2024

ANNUAL INVESTMENT PLAN

Defined Benefit Fund
Health Care 115 Trust Fund

Ohio Public Employees Retirement System
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OPERS

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Chief Investment Officer's Letter

Members of the Ohio Public Employees Retirement System's Retirement Board:

On behalf of the Investments Division and OPERS Investment Advisor, I am delighted to present the 2024 Annual Investment Plan ("AIP"). This comprehensive document illuminates OPERS' strategic approach to achieving performance goals, encompassing the constraints, risks, and resources that the Investments Division must navigate in pursuit of long-term return targets. The AIP serves as a blueprint for the Investments Division's performance objectives, establishing a framework for OPERS to realize its overarching mission of securing retirement benefits for our members.

In the first half of 2023, our Investment Staff ("Staff") successfully executed pivotal initiatives. This included the seamless implementation of a new internal Investment Grade Credit mandate, commencing with an initial funding of $2.1 billion drawn from externally managed Emerging Markets Debt managers. Simultaneously, we expanded our internal Risk Parity program and initiated a crucial upgrade to our portfolio management system, eFront, for the Private Alternatives asset class. This upgrade, slated for completion by February 2024, promises enhanced reporting and monitoring capabilities for our Private Equity, Real Estate, and Private Credit portfolios.

Notably, in 2023, Staff delivered an 11.10% return for the Defined Benefit Fund, surpassing the targeted return of 6.9%. Similarly, the Health Care Fund yielded a robust 13.83%, exceeding its 6.0% target return. As of December 31, 2023, the net assets of the Defined Benefit Fund and the Health Care Fund stood at $98.8 billion and $12.7 billion, respectively, surpassing the asset growth targets set for both funds.

We extend our sincere appreciation to OPERS Investment Advisor NEPC for their invaluable assistance and guidance. Their insights and research play a critical role in our success. Equally deserving of recognition are the dedicated professionals across various departments at OPERS who contribute to the success of the Investments Division. While an exhaustive list is impractical, we express gratitude to teams in Investment Accounting Operations & Compliance, Legal Services, Information Technology, Executive Services, Internal Audit, Human Resources, and Enterprise Risk.

Lastly, I express heartfelt thanks to the OPERS Retirement Board members for their unwavering confidence in our Staff, the resources they generously allocate, and their continued vigilant oversight of the Investments Division on behalf of our members. Your trust and support are instrumental in our pursuit of excellence.

Paul T. Greff
Chief Investment Officer
January 18, 2024

Executive Summary

The following Summary outlines the strategies, asset allocation, and asset class strategies for both OPERS Defined Benefit and Health Care Funds. This Summary also includes initiatives and resources as well as performance and risk expectations.

Fund Strategies

For the Defined Benefit Fund ("DB Fund") and Health Care Fund ("HC Fund"), Staff is working towards the new asset allocation targets approved as part of the annual dynamic asset allocation review at the January 2024 Board meeting. Staff expects the DB Fund and HC Fund transition to be completed by the end of the first quarter of 2024 for all asset classes except Private Credit which will take much longer to achieve the target exposure.

The following table outlines the projected base case returns with ranges for both the Defined Benefit and Health Care Funds. The base case 2024 return expectations are slightly lower than 2023 for both the Defined Benefit and Health Care Funds due to lower expected returns for the Public Equity, and Alternatives Asset Classes.

	Base Case Return*	Return Range	Active Return	Tracking Error	Information Ratio
Defined Benefit Fund					
2024	7.41	-7.27 to 22.09	0.42	1.05	0.40
2023	7.86	-7.79 to 23.50	0.39	0.97	0.40
2022	5.95	-9.01 to 20.91	0.36	0.90	0.40
Health Care Fund					
2024	6.78	-5.43 to 18.99	0.30	0.75	0.40
2023	7.26	-5.88 to 20.40	0.26	0.65	0.40
2022	4.92	-8.13 to 17.97	0.26	0.66	0.40

**Source: 2024 NEPC Capital Market Expectations applied to OPERS Strategic Asset Allocation targets*

The active returns shown above incorporate an information ratio of 0.40. This risk-adjusted return metric is a ratio which measures the active return per unit of tracking error (active risk).

	3 year Alpha Target	1 year Alpha Target
Defined Benefit Fund		
2024	0.22	0.42
2023	0.21	0.39
2022	0.21	0.36
Health Care Fund		
2024	0.16	0.30
2023	0.15	0.26
2022	0.15	0.26

Asset Allocation and Asset Class Strategies

NEPC, OPERS Retirement Board's retained Investment Advisor, has recommended asset allocation changes for the DB Fund and HC Fund in 2024 as part of the annual dynamic asset allocation review along with Staff. Staff will continue its focus on determining the optimal mix of active, passive, internally managed and externally managed portfolios when implementing the asset allocation changes.

The Public Equity allocation in the Defined Benefit and Health Care Funds targets the market-based global weighting between U.S. Equity and Non-U.S. Equity in the MSCI All Country World Index-Investable Market Index ("MSCI ACWI-IMI"). The current asset allocation targets for U.S. Equity and Non-U.S. Equity in the DB and HC Funds are evaluated annually by the Investment Advisor, (refer to pages 6 and 9 for target allocations for the DB and HC Funds).

With regard to the Fixed Income allocation, the following sub-asset classes, namely Core Fixed, Investment Grade Credit, Securitized Debt, TIPS, High Yield and U.S. Treasury are managed utilizing internal Staff. Staff is also continuously reviewing the current mix of external managers within the Emerging Markets Debt and High Yield sub-asset classes to achieve lower fees and higher excess returns. The High Yield allocation is increasingly managed internally with the expansion of the High Yield staff, with approximately 45% of the assets now managed internally. This provides improved liquidity, better risk-adjusted returns, and lower fees for the overall exposure.

Within the Alternatives asset class, the Private Equity commitment pace is expected to moderate, given that the program's current allocation is close to its long-term Defined Benefit Plan target of 15%. In the Private Real Estate sub-asset class, Staff will continue its strategy of seeking attractive core and non-core investments to maintain the DB Plan target allocation of 12%.

Staff will continue to monitor the AIP progress and report to the OPERS Retirement Board quarterly along with the NEPC's quarterly performance report.

