# 2023

Ohio Public Employees Retirement System

# ANNUAL INVESTMENT PLAN

Defined Benefit Fund

Health Care 115 Trust Fund

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## Chief Investment Officer's Letter

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

On the behalf of the Investments Division and OPERS Investment Advisor, I am pleased to present the 2023 Annual Investment Plan ("AIP"). The AIP illustrates how OPERS seeks to achieve its performance goals along with the constraints, risks, and resources the Investments Division must work with to achieve long-term return targets. The AIP lays out the performance goals for the Investments Division and provides a framework for OPERS to achieve its long-term goal of securing retirement benefits for our members.

During the first half of the year 2022, Investment Staff ("Staff") successfully implemented its new risk management platform. The risk management system will be transformational over time by providing a common system across all OPERS asset classes. Other key initiatives consisted of the implementation of opportunistic mandates, namely internal Gold and an internal Global Risk Parity portfolio. Major research was completed throughout the year to introduce a new Private Credit allocation in 2023. In addition, in early March, Staff outsourced the management of the Defined Contribution ("DC") Fund – Target Date Funds ("TDF") to a third-party vendor BlackRock while Voya continued to be the master recordkeeper for the DC Fund.

Three major themes dominated the headlines and capital markets in 2022: elevated geopolitical tensions, persistently high inflation and rapidly rising interest rates engineered by a hawkish Federal Reserve to combat inflationary pressures. First, the Russian invasion of Ukraine created a global energy shock and together with rising US-China tensions accelerated the multi-year trend of deglobalization and international decoupling. These forces hastened the ascent of global inflation which had been supported by the unprecedented combination of monetary and fiscal stimulus implemented since the COVID pandemic in 2020. Here in the US, the headline Consumer Price Index reached a high of 9.1% - a level not seen since the 1980's. It was clear the Federal Reserve had misjudged the "transitory" nature of inflation and began an historic rate hiking campaign to bring down inflation. In only nine months the Fed raised rates from 0.25% to 4.50% marking one of the swiftest and largest increases in history. The carnage in financial assets was quick and broad based. For stocks, the S&P 500 was down -18% and the Bloomberg U.S. Aggregate Bond Index was down -13%. This produced one of the worst years on record for a 60/40 portfolio of stocks/bonds, which declined -16%.

In 2022, Staff produced a -12% return for the Defined Benefit Fund, below the 6.9% target return. The results were similar for the Health Care Fund, which returned -15%, falling below its target return of 6.0%. As of December 31, 2022, net assets of the Defined Benefit Fund and the Health Care Fund were $93 billion and $12 billion, respectively, behind the asset growth targets for both funds.

Staff would like to acknowledge the assistance and advice of OPERS Investment Advisor NEPC. While consultants to OPERS Retirement Board and Staff are strictly advisory, their knowledge, experience, and insights are valued and appreciated. Staff would also like to acknowledge the critically important work of many others at OPERS who make the Investments Division's work possible. While a complete list is impossible, the invaluable assistance of Investment Accounting,

## CHIEF INVESTMENT OFFICER'S LETTER

Operations and Compliance, Legal Services, Information Technology, Executive Services, Internal Audit, Human Resources, and Enterprise Risk are greatly appreciated.

Finally, I would like to thank the OPERS Retirement Board members for their confidence in Staff, for the resources they make available to us, and for their continued judicious oversight of the Investments Division for our members.

Paul T. Greff
Chief Investment Officer
January 18, 2023

## 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 at the January 2023 Board meeting. Staff expects the DB Fund and HC Fund transition to be completed by the end of the first quarter of 2023, except for Private Credit allocation in the DB Fund.

The following table outlines the projected base case returns with ranges for both the Defined Benefit and Health Care Funds. The base case 2023 return expectations are slightly higher than 2022 for both the Defined Benefit and Health Care Funds due to higher expected returns for the Public Equity, Fixed Income and Alternatives Asset Classes.

| | Base Case Return* | Return Range | Active Return | Tracking Error | Information Ratio |
|---|---|---|---|---|---|
| **Defined Benefit Fund** | | | | | |
| **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 |
| **2021** | 6.40 | -7.35 to 20.15 | 0.36 | 0.90 | 0.40 |
| **Health Care Fund** | | | | | |
| **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 |
| **2021** | 5.38 | -7.12 to 17.88 | 0.26 | 0.66 | 0.40 |

*Source: 2023 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** | | |
| **2023** | 0.21 | 0.39 |
| **2022** | 0.21 | 0.36 |
| **2021** | 0.22 | 0.36 |
| **Health Care Fund** | | |
| **2023** | 0.15 | 0.26 |
| **2022** | 0.15 | 0.26 |
| **2021** | 0.16 | 0.26 |

# EXECUTIVE SUMMARY

**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 2023 as part of Asset and Liability study and dynamic asset allocation with Staff support. Staff will continue its focus on reviewing the existing line-up of managers and portfolios in the context of internal versus external management with an emphasis on reducing management fees by bringing additional assets in-house.

