

SWIB Board Materials for April 2018

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Regular Meeting of the Board of Trustees

Tuesday, April 10, 2018

STATE OF WISCONSIN INVESTMENT BOARD

Offices of the Wisconsin Investment Board

121 East Wilson Street

Madison, Wisconsin

Board Room

(At the conclusion of the Strategic Planning and Corporate Governance Committee Meeting and Lunch, approximately 1:30 p.m.)

OPEN SESSION

1. **Open Session Minutes of February 14, 2018**
2. **Overview of Leverage Performance and Alpha Beta Overlay**
3. **2018 Investment Strategy and Review**

CLOSED SESSION*

RECONVENE IN OPEN SESSION

4. **Announcement of Board Actions Relating to Items Taken up in Closed Session**
5. **Investment Committee Open Session Business**
 - A. **Approved Open Session Investment Committee Meeting Minutes of January 23, 2018 and March 1, 2018**
 - B. **Final Open Session Agenda for March 27, 2018 Meeting and Draft Open Session Agendas for April 24, 2018 and May 22, 2018 Meetings**

* The motion to go into closed session at this meeting is made pursuant to ss. 19.36 (5) and 19.85 (1)(e) of the Wisconsin Statutes (i) to consider confidential and proprietary strategies for the investment of public funds relating to the active risk and specific proprietary investment strategies of internal WRS portfolios and (ii) to approve prior closed minutes that discuss the same; pursuant to s. 19.85 (1)(c) of the Wisconsin Statutes (iii) to discuss the performance evaluation data and compensation of SWIB's senior staff, portfolios managers, former executive director, and internal audit director related to SWIB's incentive compensation program and 2017 performance and (iv) to approve prior closed minutes related to the Board's performance evaluation and the performance evaluation of SWIB's former Executive Director and to discuss the performance goals of the current Executive Director; and pursuant to s. 19.85(1) (g) of the Wisconsin Statutes (v) to approve prior executive closed minutes that discuss the Chief Legal Counsel report regarding confidential strategies regarding pending litigation. The Board may convene in additional closed sessions or announce additional closed session items at the meeting in accordance with the procedure outlined in the Attorney General's Opinion reported at 66 OAG 106 (1977). Whenever a closed session is held, the Board will subsequently reconvene in open session to cover remaining agenda items.

- C. Amendment to Investment Guidelines
 - (1) SIF and Separately Managed Funds Investment Policy and Guidelines
 - (a) UW System Trust Funds Asset Allocation
 - (b) UW System Trust Funds Investment Guidelines
 - (2) WRS IC Investment Committee Investment Guidelines
- 6. **Committee Reports and Recommended Actions from Committee Agenda - Open Session Items**
 - A. Benchmark and Performance Committee
 - (1) Approval of UW System Trust Funds Benchmarks
 - (2) Approval of Leverage Benchmark
 - B. Compensation Committee
 - (1) Approval of 2017 Incentive Compensation Awards
 - C. Strategic Planning and Corporate Governance Committee
 - (1) Board Meeting Proposal
 - (2) Interim Proxy Guideline Amendment
- 7. **In the Absence of Questions, the Following Reports will be Filed Without Comment**
 - A. Enterprise Risk Management Quarterly Report
 - B. Private Markets and Funds Alpha Commitments, Q1 2018; Private Equity Commitments, Q4 2017
- 8. **Future Items for Discussion**
- 9. **Motion to Recess**

***Joint Educational Session of State of Wisconsin Investment Board
Board of Trustees
CFA Society Madison***

**Wednesday, April 11, 2018
8:30 a.m.
Monona Terrace, Madison, WI
Level 2 – Community Terrace**

OPEN SESSION

- 1. Call to Order and Welcome – Chairman Dave Stein and Executive Director Rick Smirl**
- 2. Risks to U.S. Credit from Higher Inflation, More Treasury Supply, and ECB Exit – Torsten Slok, Ph.D., Chief International Economist, Managing Director, Deutsche Bank Securities**
- 3. Current Private Equity Environment – Joe Baratta, Global Head, Private Equity, Blackstone Capital Partners**

BREAK

- 4. Evolution of Investment Management Industry – Geoff Duncombe, Chief Investment Officer, Two Sigma Advisers**

LUNCH

- 5. Global Future Mobility – Beijia Ma, Thematic Investing Strategist, Bank of America Merrill Lynch / Lunch**

BREAK

- 6. Star Wars, the Force and Value Investing – James Montier, Partner and Asset Allocation Portfolio Manager, GMO**
- 7. More than a Gambler's Fallacy: How Luck Fools Investors, Baseball Umpires, Asylum Judges and Even Dating – Tobias Moskowitz, Ph.D., Principal, AQR Capital Management and Dean Takahashi Professor of Finance, Yale University**
- 8. Adjourn – Chairman Dave Stein**

** The Joint Educational Session is open to the public. Members of the public planning to attend this meeting should notify SWIB at (608) 267-3175 or e-mail annette.wiemann@swib.state.wi.us so plans can be made for seating and food.*

STATE OF WISCONSIN INVESTMENT BOARD
Board Meeting-Open Session

Wednesday, February 14, 2018

Offices of the Investment Board
121 East Wilson Street
Madison, Wisconsin

Board Members Present: Dave Stein, Chair
Norm Cummings, Vice-Chair
Bob Conlin, Secretary
Sandra Claflin-Chalton, Trustee
Scott Neitzel, Trustee
Barb Nick, Trustee
Tim Sheehy, Trustee
Paul Stewart, Trustee

Staff and Others Present: Rick Smirl, Executive Director
Rochelle Klaskin, Chief Legal Counsel
David Villa, Chief Investment Officer
Brandon Brickner, Internal Audit Director
Chuck Carpenter, Managing Director-Private Markets & Funds Alpha
Scott Anderson, Managing Director-Asset & Risk Allocation
Brian Hellmer, Managing Director-Public Equities
Todd Ludgate, Managing Director-Public Fixed Income
Nick Stanton, Head of Multi-Asset Strategy
Phil Richards, Performance Director
Brad Gentert, Performance Analyst
Kate Burkart-Paulson, Assistant Legal Counsel
Ithipol Yang, Help Desk Specialist
Janet Klosterman, Legal Assistant
Eileen Neill, Wilshire Associates, Inc.
Jeanna Cullins, Aon Hewitt Investment Consulting
Julie Becker, Aon Hewitt Investment Consulting
Bob Schaefer, Wisconsin State Engineering Association
Michael P. McGuire, Northwest Passage Capital Advisors
(Some of those listed may have attended only portions of the meeting.)

With a quorum present, the Board Chair called the Board of Trustees meeting to order at 8:30 a.m.

1. Approval of Open Session Minutes

Motion: A motion was made by Trustee Claflin-Chalton and seconded by Trustee Stewart to approve the open session minutes of the December 13, 2017 meeting, as submitted. The motion passed unanimously.

2. Election of Secretary and Assistant Secretary

The Chair stated that in accordance with Investment Board procedures, the Board elects a

Secretary and Assistant Secretary annually. Duties of the Secretary include signing the minutes of the Board meetings. Duties of the Assistant Secretary include certifying to the validity of copies of statutes and SWIB documents when requested by counterparties. Typically, the Board selects a Trustee as Secretary and the Chief Legal Counsel as Assistant Secretary. Trustee Conlin is currently serving as Secretary and Rochelle Klaskin as Assistant Secretary.

Motion: A motion was made by Trustee Nick and seconded by Trustee Stewart to elect Trustee Conlin as Secretary and Rochelle Klaskin as Assistant Secretary for 2018. The motion passed unanimously.

3. Committee Reports and Recommended Actions from Committee Agendas

A. Compensation Committee

Trustee Stein reported that the Compensation Committee (a) performed its annual review of the Compensation Committee Charter and the SWIB Compensation Philosophy; (b) reviewed the *2018 Strategic Results Pool Scorecard*; (c) reviewed updated calendar year 2017 incentive compensation projections; and (d) revisited the proposed 2018 Relative Performance Maximums (RPMs).

Trustee Stein commented that most of the Trustees were present at the Committee meeting and, hearing no desire for further discussion, he offered the following recommendations for the Board's consideration.

1. Comprehensive Relative Performance Maximums (RPM) Results

Motion: A motion was made by Trustee Stein and seconded by Trustee Cummings to approve the Comprehensive RPM results, as presented in the Committee meeting materials and as recommended by the Compensation Committee. The motion passed unanimously.

2. Amendment to the Compensation Committee Charter

Motion: A motion was made by Trustee Stein and seconded by Trustee Cummings to amend the Compensation Committee Charter to reflect an increase in the maximum number of Committee members from four to five, as recommended by the Compensation Committee. The motion passed unanimously.

3. Annual Compensation Philosophy Review

Motion: A motion was made by Trustee Stein and seconded by Trustee Stewart to update SWIB's Compensation Philosophy to clarify that it pertains to total "cash" compensation, as recommended by the Compensation Committee. The motion passed unanimously.

4. Approval of the 2018 Strategic Results Pool Scorecard

Motion: A motion was made by Trustee Stein and seconded by Trustee Nick to approve the *2018 Strategic Results Pool Scorecard*, as presented in the Committee meeting materials and as recommended by the Compensation Committee. The motion passed unanimously.

B. Audit and Finance Committee

Trustee Cummings reported that the Audit and Finance Committee (1) received a quarterly Cost of Management update; (2) received an update from the Internal Audit Director on open audit issues and the status of the 2018 Audit Plan; (3) approved the Follow-up Audit Report and the Chapter 25 Internal Operating Expenses Audit Report; (4) discussed the 2018 Internal Audit Plan; (5) reviewed the Committee's Charter; and (6) received other routine reports.

1. Amendment to Audit and Finance Committee Charter

Motion: A motion was made by Trustee Cummings and seconded by Trustee Conlin to approve the revisions to the Audit and Finance Committee Charter, as presented in the Committee meeting materials, and further to reflect an increase in the maximum number of Committee members from four to five, as discussed and recommended by the Audit and Finance Committee. The motion passed unanimously.

C. Strategic Planning and Corporate Governance Committee

Trustee Nick reported that the Strategic Planning and Corporate Governance (SPCG) Committee received updates from staff on the 2017 Annual Strategic Plan and the April 11, 2018 Spring Investment Forum. The Committee also met with SWIB's Real Estate Consultant, Courtland Partners, for an annual overview of the real estate market and discussion of SWIB's Real Estate portfolio.

4. Investment Performance and Market Updates

A. Board Investment Performance Report, Q4 2017

Phil Richards, Performance Director, and Brad Gentert, Performance Analyst, presented the *Investment Performance Report*, as of December 31, 2017, included on pages 21-38 in the meeting materials.

Mr. Richards reported that (1) the Core Trust Fund (CTF) returned 3.9% gross of fees in Q4 2017, resulting in a year-to-date (YTD) gross-of-fee return of 16.2%, which outperformed the Policy Benchmark by 51 basis points (bps); (2) Private Equity remains the highest contributor to the CTF YTD excess return; (3) Public Fixed Income had a strong relative return for the quarter (gross of fees) among all sub-asset classes; and (4) the CTF five-year gross-of-fee return of 8.6% outperformed the Policy Benchmark by 37 bps on an annualized basis. Mr. Richards then walked the Board through the details of the *Investment Performance Report*, and Mr. Villa discussed the breakdown of internal versus external management presented on page 25 of the meeting materials.

