 2022 Statewide Expenditures by Source, Oregon Tech

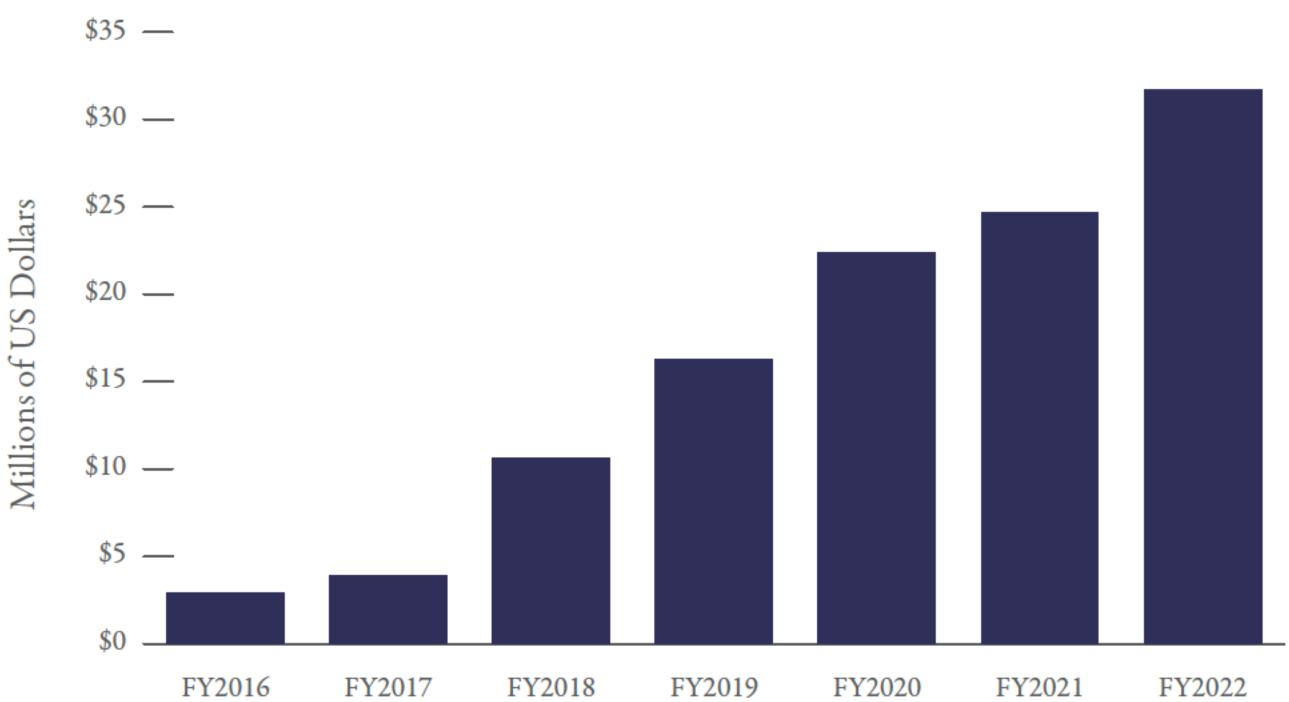


Source: Oregon Tech. Analysis by Beacon Economics.

While student expenditures, operational expenditures, and visitor expenditures associated with universities are generally stable over time, capital expenditures are not. Oregon Tech's significant capital expenditure projects are funded primarily through the state's capital construction program administered by the Higher Education Coordinating Commission (HECC). State capital project funding is awarded through a ranking system amongst all seven public universities in the state. Funding available for capital investment by the state varies year-to-year, depending upon actual capital projects approved and funded. As a result, Oregon Tech's capital expenditures can fluctuate significantly between fiscal years. For example, if Oregon Tech was awarded funding to construct a new state-of-the-art engineering research center, such as the University's Center for Engineering Excellence and Technology (CEET) completed in Fiscal Year 2020-21, the University may see total capital expenditures vary significantly from one year to the next, and between biennia.

While many of the findings of this report may be comparable in future years, the high variability of capital expenditures limits the reliability of the 2022 expenditure estimates as predictors of future years. Given recent Oregon Tech capital expenditure trends, it is not unlikely that the University could have significantly higher capital expenditures (with corresponding impacts) in future years, depending on state investment.

Figure A.2: Oregon Tech Capital Expenditures Trend Upward, by Fiscal Year



Source: Oregon Tech. Analysis by Beacon Economics.

Note that FY2022 in this chart is the same as the "Fiscal Year 2021-22" referenced throughout the text of this report.

Economic and Fiscal Impact

Oregon Tech's economic impact was significant in fiscal year 2021-22, both locally and statewide. In total, the University generated $286.4 million in economic output across Oregon, of which $204.3 million was generated in Klamath County. Oregon Tech-related expenditures helped support 1,760 jobs in Klamath County alone. The University also supported over 2,500 jobs statewide.

The total fiscal impact (also known as tax revenues) generated by Oregon Tech-related expenditures was approximately $37.9 million, with $18.7 million in state and local tax revenue, and $19.2 million in federal tax revenue. Sources of revenue vary by government agency, with most state and local taxes being collected through income taxes, while most federal taxes come from payroll tax and income tax.

Figure A.3: Oregon Tech FY 2021-22 Total Economic and Fiscal Impact Estimates by Region ($ Values in $Millions)

	Klamath County	Marion County	Clackamas & Washington Counties	Columbia County	State of Oregon
Jobs Supported Annually	1,760	62	489	78	2,555
Labor Income Generated	$ 91.4	$ 2.6	$ 19.0	$ 3.3	$ 124.5
Total Economic Output Created	$ 204.4	$ 5.7	$ 44.9	$ 7.8	$ 286.4
State and Local Tax Revenue	$ 15.0	$ 0.2	$ 2.6	$ 0.2	$ 18.7
Federal Tax Revenue	$ 13.9	$ 0.5	$ 3.2	$ 0.3	$ 19.2

Source: IMPLAN. Note that the "State of Oregon" geography is not equivalent to the sum of the four proceeding geographies. Analysis by Beacon Economics.

Social Impact

Oregon Tech has substantial qualitative impacts beyond its economic and fiscal impacts. These impacts, driven by the people of Oregon Tech, help improve the greater Oregon community.

Community Efforts

Oregon Tech Foundation

Equity, Diversity, and Inclusion

Academics and Research

Introduction

Oregon Institute of Technology was founded in 1947 as Oregon Vocational School, with a mission to provide accessible higher education to all, regardless of race or gender. It was renamed to Oregon Technical Institute in 1960, and then to Oregon Institute of Technology in 1973. The 2021 Oregon State Legislature designated Oregon Tech as "Oregon's Polytechnic University". The University offers a wide range of bachelor's and master's degrees, including programs in health sciences, engineering, applied sciences, management, and communication. The University consists of the College of Engineering, Technology, and Management, and the College of Health, Arts, and Sciences. The main Oregon Tech campus is in the city of Klamath Falls, Oregon, surrounded by lakes and mountains.

Oregon Tech has a diverse student body, a robust alumni network, and a long history of community engagement. Oregon Tech's alumni are valued members of the community and are encouraged to support each other in their entrepreneurial ventures. The University also promotes volunteer work and community service, encouraging its students and alumni to make a positive impact in their communities through partnerships and collaborations with local businesses and organizations. Oregon Tech also partners with local schools to provide mentorship, resources, and scholarships to students in the surrounding areas. These social factors, in tandem with significant economic and fiscal impacts, make Oregon Tech a vital asset to the greater Oregon region. This report seeks to understand the quantitative (economic and fiscal) impacts and qualitative (social) impacts that Oregon Tech has on the surrounding region.

Oregon Tech celebrated it's 75th anniversary on July 14th, 2023.

Oregon Tech began as Oregon Vocational School in 1947 and admitted only war veterans and their wives in the initial schools of Auto Mechanics, Commercial Cooking and Automotive Body & Fender. By 1948 the School had expanded its curriculum and enrolled over 500 students.

Methodology

To analyze the total economic and fiscal impacts of Oregon Tech, Beacon Economics assessed spending categories associated with the University. This includes Oregon Tech operations spending (wages, vendor payments, services, etc.), construction and capital expenditures, and student and visitor spending for the 2021-22 fiscal year. The 2021-22 fiscal year was chosen as it was the most recent full year, and as such, the economic activity generated that year represents the full recent impact of the University. This does, however, mean that estimates in this report may be lower than in future iterations of this study, particularly with regards to spending by visitors at Oregon Tech campuses and events that may have been limited by the COVID-19 pandemic.

Data for the analysis was provided by Oregon Tech for the 2021-22 fiscal year. Beacon Economics uses IMPLAN, a state-of-the-art input-output modeling system that estimates how certain expenditures correlate and affect other industries in the economy to generate the total economic and fiscal impact. This study assumes that any change in spending generates a direct, indirect, and induced effect. The indirect and induced effects are also known as 'ripple' or 'multiplier' effects, and in combination are referred to as 'secondary' impacts. For each type of impact (direct, indirect, and induced), impacts are measured using three economic indicators: employment, labor income, and output. The initial direct expenditures lead to sequential spending in the respective economy. Together, the direct, indirect, and induced effects add up to the total impact.

The direct impact is the additional goods or services generated from immediate spending related to Oregon Tech (i.e., purchasing new goods, paying wages, or students spending money on food, etc.). The indirect impact is the subsequent output generated through supply chain, or business-to-business transactions with suppliers of Oregon Tech's direct purchases or spending (i.e., restaurants restocking goods due to student expenditures, logistics and transportation firms spending money to deliver goods to the University, etc.). The induced impact is the spending that will occur through the employees that either receive wages directly from Oregon Tech or the subsequent supply chain workers who benefit from the money paid by the University (i.e., spending by the worker's households on rent, goods and services, etc. through the direct expenditures paid by the University). The total economic impact is the combination of direct, indirect, and induced impacts.

The study reports economic impacts using three key economic indicators: employment, labor income, and output.

- Employment represents the number (headcount) of part-time, full-time, and temporary jobs supported through spending associated with Oregon Tech (i.e., spending on operations and construction/capital expenditures, student spending, and visitor spending). Jobs "supported" is inclusive of jobs generated and existing jobs that have now been expanded in scope by University-related spending, which helps keep workers employed.

- Labor Income (reported in 2022 U.S.D) represents the value of all employment income paid through Oregon Tech spending, including fringe benefits such as health care, etc.

- Output (reported in 2022 U.S.D) refers to the total value of production generated through University-related spending, including the value of intermediate inputs – the goods and services used in the production of equipment, raw materials, energy, and other production inputs.

Note that employment, labor income, and output can all be further broken down into the direct, indirect, and induced effects. As an example, employment economic impacts can be broken down like so: direct employment impacts include Oregon Tech employees and employees at firms that receive related expenditures, indirect employment impacts include employees at businesses that service and supply Oregon Tech and other direct expenditure establishments, and induced employment impacts include employees at businesses where employees at firms receiving direct expenditures spend their wages (such as restaurants and grocery stores).

Using IMPLAN's Multi-Regional Input-Output (MRIO) analysis, Beacon Economics estimates the impact that Oregon Tech has on Klamath County (Klamath Falls campus location), on Marion County (Salem campus location), on Clackamas & Washington Counties (Wilsonville campus location), on Columbia County (OMIC-Scappoose) and on Oregon overall. No out-of-state spending was considered for this analysis, except for capital expenditures which were attributed to the proper campus location. Each larger region encompasses the impacts from the smaller regions. For example:

State of Oregon Impacts = Klamath County Impacts + Marion County + Clackamas & Washington Counties + Columbia County + All Other Oregon Impacts.

For more information on the IMPLAN MRIO modeling system, please see the Appendix.

Expenditures

Higher education institutions require significant funding not only to maintain day-to-day operations, but also to grow programs and enhance the experiences offered to students and surrounding communities. Universities and colleges spend millions on capital improvements and construction, on operations to maintain goods and services, and on wages for staff and faculty. Students and visitors spend money on food, room and board, local transport, merchandise, athletic events, and various other goods and services. Visitor data was aggregated based on estimates of non-local visitor spending on events or locations including commencements, sporting events, on-campus concerts like Music Garden, and Family Weekend. Beacon Economics has considered the key expenditures below in examining Oregon Tech's total spending.

Total expenditures for Oregon Tech in 2021-22 reached just under $141 million, driven primarily by operations ($61.1 million) and student spending ($47.3 million). Capital expenditures and visitor spending accounted for $31.7 million and $0.4 million respectively in statewide expenditures. Approximately 73% of the University's statewide expenditures occurred in the Klamath County, due in large part to the size of the Oregon Tech Klamath campus and number of students attending school in-person in that region. Nonetheless, spending by Oregon Tech throughout the entire state is substantial, and that spending ripples out through the local economy, benefiting many other industries and subsectors.

Figure B.1: Total Expenditures of Oregon Tech by Type and Region in FY 2021-22 ($Millions)

Expenditure Category	Klamath County	Marion County	Clackamas & Washington Counties	Columbia County	State of Oregon
Construction/Capital	$ 28.2	$ -	$ 0.3	$ 3.3	$ 31.7
Employee Comp.	$ 41.6	$ 0.9	$ 10.4	$ 1.0	$ 54.5
Other Operations	$ 1.7	$ 1.4	$ 0.2	$ 0.1	$ 6.6
Operations (Total)	$ 43.3	$ 2.3	$ 10.6	$ 1.1	$ 61.1
Student Spending	$ 31.4	$ 0.1	$ 6.7	$ 0.1	$ 47.3
Visitor Spending	$ 0.4	$ -	$ -	$ -	$ 0.4
Total Expenditures	**$ 103.3**	**$ 2.4**	**$ 17.6**	**$ 5.6**	**$ 140.5**

Source: IMPLAN. Note that the "State of Oregon" geography is not equivalent to the sum of the four proceeding geographies. Analysis by Beacon Economics.

$141M

Total Expenditures

2,500

Jobs Supported

$37.9M

Generated by State, Local, and Federal Taxes

Economic Impacts

In the 2021-22 fiscal year, expenditures associated with Oregon Tech supported over 2,500 jobs in Oregon, with 74% of them specific to Klamath County. Of the nearly 1,800 jobs supported in Klamath County, 70% were categorized as direct effects, with businesses supported in sectors such as education, leisure and hospitality, arts and recreation, transportation, and more. With thousands of jobs supported in multiple industries, the University's economic impact on both local and statewide labor income was significant. Statewide labor income generated was approximately $125 million, with roughly three quarters of the impacts in Klamath County. Oregon Tech's total economic output (essentially the 'value add' the University brings to the local and broader community as well as secondary economic activity or intermediate inputs) totaled $286.4 million across Oregon. Put another way, total Oregon Tech-related expenditures of $140.5 million within the state generated $286.4 million in statewide output, for a 2.04 output multiplier effect.

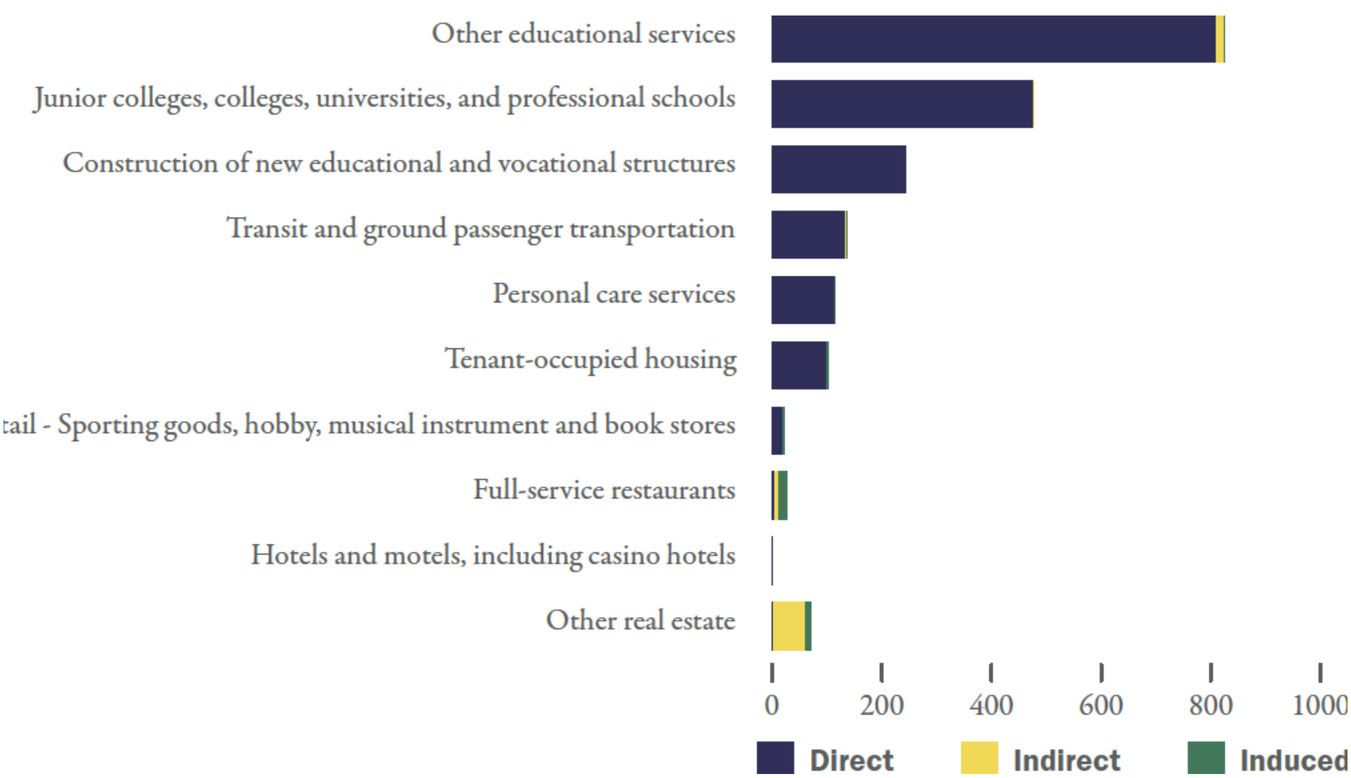
Figure B.2: Total Impacts of Oregon Tech by Impact Type and Region in FY 2021-22

Region	Klamath County	Marion County	Clackamas & Washington Counties	Columbia County	State of Oregon
	Employment Impacts: Full-Time, Part-Time, and Seasonal Jobs Supported Annually				
Direct Effect	1,314	49	401	65	1,899
Indirect Effect	157	5	38	6	260
Induced Effect	289	8	50	7	397
Total Effect	**1,760**	**62**	**489**	**78**	**2,555**
	Labor Income Impacts ($Millions)				
Direct Effect	$ 69.7	$ 1.8	$ 13.3	$ 2.8	$ 90.0
Indirect Effect	$ 7.6	$ 0.3	$ 2.6	$ 0.3	$ 14.1
Induced Effect	$ 14.1	$ 0.5	$ 3.1	$ 0.3	$ 20.4
Total Effect	**$ 91.4**	**$ 2.6**	**$ 19.0**	**$ 3.3**	**$ 124.5**
	Economic Output Impacts ($Millions)				
Direct Effect	$ 135.3	$ 3.3	$ 27.6	$ 5.5	$ 176.2
Indirect Effect	$ 25.9	$ 1.1	$ 8.3	$ 1.2	$ 48.5
Induced Effect	$ 43.1	$ 1.4	$ 9.1	$ 1.1	$ 61.7
Total Effect	**$ 204.4**	**$ 5.7**	**$ 44.9**	**$ 7.8**	**$ 286.4**

Source: IMPLAN. Note that the "State of Oregon" geography is not equivalent to the sum of the four proceeding geographies. Analysis by Beacon Economics.

Sectors that benefit significantly from expenditures associated with the University include educational services, colleges and universities, construction, transit, housing (specifically for off-campus students and employees), personal care services, and retail. These establishments, particularly on the local level (a business in Klamath Falls, for example), have benefitted from the people and economic activity Oregon Tech supports in Oregon's many localities.

Figure B.3: Top 10 Sectors, Statewide Jobs Supported Annually, by Type of Impact



Source: Implan. Analysis by Beacon Economics.

Fiscal Impacts

The economic activity generated by Oregon Tech resulted in the collection of significant fiscal tax revenue by governments. In Fiscal Year 2021-22, the University generated a total of $37.9 million in state, local, and federal taxes. Of that, $28.9 million was generated in Klamath County. A significant portion of state and local tax component of Oregon Tech's overall fiscal impacts goes to improving infrastructure and providing services to the community. Notably, while Oregon has no explicit sales tax, other taxes such as excise taxes on alcohol are counted as sales taxes for the purposes of this model. Income tax is the largest source of state and local revenue, thanks to earnings from workers. In Fiscal Year 2021-22, total income tax revenue generated in Klamath County was roughly $10.2 million.

Figure B.4: State and Local Fiscal Impacts by Type and Region ($Millions)

Tax Type	Klamath County	Marion County	Clackamas & Washington Counties	Columbia County	State of Oregon
Property	$ 6.2	$ 0.1	$ 1.1	$ 0.1	$ 7.6
Personal Income	$ 3.1	$ 0.1	$ 0.6	$ -	$ 4.0
Sales Tax	$ 2.8	$ -	$ 0.4	$ -	$ 3.3
Other Taxes	$ 2.3	$ -	$ 0.4	$ -	$ 2.8
Corporate Profits Tax	$ 0.2	$ -	$ 0.1	$ -	$ 0.4
Motor Licenses	$ 0.3	$ -	$ 0.0	$ -	$ 0.3
Payroll Tax	$ 0.2	$ -	$ 0.0	$ -	$ 0.3
Total	**$ 15.0**	**$ 0.2**	**$ 2.6**	**$ 0.2**	**$ 18.7**

Source: IMPLAN. Note that the "State of Oregon" geography is not equivalent to the sum of the four proceeding geographies. Analysis by Beacon Economics.

$28.9M
Generated in Klamath County

$10.2M
Income Tax Generated in Klamath County

$37.9M
Generated by State, Local, and Federal Taxes

Federal taxes are generated and collected from different sources of revenue than state and local taxes; federal revenues make up the largest share of fiscal year 2021-22 University fiscal impacts. Payroll taxes made up most of the tax revenue across every geography in this study, including 66% of statewide federal fiscal impacts. Spending associated with Oregon Tech contributed to almost $20 million in federal revenues in the studied period.

Figure B.5: Federal Fiscal Impacts by Type and Region ($Millions)

Tax Type	Klamath County	Marion County	Clackamas & Washington Counties	Columbia County	State of Oregon
Payroll and Other	$ 6.3	$ 0.3	$ 1.7	$ 0.2	$ 9.1
Personal Income	$ 7.1	$ 0.2	$ 1.2	$ 0.1	$ 9.1
Corporate Profits	$ 0.5	$ -	$ 0.3	$ -	$ 1.1
Total	**$ 13.9**	**$ 0.5**	**$ 3.2**	**$ 0.3**	**$ 19.2**

Source: IMPLAN. Note that the "State of Oregon" geography is not equivalent to the sum of the four proceeding geographies. Analysis by Beacon Economics. Negative values reflect subsidies and/or tax credits applied to this specific tax category.

Oregon Tech Social Impacts

Aside from considerable economic and fiscal benefits, Oregon Tech also generates substantial social and community impacts at the local, state, and national level. This section highlights the significance of Oregon Tech's role in building relationships between its staff, faculty, and students with the local community. The University and its regions of operation both benefit greatly from these relationships, which range from providing local businesses with promotional and sales opportunities to expanding and enhancing the local talent pipelines. The section will detail the major partnerships and engagements that exist between University departments, students, and alumni and the greater Oregon community.