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, 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 being managed internally, with approximately 50% 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, Staff is continuing to wind down the remaining assets in the terminated Hedge Fund allocation. By mid-2023, most of these assets will be liquidated from the three remaining managers. 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 2022 strategic initiatives and new 2023 strategic initiatives are highlighted below.

**<u>2022 Completed Initiatives</u>**

- Implementation of a new Investments portfolio and risk system.
- New Stable Value benchmark for Defined Contribution Fund.
- Research return enhancing and risk diversifying assets: Gold, Infrastructure and Private Credit.

## 2023 Initiatives

- Implementation of an upgraded Portfolio Management system for Private Alternatives.
- 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.

**Resources**

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

The Investments Division submitted an estimated operating budget of $20.4 million for 2023. The budget includes the Finance Division's estimate of the 2023 incentive compensation payout, based on the prior year's budget. The budget incorporates the Investments Division's effort 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 46.8 basis points. or $488.7 million. This is a reduction in fees from the prior year primarily due to reductions in externally managed public market assets and lower management fees negotiated by Staff. 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, 2023. Pessimistic and optimistic cases are also provided for comparison purposes.

| | Defined Benefit Fund<br>2023 Expected Asset Growth<br>Estimated Market Values, Returns and Cash Flows | | |
|---|---|---|---|
| | Pessimistic Case | Base Case | Optimistic Case |
| **12/31/22 Market Value ($ billions)** | $92.57 | $92.57 | $92.57 |
| **Expected Total Return** | -7.79% | 7.86% | 23.50% |
| **Expected Investment Gain ($ billions)** | -$7.21 | $7.27 | $21.76 |
| **Expected Cash Flow ($ billions)** | -$3.60 | -$3.60 | -$3.60 |
| **12/31/23 Market Value ($ billions)** | $81.76 | $96.25 | $110.73 |

The base market value of $92.57 billion for December 31, 2022, is based on the unaudited financial BNY performance report.

### Asset Allocation – Defined Benefit Fund

The 2023 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 2022 (refer to page 22).

| Asset Class | 12/31/2022 Target | 12/31/2023 Target | Range | Peer Group |
|---|---|---|---|---|
| **Public Equity** | **46.4%** | **44.8%** | **27% to 67%** | **41.26%** |
| U.S. Equity | 23.4% | 23.8% | 19% to 29% | 24.76% |
| Non-U.S. Equity | 23.0% | 21.0% | 16% to 26% | 16.51% |
| **Fixed Income** | **24.0%** | **23.0%** | **16% to 30%** | **17.16%** |
| Core Fixed | 11.0% | 10.0% | 7% to 13% | 12.84% |
| Securitized Debt | 1.0% | 1.0% | 0% to 2% | 0.00% |
| TIPS | 3.0% | 3.0% | 0% to 5% | 1.24% |
| High Yield | 2.0% | 3.0% | 0% to 5% | 1.89% |
| Emerging Markets Debt | 4.0% | 1.0% | 0% to 4% | 1.20% |
| U.S. Treasury | 3.0% | 3.0% | 0% to 5% | 0.00% |
| Inv. Grade Credit | 0.0% | 2.0% | 0% to 4% | |
| **Alternatives** | **24.6%** | **30.2%** | **16% to 30%** | **33.24%** |
| Private Equity | 12.0% | 15.0% | 10% to 20% | 16.06% |
| Real Estate | 10.0% | 12.0% | 7% to 17% | 11.51% |
| Hedge Funds | 0.0% | 0.0% | 0% to 1% | 4.41% |
| Opportunistic | 0.6% | 0.2% | 0% to 4% | 0.00% |
| Commodities | 1.0% | 2.0% | 0% to 4% | 1.25% |
| REITs | 1.0% | 1.0% | 0% to 2% | |
| Private Credit | 0.0% | 0.0% | 0% to 3% | |
| **Risk Parity** | **5.0%** | **2.0%** | **0% to 4%** | **0.00%** |
| **Other** | | | | **8.34%** |
| **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** | **23.8%** | 12 | 3 | 30 | 0-100 | 0.40 |
| **Non-U.S. Equity** | **21.0%** | 60 | 13 | 150 | 0-300 | 0.40 |
| **Fixed Income** | **23.0%** | 17 | 4 | 50 | 0-200 | 0.34 |
| **Alternatives** | **30.2%** | 64 | 19 | 500 | 250-750 | 0.13 |
| **Risk Parity** | **2.0%** | 0 | 0 | 100 | 0-200 | NA |
| **Defined Benefit Fund** | **100.0%** | **NA** | **39** | **97** | **0-300** | **0.40** |