5. Review of 2017 Performance and Quarterly Investment Update, Q4 2017

Mr. Villa kicked off the *Quarterly Investment Update*, which was included on pages 40-88 in the meeting materials. He highlighted illustrations on pages 42-50, including decomposing the 2017 CTF five-year annual return and providing some preliminarily forecasts for the 2018 CTF five-year return. He also discussed some of the causes for the decline in labor's and capital's shares of the U.S. economy as well as the drivers of today's corporate profits, and facilitated the Board's

discussion of the implications of those factors.

Mr. Anderson reviewed the market outlook, referring to the illustrations on pages 53-55 of the meeting materials, and noted that (a) CCC bond issuance is rising; (b) international equities (unhedged) lead 2017; and (c) credit spreads have narrowed, equity multiples are higher and the U.S. 10-Year Treasury Bond yield has increased.

Messrs. Hellmer, Ludgate, Stanton, Carpenter, and Anderson then provided commentary and reviewed the outlook for each manager's respective asset class as they walked the Board through the materials on page 56-88 and answered questions while facilitating Board discussion.

6. Investment Committee Open Session Business

A. Approved Minutes

Mr. Villa stated that the approved open session minutes of the November 30, 2017 and December 21, 2017 Investment Committee meetings were included on pages 90-99 in the meeting materials for the Board's review, and noted that he had previously reviewed the agendas for these meetings with the Board.

B. Agendas for Upcoming Meetings

Mr. Villa referenced the open session agenda for the January 23, 2018 Investment Committee meeting and the draft open session agendas for the March 1, 2018 and March 27, 2018 meetings, which were included on pages 100-105 in the meeting materials.

8. Annual Fiduciary Training

Jeanna Cullins, a partner at the Board's Governance Consultant, Aon Hewitt Investment Consulting, provided the Trustees with their annual training on the Board's fiduciary responsibilities. A copy of her presentation was included in the meeting materials on pages 107-122.

9. Motion to Convene in Closed Session

Motion: A motion was made by Trustee Stein and seconded by Trustee Neitzel to convene in closed session pursuant to §§ 19.36(5) and 19.85(1)(e) of the Wisconsin Statutes to (a) consider confidential and proprietary strategies for the investment of public funds relating to the active risk and specific proprietary investment strategies of internal WRS portfolios, and (b) approve prior closed minutes that discuss the same; pursuant to § 19.85(1)(c) of the Wisconsin Statutes to (c) discuss the performance evaluation data of SWIB's former Executive Director, and (d) approve executive closed minutes related to performance review of the Internal Audit Director; and pursuant to § 19.85(1)(g) of the Wisconsin Statutes to (e) discuss with the Chief Legal Counsel confidential strategies regarding pending litigation.

The Chair called for a roll call vote.

Claflin-Chalton-Aye
Nick-Aye

Conlin-Aye
Sheehy-Aye

Cummings-Aye
Stein-Aye

Neitzel-Aye
Stewart-Aye

There being eight ayes and no nays, the Chair declared the motion passed. The Board convened in closed session at 10:12 a.m. and reconvened in open session at 12:56 a.m.

7. Announcement of Board Actions Relating to Items Taken up in Closed Session

Trustee Stein reported that during its regular closed session, staff updated the Board on confidential investment strategies and approved closed session minutes. During executive closed session, the Board conducted its annual self-evaluation and the evaluation of SWIB's former Executive Director, and approved executive closed session minutes.

8. Enterprise Risk Management Quarterly Report

Trustee Stein noted that the draft open session minutes of the *Enterprise Risk Management Quarterly Report* were included in the meeting materials on pages 125-127 for the Board's information. There was no formal presentation.

9. Annual Committee Assignments by Board Chair

Trustee Stein noted that pursuant to each Committee Charter, the Board Chair shall appoint members of each Committee and appoint members to serve as Committee Chair, Vice-Chair and Secretary for terms not to exceed one year. Trustee Stein stated that the following appointments shall be in effect until February 28, 2019.

Audit and Finance Committee

Norm Cummings, Chair
Bob Conlin, Vice-Chair & Secretary
Tim Sheehy
Paul Stewart

Jeff Anderson State Controller, ex-officio
Joe Chrisman, State Auditor, ex-officio

Benchmark and Performance Committee

Sandra Claflin-Chalton, Chair
Paul Stewart, Vice-Chair & Secretary
Mark Doll
David Stein

Compensation Committee

David Stein, Chair
Mark Doll, Vice-Chair & Secretary
Barb Nick
Tim Sheehy

Strategic Planning and Corporate Governance Committee

Barb Nick, Chair
Norm Cummings, Vice-Chair & Secretary
Sandra Claflin-Chalton
Bob Conlin
Scott Neitzel

10. Reports Filed Without Comment

In the absence of questions, the following reports were filed without comment: (a) New Contracts, Q4 2017; and (b) Private Markets and Funds Alpha Commitments, Q4 2017.

11. Future Items for Discussion

There were no future items discussed.

12. Adjournment

Motion: A motion to adjourn was made by Trustee Cummings and seconded by Trustee Stewart. The motion passed unanimously and the meeting adjourned at 1:00 p.m.

Date of Board Approval: _____

Signed: _____
Robert J. Conlin, Board Secretary

DRAFT



Leverage Performance – 2017

Board Meeting – Open Session

April 10, 2018

CTF Leverage Performance

As of December 31, 2017

CTF Leverage Strategy (Gross of Fees)

Core Trust Fund	2017	5 Year	10 Year
Portfolio Return (Unleveraged)	14.73%	8.08%	5.61%
Return from Leverage ¹	1.45%	0.50%	0.25%
Implementation (+) or (-) ^{2, 3, 4}	0.04%	0.02%	0.01%
Portfolio Return (Leveraged)	16.22%	8.60%	5.87%

- Leverage added 145 bps (1-yr) and 50 bps (5-yr)
- 2017 leverage = 8.9%
- Implementation: Managing relative cost of leverage +4 bps (1-yr)
- Gross absolute return = 16.2% (1-yr)
- The true benefit of leverage: SWIB has the ability to construct a more efficiently allocated portfolio, resulting in greater return for the same level of risk

Notes:

¹ The returns from leverage are effectively (assumed) to be the same for the portfolio and benchmark

² The cost of leverage financing isn't the same for the portfolio and benchmark

³ Implementation is the relative cost of leverage financing (portfolio - benchmark)

⁴ If the number is positive (negative), strategy implementation added (lost) value

Alpha-Beta Leverage Performance

As of December 31, 2017

Alpha-Beta Overlay Strategy

Alpha Category (Net of Fees)	2017	Inception ¹
Alpha Portfolio Return	0.78%	0.20%
Alpha Benchmark Return ^{2, 3}	1.36%	1.17%
Alpha Excess Return (Active)	-0.58%	-0.97%
Beta Category (Gross of Fees)		
CTF Benchmark Return ⁴	15.71%	9.91%
Alpha-Beta Return	15.13%	8.94%

- Alpha absolute return = 78 bps (1-yr)
- Alpha active return = - 58 bps (1-yr)
- Beta absolute return = 15.7% (1-yr)
- Alpha (active) is transported (overlaid) onto the CTF beta exposure, resulting in a return of 15.1% (1-yr)
- Portable alpha program is more risk/return efficient vs. alpha assets in the policy benchmark

Notes:

¹ Inception date = 11/30/15

² The alpha benchmark represents the estimated cost of leverage financing (Libor + Spread)

³ (Inception thru 12/31/16 = Libor + 30 bps) | (01/01/17 thru 12/31/17 = Libor + 10 bps)

⁴ The CTF portfolio and benchmark betas are equal. To remove the double counting of alpha, the benchmark return is used instead of the portfolio



