



HPOPS[®]

FOR TODAY & TOMORROW

June 14, 2023

Texas Pension Review Board
300 West 15th Street, Suite 406
William P. Clements State Office Building
Austin, Texas 78701

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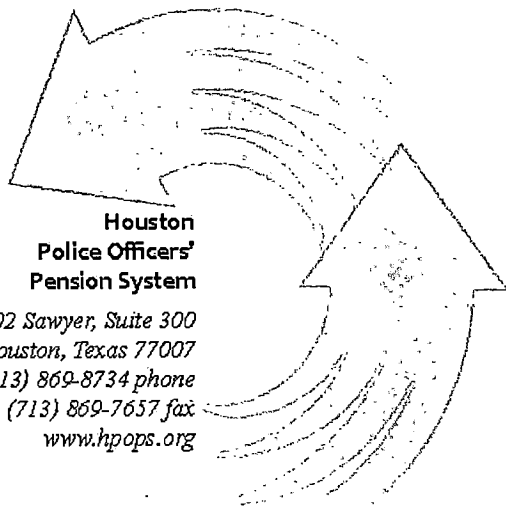
Patrick S. Franey

Dear Sirs:

Enclosed please find the Investment Performance Evaluation report for 2023 as required by Section 802.109 of the Texas Government Code for the Houston Police Officers' Pension System. If you have any questions please do not hesitate to contact me.

Sincerely,

Patrick S. Franey
Executive Director



**Houston
Police Officers'
Pension System**

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MAY 2023

Investment Practices and Performance Evaluation

Houston Police Officers' Pension System

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Section 1 - Executive Summary

Through our evaluation process, we found HPOPS to be a well-managed plan with a well-defined and disciplined governance structure, a strong and ethical culture, clear decision-making processes, and an institutional quality investment strategy. We found no critical-path practices which we believe would imperil the health and solvency of the Plan. We found HPOPS to be somewhat unique relative to many of its peers in that they do not utilize a general consultant to assist with program implementation. However, this has not hindered their long-term performance, which places them in the top percentile among their public fund peers over the long-term. Through our detailed review, we developed a number of recommendations for consideration by the HPOPS' Board and Staff that we have included throughout this report.

Section 2 - Introduction

Verus was retained by the Board of Trustees of the Houston Police Officers' Pension System ("HPOPS" or "the Plan") to conduct an investment program review in satisfaction of the requirements stated in [Texas Government Code Section 802.109 Investment Practices and Performance Reports](#).

Verus is an institutional investment consulting firm acting as an independent reviewer of HPOPS' overall investment program. We conducted a thorough programmatic review, utilizing the aggregate experience of a team of investment professionals assigned to this project. We are not an audit firm and did not conduct our work from that perspective. Rather, we are an investment advisory firm with decades of experience implementing leading practice investment solutions for our institutional investor clients. We drew on that experience to form opinions and judgments about HPOPS' investment program. The areas covered in this report are in alignment with those found in [Section 10A of Article 6243g-4 of the Texas Civil Statutes](#) and the Pension Review Board's [Guidance for Investment Practices and Performance Evaluations](#) (adopted October 17, 2019; Updated October 6, 2022).

Each of the reference documents listed above imply modestly different perspectives on the elements of the investment program to be assessed. We have chosen to focus on the following areas as most relevant to HPOPS' investment program:

- Policy compliance;
- Asset allocation;
- Leverage;
- Portfolio structure;
- Portfolio implementation
- FX hedging;
- Performance benchmarking;
- Liquidity; and
- Investment management fees

In our experience, there exists no single set of best practices for all investors to follow in the development and implementation of a successful investment program. Therefore, we defined the scope of our mandate to be to assess the reasonableness of the practices associated with each program element reviewed and to offer recommendations to be considered by the Board.

Section 3 - Methodology

In completing this report, we utilized three main approaches to evaluate the areas of focus: Trustee and Investment Staff interviews, document review, and quantitative portfolio analysis.

Interviews

As a part of our evaluation procedures, we met with the following Board and Staff members, either in person or through video conference interviews:

- Dwayne Ready – Chairman of the Board of Trustees
- Terry Bratton – Vice Chairman of the Board of Trustees
- Trey Coleman – Chairman of the Investment Committee
- George Guerrero – Trustee
- Steven Le – Trustee
- Melissa Dubowski – Trustee
- Don Sanders – Trustee
- Pat Franey – Executive Director
- Stacey Ables – Chief Investment Officer
- Neal Wallach – Investment Officer
- Andrew Risken – Investment Analyst
- Nick Dang – General Counsel

Broadly speaking, the interviews were conducted to: obtain an understanding of the working relationship between and among Trustees and staff; uncover general concerns and identify improvement opportunities; and identify areas for further investigation. We specifically asked about Board and Staff effectiveness with respect to culture, structure, resource sufficiency, decision-making processes, and policy compliance. We also initiated unstructured discussion with open-ended questions about what is currently working well and what opportunities may exist to enhance the Plan's operations and performance.

Document Review

The Verus Project Team reviewed a full set of representative documents, including:

- Investment Policy
- Ethics Policy
- Board and Staff reports
- Board education materials
- Comprehensive Annual Financial Reports (CAFR)
- Third-party work product

Observations made during our document review provided us with key insights into HPOPS' work processes and helped us to identify opportunities to enhance the Plan's operations and performance.

Quantitative Analysis

Members of our Portfolio Analytics and Risk Advisory Services groups conducted the following quantitative analyses to assess the reasonableness of HPOPS' investment strategy:

- Mean Variance Analysis
- Performance Analysis
- Liquidity Analysis

Section 4 - Evaluation

Policy Review

We reviewed HPOPS' Investment Policy Statement and Code of Ethics for reasonableness, structure, and compliance. Within the Investment Policy, there exist a number of requirements which dictate how the Plan shall be managed. We reviewed these requirements in detail and sought documentary evidence demonstrating compliance. Through our review, we found HPOPS takes compliance very seriously, and we found that HPOPS closely follows both the letter and spirit of its policies in most cases. However, we identified certain areas where Policy has not been updated to match current practice, and our recommendations in these areas are detailed below.

Investment Policy Statement (effective date: 9/8/22)

The investment policy statement (IPS) serves as a strategic guide in the planning and implementation of an investment program. When implemented successfully, the IPS anticipates issues related to governance of the investment program, planning for appropriate asset allocation, implementing an investment program with internal and/or external managers, monitoring the results, risk management, and appropriate reporting. The IPS also establishes accountability for the various entities that may work on behalf of an investor. Perhaps most importantly, the IPS serves as a roadmap offering an objective course of action to be followed during periods of market disruption when emotional or instinctive responses might otherwise motivate less prudent actions. The IPS is a highly customized document that is uniquely tailored to the preferences, attitudes, and situation of each investor.