The table above shows an anticipated active management contribution of 39 basis points to the Defined Benefit Fund's return for 2023. The estimated tracking error of 97 basis points indicates a 68% probability that the active return will be in a range of -58 basis points to +136 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 interest rate 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 7.86% is comprised of an expected return of 7.47% from the policy mix and an additional contribution of 0.39% 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.

| 2023 Policy Return Assumptions | | | |
|---|---|---|---|
| **Asset Classes** | **Pessimistic** | **Base** | **Optimistic** |
| **Public Equity** | **-11.25%** | **7.55%** | **26.35%** |
| U.S. Equity | -11.00% | 6.58% | 24.16% |
| Non-U.S. Equity | -13.53% | 8.28% | 30.09% |
| **Fixed Income** | **0.16%** | **5.41%** | **10.66%** |
| Core Fixed | -0.76% | 4.86% | 10.48% |
| Securitized Debt | -3.70% | 7.53% | 18.76% |
| Emerging Markets Debt | -4.59% | 7.83% | 20.25% |
| High Yield | -3.70% | 7.53% | 18.76% |
| TIPS | -1.41% | 4.37% | 10.16% |
| U.S. Treasury | -1.08% | 4.22% | 9.52% |
| Inv. Grade Credit | -1.06% | 6.25% | 13.57% |
| **Alternatives** | **-9.23%** | **7.98%** | **25.19%** |
| Private Equity | -15.33% | 9.87% | 35.06% |
| Real Estate | -10.27% | 5.20% | 20.67% |
| Opportunistic | -10.52% | 6.09% | 22.70% |
| Commodities | -14.40% | 4.10% | 22.60% |
| REITs | -14.34% | 7.04% | 28.42% |
| Private Credit | -2.82% | 8.80% | 20.42% |
| **Risk Parity** | **-5.75%** | **6.52%** | **18.79%** |
| **Policy Return** | **-6.65%** | **7.47%** | **21.59%** |

| 2023 Total Return Assumptions | | | |
|---|---|---|---|
| **Sources of Return** | **Pessimistic** | **Base** | **Optimistic** |
| **Policy** | -6.65% | 7.47% | 21.59% |
| **Active** | -0.58% | 0.39% | 1.35% |
| **Total Return** | **-7.79%** | **7.86%** | **23.50%** |

| 2023 Total Risk and Active Risk Assumptions | | | |
|---|---|---|---|
| **Sources of Risk** | **Variability Risk** | **Information Ratio** | **Sharpe Ratio*** |
| **Policy** | 14.12% | | 0.25 |
| **Active** | 0.97% | 0.40 | |
| **Total Risk** | **15.65%** | | **0.25** |

*The Sharpe Ratio reflects 3.9% (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, 2023. Pessimistic and optimistic cases are also provided for comparison purposes.

| | Health Care Fund 2023 Expected Asset Growth Estimated Market Values, Returns and Cash Flows | | |
|---|---|---|---|
| | Pessimistic Case | Base Case | Optimistic Case |
| **12/31/22 Market Value ($ billions)** | $11.70 | $11.70 | $11.70 |
| **Expected Total Return** | -5.88% | 7.26% | 20.40% |
| **Expected Investment Gain ($ billions)** | -$0.69 | $0.85 | $2.39 |
| **Expected Cash Flow ($ billions)** | -$1.08 | -$1.08 | -$1.08 |
| **12/31/23 Market Value ($ billions)** | $9.93 | $11.47 | $13.00 |

The base market value of $11.7 billion for December 31,2022 is based on the unaudited financial BNY performance report.

**Asset Allocation – Health Care Fund**

The 2023 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 | 12/31/2022 Target | 12/31/2023 Target | Range |
|---|---|---|---|
| **Public Equity** | **52.4%** | **52.4%** | **33% to 73%** |
| U.S. Equity | 27.4% | 27.4% | 23% to 33% |
| Non-U.S. Equity | 25.0% | 25.0% | 20% to 30% |
| **Fixed Income** | **34.0%** | **34.0%** | **24% to 44%** |
| Core Fixed | 17.0% | 17.0% | 12% to 22% |
| Securitized Debt | 2.0% | 2.0% | 0% to 4% |
| TIPS | 7.0% | 7.0% | 0% to 9% |
| High Yield | 4.0% | 4.0% | 0% to 6% |
| Emerging Markets Debt | 2.0% | 2.0% | 0% to 4% |
| Inv. Grade Credit | 0.0% | 0.0% | 0% to 3% |
| U.S. Treasury | 2.0% | 2.0% | 0% to 4% |
| **Alternatives** | **11.6%** | **11.6%** | **8% to 14%** |
| REITs | 7.0% | 7.0% | 0% to 9% |
| Hedge Funds | 0.0% | 0.0% | 0% to 2% |
| Opportunistic | 0.6% | 0.6% | 0% to 5% |
| Commodities | 4.0% | 4.0% | 0% to 6% |
| **Risk Parity** | **2.0%** | **2.0%** | **0% to 4%** |
| **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** | **27.8%** | 12 | 3 | 30 | 0-100 | 0.40 |
| **Non-U.S. Equity** | **25.0%** | 60 | 15 | 150 | 0-300 | 0.40 |
| **Fixed Income** | **34.0%** | 18 | 6 | 50 | 0-200 | 0.36 |
| **Alternatives** | **11.2%** | 13 | 1 | 300 | 200-400 | 0.04 |
| **Risk Parity** | **2.0%** | 0 | 0 | 100 | 0-200 | NA |
| **Health Care Fund** | **100.0%** | **NA** | **26** | **65** | **0-300** | **0.40** |