Investment Strategy

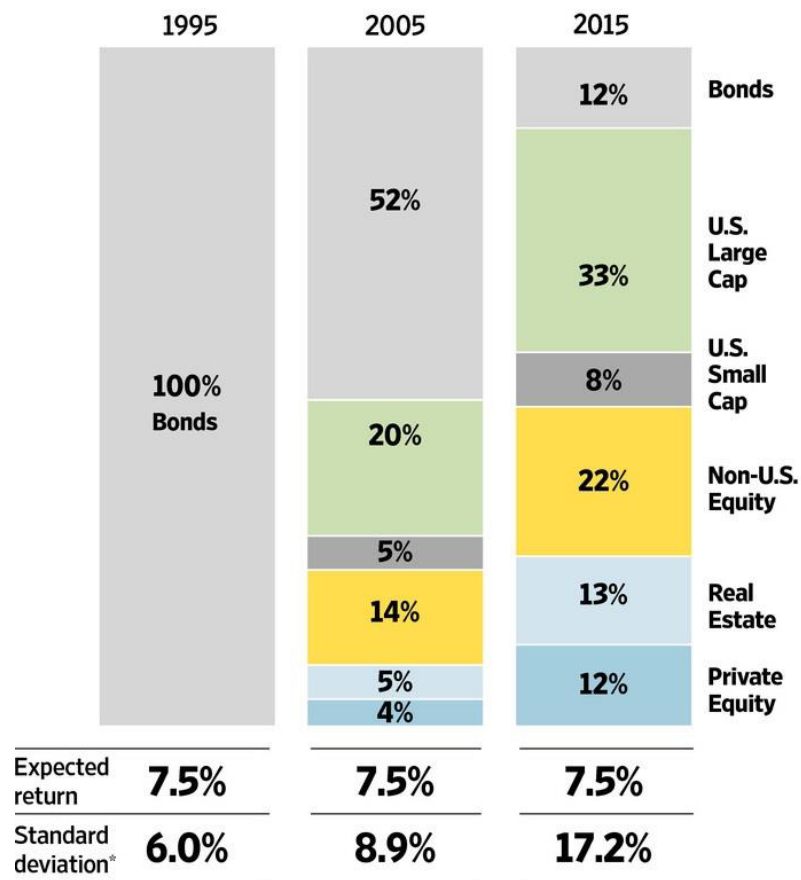
April 2018

CIO and Managing Directors

Trends in Return Assumptions

Present significant challenges today

Estimates of what investors needed to earn 7.5%



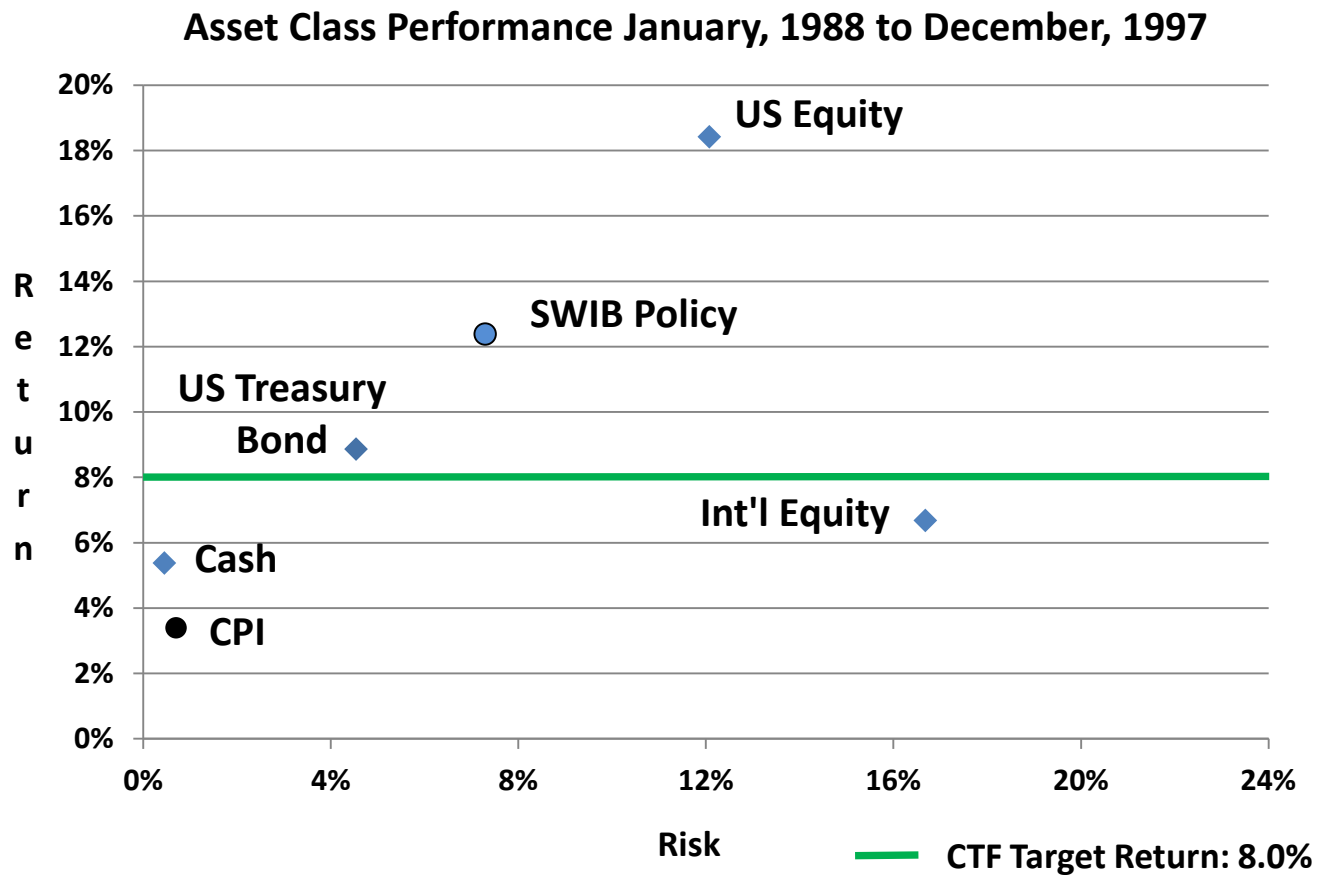
*Likely amount by which returns could vary

Source: Callan Associates

THE WALL STREET JOURNAL.

Asset Class Performance

3 Decades Ago

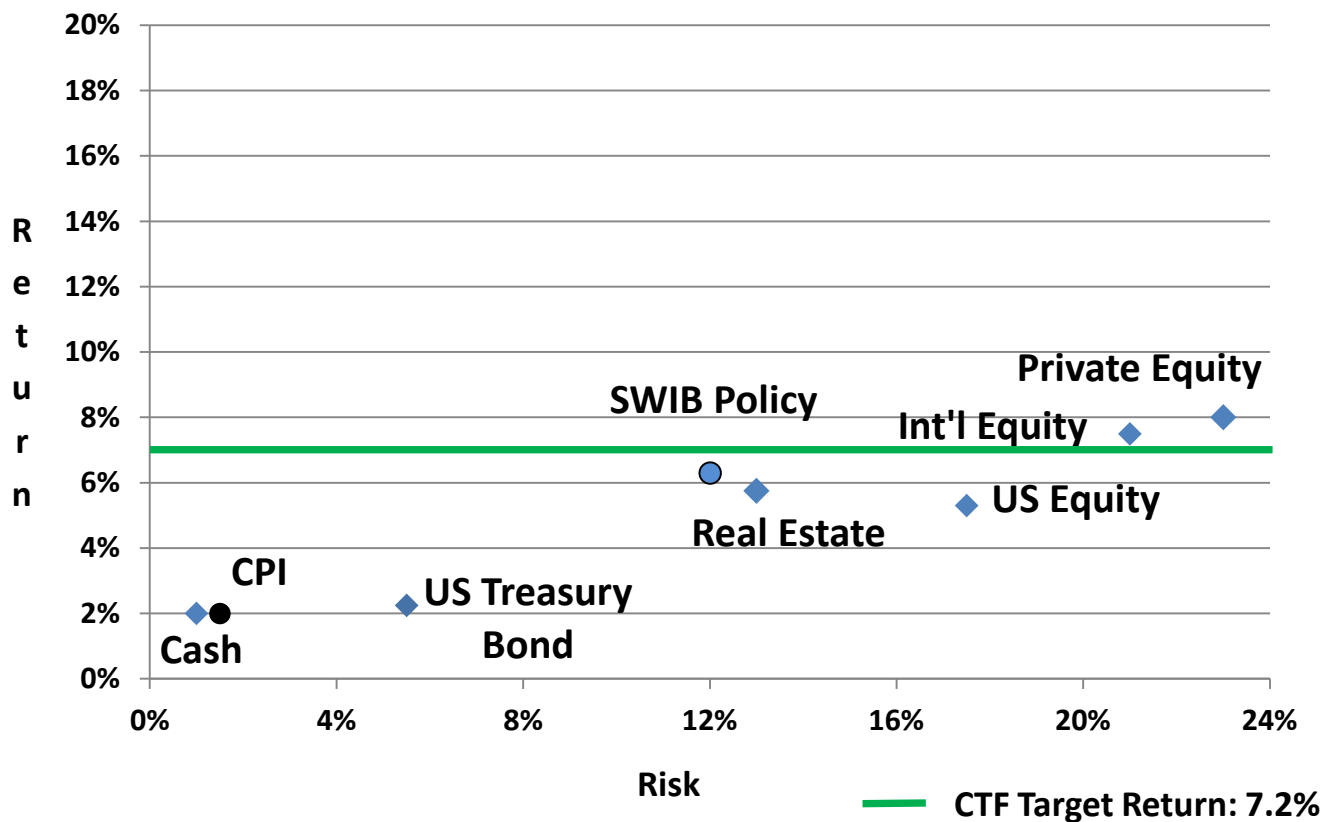


Source: FactSet, SWIB

Current Asset Class Expectations

Significantly below historical experience

5 – 7 Year Asset Class Expectations



Source: NEPC Assumptions as of January, 2018

2018 Investment Strategy Summary

- Deliver complex policy portfolio with leverage that outperforms the low cost passive reference portfolio. (Deliver \$1.3 billion per year on average above reference.)
- Increase the expected value added from active management relative to the policy portfolio. (Risk Budget Target Value Added = \$570 million.)
 - Expand the alpha/beta overlay.
 - Strengthen the internal equity and multi asset divisions.
 - Increase the private equity and debt co-investment program.
- Improve cross functional collaboration and project management.

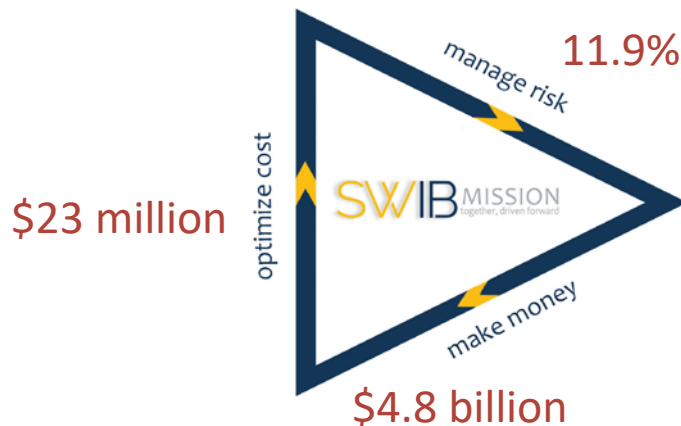
SWIB Staff and Infrastructure Add \$1.7 Billion

With \$30 million additional cost and 20 bps additional risk

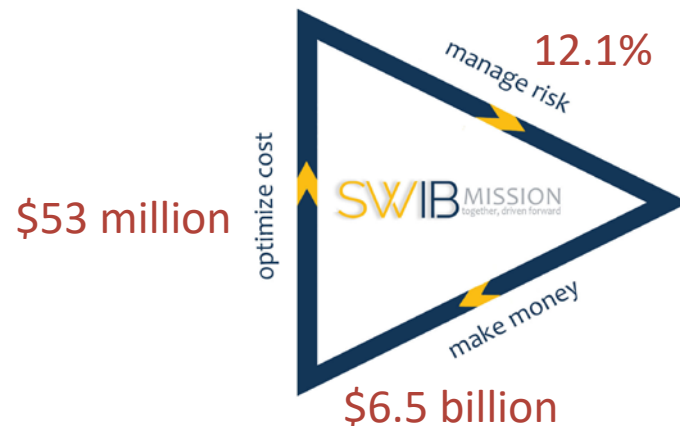
Investment Strategies + Effective Operational Execution

increases likelihood of 6.8% return
in next 5-7 years within a risk controlled and cost
optimized manner