With this in mind, we conducted a detailed review of HPOPS's current IPS to identify potential improvement opportunities and to assess compliance with its key provisions. Compliance was determined to be demonstrated via discussion with staff and/or review of supporting documentation, as appropriate. The table in Appendix A of this report lists key policy guidelines, whether or not the Plan was in compliance, and our recommendation to attain compliance in the limited instances where we determined non-compliance. While we found HPOPS' Investment Policy Statement to be thorough and inclusive of all key content elements, we identified recommendations, listed below, which may be additive, given the specific characteristics of HPOPS' investment program.

Recommendations

- Add a section on program-level leverage that includes a description of:
 - Objective(s);
 - Implementation; and
 - Performance attribution
- Add detail on tactical asset allocation
 - Include governance parameters in roles and responsibilities (Section 428)
 - Define allowable ranges

- Performance attribution
- Define specific Total Fund benchmark aligned with Strategic Asset Allocation targets, possibly in a separate referenceable Appendix on Benchmarks
- Include allowable ranges in Strategic Allocation table contained in Executive Summary section of IPS and move to separate referenceable Appendix
- Identify specific risk parameters established by the Board as described in sub-section 404.02, possibly in section 432, Risk Control Policy
- Adjust manager selection and manager monitoring process language to match current practice as identified in the Implementation section below (pp.14-16).

Ethics Policy (effective date: 11/10/22)

Upon review, we found HPOPS' Ethics Policy to be thorough and well- structured with sufficient requirements to effectively monitor compliance. The table in Appendix B of this report lays out the reporting requirements designed to enforce compliance and whether we were able to obtain satisfactory demonstrative and/or anecdotal evidence of compliance.

Asset Allocation

Asset allocation is broadly recognized as the primary tool institutional investors have at their disposal to meet risk and return objectives. HPOPS' risk and return objectives are to achieve its actuarial investment rate, currently set at 7.0% net of fees and expenses, within the risk parameters established by the Board.

HPOPS follows a specific and disciplined process to determine the strategic asset allocation targets for the investment portfolio. The process relies primarily on a mean-variance optimization approach with inputs (expected returns, risk, and correlation) derived from a survey of well-known capital markets participants. The quantitative modeling output is overlaid with the Plan's liquidity profile to help determine appropriate exposure to illiquid assets. Staff conducts scenario analysis on the policy portfolio against historical market conditions in addition to stress testing high and low capital market assumptions as additional lenses through which to judge the reasonableness of strategic asset allocation. The asset allocation is reviewed frequently in light of current and expected market conditions, and the process described above is conducted at least annually.

HPOPS INVESTMENT PRACTICES AND PERFORMANCE EVALUATION

HPOPS current strategic asset allocation targets (approved 9/8/22) are shown below, along with their actual allocation as of 12/31/22 relative to peers.

Asset Class	Policy Target
Domestic Equity	33.65%
International Equity	18.1%
Fixed Income	11.7%
Credit Strategies	9.8%
Real Estate	10.0%
Liquid Alternatives	6.5%
Private Equity	20.0%
Cash	-9.75%
Total Fund	100%



Source: Verus, PARis
As of 12/31/22

HPOPS' current allocation is tilted toward heavier equity exposure and lower fixed income exposure than its peers, which has served it well as higher risk exposures have been accretive to performance since the Global Financial Crisis, notwithstanding the meaningful drawdown that occurred in 2022.

We conducted a mean-variance analysis on HPOPS' current policy allocation, using our proprietary 2023 capital market assumptions to determine a range of potential outcomes within which the Plan's performance could reasonably be expected to fall.

HPOPS INVESTMENT PRACTICES AND PERFORMANCE EVALUATION

	Policy	Verus 2023 CMA's (10 Yr)			
		Return (g)	Return (a)	Standard Deviation	Sharpe Ratio (a)
US Large	33.65	6.5	7.6	15.6	0.28
Total Domestic Equity	34				
Intl Developed Hedged	18.1	10.8	11.9	15.7	0.55
Total Int'l Equity	18				
Total Equity	52				
Core Fixed Income	11.7	4.3	4.4	4.6	0.24
Short-Term Credit	0.0	4.3	4.4	3.7	0.30
High Yield Corp. Credit	3.3	6.4	7.0	11.2	0.33
US TIPS	0.0	4.1	4.3	5.6	0.18
Total Fixed Income	15				
Value Add Real Estate	10.0	7.8	8.9	15.5	0.36
Total Real Assets	10				
Hedge Fund	6.5	4.6	4.9	7.7	0.21
Private Equity	20.0	9.2	12.1	25.8	0.34
Private Credit	6.5	8.2	9.0	13.0	0.44
Total Non-Public Investments	33				
Cash	-9.75	3.3	3.3	1.2	-
Total Allocation	100				

	Policy
Mean Variance Analysis	
Forecast 10 Year Return	8.4
Standard Deviation	14.2
Return/Std. Deviation	0.6
1st percentile ret. 1 year	-19.7
Sharpe Ratio	0.42

Based on this analysis, the Plan's expected average annualized return for the next 10 years is 8.4% with a 14.2% standard deviation and a Sharpe Ratio of 0.42. These metrics indicate a strategic asset allocation that exceeds HPOPS' risk and return objectives, based on Verus' latest capital market assumptions.

Mean-variance optimization modeling provides highly precise analytical output that specifies an "optimal" asset mix for any given target rate of return or level of risk. However, it is broadly recognized that the quality of the output is only as good as the quality of the forecasted inputs, and forecasted inputs have historically been notoriously inaccurate. Therefore, mean-variance modeling should not be the only standard by which the reasonableness of a strategic asset

HPOPS INVESTMENT PRACTICES AND PERFORMANCE EVALUATION

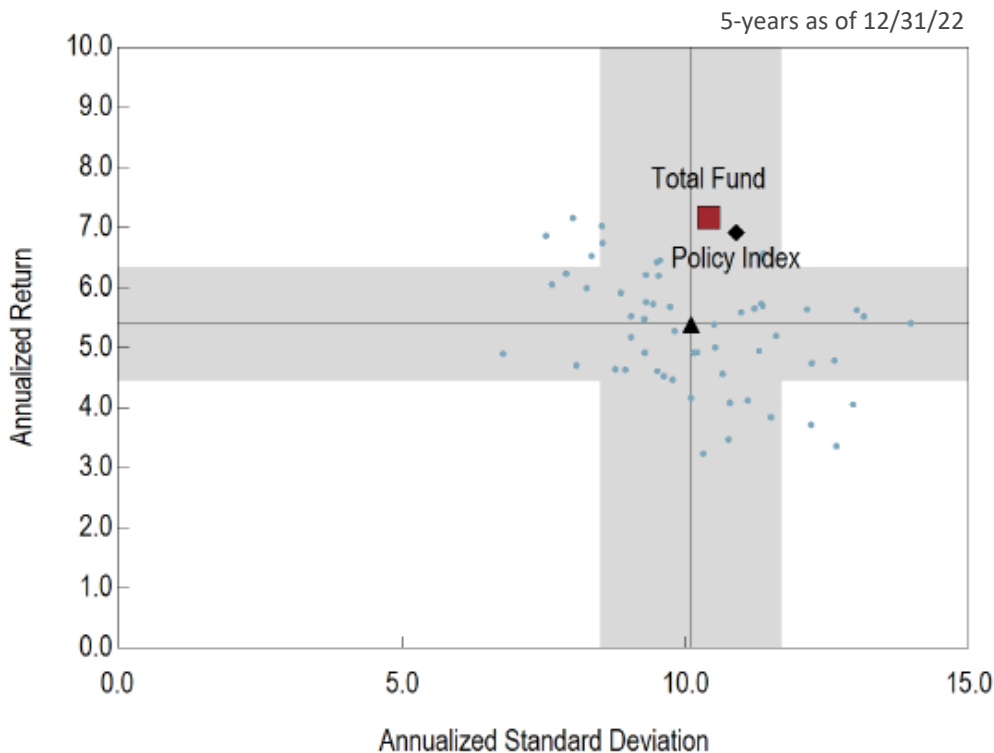
allocation is measured. With that in mind, we further assessed the reasonableness of HPOPS' asset allocation decisions using historical performance (provided by HPOPS Staff) relative to stated investment objectives and to peers (public pension funds with assets >\$1 billion).