Community Efforts

Oregon Tech is a university that is committed to giving back to its community, and it does so through a range of charitable and community events throughout the year. These events vary greatly and on a yearly basis often include public health events, alumni gatherings, educational opportunities, and volunteer work. These events help drive community throughout Oregon.

One of the most significant events that the University hosts is the annual Winter Wings Festival, which typically takes place in February. This festival is an opportunity for bird enthusiasts to come together at Oregon Tech's Klamath Campus to celebrate and learn about birds, and it includes a variety of workshops, lectures, and guided birding tours. The festival is the oldest birding festival in the western United States and is managed by the Klamath Basin Audubon Society.[3]

3 Lawson, Susanna. "Winter Wings Festival." All About Birds, https://www.allaboutbirds.org/news/event/winter-wings-festival/#.

Spotlight: Oregon Tech Sports

Oregon Institute of Technology offers six varsity men's sports and seven varsity women's sports as a member of the National Association of Intercollegiate Athletics (NAIA). The Owls and Lady Owls typically compete in the Cascade Collegiate Conference. Oregon Tech men's basketball has won the Division II and NAIA National Titles for three championships in the past two decades. Oregon Tech's men's basketball game has a loyal local following, earning the team's fans notoriety with other regional opponents like rival Southern Oregon University.

Another event that is essential to Oregon Tech's commitment to its community is the Future Business Leaders of America (FBLA) district competition. Held in January, this competition is an opportunity for high school students to showcase their business skills and compete against other students from the region. Without Oregon Tech's support, the competition may have to move to a different location, such as Bend, which could make it more challenging for students from other regions to participate. Similarly, Oregon Tech also hosts the DECA district competition each December, which provides high school students with the opportunity to compete in various business categories. Like the FBLA district competition, this event would move to Medford if not for Oregon Tech hosting the event, removing a professional and educational development tool from youth local to Klamath Falls.

In addition to these competitions, Oregon Tech also hosts career fairs in November and February, which are critical for students who are looking to enter the job market. These events provide students with the opportunity to meet with potential employers, learn about job opportunities, and network with professionals in their fields. Employers that attend these events are more likely to be from a nearby region, increasing the odds that students who receive degrees from Oregon Tech in critical fields like Engineering and Public Health keep their acquired skills in the regional economy.

4 Oregonian, Special to The. "Men's Basketball: Oregon Tech Wins NAIA Division II National Championship." Oregonlive, 14 Mar. 2012, www.oregonlive.com/sports/2012/03/mens_basketball_oregon_tech_wi.html.

Oregon Tech also plays a significant role in supporting local community health through its blood drive, Applied Behavioral Analysis (ABA) Clinic, AIRE Research Laboratory, and COVID-19 vaccine clinic. The blood drive, which takes place in November, provides the community with an opportunity to give back by donating blood to those in need. The COVID vaccine clinic, held twice in November, is an essential service that the University provides to help keep the Klamath County community safe and healthy.

Oregon Tech hosts a wide range of alumni events throughout the year, providing graduates with opportunities to reconnect with their alma mater and fellow alumni. These events help to build and strengthen relationships among graduates and help create a sense of belonging in Oregon. An industry luncheon, alumni pregame events, a Reno Alumni BBQ, the Oregon Tech Blazers event, and a variety of academic alumni events are all small-scale events that allow for more intimate gatherings and more personalized interactions. Larger events like the alumni basketball and baseball games, the Golden Owls Reunion, and the Alumni and Family Weekend bring together larger groups of alumni, creating an energetic and lively atmosphere. Alumni are encouraged to support one another, support the Oregon region, and to continually support Oregon Tech as it provides vital educational services to new students. This continual support is apparent at the annual alumni advisory board meeting, which provides a more formal setting for alumni to come together and help guide the University's direction. Overall, these events play a crucial role in keeping alumni engaged with Oregon Tech and building a strong community of graduates who contribute to state and local economies and communities.

In addition to community events and alumni gatherings, Oregon Tech supports the community beyond the University's walls through a range of volunteer events that provide valuable assistance to community members. Scholarship Reader Volunteers, often numbering over 100 people, donate their time to read and evaluate scholarship applications, ensuring that deserving students receive the financial support they need to pursue their academic goals. In addition to this, Oregon Tech board members also volunteer their time to support the University and the community. These board members, including those on the Oregon Tech Foundation, on the Shaw Board of Governors, and on the Alumni Advisory Board, donate an average of 40 hours per year to help guide the University's direction, support its initiatives, and give back to the community.

Oregon Tech Foundation

The Oregon Tech Foundation ('The Foundation') is a nonprofit organization that serves as the fundraising arm of Oregon Tech. The Foundation's mission is to support Oregon Tech's educational, research, and community outreach efforts through fundraising, stewardship, and advocacy. Since its inception in 1976, the Oregon Tech Foundation has raised millions of dollars to support scholarships, research, faculty development, and capital projects, making a significant social impact to Oregon Tech and the wider Oregon population.

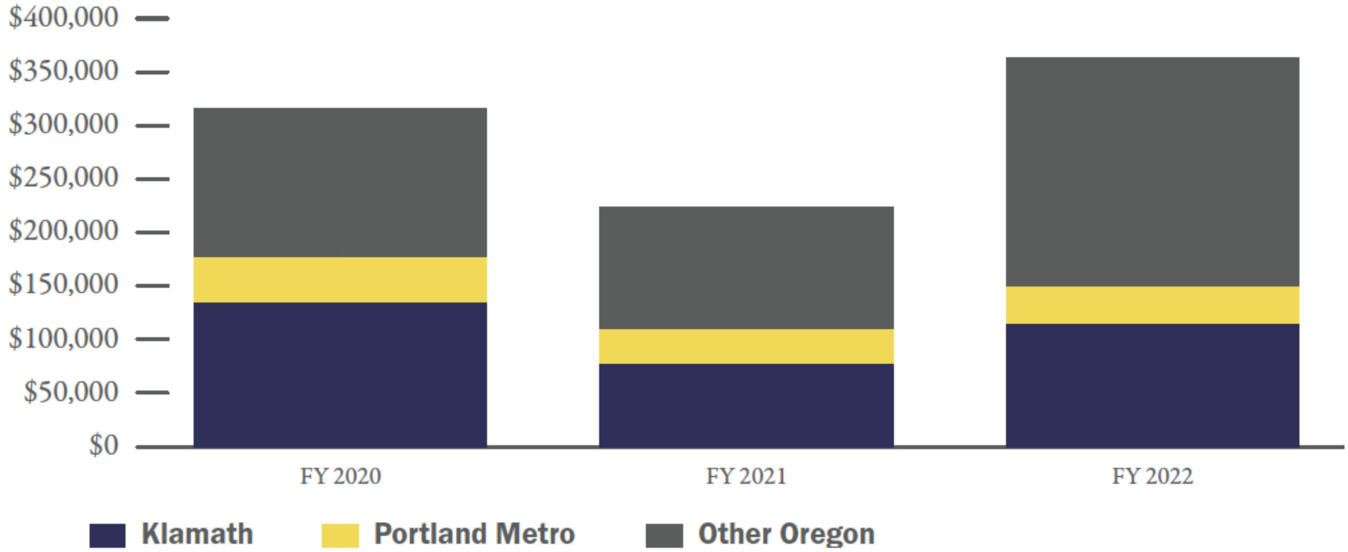
One of the primary ways the Oregon Tech Foundation creates social impact is by providing financial support to students through scholarships. The Foundation administers scholarship funds that provide students with much-needed financial assistance to pursue their academic goals. In the 2020-2021 academic year, the Foundation awarded over $1 million in scholarships to over 300 students,[5] helping to make education more accessible to those who might otherwise be unable to afford it.

In addition to providing scholarships, the Oregon Tech Foundation also supports the University's research initiatives and capital projects. The Foundation has raised funds to support a range of projects, including the construction of new academic and research buildings, the acquisition of cutting-edge equipment and technology, and the establishment of endowed professorships to support faculty development. These capital investments allow Oregon Tech to maintain and grow as a leading regional academic institution with regards to engineering and healthcare.

While much of the Oregon Tech Foundation's spending is directed within the school, the Foundation also directly contributes money to regional vendors throughout Oregon, benefitting the local economy. Over just the past three years, the Foundation has disbursed over $1 million dollars to local vendors throughout Oregon. These disbursements generate jobs and support local small businesses and are included in economic and fiscal impact estimates.

5 "Oregon Tech Foundation Awards More than $1 Million in Scholarships." Oregon Tech, 28 Nov. 2022, https://www.oit.edu/news/oregon-tech-foundation-awards-more-1-million-scholarships.

Figure C.1: Annual OTF Disbursements to Vendors Other Than Oregon Tech



Source: Oregon Tech. Analysis by Beacon Economics.

The Foundation's annual events also play a crucial role in building community. The Oregon Tech Foundation Board of Directors meetings bring together key stakeholders to discuss the University's strategic direction and make important decisions about funding priorities. Recent ribbon-cutting ceremonies for the Cornett Hall and Center for Excellence in Engineering and Technology demonstrate the Foundation's commitment to supporting capital projects that enhance the University's facilities and academic programs. Additionally, the annual Scholarship Banquet recognizes the hard work and achievements of scholarship recipients while also providing an opportunity for donors, volunteer readers, and board members to connect and celebrate their shared commitment to supporting education.

Overall, the Oregon Tech Foundation's social impact in Oregon is significant, providing critical support for students, faculty, and research initiatives at Oregon Tech and general economic support for regional businesses. By partnering with donors, volunteers, and community members, the Foundation creates a more equitable and accessible educational landscape in Oregon and make a positive impact on the lives of thousands of students every year.

50

States Represented by OIT Students

36%

First Gen Students

2.2x

Share POC vs OR Population

Equity, Diversity, and Inclusion

Oregon Tech has made significant strides in promoting diversity and inclusion in its campus and the overall community. The institution recognizes the importance of creating a safe, inclusive, and welcoming environment for all individuals, regardless of their race, ethnicity, gender, sexual orientation, religion, or socioeconomic background. Doing this allows people the security to reach towards their full academic and employment potentials.

In keeping with their fundamentally held values of diversity and inclusion, Oregon Tech enrolls students from all corners of the globe. The University's nearly 5,000 students represent all 50 states and a handful of international countries. The University has an approximate 45:55 male to female ratio. Roughly 36% of its degree-seeking undergraduate student body is made up of first-generation students, and roughly 33% of overall students are self-identifying people of color. This is particularly noteworthy given the racial makeup of the state of Oregon – roughly 86% of Oregon's residents identify as white, per 2022 US Census Estimates.[6] Oregon Tech's Office of Diversity, Inclusion, and Cultural Engagement (DICE) is responsible for promoting diversity and inclusion across all aspects of the institution, including student life, academic programs, and campus culture. The office provides training, support, and resources for faculty, staff, and students to enhance their understanding and appreciation of diverse perspectives and experiences.

In addition to the DICE, Oregon Tech has several student-led organizations that promote diversity and inclusion on campus, such as the Latinx Club, Asian Cultural Club, Out in STEM Club,

6 U.S. Census Bureau Quickfacts: Oregon. https://www.census.gov/quickfacts/fact/table/OR/PST045221.

Rainbow Owls Club, and the Society of Women Engineers.[7] These groups provide a platform for students to share their experiences, organize events and activities, and advocate for equity and justice as they receive a quality education.

Of student-led organizations, The Treehouse stands out in terms of diversity and inclusion. The Treehouse is a student-run program under Diversity & Belonging that operates in the College Union of Oregon Tech's Klamath campus. This space, which formed in 2018, leads events like the Women of Color Collective and multi-faith dinners in addition to offering convenient student services like printing.[8]

Oregon Tech also offers various programs and initiatives to attract and retain underrepresented students in STEM fields. The institution partners with local high schools and community colleges to provide mentoring, tutoring, and outreach programs for students from diverse backgrounds. Approximately 1,500 of Oregon Tech's students are non-degree-seeking students obtaining college credits through the school's Dual Credit at High School program. This provides quality educational opportunities to students at a lower cost than traditional university educational opportunities.

Oregon Tech provides scholarships and financial aid to support students who may face financial barriers to pursuing a college education. Oregon Tech awards Leadership and Diversity (LAD) Scholarships to qualifying degree-seeking students every year. As a requirement of these scholarships, recipients must engage in 10+ hours of community work each semester, helping connect students to the local community. The school also aggregates resources for national LGBTQ+ scholarships to help individuals within the LGBTQ community access funds needed to receive a secondary education.

Overall, Oregon Tech's commitment to diversity and inclusion is evident in its efforts to create an inclusive campus community and foster an environment where all individuals can thrive. The institution's dedication to equity and justice aligns with its mission to provide accessible, affordable, and high-quality education to all students, regardless of their background.

7 "Oregon Institute of Technology." | Oregon Institute of Technology, https://oit.presence.io/organizations.

8 "The Treehouse." The Treehouse | Oregon Tech, https://www.oit.edu/campus-life/student/programs/campus-life-resource-centers.

Academics and Research

Oregon Tech is Oregon's Polytechnic University and is known for its strong academics and cutting-edge research facilities. The University offers a wide range of degree programs at the undergraduate and graduate levels, including programs in engineering, health sciences, business, and applied sciences. Oregon Tech's rigorous academic curriculum is designed to prepare students for success in their careers by providing them with the knowledge, skills, and hands-on experience they need to excel in their fields.

One of the most significant academic programs at Oregon Tech is the Bachelor of Science in Renewable Energy Engineering. Oregon Tech was the first university in North America to offer a bachelor's degree in this area of study.[9] This program is designed to provide students with the skills and knowledge they need to design and implement renewable energy systems that are sustainable and efficient. Students in this program learn about solar, wind, geothermal, and hydropower energy systems, and are exposed to the latest technologies and practices in the field. Graduates of this program are in high demand and are well-prepared to work in a variety of industries, including energy production, consulting, and research.

Spotlight: Oregon Manufacturing Innovation Center (OMIC)

Oregon Institute of Technology hosts OMIC R&D at its Scappoose facility. OMIC provides students with opportunities to engage in leading research, including exciting projects like jet engine manufacturing, space vehicle development, and rocket production and testing. OMIC allows students to get hands-on research and contributes to Oregon Tech student's 97% job placement rate within six months of graduation.

9 "Renewable Energy Engineering." Renewable Energy Engineering Degree | Oregon Tech, https://www.oit.edu/academics/degrees/renewable-energy-engineering.

Another significant academic program at Oregon Tech is the Bachelor of Science in Diagnostic Medical Sonography. This program is designed to provide students with the skills and knowledge they need to perform medical imaging procedures using ultrasound technology. Students in this program learn about the human body, medical terminology, patient care, and ultrasound technology. Graduates of this program are well-prepared to work in hospitals, clinics, and other healthcare settings, and they are also in high demand due to the growing need for medical imaging services.

The University has a strong research focus, and it provides students with many opportunities to get involved in research projects and work alongside faculty members on cutting-edge research initiatives. Some of the research facilities available to Oregon Tech students include the Oregon Renewable Energy Center (OREC), the University's Scappoose Oregon Manufacturing Innovation Center (OMIC), the Center for Advanced Interdisciplinary Research on the Environment, the Applied Behavioral Analysis (ABA BIG) Clinic and the Oregon Tech Dental Clinic. Once students have developed their research and technical skills at Oregon Tech, many go on to use those skills throughout Oregon. The alumni who get in-demand research experience at Oregon Tech typically keep their valuable skills within the state of Oregon after graduation. Amongst responding Oregon Tech alumni who stayed in the United States, nearly two thirds (63%) remained in the state of Oregon after completing their degree. University alumni from Oregon Tech, often with degrees variants of engineering or healthcare, use their degrees to get jobs in Oregon, pay taxes in Oregon, and continue to foster community in Oregon.

Where Do Oregon Tech Alumni Live?

Source: Oregon Tech. Analysis by Beacon Economics.

Overall, Oregon Tech's academic programs are designed to provide students with the skills and knowledge they need to succeed in their careers. Whether they are pursuing a degree in engineering, health sciences, business, or applied sciences, students at Oregon Tech are exposed to the latest technologies and practices in their fields. With a strong emphasis on hands-on learning and research, Oregon Tech provides students with many opportunities to gain practical experience and develop the skills they need to make a positive impact in their industries and the greater Oregon community.

Conclusion

Oregon Tech has a substantial impact on the state of Oregon. The University's activities generate significant economic output that supports thousands of jobs and creates millions of dollars in essential tax revenues at the federal, state, and local levels. In the 2021-22 fiscal year, Oregon Tech's expenditures through its operations, capital expenditures, and student and visitor spending generated the following:

Figure D.1: Impact Summary by Region and Type ($ Values in $Millions)

	Klamath County	Marion County	Clackamas & Washington Counties	Columbia County	State of Oregon
Jobs Supported Annually	1,760	62	489	78	2,555
Labor Income	$ 91.4	$ 2.6	$ 19.0	$ 3.3	$ 124.5
Economic Output	$ 204.4	$ 5.7	$ 44.9	$ 7.8	$ 286.4
State and Local Tax Revenue	$ 15.0	$ 0.2	$ 2.6	$ 0.2	$ 18.7
Federal Tax Revenue	$ 13.9	$ 0.5	$ 3.2	$ 0.3	$ 19.2

Source: IMPLAN. Note that the "State of Oregon" geography is not equivalent to the sum of the four proceeding geographies. Analysis by Beacon Economics.

In addition to the significant quantitative impacts that the University generates, the University has a notable positive social impact. Oregon Tech facilitates many programs that are aimed at improving the lives of local community members, including providing credit opportunities to students in local high schools, providing individual financial help through the Oregon Tech Institute, and implementing a variety of programs and events for students, alumni, and regional community members to benefit from. It is exceptionally noteworthy that Oregon Tech plays a key role in developing the local workforce and supplying it with talent. A significant number of its degree-seeking students remain in the region after graduation and work in local establishments. This leads to tremendous benefits for the counties studied in this report and for the state as a whole.

Appendix

This report is based on an economic analysis technique known as Multi-Regional Input-Output (MRIO) analysis, which examines inter-industry relationships across several regions. A MRIO analysis builds off the standard Input-Output (I-O) analysis by expanding effects from monetary market transactions beyond a single region. It also helps capture leakages in other regions. In a MRIO analysis, the direct effect in one region triggers indirect and induced effects in other regions. The results of the analysis reveal the effects of a change in one or several economic activities on an entire economy, along with the economic interdependence of regions. IMPLAN expands on the traditional I-O approach to include transactions among industries and institutions, and within institutions themselves, thereby capturing all monetary market transactions in a given period. This specific report uses the IMPLAN web model. For more information on the IMPLAN modeling process, visit IMPLAN.com. Although IMPLAN provides an excellent framework for conducting impact analysis, Beacon Economics takes extra precautions to ensure model results are valid, employing decades of experience to tailor the model to the unique demands of each economic impact analysis the firm conducts. Procedures and assumptions are thoroughly and systematically inspected for validity and individual project appropriateness before any analysis is performed.

About Beacon Economics

Founded in 2007, Beacon Economics, an LLC and certified Small Business Enterprise with the state of California, is an independent research and consulting firm dedicated to delivering accurate, insightful, and objectively based economic analysis. Employing unique proprietary models, vast databases, and sophisticated data processing, the company's specialized practice areas include sustainable growth and development, real estate market analysis, economic forecasting, industry analysis, economic policy analysis, and economic impact studies. Beacon Economics equips its clients with the data and analysis they need to understand the significance of on-the-ground realities and to make informed business and policy decisions.

Learn more at **beaconecon.com**

Expertise in Economic Impact Analysis

Since 2011, Beacon Economics has conducted multiple comprehensive analyses that have provided reliable and quantifiable data on the economic impact of various industries and organizations. Analyses evaluate major economic impacts associated with these entities and their fiscal impact on national, state, and local governments. They also incorporate a comprehensive assessment of the social and qualitative impacts associated with these institutions. By combining sampling methods, financial data, surveys, and other available economic resources with current frameworks for studying economic impacts, Beacon Economics estimates the amount of economic activity generated in the local and broader economy by calculating the spending of entities and other participants in the affected region.

Acknowledgements

Commissioned By

Oregon Institute of Technology (Oregon Tech, the University)

Oregon Tech is a public university and was founded in 1947 at its main campus in Klamath Falls, Oregon. It is fully accredited by the Northwest Commission on College and Universities (NWCCU) and provides higher education programs to a diverse array of students across multiple campuses in the Pacific Northwest. Oregon Tech students earn the highest average salaries upon graduation of any public university in the state.

Special Thanks To

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Attachment F

Annual Financial and Compliance Audits

Internal planning and year-end work have commenced. The financial and compliance audits are planned to be issued mid-December 2023.

The audit opinions, Annual Financial Report, Single Audit Report, and results of the fiscal year will be presented as part of the Audit Committee's regularly scheduled first meeting of 2024.

Tentative timeline of the audit function for the fiscal and compliance audits for the year ending June 30, 2023:

- February – May 2023: Internal planning including all audit areas: financial reporting, federal financial aid, and Information Technology Services (ITS) portions of the audits; coordination and planning meetings with various campus departments, including university-wide meetings

- May - June 2023: Auditors conduct interim fieldwork for the financial and financial aid compliance audits, including testing ITS portion of the audits (IT-related internal controls)

- June – August 2023: Auditors wrap-up interim testing; year-end preparation

- June - October 2023: Fiscal year-end close, audit related schedules, financial statement drafting

- September – October 2023: Auditors conduct on-site final fieldwork; finalize financial statement compilation and draft review

- November – December 2023: Auditors conclude testing and audit wrap-up; finalize Annual Financial Report and Single Audit Report

- Draft audited financial information submitted to the State of Oregon on or before November 15, 2023

Timeline through report issuance includes:

- October 2023: Financial statement drafting, auditors conduct on-site final fieldwork

- November 2023: Submission of draft audit report to State for discretely presented component unit reporting; auditors conclude testing and audit wrap-up

- First meeting in 2024: Presentation to Audit Committee (regularly scheduled Board meeting)

The VPFA Office oversees the progression and completion of the annual financial and compliance audits with significant contributions from multiple university areas including: Audit & Compliance, Business Affairs Office, Financial Aid Office, Human Resources Office, Information Technology Services, Payroll Operations, Office of Sponsored Projects and Grants, Registrars' Office, and others.

ACTION ITEM

Agenda Item No. 4.1
Recommendation for Approval of a Technical Update to the Board Policy on Undergraduate Resident Tuition and Mandatory Fees Process

Background

A primary responsibility of the Oregon Tech Board of Trustees is to establish tuition and mandatory enrollment fees each fiscal year. Oregon Revised Statute (ORS) 352.102 outlines the Board's responsibilities relative to tuition and mandatory enrollment fees. Section 352.103(2) (see Attachment A) outlines the required representation on the university committee charged with the responsibility of developing a recommendation for tuition and fees as follows:

> (2) The public university shall:
> (a) Establish a process to ensure that the advisory body required under subsection (1) of this section is composed of no fewer than:
> (A) Two administrators of the university;
> (B) Two faculty members of the university;
> (C) Two students representing the recognized student government of the university; and
> (D) Two students representing historically underserved students of the university, as defined by the public university.