Initiatives

Each year the Investments Division undertakes significant initiatives to enhance the capabilities and performance of the Funds. Completed 2023 strategic initiatives and new 2024 strategic initiatives are highlighted below.

<u>2023 Completed Initiatives</u>

- Implementation of an upgraded portfolio management system for Private Alternatives has begun and will continue into early 2024.
- Review of High Yield, Risk Parity, and Private Equity benchmarks.
- Research and implement a standalone investment grade credit portfolio.
- Research return enhancing and risk diversifying strategies including enhanced derivatives use.
- Continue the expansion of the internal Risk Parity program.

2024 Initiatives

- Undertake thorough research to refine the framework for both strategic and tactical asset allocation within the OPERS Investments program.
- Review the OPERS Derivatives Policy and use of derivatives strategies, including options, with the aim of optimizing asset class returns and mitigating downside risk.
- Finalize the implementation of an upgraded portfolio management system dedicated to Private Alternatives, that will produce enhanced reporting and functionality.

Resources

The Investments Division Staff is comprised of 62 budgeted positions. Two positions are currently vacant.

The Investments Division submitted an estimated operating budget of $21.6 million for 2024. The budget includes the Finance Division’s estimate of the 2024 incentive compensation payout, based on the prior year’s budget. The budget incorporates the Investments Division’s efforts to maintain internal investment management, where appropriate, due to the material cost savings in asset management fees.

Staff estimates the total cost to manage the OPERS asset base at 48.6 basis points or $542.7 million. This is an increase in fees from the prior year primarily due to higher allocations in Private Alternatives. This cost estimate assumes long-term growth in the Fund’s asset base, whereas an unanticipated bear market would reduce the absolute dollar cost.

Defined Benefit Fund

Expected Asset Growth – Defined Benefit Fund

The table below summarizes Staff's estimate (base case) of market values and ranges for the Defined Benefit Fund on December 31, 2024. Pessimistic and optimistic cases are also provided for comparison purposes.

	Defined Benefit Fund 2024 Expected Asset Growth Estimated Market Values, Returns and Cash Flows		
	Pessimistic Case	Base Case	Optimistic Case
12/31/23 Market Value ($ billions)	$98.81	$98.81	$98.81
Expected Total Return	-7.27%	7.41%	22.09%
Expected Investment Gain ($ billions)	-$7.18	$7.32	$21.82
Expected Cash Flow ($ billions)	-$3.60	-$3.60	-$3.60
12/31/24 Market Value ($ billions)	$88.03	$102.53	$117.03

The base market value of $98.81 billion for December 31, 2023, is based on the unaudited financial BNY performance report.

Asset Allocation – Defined Benefit Fund

The 2024 target asset allocation and ranges for the Defined Benefit Fund reflect an estimate by Staff of the expected progress to be made toward the strategic asset allocation targets. Also included are asset allocations for a comparable peer group as of February 2023 (refer to page 22).

Asset Class	12/31/2023 Target	12/31/2024 Target	Range	Peer Group*
Public Equity	**43.6%**	**41.0%**	**27% to 67%**	**41.03%**
U.S. Equity	22.6%	21.0%	19% to 29%	24.98%
Non-U.S. Equity	21.0%	20.0%	16% to 26%	16.05%
Fixed Income	**23.0%**	**24.7%**	**16% to 30%**	**17.54%**
Core Fixed	10.0%	9.7%	7% to 13%	12.79%
Securitized Debt	1.0%	1.0%	0% to 5%	0.00%
TIPS	3.0%	3.0%	0% to 5%	1.70%
High Yield	3.0%	4.0%	0% to 5%	2.10%
Emerging Markets Debt	1.0%	1.0%	0% to 5%	0.95%
U.S. Treasury	3.0%	3.0%	0% to 5%	0.00%
Inv. Grade Credit	2.0%	3.0%	0% to 5%	
Alternatives	**31.4%**	**32.3%**	**16% to 30%**	**33.33%**
Private Equity	15.0%	15.0%	10% to 20%	16.70%
Real Estate	12.0%	12.0%	7% to 17%	12.23%
Hedge Funds	0.0%	0.0%	0% to 1%	3.31%
Opportunistic	1.4%	2.0%	0% to 5%	0.00%
Commodities	2.0%	2.0%	0% to 5%	1.08%
REITs	1.0%	1.0%	0% to 5%	
Private Credit	0.0%	0.3%	0% to 5%	
Risk Parity	**2.0%**	**2.0%**	**0% to 5%**	**0.00%**
Other				**8.10%**
Defined Benefit Fund	**100.0%**	**100.0%**		**100.00%**

*The asset allocations are derived from the organizations in the Peer Group Comparison section on page 22.

	Schedule of Expected Performance and Volatility					
	Average Allocation (%)	Active Return Performance Objectives (bps)	Active Return Performance Contribution (bps)	Target Tracking Error (bps)	Tracking Error Range (bps)	Target Information Ratio
U.S. Equity	**21.0%**	14	3	36	0-100	0.40
Non-U.S. Equity	**20.0%**	60	12	150	0-300	0.40
Fixed Income	**24.7%**	17	4	50	0-200	0.34
Alternatives	**32.3%**	70	23	500	250-1500	0.14
Risk Parity	**2.0%**	0	0	0	0-200	NA
Defined Benefit Fund	**100.0%**	**NA**	**42**	**105**	**0-300**	**0.40**

The table above shows an anticipated active management contribution of 42 basis points to the Defined Benefit Fund's return for 2024. The estimated tracking error of 105 basis points indicates a 68% probability that the active return will be in a range of -63 basis points to +147 basis points. This interval is calculated by subtracting the tracking error from, and adding the tracking error to, the expected active return.

Return and Risk – Defined Benefit Fund

The performance objectives for the Defined Benefit Fund are to: 1) exceed the return of the Policy benchmark within an appropriately constrained risk framework, net of investment expenses, and 2) exceed the actuarial required rate of return over a reasonably longer time horizon. The Policy benchmark combines designated market indices for asset classes, weighted by asset allocation targets.

The return estimates in the following table were derived from the asset class return expectations developed by the OPERS Retirement Board's retained Investment Advisor, NEPC. The single-point estimate return of 7.41% is comprised of an expected return of 6.99% from the policy mix and an additional contribution of 0.42% from active management, net of fees.

In the following table, Staff divides return and risk into two components.