	1 Yr	3 Yr	5 Yr	10 Yr	15 yr	20 Yr
Total Fund	-9.0%	7.4%	7.5%	7.6%	6.4%	8.7%
Policy Index	-10.2%	6.8%	6.9%	8.3%	6.5%	8.0%
Percentile Peer Ranking	29	5	1	37	7	1

Performance as of 12/31/22.

Based on these performance metrics, HPOPS' actual allocation as implemented has been highly effective in meeting its return objectives over most historical periods and showing strong performance relative to peers.

While the Plan has performed well relative to its policy benchmark over most time periods, the investment portfolio has generally been more conservatively positioned than the policy allocation, which can lead to less risk and return in a secularly strong equity bull market. The chart below shows the Plan's risk and return relative to the Policy Index and also relative to a representative peer group of public plans with assets greater than \$1 billion for the five year period ended December 31, 2022 (peers represented by blue dots, median peer risk and return represented by vertical and horizontal lines, respectively).



Based on this analysis, we expect the Plan to outperform peers but underperform the Policy Index during risk-on investment environments and vice versa.

Recommendations

- Conduct a Strategic Asset Allocation review in light of generally higher capital market assumptions to determine if a lower risk portfolio is a viable option.

Leverage

HPOPS investment program seeks to increase risk-adjusted returns through the prudent use of leverage, and the Plan first began to utilize leverage at the total fund level in 2014. Current investment policy allows explicit leverage up to 9.75% of the total portfolio. As of April 2023, explicit total plan leverage was 4.9%, or half the strategic target.

Leverage is gained in the portfolio through the use of futures in the domestic and international equity portfolios. HPOPS' Staff monitors the Plan's leverage position daily as part of an internally produced flash report, and the notional exposure/cash collateral ratio may not exceed 200%.

Based on mean-variance modeling using our 10-year capital market forecasts, adding approximately 10% of explicit leverage to the Plan's asset allocation (with a Sharpe Ratio of 0.42) increases the average annualized expected return from 8.0% to 8.4% and annualized volatility from 12.7% to 14.2%. The expected worst case (1st percentile) scenario goes from minus 17.7% to minus 19.7% (see table on next page).

	Policy	Policy No Lev ¹	Verus 2023 CMA's (10 Yr)			
			Return (g)	Return (a)	Standard Deviation	Sharpe Ratio (a)
US Large	33.65	27.3	6.5	7.6	15.6	0.28
Total Domestic Equity	34	27				
Intl Developed Hedged	18.1	14.7	10.8	11.9	15.7	0.55
Total Int'l Equity	18	15				
Total Equity	52	42				
Core Fixed Income	11.7	11.7	4.3	4.4	4.6	0.24
Short-Term Credit	0.0	0.0	4.3	4.4	3.7	0.30
High Yield Corp. Credit	3.3	3.3	6.4	7.0	11.2	0.33
US TIPS	0.0	0.0	4.1	4.3	5.6	0.18
Total Fixed Income	15	15				
Value Add Real Estate	10.0	10.0	7.8	8.9	15.5	0.36
Total Real Assets	10	10				
Hedge Fund	6.5	6.5	4.6	4.9	7.7	0.21
Private Equity	20.0	20.0	9.2	12.1	25.8	0.34
Private Credit	6.5	6.5	8.2	9.0	13.0	0.44
Total Non-Public Investments	33	33				
Cash	-9.75	0.0	3.3	3.3	1.2	-
Total Allocation	100	100				

	Policy	Policy No Lev
Mean Variance Analysis		
Forecast 10 Year Return	8.4	8.0
Standard Deviation	14.2	12.7
<i>Return/Std. Deviation</i>	<i>0.6</i>	<i>0.6</i>
<i>1st percentile ret. 1 year</i>	<i>-19.7</i>	<i>-17.7</i>
Sharpe Ratio	0.42	0.42

¹ - Leverage removed from equity only pro rata of US/non-US equity allocation

Notwithstanding tactical adjustments, HPOPS' use of leverage will likely cause them to outperform their median peer during risk-on environments and underperform during risk-off environments.

We find HPOPS' policy on leverage to be intentionally considered, well implemented, and sufficiently monitored. That said, the cost of leverage has increased along with the cyclical rise in interest rates. This may impact the ability of HPOPS to derive value from total fund level leverage.

Recommendations

Assess ongoing ability to derive value from portfolio leverage in higher rate environment.

Implementation

Active vs. Passive Management

Philosophically, HPOPS believes excess returns produced by active management to be fleeting and difficult to identify in advance. They further recognize the behavioral biases faced by most investors that often lead to hiring a manager at the peak of cyclical performance and terminating at the trough. For these reasons, the Plan utilizes predominantly passive exposure in its public markets investment portfolio, obtained through a combination of index funds, ETFs, and futures positions. The following table provides an accounting of the total portfolio broken down into active and passive positions as of 12/31/22.

Passive

Asset Class	Market Value	% of Total Exposure
Domestic Equity	\$2,003,863,545	29.6%
International Equity	\$880,574,470	13.0%
Fixed Income	\$538,217,231	7.9%
<i>Total Passive</i>	<i>\$3,422,655,246</i>	<i>50.5%</i>

Active

Asset Class	Market Value	% of Total Exposure
Fixed Income	\$353,982,100	5.2%
Credit Strategies	\$512,251,113	7.6%
Private Equity	\$1,333,838,558	19.7%
Private Real Estate	\$738,076,137	10.9%
Liquid Alternatives	\$367,373,272	5.4%
<i>Total Active</i>	<i>\$3,305,521,180</i>	<i>48.8%</i>

Asset Class	Market Value	% of Total Exposure
Cash	\$45,213,891	0.7%

Combined

<i>Total Fund</i>	<i>\$6,773,390,317</i>	<i>100.0%</i>
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HPOPS' commitment to passive investing is high relative to that of most other public pension plans. That said, we find the rationale behind their decision sound and their position reasonable.