Reference Portfolio
2017

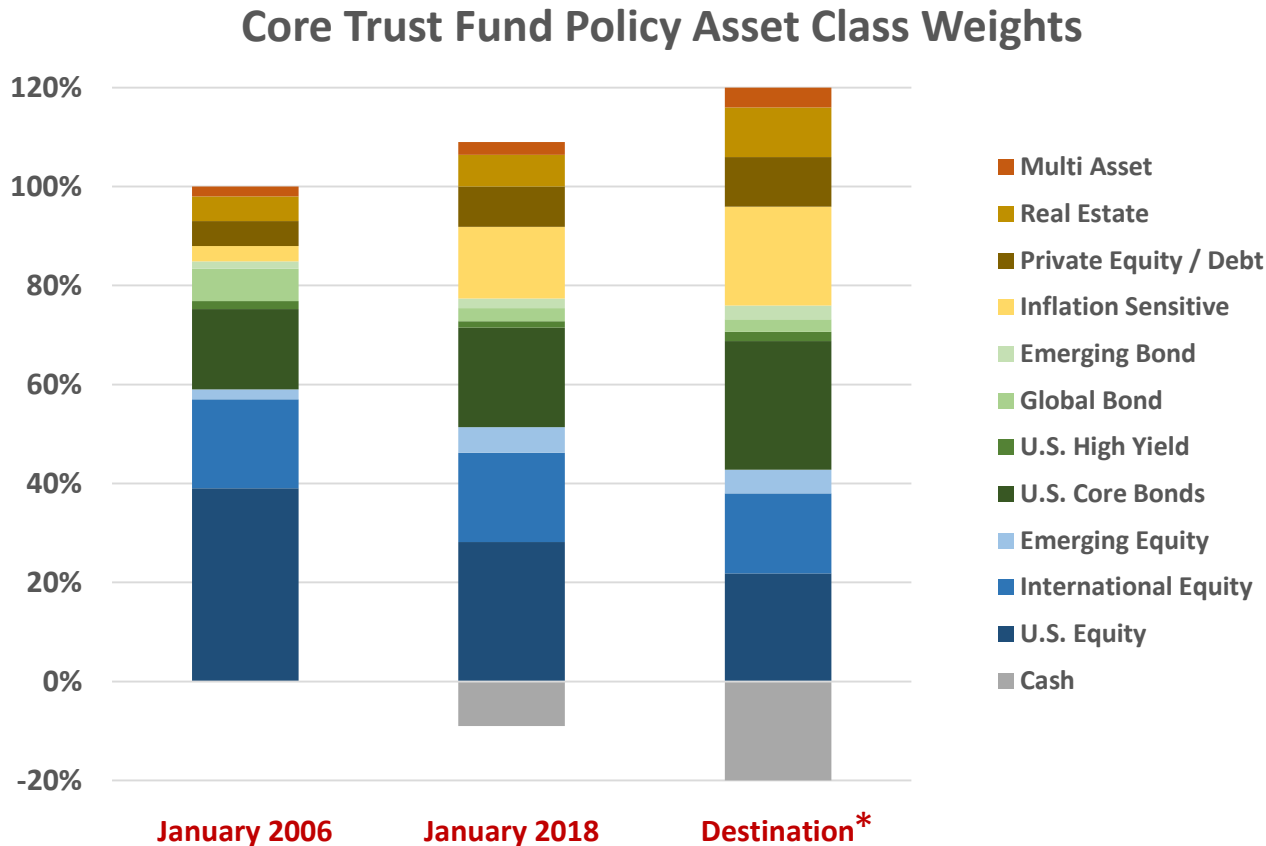


Policy Portfolio
2017



Core Trust Fund Composition

Historical, Current and Destination Asset Mixes



Source: Dec-05 AASPE, Dec-17 Exposure Report

* SUBJECT TO FUTURE MARKET CONDITIONS

Core Trust Fund Composition

Historical, Current and Destination Asset Mixes

Asset Class	January 2006	January 2018	Destination*
U.S. Equity	39.0%	28.2%	21.9%
International Equity	18.0%	18.0%	16.2%
Emerging Equity	2.0%	5.1%	4.8%
U.S. Core Bonds	16.2%	20.1%	26%
U.S. High Yield	1.6%	1.3%	1.9%
Global Bond	6.6%	2.6%	2.5%
Emerging Bond	1.5%	2.0%	2.7%
Inflation Sensitive	3.1%	14.5%	20.0%
Private Equity / Debt	5.0%	8.1%	10.0%
Real Estate	5.0%	6.4%	10.0%
Multi Asset	2.0%	2.6%	4.0%
Cash	0.0%	-9.0%	-20.0%

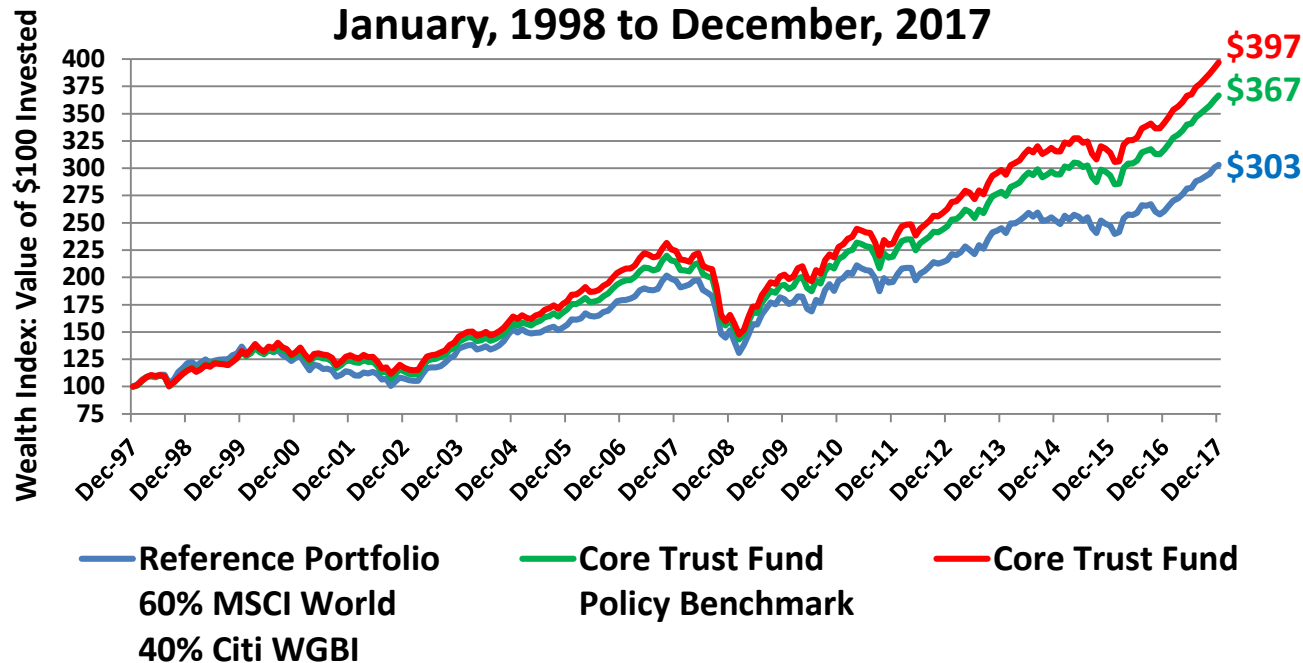
Source: Dec-05 AASPE, Dec-17 Exposure Report

* SUBJECT TO FUTURE MARKET CONDITIONS

Core Trust Fund Performance

20-Year History

Wealth Accumulation over 20 Years January, 1998 to December, 2017



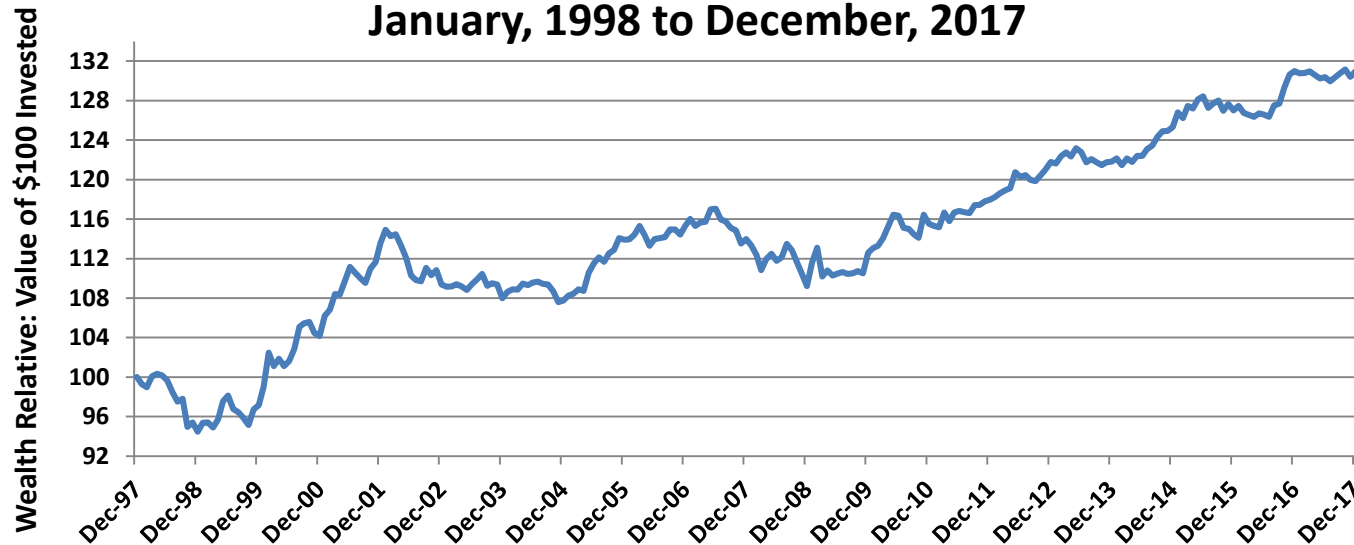
Reference Portfolio 20-Year Dollar Return	Additional Policy Portfolio Return Above Reference	Additional Active Portfolio Return	Total Core Trust Fund Dollar Return
\$87.3 Billion	+ \$27.4 Billion	+ \$13.0 Billion	= \$127.7 Billion

Source: Monthly gross returns applied to January, 1998 beginning CTF market value of \$43 billion.

CTF Outperforms Reference Portfolio by 31%

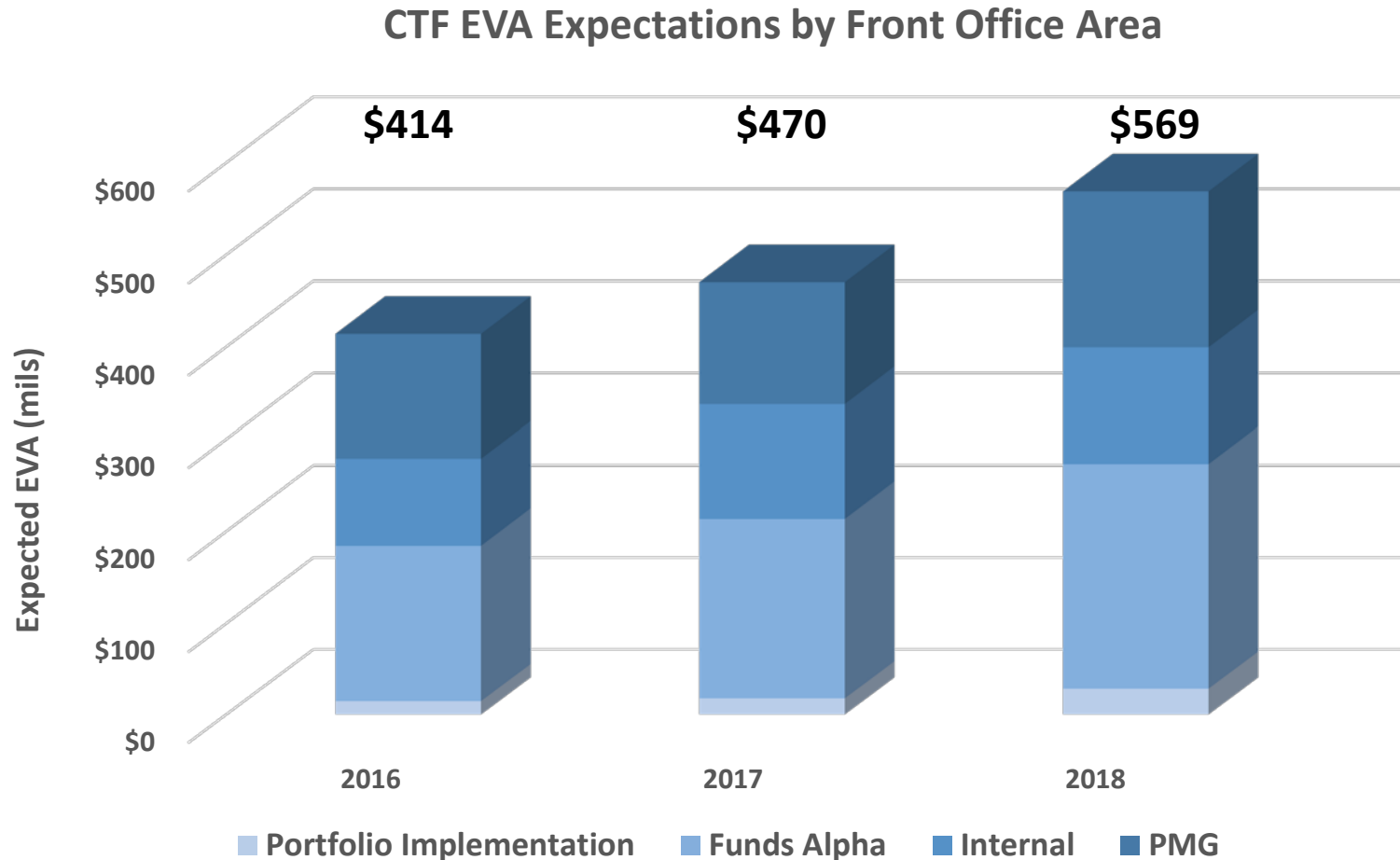
\$40.4 billion in value-added over 20 years

**Core Trust Fund versus Reference Portfolio
January, 1998 to December, 2017**



	Reference Portfolio Return	Policy Portfolio Return Above Reference	Active Portfolio Return	SWIB Core Trust Fund Return
1 Year	16.24%	- 0.53%	+ 0.51%	= 16.22%
5 Year	7.03%	+ 1.20%	+ 0.37%	= 8.60%
10 Year	4.40%	+ 1.10%	+ 0.36%	= 5.87%

CTF Active Risk Budgets Over Time



Private Markets and Funds Alpha

Private Markets and Funds Alpha Strategy

A. Private Equity and Current Return Co-Investments

- Recruit a Senior Investment Professional to source and underwrite new co-investments.
- Recruit an Investment Analyst to be the Subject Matter Expert for the PMFA Technology Platform implementation and support the Funds and Co-Investment Portfolios.
- Recruit a Managing Analyst to lead a new Current Return Co-Investment Portfolio.
- Leverage existing Current Return GP relationships to generate Current Return Co-Investment deal flow.