Policy: The return and risk derived from the policy asset allocation and the intermediate term return and risk forecast of the underlying asset classes.

Active: The return and risk associated with deviations from benchmark allocations at either the asset class level or portfolio level. It reflects the potential impact to relative performance from deviating from the asset class policy allocation targets, from asset class benchmark mismatches, and from individual portfolio active risk.

FUND STRATEGIES

The Policy Return and Active Return are calculated as weighted average of expected returns and expected alphas of each sub-asset class.

2024 Policy Return Assumptions			
Asset Classes	**Pessimistic**	**Base**	**Optimistic**
Public Equity	**-12.41%**	**6.22%**	**24.85%**
U.S. Equity	-11.98%	5.18%	22.34%
Non-U.S. Equity	-14.92%	7.00%	28.92%
Fixed Income	**0.22%**	**5.99%**	**11.76%**
Core Fixed	-0.42%	5.35%	11.11%
Securitized Debt	-3.89%	7.23%	18.35%
Emerging Markets Debt	-4.90%	7.71%	20.32%
High Yield	-3.89%	7.23%	18.36%
TIPS	-0.90%	5.19%	11.27%
U.S. Treasury	-0.55%	4.84%	10.22%
Inv. Grade Credit	-1.34%	6.30%	13.95%
Alternatives	**-9.64%**	**8.01%**	**25.66%**
Private Equity	-16.40%	9.32%	35.05%
Real Estate	-10.27%	5.77%	21.81%
Opportunistic	-6.81%	6.88%	20.57%
Commodities	-13.79%	4.71%	23.21%
REITs	-14.92%	6.82%	28.56%
Private Credit	-3.05%	8.76%	20.57%
Risk Parity	**-6.56%**	**6.33%**	**19.22%**
Policy Return	**-7.02%**	**6.99%**	**21.00%**

2024 Total Return Assumptions			
Sources of Return	**Pessimistic**	**Base**	**Optimistic**
Policy	-7.02%	6.99%	21.00%
Active	-0.63%	0.42%	1.47%
Total Return	**-7.27%**	**7.41%**	**22.09%**

2024 Total Risk and Active Risk Assumptions			
Sources of Risk	**Variability Risk**	**Information Ratio**	**Sharpe Ratio***
Policy	14.01%		0.18
Active	1.05%	0.40	
Total Risk	**14.68%**		**0.21**

*The Sharpe Ratio reflects 4.4% (10 year Cash Return) as the risk free rate.

Health Care Fund

Expected Asset Growth – Health Care Fund

The table below summarizes Staff's estimate (base case) of market values and ranges for the Health Care Fund on December 31, 2024. Pessimistic and optimistic cases are also provided for comparison purposes.

	Health Care Fund 2024 Expected Asset Growth Estimated Market Values, Returns and Cash Flows		
	Pessimistic Case	Base Case	Optimistic Case
12/31/23 Market Value ($ billions)	$12.74	$12.74	$12.74
Expected Total Return	-5.43%	6.78%	18.99%
Expected Investment Gain ($ billions)	-$0.69	$0.86	$2.42
Expected Cash Flow ($ billions)	-$1.08	-$1.08	-$1.08
12/31/24 Market Value ($ billions)	$10.97	$12.52	$14.07

The base market value of $12.74 billion for December 31,2023 is based on the unaudited financial BNY performance report.

Asset Allocation – Health Care Fund

The 2024 target asset allocation and ranges for the Health Care Fund reflect an estimate by Staff of the expected progress to be made toward the strategic asset allocation targets, which are shown below. There is no peer universe of public pension plans with separate health care funds.

Asset Class	12/31/2023 Target	12/31/2024 Target	Range
Public Equity	**51.6%**	**50.0%**	**33% to 73%**
U.S. Equity	26.6%	25.0%	23% to 33%
Non-U.S. Equity	25.0%	25.0%	20% to 30%
Fixed Income	**34.0%**	**37.0%**	**24% to 44%**
Core Fixed	16.0%	16.0%	12% to 22%
Securitized Debt	2.0%	3.0%	0% to 5%
TIPS	7.0%	7.0%	0% to 9%
High Yield	4.0%	5.0%	0% to 8%
Emerging Markets Debt	1.0%	1.0%	0% to 5%
Inv. Grade Credit	2.0%	3.0%	0% to 5%
U.S. Treasury	2.0%	2.0%	0% to 5%
Alternatives	**12.4%**	**10.0%**	**7% to 20%**
REITs	7.0%	5.0%	0% to 11%
Hedge Funds	0.0%	0.0%	0% to 1%
Opportunistic	1.4%	2.0%	0% to 5%
Commodities	4.0%	3.0%	0% to 8%
Risk Parity	**2.0%**	**3.0%**	**0% to 5%**
Health Care Fund	**100.0%**	**100.0%**	

	Schedule of Expected Performance and Volatility					
	Average Allocation (%)	Active Return Performance Objectives (bps)	Active Return Performance Contribution (bps)	Target Tracking Error (bps)	Tracking Error Range (bps)	Target Information Ratio
U.S. Equity	**25.0%**	14	4	36	0-100	0.40
Non-U.S. Equity	**25.0%**	60	15	150	0-300	0.40
Fixed Income	**37.0%**	18	7	50	0-200	0.36
Alternatives	**10.0%**	39	4	300	200-400	0.13
Risk Parity	**3.0%**	0	0	0	0-200	NA
Health Care Fund	**100.0%**	**NA**	**30**	**75**	**0-300**	**0.40**

The table above shows an anticipated active management contribution of 30 basis points to the Health Care Fund's return for 2024. The estimated tracking error of 75 basis points indicates a 68% probability that the active return will be in a range of -45 basis points to +105 basis points. This interval is calculated by subtracting the tracking error from, and adding the tracking error to, the expected active return.

Return and Risk – Health Care Fund

The performance objectives for the Health Care Fund are to (1) exceed the return of the Policy benchmark within an appropriately constrained risk framework, net of investment expenses, and (2) exceed the actuarial required rate of return over a reasonably longer time horizon. The Policy benchmark combines designated market indices for asset classes, weighted by asset allocation targets.

The return estimates in the following table were derived from the asset class return expectations developed by the OPERS Retirement Board's retained Investment Advisor, NEPC. The single-point estimate return of 6.78% is comprised of an expected return of 6.48% from the policy mix and an additional contribution of 0.30% from active management, net of fees.