In response to the ORS, the Oregon Tech Board of Trustees adopted the *Board Policy on Undergraduate Resident Tuition and Mandatory Fees Process* on February 22, 2016. The Policy was amended on June 30, 2016 and again on January 24, 2019.

The Board Policy requires the establishment of a Tuition Recommendation Committee (TRC) to exercise the responsibilities under the Policy as required by the statute. An amendment to language in the Board Policy is necessary to more clearly reflect the requirements. (see Attachment B).

Recommendation

After discussion and review of related documents, **staff requests a Motion by the Committee to the full Board to Accept the proposed technical update to the Board Policy on Resident Tuition and Mandatory Fees Process**.

Attachments:

A. ORS 352.103 Undergraduate Resident Tuition and Mandatory Enrollment Fees
B. Amended Board Policy with Recommended Technical Update to Undergraduate Resident

Tuition and Mandatory Fees Process

Attachment A

352.102 Tuition and mandatory enrollment fees. (1) Except as set forth in this section, the governing board may authorize, establish, eliminate, collect, manage, use in any manner and expend all revenue derived from tuition and mandatory enrollment fees.

(2) The governing board shall establish a process for determining tuition and mandatory enrollment fees. The process must:

(a) Include the use of an advisory body in the manner set forth in ORS 352.103; and

(b) Ensure that the governing board receives and considers all written reports and minority reports, including all recommendations, deliberations and observations of the advisory body that are provided to the president of the university under ORS 352.103.

(3) The governing board shall request that the president of the university transmit to the board the joint recommendation of the president and the recognized student government before the board authorizes, establishes or eliminates any incidental fees for programs under the supervision or control of the board and found by the board to be advantageous to the cultural or physical development of students.

(4) In determining tuition and mandatory enrollment fees for undergraduate students who are enrolled in a degree program and are qualified to pay resident tuition:

(a) The governing board may not increase the total of tuition and mandatory enrollment fees by more than five percent annually unless the board first receives approval from:

(A) The Higher Education Coordinating Commission; or

(B) The Legislative Assembly.

(b) The governing board shall attempt to limit annual increases in tuition and mandatory enrollment fees for undergraduate students who are enrolled in a degree program and have established residency in Oregon to a percentage that is not greater than the percentage increase in the Higher Education Price Index, as compiled by the Commonfund Institute.

(5) If the governing board of a public university requests that the commission approve an increase in the total amount of tuition and mandatory enrollment fees of more than five percent under subsection (4)(a) of this section, the public university shall provide to the commission:

(a) All written reports and minority reports, including all recommendations, deliberations and observations of the advisory body that are provided to the president of the university under ORS 352.103; and

(b) Any other information or materials the commission determines are necessary in order for the commission to determine whether to approve the proposed increase in the total amount of tuition and mandatory enrollment fees.

(6) The governing board may not delegate authority to determine tuition and mandatory enrollment fees for undergraduate students who are enrolled in a degree program and are qualified to pay resident tuition. [2013 c.768 §10; 2018 c.65 §3]

352.103 Advisory body for tuition and mandatory enrollment fees; composition; process for making recommendation. (1) Each public university listed in ORS 352.002 shall have an advisory body to advise the president of the university on the president's recommendations to the governing board regarding resident tuition and mandatory enrollment fees for the upcoming academic year.

(2) The public university shall:

(a) Establish a process to ensure that the advisory body required under subsection (1) of this section is composed of no fewer than:

(A) Two administrators of the university;

Attachment A

(B) Two faculty members of the university;
(C) Two students representing the recognized student government of the university; and
(D) Two students representing historically underserved students of the university, as defined by the public university.

(b) Establish a written document describing the role of the advisory body and the relationship of the advisory body to the public university, president of the university and the governing board.

(3) The public university shall ensure that all members of the advisory body are offered training on:

(a) The budget of the public university;

(b) The mechanisms by which moneys are appropriated by the Legislative Assembly to the Higher Education Coordinating Commission for allocation to public universities; and

(c) Historical data regarding the relationship between the amount of resident tuition and mandatory enrollment fees charged by the public university and the amount of state appropriations that the commission allocates to the public university.

(4) In order to assist the advisory body in making its recommendations, the public university shall provide the advisory body with:

(a) A plan for how the governing board and the public university's administration are managing costs on an ongoing basis; and

(b) A plan for how resident tuition and mandatory enrollment fees could be decreased if the public university receives more moneys from the state than anticipated.

(5) Before making a recommendation to the president of the university that resident tuition and mandatory enrollment fees should be increased by more than five percent annually, the advisory body must document its consideration of:

(a) The impact of the resident tuition and mandatory enrollment fees that the advisory body intends to recommend to the president of the public university on:

(A) Students at the public university, with an emphasis on historically underserved students, as defined by the public university; and

(B) The mission of the public university, as described by the mission statement adopted under ORS 352.089; and

(b) Alternative scenarios that involve smaller increases in resident tuition and mandatory enrollment fees than the advisory body intends to recommend to the president of the public university.

(6) The advisory body shall:

(a) Provide meaningful opportunities for members of the recognized student government and other students enrolled at the public university to participate in the process and deliberations of the advisory body; and

(b) At a time established by the public university, provide a written report to the president of the university that sets forth the recommendations, deliberations and observations of the advisory body regarding resident tuition and mandatory enrollment fees for the upcoming academic year. The written report must include any minority report requested by a member of the advisory body and any documents produced or received by the advisory body under subsections (4) and (5) of this section.

(7) Each public university shall ensure that the process of establishing resident tuition and mandatory enrollment fees at the public university is described on the Internet website of the public university. This material must include, but is not limited to:

Attachment A

(a) The written document produced by the public university under subsection (2)(b) of this section; and

(b) All relevant documents, agendas and data that are considered by the advisory body during its deliberations.

(8) As used in this section, “resident tuition and mandatory enrollment fees” means the tuition and mandatory enrollment fees for undergraduate students who are enrolled in a degree program and have established residency in Oregon. [2018 c.65 §2]

Board Policy on Resident Undergraduate Tuition and Mandatory Enrollment Fee Process
Board of Trustees of Oregon Institute of Technology

1. Purpose

It is the policy of Oregon Institute of Technology that tuition, fees, fines and other charges are to be developed, approved, issued and communicated in a transparent and consistent manner, with the engagement of appropriate University stakeholders. The purpose of this policy is to outline and clarify the process for setting tuition, fees, fines and other charges at the University.

2. Background

2.1 Tuition and Mandatory Enrollment Fees. ORS 352.102(2) requires the Board of Trustees to establish a process for determining tuition and mandatory enrollment fees. Some of these fees will be different between Klamath Falls and Wilsonville due to the availability and extent of services provided at each campus.

2.1.1 Incidental Fees. ORS 352.102(3) requires the institutional president to submit the joint recommendation of the president and the Associated Students of Oregon Institute of Technology (ASOIT) prior to the Board taking action on incidental fees. ORS 352.105 requires the Board to collect mandatory incidental fees upon the request of ASOIT, except in certain circumstances. ORS 352.105(1) requires that ASOIT consult with the Board in the establishment of a process for requesting mandatory student incidental fees.

2.1.2 Health Service Fees. Set each year upon recommendation by the Health Service Advisory Committee to the presidents of both ASOIT the recognized student government and OIT. Assessed to enrolled students who are eligible for health services.

2.1.3 Building Fees. Set each year by the Board upon recommendation by the institutional president. This fee is used to pay for bond debt service associated with projects for auxiliary or education and general facilities or athletic facilities.

2.1.4 Other Mandatory Fees. Set based on the recommendation of the ASOIT or a successful referendum vote of the student body, and upon recommendation of the institutional president with approval by the Board. These fees are used to pay for activities, assessments or needs to support the mission of the university.

3. Definitions

3.1 Associated Students of Oregon Institute of Technology (ASOIT) The recognized student government of the University.

3.2 Incidental Fee Committee The ASOIT committee responsible for recommending the amount and allocation of the Incidental Fee to ASOIT and the President and for developing Student Fee Guidelines which are subject to review and approval by the President and are to be provided at least annually to the Board’s Finance and Facilities Committee.

3.3 Tuition Recommendation Committee This committee is responsible for recommending the undergraduate tuition and mandatory fee rates to the institutional president.

Comprised of no fewer than ~~six students representing both campuses appointed by the ASOIT presidents(s)~~, two students (one from each campus)~~of~~ who~~ich~~ represent ASOIT and no fewer than two students (one from each campus) ~~of~~ who~~ich~~ represent historically underserved students of the university, as defined by the university; no fewer than two faculty members, one of which is the chair of the Fiscal Operations Advisory Council (FOAC); and no fewer than two ~~senior~~ administrators.

3.4 Fiscal Operations Advisory Council (FOAC) The Fiscal Operations Advisory Council is a faculty/administrative council for the purpose of advising the President on budget and financial matters.

3.5 Historically Underserved Students This is defined as "Targeted Student Populations" as identified by the Higher Education Coordinating Commission in Oregon Administrative Rules related to the administration of the Student Success and Completion Model (OAR 715-013-0025(1)(bb)).

3.6 Resident Tuition and Mandatory Enrollment Fees The tuition and mandatory enrollment fees for degree-seeking, undergraduate students who have established residency in Oregon.

4. Roles and Responsibilities

4.1 The Board of Trustees retains authority and responsibility to annually establish Tuition and Mandatory Student Fees.

4.2 The Board delegates to the President, who may further delegate to the Vice President for Finance and Administration, authority and responsibility to annually establish other fines, fees, and charges, as provided in Section 6.0 of this policy.

5. Setting of Tuition and Mandatory Student Fees, and Incidental Fees

Tuition and Mandatory Enrollment Fees, and Incidental Fees, are established annually by the Board, generally at the Board's meeting in spring prior to the applicable academic year in accordance with the requirements of ORS 352.102 and ORS 352.105.

5.1 Process for Setting of Tuition and Mandatory Enrollment Fees. The Tuition Recommendation Committee shall meet at least twice between January and February prior to providing the President written recommendations on proposed tuition and mandatory fee rates for resident undergraduate students the upcoming academic year; these meetings shall be open to the student body. A minimum of one public forum shall be held at the Klamath Falls campus and a minimum of one at the Portland-Metro campus to discuss and obtain input on the proposed tuition and mandatory fees; and broad notification of the forum shall be made to the university community.

To assist in making its recommendations, the Tuition Recommendation Committee shall receive a plan for how the Board of Trustees and Administration are managing costs on an ongoing basis and a plan for how resident tuition and mandatory enrollment fees could be decreased if the university receives more moneys from the state than anticipated.

When advising the president, the Tuition Recommendation Committee shall include input received at the public forum and considerations regarding the mechanisms by which moneys are appropriated by the Legislative Assembly to the Higher Education Coordinating Commission for allocation to universities, historical tuition and fee trends, comparative data for peer institutions, the University's budget and projected cost increases, and anticipated state appropriation levels. In addition to the recommendations, the report shall convey deliberations and observations of the Tuition Recommendation Committee, and must include any minority report requested by a Tuition Recommendation Committee member and any documents produced or received by the Tuition Recommendation Committee. The President shall bring the recommendations report and all associated documents to the Board for approval.

If the Tuition Recommendation Committee recommends to the president that resident tuition and mandatory enrollment fees should be increased by more than five percent annually, it must document its consideration of the impact of the recommended increase on (a) students at the public university, with an emphasis on historically underserved students, as defined by the university, (b) the mission of the university; and its consideration of: alternative scenarios that involve smaller increases in resident tuition and mandatory enrollment fees than the advisory body intends to recommend to the president.

When setting tuition and fees, the Board may consider a number of factors, including the intent to (a) create affordable access to degree programs, (b) create a diverse student body, (c) maintain strong degree programs at every level, (d) develop and maintain the human and physical infrastructure necessary to support the university's educational outcome goals, and (e) maintain the fiscal integrity of the institution over the long-term.

5.2 <u>Process for Setting of Incidental Fees.</u> An incidental fee is assessed each term to support institutional student programs that are advantageous to the cultural or physical development of students. Funds generated by the incidental fee are used to fund college union operations, student clubs and programs, and athletics, among other programs.

The Incidental Fee Committee is responsible for recommending the amount and allocation of the incidental fee to the ASOIT and the President, pursuant to the Incidental Fees Policy (OIT 40-090).

ASOIT and the President are to work together to reach agreement on a joint recommendation regarding the incidental fee. Once approved, the President shall bring the joint recommendation to the Board for consideration.

5.3 <u>Limits on Tuition and Mandatory Student Fees Increases.</u> When setting Tuition and

Mandatory Student Fees, the Board shall consider the following limits:

5.3.1 The Board may not increase the total of Tuition and Mandatory Student Fees by more than five percent annually unless the Board first receives approval from the Higher Education Coordinating Commission or the Legislative Assembly (ORS 352.102(4)(a)).

5.3.2 If the Board requests an increase in the total amount of tuition and mandatory enrollment fees of more than five percent, the university shall provide the Higher Education Coordinating Commission the full report and all associated documents submitted to the President from the Tuition Recommendation Committee; and any other information or materials the Higher Education Coordinating Commission determines are necessary to determine whether to approve the proposed increase in the total amount of tuition and mandatory enrollment fees.

5.3.3 The Board will attempt to limit the annual increases in Tuition and Mandatory Student Fees for undergraduate students who are enrolled in a degree program and have established residency in Oregon to a percentage that is not greater than the percentage increase in the Higher Education Price Index, as compiled by the Commonfund Institute (ORS 352.102(4)(b)).

5.4 <u>Fee Remissions.</u> Tuition rates set by the Board shall also include an allowance for fee remissions to be used for access, affordability, athletic and merit purposes.

6. Setting of Other Tuitions, Fees, Fines, and Charges

6.1 <u>Process for Setting Other Fees, Fines, and Charges.</u> The President is authorized to establish other fees, fines, and charges to cover specified costs of the University or for other purposes. Such other fees, fines, and charges are to be reconsidered annually.

6.2 <u>Process for Setting Other Tuitions.</u> The President will recommend all proposed tuition rates including, but not limited to, non-residential, differential, and other programs, to the board for approval annually after a transparent and collaborative campus process.

7. Website Posting

The process of establishing resident tuition and mandatory enrollment fees must be described on the university website.

7.1 Material posted must include this policy or another written document describing the role of the Tuition Recommendation Committee and the relationship of the Tuition Recommendation Committee to the public university, university president, and the board of trustees; and all relevant documents, agendas and data that are considered by the Tuition Advisory Committee during its deliberations.

Provided for reference only – Statutory guidance on tuition and mandatory fees:

352.102 Tuition and mandatory enrollment fees. (1) Except as set forth in this section, the governing board may authorize, establish, eliminate, collect, manage, use in any manner and expend all revenue derived from tuition and mandatory enrollment fees.

(2) The governing board shall establish a process for determining tuition and mandatory enrollment fees. The process must provide for participation of enrolled students and the recognized student government of the university.

(3) The governing board shall request that the president of the university transmit to the board the joint recommendation of the president and the recognized student government before the board authorizes, establishes or eliminates any incidental fees for programs under the supervision or control of the board and found by the board to be advantageous to the cultural or physical development of students.

(4) In determining tuition and mandatory enrollment fees for undergraduate students who are enrolled in a degree program and are qualified to pay resident tuition:

(a) The governing board may not increase the total of tuition and mandatory enrollment fees by more than five percent annually unless the board first receives approval from:

(A) The Higher Education Coordinating Commission; or

(B) The Legislative Assembly.

(b) The governing board shall attempt to limit annual increases in tuition and mandatory enrollment fees for undergraduate students who are enrolled in a degree program and have established residency in Oregon to a percentage that is not greater than the percentage increase in the Higher Education Price Index, as compiled by the Commonfund Institute.

(5) The governing board may not delegate authority to determine tuition and mandatory enrollment fees for undergraduate students who are enrolled in a degree program and are qualified to pay resident tuition. [2013 c.768 §10]

ACTION Item

Agenda Item No. 4.2
Recommendation for Acceptance of $18 million in Series XI-Q Bond Funds and Authorization for President to Proceed with Geothermal System Renovation

Background:

During the 2022-2023 Oregon legislative session, Oregon Tech (University) received an authorization for Series XI-Q bonds for the Geothermal System Emergency Renovation project (renovation, project). These bond proceeds total $17,956,151 and are issued on the credit of the state and do not require repayment by the University. The emergency renovation is a multiphase project to address the system's current critical condition of genuine life safety risks with severe implications for student and employee safety and the University's operations.

This project will completely renovate the geothermal infrastructure on the Klamath Falls campus. The renovation includes a combination of rehabilitation, replacement, and modernization of geothermal wells (production and injection wells), geothermal mechanical building and main geothermal storage and pumping system, geothermal distribution system (distribution piping), campus main electrical gear and distribution system (building heat exchange system), campus snowmelt and campus main electrical equipment. The project also includes addressing code compliance, imminent life safety risks, improvements to surrounding areas, landscaping and ADA accessibility.

An engineering assessment of the geothermal heating system was conducted in June 2022, identifying: (a) system elements, (b) observed issues and description of recommended action, (c) rationale for recommendation and (d) expected outcomes of recommended actions. Upon Board approval, the University will engage an engineering firm for final design of geothermal heating system renovations. Permits and other approvals would be obtained upon completion of the engineering and design phase. Project renovation is expected to be completed over 36-months beginning fall 2023 and completed by fall 2026. Due to geothermal system infrastructure complexities, renovations would be performed in distinct phases to minimize disruptions to campus. The University is able to complete much of its renovation activity during the summer months, when the majority of residential students are not on campus and when heating demands are lowest. Some renovation activity could take place when classes are in session in select areas.

The project is fully funded by state-issued taxable bonds. As a result, a reimbursement resolution is not required. Additionally, a university match is also not required to obtain state funding support.

It is anticipated that the state's bond issuance will take place mid-November 2023, with bond proceeds available to Oregon Tech at that time.

Estimated Project Budget:

Construction/Renovation	$ 13,012,835
Architectural and Engineering Fees	2,602,567
Contingencies	1,561,300
Permits, Incidental Fees	779,449
Estimated Total Project Costs	**$ 17,956.151**

Estimated total project costs include projected inflation over the life of the multiphase construction period. The University is prepared to move forward with the multi-phase renovation once the Board approves acceptance of bond proceeds and authorizes the president to proceed with the project.

Recommendation:

After discussion and review of documents, **staff recommends a motion by the Committee to the full Board to accept $17,956,151 in Series XI-Q bond proceeds and authorization for the president to proceed with the geothermal system renovation** on the Klamath Falls campus.

Attachments:

A. Oregon Tech Geothermal Funding Request, dated October 26, 2022
B. 2022 Oregon Tech Geothermal Condition Assessment

Oregon Institute of Technology

Emergency Funding Request
Geothermal Infrastructure and Heating System

October 26, 2022

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Oregon TECH
Oregon Institute of Technology
OFFICE OF THE PRESIDENT
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October 26, 2022

Oregon Legislature
Legislative Fiscal Office
900 Court St. NE, H-178
Salem, OR 97301

Subject: Emergency Funding Request – Geothermal Infrastructure and Heating System on Klamath Falls Campus

The Oregon Institute of Technology (Oregon Tech) respectfully submits this emergency funding request for significant repairs to our geothermal infrastructure and heating system (system) on the Klamath Falls, Oregon campus. The pervasive nature of significant deficiencies in the system, which is about 60 years old, including repeated, dangerous multiple single points of failure, requires immediate action. This emergency funding is critical to reduce life safety risks and to prevent a complete loss of the geothermal infrastructure and heating system function to some or all buildings on the Klamath Falls campus. Such a failure, in turn, would necessitate a complete campus closure.

More than 2,000 students and 326 regular faculty and staff call the Oregon Tech Klamath Falls campus home. Oregon Tech's Klamath Falls campus is fortunate and unique in having a renewable geothermal resource used extensively on campus. As a result, loss of geothermal heat can lead to the complete loss of use of some or all buildings on campus. Klamath Falls is at or below freezing on average for seven months of the year due to its high elevation on the eastern slope of the Cascade Mountains. Comfort heating is also required for an additional three months of the year.

The critical nature of the system's current condition is a genuine life safety risk with severe implications for student and employee safety and the university's operations. During the last few years, many buildings have been taken off-line from time to time due to intermittent geothermal system failure.

We are beginning to reach a point where the entire campus geothermal heating system at Oregon Tech is at risk of no longer functioning. Oregon Tech's only option is to address this emergency immediately. Unfortunately, no other funding source of this magnitude is available to the university to handle this emergency.

In June 2022, Oregon Tech commissioned an engineering geothermal condition assessment to objectively determine the system's emergency status. This request is based on that assessment, including detailed descriptions of life safety risks and the poor condition of system components. The assessment is included in its entirety as Exhibit 1 and Appendices A, B, and C.

With the approval of our emergency funding request, Oregon Tech will be better positioned to serve its students' basic needs, promote student success, and provide a safe and reliable infrastructure well into the future. We respectfully request your favorable consideration of our funding proposal.

Sincerely,

Executive Summary

Overview:
The Oregon Institute of Technology (Oregon Tech) is seeking emergency funding for its geothermal infrastructure and heating system (the system) in Klamath Falls, Oregon, a residential campus. The current condition of Oregon Tech's geothermal system is critical and requires immediate action. The system's current status presents day-to-day student safety and other life safety risks.

The entire campus geothermal heating system at Oregon Tech is at risk of no longer functioning. Loss of geothermal heat can result in complete loss of some or all buildings on campus. Klamath Falls is at or below freezing on average seven months of the year due to its higher elevation on the eastern slope of the Cascade Mountains. Comfort heating is required for an additional three months of the year. Consequences of not addressing deficiencies of the system range up to a complete loss of the geothermal heating system, requiring campus closure.

Emergency Status:
A geothermal condition engineering assessment was commissioned in June 2022 as part of the university's assessment of the emergency status of the geothermal heating system. This request is based on that assessment and is included in full as Exhibit 1 and Appendixes A – C.

Per the geothermal condition engineer's assessment, "virtually all elements of the geothermal heating system are critical to campus. Loss of the geothermal heating system during the cold months, with the system used 10-months of the year, would result in catastrophic consequences not only on the educational function and operation of campus, but would also likely result in severe damage to building components and systems resulting in potentially millions of dollars' worth of damage".

Emergency Repair:
Emergency repair to the system's four critical elements addresses:
- Life safety risks
- Age and deterioration of critical system components including those that have either failed, or reached the end of expected life
- System resiliency
- Capacity concerns

System failure and breakdown are occurring with increased frequency. Ongoing system failures have created an emergency situation, presenting life safety risks, interruption of campus operations and significant potential for university shutdown.

Geothermal Background:
The geothermal infrastructure and heating system is located throughout the university's residential campus in Klamath Falls, serving 17 buildings totaling approximately 884,686 gross sq. ft. The geothermal infrastructure and heating system is made up of wells, pumps, heat exchangers, heated air/water distribution systems, campus distribution piping, and injection wells returning the renewable resource back to the ground.

On an annual basis, the geothermal heating system saves the campus approximately $600,000 in energy costs. An excellent renewable resource, the system provides the university with protection from rising energy costs. The system has been reliable and effective for over 60 years and is a unique renewable resource benefitting the university and state. However, now a majority of the geothermal infrastructure and heating system is beyond its serviceable life.