Private Markets and Funds Alpha Strategy

B. Expand Alpha/Beta Overlay and Beta One

- Continue to work with the Project Management Office to further enhance new manager onboarding.
- Build working relationship with Aksia (SWIB's newly engaged hedge fund staff consultant).
- Access high quality, uncorrelated and efficient sources of active return and active risk.
- Access markets and strategies with good opportunities for active management and in which SWIB does not currently hold capabilities (Emerging Markets, High Yield, Structured Credit, Quant Strategies, etc.).
- Access the best external investment talent to enhance internal alpha generation.

Internal Public Markets

Public Equities Division

Historical Performance Summary

- Small-Cap Diversified portfolio
 - 5 person team has been consistent alpha generator
 - \$2.1 billion in AUM, 5 year alpha of 2.16% annualized
 - Annual cost of about \$3 million (14 bps), EVA of \$42 million
- Global Sector Aggregate Portfolio (GSAP)
 - Challenging 5 year performance, showing improvement
 - \$11.6 billion in AUM – scalable to \$20 billion potentially
 - Annual cost of about \$10 million (9 bps), total of 19 people

	SWIB	MSCI	
	<u>Global Sector</u>	<u>World</u>	<u>Alpha</u>
June 2016 - Dec 2017	32.08%	31.72%	0.36%
Dec 2012 - June 2016	1.66%	6.06%	-4.41%
Trailing 5 Years	34.27%	39.71%	-5.44%

Strategic Goal – Improve the GSAP

Strengths to Build Upon

- High quality fundamental research
- Active risk composition mostly idiosyncratic
- Portfolio construction sophistication level very high for some teams
- Sector team structure creates opportunity for the GSAP to be consistent and efficient alpha producer
 - Variety of quality investment processes creates diversification benefits (fund of funds strategy)
 - Risk factor exposures often cancel out - sets stage for strong alpha production per unit of active risk (high Information Ratio)

Strategic Goal – Improve the GSAP

Opportunities to Improve

- Aggregation process to build GSAP from underlying sector portfolios was suboptimal
 - Risk canceling results in GSAP active risk level being too low
 - Active risk contribution from individual sector portfolios was unbalanced and often a function of sector size
 - Overall factor tilts were not optimized at GSAP level
- Inconsistencies in process robustness, portfolio construction, risk management
- Lack of necessary reports, data & tools
- Shorting was under-utilized across most teams

Strategic Goal – Improve the GSAP

2018 Focus Points

- Implement new aggregation process for the GSAP
 - Will give us the ability to magnify and balance active risk levels of the GSAP
 - Stretches active weights (long & short) of current sector portfolios, balances risk contribution among various sector portfolios
 - Maintains focus of current sector teams and variety of processes
 - Key dependencies include upgraded trading system & improved shorting capabilities
- Improve consistency of investment process & risk management
- Revamp personnel structure to increase alpha potential, efficiency and improve development opportunities
- Introduce new tools and data sets

Multi-Asset Strategic Goal - Identify New Strategies

- The Multi-Asset team currently runs six “anchor” strategies. These strategies are well-vetted and scalable to total division AUM of \$5 bil.
- The Multi-Asset Team believes there are at least two additional broad areas of the market where efficient, scalable strategies can be developed: Volatility and Commodities.
- The Multi-Asset Team is currently in the process of hiring an additional managing analyst, and is specifically looking for analysts with experience in at least one of these two areas. It is difficult to find this specialized expertise.

Multi Asset Strategic Goal - Expand Derivatives Capabilities

- SWIB has greatly expanded its derivatives capabilities over the last decade, and now makes extensive use of complex futures and options instruments across its portfolios. However, SWIB has further opportunities to expand its derivatives use, particularly in the area of swaps.
- The Multi-Asset Team plans to continue to push for additional capabilities in the derivatives space, as using these instruments can lead to additional alpha opportunities and more efficient hedging.

Multi-Asset Strategic Goal – Expand Strategy Tagging

- The Multi-Asset portfolios need the capability to see P&L and risk by strategy. This assures that strategies are acting as intended and mitigates risk.
- Off-the-shelf solutions for this capability are difficult to find, and SWIB has had to begin to develop a propriety system of tagging trades and flowing them into front-office systems.
- Although some solutions are beginning to come onboard for tagging at SWIB, there are still gaps in capabilities. Work will continue on improving SWIB's tagging capabilities.

Fixed Income Strategic Objectives

2018

- The 2018 risk budget increased the net economic value added target for fixed income, in support of the total increased value add objective for SWIB.
- Consistent with this objective, the active portfolios are adding risk in order to generate additional alpha.
- The primary method of adding risk has been to increase position concentration.

Fixed Income Strategic Objectives

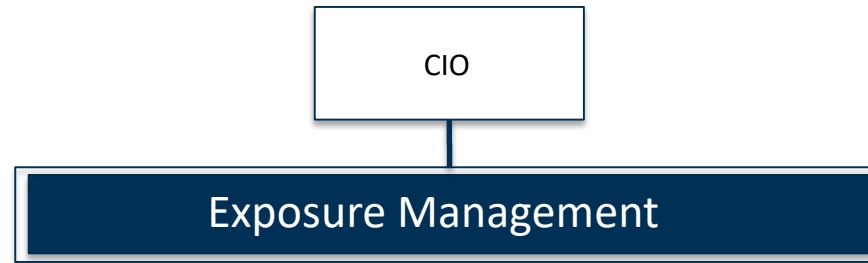
2018

- New areas of interest to generate alpha include emerging market bonds; this requires increased operational and legal support to enable.
- We are implementing a new fixed income risk and analytics system to replace our existing platform which is being retired by the vendor. This project requires resources from many areas including IT and Operations.
- Currently hiring for two managing analysts in the credit area to assist with alpha generation.

Asset and Risk Allocation

Exposure management/Risk management

Improves fund efficiency by adding return when opportunities are available and managing risk.



1 Measure Exposures

Factor Exposures	Absolute Exposures
Misfit Exposures	Relative Exposures

2 Measure Risks

- Market Risk
- Concentration Risk
- Liquidity Risk
- Event Risk
- Valuation Risk
- Portfolio Level Risks

3 Rebalance

- Asset Class
- Sub Asset Class
- Factor
- Risk Based Method

4 Value Risk Premiums

- Valuation Framework
- Factor Analysis
- Risk Premium Cash Allocation

5 Implement Playbook

- Plays
- Measurement
- Implementation Process
- Signals
- Macro Outlook

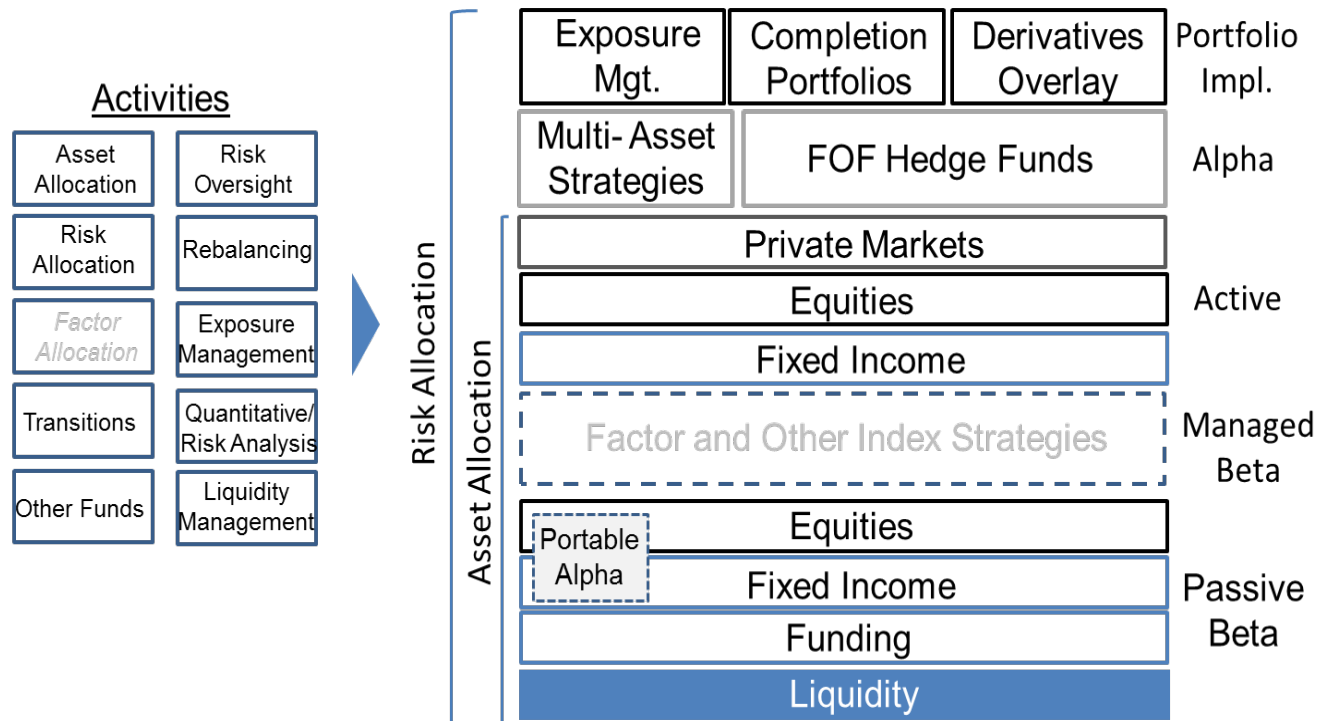
26

Manage Liquidity

Liquidity management creates opportunity in times of market stress.

- Identify and deploy sources of liquidity in times of market stress to take advantage of market distortions.
- Manage the cost of leverage. Savings greater than \$125 mil/year. Other cost savings opportunities may be available longer term.
- Manage the amount and return on collateral.
- Manage funding risk with funding source diversification and by designing an appropriate term structure of funding.