The table above shows an anticipated active management contribution of 26 basis points to the Health Care Fund's return for 2023. The estimated tracking error of 65 basis points indicates a 68% probability that the active return will be in a range of -39 basis points to +91 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 interest rate 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 7.26% is comprised of an expected return of 7.00% from the policy mix and an additional contribution of 0.26% 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.

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

| 2023 Policy Return Assumptions | | | |
|---|---|---|---|
| **Asset Classes** | **Pessimistic** | **Base** | **Optimistic** |
| **Public Equity** | **-11.26%** | **7.55%** | **26.36%** |
| U.S. Equity | -11.00% | 6.58% | 24.16% |
| Non-U.S. Equity | -13.53% | 8.28% | 30.09% |
| **Fixed Income** | **0.19%** | **5.47%** | **10.75%** |
| Core Fixed | -0.76% | 4.86% | 10.48% |
| Securitized Debt | -3.70% | 7.53% | 18.76% |
| Emerging Markets Debt | -4.59% | 7.83% | 20.25% |
| High Yield | -3.70% | 7.53% | 18.76% |
| TIPS | -1.41% | 4.37% | 10.16% |
| U.S. Treasury | -1.08% | 4.22% | 9.52% |
| Inv. Grade Credit | -1.06% | 6.25% | 13.57% |
| **Alternatives** | **-9.30%** | **6.56%** | **22.42%** |
| REITs | -14.34% | 7.04% | 28.42% |
| Opportunistic | -10.52% | 6.09% | 22.70% |
| Commodities | -14.40% | 4.10% | 22.60% |
| **Risk Parity** | **-5.75%** | **6.52%** | **18.79%** |
| **Policy Return** | **-5.12%** | **7.00%** | **19.12%** |

| 2023 Total Return Assumptions | | | |
|---|---|---|---|
| **Sources of Return** | **Pessimistic** | **Base** | **Optimistic** |
| **Policy** | -5.12% | 7.00% | 19.12% |
| **Active** | -0.39% | 0.26% | 0.91% |
| **Total Return** | **-5.88%** | **7.26%** | **20.40%** |

| 2023 Total Risk and Risk Attribution Assumptions | | | |
|---|---|---|---|
| **Sources of Risk** | **Variability Risk** | **Information Ratio** | **Sharpe Ratio*** |
| **Policy** | 12.12% | | 0.26 |
| **Active** | 0.65% | 0.40 | |
| **Total Risk** | **13.14%** | | **0.26** |

*The Sharpe Ratio reflects 3.9% (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 2023.

**Capital Markets Observations**

- **Key Market Themes**
  - Stagflation dynamics pose a challenge to portfolio diversification and represent a headwind for equity valuations and profit margins.
  - The path of U.S. corporate earnings does not reflect material weakness for 2023 despite the tightening monetary policy environment.
  - Europe's economy is exposed to an energy shock as its infrastructure undergoes an emergency transplant to pivot from Russian energy.
  - China's zero-COVID policy had global supply chain implications and continues to impact consumer spending and industrial activity.
  - U.S. Dollar strength reveals risks in the global financial system and will continue to pressure weaker markets, companies, and nations.

**Market Outlook**

- **U.S. and Non-U.S. Equities**
  - NEPC recommends investors maintain an underweight equity posture due to concerns related to the path of corporate earnings and stagflation growth dynamics.
  - Conviction remains high regarding the addition of value exposure to U.S. large-cap equity.

- **Fixed Income**
  - Despite the challenging environment, NEPC encourages maintaining adequate portfolio duration with safe-haven fixed income exposure.
  - NEPC also recommends investors look to build exposure to short-term investment grade credit as higher yields boost our outlook relative to risk assets.

- **Real Assets**
  - We expect 2023 to be a year of both challenges and opportunities as markets continue to evolve and react to macroeconomic shifts.
    - Rising interest rates, limited debt availability, and diminished office occupancy weigh on real estate markets.

- Well-capitalized investors can take advantage of potential distress in the real estate market.
  - Debt funds, opportunistic funds, and skilled "sharpshooters" should be well-positioned.
  - Secondaries opportunities may arise from LPs seeking liquidity
- Secular trends continue to drive opportunities for real assets
  - Strong demand tailwinds persist for digital infrastructure
  - Energy transition and renewables theme creates opportunities across infrastructure and mining strategies.
- Continue to follow private market best-practices – stick to your pacing plan and ensure vintage year diversification.