The six critical system elements requiring emergency repair are essential for student safety and day-to-day operations of the Klamath Falls campus:

- Production and injection wells (geothermal wells)
- Geothermal mechanical building and main geothermal storage and pumping system
- Geothermal distribution system (distribution piping)
- Campus main electrical gear and distribution system (building heat exchange system)
- Geothermal System - Campus Snowmelt System
- Geothermal System - Campus Main Electrical Equipment

Budget and Timeline:
Requested emergency funding totals $17,956,151 for all six critical geothermal system elements:

- Production and injection wells (geothermal wells): $3,066,153
- Geothermal mechanical building and main geothermal storage and pumping system: $2,684,235
- Geothermal distribution system (distribution piping): $6,463,782
- Campus main electrical gear and distribution system (building heat exchange system): $1,383,552
- Geothermal System - Campus Snowmelt System: $2,038,097
- Geothermal System - Campus Main Electrical Equipment: $2,320,332

Requested funding includes engineering, construction, contingency and other costs.

The timeline for expected emergency repair would require 36 months, taking place between July 2023 and June 2026. This is partially due to system complexity, but also because the project must be completed in phases to minimize campus disruption.

Expected Outcomes and Positive Impact:
Through emergency funding, the condition of the six critical elements would be significantly improved, mitigating life and safety issues, enhancing reliability and preventing operational shutdown.

- Production and injection wells (geothermal wells)
    - Current condition: Poor
    - Goal: Bring to current standards with reliance on redundant wells with ability to increase flow without damage/debris
- Geothermal mechanical building and main geothermal storage and pumping system
    - Current condition: Poor/Unknown
    - Goal: Provide adequate protection from sediment; bring equipment within expected service life; bring electrical to code; eliminate multiple single failure points through consolidation with ability to bypass failure points
- Geothermal distribution system (distribution piping)
    - Current condition: Good to Fair
    - Goal: Replace inconsistent, inferior materials having potential to cause complete loss of the system for extended periods of time; consistent material selection throughout system
- Campus main electrical gear and distribution system (building heat exchange system)
    - Current condition: Poor to Good
    - Goal: Reduce flooding risk mitigating additional damage; bring to current code and standards
- Geothermal System - Campus Snowmelt System

    - Current condition: Poor
    - Goal: Improve condition and optimize for efficient use of geothermal resource
- Geothermal System - Campus Main Electrical Equipment
    - Current condition: Inadequate to incomplete
    - Goal: Replace older heat exchangers and pumps; connect existing snowmelt equipment to geothermal system; add additional geothermal snowmelt to create continuous pathways between buildings

Addressing deficiencies of the current geothermal infrastructure and heating system will eliminate emergency life and safety issues and also eliminate single points of failure within the system. The system would be able to operate with electrical backup, and isolate system issues for future repair as they arise. Emergency repair of the current system will allow it to serve the Klamath Falls campus for the next 60 years and beyond.

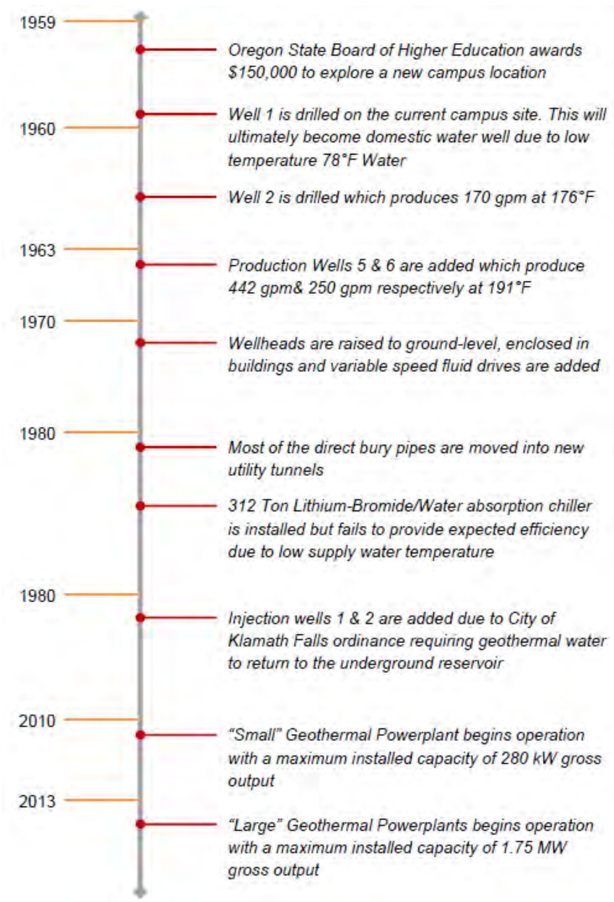
University and Geothermal Background

Founded in 1947, originally as a vocational rehabilitation school for World War II veterans, the university has grown immensely in size and scope as it has become *"Oregon's Polytechnic University".* As Oregon's polytechnic university, we take pride in our mission to deliver an exceptional quality education with a highly recognized superb return on investment. We continually partner with industry leaders to ensure that at the baccalaureate and master's level we adapt to new technology and that our high-quality programs and classes prepare students to meet workforce demands. Oregon Tech is known as "industry's university" because of our intense focus on meeting workforce and economic needs in the state and region.

Oregon Tech's residential campus is located in Klamath Falls on the eastern slope of the Cascade Mountains. The campus has an enrollment of more than 2,000 students and employs nearly 326 faculty and staff. The original geothermal heating system supports the 303-acre campus serving 17 buildings totaling approximately 884,686 gross sq. ft. Temperatures are at or below freezing on average seven months of the year due to its higher elevation on the Cascade Mountains. Comfort heating is required for an additional three months of the year.

The university's Klamath Falls campus was constructed in the 1960's with the site specifically selected for its geothermal renewable hot water resource. Geothermal wells and system infrastructure were constructed primarily between the 1960's-70's. However, additional features adding capacity and function have been added as recently as 2013.

Major milestones in the history of the geothermal infrastructure and heating system at Oregon Tech:



History of System Breakdown and Failure

The geothermal utility system presents imminent life safety risks. Additional risks include total breakdown of the system, significantly affecting operations to the point of multiple building loss or complete campus closure.

System breakdowns have occurred as recently as September 2022 and June 2022, with escalating severity. In each respective incident, geothermal disruption affected the ability to deliver and maintain hot water in campus buildings, including the Residence Hall. These incidents underscore serious deficiencies within the current system, including multiple single points of failure.

Over the decades, Oregon Tech has consistently invested in its geothermal heating system. Oregon Tech's funding does not provide resources adequate to address the emergency nature of the system. The needed emergency repairs and frequency of breakdowns is negatively affecting operations, student safety and causing life safety risks.

Below is an outline of the three most recent system failures, and the university's investment in its geothermal system over the last five years.

Incident - September 14, 2022:

Owens Hall Geothermal Heat Exchanger – Critical condition of heat exchangers in Owens Hall.

- Requires immediate replacement to prevent breakdowns during the academic year to avoid classroom disruption.
- Equipment life beyond serviceable repair.

Figure 1 - Owens Hall heat exchanger, beyond useful life, from incident on September 14, 2022

Figure 2 - Owens Hall heat exchanger, beyond useful life, from incident on September 14, 2022

Incident – September 7, 2022:

Well #6 – Main pipe from geothermal Well #6 ruptured at the foundation footing of the Heat Exchange Building.

- Well #6 shut-off, running on Well #5. Well #5 unable to keep up with campus demand.
- Began lubricating column shaft on Well #7 in order to meet campus demand. Up to 24 hours needed to start Well #7.
- Until Well #7 operating, campus too cold in spots and struggled to keep hot water in the Residence Hall.

Figure 1 - Main pipe from Well #6 ruptured at building foundation footing, from incident on September 7, 2022

Figure 2 –Well #6 main pipe rupture flooding, from incident on September 7, 2022

Incident – June 14, 2022:

Geothermal Distribution Piping – A break in a corroded section of pipe ruptured leaving the campus without water for building heating or domestic hot water.

- Ruptured pipe occurred in a tunnel.
- Leaks in the tunnels can lead to personnel life safety risks due to the high temperature in a confined space.
- Large leaks in the tunnels can lead to building and/or electrical service flooding.

Figure 3 - Ruptured pipe, from incident on June 14, 2022

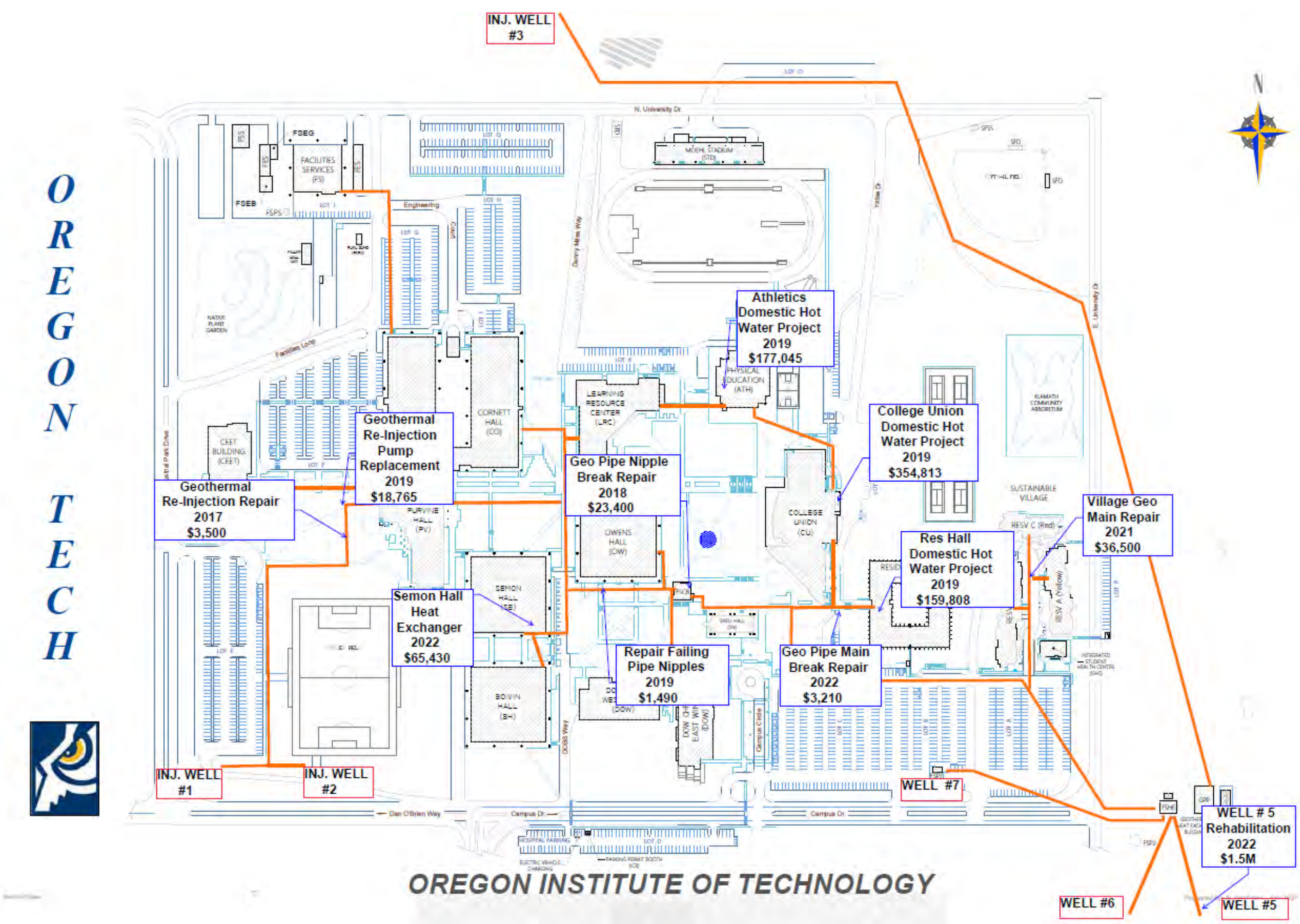
University Investment in the Geothermal System over the Last Five Years:

Over the past five years Oregon Tech has invested $2,343,961 in its geothermal heating system:

- 2022 - Well 5 Rehabilitation: $1,500,000
- 2022 - Semon Heat Exchange Replacement: $65,430
- 2021 - Village Geo Supply Main Repair: $36,500
- 2019 - Res Hall Domestic Hot Water Project: $159,808
- 2019 – Athletics Domestic Hot Water Project: $177,045
- 2019 – CU Domestic Hot Water Project: $354,813
- 2022 – Geo Main Line Repair: $3,210
- 2019 - Repair failing Geo Pipe Nipples: $1,490
- 2018 – Geo Pipe Nipple Repair: $23,400
- 2019 – Geo Re-Injection Pump Replacement: $18,765
- 2017 – Geo Re-Injection Repair: $3,500

Not shown on the map are multiple on-going geothermal projects (with anticipated costs), including:

- 2022 - Owens Heat Exchanger Replacement: $40,000
- 2022 - Well 6 Supply Line Break Repair: $30,000



Emergency Status

As listed in the recent geothermal condition engineering assessment performed by an external professional engineering firm, any downtime or loss of the geothermal heating system during the cold months would have catastrophic consequences on: (1) educational function, (2) operation of the campus, (3) likely result in severe damage to building components and systems resulting in potentially millions of additional dollars' worth of damage. Oregon Tech's Klamath Falls campus experiences below freezing temperatures seven months of the year.

The sudden and pervasive nature of significant deficiencies in the system, dangerous results of failure, and multiple single points of failure give rise to Oregon Tech determining its geothermal heating system is in emergency condition requiring immediate action.

Oregon Tech's only option is to immediately address this emergency. No other funding source for the emergency is available to the university.

In addition to dangerous life safety risks, a significant number of buildings could be taken off-line at any time, and at the same time, due to any one of multiple areas of great engineering concern.

<u>Below is a list of major elements of the geothermal heating system and the consequence of failure:</u>

Production and Injection Wells (Geothermal Wells)

- Loss of both production wells would result in no heating water to campus
- Loss of just one well would substantially reduce system capacity and could result in freezing conditions in one or more buildings
- Loss of electrical power at the wells would disable the pumping system resulting in the inability to distribute heat to the buildings

Geothermal Mechanical Building (Heat Exchanger Building)

- Loss of the GEO storage tank and piping system can lead to inability to heat campus buildings; there is <u>no backup</u> or standby heating system

Geothermal Distribution System (Distribution Piping)

- Loss of supply piping system can lead to inability to heat campus buildings; there is <u>no backup</u> or standby heating system
- Loss of a section of piping or fitting leak can result in <u>loss of the entire system</u> due to a lack of isolation capacity and alternate flow routing
- Leaks in the tunnels can lead to personnel life safety risks due to the high temperature and confined space
- Large leaks in the tunnels can lead to building or electrical service flooding

Campus Main Electrical Gear and Distribution System (Building Heat Exchange System)

- Loss of building heat exchange system can lead to the inability to heat the specific camps building; there is <u>no backup</u> or standby heating system

Emergency Funding Request

To prevent total system failure and life safety risks, $17,956,151 of emergency funding is requested.

Emergency funding would repair the following six critical elements of the geothermal heating system:

- Production and injection wells (geothermal wells): $3,066,153
- Geothermal mechanical building and main geothermal storage and pumping system: $2,684,235
- Geothermal distribution system (distribution piping): $6,463,782
- Campus main electrical gear and distribution system (building heat exchange system): $1,383,552
- Geothermal System - Campus Snowmelt System: $2,038,097
- Geothermal System - Campus Main Electrical Equipment: $2,320,332

Each critical element is described on the following pages with budget information.

Additional detailed descriptions, including additional budget information is included as part of Exhibit C *Detailed Cost Evaluation Matrix,* prepared by Fluent Engineering, Inc. as part of their *2022 Oregon Tech Geothermal Condition Assessment.* Exhibit C lists individual system elements, with summary of recommended action and supporting photos.

Figure 4 - Geothermal Mechanical Building; existing pipping has been in service for 60 years.

Production and Injection Wells (Geothermal Wells):

Production Wells:

The source of geothermal energy used at the Oregon Tech campus is residual volcanic heat, transferred to water that flows up from several thousand feet deep through a fault that crosses campus. Prior studies indicate that the source water temperature is in excess of 300°F. Source hot water mixes with cooler groundwater to provide water temperature for campus heat of about 192°-196°F. The main production wells for the campus heating system are wells #5 and #6, which have a nominal pumping capacity of 500 gpm and 350 gpm, respectively.

Injection Wells:

Originally, the geothermal water was used directly in the building heating equipment, with wastewater discharged to the storm sewer through building roof drains. In 1985 the City of Klamath Falls instituted an ordinance requiring that geothermal waters be reinjected into the same or similar aquifer to better conserve the resource.

Critical Nature of System:

Loss of production or injection capacity can lead to inability to heat campus buildings. There is no backup or standby heating system.

Oregon Tech Action:

An engineering firm will be hired to complete the well rehabilitation designs and work with the governing agency, Oregon Water Resources (OWR) on project approval. With emergency funding Oregon Tech will be able to rehabilitate this portion of critical infrastructure and significantly reduce deferred maintenance costs for the next twenty years. The attached engineer's assessment outlines the condition and recommendation for each of the geothermal wells (Exhibit A). Exhibit B includes a campus map identifying the Oregon Tech geothermal well locations.

Detailed Budget:

PRODCUTION AND INJECTION WELLS (GOTHERMAL WELLS)		
	2022 Dollars	Construction Cost Increase
Architecture & engineering costs @ 10%	$ 255,300	$ 306,615
Construction costs	1,787,100	2,146,307
Contingency @ 15%	382,950	459,923
Other @ 5%	127,650	153,308
Total	$ 2,553,000	$ 3,066,153

Figure 7 - Well #1 in need of cleaning and repairs

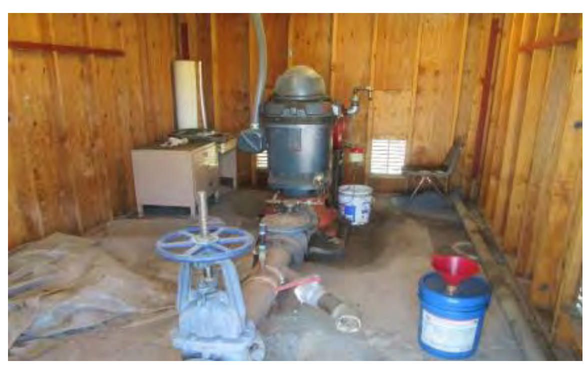


Figure 8 - Well #6, end of life

Geothermal Mechanical Building and Main Geothermal Storage and Pumping System:

The geothermal storage and pumping building are located at the southwest corner of campus, near the production wells. The building houses:

- 4000 gal receiving/storage/settling tank receiving flow from the well pumps
- Circulation pump to supply GEO to Crystal Terrace (GEO heat sales customer)
- 280 kW UTC geothermal power generator
- Electrical power supply for well pumps, with variable frequency drives to control pump speed and flow
- Controls to operate wells, pumps, and GEO power generation

The storage tank is a vented tank that receives all the flow from the production wells. A tank level controller attached is used to control pump speed and flow to maintain a tank level setpoint. GEO supply to all uses on campus flows from the tank by gravity, with the total flow determined by the sum of flow demand at each individual heat load.

Critical Nature of System:

- Loss of the GEO storage tank and pumping system can lead to inability to heat campus buildings; there is no backup or standby heating system
- Loss of power for the wells results in loss of campus heat

Oregon Tech Action

An engineering firm will be hired to complete the HX Rehabilitation design and work with Oregon Tech through completion of construction. With emergency funding Oregon Tech will be able to renovate this critical infrastructure and significantly reduce deferred maintenance costs for the next twenty years. The attached engineer's assessment outlining the condition and recommendation for each of the geothermal wells (Exhibit A). Exhibit B includes a campus map identifying the heat Exchanger Building location.

Detailed Budget:

RENOVATION OF CAMPUS HEAT EXCHANGE SYSTEMS		
	2022 Dollars	Construction Cost Increase
Architecture & engineering costs @ 10%	$ 223,500	$ 268,424
Construction costs	1,676,250	2,013,176
Contingency @ 15%	223,500	268,423
Other @ 5%	111,750	134,212
Total	$ 2,235,000	$ 2,684,235

Figure 9 - Existing storage tank corroded and at risk of failure

Geothermal Distribution System (Distribution Piping):

The geothermal distribution system is the piping that conveys the hot geothermal fluid from the production wells to point of beneficial heat use and then to the injection wells for disposal of the cooled fluid. Currently, the piping from the wells to the heat exchanger building still uses the original steel pipe. There is also some direct-buried steel piping between the heat exchanger building and the campus tunnel system, and some steel pipe within the tunnel. The balance of the GEO supply piping is FRP. Specific components of the distribution system include:

- Piping from the production wells to a storage and settling tank in the geothermal building
- Gravity flow supply piping from the tank to heat transfer equipment in the buildings
- Gravity flow return/collection piping from the buildings to an injection collection tank
- Pumped or gravity flow from the collection tank to the injection wells

Critical Nature of System:

Loss of the GEO distribution system can lead to inability to heat campus buildings. There is no backup or standby heating system.

- Loss of a section of the piping or a fitting leak can result in loss of the entire system due to lack of isolation capacity and alternate flow routing
- Leaks in the tunnels can lead to personnel life safety risk due to the high temperature and confined space
- Large leaks in the tunnels can lead to building or electrical service flooding

Oregon Tech Action:

An engineering firm will be hired to complete the geothermal piping renovation project and work with Oregon Tech through completion of construction. With emergency funding Oregon Tech will be able to renovate this critical infrastructure and significantly reduce deferred maintenance costs for the next twenty years. The attached engineer's assessment outlines the condition and recommendations for the geothermal distribution system (Exhibit A). Exhibit B includes a campus map identifying the Oregon Tech geothermal piping, including both direct bury and tunnel piping.

Detailed Budget:

RENOVATION OF GEOTHERMAL DISTRIBUTION SYSTEM (DISTRIBUTION PIPING)		
	2022 Dollars	Construction Cost Increase
Architecture & engineering costs @ 10%	$ 538,200	$ 646,378
Construction costs	3,767,400	4,524,648
Contingency @ 15%	807,300	969,567
Other @ 5%	269,100	323,189
Total	5,382,000	$ 6,463,782

Figure 10 - Geothermal supply piping; valve inoperative, pipes questionable

Campus Main Electrical Gear and Distribution System (Building Heat Exchange System):
The geothermal hot water is used for heating all campus building and domestic hot water.

Building heating systems:

- Stainless steel heat exchanger to transfer heat from the GEO to the building heating water, with a control valve to limit the GEO flow based on heating water temperature
- Pumps to circulate the building hot water; control valves limit the heating water flow based on demand
- A water-to-air heat transfer coil to deliver heat to the building air
- Fans circulate heated air to rooms.

Domestic Hot Water Systems:

- Geothermal water is used to heat potable water for domestic hot water demands in all campus buildings
- Domestic hot water is heated using heat exchangers and hot water storage tanks

Critical Nature of System:

- The loss of building heat exchange systems will directly impact the ability to heat and use the effected building(s); there is no backup or standby heating system
- A planned renovation of building heat exchange systems will allow work to be scheduled for the summer months to not adversely affect building use.

Oregon Tech Action

An engineering firm will be hired to complete the building heat exchange renovations and work with Oregon Tech through completion of construction. With emergency funding Oregon Tech will be able to renovate this critical infrastructure and significantly reduce deferred maintenance costs for the next ten to fifteen years. The attached engineer's assessment outlines the condition and recommendations for the building heat exchange system (Exhibit A). Exhibit B includes a campus map identifying the Oregon Tech buildings that require renovation of existing heat exchange systems.