ARA Activities and Portfolio Impact



Requirements:

- Advanced risk analytics and other systems/technology
- Derivative counter-parties, contracts and operations
- High quality return, holding and transaction data
- Liquidity management – funding cost and risk, collateral management
- Talent

➔

- \$28 m/yr – Port Impl
- \$125 m/yr – Funding

>150 mil/yr NEVA

STATE OF WISCONSIN INVESTMENT BOARD

Investment Committee Meeting-Open Session

Tuesday, January 23, 2018

Offices of the Investment Board
121 East Wilson Street, Madison, Wisconsin

Committee Members Present: David Villa, Chief Investment Officer (Chair)
Chuck Carpenter, Managing Director-Private Markets & Funds
Alpha (Vice-Chair)
Todd Ludgate, Managing Director-Public Fixed Income
Brian Hellmer, Managing Director-Public Equities
Scott Anderson, Managing Director-Asset & Risk Allocation
Nick Stanton, Head of Multi-Asset Strategy
Chirag Gandhi, Portfolio Manager-Global Bonds
Chris Prestigiacomo, Portfolio Manager-Private Debt & Venture Capital
Derek Drummond, Funds Alpha Manager
Brian Heimsoth, Quantitative Manager
Rick Smirl, Executive Director

Also in Attendance: Rochelle Klaskin, Chief Legal Counsel
Shirley Eckes, Chief Operating Officer
Mike Bress, Chief Financial Officer
Jennifer Schmeiser, Chief Human Resources Officer
Russell Snow, Investment Operations & Fund Accounting Director
Phil Richards, Performance Director
Brandon Brickner, Internal Audit Director
James Wooten, Data Management Director
Brad Gentert, Performance Analyst
Mike Shearer, Managing Analyst-Multi-Asset Strategy
Chase Nicholson, Managing Analyst-Multi-Asset Strategy
Chris Benish, Asset & Risk Allocation Analyst
Gretchen Wegner, Securities Analyst-Liquidity, Inflation & Rates Mgmt.
Keith Schmidt, Project Management Office Manager
Sara Chandler, Assistant Legal Counsel
Lisa Lange, Compliance Counsel
Scott Parrish, Portfolio Manager-Private Equity
Kurt Petrie, Internal Auditor
Chris Preisler, Communications Specialist
Janet Klosterman, Legal Assistant
Eileen Neill, Verus Advisory Inc. (by telephone)
Rose Dean, Wilshire Inc. (by telephone)
Jennifer Wildeman, Aksia, LLC (by telephone)
Some individuals may have attended only portions of the meeting.)

OPEN SESSION

With a quorum present, Mr. Villa called the meeting to order at 1:02 p.m.

1. Approval of the Minutes

David Villa, Chief Investment Officer and Committee Chair, asked if there were any comments on either the open or closed session minutes of the December 21, 2017 Investment Committee (IC) meeting. Hearing no comments, Mr. Villa stated that the Committee could approve both the open and closed session minutes in open session.

Motion: A motion was made by Mr. Ludgate and seconded by Mr. Stanton to approve both the open session and the closed session minutes of December 21, 2017 IC meeting, as presented. The motion passed unanimously.

2. Quarterly Performance Review

A. Core Trust Fund Performance and Attribution

Phil Richards, Performance Director, and Brad Gentert, Performance Analyst, presented the *Preliminary Performance and Attribution Update-Q4 2017*. A copy of their report was included in the meeting materials on pages 9-14. Based on the available data as of January 16, 2018, Mr. Gentert reported **(a)** the Core Trust Fund (CTF) returned 3.9% gross of fees in Q4 2017, resulting in a year-to-date (YTD) gross of fee return of 16.2%, which outperformed the Policy benchmark by 50 basis points (bps); **(b)** Private Equity remained the highest contributor to the CTF YTD excess return; **(c)** Public Fixed Income had a strong relative return for the quarter driven by the internal Government/Credit Portfolio and external managers (gross of fees) among all sub asset classes; and **(d)** the CTF 5-year gross of fee return of 8.6% outperformed the Policy benchmark by 37 bps on an annualized basis. Mr. Gentert then reviewed the relative return attribution for the Core Trust Fund and Variable Trust Fund.

B. Cost of Leverage Benchmark

Eileen Neill, Verus Advisory, stated that Verus had followed up on the Cost of Leverage Benchmark (currently LIBOR + 10bps) based upon a notification from the Asset & Risk Allocation division (ARA) that actual roll costs had increased by more than 10bps. Ms. Neill explained that Verus had conducted due diligence on current leverage costs with external pricing sources and was making a preliminary recommendation to increase the Cost of Leverage Benchmark to LIBOR + 30bps. Ms. Neill answered questions regarding the diligence process and the data collected and facilitated a discussion of the calculation methodology of the benchmark.

Ms. Klaskin stated that the current Cost of Leverage Benchmark was approved by the Board of Trustees in 2016 as part of the comprehensive benchmark review. Pursuant to the process approved by the Board, when actual roll costs are observed by ARA to increase by more than 10 bps, the Benchmark Consultant, if in agreement after independent review and analysis, may recommend a provisional benchmark change.

Mr. Villa requested that Ms. Neill undertake continued conversations with members of the Committee and Mr. Richards regarding the proposed benchmark change and return at a future meeting with a final recommendation for the Committee's consideration.

3. Fixed Income Q4 2017 Update

Todd Ludgate, Managing Director-Fixed Income, presented the Fixed Income Q4 2017 Update. A copy of his report, *Investment Strategies: Public Fixed Income*, was included in the meeting materials on pages 15-35.

Mr. Ludgate reported that current assets under management (AUM) were \$16.6 billion. Referring to the illustration on page 16, Mr. Ludgate provided a breakdown of the total AUM between the three fixed income portfolios (Global, Government/Credit, and Liquidity, Inflation & Rates Management) and highlighted the year-to-date net economic value added (NEVA) for each.

Mr. Ludgate noted that compliance information for each portfolio was included on pages 17-21 for the Committee's information. He then referred to charts on pages 22-25, as he discussed the current market environment and answered questions.

4. Public Equities Q4 2017 Update

Brian Hellmer, Managing Director-Public Equities, presented the Public Equities Q4 2017 Update. A copy of his report, *Public Equities Internal Management Quarterly Update*, was included in the meeting materials on pages 36-54.

Mr. Hellmer reported that current assets under management (AUM) were \$15.7 billion. Referring to the illustration on page 37, Mr. Hellmer provided a breakdown of the total AUM between the two public equities portfolios (Global Sector and Small Cap Diversified) and highlighted the year-to-date economic value added (EVA) for each.

Mr. Hellmer noted that compliance information for each portfolio was included on pages 38-39 for the Committee's information. He then discussed both 2017 and historical performance for the Global Sector Aggregate portfolio and the Small Cap Diversified portfolio and reviewed 2017 equity market performance along with the equity markets outlook as illustrated on pages 42 and 44, and answered questions.

5. Multi-Asset Q4 2017 Update

Nick Stanton, Head of Multi-Asset Strategy, presented the Multi-Asset Q4 2017 Update. A copy of his report, *Multi-Asset Internal Management Quarterly Update*, was included in the meeting materials on pages 55-60.

Mr. Stanton walked the Committee through his presentation, discussing Q4, year-to-date and historical performance for the Global Securities and Alpha portfolios, the 2017 P&L for the Options Overlay, and answered questions.

6. Instrument Governance-Futures

Rochelle Klaskin, Chief Legal Counsel, reviewed the Committee's governance requirements for new instruments and derivatives, including the Committee's required approval. She explained that to clarify previous approvals made by the Committee and the interpretation over time of the same, she will facilitate the Committee's ratification of approved instruments, as necessary, in this and subsequent meetings to document the governance for such new instruments and derivatives. For today, she addressed the authorizations to trade futures contracts in the various internal portfolios.

Motion: A motion was made by Mr. Gandhi and seconded by Mr. Hellmer to:

- Authorize, approve and ratify that all internal public equities portfolios may invest in and trade futures contracts pursuant to their portfolios guidelines and subject to the general and derivative guidelines contained in the IC WRS Investment Guidelines; provided that the underliers to such futures contracts are public-equity related securities;
- Authorize, approve and ratify that all internal public fixed income portfolios may invest in and trade futures contracts pursuant to their portfolios guidelines and subject to the general derivative guidelines contained in the IC WRS Investment Guidelines, provided that the underliers to such futures contracts are either specified in their investment guidelines or are fixed-income related securities.
- Authorize, approve and ratify that all internal portfolios managed by the Multi-Asset Strategies Division may trade any futures contracts for all underliers, subject to the general and derivatives guidelines contained in the IC WRS Investment Guidelines.

The motion passed unanimously.

7. Motion to Convene in Closed Session

Motion: A motion to go into closed session pursuant to § 19.85(1)(e) and § 19.36(5) of the Wisconsin Statutes to consider confidential strategies for the investment of public funds, including **(a)** the active risk profiles of portfolio investments and the Core Trust Fund, **(b)** specific proprietary investment strategies related to Funds Alpha, Private Debt, Private Equity, Venture Capital, and Real Estate, **(c)** the review of specific investment trades, active risk and proprietary investment strategies in internal portfolios, including in Exposure Management, Fixed Income, Public Equities, and Multi-Asset Portfolios, and **(d)** the review and approval of credit guidelines for an external manager, was made by Mr. Ludgate and seconded by Mr. Carpenter.

The Chair called for a roll call vote.

Anderson-Aye	Carpenter-Aye	Drummond-Aye	Gandhi-Aye
Heimsoth-Aye	Hellmer-Aye	Ludgate-Aye	Prestigiacomo-Aye
Smirl-Aye	Stanton-Aye	Villa-Aye	

There being eleven ayes and no nays, the Chair declared the motion passed. The Committee then convened in closed session at 1:56 p.m. and reconvened in open session at 4:34 p.m.

8. Announcement of Committee Actions Relating to Items Taken up in Closed Session

Mr. Villa announced that, while in closed session, the Committee **(a)** discussed Core Trust Fund Leverage and Alpha Overlay Performance and attribution; **(b)** reviewed Q4 investment strategies in Fixed Income, Public Equities, Multi-Asset, and exposure management; **(c)** approved the 2018 Funds Alpha, Private Debt, Venture Capital, Private Equity, and Real Estate strategies; **(d)** discussed a potential new Multi-Asset strategy; and **(e)** approved amendments to the Passive External Manager Guidelines.

9. Spring Investment Forum Preview

Mr. Villa stated that the preliminary agenda for the Spring Investment Forum, to be held at the Monona Terrace on April 11, 2018, was included on page 280 in the meeting materials for the Committee's review and that there would be no formal presentation unless there were comments or questions.

10. Soft Risk Parameters Report

Mr. Villa stated that the report, *Soft Risk Parameters-Asset Class and Portfolio* dated December 31, 2017, was included on pages 281-284 in the meeting materials for the Committee's review. Mr. Heimsoth noted that there were no new triggers that required the Committee's review or discussion.

11. Future Meeting Topics

Mr. Villa noted that a summary of standard Investment Committee agenda items and draft agendas for the March 1, 2018 and March 27, 2018 meetings were included on pages 285-290 of the meeting materials for the Committee's review.

12. Adjournment

Motion: A motion to adjourn the meeting was made by Mr. Carpenter and seconded by Mr. Anderson. The motion passed unanimously and the meeting adjourned at 4:36 p.m.

Date of Committee Approval: 3-1-2018

Signed: /s/ Scott M. Anderson
Scott M. Anderson
Investment Committee Secretary

STATE OF WISCONSIN INVESTMENT BOARD

Investment Committee Meeting-Open Session

Thursday, March 1, 2018

Offices of the Investment Board
121 East Wilson Street, Madison, Wisconsin

Committee Members Present: David Villa, Chief Investment Officer (Chair)
Chuck Carpenter, Managing Director-Private Markets & Funds
Alpha (Vice-Chair)
Todd Ludgate, Managing Director-Public Fixed Income
Brian Hellmer, Managing Director-Public Equities
Scott Anderson, Managing Director-Asset & Risk Allocation
Nick Stanton, Head of Multi-Asset Strategy
Chirag Gandhi, Portfolio Manager-Global Bonds
Chris Prestigiacomo, Portfolio Manager-Private Debt & Venture Capital
Derek Drummond, Funds Alpha Manager
Brian Heimsoth, Quantitative Manager
Rick Smirl, Executive Director

Also in Attendance: Rochelle Klaskin, Chief Legal Counsel
Phil Richards, Performance Director
Brandon Brickner, Internal Audit Director
Jon Simon, Managing Analyst-Public Fixed Income
Sara Chandler, Assistant Legal Counsel
Vicki Hearing, Communications Manager
TerriJo Saarela, Corporate Governance Manager
Janet Klosterman, Legal Assistant
Eileen Neill, Verus Advisory Inc. (by telephone)
Rose Dean, Wilshire Inc. (by telephone)
Chris Levell, NEPC (by telephone)
(Some individuals may have attended only portions of the meeting.)