- **Private Equity**
  - An ebullient 2021 market environment buoyed fundraising during 1H 2022. As macro concerns intensified through the year and capital deployment slowed, fundraising timelines extended and resulted in a much slower fundraising environment during the second half of the year.
  - Deal activity was meaningfully lower throughout the year relative to 2021, reflecting a general uncertainty about the economy. Exit activity was extremely subdued, as the "IPO window" effectively closed. This is likely to create opportunities for secondary buyers that can step in as liquidity providers.
  - While PE and VC valuations have mostly plateaued, a full-scale valuation reset has yet to impact markets in the same way public equity multiples have been impacted. This has delayed write downs of currently invested funds, although we expect more meaningful downside marks in the coming quarters.
  - Second half 2022 dynamics are likely to continue throughout 2023, e.g., extended fundraises, lower deal activity, and subdued exit activity.
  - Recession-era and recovery vintage years have historically been some of the most attractive times to commit to private equity.

# 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 12 basis points, net of fees. The tracking error target is 30 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<br>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* | 12 | 30 | 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<br>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 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 Credit Corporate Index* | 30 | 75 | 0.40 | 0 - 100 |

*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<br>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 CP Index.

### Securities Lending

In the securities lending program, Staff manages two lending portfolios and utilizes a lending agent to maximize lending revenue. Staff strives 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<br>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 Index* | 100 | 700 | 0.14 | NA |
| **Real Estate** | *Net NFI-ODCE + 0.85%* | 30 | 700 | 0.04 | NA |
| **Opportunistic** | *Custom Benchmark** | 0 | 40 | NA | NA |
| **REITs** | *DJ U.S. Select RESI* | 0 | 10 | NA | 0 - 250 |
| **Commodities** | *Bloomberg Commodity Index* | 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 three Global strategies within the Opportunistic Asset Class. Staff manages $400 million in an Internal Risk Parity portfolio. This portfolio has a volatility target of 8% and is benchmarked to the S&P Global Risk Parity Index – 8% Target Volatility. The second strategy is active currency and is managed by an external manager. The active currency strategy was funded with $200 million in the fourth quarter of 2021 and currently has an AUM of $480 million. The third strategy is Internal Gold portfolio and currently has an AUM of $185 million

## Hedge Funds (In Liquidation)

The Hedge Funds allocation was terminated in 2020 and the remaining assets of approximately $50 million are being liquidated. The custom benchmark for 2023 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 external OPERS Risk Parity asset class 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 CONTRIBTUION 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 |

**INVESTMENT-WIDE POLICIES**

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

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

### 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 Funds 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

### 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 2023.

| | Target Staffing for Year End 2023 | | | | | |
|---|---|---|---|---|---|---|
| | Office of the CIO | Fund Mgmt. | Risk Mgmt. | Internal Funds | External Funds | Total Invest. Division |
| **2023 Investment Plan Projected Staffing** | 4 | 4 | 5 | 33 | 16 | 62 |
| **Current Staffing** | 4 | 4 | 5 | 30 | 11 | 54 |
| **Vacant Positions - To be filled in 2023** | 0 | 0 | 0 | 3 | 5 | 8 |
| **Year End 2023 Target Staffing** | 4 | 4 | 5 | 33 | 16 | 62 |

| | Current Open and Budgeted Positions | |
|---|---|---|
| | Position | Vacant |
| **Internal Management** | Investment Analyst - Cash/Sec Lending | 1 |
| **Internal Management** | Investment Analyst - High Yield | 1 |
| **External Management** | Portfolio Manager - Private Credit | 1 |
| **External Management** | Portfolio Manager - Private Real Estate | 1 |
| **External Management** | Investment Analyst - Private Real Estate | 1 |
| **Internal Management** | Sr. Investment Analyst - High Yield | 1 |
| **External Management** | Sr. Portfolio Manager - EPM | 1 |
| **External Management** | Sr. Portfolio Manager - Private Alternatives | 1 |
| **Total** | | **8** |

### Staffing Costs

Assuming full staffing levels in 2023, the chart below details the estimated $20.42 million of salaries, benefits, and incentive compensation for the Investments Division. This represents approximately 1.96 basis points of cost, an increase of 0.42 basis points from the 2022 projection.