In the following table, Staff divides return and risk into two components.

Policy: The return and risk derived from the policy asset allocation and the intermediate-term return and risk forecast of the underlying asset classes.

Active: The return and risk associated with deviations from benchmark allocations at either the asset class level or portfolio level. It reflects the potential impact to relative performance from deviating from the asset class policy allocation targets, from asset class benchmark mismatches and from individual portfolio active risk.

FUND STRATEGIES

The Policy Return and Active Return are calculated as the weighted average of expected returns or expected alphas of each sub-asset class.

2024 Policy Return Assumptions			
Asset Classes	**Pessimistic**	**Base**	**Optimistic**
Public Equity	**-12.46%**	**6.24%**	**24.94%**
U.S. Equity	-11.98%	5.18%	22.34%
Non-U.S. Equity	-14.92%	7.00%	28.92%
Fixed Income	**0.28%**	**5.95%**	**11.62%**
Core Fixed	-0.42%	5.35%	11.11%
Securitized Debt	-3.89%	7.23%	18.35%
Emerging Markets Debt	-4.90%	7.71%	20.32%
High Yield	-3.89%	7.23%	18.36%
TIPS	-0.90%	5.19%	11.27%
U.S. Treasury	-0.55%	4.84%	10.22%
Inv. Grade Credit	-1.34%	6.30%	13.95%
Alternatives	**-8.79%**	**6.74%**	**22.27%**
REITs	0.00%	0.00%	0.00%
Opportunistic	-6.81%	6.88%	20.57%
Commodities	-13.79%	4.71%	23.21%
Risk Parity	**-6.56%**	**6.33%**	**19.22%**
Policy Return	**-5.40%**	**6.48%**	**18.36%**

2024 Total Return Assumptions			
Sources of Return	**Pessimistic**	**Base**	**Optimistic**
Policy	-5.40%	6.48%	18.36%
Active	-0.45%	0.30%	1.05%
Total Return	**-5.43%**	**6.78%**	**18.99%**

2024 Total Risk and Risk Attribution Assumptions			
Sources of Risk	**Variability Risk**	**Information Ratio**	**Sharpe Ratio***
Policy	11.88%		0.18
Active	0.75%	0.40	
Total Risk	**12.21%**		**0.20**

*The Sharpe Ratio reflects 4.4% (10 year Cash Return) as the risk free rate.

ASSET CLASS STRATEGIES

Tactical Outlook

The following tactical outlook provides a background and context for the asset class strategies for the Defined Benefit and Health Care Funds.

The following are overviews of the two components of the tactical outlook: the capital markets observations and the asset class outlook. The Investment Advisor, NEPC, retained by the OPERS Retirement Board, provided the outlook for 2024.

Capital Markets Observations

- **Key Market Themes**
    - U.S. markets have fully embraced the soft-landing narrative by pricing in four Fed rate cuts for 2024 and lower long-term yields.
    - The outlook for U.S. TIPS is favorable with attractive real interest rates and subdued breakeven inflation expectations.
    - We are concerned about U.S. mega-caps and suggest reducing exposure, while maintaining U.S. large-cap value exposure.
    - We believe U.S. high yield offers a greater return versus U.S. large-cap equity and we recommend increasing exposure.
    - We do not foresee a recession in 2024 and expect “higher-for-longer” interest rates to persist.
    - The economy has been resilient with higher rates; robust labor market data reinforces a “no recession” outcome.
    - The monetary policy lag is likely longer and more variable today given the services-orientation of the economy.

Market Outlook

- **U.S. and Non-U.S. Equities**
    - NEPC recommends investors maintain a neutral weight to Equities given concerns around an uncertain macro and political backdrop. In addition, with the increase in yields, the Equity Risk Premium has shrunk making the risk/reward tradeoff for Equities less attractive than in the recent past.
    - Our conviction remains high regarding the addition of value exposure within U.S. large-cap equity. More broadly, we recommend utilizing investment strategies with a strong quality bias as we think the lagged impact of rising rates and a lack of access to capital will negatively affect lower quality companies.

- **Fixed Income**
    - Overall, the fixed income markets generally remain attractive as all-in yields offer appealing forward-looking returns despite a defensive macro-outlook.
        - We think that there is Beta opportunity in long-only high-grade credit and relative value across duration and rating. IG fundamentals have stabilized

with net upgrades outpacing downgrades and spreads tightening relative to historic median.

        - From a return seeking standpoint, we think that there is an alpha opportunity in high yield, stressed or distressed, special situations, and pockets of structured credit.
            - Within the high yield market, while the overall level of dispersion has likely peaked, the dispersion at the issuer level has increased, primarily driven by CCCs.
            - The credit quality of the leveraged loan universe is worse than the high yield bond universe. Interest coverage has declined, and loan-only issuances have ramped up, reducing the sub-ordination. Downgrades have increased resulting in an increase in the share of CCC segment. This trend is expected to amplify the volatility in leveraged structures such as CLOs.

    - For investors who can tolerate illiquidity and complexity, we think there is an opportunity to earn a premium by investing in stressed/distressed credit hedge funds, pockets of structured credit markets such as CMBS, and in cross-over funds that straddle between hedge funds and private debt opportunity.

- **Real Assets**

    - Energy markets remain complex.
        - Energy markets are increasingly complex, with a combination of hydrocarbon and renewable sources needed.
        - Oil and gas remain under-invested in, with a lack of both debt and equity capital available.
        - This lack of capital provides attractive entry points for investors in hydrocarbons, but NEPC advises that clients be mindful of commodity price exposure and consider hedges when reasonable.
        - Investments in "nuts and bolts" needed to support energy transition are also attractive.
    - Tailwinds for Digital Infrastructure remain robust.
        - Demand for digital and communications infrastructure remains strong, supported by carriers and network operators, typically with strong credit profiles.
        - Overall data traffic growth is driven by secular and demographic trends.
            - New technology (5G, cloud services, streaming) provide fresh support for demand growth.
            - Demand is also supported by demographic trends (growing populations and expanded access to technology).
        - Underlying asset types include cell towers, fiber, and data centers, with strategies ranging from core to development.
    - Real Estate market dislocation creates potential opportunity.
        - Real estate market continues to (slowly) digest sharply rising rates, which are putting pressure on asset values and capital markets.