OPEN SESSION

With a quorum present, Mr. Villa called the meeting to order at 1:30 p.m.

1. Approval of the Minutes

David Villa, Chief Investment Officer and Committee Chair, asked if there were any comments on either the open or closed session minutes of the January 23, 2018 Investment Committee (IC) meeting. Hearing no comments, Mr. Villa stated that the Committee could approve both the open and closed session minutes in open session.

Motion: A motion was made by Mr. Prestigiacomo and seconded by Mr. Smirl to approve both the open session and the closed session minutes of the January 23, 2018 IC meeting, as presented. The motion passed unanimously.

2. Funds Alpha Q4 2017 Update

Derek Drummond, Funds Alpha Manager, presented the Funds Alpha Q4 2017 Update. A copy of his report was included in the meeting materials on pages 9-24.

Mr. Drummond reviewed the 2017 EVA for each business line as compared to the 2017 EVA targets. He then reviewed the long-term performance of the Hedge Fund and Beta One portfolios, including historical betas and correlation to various markets, and explained the performance attribution for 2017, year-to-date and Q4. He also noted that both portfolios are in compliance with all strategy weights and ranges.

Mr. Drummond reported that SWIB'S Hedge Fund portfolio returned over 2% in the absolute return space to finish the year flat with the Libor + 10bps benchmark, and the Beta One portfolio's 2017 performance was positive in both equity and fixed income, with Q4 positive performance driven by fixed income strategies. He also walked the Committee through the Funds Alpha Pipeline included on page 24 of the meetings materials.

Mr. Drummond also noted that an offer had been accepted to fill the open Managing Analyst role on the Funds Alpha team.

3. Private Debt Q4 2017 Update

Chris Prestigiacomio, Portfolio Manager-Private Debt & Venture Capital, presented the Private Debt Portfolio Q4 2017 Update. A copy of his report was included in the meeting materials on pages 25-32.

Mr. Prestigiacomio reported that, at December 31, 2017, the Private Debt Portfolio market value was \$512,983,532. He then described the portfolio characteristics. He reviewed portfolio returns and the loan pipeline and answered questions. Mr. Prestigiacomio also reported that there are no active watchlist or workout loans to be reported at this time and that the Private Debt portfolio is in compliance with all portfolio guidelines.

Mr. Prestigiacomio also noted that the Private Debt team will be moving to a new pricing vendor this year.

4. Cost of Leverage Interim Benchmark

Phil Richards, Performance Director, introduced Eileen Neill, Verus Advisory, Inc., SWIB's benchmark consultant. Ms. Neill noted that the Committee had discussed at its January 23, 2018 meeting, the Cost of Leverage Benchmark (currently LIBOR + 10bps) and increasing roll costs. Based on those increased costs, Verus is recommending a change to the benchmark from LIBOR +10bps to LIBOR + 30bps. Under the Board's benchmark policies, the Investment Committee can approve provisional benchmarks under certain conditions. All provisional benchmarks must be confirmed by the Board of Trustees prior to the end of the calendar year. Ms. Neill referred to her memorandum on pages 33-34 of the meeting materials, discussed the rationale for the recommended change and answered questions.

Motion: A motion was made by Mr. Anderson and seconded by Mr. Gandhi to approve the recommended Cost of Leverage provisional benchmark of 3-Month LIBOR + 30 bps, effective as of January 1, 2018. The motion passed unanimously.

5. Motion to Convene in Closed Session

Motion: A motion to go into closed session pursuant to § 19.85(1)(e) and § 19.36(5) of the Wisconsin Statutes to consider confidential strategies for the investment of public funds, including (a) the review of active risk profiles of portfolio investments; and (b) the review of specific proprietary investment strategies related to venture capital, funds alpha, private debt, and exposure management was made by Mr. Carpenter and seconded by Mr. Prestigiacomo.

The Chair called for a roll call vote.

Anderson-Aye	Carpenter-Aye	Drummond-Aye	Gandhi-Aye
Heimsoth-Aye	Hellmer-Aye	Ludgate-Aye	Prestigiacomo-Aye
Smirl-Aye	Stanton-Aye	Villa-Aye	

There being eleven ayes and no nays, the Chair declared the motion passed. The Committee then convened in closed session at 2:01 p.m. and reconvened in open session at 3:14 p.m.

6. Announcement of Committee Actions Relating to Items Taken up in Closed Session

Mr. Villa announced that, while in closed session, the Committee (a) reviewed Q4 investment strategies in Private Debt, Venture Capital, Funds Alpha, and exposure management; and (b) discussed total and active risk for the Core and Variable Funds.

(Note: The Committee recessed for a five-minute break at 3:15 p.m.)

7. Currency Task Force Report

Chirag Gandhi, Chair of the Currency Task Force, referred to the February 19, 2018 meeting agenda included on page 107 in the materials, as he talked about the task force's recent discussions and answered questions.

8. Credit Task Force Report

Jon Simon, Chair of the Credit Task Force, referred to the February 20, 2018 meeting agenda included on page 108 in the materials, as he talked about the task force's recent discussions and answered questions. He noted that (a) that the task force has not identified any credit issues with SWIB's counterparties that require the Investment Committee's discussion, (b) credit market indicators continue to suggest we are late in the credit cycle, and (c) the Task Force is continuing to work on enhancing credit reporting capabilities.

9. Research Task Force Report

Todd Ludgate, Co-Chair of the Research Task Force, presented the *Research Task Force Report to Investment Committee* dated February 2018, which was included on page 109 in the meeting materials, as he reviewed the list of completed projects, updated the Committee on projects in progress and ideas under consideration, and answered questions.

10. Spring Investment Forum Preview

Mr. Villa stated that the tentative speaker agenda for the Spring Investment Forum, to be held at the Monona Terrace on April 11, 2018, was included on page 110-113 in the meeting materials for the Committee's review and that there would be no formal presentation unless there were comments or questions.

11. Soft Risk Parameters Report

Mr. Villa stated that the report, *Soft Risk Parameters-Asset Class and Portfolio* dated January 31, 2018, was included on pages 114-117 in the meeting materials for the Committee's review. Rochelle Klaskin, Chief Legal Counsel, noted that a new trigger for Private Markets and Funds Alpha based on hedge fund equity delta to the S&P500 appeared on the report. The Investment Committee discussed it, and was satisfied that staff will continue to monitor the level and that the threshold was only mildly above the trigger.

12. Future Meeting Topics

Mr. Villa noted that a summary of standard Investment Committee agenda items and draft agendas for the March 27, 2018 and April 24, 2018 meetings were included on pages 118-123 of the meeting materials for the Committee's review.

13. Adjournment

Motion: A motion to adjourn the meeting was made by Mr. Carpenter and seconded by Mr. Anderson. The motion passed unanimously and the meeting adjourned at 3:21 p.m.

Date of Committee Approval: 3/27/2018

Signed: /s/ Scott M. Anderson
Scott M. Anderson
Investment Committee Secretary

Staff Investment Committee Meeting

Tuesday, March 27, 2018

STATE OF WISCONSIN INVESTMENT BOARD

121 East Wilson Street

Madison, Wisconsin

Presentation Room

1:30 p.m.

**Est. Time
(minutes)**

OPEN SESSION



1. Approval of the Minutes - Open Session

A. March 1, 2018

15

2. Private Equity Q4 2017 Update – Scott Parrish

15

3. Real Estate Q4 2017 Update – Steve Spiekerman

10



4. Investment Guidelines Amendments

A. UW System Trust Funds Asset Allocation and Guidelines

Recommendation – Rochelle Klaskin and Chris Levell, NEPC



B. Investment Committee WRS Investment Guidelines – Rochelle Klaskin

10



5. Benchmark Recommendation for UW System Trust Funds – Eileen Neill, Verus



CLOSED SESSION*



RECONVENE IN OPEN SESSION

6. Announcement of Committee Actions Relating to Items Taken up in Closed Session

7. Soft Risk Parameters (No presentation unless requested)

8. Spring Investment Forum Preview (No presentation unless requested)

9. Future Meeting Topics



10. Motion to Adjourn

*A motion to go into closed session at this meeting is authorized pursuant to § 19.85(1)(e) and §19.36(5) of the Wisconsin Statutes to approve prior closed session minutes and to consider confidential strategies for the investment of public funds, including the review of the active risk profiles of portfolio investments, specific proprietary investment strategies related to Private Equity and Real Estate, and the review of specific investment trades and strategies in SWIB's exposure management portfolios. The Committee may convene in additional closed sessions or announce additional closed session items at the meeting in accordance with the procedure outlined in the Attorney General's Opinion reported at 66 OAG 106 (1977). Whenever a closed session is held, the committee will subsequently reconvene in open session to cover remaining agenda items.

NOTES: Items may be taken in order other than listed.

The meeting site is physically accessible. Upon prior request, reasonable accommodations will be provided.

FUTURE MEETINGS

4/24/18 – April Committee Mtg.
5/29/18 – May Committee Mtg.
6/26/18 – June Committee Mtg.
7/24/18 – July Committee Mtg.
8/28/18 – August Committee Mtg.
9/25/18 – September Committee Mtg.
10/23/18 – October Committee Mtg.
11/27/18 – November Committee Mtg.
12/20/18 – December Committee Mtg.

Investment Committee Members:

Chief Investment Officer: David Villa (Chair)
Managing Director-Private Markets & Funds Alpha: Chuck Carpenter (Vice-Chair)
Managing Director-Asset & Risk Allocation: Scott Anderson (Secretary)
Managing Director-Public Equities: Brian Hellmer
Managing Director-Fixed Income: Todd Ludgate
Head of Multi-Asset Strategy: Nick Stanton
Portfolio Manager: Chris Prestigiacomo
Portfolio Manager: Chirag Gandhi
Quantitative Manager: Brian Heimsoth
Funds Alpha Manager: Derek Drummond
Executive Director: Rick Smirl

Staff Investment Committee Meeting

**Tuesday, April 24, 2018
STATE OF WISCONSIN INVESTMENT BOARD
121 East Wilson Street
Madison, Wisconsin
Presentation Room
1:30 p.m.**



**Est. Time
(minutes)**

OPEN SESSION

- | | | |
|----|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| |  | 1. Approval of the Minutes – Open Session
A. March 27, 2018 |
| 5 | | 2. October Board Workshop Preview – David Villa and Scott Anderson |
| 5 | | 3. Transition Update – Gary Wensing |
| 15 | | 4. Quarterly Performance Review – Phil Richards and Brad Gentert |
| 5 | | 5. Fixed Income Q1 2018 Update – Todd Ludgate |
| 5 | | 6. Public Equities Q1 2018 Update – Brian Hellmer |
| 5 | | 7. Multi-Asset Q1 2018 Update – Nick Stanton |



CLOSED SESSION*

- | | | |
|----|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| 1. |  | RECONVENE IN OPEN SESSION |
| | | 8. Announcement of Committee Actions Relating to Items Taken up in Closed Session |
| | | 9. Soft Risk Parameters (No presentation unless requested) |
| | | 10. Future Meeting Topics |
| |  | 11. Motion to Adjourn |

*A motion to go into closed session at this meeting is authorized pursuant to § 19.85(1)(e) and §19.36(5) of the Wisconsin Statutes (a) to approve prior closed session minutes and (b) to consider confidential strategies for the investment of public funds, including (i) the active risk profiles of portfolio investments and the Core Trust Fund, (ii) specific proprietary investment strategies related to Funds Alpha, Private Debt, Private Equity, Venture Capital, and Real Estate, (iii) the review of specific investment trades, active risk and proprietary investment strategies in internal portfolios, including in Exposure Management, Fixed Income, Public Equities, and Multi-Asset Portfolios, and (iv) the review and approval of credit guidelines for an external manager. The Committee may convene in additional closed sessions or announce additional closed session items at the meeting in accordance with the procedure outlined in the Attorney General's Opinion reported at 66 OAG 106 (1977). Whenever a closed session is held, the committee will subsequently reconvene in open session to cover remaining agenda items.