| | Estimated 2023 Total Compensation Costs ($ millions) | | | | |
|---|---|---|---|---|---|
| | Office of the CIO | Internal Mgmt. | External Mgmt. | 2023 Projected Total | 2022 Projected Total |
| **Salaries** | $2.52 | $6.25 | $2.30 | $11.07 | $9.56 |
| **Benefits** | $1.26 | $3.17 | $1.13 | $5.56 | $4.99 |
| **Incentive Compensation** | $0.77 | $2.38 | $0.63 | $3.78 | $4.50 |
| **Total Compensation** | $4.55 | $11.81 | $4.06 | $20.42 | $19.05 |
| **Average Assets ($ billions)** | $104.27 | $56.67 | $47.60 | $104.27 | $123.89 |
| **Compensation (Basis Points)** | 0.44 | 2.08 | 0.85 | 1.96 | 1.54 |

**Operating Budget**

The Investments Division's 2023 operating budget (excluding compensation) is $10.23 million. This operating budget reflects a decrease of $0.11 million, or 1.1% percent, from the 2022 budget and, as a percentage of assets, is 0.98 basis points as compared to 0.82 basis points in 2022. The increase in bps is due to the decrease in AUM.

| | Operating Budget less Total Compensation ($ millions) | | |
|---|---|---|---|
| | Internal Mgmt. | External Mgmt. | Total Invest. Division |
| **2022 Operating Budget** | $7.83 | $2.29 | $10.12 |
| **2023 Operating Budget** | $7.63 | $2.60 | $10.23 |
| **Percent Change** | -2.6% | 13.5% | 1.1% |
| **Percent of Total** | 74.6% | 25.4% | 100.0% |
| **Average Assets ($ billions)** | $56.67 | $47.60 | $104.27 |
| **Operating Budget (Basis Points)** | 1.35 | 0.55 | 0.98 |

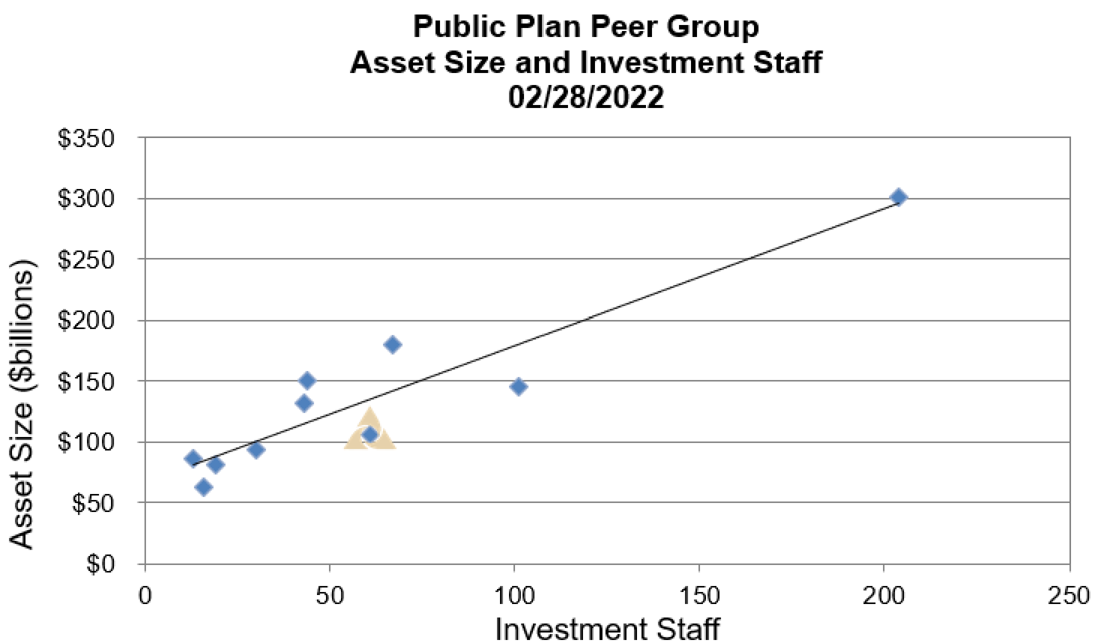
**Total Costs**

The total costs of the investment program in 2023 are projected to be $488.7 million, or 46.8 basis points of assets under management. External management fees are projected to be $456.6 million in 2023. In 2021 OPERS actual cost of 33.9 basis points (excluding performance fees) was below the CEM benchmark average cost of 37.1 basis points. CEM Benchmarking, Inc, an independent firm that provides an assessment of pension plans, evaluates OPERS investment program relative to the peer group of comparable size. CEM Benchmarking excludes the incentive/performance fees for Private Equity and Real Estate in their peer group analysis.

| | Estimated 2023 Total Costs ($ millions) | | | |
|---|---|---|---|---|
| | Internal Mgmt. | External Mgmt. | Total Invest. Division | % of Total |
| Total Compensation | 16.4 | 4.1 | 20.4 | **4.2%** |
| Operating Budget less Compensation | 7.6 | 2.6 | 10.2 | **2.1%** |
| Manager Fees | | 444.8 | 444.8 | **91.0%** |
| Custody & Oversight | 8.1 | 5.1 | 13.3 | **2.7%** |
| **Total Costs** | **32.1** | **456.6** | **488.7** | **100.0%** |
| Percent of Total | 0.1 | 0.9 | | |
| Average 2022 Asset Size ($ Billions) | 56.7 | 47.6 | 104.3 | |
| **Costs in Basis Points** | **5.7** | **95.9** | **NA** | |
| **Costs in Basis Points to Total Fund** | **NA** | **NA** | **46.8** | |

**Peer Group Comparison**

The following chart compares the OPERS asset size and Investment Staff to its peer group as of February 28, 2022.