- Debt capital is less available and much more expensive (relative to past several years).
- Real estate transaction markets remained tepid through 2023.
- The market broadly anticipates transaction volume to increase, with potential for growth in distressed situations.
- NEPC believes that debt and opportunistic strategies can capitalize on this market dislocation by providing rescue capital and/or pursuing distressed opportunities.
- GP-led secondary opportunities are also expected to grow as funds approach end of term.

- **Private Equity**
  - Buyout Valuations: The current economic uncertainty has prompted investors to adopt a more cautious and risk-averse approach. This has resulted in widening bid/ask pricing spreads and a decrease in transaction volume compared to previous years. While premium pricing for top-notch assets might still be attainable in certain cases, such instances are likely to be exceptions rather than the norm. Despite the evolving valuation landscape, we remain optimistic about investing in buyout markets, as we believe it is still a favorable time to capitalize on opportunities. One key area we are focusing on is Special Situations, where the strategy is centered around operational improvement to drive value rather than relying solely on financial engineering.
  - Venture Valuations: As with buyout valuations, the current economic uncertainty has caused investors to adopt a more cautious approach. This has resulted in widening bid/ask pricing spreads and a decrease in transaction volume compared to previous years. Moreover, it has led to a reduction in competition as "tourist capital" or momentum investors have largely exited the market.
  - In light of the current market dynamics, two distinct trends are emerging. Firstly, there is an opportunity to invest in high-quality assets at discounted prices from previous rounds through secondary transactions. Secondly, the trend of lower valuations has opened opportunities for primary rounds to be executed at more normalized valuations.
  - Overall: It is crucial for investors to approach private equity (buyout and venture) investing with a measured and disciplined pacing strategy, considering the inherent challenges in timing the market. It is important to approach the market cautiously and selectively back the very best investors in all cases.

- **Private Debt**
  - Market disruptions created a new area of activity in 2023. Subordinated debt and preferred equity investments picked up as some senior lenders and common equity holders were reluctant to provide further financing or capital due to market uncertainty. Senior lenders pulled back on how deep they would lend in a capital structure (approx. 6.5x to 5.0x) and sponsors or common equity holders were either fatigued, capped by concentration limits or reluctant to provide further equity support. This is an area that NEPC has identified as being particularly attractive and a timely opportunity. Another pocket of activity is the increase in structured

credit with payment-in-kind (“PIK”) features as companies/sponsors sought to conserve cash and preserve liquidity.

- We are focused on three general themes in the private debt market.
  - Theme 1: There is potential for better risk-adjusted returns for floating rate strategies due to higher spreads, borrowers having lower leverage levels and deals having tighter documentation. However, we encourage investors to look at managers with smaller, cleaner existing portfolios and historical workout capabilities. Strategies that diversify away from directly originated corporate debt including asset-based lending have demonstrated some attractive dynamics.
  - Theme 2: Widespread defaults have not yet occurred; however, indications point towards trouble ahead. Increased interest expenses, coupled with potentially depressed corporate profit margins, is expected to put pressure on liquidity and coverage ratios. Opportunistic, distressed and structured capital strategies could become more attractive. Opportunities specifically in areas such as structured capital and regulatory capital relief have emerged as compelling this year as well.
  - Theme 3: Continue to commit to private debt managers, even if it means writing smaller checks in this environment. When evaluating new funds, place emphasis on a managers’ sourcing, deal structuring and restructuring/workout capabilities.

Performance Expectations – Excess Return Targets

Public Equity

The following table shows the benchmarks and performance objectives for the Public Equity asset class. The benchmark for the U.S. Equity asset class is the Russell 3000 Index with an alpha target of 14 basis points, net of fees. The tracking error target is 36 basis points with a range of 0 to 100 basis points. The performance objective (alpha) and target tracking error for Non-U.S. Equity are 60 basis points and 150 basis points, respectively.

	Public Equity Asset Class Alpha Target and Target Tracking Error				
	Benchmark	Alpha Target (net of fees) (bps)	Target Tracking Error (bps)	Target Information Ratio	Tracking Error Range (bps)
U.S. Equity	*Russell 3000*	14	36	0.40	0 - 100
Non-U.S. Equity	*Custom Benchmark*	60	150	0.40	0 - 300

* The tracking error ranges for U.S. Equity and Non-U.S. Equity are 20 - 100 bps and 80 - 300 bps, respectively.

The custom benchmark for Non-U.S. Equity is composed of 55% MSCI World Index ex U.S. Standard Index; 10% MSCI World Index ex U.S. Small Cap Index; 31% MSCI Emerging Markets Standard Index; and 4% MSCI Emerging Markets Small Cap Index. This structure reflects a strategic overweight to Emerging Markets compared to the Emerging Markets allocation of the MSCI All Country World Index ex U.S. Investable Markets Index (“MSCI ACWI ex U.S. IMI”).

Fixed Income

The following table shows the benchmarks and performance objectives for the Fixed Income asset class.

	Internal - Fixed Income Asset Class Alpha Target and Target Tracking Error				
	Benchmark	Alpha Target (net of fees) (bps)	Target Tracking Error (bps)	Target Information Ratio	Tracking Error Range (bps)
Core Fixed	*Bloomberg U.S. Aggregate*	30	75	0.40	0 - 150
Securitized Debt	*Securitized Debt Custom Benchmark**	80	200	0.40	0 - 400
High Yield	*OPERS Custom Bloomberg Very Liquid BB/B High Yield*	30	75	0.40	0 - 150
TIPS	*Bloomberg U.S. TIPS*	0	15	NA	0 - 30
U.S. Treasury	*Bloomberg U.S. Treasury*	0	15	NA	0 - 30
Inv. Grade Credit	*Bloomberg U.S. Corporate Bond*	30	75	0.40	0 - 150

*50% Bloomberg Non-Agency Investment Grade CMBS: BBB Total Return Index Unhedged USD & 50% Bloomberg Non-Agency CMBS Agg Eligible Total Return Index Value Unhedged USD.