Manager Selection and Monitoring

HPOPS has developed robust processes for assessing manager suitability for hire and for conducting periodic on-site due diligence after a manager has been hired, which are described in detail in the Investment Policy Statement. In addition, HPOPS' Investment Staff monitors each manager on an ongoing basis, utilizing a monthly performance report that is published and reviewed in summary with the Investment Committee.

Manager Selection

Currently, HPOPS' process for conducting manager searches contains the following key steps, as generally defined in the IPS:

- Establish search criteria
- Identify list of candidates meeting criteria
- Review list with Board
- Identify subset of managers to complete RFI/RFP
- Identify short-list of preferred managers
- Interview short-list candidates
- Conduct on-site due diligence, as appropriate
- Make final recommendation to Investment Committee
- Gain Board approval
- Document process throughout

Because HPOPS utilizes mostly passive management for its public markets investments, the opportunities to follow the above-described process have been limited. One example occurred in mid-2020 with the addition of a dedicated convertible bond strategy. Based on our review of the search process, this search was not conducted in strict compliance with Investment Policy. The key areas of divergence were:

- No clear search criteria were established; and
- The search focused on a single candidate rather than a comparative evaluation of a field of candidates (although it is worth noting the single candidate was a manager with whom the fund has prior experience).

Staff represents these deviations from Policy were discussed with and accepted by the Board in consideration of the timing and nature of this particular investment, and Staff recognizes these deviations should have been explicitly documented in the minutes of the Investment Committee meeting.

In our view actively managed traditional investments and alternative investments require different approaches to due diligence, including varying degrees of rigor. HPOPS' established search process does not explicitly address these differences.

To better manage appropriate deviations from Policy in the manager selection process, as currently defined, we recommend the following:

1. Specify separate requirements for active and passive traditional investments, as well as for alternative investments.
2. Simplify the process description, providing high-level guidelines for flexibility with specificity on required rigor only where necessary. For example, it may not be necessary to have candidate managers complete an RFP for every search, but it may be necessary to obtain Investment Committee and Board approval every time.
3. Prepare and maintain adequate documentation to ensure/demonstrate process has been followed.

Manager Monitoring

Once a manager is hired, the focus shifts to ensuring they are meeting established performance expectations and can be expected to continue to do so. Typically, this is accomplished by tracking investment performance through time and periodically reviewing qualitative factors such as style drift and organizational stability. HPOPS has established procedures for both.

PERFORMANCE REVIEW

HPOPS prepares monthly performance reports that list all managers compared to a passive benchmark over multiple periods, from latest month through to since inception. These reports are presented to the Investment Committee and the Board of Trustees in advance of their monthly meetings.

ON-SITE DUE DILIGENCE

Currently, HPOPS' Investment Policy Statement specifies that Staff shall meet with each manager annually to review a comprehensive set of topics listed in Appendix G of the IPS. Through discussions with Staff, we confirmed annual meetings occur as mandated but that the reviews, while covering performance, organizational update and macroeconomic topics are unstructured (e.g. no formal checklists). Additionally, while each staff member maintains detailed individual notes, the documentation of each meeting is not standardized.

In addition, and similar to the procedures for manager selection, ongoing monitoring procedures are different for traditional active managers and alternative investments. For example, passive investments should require very little to no monitoring, and private markets investments may only require a review upon renewal.

To remediate potential deficiencies in the monitoring process, as currently defined, we recommend the following:

1. Include peer rankings in periodic performance reports, as appropriate.
2. Clarify the level of due diligence required by type of investment.
3. Reduce the specificity of the coverage topics in Section 443 to provide Staff with flexibility.
4. Standardize documentation to ensure/demonstrate process has been followed.

Currency Hedging

HPOPS believes that exposure to foreign currencies is an uncompensated risk that should be managed and has been doing so since 2011. The policy is to hedge out Euro, Pound, Yen, and Yuan exposure in the Plan’s international equity portfolio with a target hedge ratio of 50%. Investment Staff has the authority to tactically adjust the hedge ratio within a range of +/- 25 percentage points.

Over very long time periods, a hedging program would be expected to produce a slight negative return in line with the cost of the program. According to Investment Staff, HPOPS’ program has provided a positive return since program inception.

Benchmarking

HPOPS utilizes a combination of benchmarking approaches to help measure the ongoing effectiveness of its investment program, as described below.

Public Markets

The Plan’s public markets investments are predominately passive and benchmarked against the broad market indexes they are designed to replicate. Public markets benchmarks are listed below

Investment Strategy	Benchmark
BlackRock Equity Index Fund Parametric US Futures	S&P 500 Index
NT Russell 3000 Index Fund	Russell 3000 Index
BlackRock ACWI ex-US Index Fund NT MSCI ACWI ex-US Index Fund Parametric Non-US Futures	MSCI ACWI ex-US Index
BlackRock US Debt Fund NT Investment Grade Debt Fund	Bloomberg US Aggregate Bond Index
BlackRock TIPS Short Duration Fund	Bloomberg US TIPS 0-5 Year Index
Shenkman Short Duration Bond Fund	ICE BofA ML 0-2Yr DTW BB-B US Const Index
Shenkman High Yield Bond Fund	FTSE HY Market TR Index

Northern Trust HY Bond Fund Credit Portfolio	
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We believe these benchmarks are broadly appropriate. We further believe additional useful information could be obtained by comparing each fund to a relevant peer universe of actively managed strategies in a more formalized / structured manner.

Liquid Alternatives

The Liquid Alternatives portfolio utilizes three primary benchmarks for comparative purposes:

- An absolute return benchmark of 15% per annum;
- The return of a passively invested domestic 60/40 (S&P 500/Bloomberg Agg) portfolio; and
- The HFRI Fund of Funds Composite Index

Despite the high tracking error and long-term underperformance of the Liquid Alternatives Portfolio relative to HPOPS' benchmark, and because benchmarking liquid alternatives is notoriously difficult, we believe these benchmarks are reasonable.

Private Markets

Due to strategy heterogeneity, combined with lagged valuations, private market investment strategies are also notoriously difficult to benchmark, particularly over shorter time periods. The Plan utilizes widely used benchmarks that include Cambridge Associates Private Equity, Burgiss Private Credit, NCREIF, and S&P Energy Sector Index for its Private Equity, Private Credit, Real Estate, and Energy investments, respectively. We believe these are reasonable and appropriate and in line with common industry practices, given the lack of better alternatives.

Total Fund

The Total Fund uses a blended benchmark based on the individual strategy benchmarks, weighted by the policy allocation to each. This is a typical approach that we believe is reasonable and appropriate.