Detailed Budget:

RENOVATION OF BUILDING HEAT EXCHANGE SYSTEMS		
	2022 Dollars	Construction Cost Increase
Architecture & engineering costs @ 10%	$ 115,200	$ 138,355
Construction costs	864,000	1,037,664
Contingency @ 15%	115,200	138,355
Other @ 5%	57,600	69,178
Total	$ 1,152,000	$ 1,383,552

Figure 11 - Heat Exchanger; leaking a safety hazard, needing repair/replacement based on respective building

Geothermal System – Campus Snowmelt System:

Oregon Tech's snowmelt system provides improved campus access and safety during inclement weather while reducing the cost of snow removal. Upgrades and expansion of the campus snowmelt system will help reduce campus closures and the risk of potential injuries.

Critical Nature of System:

- Reduce the cost of snow/ice removal and limit campus closures due to winter weather conditions
- Reduce the risk of potential injuries

Oregon Tech Action

An engineering firm will be hired to complete the snowmelt system upgrades design and work with Oregon Tech through completion of construction. With emergency funding Oregon Tech will be able to complete upgrades to this critical infrastructure and improve campus safety and reduce snow removal costs moving forward. The attached engineer's assessment outlines recommendations (Exhibit A). Exhibit B includes a campus map identifying areas on the Oregon Tech campus that are priorities for snowmelt system upgrades.

Detailed Budget:

REPLACE AND EXPAND CAMPUS SNOWMENT SYSTEMS		
	2022 Dollars	Construction Cost Increase
Architecture & engineering costs @ 10%	$ 169,700	$ 203,810
Construction costs	1,272,750	1,528,573
Contingency @ 15%	169,700	203,810
Other @ 5%	84,850	101,904
Total	$ 1,697,000	$ 2,038,097

-

Figure 12 - Snowmelt; confined space - improved safety and control

Geothermal System – Campus Electrical Equipment:

Oregon Techs main power distribution switchgear is located in the same building and directly under geothermal supply piping. Any failure in the geothermal piping could result in a disruption of power to campus as well as major safety concerns. Relocation and replacement of the campus main switchgear will help prevent campus closures and reduce the risk of potential injuries.

Critical Nature of System:

- Prevent campus closures due to disruption of power distribution
- Reduce the risk of potential injuries

Oregon Tech Action

An engineering firm will be hired to complete the electrical system upgrade design and work with Oregon Tech through completion of construction. With emergency funding Oregon Tech will be able to complete upgrades to this critical infrastructure and improve campus safety moving forward. The attached engineer's assessment outlines the condition and recommendations for the campus electrical systems (Exhibit A). Exhibit B includes a campus map identifying the Oregon Tech buildings that require renovation of existing heat exchange systems.

Detailed Budget:

RELOCATE AND REPLACE CAMPUS MAIN ELECTRICAL DISTRBUTION SWITCHGEAR		
	2022 Dollars	Construction Cost Increase
Architecture & engineering costs @ 10%	$ 193,200	$ 232,033
Construction costs	1,449,000	1,740,249
Contingency @ 15%	193,200	232,033
Other @ 5%	96,600	116,017
Total	$ 1,932,000	$ 2,320,332

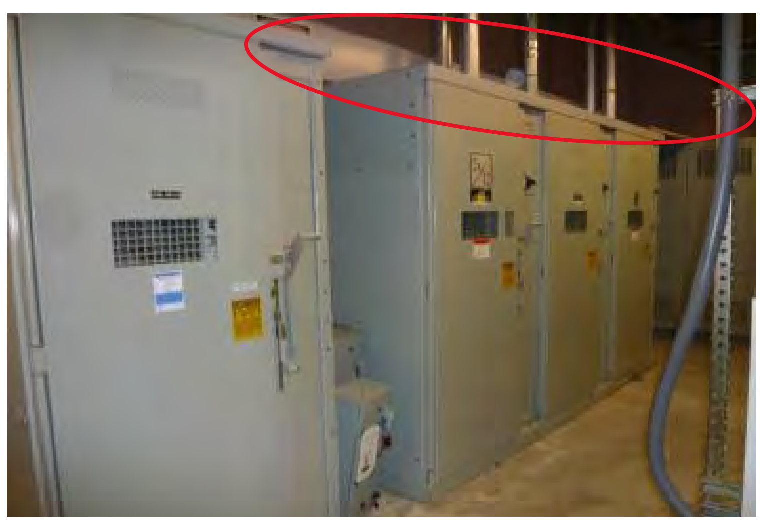


Figure 13 - Campus main electrical equipment; subject to complete failure and prone to flooding

Emergency Project Timeline

The estimated time of completion for all elements and phases of emergency repairs is anticipated to be up to 36 months. If emergency funding is granted, Oregon Tech anticipates emergency repairs to start summer of 2023 with completion estimated to be summer 2026.

Because the Oregon Tech geothermal system infrastructure is complex, the repairs will need to be made in distinct phases so as to minimize disruptions to campus. The university is able to complete much of its repair activity during the summer months, when the majority of residential students are not on campus. Some repair activity could take place when classes are in session, but at a reduced rate.

Geothermal Heating System Annual Savings

Annual Utility Costs

Oregon Tech estimates that annual utility costs savings because of the geothermal heating system is approximately $604,000. This is a conservative estimate, based on an on-line geothermal savings calculator. Source: *climatemaster.com/residential/geothermal-savings-calculator.*

Geothermal heating system utility savings over the next 20 to 30 years is estimated to be approximately $11,800,000 to $17,700,000 in today's dollars.

Deferred Maintenance Costs

The University estimates that future deferred maintenance costs would be significantly reduced over the next 20 years through funding of the emergency request. This could be as much as $6,000,000 over the next five years, which is currently unfunded due to the sudden emergency nature of the system.

Assumptions used to develop utility cost and deferred maintenance savings is included under section "Assumptions".

Return on Investment

Emergency funding of the geothermal heating system would address imminent life safety risks and also result in a return on investment for the university and state.

Return on investment could reach 38.90% over 30 years. This is a conservative estimate based on annual geothermal utility cost savings, and deferred maintenance savings over the first five years of the project.

Assumptions used to develop utility cost and deferred maintenance savings included under section "Assumptions".

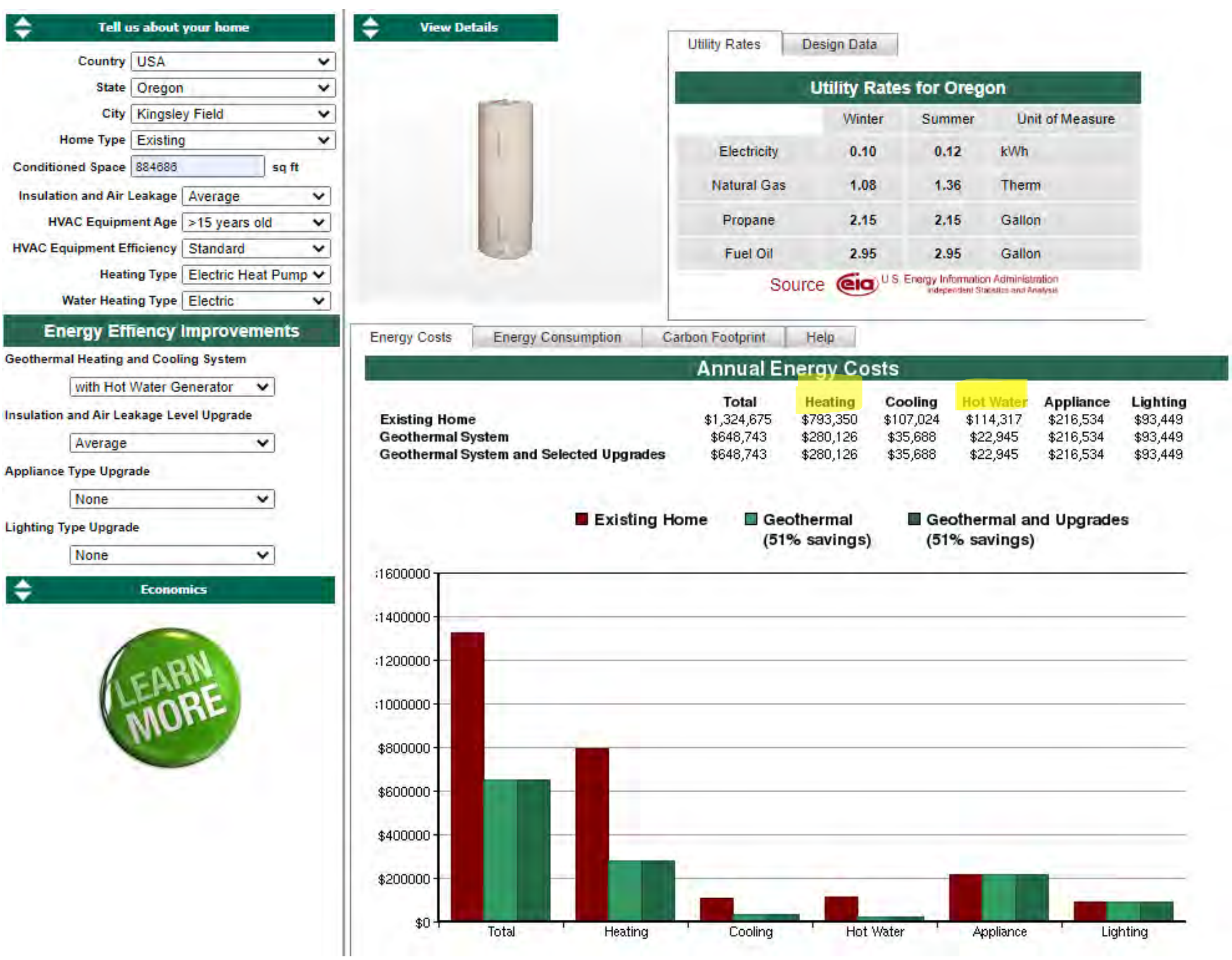
Life safety risks are most important to the emergency repair of the geothermal infrastructure and heating system. However, the return on investment supports the continued viability and use of the university's existing geothermal heating system.

Assumptions

Outlined below are assumptions developed for estimating (1) Geothermal System Savings, (2) Project Budget, and (3) Return on Investment.

Geothermal System Savings:
An online geothermal calculator was used to estimate annual utilities cost savings. Utility costs for (a) heating, and (b) hot water were included in the cost savings estimate. Source:
https://www.climatemaster.com/residential/geothermal-savings-calculator/sc01.php

	Annual Energy Costs		
Source	**Heating**	**Hot Water**	**Sub-Total**
Electric	$ 793,350	$ 114,317	$ 907,667
Geothermal	280,126	22,948	303,074
Difference - Estimated Savings	$ 513,224	$ 91,369	$ 604,593



Project Budget:
The overall project budget was developed as part of the engineering assessment report commissioned by Oregon Tech in June 2022. Those figures were developed by the engineering firm in 2022 dollars and include (1) construction costs, (2) soft costs, (3) contingency, and (4) other costs.

Oregon Tech applied an estimate for project construction cost increases over the project period. Source: *https://www.cbre.com/insights/books/2022-us-construction-cost-trends*

CRBE's Construction Cost Index forecasts:
- 14.10% year-over-year increase in construction costs by year-end 2022
- 2.00% - 4.00% increases in 2023 and 2024, respectively

Based on CRBE's Construction Cost Index, construction costs are estimated to increase 20.10% over the life of the project.

	2022 Dollars	Project Period Dollars
Total:	$ 14,951,000	$ 17,956,151
Project Components:		
Production & Injection Wells	$ 2,553,000	$ 3,066,153
Geothermal Mechanical Building and Main Geothermal Storage and Pumping System	2,235,000	2,684,235
Geothermal Distribution System	5,382,000	6,463,782
Building Heat Exchange System	1,152,000	1,383,552
Geothermal System - Campus Snowmelt System	1,697,000	2,038,097
Geothermal System - Campus Main Electrical Equipment	1,932,000	2,320,332
	$ 14,951,000	$ 17,956,151
Project Period Dollars, Estimated Increase from July 2022		20.10%

Return on Investment:
Return on investment (ROI) was calculated based on estimates for (a) geothermal annual utility cost savings and (b) deferred maintenance costs saved within the first five years after emergency project completion.

ROI calculation:
- Present value of future savings of geothermal annual utility costs
  - 30 years: $17,695,405
- Deferred maintenance cost savings within first five years of emergency project completion
  - $6,000,000
- Internal borrowing rate
  - 2.50%
- Emergency Project Funding (amount invested)
  - $17,956,151
- Number of years
  - 20-30 based on expected life of geothermal infrastructure

Summary Statement

Oregon Tech believes this emergency funding request is essential to protecting student safety, life safety risks, and to prevent complete loss of the geothermal infrastructure and heating system, which would necessitate campus closure. Klamath Falls campus operations, including academic buildings and student housing, are wholly dependent on the geothermal infrastructure and heating system ten months out of the year. The critical nature of necessary improvements requires immediate action and an urgent investment in repairs to avoid the dire consequences of geothermal system shutdown, hence the emergency status designation.

As part of the university's emergency assessment of its geothermal heating system, an engineering geothermal condition assessment was performed in June 2022 by Fluent Engineering, Inc. Much of the justification for our emergency funding request is based on that assessment, including detailed descriptions of safety risks and condition of system components. That assessment is included in its entirety as Exhibit 1 and Appendixes A – C.

Of the commissioned engineering geothermal condition assessment, Oregon Tech believes Appendix B2 *Geothermal System Distribution - Enlarged* and Appendix C *Detailed Cost Evaluation Matrix* are most informative. Together, they provide a snapshot of detailed information throughout the entire geothermal infrastructure and heating system.

- Appendix B2: Provides a campus map, overlaid with the geothermal distribution system identifying the location of each system element requiring emergency repair.
- Appendix C: For *each* system element, lists detailed evaluation cost estimates (in 2022 dollars) as well as information regarding: system safety, system resiliency, effect on system capacity, effect on future system maintenance costs, and supporting photos.
- Numbering of system elements on Appendixes B2 and C tie to one another. Together, the map and system element listing provide a visual and narrative on the pervasive nature of emergency repairs throughout the entire geothermal heating system.

Oregon Tech deeply appreciates the time and consideration of the Oregon Legislature and the Legislative Fiscal Office for our emergency funding request. The university would also like to acknowledge and thank the HECC for their guidance with this submission.

Please do not hesitate to contact us should you have any questions or would like additional detail about this request. We welcome any questions and requests you may have.

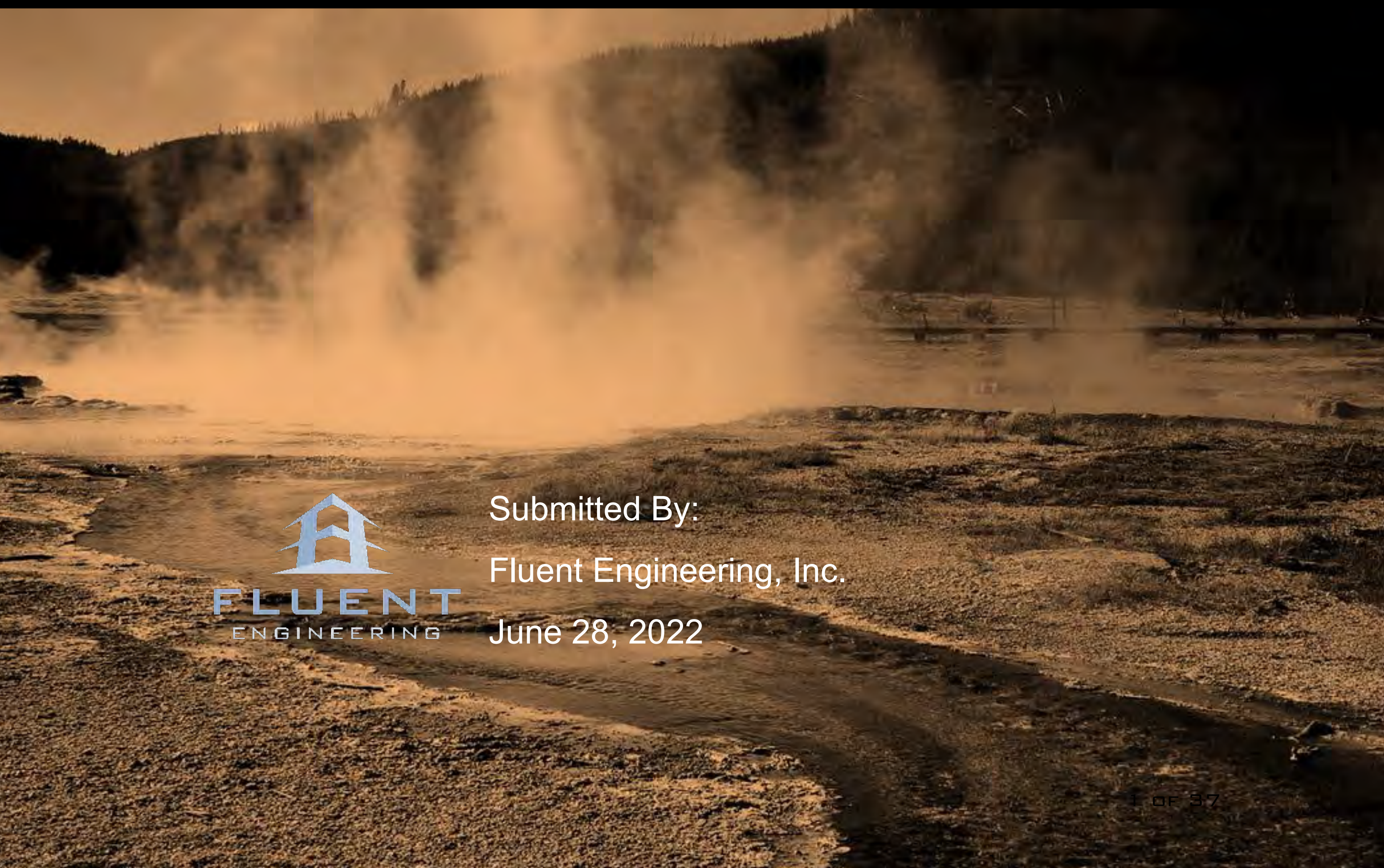
Contact Information

Please contact John Harman, MBA, CGMA, CMPE, Vice President for Finance and Administration, with any questions or for additional detail.

- Email: John.Harman@oit.edu
- Direct line: (541) 885-1106
- Mobile: (817) 475-5646

Exhibit 1

2022 OREGON TECH GEOTHERMAL CONDITION ASSESSMENT



Submitted By:

Fluent Engineering, Inc.

June 28, 2022

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Engineering Stamps

Report Sections Applicable to Brian Brown, PE Stamp and Signature: Mechanical

REGISTERED PROFESSIONAL ENGINEER
12227PE
OREGON
JULY 15, 1983
BRIAN BROWN

Report Sections Applicable to Matthew J. Cash, PE Stamp and Signature: Electrical

REGISTERED PROFESSIONAL ENGINEER
59,920
OREGON
January 18, 2005
MATTHEW J. CASH

EXPIRES: 12/31/2023

Date Signed: 06/28/2022

Contents

Executive Summary

The geothermal heating system at the Klamath Falls Campus of Oregon Tech has been effective for over 60 years and is not only a unique renewable resource that benefits Oregon, but it is critical to the continued operation of Oregon Tech. Geothermal is the only heating source for almost all of the campus, and the majority of the system is beyond its service life. The consequences of not addressing the deficiencies of the system range from periodic with increasing frequency operational disruptions to a complete loss of assets at the entire Klamath Falls Campus. As evidenced approximately 3 weeks prior to the date of this report, a geothermal valve/pipe failed, resulting in a complete shutdown of the system. Fortunately, this occurred during non-freezing temperatures. The Geothermal system is critical to Oregon Tech's operations, and given that Klamath Falls is at or below freezing on average 7 months out of the year due to its higher elevation, loss of heat can result in complete loss of some/all buildings on campus. Comfort heating is required for at least 3 more months. It has snowed in July on several occasions in Klamath Falls.

The geothermal heating system is made up of wells, pumps, heat exchangers, heated air/water distribution systems, campus distribution piping, and injection wells that return the resource back to the ground. There are four crucial elements to the system which are described below. If any one of these crucial elements fails, the entire campus heating system at Oregon Tech- Klamath Falls will no longer function. The list and condition of these crucial elements are as follows:

Geothermal Wells

Description:

Wells in the ground produce the heated geothermal water that is distributed to the buildings and injection wells to return the geothermal water to the ground. Wells include casings, pumps, shafts, electrical, and piping.

Condition:

Most are in poor condition, do not meet current standards, and have exceeded expected service life. Cannot rely on redundant wells due to inability to increase flow without damage/debris.

Geothermal Mechanical Building Sediment Tank & Electrical

Description:

All the wells route the water to this building, where it is then distributed to the campus. The building also powers and monitors (controls) the wells and other parts of the geothermal system network.

Condition:

Tank- Unknown/Poor, undersized for the campus, and does not provide adequate protection from sediment esp. as existing wells fail. Tank is critical to system operation and therefore inspection windows are short/cannot risk a shutdown of the system for scheduled tank inspection. Tank is beyond expected service life.

Electrical- Fair Condition, but has no backup and does not meet current code. Additionally, is distributed such that multiple single failure points exist (should be consolidated with the ability to -bypass failure points).

Distribution Piping

Description:

Moves geothermal water across campus, to each building, snow melt, and back to Injection Wells. Includes Valves, supports, piping, etc.

Condition:

Mostly good to fair; however, this is due to correct material selection which is not present throughout the system, and there is no ability to isolate such that a small failure, and/or failure in one area results in a full campus shutdown for potentially extended periods of time. Areas with inferior materials will cause complete loss of the system that can result in loss of heat for extended periods (weeks to months).

Campus Main Electrical Gear & Distribution System

Description:

Provides power to all the buildings, and Geothermal controls, pumps, warm air distribution, etc. This is where the 12,470 Volt campus distribution system splits from the utility feed coming in, to each building, and consists of disconnects, breakers, transformers, and fuses.

Condition:

Main Electrical Equipment- Poor, life reduced due to previous damage, and Complex to replace. Has experienced flooding, and due to its location is subject to additional damage. Does not meet current code, or standards.

Campus distribution- Good. Due to recent investments, after the main electrical gear, the campus distribution system is poised to serve years into the future meeting modern standards.

In addition to the crucial elements above, the geothermal system also consists of the following important elements. Failure to the following systems, while serious, would be localized and not take down the entire campus heating system.

Building heat exchange

Description:

Transfers heat from the geothermal distribution system to the buildings for space heating and domestic hot water.

Condition:

Heat exchangers, pumps, and controls in older buildings are generally in poor condition or not optimized for efficient use of the geothermal resource

Snowmelt:

Description:

Transfers heat from the geothermal distribution system to exterior stairs and sidewalks for snow removal/deicing. The snowmelt serves the students, faculty, and staff by keeping sidewalks passable and de-iced which also provides removal of ADA barriers.

Condition:
Existing snowmelt equipment has been installed and is not connected to the Geothermal System. Some areas on campus do not have continuous paths between buildings, additional GEO snowmelt should be added to address the most commonly utilized pathways. Future snowmelt locations should also be identified as part of the overall system capacity and distribution upgrades. Older heat exchangers and pumps are no longer adequate and require replacement.