External - Fixed Income Asset Class Alpha Target and Target Tracking Error					
	Benchmark	Alpha Target (net of fees) (bps)	Target Tracking Error (bps)	Target Information Ratio	Tracking Error Range (bps)
Core Fixed	*Bloomberg U.S. Aggregate*	36	90	0.40	0 - 150
Emerging Markets Debt	*EMD Custom Benchmark***	46	230	0.20	0 - 800
High Yield	*Bloomberg U.S. High Yield*	20	100	0.20	0 - 700

**50% JP Morgan Emerging Markets Bond Index Global & 50% JP Morgan Government Bond Index-Emerging Markets Global Diversified.

Cash Management

The cash portfolios are managed with a low-to-moderate risk profile that results in principal preservation while exceeding the performance of the respective benchmarks. The benchmark for the OPERS Short Term Investment Funds ("STIF") is the Bloomberg Tier 1 30-Day Commercial Paper Index.

Securities Lending

In the securities lending program, Staff manages two lending portfolios and utilizes a lending agent to maximize lending revenue. Staff strive to hire agents who provide competitive fee splits, while providing adequate risk controls and expertise in the asset class being loaned. There is a bias toward lending assets in an auction environment, so borrowers are providing maximum revenue in a competitive environment on a regular basis. Staff will continue lending the U.S. Treasury, Agency and a portion of the corporate bond assets in-house. The collateral from the securities lending program is managed internally. The combination of lending revenue and investment income comprise the total securities lending performance. The benchmark for the Securities Lending STIF is the Overnight Bank Funding Rate.

Alternatives

The Alternatives asset class is composed of Private Equity, Real Estate, Opportunistic, REITs, and Commodities investment strategies. The Defined Benefit and Health Care Funds invest differently in the Alternatives asset class to meet their unique investment objectives.

The following table summarizes the benchmark, performance objectives and tracking error for the various alternative investment strategies utilized within the Fund.

Alternatives Asset Class Alpha Target and Target Tracking Error					
	Benchmark	Alpha Target (net of fees) (bps)	Target Tracking Error (bps)	Target Information Ratio	Tracking Error Range (bps)
Private Equity	*State Street Private Equity*	100	NA	NA	0 - 1500
Real Estate	*Net NFI-ODCE + 0.85%*	30	NA	NA	0 - 1500
Opportunistic	*Custom Benchmark**	140	350	0.40	NA
REITs	*DJ U.S. Select RESI*	0	10	NA	0 - 250
Private Credit	*Credit Suisse Leveraged Loan*	200	500	0.40	NA
Commodities	*Bloomberg Commodity*	36	90	0.40	0 - 300

* Market value weight of the underlying benchmarks

Opportunistic

Investments in the Opportunistic sub-asset class typically include investment strategies or assets that are not currently used in the respective DB or HC Funds, but which have the potential to improve investment results over time. The opportunistic allocation also represents the idea that a broad universe of investment strategies, concepts and assets can be considered available for potential inclusion in OPERS investment program. Strategies are developed based on their individual merit and circumstances and are assessed as to their scalability and feasibility for a potentially larger allocation. The maximum size for any single benchmarked strategy is 1.0% of the total fund.

There are currently two strategies within the Opportunistic sub-asset class. The first strategy is an active currency mandate and is managed by an external manager. It currently has an AUM of $744 million. The second strategy is an index-oriented gold mandate and is managed in-house with a current AUM of $745 million.

Strategy	Benchmark	Alpha Target (bps)	Target Tracking Error (bps)
P/E Global FX	*Russell 2000*	280	700
Internal Gold	*Bloomberg Gold Subindex*	0	25

Hedge Funds (In Liquidation)

The Hedge Funds allocation was terminated in 2020 and the remaining assets of approximately $6 million are in the process of being liquidated. The custom benchmark for 2024 is defined by the table below and is based on the estimated remaining assets.

Strategy	Target	Range
Event Driven	65%	0-100%
Relative Value	35%	0-100%

Risk Parity

Risk Parity is an alternative approach to investment portfolio management, which focuses on the allocation of risk rather than allocation of capital. The Risk Parity approach is underpinned by the expectation that when asset allocations are adjusted to the same risk level, a portfolio can achieve a higher Sharpe ratio and be more resilient to market downturns.

The Risk Parity asset class is comprised of both internal and external mandate with an approximate split of 50:50 within the composite. The internal mandate portfolio has a volatility target of 10% and is benchmarked to the S&P Global Risk Parity Index – 10% Target Volatility. The external OPERS Risk Parity managers' performance benchmark is an OPERS custom benchmark made up of equally weighted returns of the existing risk parity managers. The custom benchmark provider is HFR.

POLICIES, COMMITTEES, AND RESOURCES

OPERS Retirement Board Policies Governing Investment Activities

The following exhibit illustrates the structure and relationship of the Policies within the OPERS System and its three Investment Funds.

OPERS FUNDS

FUND POLICIES

DEFINED BENEFIT FUND	HEALTH CARE FUND	DEFINED CONTRIBUTION FUND
Investment Objectives and Asset Allocation Policy	Investment Objectives and Asset Allocation Policy	Defined Contribution Fund Policy*

ASSET/SUB-ASSET CLASS POLICIES

Public Equity Policy	Cash Policy
Fixed Income Policy	Commodities Policy
Private Equity Policy	Opportunistic Policy
Real Estate Policy	Risk Parity Policy
Private Credit Policy	REITs Policy

INVESTMENT-WIDE POLICIES

Broker - Dealer Policy	Personal Trading Policy
Corporate Governance Policy	Responsible Contractor Policy
Derivatives Policy	Securities Lending Policy
External Investment Managers' Insurance Policy	Soft Dollar Policy
Iran and Sudan Divestment Policy	OFAC Policy
Material Non-public Information Policy	Leverage Policy
Ohio-Qualified & Minority-Owned Manager Policy	Liquidity Policy
Russia Divestment Policy	Benchmarks Policy

*Defined Contribution Fund has a stand-alone policy and other sub-asset class policies are not applicable.

POLICIES, COMMITTEES, AND RESOURCES

Staff Committee Structure

The Chief Investment Officer ("CIO") utilizes a variety of committees, working groups and meeting structures to govern the Investments Division's activities. This internal governance arrangement enhances collective inputs, retains institutional knowledge, provides documentation of the due diligence process and other processes, promotes transparency and accountability, and formalizes decision-making processes. These committees are designed to combine structure and flexibility to efficiently bring the appropriate decision makers together on a timely basis and maintain a controlled environment to minimize operational risk.

The following provides an outline of the Investment related committees.