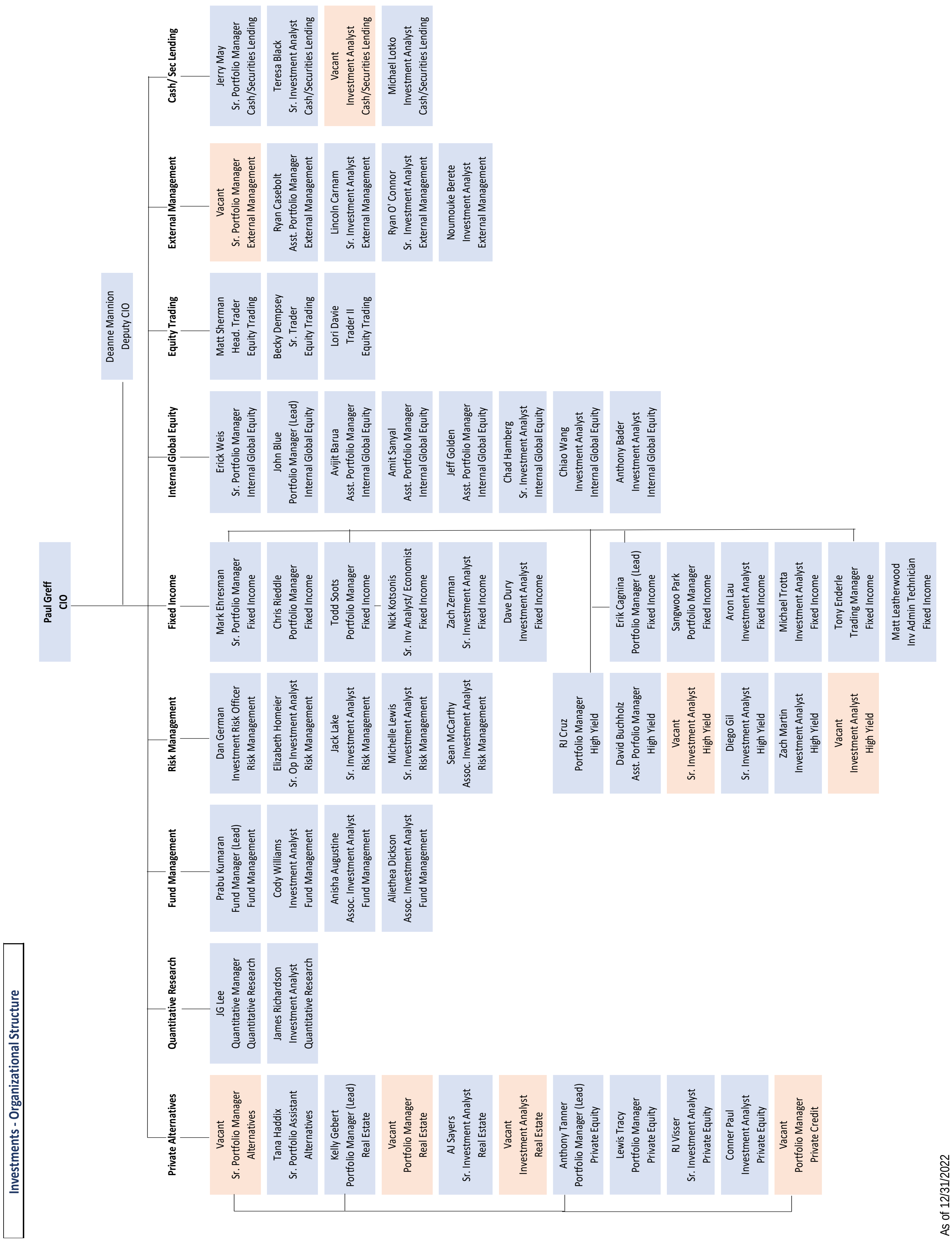

The following table lists the public pension peer group referenced in the chart.