The geothermal system is an excellent renewable resource that has no harm to the natural biological environment and provides Oregon with protection from rising energy costs. According to a 2010 article on the uses of geothermal at Oregon Tech, former Oregon Tech Professor Dr. John Lund estimates that the return on investment is at least $1M/year in energy savings (Lund & Boyd, 2010).

If the deficiencies outlined in this report are corrected, the vulnerabilities in the systems listed above will be eliminated. In other words, the system would no longer be subject to these single points of failure and could continue to operate with electrical backup, and system isolation to fix issues that may arise. The estimated cost of the recommended actions in this report is $14,951,000. If these items are addressed, the Geothermal Heating system will continue to serve the campus for the next 60 years and beyond.

1. Introduction

1.1 Project Description and Scope

Fluent Engineering, Inc. was tasked with evaluating the hydrothermal (Geothermal) resources of the Oregon Tech – Klamath Falls Campus. The purpose of this task was to aid in the development of an emergency funding request to the Oregon Higher Education Coordinating Committee (HECC) to address immediate life safety and risk of failure concerns within the geothermal system of Oregon Tech.

The objectives of this project were as follows:

- Provide information used to develop an emergency funding request
- Provide Campus overview and history of the geothermal system
    - Describe the history of geothermal at Oregon Tech
    - How geothermal energy is integral, and critical to campus operation and ongoing development
- Provide a description of the existing geothermal system
    - Uses of geothermal energy at Oregon Tech
    - Determine System Capacity
- Describe environmental and financial benefits of geothermal
- Analyze concerns and consequences of system failure
    - Age and deterioration of critical components
        - Production wells and pumps
        - Pipelines
        - Injection wells
        - Heat exchangers in buildings
        - Isolation valves in distribution piping
    - Lack of resiliency to component failure (including geothermal distribution and supporting electrical power)
        - Loss of critical components can shut down the entire system and campus operations
        - No way to isolate a portion of the system while the rest continues to operate
        - Possible collateral damage to other systems or buildings
        - No other source of heat or hot water
    - Life safety risks
        - Risk of scalding with hot water in confined space utility tunnels
        - Equipment such as snowmelt systems in tunnels
        - No way to quickly respond to failure
        - Aging system in mechanical rooms
        - Failing/non-compliant wells
    - Environmental risks
    - Capacity
        - Ability to support planned campus growth
        - Ability to modulate system
- Provide recommended actions to address concerns

- Identify and repair or replace critical components
- Improve resiliency
- Improve or optimize system capacity
    - Establish a plan for support of future buildings
    - Optimize the use of resources to allow more buildings to be served
    - Operation plan for production wells to meet capacity peaks
- Improve Safety

This project served to complement a Facility Condition Assessment performed by Fluent Engineering in 2018 that examined elements of the campus geothermal system. That analysis addressed immediate and long-term concerns of the system. This analysis builds on that assessment to provide a comprehensive set of recommendations to address life safety concerns, improve system resiliency, support future campus growth, and address components that have either failed or reached the end of their expected life.

The analysis looked at the following systems and components:

- Central Plant / Heat Exchange Building
    - Storage
    - Settling Tank
    - Pumps
    - Valves
    - Strainers
    - Electrical Feeders Serving Geothermal Systems
- Geothermal Supply Well #6
- Geothermal Injection Wells #1 and #2
- Distribution Supply and Return Piping
- Heat Transfer Within Building (Heat-Exchangers)
- Snow-Melt System
- Electrical Distribution System

1.2 Project Team

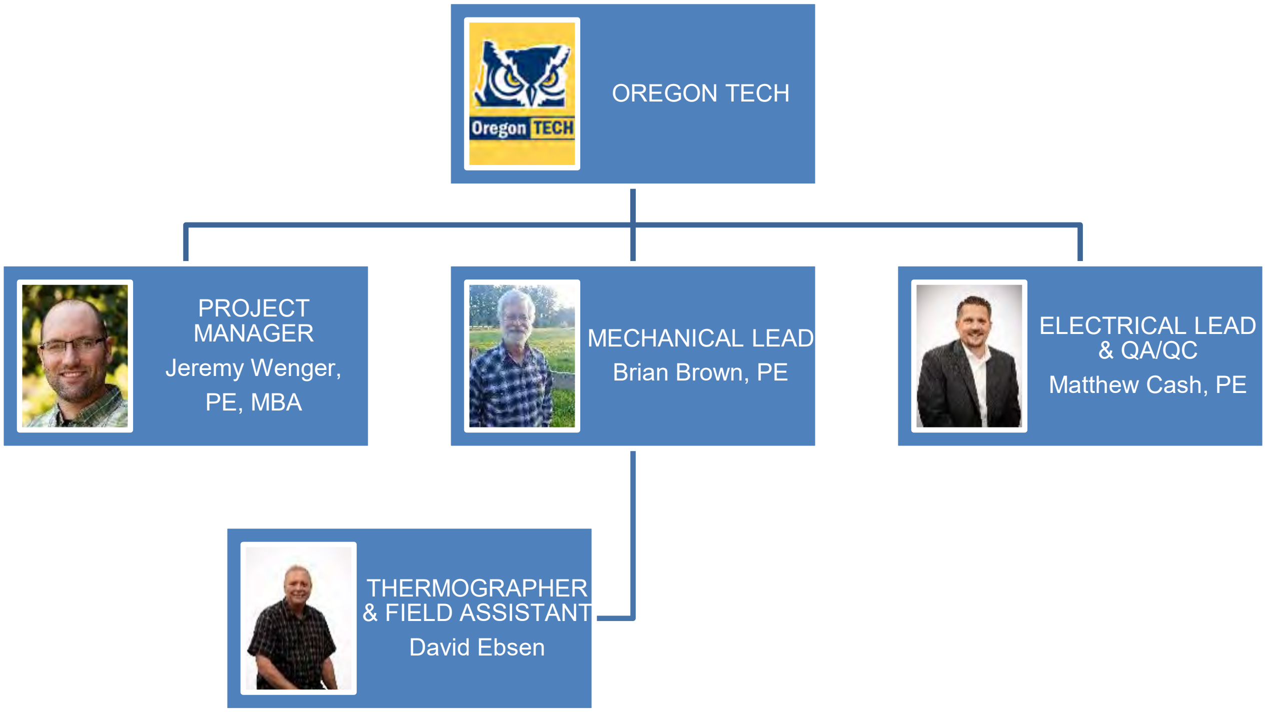
The Fluent Engineering project team consisted of the following individuals:

Jeremy Wenger, PE, MBA served as Fluent Engineering's Project Manager. Jeremy served as the Project Manager of a 2018 Facilities Condition Assessment of the Oregon Tech Campuses in Klamath Falls and Wilsonville.

Brian Brown, PE served as the lead engineer for the planning and evaluation of the geothermal system. Brian has over twenty-two years of experience working with the Oregon Tech geothermal systems and is an alumnus of Oregon Tech. Brian has provided engineering throughout the entire campus and has consistently assisted with the operation and provided engineering of the geothermal heating systems, geothermal power plants, fire water systems, domestic water system/irrigation, and central chilled water loop. Brian is currently Oregon Tech's on-call engineer for mechanical and plumbing systems.

Matthew Cash, PE served as the lead engineer for evaluating the electrical system associated with the geothermal system. Matt has extensive historical and current knowledge of the campus power distribution system as it relates to capacity, limitations, lifespans, and interconnections for the purposes of master planning.

Organizational Chart



1.3 Limitations of the Evaluation

The scope of this project was limited to components that were readily accessible such as exposed piping, valves, fittings, pumps, heat exchangers, tanks, and electrical gear. Direct buried pipes were not accessible and no destructive or invasive testing methods were employed.

Some piping in the tunnels was evaluated but due to the confined nature of the tunnels and accessibility, not all of it was able to be viewed. Assumptions about those elements that were non-accessible were based on the known age of the equipment and those elements that were able to be observed.

The large electrical power plant consisting of powerplants Alpha and Bravo along with small power plant Charlie, along with the associated production Well #7 were excluded from the scope of this project.

The cost estimate produced in this report is reported in 2022 dollars. Due to current high inflation levels, with prices in April 2022 being 8.3% higher than the previous year, we recommend that the funding request should include a factor for inflation based upon when the funds will be made available (U.S. Bureau of Labor Statistics, 2022).

2 Oregon Tech Geothermal System

2.1 Overview of Geothermal

At its most basic level, geothermal energy is simply heat that is from the earth. Early civilizations used geothermal energy in the form of hot springs and fumaroles (steam discharges) for cooking, heating, and bathing. In modern times, in addition to the more ancient uses, geothermal energy is used to provide building heat, generate electricity, and provide chilled water through absorption refrigeration. Geothermal energy has provided renewable, clean, affordable, and reliable heating for commercial and residential buildings in the United States since the 1890s and has continued to expand to include utility-scale power generators, distributed or district-wide heating, and supporting various industrial processes (Mink, 2017).

Geothermal heat radiates from the Earth's hot core outward to the surface. The temperature at the center of the Earth is nearly 10,800°F which is nearly the same temperature as the surface of the sun (U.S. Department of Energy, 2019). Geothermal heat flows upward to the surface but the temperature of the earth at various locations changes based on the geological conditions including soil and rock types, locations of fault lines, proximity to magma chambers, and changes based on depth from the surface. Resources are typically accessed through the use of well-drilling which can be on the order of magnitude of tens of feet to up to 4 miles with current drilling technology.

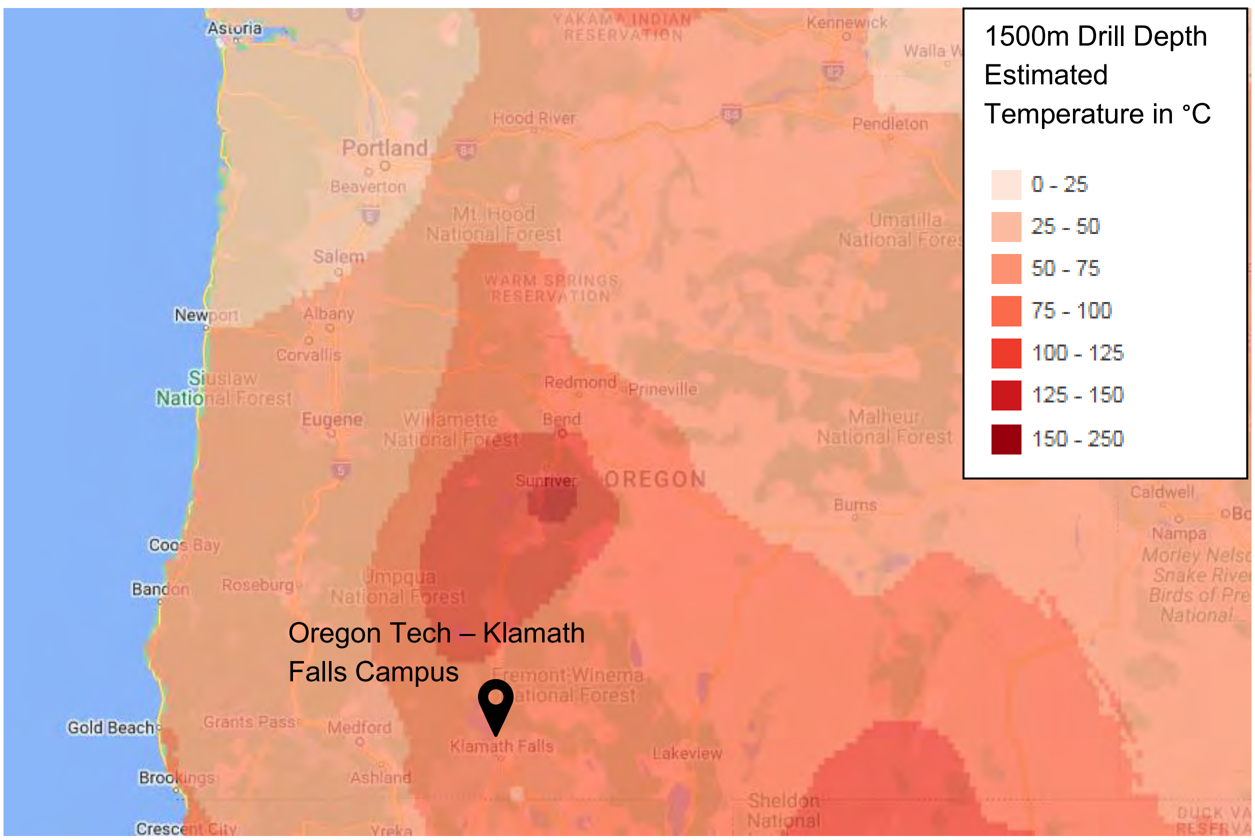


FIGURE 1: MAP OF ESTIMATED BELOW-GROUND TEMPERATURES IN OREGON AT 1500M DEPTH (SOURCE: NREL GEOTHERMAL PROSPECTOR TOOL)

It is important to distinguish different types of Geothermal energy and common terms in order to understand the unique renewable resource at Oregon Tech. Oregon Tech utilizes Geothermal water that the US Department of Energy also calls “Hydrothermal”.

Hydrothermal Renewable Resource(Commonly Referred to as “Geothermal” by Oregon Tech &What the Term “Geothermal” Used Throughout This Report Refers To):
Underground aquifers and groundwater [typically] deep below the Earth’s surface can have temperatures ranging from just a few degrees above ambient surface temperatures to temperatures exceeding 700°F. This is the type of geothermal resource used in most geothermal heating and power generation applications today. Higher temperatures provide greater opportunities for power generation and better efficiency. The tradeoff is that higher temperatures are found at deeper well depths and are more costly to access.

DOE defined Hydrothermal as the type of resource utilized by Oregon Tech. Other areas of the state generally refer to “Geothermal” as a Heat-Pump Resource. Per DOE Geothermal Heat-Pump Resources:

Shallow soil, rock, and aquifers provide valuable thermal storage properties. At depths of around 30 ft, the ground temperature is stable all year round and can be used with ground-source heat pump (GHP) mechanical equipment for both heating and cooling. Heat can be pumped to and from the ground to provide both heating and cooling to buildings and are generally more efficient than air-based heat exchangers.

Ground Source Heat Pumps aka Heat-Pump geothermal can generally be implemented throughout Oregon with enough ground/depth surface area, where the Geothermal renewable resource at Oregon Tech is localized with nearer surface hot water.

2.2 History of Geothermal at Oregon Tech

The use of geothermal energy at Oregon Tech has been at the core of the university since the 1960s. The campus was relocated from a World War II military facility to its current location to take advantage of the geothermal hot water available at the campus’ current location (Lund & Boyd, 2010). Below is a summarized timeline of the major milestones in the history of the campus geothermal system.

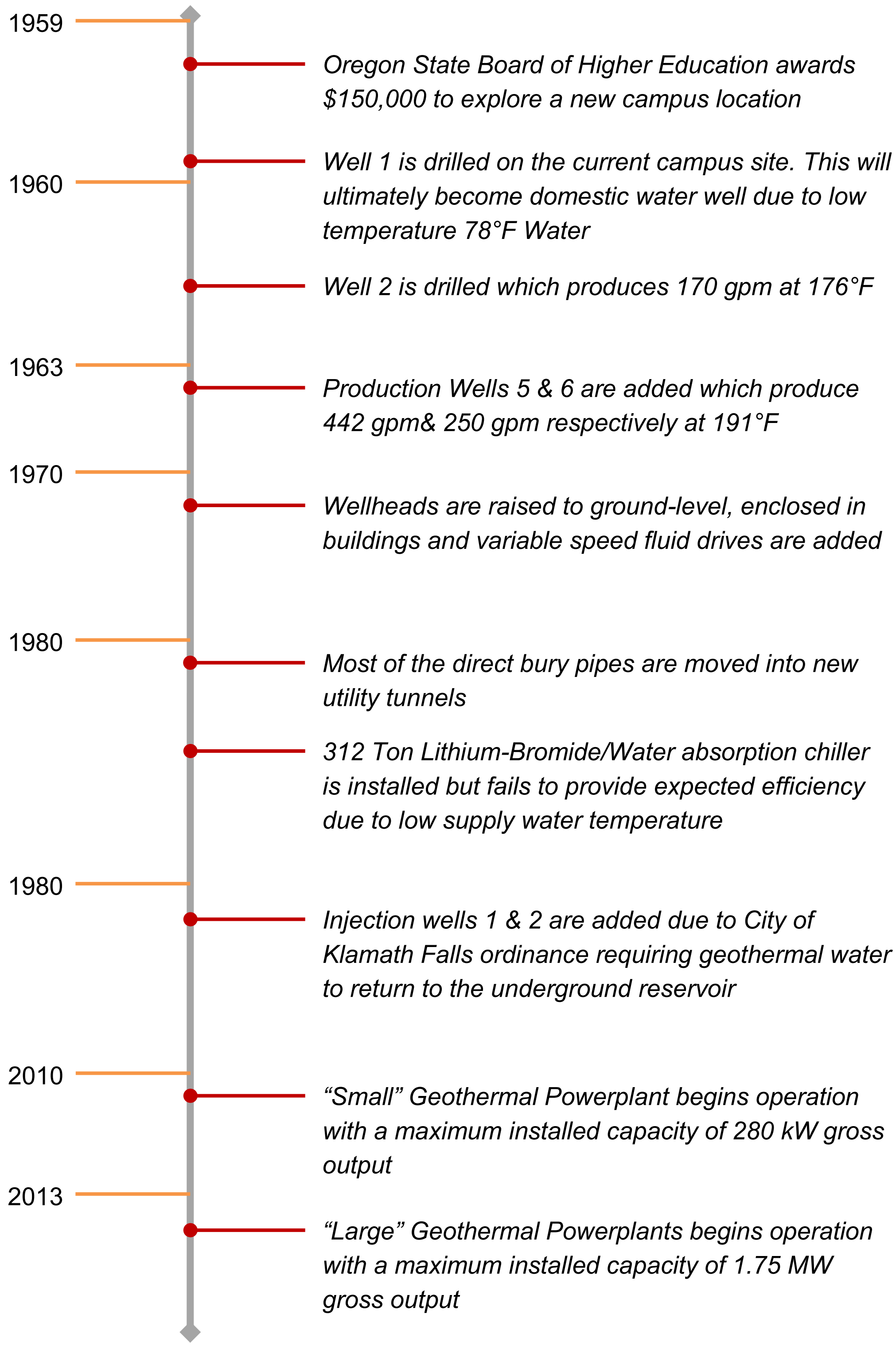


Figure 2: Major milestones in the history of the geothermal system at OregonTech

A more thorough description of the history of the Oregon Tech Geothermal System can be found in former Oregon Tech Professor John W Lund's report "Geothermal Uses and Projects on the Oregon

Institute of Technology Campus". This report was published in the May 2010 edition of the Geo-Heat Center Bulletin which can be found in the link below which is also listed in the References section of this report:

https://oregontechsfcdn.azureedge.net/oregontech/docs/default-source/geoheat-center-documents/quarterly-bulletin/vol-29/art3c37aee4362a663989f6fff0000ea57bb.pdf?sfvrsn=5edc8d60_4

2.3 Description and Condition of Existing System at Oregon Tech

2.3.1 Overview

The Oregon Tech campus utilizes a near-surface hot (~194°F) geothermal resource as the exclusive heat source for heating major campus buildings, major domestic hot water needs, and snowmelt/deicing of outside stairs and sidewalks. Additionally, the 194°F geothermal water is used to generate electricity that helps offset power demand by the well pumps and campus. The geothermal water is pumped from wells into a holding tank and flows from there by gravity. Supply piping conveys the geothermal water to heat exchangers where the heat is transferred to meet building, hot water, and snowmelt heat loads. The cooled geothermal water is collected by return/collection pipes and injected back into the ground into a similar aquifer.

2.3.2 Production Wells

The source of the geothermal energy used at the Oregon Tech campus is residual volcanic heat, transferred to the water that flows up from several thousand feet deep through a fault that crosses campus. Prior studies indicate that the source water temperature is in excess of 300°F. The source hot water mixes with cooler groundwater to provide water temperature for campus heat of about 192°-196°F. The main production wells for the campus heating system are wells #5 and #6, which have a nominal pumping capacity of 500 GPM and 350 GPM respectively. These geothermal wells were drilled in 1962 and 1963 to supply heat to the then-new Oregon Tech campus buildings.

Production Well #	ODWR Well #	Depth	Static Water Level	Casing Depth	Pump Flow Data
Well 5	KLAM 11830	1716 ft	358 ft below surface	12.75" from +1' to 529'3" 10.75" from +1' to 813'6" 8.625" from 790'6" to 1109' 6.625" from 1068' to 1716'	500 GPM @ 425' TDH 100 HP
Well #6	KLAM 11829	1805 ft	359 ft below surface	12.75" from +1' to 416'4" 10.75" from +1' to 867' 6" 8.625" from ~850' to ~1145' 6.625" from ~1127' to 1805'	325 GPM @ 630' TDH 100 HP

Table 1: Production Well Data

Condition of Wells:

Production Well #5

Well #5 exhibited considerable corrosion of the original 12" casing and 10" casing liner, resulting in cold groundwater intrusion into the well and sediment and scale interfering with pump operation. A contract to repair the well was issued in 2019. Repair and upgrades included:

- New casing with grouting per Oregon Department of Water Resources (ODWR) requirements
- Cleaning of the well to the original depth
- New deep well turbine pump
- Reconditioning of the pump motor
- New well house

PRODUCTION WELL #6

Well#6 is nearly the same age as Well #5 and is expected to have similar age-related problems. Verification of well condition will require removal of the pump and camera inspection of the well. The pump has likely lost efficiency as indicated by the power required to supply the maximum available flow. Existing pump efficiency is estimated to be 52%, compared to better than 75% for a new pump.

Recommendations:

PRODUCTION WELL #5

- No modifications needed

PRODUCTION WELL #6

- Remove pump for well inspection
- Replace casing as indicated per inspection. New work will be required to meet to current OWDR well standards
- Install new pump
- Install new or reconditioned pump motor
- Install new well house

Each well listed above is connected to the geothermal mechanical building's power distribution system. Refer to section 2.3.4 Geothermal Mechanical Building section below for further discussion.

2.3.3 Injection Wells

Originally, the geothermal water was used directly in the building heating equipment, with wastewater discharged to the storm sewer through building roof drains. In 1985 the City of Klamath Falls instituted an ordinance requiring that geothermal waters be reinjected into the same or similar aquifer to better conserve the resource. Oregon Water Resources regulations require the same for all new water rights issued for thermal energy extraction from groundwater. In response to the ordinance, Oregon Tech installed geothermal collection piping and injection wells #1 (1989) and #2 (1992) at the southwest corner of campus.

Condition of Wells:

INJECTION WELL #1:

The ODWR well log shows a 14" outer casing to 73', and a 10" inner casing to 1685', with perforations between 1450' and 1644' Inspection in 2018 showed that the well has significant deterioration of the near-surface outer casing and inner casing. Additionally, the well is significantly obstructed with scale.

INJECTION WELL #2:

The ODWR well log shows a 16" outer casing to 72', and a 10" inner casing to 950', with an open borehole to 992'. Inspection in 2018 showed that the well casing appears to be in good condition. There is some minor scale accumulation inside the casing.

Recommendations:

INJECTION WELL #1

- Clean accumulated scale from inside of the well casing
- Camera inspection of cleaned casing and perforations
- Replace a portion of the inner and outer casing as indicated by the inspection
- Clean perforations as indicated by inspection

INJECTION WELL #2

- Clean accumulated scale from inside of the well casing
- Camera inspection of cleaned casing
- Additional work as indicated by inspection

2.3.4 Geothermal Mechanical Building

The geothermal mechanical building (AKA Heat Exchanger Building) is located at the southwest corner of campus, near the production wells.