Committee/Meeting	Purpose and Description
Staff Investment Committees *	**Approvals and Decisions**
Broker Review	Monitor/Approve and Evaluate Brokers, Complete ORSC Reports
Counterparty Risk	Set Counterparty Limits and Monitor Counterparty Exposures
DC Fund Staff Investments Committee	Review/Monitor Defined Contribution Fund's Investment Options and Performance
Fund Management	Implement Asset Allocation and Investment Strategies, Cash Forecasting, Fund and Portfolio Exposure Metrics, and Set Quarterly Fund Target Benchmark Allocations During Transition, Liquidity Management
Operational Risk Management	Identify and Monitor Operational Risks
ITAA Committee	Review Capital Markets, Asset Allocation Mixes for DB/HC Fund, and Recommend Tactial Allocation moves
Public Markets Committee	Recommend to hire or terminate External Managers and to open or close internally managed portfolios in relation to OPERS Investment Polices
Private Alternatives Committee	Review Private Equity/Real Estate Opportunities for CIO Approval

* Committee has charter and maintains minutes

POLICIES, COMMITTEES, AND RESOURCES

Staffing

Recruiting and retaining the best and most talented staff is a critical priority for the Investments Division. The following table shows the anticipated full staffing for 2024.

	Target Staffing for Year 2024					
	Office of the CIO	Fund Mgmt.	Risk Mgmt.	Internal Funds	External Funds	Total Invest. Division
2024 Investment Plan Projected Staffing	5	4	5	33	15	62
Current Staffing	5	4	5	33	13	60
Vacant Positions - To be filled in 2024	0	0	0	0	2	2
Year End 2024 Target Staffing	5	4	5	33	15	62

	Current Open and Budgeted Positions	
	Position	Vacant
External Management	Sr. Investment Analyst - EPM	1
External Management	Sr. Portfolio Manager - EPM	1
Total		2

Staffing Costs

Assuming full staffing levels in 2024, the chart below details the estimated $21.65 million of salaries, benefits, and incentive compensation for the Investments Division. This represents approximately 1.94 basis points of cost, a decrease of 0.02 basis points from the 2023 projection.

	Estimated 2024 Total Compensation Costs ($ millions)				
	Office of the CIO	Internal Mgmt.	External Mgmt.	2024 Projected Total	2023 Projected Total
Salaries	$2.20	$6.82	$2.25	$11.28	$11.07
Benefits	$1.10	$3.51	$1.15	$5.75	$5.56
Incentive Compensation	$0.77	$2.95	$0.91	$4.62	$3.78
Total Compensation	$4.06	$13.28	$4.31	$21.65	$20.42
Average Assets ($ billions)	$111.55	$61.00	$50.55	$111.55	$104.27
Compensation (Basis Points)	0.36	2.18	0.85	1.94	1.96

Operating Budget

The Investments Division's 2024 operating budget (excluding compensation) is $10.82 million. This operating budget reflects an increase of $0.59 million, or 5.8% percent, from the 2023 budget and, as a percentage of assets, is 0.97 basis points as compared to 0.98 basis points in 2023. The decrease in bps is due to the increase in AUM.

	Operating Budget less Total Compensation ($ millions)		
	Internal Mgmt.	External Mgmt.	Total Investments Division
2023 Operating Budget	$7.63	$2.60	$10.23
2024 Operating Budget	$7.76	$3.06	$10.82
Percent Change	1.7%	17.7%	5.8%
Percent of Total	71.7%	28.3%	100.0%
Average Assets ($ billions)	$61.00	$50.55	$111.55
Operating Budget (Basis Points)	1.27	0.61	0.97

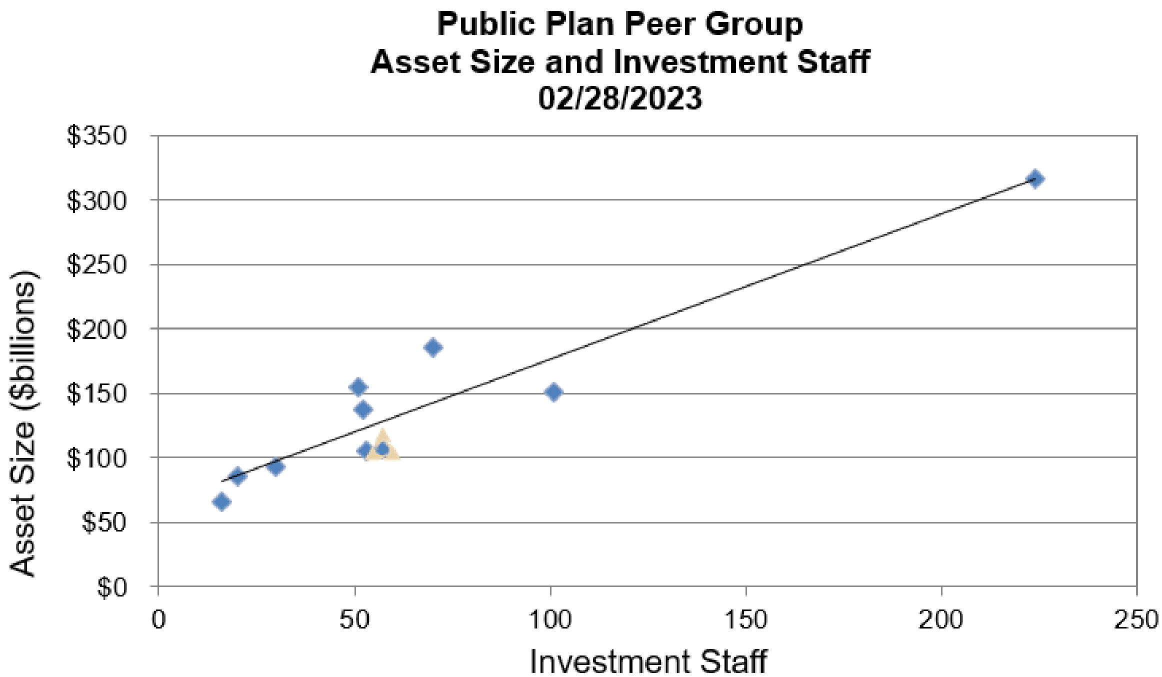
Total Costs

The total costs of the investment program in 2024 are projected to be $542.7 million, or 48.6 basis points of assets under management. External management fees are projected to be $508.1 million in 2024. In 2022 OPERS actual cost of 35.5 basis points (excluding performance fees) was below the CEM benchmark average cost of 40.6 basis points. CEM Benchmarking, Inc. an independent firm that provides an assessment of pension plans, evaluates OPERS investment program relative to a group of comparatively sized peers. CEM Benchmarking excludes the incentive/performance fees for Private Equity and Real Estate in their peer group analysis.