Recommendations

- Consider utilizing peer universe comparisons for public markets investment strategies, including passive mandates in a more formalized / structured manner
- Reassess liquid alternatives portfolio to align benchmarks with strategic purpose

Liquidity

HPOPS Investment Staff monitors liquidity and cash needs closely and reports on the topic regularly to the Investment Committee and the Board of Trustees. The following reports are reviewed by Staff on a monthly basis:

- Liquidity Profile: report on how long it will take to turn each investment into cash;
- FYTD Cash Flow Review: reconciliation of beginning and ending cash for the last six months and fiscal year-to-date; and
- Cash Flow Forecasts: sources and uses report that contains two years of actual and two years of forecasted cash flows

The following reports are presented to the Investment Committee and the full Board on a monthly basis:

- Portfolio Liquidity Schedule: report of how long it will take to turn each investment into cash, summarized by asset class; and
- Cash Flows and Concentrations: historical report on components of annual net cash flow for last eight years and current fiscal year-to-date

In order to assess liquidity sufficiency, we conducted an analysis of the Plan’s cash flow needs and the liquid financial assets that can be used to meet them. Through this analysis, we answer the question, “Will the plan be forced to sell illiquid assets to cover cash outflows in the next 5 years?”. We quantify this dynamic using a liquidity coverage ratio (LCR), which is defined as follows:

$$\text{Liquidity Coverage Ratio (LCR)} = \frac{\begin{aligned} & \text{Liquid Financial Assets (stressed market condition)} \\ & \sum(\text{Distributions from Illiquid Assets}) \\ & \sum\left(\frac{\text{Employer}}{\text{Employee}} \text{Contributions}\right) \\ & \sum(\text{Investment Income}) \end{aligned}}{\begin{aligned} & \sum(\text{Benefit Payments}) \\ & \sum(\text{Capital Calls for Illiquid Assets}) \\ & \sum(\text{Plan Expenses}) \end{aligned}}$$

LCR Value	Implication
<1	The plan will need to sell illiquid assets to cover cash flows
1	The plan has sufficient liquidity to cover all cash flows
>1	The plan will not be required to sell illiquid assets to cover liquidity needs

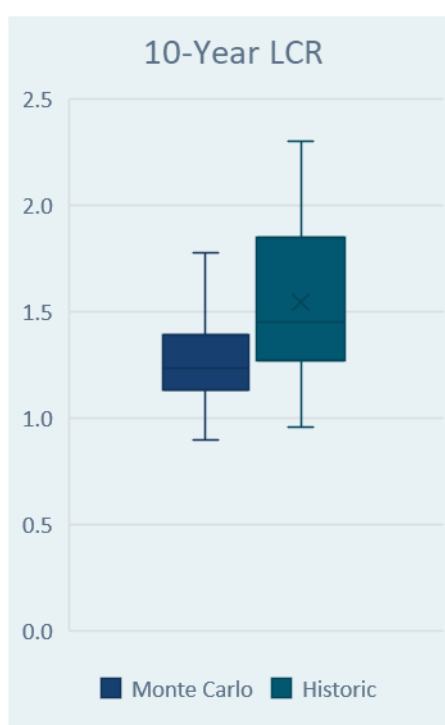
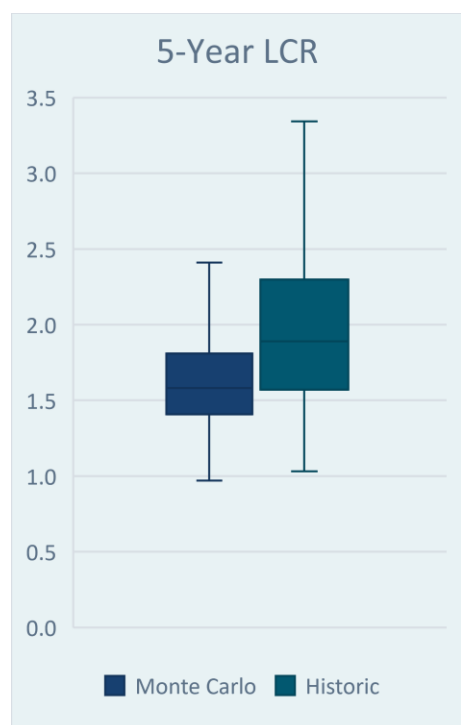
A deterministic analysis shown below, based on cash flow projections provided by HPOPS, shows that even under extreme market conditions, the Plan maintains sufficient liquidity to cover net cash outflows.

HPOPS INVESTMENT PRACTICES AND PERFORMANCE EVALUATION

	Baseline	20% Drawdown	25% Drawdown	30% Drawdown	35% Drawdown	40% Drawdown
Liquid Financial Assets	5,918,940,284	4,735,152,228	4,439,205,213	4,143,258,199	3,847,311,185	3,551,364,171
Illiquid asset Distributions	1,565,000,000	1,565,000,000	1,565,000,000	1,565,000,000	1,565,000,000	1,565,000,000
Contributions (Employee + Employer)	1,121,158,000	1,121,158,000	1,121,158,000	1,121,158,000	1,121,158,000	1,121,158,000
Benefit Payments	2,820,072,000	2,820,072,000	2,820,072,000	2,820,072,000	2,820,072,000	2,820,072,000
Illiquid asset Capital Calls	1,755,000,000	1,755,000,000	1,755,000,000	1,755,000,000	1,755,000,000	1,755,000,000
Liquidity Coverage Ratio	1.88	1.62	1.56	1.49	1.43	1.36

Note: Based on cash flow projections provided by HPOPS.

The charts below show the results of stochastic analyses using HPOPS' strategic asset allocation, Verus 10-year capital market assumptions, and actual historic market experience to assess liquidity sufficiency under a multitude of different market conditions. In both sets of analyses, HPOPS appears to have sufficient liquidity to manage through challenging market conditions.



In addition to sufficient liquidity indicated by a stressed LCR remaining above 1, HPOPS' Investment Policy Statement allows the Executive Director to initiate a line of credit of up to \$100 million from the Plan's custodian bank to help meet liquidity needs.

Fees & Commissions

We utilized three data sources to evaluate the reasonableness of HPOPS' investment management fees: HPOPS' Staff fee estimates; HPOPS' latest ACFR; and an externally prepared benchmarking study. Deciphering fee data can be a complex undertaking given that different reports and studies often contain different metrics, but we use the three sources identified above to circle in on the reasonableness of HPOPS' fee load.

We reviewed the fee schedule from HPOPS' September 2022 Trustee Handbook, which contains HPOPS' monthly estimate of investment management and other service provider fees, based on established fee schedules.

Investment management fees illustrated in HPOPS' 2021 ACFR were lower than those included in the schedule referenced above, at approximately \$6.9 million or less than 10 basis points of total assets. However, the ACFR figures did not include investment management fees for private market investments. After removing private markets investments from the table referenced above, the two data sets are comparable.

In 2022, HPOPS commissioned a study by CEM Benchmarking to conduct a review of the Plan's fees paid to both public and private markets investment managers. For private markets, the study included private equity, private credit, and private real estate investments. The study concluded HPOPS pays modestly higher fees on average than other institutional investors in private markets.

Because of HPOPS' heavy usage of passively managed investment strategies, overall fees are low relative to public market peers.

While we find HPOPS' fee structure to be reasonable in aggregate, given its investment strategy implementation, we believe there may be opportunities to reduce the Plan's fee load further, as a result of the general downward trend in investment management fees over the past several years.