The building houses:

- 4000 gal receiving/storage/settling tank receiving flow from the well pumps
- Circulation pump to supply GEO to Crystal Terrace (GEO heat sales customer)
- 280 kW UTC geothermal power generator
- Electrical power supply for well pumps, with variable frequency drives to control pump speed and flow
- Controls to operate wells, pumps, and GEO power generation

The storage tank is a vented tank that receives all the flow from the production wells. A tank level controller attached is used to control pump speed and flow to maintain a tank level setpoint. GEO supply to all uses on campus flows from the tank by gravity, with the total flow determined by the sum of flow demand at each individual heat load.

The geothermal power generator is an Organic Rankine Cycle power plant manufactured by United Technologies Corp. (UTC) that uses geothermal heat to generate electrical power. The power plant generates enough power to operate the production pumps which heat the campus and supply additional power to the campus electrical grid. The heat input for power generation is derived by cooling the geothermal water from about 194°F input to about 165° delivered to campus for heating.

The electrical system for the geothermal mechanical building supports the production well pumps. Should any portion of the geothermal mechanical building's power distribution system fail, heat throughout the campus will be unavailable for the duration of the failure or normal power outage. The

Geothermal Mechanical Building's power distribution system consists of a building service feeder, building transformer, building feeder, building main distribution board, fuses, and manual switches.

Condition of the Geothermal Mechanical Building:

- GEO storage tank:
    - Tank is steel, is open to oxygen from the air through the tank vent, and likely has significant corrosion. There is evidence of leaking from the tank under the insulation.
    - Tank provides only about 5 minutes of storage at the design campus GEO flow
    - Small tank size results in instability in the tank level and production pump control loop
    - Tank elevation is inadequate to supply the new student housing (Center for Sustainable Living) at design heating flow. That resulted in the need for a booster pump station.
    - Tank size does not allow for effective settling and separation of fine sand in the geothermal water, resulting in sediment accumulation in downstream heat exchange equipment.
- Crystal Terrace pump: The pump is in serviceable condition, however, the configuration of the piping leads to inadequate flow to the pump under some conditions.
- UTC power plant: The power plant was installed in 2009 and is still operable. However, there is little technical or maintenance support available as the equipment is no longer manufactured. Evaluation of power production is outside the scope of this study, but the design of improvements to the GEO supply system needs to accommodate power production in some form.
- Electrical System: Generally in good condition; however, does not meet current code, or industry protection standards. Additionally, there are unnecessary fuses, breakers, and a power train that has additional but not redundant equipment. There are multiple points of failure in the system. Some variable frequency drives (VFD) are nearing the end of service life, and/or are no longer manufactured.

Recommendations:

- Replace the GEO tank with a larger approximately 45,000 gallon, in-ground insulated concrete tank located further up the hill. Features/Benefits:
    - More pressure head to supply uses at higher elevations on campus. Eliminates the need for booster pump serving Villages and accommodates the proposed new residence hall
    - More storage volume, ~45 minutes of available heating water
    - More stable level and pump control
    - Corrosion-resistant
    - Better sand separation
- Replace piping and valves
- Replace older pump VFDs
- Consolidate electrical equipment to reduce failure points. Include backup power generation, bypass, and servings switches as part of the consolidation.

2.3.5 Distribution System

The geothermal distribution system is the piping that conveys the hot geothermal fluid from the production wells to point of beneficial heat use and thence to the injection wells for disposal of the cooled fluid. Specific components of the distribution system include:

- Piping from the production wells to a storage and settling tank in the geothermal building
- Gravity flow supply piping from the tank to heat transfer equipment in the buildings
- Gravity flow return/collection piping from the buildings to an injection collection tank
- Pumped or gravity flow from the collection tank to the injection wells

Supply Piping

The original design in the 1960s used direct-buried steel piping, insulated with rigid "foamglass" insulation to distribute the geothermal fluid to the buildings. The experience over the first 17 years of operation was that thermal expansion of the piping created cracks in insulation, introducing groundwater and surface runoff with deicing salts to the exterior of the steel pipe, causing extensive corrosion. The resolution was to replace the steel pipe with fiberglass pipe (FRP) and to route the piping through utility tunnels within the campus (Boyd, March 1999). Currently, the piping from the wells to the heat exchanger building still uses the original steel pipe. There is also some direct-buried steel piping between the heat exchanger building and the campus tunnel system, and some steel pipe within the tunnel. The balance of the GEO supply piping is FRP.

The GEO supply piping includes valves at building connections and strategic locations in the tunnels or outside vaults to isolate sections of the distribution system.

Condition of Supply Piping:

- Wells to Geothermal Mechanical Building: Buried original steel pipe; condition unknown. No leaks have been observed. Well #6 piping is now inaccessible under a new parking lot.
- Geothermal Mechanical Building to campus: Buried, believed to be fiberglass with some sections of steel. Condition unknown, no leaks have been observed
- Supply valve vault in the lawn between Snell and Residence Hall: Fiberglass pipe, butterfly valve is in poor condition, inadequate temporary thrust restraint
- Isolation valves: Generally in poor condition or non-functional. The lack of isolation valves requires that the entire system be shut down and drained to work on the system
- FRP pipe in tunnels: Generally in good condition. Minor leaks at some joints

Recommendations:

- Replace steel piping between wells and Geothermal Mechanical Building
- Repair/ replace piping and valve in supply vault
- Remove GEO valves and connections located above electric panels in the chiller building; replace with continuous pipe section and relocate valve.
- Replace building and in-line isolation valves in tunnels. Consider motorized valves that can be operated without entering tunnels
- Consider a new main 8" supply feed from the Heat Exchanger building, past the site of the proposed new residence hall, to tie into the existing tunnel piping between LRC and Cornett. Add isolation valves so any building can be isolated and adjacent buildings can be fed in

either direction through the supply piping loop. This new supply would add resiliency so a single point of failure is less likely to cause a complete system failure.

Return Piping and Collection System

In the original 1960s design, the geothermal fluid was discharged directly to the building roof drain/ storm sewer system after extracting heat for space heating. A waste geothermal collection system was installed in the late 1980s to collect the water and route it to a 5000-gallon collection tank west of Purvine Hall. The collection system piping is mostly FRP and is mostly installed in the tunnels. There is a short section of 6" steel pipe in the tunnel near the Residence Hall and College Union buildings.

A GEO injection pump station near the collection tank provides additional pressure as needed to discharge the waste GEO into the injection wells. The pumps were replaced in 2018, and the controls were upgraded to variable speed pump control to better match the required flow and pressure boost. If the injection system fails, the collection tank overflows into the storm sewer.

Condition of Return Piping and Collection System:

- Leaking and corrosion in the steel pipe, on the return from the Residence Hall
- FRP pipe in tunnels: Generally in good condition. No leaks were noted.
- Isolation valves at buildings are not operable
- Injection pumps are new and in good shape

Recommendations:

- Replace approximately 30 feet of 6" steel piping in the tunnels
- Replace isolation valves, consider motorized valves to allow isolation of a leak without entering the tunnels

2.3.6 Building Heat Exchange System

The GEO is used for heating the buildings and domestic hot water. Originally, building heat was provided by using the geothermal water directly in the coils of heating equipment. That led to coil failure due to the corrosive nature of the geothermal water. The design was modified to isolate the GEO from a closed-loop building heating water system with a heat exchanger.

A typical building heating system consists of:

- A heat exchanger to transfer heat from the GEO to the building heating water
- Circulation pumps to circulate the building heating water
- A water-to-air heat transfer coil to deliver heat to the building air. A control valve limits the heating water flow based on air temperature
- A fan to circulate the heated air to the rooms
- Electrical power at each building to operate the heating water circulation pumps, fans, and controls

All stages of the building heating process provide opportunities for optimizing the use of renewable geothermal energy to protect buildings and maintain occupant comfort. The building heating systems were generally designed to use 190°F supply water temperature and reduce the water temperature by about 40°F to heat air to maintain a building air temperature of about 72°F. The objective of maintaining 72°F can be accomplished at a lower water temperature by improving the effectiveness of the heat transfer.

At Oregon Tech, most of the buildings were designed to operate on 192°F water from the well. However, they have operated successfully on 165°F supply water leaving the power plant. Newer buildings on the lower (west) end of campus, including Dow, Purvine, and CEET were designed to operate on reduced-temperature return water from the building higher on campus. The heating system at Purvine was designed to operate using 130°F geothermal water.

Planning for future buildings at the Oregon Tech campus needs to consider both available flow and temperature. Improvements to delivery piping and production and injection wells can increase the available flow to campus. Optimizing flow to existing buildings can make existing flow capacity available for new loads. Designing for GEO with lower supply and discharge temperature will make more heat available without increasing flow demand.

Building heat is required for:

- Heating to replace heat loss through the building envelope to the cold outside. Heat demand is proportional to the temperature difference divided by the envelope insulation value.
- Heating of ventilation air
- Heating for morning warm-up after a setback in space temperature when the building is unoccupied.

The campus heating system was designed in the 1960s to support 1960s buildings with relatively minimal insulation and ventilation control. As buildings are upgraded with improved insulation the heat requirement for the building envelope is reduced. Building ventilation improvements such as demand-controlled ventilation and ventilation heat recovery reduce the heat requirement for ventilation. More efficient buildings free up GEO capacity to serve additional buildings.

One significant component of the existing building load is morning warm-up from a night setback. Currently, the maximum GEO system demand occurs during the morning warm-up. Night setback reduces energy use because the temperature difference between the inside of the building and the ambient air is reduced during the setback period. In a conventional heating system, with natural gas or oil as the heat source, then the energy savings directly results in energy cost savings. In the geothermal heating system, the energy itself does not cost anything. What costs money is the power needed to run the pumps and fans to deliver the energy.

In a closed-loop heating water or heating air delivery system, with variable speed pumps and fans, the power to operate the pumps and fans is proportional to the cube of the speed. At 25% speed, the power is 0.25 x 0.25 x 0.25 = 0.0156; or less than 2% of the power at full speed. Operating the system overnight at minimum speed will require less power than operating at full speed for one to two hours for morning warm-up.

Eliminating the night setback and morning warm-up will reduce cooling and heating stress on the buildings and will reduce the maximum heating demand on the GEO heating system. It will also likely reduce the cost of heating.

Details of the condition of specific geothermal building systems are in Table 2 below.

Building	Geothermal Equipment		Heating water		Air Handling	Domestic Hot Water	
	HX	*Piping*	*Pumps*[1]	*Pump Type*	*Fan Type*	*HX*	*Storage Tanks*
Villages	GOOD	GOOD	1 EACH BLDG	CV	CV	GOOD	GOOD
Residence Hall	POOR	GOOD	1	CV	CV	GOOD	GOOD
College Union	GOOD	GOOD	2	CV	VV	GOOD	GOOD
PE	GOOD	GOOD	1	CV	CV	GOOD	GOOD
LRC	POOR	POOR	2	CV	CV	NA/Electric	
Cornett	GOOD	GOOD	2	VV	CV	NA/Electric	
Facilities	POOR	POOR	1	CV	CV	NA/Electric	
Snell	FAIR	FAIR	1	CV	CV	NA/Electric	
Owens	POOR	POOR	1	CV	VV	POOR	POOR
Dow	GOOD	POOR	2	VV	VV	GOOD	GOOD
Semon	GOOD	GOOD	1	CV	CV	GOOD	GOOD
Boivin[2]	GOOD	GOOD	2	VV	VV	GOOD	GOOD
Purvine	GOOD	GOOD	1	CV	VV	NA/Electric	
CEET	GOOD	GOOD	2	VV	VV	GOOD	GOOD

TABLE 2: BUILDING HEATING SYSTEM CONDITION OVERVIEW

[1]Heating Water Pumps: 2 parallel pumps with VFD, with lead/lag control is recommended
[2]Boivin condition reflects upgrades currently under construction

<u>Pump and Fan Type Legend:</u>

CV: Constant volume. Consider upgrading to a variable volume system
VV: Variable volume; preferred for optimum geothermal efficiency

<u>Rating Descriptions:</u>

GOOD: Likely service life > 10 years
FAIR: Nearing the end of service life, consider replacing
POOR: Active corrosion or leaking, beyond service life, replace now

For the Geothermal System to distribute heat throughout each building, electrical power is required. Each building is fed from the 12,470 Volt campus power distribution system. There is only one piece of equipment that controls the entire campus distribution from the incoming utility feeder line. Should this one unit fail, get damaged, and/or otherwise become inoperable, there will be a loss of campus power. This single unit is currently located in the chiller building that houses various piping systems including large, main geothermal lines. In the past, those lines/chillers have leaked and started to flood the electrical equipment. Due to the slight elevation of the equipment (approx. 4 inches above the floor), quick notice and reaction of Oregon Tech facilities staff, and ability at the time to shut down the water flow, the equipment "survived" past flood events. The electrical equipment still experienced water intrusion/damage/dampness, and additionally is beyond its service life, and does not meet current industry standards and codes. Relocation of the chillers, geothermal, cooling towers, and the like is more expensive than relocation and replacement of the electrical equipment, especially since the electrical equipment requires replacement already.

Condition of Building Heating System:

- Heat exchangers at some buildings are currently leaking and need to be replaced; others are new and in good condition.
- Piping and valves associated with heat exchangers are leaking or corroded in some buildings
- Most buildings have a single constant speed, constant flow heating water pump
- Building air handling systems are a mix of constant airflow for older systems and variable airflow for newer systems
- Electrical equipment in the chiller building is beyond its service life and does not meet current code and standards

Recommendations:

- Replace leaking heat exchangers. Size new replacements to accommodate lower GEO supply water temperature.
- Replace leaking or corroded piping and valves associated with heat exchangers.
- Upgrade heating water pumping system to variable-flow with VFD-controlled circulation pumps, lead/lag pumps, and 2-way valves at air handlers
- Upgrade air handling systems to variable air-flow
- Modify controls to minimize morning warm-up heat demand by minimizing night setbacks
- Upgrade air handler ventilation control to provide demand-controlled ventilation
- Replace & relocate electrical equipment currently in the chiller building as noted above.

2.3.7 Snowmelt System

Oregon Tech experiences several snowfall events each winter, and about seven months per year when conditions could be conducive to snow or ice accumulation on outdoor sidewalks and steps. Geothermally-heated thermal snowmelt/de-icing systems are installed in many of the sidewalks and steps which provide these benefits:

- Reduced risk of slip and fall due to icy walking surfaces
- Reduced concrete deterioration from freeze-thaw cycles
- Reduced concrete deterioration and environmental risk from de-icing salt

A thermal snowmelt system works by maintaining a concrete surface temperature of about 38°F; warm enough to melt fresh snow and prevent ice accumulation. The heat load to maintain a clear sidewalk depends on snowfall rate, wind speed, and temperature. The existing snowmelt systems at Oregon Tech and in Klamath Falls are designed for a heat output of about 80 Btu per square ft (Btu/ft^2). That heat output is not adequate to keep up with heavy snowfall but will catch up in a reasonable time. It does prevent ice from sticking to the concrete, making manual removal much easier if needed. 80 Btu/ft^2 is also not able to keep the concrete surface above 32°F in extremely cold weather with high wind. However, snowfall in Klamath Falls does not usually occur in those conditions so the sidewalk would likely be dry.

Snowmelt is a lower priority than building heat, so in cold weather, it may be necessary to curtail snowmelt operation to adequately supply building heat. A standby mode snowmelt operation can maintain some heat in the concrete at a lower heat output than would be required for active melting.

The snowmelt mechanical system consists of a heat exchanger, circulation pump, supply and return mains, distribution headers, and PEX tubing embedded in the sidewalk concrete. The mechanical equipment for the newer, larger, existing snowmelt systems is located in building mechanical rooms. These larger snowmelt systems total about 60,000 ft^2 and include:

- Dow Hall
- Cornett Hall
- CEET
- Center for Sustainable Living

Several smaller, generally older, snowmelt systems are supplied by mechanical equipment located in the utility tunnels. These systems total about 5,000 ft^2 and include:

- Snell steps
- College union and residence hall steps
- Owens steps
- Bovin Ramp

About 40,000 ft^2 of snowmelt tubing has been installed in sidewalks but is not connected to pumps or heat exchange equipment. Most of the supply mains are stubbed into the tunnels, with the original intent of installing equipment in the tunnel to supply the heat.

The total installed snowmelt system area is about 105,000 ft^2. As additional sidewalks are replaced over time, the intent is to include snowmelt in most of the sidewalks. It is likely that an additional 100,000 ft^2 of existing sidewalks could be added, bringing the total to about 200,000 ft^2, not including a new residence hall or other new buildings. At 80 Btu/ft^2, the potential snowmelt heat load would be 16,000,000 Btu/hr.

As buildings become more efficient and as snowmelt area is increased, it is likely that snowmelt will be the largest heat load on the system. Location of the snowmelt systems centralized in building mechanical rooms provides more ability to control snowmelt operation or shed snowmelt load as needed to meet the higher priority building heating load. Also, the removal of snowmelt mechanical equipment from the tunnels will reduce the safety concern of a hot water leak in the tunnel's confined space. Snowmelt supply and return mains can be routed through the tunnels to the service snowmelt connections.

Recommendations:

- Supply snowmelt connections from building mechanical rooms, eliminating pumps and heat exchangers in tunnels
- Connect new and existing tunnel-fed snowmelt systems to new snowmelt supply and return mains routed through the tunnels

- Expand the snowmelt system from the main SW parking lot to the Physical Education building to improve accessibility for athletic events
- Generally supply snowmelt systems from GEO return piping, reducing the impact on required system GEO flow
- Provide controls with the ability to shed snowmelt heating load when required to meet building heating requirements

2.3.8 Domestic Hot Water Systems

GEO heat is used to heat potable water for domestic hot water demands. The major hot water demands are in the residence halls, PE building, and College Union food services. Those heat exchangers and storage tanks are relatively new or have been upgraded recently.

Recommendations:

- The hot water tank and heat exchanger in Owens Hall is in poor condition and should be replaced.

2.4 Critical Nature of Geothermal System to Campus Operations

Virtually all elements of the geothermal system are critical to campus operations. The geothermal system serves as the ONLY source of heating for all significant buildings on campus. Below is a graph of the yearly average temperatures in Klamath Falls:

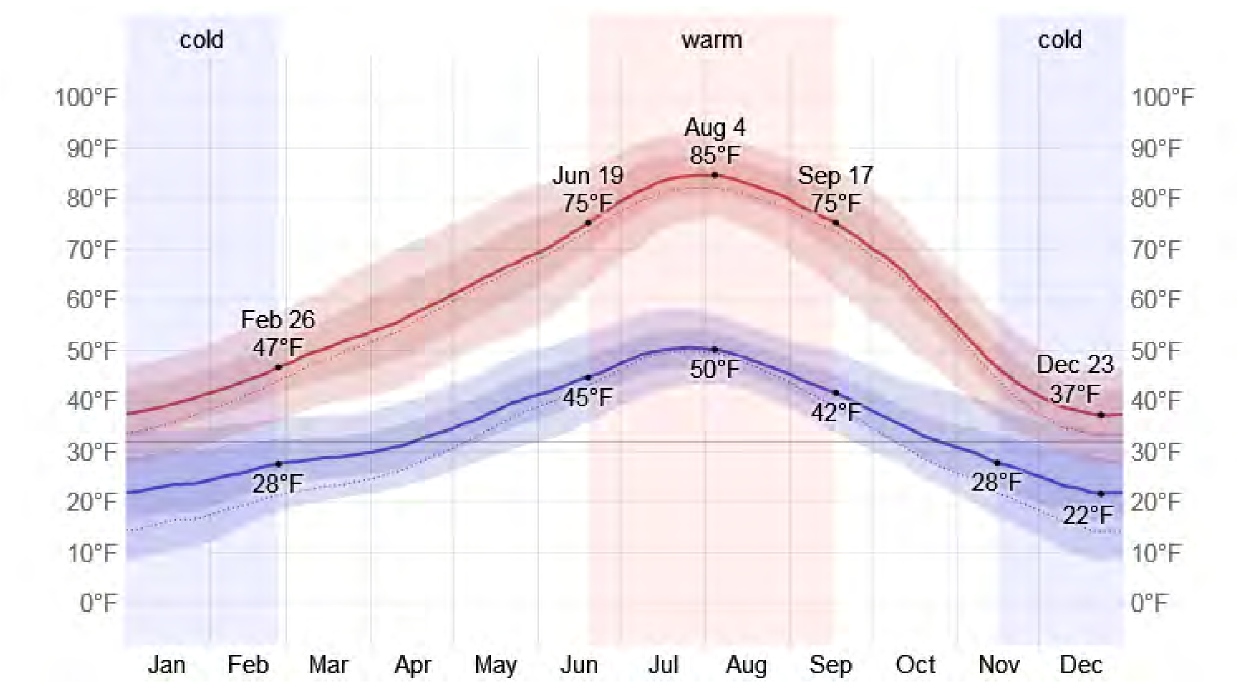


Figure 3: Average Yearly Temperatures in Klamath Falls, OR. (Source: Weatherspark.com)

As can be seen in the above graph, average low temperatures are below freezing for nearly 7 months out of the year. Any downtime or loss of the geothermal heating system during the cold months would have catastrophic consequences not only on the educational function and operation of the campus but would likely result in severe damage to building components and systems resulting in potentially millions of dollars worth of damage.

Below is a list of the major elements of the geothermal system and the resulting consequence if a failure occurs in any one of these elements:

GEOTHERMAL WELLS

- The loss of both of the production wells would result in no heating water to the campus.
- A loss of just one of the wells would substantially reduce the system capacity and could result in freezing conditions in one or more buildings
- A loss of electrical power at the wells would disable the pumping system resulting in the inability to distribute heat to the buildings.

GEOTHERMAL MECHANICAL BUILDING (AKA HEAT EXCHANGER BUILDING)

- Loss of the GEO storage tank and piping system can lead to the inability to heat campus buildings. There is no backup or standby heating system.

GEOTHERMAL DISTRIBUTION PIPING

- Loss of the supply piping system can lead to the inability to heat campus buildings. There is no backup or standby heating system.
- Loss of a section of the piping or a fitting leak can result in loss of the entire system due to a lack of isolation capacity and alternate flow routing.

An example of this occurred on June 14th, 2022. A break from a corroded section of pipe ruptured leaving the campus without water for building heating or domestic hot water.

FIGURE 4: RUPTURED PIPE IN TUNNEL

- Leaks in the tunnels can lead to personnel life safety risks due to the high temperature and confined space
- Large leaks in the tunnels can lead to building or electrical service flooding

Building Heat Exchange System

- Loss of building heat exchange system can lead to the inability to heat the specific campus building. There is no backup or standby heating system.

3 Sustainability & Financial Benefits of Geothermal

The hot geothermal water source provides a unique benefit to the Oregon Tech and helps reduce educational costs by maintaining a system to fully heat Oregon Tech's entire campus for a nearly insignificant electrical cost to various pumps and wells. The energy source is renewable because the amount of water removed equals the amount of water placed back in.

Provided the system utilizes appropriate materials and is maintained and operated effectively there is no reason to believe the system would not last for another 60 years between major overhauls. The geothermal resource provides a nearly perfect balance for energy because a) what is removed is re-injected, b) there are no emissions, and c) there are no known resource impacts on any biological/ecological systems.