	Estimated 2024 Total Costs ($ millions)			
	Internal Mgmt.	External Mgmt.	Total Investments Division	% of Total
Total Compensation	17.3	4.3	21.6	**4.0%**
Operating Budget less Compensation	7.8	3.1	10.8	**2.0%**
Manager Fees		494.5	494.5	**91.1%**
Custody & Oversight	9.5	6.2	15.7	**2.9%**
Total Costs	**34.6**	**508.1**	**542.7**	**100.0%**
Percent of Total	0.1	0.9		
Average 2023 Asset Size ($ Billions)	61.0	50.6	111.5	
Costs in Basis Points	**5.7**	**100.5**	**NA**	
Costs in Basis Points to Total Fund	**NA**	**NA**	**48.6**	

Peer Group Comparison

The following chart compares the OPERS asset size and Investment Staff to its peer group as of February 28, 2023.



The following table lists the public pension peer group referenced in the chart.

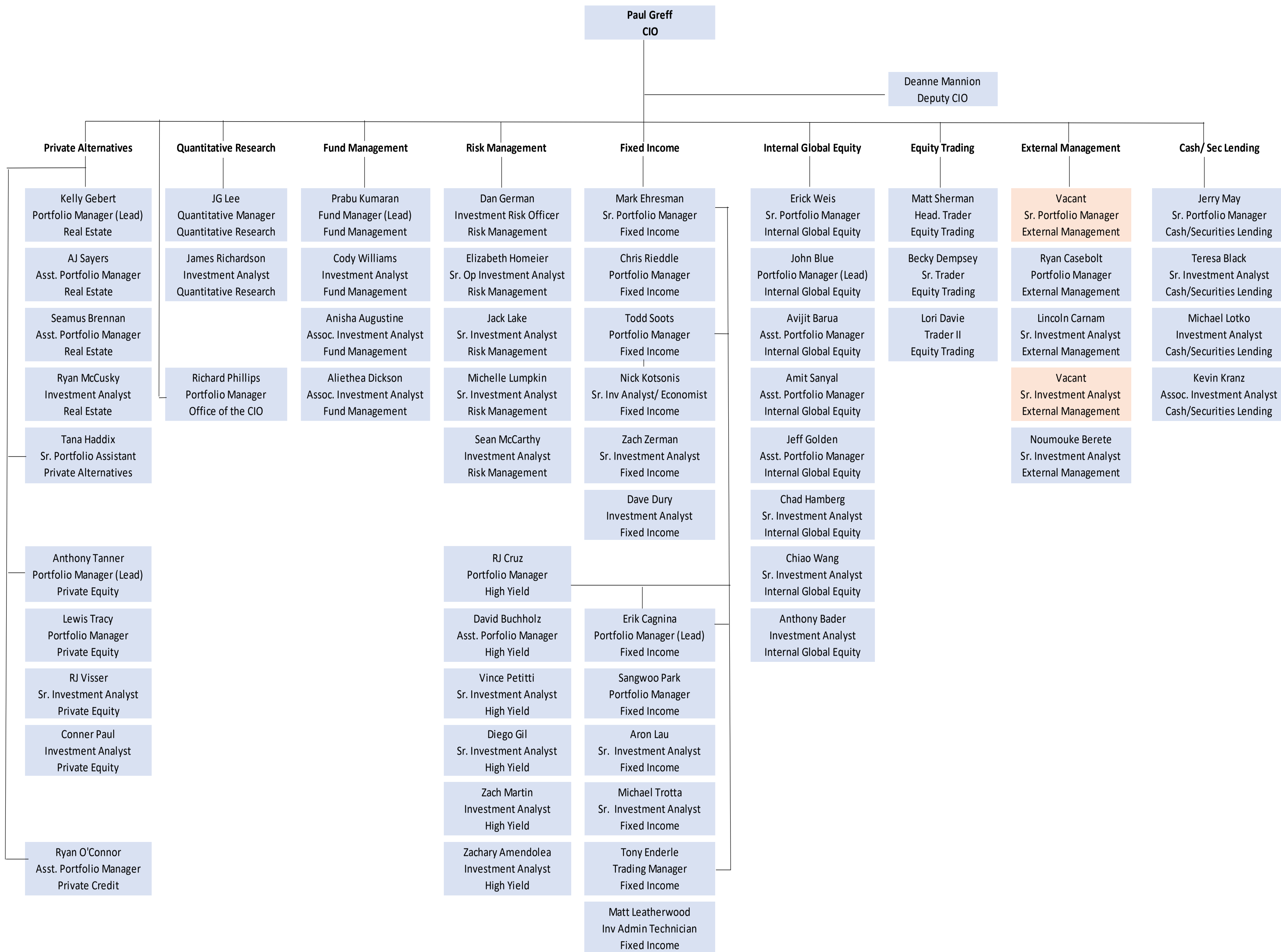
Public Plan Peer Group (as of 2/28/2023)			
Peers	Asset Size ($ millions)	Investment Staff	Asset Size per Investment Staff
California State Teachers' Retirement System	$316,000	224	$1,411
State Board of Administration of Florida	$186,000	70	$2,657
Washington State Investment Board	$155,000	51	$3,039
State of Wisconsin Investment Board	$151,000	101	$1,495
New York State Teachers' Retirement System	$137,000	52	$2,635
Ohio Public Employees Retirement System	**$107,000**	**57**	**$1,877**
Virginia Retirement System	$105,000	53	$1,981
Oregon Public Employees' Retirement Fund	$93,000	30	$3,100
Minnesota State Board of Investments	$85,700	20	$4,285
Teachers' Retirement System of the State of Illinois	$66,000	16	$4,125
Average	**$140,170**	67	**$2,661**

Source: PFDE (Pension Fund Data Exchange), OPERS

*Staffing data sourced from PFDE is as of 02/28/2023

APPENDIX

Investments - Organizational Structure



As of 12/31/2023