Trading costs were not evaluated in our review for two primary reasons. First, HPOPS' emphasis on passive management means very little trading occurs in the Plan's investment portfolio, and trading cost is therefore a very small share of total plan cost. Second, meaningful and accurate trading cost analysis requires highly specialized and technical analytical tools and capabilities. If HPOPS is interested in pursuing such a study, which we do not recommend, we

would be happy to provide a referral to a well-regarded specialty firm we have worked with in the past.

Recommendations

- Undertake a comparative fee review of investment managers across the public markets portfolio, including passive mandates
- Evaluate ways to reduce the fee structure of future private markets commitments

Appendix A
Investment Policy Compliance

The following table contains key guidelines and reporting requirements from HPOPS' Investment Policy Statement, in addition to an indication of whether or not HPOPS was in compliance with such guidelines and requirements at the time of our review.

Section	Description	In Compliance? (Y/N)
401	<p>Purpose:</p> <p>Any changes in this Statement of Policy and Guidelines and Investment Objectives, or exceptions to them, will be in writing and delivered to the Manager(s).</p>	Y
408	<p>Public Equity Investments:</p> <p>For each portfolio, the maximum allocation to any one single equity issue is 15% of the total portfolio at market value; and any equity issue held in the portfolio must not exceed 5% of the issued and outstanding shares of common stock in the issuer corporation.</p>	Y
409	<p>Fixed Income:</p> <p>Each security selected is to be subjected to thorough financial analysis by the manager to determine its suitability for investment. Reliance on one or more of the rating agencies is prohibited.</p> <p><i>Recommendation: Guideline is specific to separate accounts. Additional language clarifying such may be useful.</i></p>	N/A
410	<p>Alternative Investments:</p> <p>Generally, the minimum investment committed for any of these investments is \$35 million.</p> <p><i>Recommendation: Change language to match practice.</i></p>	N
411	<p>Private Equity:</p> <p>Committed but undrawn capital shall be invested in accordance with the System's asset allocation targets subject to liquidity constraints and tactical adjustments of up to twenty-five percent of such amounts.</p> <p><i>Recommendation: Change language to match practice.</i></p>	N

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414	<p>Credit Managers:</p> <p>Assets committed to, but not yet invested in credit strategies shall be invested in accordance with the System’s asset allocation targets with variations subject to liquidity constraints or tactical allocations as approved by the Board.</p> <p><i>Recommendation: Change language to match practice and align with PE language in section 411 above.</i></p>	Y
416	<p>General:</p> <p>Excess cash shall be securitized in a ratio approximating the System’s asset allocation mix. When the three-month moving average of the VIX is above 23 then securitization mix will be one hundred percent fixed income and when the three-month moving average is below 14 the securitization mix will be 100 percent equity.</p>	Y
416	<p>General:</p> <p>Fifty percent of the Euro, Yen, Pound and Yuan exposure in the System’s developed non-US public equity allocation will be the target hedge ratio while Staff has the authority to tactically adjust this hedge with a 25% floor and a 75% ceiling.</p>	Y
417	<p>Equity Index Managers:</p> <p>Performance requirements (monitored)</p>	Y
418	<p>Fixed Income Managers:</p> <p>Performance requirements (monitored)</p>	Y
419	<p>Equity Income Managers:</p> <p>Performance requirements (monitored)</p>	Y
420	<p>Credit Managers:</p> <p>Performance requirements (monitored)</p>	Y
421	<p>Alternative Investment Managers:</p> <p>Performance requirements (monitored)</p>	Y
422	<p>Total Fund:</p> <p>Performance requirements (monitored)</p>	Y
423	<p>Standards of Measurement:</p>	Y

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	Staff shall maintain documentation of the periodic review of these standards (as listed in the Investment Policy Statement).	
424	Domestic Equity: Staff shall maintain documentation of the periodic review of these standards (as listed in the Investment Policy Statement).	Y
426	Investment Valuation Policy Objectives: Management must have sufficient information to evaluate and independently challenge the investment manager’s valuation.	Y
427	General Valuation Guidelines – Separate Accounts: Maintain and document an understanding of the custodian’s valuation process and evaluate the reasonableness of such policy.	Y
427	General Valuation Guidelines – Separate Accounts: Maintain and document an understanding of the valuation process of the underlying investment managers and evaluate the reasonableness of such policy.	Y
427	General Valuation Guidelines – Separate Accounts: Implement a program to review and evaluate the reconciliation process between the fair value estimates provided by the custodian and the Investment Manager.	Y
427	General Valuation Guidelines – Separate Accounts: Implement a program of additional procedures as considered necessary to address any weaknesses in either the custodian or Investment Manager’s valuation policy.	Y
427	General Valuation Guidelines – Separate Accounts: Implement a program of additional procedures as considered necessary to address any HPOPS-specific liquidity, marketability, legal, regulatory, or other restrictions that may require the assessment of a discount or premium to the fair value of each asset or liability.	Y
427	General Valuation Guidelines – Commingled Funds: Maintain and document an understanding of the fund’s valuation process and evaluate the reasonableness of such policy.	Y
427	General Valuation Guidelines – Commingled Funds: Implement a program to perform additional procedures as considered necessary to address any weaknesses in fund’s valuation policy.	Y

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427	<p>General Valuation Guidelines – Commingled Funds:</p> <p>Implement a program to perform additional procedures as considered necessary to address any HPOPS-specific liquidity, marketability, legal, regulatory, or other restrictions that may require the assessment of a discount or premium to the fair value of each asset or liability.</p>	Y
427	<p>General Valuation Guidelines – Commingled Funds:</p> <p>Implement a program to periodically monitor, test, and update our understanding of the valuation policy and procedures of our custodian and of the underlying investment managers.</p>	Y
427	<p>General Valuation Guidelines – Limited Partnerships:</p> <p>Maintain and document an understanding of the partnership’s valuation process and evaluate the reasonableness of such policy.</p>	Y
427	<p>General Valuation Guidelines – Limited Partnerships:</p> <p>Implement a program to perform additional procedures as considered necessary to address any weaknesses in limited partnership’s valuation policy.</p>	Y
427	<p>General Valuation Guidelines – Limited Partnerships:</p> <p>Implement a program to perform additional procedures as considered necessary to address any HPOPS-specific liquidity, marketability, legal, regulatory, or other restrictions that may require the assessment of a discount or premium to the fair value of the System’s interest in the partnership.</p>	Y
427	<p>General Valuation Guidelines – Limited Partnerships:</p> <p>Implement a program to periodically monitor, test, and update our understanding of the valuation policy and procedures of the partnerships</p>	Y
427	<p>General Valuation Guidelines – Limited Partnerships:</p> <p>To the extent possible, obtain FAS 157 compliant audited financial statements from the partnerships and develop a procedure to roll-forward and review the valuations inherent in these financial statements.</p>	Y
427	<p>General Valuation Guidelines – Offshore Mutual Funds:</p> <p>Maintain and document an understanding of the fund’s / administrator’s / custodian’s valuation process, as is applicable, and evaluate the reasonableness of such policy(s).</p>	Y