Maintaining the system and addressing the deficiencies is substantially cheaper than replacing the system.

For additional geothermal sustainability, and renewable benefits, see the DOE's GeoVision Report.

4 Summarized Recommendations with Estimated Costs

Note: A more detailed list of the recommended actions and costs can be found in Appendix C.

Production & Injection Wells

Recommended actions include:

- Rebuilding production well #6
- Cleaning and repairing injection well #1
- Cleaning and inspecting injection well #2

The estimated cost for these projects, including construction costs, soft costs, contingency, and other costs is estimated to be $2,553,000

Geothermal Mechanical Building and Main Geothermal Storage and Pumping System

Recommended actions for the production include:

- Replacement of the geothermal water storage tank
- Replacement of piping and valves inside the Geothermal Mechanical Building
- Replacing end-of-life pump speed controllers
- Adding a backup generator to supply power to the geothermal pumping system and controls to maintain heat during power outages

The estimated cost for these projects, including construction costs, soft costs, contingency, and other costs is estimated to be $2,235,000

Geothermal Distribution System

Recommended actions for the production include:

- Replacing the piping between production wells 5 & 6 and the geothermal mechanical building
- Repairing the supply piping and valves near Snell Hall
- Replacing and supplementing the distribution supply and return isolation valves to be able to isolate sections of the system in case of leaks
- Adding a new supply main and return line to the north side of campus to add system redundancy

The estimated cost for these projects, including construction costs, soft costs, contingency, and other costs is estimated to be $5,382,000

Building Heat Exchange System

Recommended actions for the production include:

- Repairing and replacing leaking heat exchangers in the Residence Hall, Learning Resource Center, Facilities, Snell Hall, and Owens Hall
- Upgrading building heating water equipment to provide variable flow circulation with added system monitoring and controls
- Replace the domestic hot water heat exchanger and storage tank in Snell Hall

The estimated cost for these projects, including construction costs, soft costs, contingency, and other costs is estimated to be $1,152,000

Campus Snowmelt System

Recommended actions for the production include:

- Move snowmelt pumps and heat exchangers out of the tunnels into the Purvine mechanical room for most of the system with other building mechanical rooms used as needed.
- Connect snowmelt systems that were installed but never connected, and provide for future snowmelt as sidewalks and stairs are replaced.
- Expand the snowmelt system to improve access between the main SW parking lot and the Physical Education building

The estimated cost for these projects, including construction costs, soft costs, contingency, and other costs is estimated to be $1,697,000

Campus Main Electrical Equipment

Recommended actions for the production include:

- Relocate, and replace the main campus power distribution system switchgear that is located in the same room as a geothermal and chilled water piping system

The estimated cost for these projects, including construction costs, soft costs, contingency, and other costs is estimated to be $1,932,000

The total estimated cost of all recommendations is $14,951,000 including construction costs, soft costs, contingency, and other costs.

References

Boyd, T. L. (March 1999). THE OREGON INSTITUTE OF TECHNOLOGY GEOTHERMAL HEATING SYSTEM - THEN AND NOW. *GHC Bulletin*, 10-13.

Lund, J. W., & Boyd, T. (2010). GEOTHERMAL USES AND PROJECTS ON THE OREGON INSTITUTE. *Geo-Heat Center Quarterly Bulletin*, 12-17.

Mink, L. L. (2017). The Nation's Oldest and Largest Geothermal District Heating System. *Geothermal Resources Council Transactions*, 205-212.

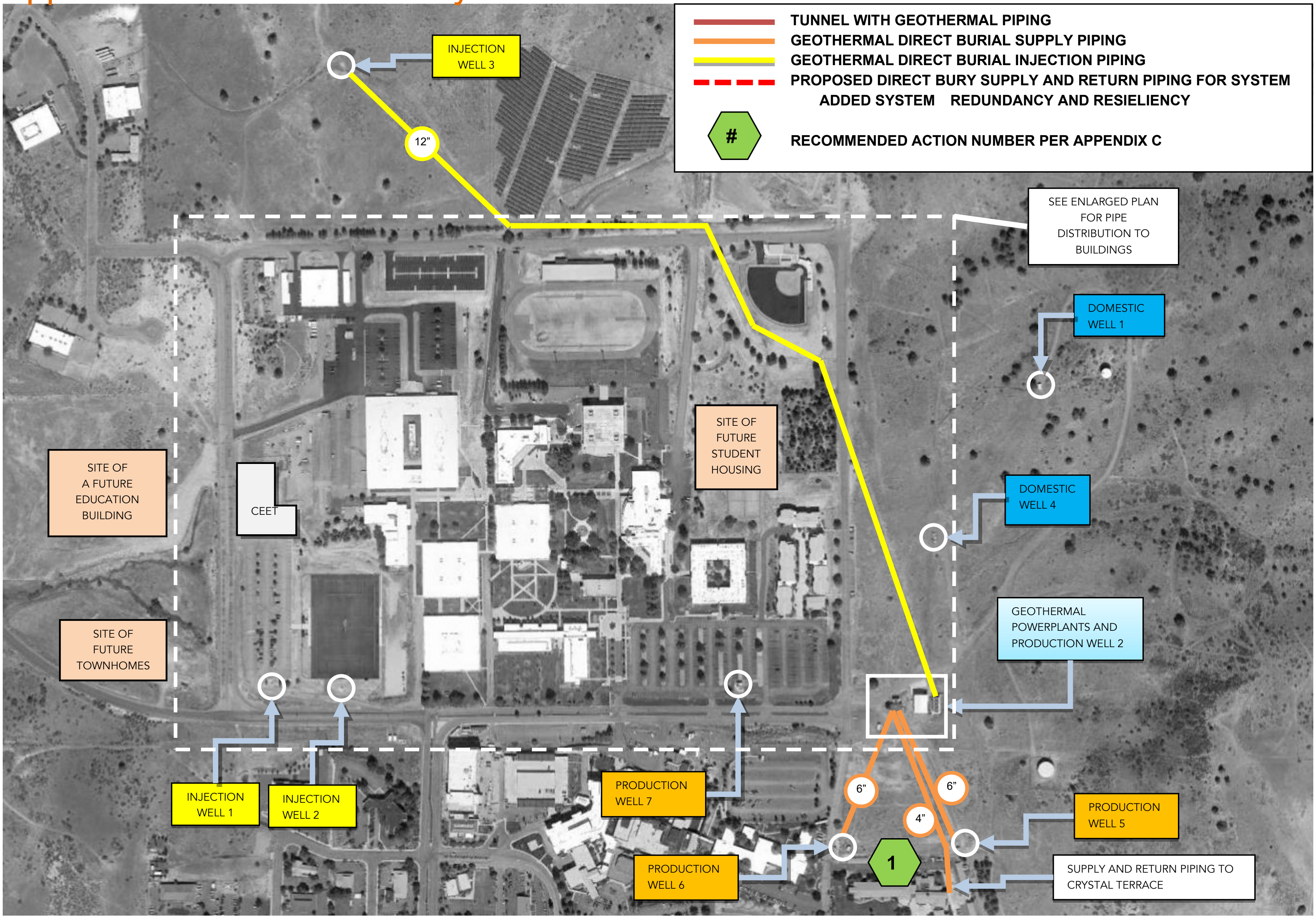
U.S. Bureau of Labor Statistics. (2022, May 11). *Consumer Price Index, West Region — April 2022*. Retrieved from Western Information Office: https://www.bls.gov/regions/west/news-release/consumerpriceindex_west.htm

U.S. Department of Energy. (2019). *Geo Vision: Harnessing the Heat Beneath Our Feet.* U.S. Department of Energy.

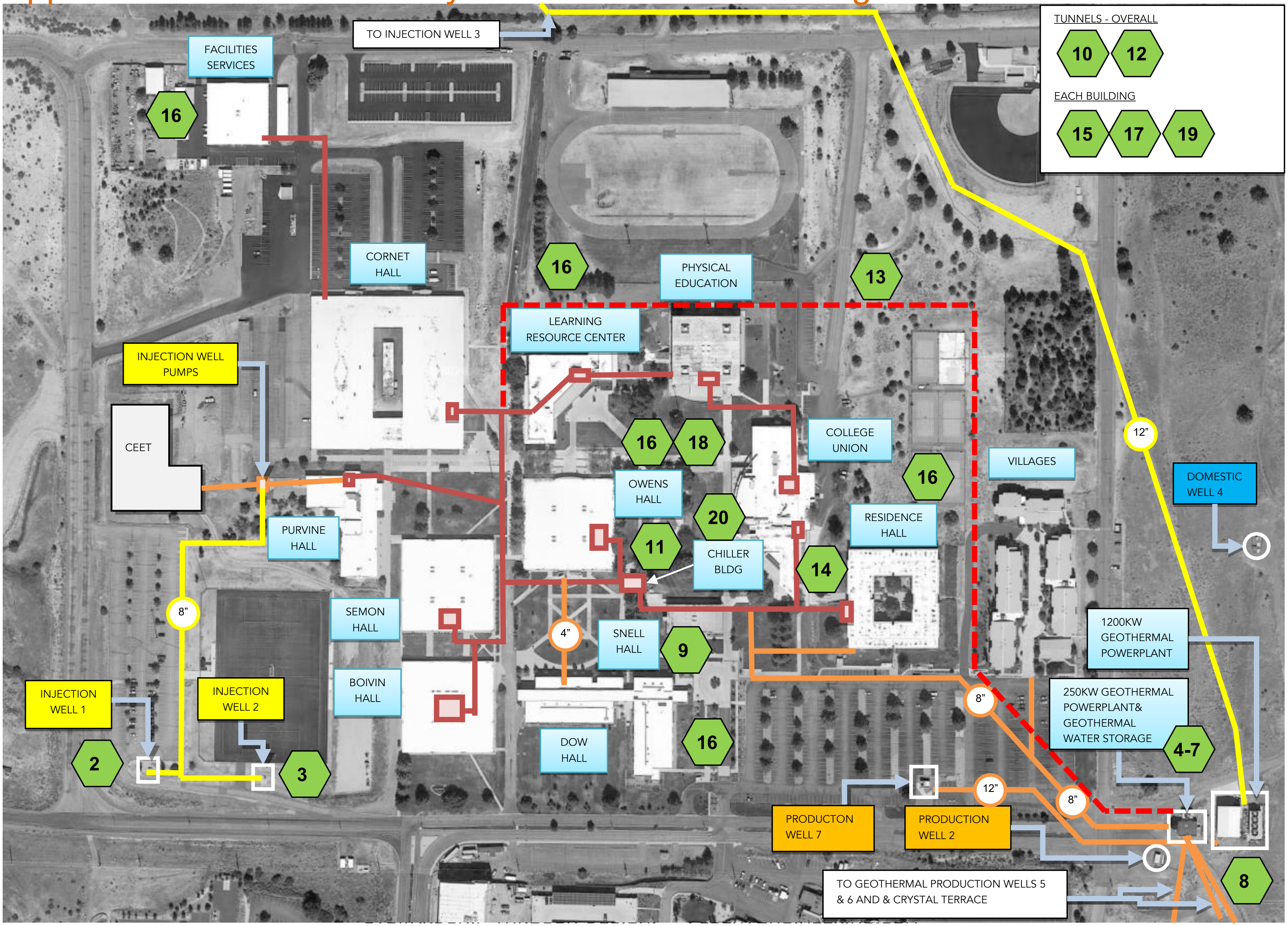
Appendix A: Acronyms

BLM	Bureau of Land Management (U.S. Department of the interior)
Btu	british thermal units
CAPEX	capital expenditure
CEET	Oregon Tech Center for Excellence in Engineering and Technology
CO_2	carbon dioxide
COP	coefficient of performance
DOE	U.S. Department of Energy
EER	energy efficiency ratio
EPA	Environmental Protection Agency
FRP	fiberglass reinforced plastic
FORGE	Frontier Observatory for Research in Geothermal Energy
GEO	geothermal or referring to the geothermal system
GHG	greenhouse gas(es)
GHP	geothermal heat pump
GHX	ground heat exchanger
HVAC	heating, ventilation, and air conditioning
HX	heat exchanger
kW	kilowatt(s)
NO_x	nitrogen oxides
ODWR	Oregon Department of Water Resources
PEX	cross-linked polyethylene
ROI	Return on investment
SO_2	sulfur dioxide
TDH	total dynamic head
TES	thermal energy storage
USGS	U.S. Geological Survey
VAV	variable-air volume
VFD	variable frequency drive

Appendix B1: Geothermal System Distribution – Overall Site



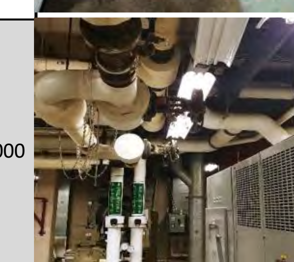
Appendix B2: Geothermal System Distribution – Enlarged

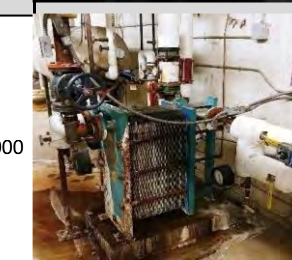
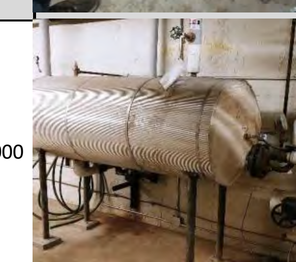


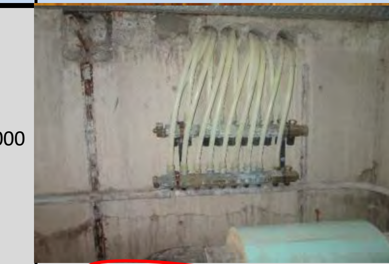
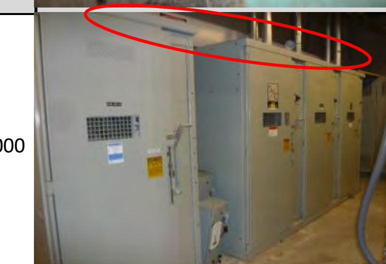
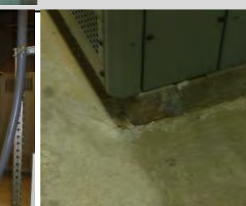
Appendix C: Detailed Evaluation Cost Estimates

Oregon Tech - Geothermal System Evaluation and Estimates

		Observed Issues and Recommended Remedy	Rationale for Recommendation	Benefits of Recommended Action				Cost to Implement (in 2022 Dollars) Total rounded to nearest $5,000 increment					Supporting Photos
Item #	Location/System Element	Description of Recommended Action	Why is this recommended	Improved Safety	Improves System Resiliency & Redundancy	Increases System Capacity	Reduces System Maintenance Costs	Construction Estimate	Design/Soft Costs	Contingency	Other Costs	TOTAL COSTS	Photos
1	Production and injection wells	Rebuild Well #6: new casing as required, new pump, new or reconditioned pump motor, new wellhouse.	Deterioration of well presents reliabilty problems, End of life	-	YES	POTENTIALLY	YES	$ 1,000,000	$ 200,000	$ 120,000	$ 60,000	$ 1,380,000	
2	Wells	Clean/ repair Inj Well #1. Access for repair will probably require replacement of the well vault.	Well is unuseable die to plugging and casing corrosion.	YES	YES	YES	YES	$ 750,000	$ 150,000	$ 90,000	$ 45,000	$ 1,035,000	 
3	Wells	Clean Inj Well #2	Remove scale accumulation in well	-	YES	-	-	$ 100,000	$ 20,000	$ 12,000	$ 6,000	$ 138,000	
4	Geothermal Mechanical Building	New concrete GEO storage/settling tank, to be located in-ground at about 20' higher elevation.	Existing tank is corroded and at risk of failure. New tank will provide more capacity, more head to better serve campus, better sand removal	YES	YES	YES	YES	$ 850,000	$ 170,000	$ 102,000	$ 51,000	$ 1,173,000	
5	Geothermal Mechanical Building	Replace piping and valves inside geothermal building. Accommodate power generation, heat sales to Crystal Terrace, second supply main to campus	Existing piping has been in service for 60 years. Removal of tank will allow reconfiguration of piping	YES	YES	YES	YES	$ 180,000	$ 36,000	$ 21,600	$ 10,800	$ 248,000	
6	Geothermal Mechanical Building	Replace older well pump speed controllers (variable frequency drives) as needed	End of life and reliability	-	YES	YES	YES	$ 40,000	$ 8,000	$ 4,800	$ 2,400	$ 55,000	

		Observed Issues and Recommended Remedy	Rationale for Recommendation	Benefits of Recommended Action				Cost to Implement (in 2022 Dollars) Total rounded to nearest $5,000 increment					Supporting Photos
Item #	Location/System Element	Description of Recommended Action	Why is this recommended	Improved Safety	Improves System Resiliency & Redundancy	Increases System Capacity	Reduces System Maintenance Costs	Construction Estimate	Design/Soft Costs	Contingency	Other Costs	TOTAL COSTS	Photos
7	Geothermal Mechanical Building Electrical	Provide ~500kW backup electrical generator at building supplying the Geothermal Heating Wells. Generator will also connect to head-end Geothermal controls. Replace electrical panels.	No campus heating will be available if a single building loses power, and/or has electrical equipment failure. Power at heat-exchange building is critical to entire system operation.	YES	YES	YES	YES	$ 550,000	$ 110,000	$ 66,000	$ 33,000	$ 759,000	 
8	GEO Supply Piping	Replace steel piping between wells #5, #6 and Geothermal Mechanical Building. Re-route Well #6 piping around parking lot. Include power and communications conduits.	Piping is about 60 years old, and may be significantly corroded.	YES	YES	YES	YES	$ 400,000	$ 80,000	$ 48,000	$ 24,000	$ 552,000	
9	GEO Supply Piping	Repair GEO supply piping and valve in the 8" GEO supply pipe vault near Snell Hall	Valve is inoperable, pipe connections are questionable	YES	YES	-	-	$ 450,000	$ 90,000	$ 54,000	$ 27,000	$ 621,000	
10	GEO Supply Piping	Replace GEO isolation valves in tunnels. Use power operated valves to allow isolation of a leak without entering the tunnel.	Allows work on a segment of the supply system without shutting off entire system.	YES	YES	-	YES	$ 235,000	$ 47,000	$ 28,200	$ 14,100	$ 324,000	
11	GEO Supply Piping	Remove three (3) 6" valves in geothermal piping located above the electrical switchgear in chiller building. Replace with continuous pipe.	Improved safety by ruducing chance of a leak above the main electrical switchgear. See also Item #20.	YES	-	-	YES	$ 45,000	$ 9,000	$ 5,400	$ 2,700	$ 62,000	
12	GEO Supply Piping	Repair leaks in fiberglass piping joints in tunnels, ~20 places	Improved safety, reduce moisture in tunnels	YES	-	-	YES	$ 15,000	$ 3,000	$ 1,800	$ 900	$ 21,000	

		Observed Issues and Recommended Remedy	Rationale for Recommendation	Benefits of Recommended Action				Cost to Implement (in 2022 Dollars) Total rounded to nearest $5,000 increment					Supporting Photos
Item #	Location/System Element	Description of Recommended Action	Why is this recommended	Improved Safety	Improves System Resiliency & Redundancy	Increases System Capacity	Reduces System Maintenance Costs	Construction Estimate	Design/Soft Costs	Contingency	Other Costs	TOTAL COSTS	Photos
13	GEO Supply and Return Piping	Add new 8" supply main from Geothermal Mechanical Building to the North side of campus. Connect into existing piping in tunnel between LRC and Cornett. Add valves to allow building to feed either direction through a loop. Include 6" return pipe starting at Villages connection.	Provides increased capacity, improved resiliance. Could facilitate supplying hotter geothermal water to select buildings for adsorption cooling. Will supply capacity for planned residence hall and other potential future buildings.	YES	YES	YES	YES	$ 2,700,000	$ 540,000	$ 324,000	$ 162,000	$ 3,726,000	
14	GEO Return Piping	Replace about 30' of 6" steel return pipe with FRP pipe and fittings in tunnel where return from residence hall joins return from College Union.	This is the only steel pipe in the tunnel; the rest is FRP. Pipe is corroded, and will continute to be subject to corrosion. Changing to FRP pipe will orevent corrosion and have a longer lifespan.	YES	-	-	-	$ 30,000	$ 6,000	$ 3,600	$ 1,800	$ 41,000	
15	GEO Return Piping	Replace building isolation valves	Valves are non-functional. Required to allow working on building piping without shutting off entire system.	YES	-	-	YES	$ 25,000	$ 5,000	$ 3,000	$ 1,500	$ 35,000	
16	Building Heating	Repair or replace leaking heat exchangers in Residence Hall, Learning Resource Center, Facilities, Snell Hall, and Owens Hall buildings. Replace associated GEO piping and valves	Leaking is a safety hazard, introduces moisture in buildings. Leaking heat exchangers prevent operation of power generation because the leakage is worse at lower water temperature.	YES	YES	YES	YES	$ 350,000	$ 70,000	$ 42,000	$ 21,000	$ 483,000	
17	Building Heating	Upgrade building heating water equipment and controls to provide variable-flow heating water circulation; with 2-way valves at heating coils, lead-lag variable-speed heating water pumps	Improved reliability and better utilization of available GEO resource, reduced pumping power	YES	YES	YES	YES	$ 440,000	$ 88,000	$ 52,800	$ 26,400	$ 607,000	
18	Owens Building Domestic Hot Water	Replace domestic hot water heat exchanger and storage tank at Owens	Tank is likely to fail due to corrosion	YES	YES	YES	YES	$ 45,000	$ 9,000	$ 5,400	$ 2,700	$ 62,000	

		Observed Issues and Recommended Remedy	Rationale for Recommendation	Benefits of Recommended Action				Cost to Implement (in 2022 Dollars) Total rounded to nearest $5,000 increment					Supporting Photos
Item #	Location/System Element	Description of Recommended Action	Why is this recommended	Improved Safety	Improves System Resiliency & Redundancy	Increases System Capacity	Reduces System Maintenance Costs	Construction Estimate	Design/Soft Costs	Contingency	Other Costs	TOTAL COSTS	Photos
19	Snowmelt	Move snowmelt pumps and heat exchangers out of the tunnels into building mechanical rooms, connect snowmelt systems that were installed and never connected, expand the snowmelt system from the main SE parking lot to the Physical Education building. Includes 35,000 SF of additional snowmelt.	Improved safety by moving equipment out of the confined-space tunnels, Improved control, increased capacity by allowing use of return water	YES	YES	YES	YES	$ 1,230,000	$ 246,000	$ 147,600	$ 73,800	$ 1,697,000	
20	Campus Main Electrical Gear in Chiller Building	Relocate, and Replace the Main Campus Power Distribution System Switchgear that is located in the same room as a geothermal and chilled water piping system. Some Geothermal piping is routed over the switchgear which is not permitted by current code. Addtionally, electrical equipment is at end of expected service life. This equipment is for the 12,470 Volt Power Distibution System.	The campus main electrical equipment has begun to flood in the past; and is subject to complete failure bringing down the majority of the campus. End of Life electrical gear does not meet current code, industry standards, and subjects all connected facilities to extended power loss, and heat distribution failure.	YES	YES	-	-	$ 1,400,000	$ 280,000	$ 168,000	$ 84,000	$ 1,932,000	 
							TOTALS	**$ 10,835,000**	**$ 2,167,000**	**$ 1,300,200**	**$ 650,100**	**$ 14,951,000**	