| Public Plan Peer Group (as of 2/28/2022) | | | |
|---|---|---|---|
| Peers | Asset Size ($ millions) | Investment Staff | Asset Size per Investment Staff |
| California State Teachers' Retirement System | $301,600 | 204 | $1,478 |
| State Board of Administration of Florida | $180,000 | 67 | $2,687 |
| Washington State Investment Board | $149,982 | 44 | $3,409 |
| State of Wisconsin Investment Board | $145,800 | 101 | $1,444 |
| New York State Teachers' Retirement System | $132,300 | 43 | $3,077 |
| **Ohio Public Employees Retirement System** | **$105,700** | **61** | **$1,733** |
| Oregon Public Employees' Retirement Fund | $93,300 | 30 | $3,110 |
| New Jersey Division of Investment | $86,700 | 13 | $6,669 |
| Minnesota State Board of Investments | $81,300 | 19 | $4,279 |
| Teachers' Retirement System of the State of Illinois | $62,700 | 16 | $3,919 |
| **Average** | **$133,938** | 60 | **$3,180** |

Source: PFDE (Pension Fund Data Exchange), OPERS

*Staffing data sourced from PFDE is as of 02/28/2022

# APPENDIX


Investments - Organizational Structure
Paul Greff
CIO
Deanne Mannion
Deputy CIO
Private Alternatives
Vacant
Sr. Portfolio Manager
Alternatives
Tana Haddix
Sr. Portfolio Assistant
Alternatives
Kelly Gebert
Portfolio Manager (Lead)
Real Estate
Vacant
Portfolio Manager
Real Estate
AJ Sayers
Sr. Investment Analyst
Real Estate
Vacant
Investment Analyst
Real Estate
Anthony Tanner
Portfolio Manager (Lead)
Private Equity
Lewis Tracy
Portfolio Manager
Private Equity
RJ Visser
Sr. Investment Analyst
Private Equity
Conner Paul
Investment Analyst
Private Equity
Vacant
Portfolio Manager
Private Credit
Quantitative Research
JG Lee
Quantitative Manager
Quantitative Research
James Richardson
Investment Analyst
Quantitative Research
Fund Management
Prabu Kumaran
Fund Manager (Lead)
Fund Management
Cody Williams
Investment Analyst
Fund Management
Anisha Augustine
Assoc. Investment Analyst
Fund Management
Aliethea Dickson
Assoc. Investment Analyst
Fund Management
Risk Management
Dan German
Investment Risk Officer
Risk Management
Elizabeth Homeier
Sr. Op Investment Analyst
Risk Management
Jack Lake
Sr. Investment Analyst
Risk Management
Michelle Lewis
Sr. Investment Analyst
Risk Management
Sean McCarthy
Assoc. Investment Analyst
Risk Management
Fixed Income
Mark Ehresman
Sr. Portfolio Manager
Fixed Income
Chris Rieddle
Portfolio Manager
Fixed Income
Todd Soots
Portfolio Manager
Fixed Income
Nick Kotsonis
Sr. Inv Analyst/ Economist
Fixed Income
Zach Zerman
Sr. Investment Analyst
Fixed Income
Dave Dury
Investment Analyst
Fixed Income
RJ Cruz
Portfolio Manager
High Yield
David Buchholz
Asst. Porfolio Manager
High Yield
Vacant
Sr. Investment Analyst
High Yield
Diego Gil
Sr. Investment Analyst
High Yield
Zach Martin
Investment Analyst
High Yield
Vacant
Investment Analyst
High Yield
Erik Cagnina
Portfolio Manager (Lead)
Fixed Income
Sangwoo Park
Portfolio Manager
Fixed Income
Aron Lau
Investment Analyst
Fixed Income
Michael Trotta
Investment Analyst
Fixed Income
Tony Enderle
Trading Manager
Fixed Income
Matt Leatherwood
Inv Admin Technician
Fixed Income
Internal Global Equity
Erick Weis
Sr. Portfolio Manager
Internal Global Equity
John Blue
Portfolio Manager (Lead)
Internal Global Equity
Avijit Barua
Asst. Portfolio Manager
Internal Global Equity
Amit Sanyal
Asst. Portfolio Manager
Internal Global Equity
Jeff Golden
Asst. Portfolio Manager
Internal Global Equity
Chad Hamberg
Sr. Investment Analyst
Internal Global Equity
Chiao Wang
Investment Analyst
Internal Global Equity
Anthony Bader
Investment Analyst
Internal Global Equity
Equity Trading
Matt Sherman
Head. Trader
Equity Trading
Becky Dempsey
Sr. Trader
Equity Trading
Lori Davie
Trader II
Equity Trading
External Management
Vacant
Sr. Portfolio Manager
External Management
Ryan Casebolt
Asst. Portfolio Manager
External Management
Lincoln Carnam
Sr. Investment Analyst
External Management
Ryan O' Connor
Sr. Investment Analyst
External Management
Noumouke Berete
Investment Analyst
External Management
Cash/ Sec Lending
Jerry May
Sr. Portfolio Manager
Cash/Securities Lending
Teresa Black
Sr. Investment Analyst
Cash/Securities Lending
Vacant
Investment Analyst
Cash/Securities Lending
Michael Lotko
Investment Analyst
Cash/Securities Lending
As of 12/31/2022