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427	<p>General Valuation Guidelines – Offshore Mutual Funds:</p> <p>Implement a program to perform additional procedures as considered necessary to address any weaknesses in the valuation policy(s).</p>	Y
427	<p>General Valuation Guidelines – Offshore Mutual Funds:</p> <p>Implement a program to perform additional procedures as considered necessary to address any HPOPS-specific liquidity, marketability, legal, regulatory, or other restrictions that may require the assessment of a discount or premium to the fair value of the System’s interest in the fund.</p>	Y
427	<p>General Valuation Guidelines – Offshore Mutual Funds:</p> <p>Implement a program to periodically monitor, test, and update our understanding of the valuation policy(s) and procedures of investment managers, administrators, and custodians.</p>	Y
427	<p>General Valuation Guidelines – Offshore Mutual Funds:</p> <p>To the extent possible, obtain ASC 820 compliant audited financial statements from the funds and develop a procedure to review the valuations inherent in these financial statements.</p>	Y
429	<p>Plan Administration:</p> <p>Risk management is achieved through recognition of the internal and external risks, included in but not limited to those risks described below, and the implementation of programs to address these and other risks as well as periodic monitoring and reporting on such risks.</p>	Y
429	<p>Plan Administration:</p> <p>Leverage in the System’s equity futures accounts shall not exceed 200 percent of collateral.</p>	Y
431	<p>Asset Rebalancing:</p> <p>The Executive Director and Chief Investment Officer shall jointly have the authority to carry out the asset rebalancing and shall report all rebalancing activity to the Board.</p>	Y
432	<p>Risk Control Policy:</p> <p>Staff will monitor these metrics (as listed in Investment Policy Statement) and inform the Board if one metric is triggered. At such time when two or more metrics are triggered, a special meeting of the Board will be convened, unless a regular meeting of the Board is already scheduled within the next five business days.</p>	Y

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433	<p>Investment Manager Reporting Requirements:</p> <p>Formal reviews with the Board will be held annually or as otherwise scheduled by the Board.</p> <p><i>Recommendation: Change language to match practice.</i></p>	N
433	<p>Investment Manager Reporting Requirements:</p> <p>Each contract for investment management services with an external manager shall specify the applicable policies, risk controls, portfolio characteristics, reporting requirements, requirements or restrictions, including criteria for determining quality of investments.</p>	Y
433	<p>Investment Manager Reporting Requirements:</p> <p>Manager reporting requirements (general and by asset class).</p>	Y
438	<p>Evaluation and Review of Investment Managers:</p> <p>On at least a quarterly basis, the Board will review actual results achieved by the Investment Managers</p>	Y
438	<p>Evaluation and Review of Investment Managers:</p> <p>The Investment Committee of the Board, or Staff, will meet at least once a year with Investment Managers on investment and related matters.</p>	Y
439	<p>Proxy Voting:</p> <p>Routine proxy proposals should be voted in support of management proposals unless there is a clear reason not to do so (as listed in the Investment Policy Statement).</p>	Y
439	<p>Proxy Voting:</p> <p>Each non-routine issue must be carefully analyzed and voted in accordance with guidelines that apply to specific proposals (as listed in the Investment Policy Statement).</p>	Y
439	<p>Proxy Voting:</p> <p>On an annual basis, the investment managers must provide the Board their proxy voting report detailing the shares of securities voted, the issues involved, the votes made and a brief explanation on votes that are not consistent with proxy voting guidelines of the System or investment managers.</p>	Y

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440	<p>Manager Selection Criteria – General Selection Criteria:</p> <p>Manager candidates should have a real-time performance record of five years or more for the specific investment product that the System is seeking. However, recognizing that past performance is not indicative of future results and the fact that attractive opportunities may be available without this target, qualitative exceptions to this rule may be adopted by the Board.</p>	Y
440	<p>Manager Selection Criteria – General Selection Criteria:</p> <p>Manager candidates must have demonstrated a long-term record of performance superiority.</p>	Y
440	<p>Manager Search Criteria – General Selection Criteria:</p> <p>Manager candidates must have registered with the SEC as investment advisors or be exempt from registration.</p>	Y
440	<p>Manager Selection Criteria – General Selection Criteria:</p> <p>Manager candidates should have a material amount of assets under management for that specific investment product unless a waiver is authorized by the Board.</p>	Y
440	<p>Manager Selection Criteria – Specific Selection Criteria:</p> <p>The Board will establish specific selection criteria for each investment manager search appropriate for the investment product the System is seeking</p>	Y
440	<p>Manager Selection Criteria – Specific Selection Criteria:</p> <p>The Board should monitor the concentration of investment in any one fund or group in order to maintain a reasonable level of diversification.</p>	Y
440	<p>Manager Selection Criteria – Criteria for Alternative Managers:</p> <p>Capital commitment by the general partners should be significant.</p>	Y
441	<p>Manager Search Criteria:</p> <p>All investment manager searches will be conducted according to the process described herein that is approved by the Board.</p> <p>Variation from this procedure will occur only as approved by a majority vote of the Board.</p>	N

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441	<p>Manager Search Criteria:</p> <p>The Investment Staff, and consultant where applicable, will determine the circumstances under which a manager search is appropriate and the timetable for the completion of the search and make such recommendations to the Board for approval.</p>	Y
441	<p>Manager Search Criteria:</p> <p>The Investment Staff, and consultant where applicable will establish the criteria for the search of potential manager candidates and make such recommendations to the Board for approval.</p>	Y
441	<p>Manager Search Criteria:</p> <p>The Investment Staff, and consultant where applicable, will provide the Investment Committee with the names of the managers who meet the established criteria. The Investment Staff, and consultant where applicable, will provide the Board with manager search booklets outlining names of managers and giving further pertinent information for each manager candidate.</p>	N
441	<p>Manager Search Criteria:</p> <p>The Staff will determine which managers, who meet the established search criteria, will be invited to participate in the Request for Proposal (RFP) or a Request for Information (RFI) phase and a list will be provided to the Board.</p>	N
441	<p>Manager Search Criteria:</p> <p>If the Investment Staff considers it necessary in the circumstances the HPOPS Staff or Investment Consultant will develop and disseminate the appropriate RFP or RFI. The Executive Director will contact the Board to inform them that the RFP/RFI is available for their review. The RFP/RFI's will be distributed to the selected managers only upon the approval of the Board (Investment Committee if so designated). Copies of all the returned RFP/RFI's will be distributed to the Board.</p>	N
441	<p>Manager Search Criteria:</p> <p>Investment Managers that complete and return the RFP/RFI will be graded by Staff and a short list of managers will be selected through this grading process. This short list of managers other than managers for index and enhanced index products will be scheduled for an interview by the Board and Staff in the HPOPS office. Documentation of the RFP and grading process will be available for review by the Board in the System office. It will be the responsibility of Staff to schedule the meetings and notify the Board of the date and time of the meetings.</p>	N

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441	<p>Manager Search Criteria:</p> <p>Upon the Staff’s completion of a full review of the managers for index and enhanced index products, Staff will make hiring recommendation(s) to the Investment Committee for final approval by the Board.</p>	N
441	<p>Manager Search Criteria:</p> <p>Upon completion of the interviews, the HPOPS Staff will produce and distribute manager search booklets to the Board of Trustees.</p>	N
441	<p>Manager Search Criteria:</p> <p>If considered necessary, the Staff, subject to Board approval (Investment Committee if so designated) will establish a list of prospective managers who will be visited by Board members and/or designated Staff. After all visitations are completed, the Staff will make recommendations to the Investment Committee which will meet and establish a hiring recommendation for the Board of Trustees.</p>	Y
441	<p>Manager Search Criteria:</p> <p>The Staff will advise the Investment Consultant, if any, of the Investment Committee’s recommendation and seek their recommendation.</p>	Y
441	<p>Manager Search Criteria:</p> <p>The Staff will verify performance data of the managers recommended by the Investment Committee.</p>	Y
441	<p>Manager Search Criteria:</p> <p>A majority vote of the Board is necessary in order to hire a manager.</p>	Y
442	<p>Compliance of Performance Presentation:</p> <p>The performance of all equity and fixed income managers must be verified by the Staff before they are hired.</p>	Y
443	<p>On-Site Due Diligence (subsequent to hire)</p> <p><i>Recommendation: Change language to match practice with respect to due diligence frequency and requirement for due diligence to take place “on-site”.</i></p>	N
444	<p>Alternative Investment Operating Procedure:</p> <p>Upon completion of due diligence, Consultant will send its investment recommendation to the Staff together with a copy of the private placement memorandum and other relevant information of the fund to be considered.</p>	Y

**Appendix B
Ethics Policy Compliance**

Section	Description	Evidence obtained? (Y/N)
605.08	All business relationships with current or prospective vendors shall be reported to the Board on a signed document upon establishment of such relationship.	Y
606.01	System Representatives shall file a signed quarterly Ethics report on a form provided by the System disclosing the receipt by the System Representative or family member of the System Representative of any gift with a fair market value of greater than \$25 (including applicable taxes) from any source which is a current or prospective consultant or vendor of the System.	Y
606.02	Each System Representative shall file a signed quarterly Ethics report of all gifts and intangibles as required by this policy. The form shall note the source of the gift, the dates received, and the estimated market value of the gift.	Y
609.01.A.1 to 4	<p>All System contracts with consultants and vendors will include a requirement that thereafter records will be maintained and filed annually with the System which reflect:</p> <ol style="list-style-type: none"> 1. Any finders fees, commissions or similar payments, made to anyone whomsoever as consideration for the placement of business with the consultant or vendor; 2. Any gifts, food, lodging, transportation, or entertainment expense which does not conform with the minimum reporting limitation contained in this policy for the recipient (See examples in Section 611 of this Policy.); 3. Any direct or indirect benefit to a System Representative other than food, lodging, transportation, entertainment, or gifts; and, 4. The extent, amount and placement of any directed business, other than directed brokerage placed in accordance with a resolution adopted by the Board in open meeting which was in any way associated with the parties relationship with the System. 	Y
609.02	Current or prospective consultants and vendors will file with the System a conflict of interest questionnaire adopted by the Texas Ethics Commission.	Y

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612.02	The Ethics Committee will meet at least Quarterly to review the status of reporting as required by this Policy.	Y
613.01	System Representatives are required to file an annual form with the System acknowledging that they have read, understand, and will comply with the provisions of this Ethics Policy.	Y
613.02	Trustees shall report all expenses related to System business in accordance with the provisions of Section 500 of the Employee Handbook.	Y

Appendix C
Required Disclosures

The following disclosures are submitted in accordance with the Pension Review Board's [Guidance for Investment Practices and Performance Evaluations](#) (adopted October 17, 2019; Updated October 6, 2022).

1. Summary outlining the qualifications of the firm in evaluating institutional investment practices and performance

Verus was established in 1986 to provide a full range of investment consulting services to institutional investors (public funds, corporate DB and DC plans, endowments & foundations, Taft-Hartley trusts, private wealth trusts, and sovereign wealth trusts). Consulting is our only business, which we provide on a non-discretionary basis in the role of investment consultant and on a discretionary basis in the role of OCIO. Our business of providing investment advisory services to sophisticated institutional clients arms us with the experience, knowledge, and capabilities required to effectively review investment practices and investment performance, opine on their reasonableness and efficacy, and identify potential opportunities for improvement.

Verus has conducted three Texas IPPE reviews, along with several due diligence reviews for various state and local clients.

2. Statement that the firm meets the experience requirements

Verus meets the experience requirements stated in [Texas Government Code Section 802.109 Investment Practices and Performance Reports](#) as follows:

"...an independent firm with substantial experience in evaluating institutional investment practices and performance to evaluate the appropriateness, adequacy, and effectiveness of the retirement system's investment practices and performance and to make recommendations for improving the retirement system's investment policies, procedures, and practices."

3. Statement indicating the nature of any existing relationship between the firm and the system being evaluated

Verus conducted an IPPE for HPOPS in 2020.

4. Statement acknowledging that the firm, or its related entities, is not involved in directly or indirectly managing investments of the system

Verus is not involved in any way with managing HPOPS investments.

5. Statement identifying any potential conflict of interest or any appearance of a conflict of interest that could impact the analysis between the independent firm and the system or any current/former member of the system's governing body

Verus is not aware of any actual or potential conflict of interest or the appearance of any actual or potential conflict of interest with HPOPS or any current or former member of HPOPS' governing body.

6. A list of the types of remuneration received by the firm from sources other than the retirement system for services provided to the system

Verus receives no remuneration from sources other than the retirement system for services provided to the system.

7. An explanation of the firm's determination regarding whether to include a recommendation for each of the following evaluated matters :
 - a. an analysis of any investment policy or strategic investment plan adopted by the retirement system and the retirement system's compliance with that policy or plan;

See Recommendations on p. 4 and pp. 24-32 of this report

- b. a detailed review of the retirement system's investment asset allocation, including:
 - i. the process for determining target allocations;

See Recommendations on p. 13 of this report

- ii. the expected risk and expected rate of return, categorized by asset class;

See Table on p. 11 of this report

- iii. the appropriateness of selection and valuation methodologies of alternative and illiquid assets; and

See pp. 26-28 in Appendix A of this report

- iv. future cash flow and liquidity needs;

See Liquidity Section on p. 19-21 of this report

- c. a review of the appropriateness of investment fees and commissions paid by the retirement system;

See Recommendations on p. 23 of this report

- d. a review of the retirement system's governance processes related to investment activities, including investment decision-making processes, delegation of investment authority, and board investment expertise and education; and

Based on a document review and interviews with Board and Staff, we found HPOPS's governance structure to be well-defined and well-executed, and we identified no significant deficiencies.

- e. a review of the retirement system's investment manager selection and monitoring process.

See Manager Selection and Monitoring Section on pp. 15-17 of this report