NOTES: Items may be taken in order other than listed.

The meeting site is physically accessible. Upon prior request, reasonable accommodations will be provided.

FUTURE MEETINGS

5/29/18 – May Committee Mtg.
6/26/18 – June Committee Mtg.
7/24/18 – July Committee Mtg.
8/28/18 – August Committee Mtg.
9/25/18 – September Committee Mtg.
10/23/18 – October Committee Mtg.
11/27/18 – November Committee Mtg.
12/20/18 – December Committee Mtg.

Investment Committee Members:

Chief Investment Officer: David Villa (Chair)
Managing Director-Private Markets & Funds Alpha: Chuck Carpenter (Vice-Chair)
Managing Director-Asset & Risk Allocation: Scott Anderson (Secretary)
Managing Director-Public Equities: Brian Hellmer
Managing Director-Fixed Income: Todd Ludgate
Head of Multi-Asset Strategy: Nick Stanton
Portfolio Manager: Chirag Gandhi
Portfolio Manager: Chris Prestigiacomo
Quantitative Manager: Brian Heimsoth
Funds Alpha Manager: Derek Drummond
Executive Director: Rick Smirl

Staff Investment Committee Meeting

**Tuesday, May 29, 2018
STATE OF WISCONSIN INVESTMENT BOARD
121 East Wilson Street
Madison, Wisconsin
Presentation Room
1:30 p.m.**

**Est. Time
(minutes)**

OPEN SESSION



1. **Approval of Minutes - Open Session**
A. April 24, 2018

5

2. **Spring Investment Forum Debrief** – David Villa

5

3. **October Workshop Preview** – David Villa and Scott Anderson

15

4. **Funds Alpha Q1 2018 Update** – Derek Drummond

15

5. **Private Debt Q1 2018 Update** – Chris Prestigiacomo



CLOSED SESSION*



RECONVENE IN OPEN SESSION

6. **Announcement of Committee Actions Relating to Items Taken up in Closed Session**

5

7. **Currency Task Force Report** – Chirag Gandhi

5

8. **Credit Task Force Report** – Jon Simon

5

9. **Research Task Force Report** – Todd Ludgate, Nick Stanton and Brian Hellmer

10. **Derivatives Report** (No presentation unless requested)

11. **Soft Risk Parameters** (No presentation unless requested)

12. **Future Meeting Topics**

*A motion to go into closed session at this meeting is authorized pursuant to § 19.85(1)(e) and §19.36(5) of the Wisconsin Statutes to approve prior closed session minutes and to consider confidential strategies for the investment of public funds, including the review of active risk profiles of portfolio investments, the review of specific proprietary investment strategies related to venture capital, funds alpha, private debt, and exposure management, to approve the Core Trust Fund's active risk budget, and to review internally developed third-party counterparty credit terms and guidelines. The Committee may convene in additional closed sessions or announce additional closed session items at the meeting in accordance with the procedure outlined in the Attorney General's Opinion reported at 66 OAG 106 (1977). Whenever a closed session is held, the committee will subsequently reconvene in open session to cover remaining agenda items.



13. Motion to Adjourn

NOTES: Items may be taken in order other than listed.

The meeting site is physically accessible. Upon prior request, reasonable accommodations will be provided.

FUTURE MEETINGS

6/26/18 – June Committee Mtg.
7/24/18 – July Committee Mtg.
8/28/18 – August Committee Mtg.
9/25/18 – September Committee Mtg.
10/23/18 – October Committee Mtg.
11/27/18 – November Committee Mtg.
12/20/18 – November Committee Mtg.

Investment Committee Members:

Chief Investment Officer: David Villa (Chair)
Managing Director-Private Markets & Funds Alpha:
Chuck Carpenter (Vice-Chair)
Managing Director-Asset & Risk Allocation: Scott
Anderson (Secretary)
Managing Director-Public Equities: Brian Hellmer
Managing Director-Fixed Income: Todd Ludgate
Head of Multi-Asset Strategy: Nick Stanton
Portfolio Manager: Chris Prestigiacomo
Portfolio Manager: Chirag Gandhi
Quantitative Manager: Brian Heimsoth
Funds Alpha Manager: Derek Drummond
Executive Director: Rick Smirl

ASSET ALLOCATION



UNIVERSITY OF WISCONSIN SYSTEM TRUST FUNDS

February 2018

Christopher Levell, ASA, CFA, CAIA, Partner



BOSTON | ATLANTA | CHARLOTTE | CHICAGO | DETROIT | LAS VEGAS | PORTLAND | SAN FRANCISCO

BACKGROUND – EXISTING STRUCTURE

- **Long Term Fund: \$423 million**
 - Real return objective
 - Long term endowment time horizon
 - 15% illiquid in private equity and real assets
- **Intermediate Term Fund: \$87 million**
 - Preservation of capital objective
 - 2-5 year horizon
- **Income Fund: \$63 million**
 - Cash investment
 - Immediate liquidity

SUMMARY – PROPOSED STRUCTURE

Long Term Fund

- **SWIB assumes investment management of assets (“SWIB Fund”)**
- **Illiquid investment commitments managed by StepStone for SWIB with existing commitments met, but no future fundings anticipated**
- **Liquid investments placed in BlackRock index funds**
 - Efficient asset class exposure
 - Low administrative and management fees

Income Fund

- **Retained and managed by UW Trust Funds**

Intermediate Term Fund

- **Intermediate Fund assets to be reassigned by UW departments**
 - Each program could go into Income Fund, SWIB Fund, or a combination

RECOMMENDED INDEX FUNDS

- **Most exposure provided by broad market index funds**
 - Global Equities
 - US Government/Credit Fixed Income
 - US Treasury Inflation Protection Securities
- **Small allocation to select additional index funds to increase diversification and provide favorable risk/return tilts**
 - Each is already included as subclasses of broad funds above
 - Hedged Developed Market Equities
 - Emerging Market Equities
 - REITs
- **Other asset classes considered, but not as diversifying**
 - US Small Cap
 - EAFE Unhedged
 - EAFE Small Cap
 - Global Bonds
 - High Yield

RECOMMENDED ALLOCATION

	Current Long Term Fund	Current Interm. Term Fund	Proposed Liquid SWIB Structure	SWIB Fund @ \$423 m
Cash	2%	6%	0%	0%
Large Cap Equities	12%	0%	0%	0%
Small/Mid Cap Equities	3%	0%	0%	0%
Int'l Equities (Unhedged)	13%	0%	0%	0%
Int'l Equities (Hedged)	0%	0%	6%	5%
Emerging Int'l Equities	9%	0%	3%	3%
Global Equity	0%	14%	48%	41%
Private Equity	13%	0%	0%	13%
Total Equity	51%	14%	57%	62%
Core Bonds	10%	64%	20%	17%
High-Yield Bonds	8%	5%	0%	0%
Total Fixed Income	17%	69%	20%	17%
TIPS	0%	10%	20%	17%
Private Real Assets	2%	0%	0%	2%
REITs	0%	0%	3%	3%
Total Real Assets	2%	10%	23%	21%
Global Asset Allocation	28%	0%	0%	0%
Total Multi Asset	28%	0%	0%	0%
Expected Return 5-7 yrs	6.5%	4.1%	5.8%	6.3%
Expected Return 30 yrs	7.6%	5.3%	6.9%	7.4%
Standard Dev	13.5%	7.0%	11.1%	11.9%
Sharpe Ratio (5-7 years)	0.34	0.30	0.35	0.36
Sharpe Ratio (30 years)	0.36	0.36	0.37	0.39
Prob. of 5 yr return >4%	66%	51%	64%	66%
Prob. of 5 yr return <0%	14%	10%	12%	12%
Prob. of 30 yr return >4%	93%	84%	92%	94%

- The Proposed Liquid SWIB Structure uses six index funds for exposure
- The total allocation with alternatives will depend on the level of total assets
- The SWIB Fund has similar profile to Long Term Fund
 - Slightly less expected return and volatility
 - Improved return/risk (Sharpe) ratio
- Inflation addressed through TIPS, REITs, and higher equity exposure

Totals may not sum due to rounding



APPENDIX: ASSUMPTIONS

COMMENTS ON EXISTING STRUCTURE

- **Each of the liquid asset classes can be replicated with a BlackRock index fund, except for the Global Asset Allocation Strategy – GMO Real Return Global Balanced**
 - Best index options for real return focus are TIPS and REITS
- **Liquid equity investments are roughly similar to market cap weights, and can be replaced with the All Country World Index**
- **Core bond allocation can be replaced with Government/Credit Index**
 - Similar to SWIB approach
 - High yield, while a good long term strategic investment, has thin spreads currently
- **Cash allocation can be eliminated due to liquid nature of index funds**

2018 5-7 YEAR RETURN FORECASTS

Geometric Expected Return			
Asset Class	2018	2017	2018-2017
Cash	2.00%	1.75%	+0.25%
Treasuries	2.25%	2.00%	+0.25%
IG Corp Credit	3.50%	3.75%	-0.25%
MBS	2.50%	2.25%	+0.25%
Core Bonds*	2.75%	2.65%	+0.10%
TIPS	3.25%	3.00%	+0.25%
High-Yield Bonds	3.75%	4.75%	-1.00%
Bank Loans	4.50%	5.25%	-0.75%
Non-US Bonds (Unhedged)	0.50%	1.00%	-0.50%
Non-US Bonds (Hedged)	0.73%	1.09%	-0.36%
EMD External	4.25%	4.75%	-0.50%
EMD Local Currency	6.00%	6.75%	-0.75%
Large Cap Equities	5.25%	5.75%	-0.50%
Small/Mid Cap Equities	5.75%	6.00%	-0.25%
Int'l Equities (Unhedged)	7.50%	7.25%	+0.25%
Int'l Equities (Hedged)	7.82%	7.57%	+0.25%
Emerging Int'l Equities	9.00%	9.50%	-0.50%
Private Equity	8.00%	8.25%	-0.25%
Private Debt	6.50%	7.25%	-0.75%
Core Real Estate	5.75%	6.00%	-0.25%
Commodities	4.75%	4.75%	-
Hedge Funds**	5.83%	5.95%	-0.12%

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

** Hedge Funds is a calculated blend of 40% Equity, 40% Credit, 20% Macro-related strategies.

2018 5-7 YEAR RETURN FORECASTS

Geometric Expected Return			
Asset Class	2018	2017	2018-2017
Short Treasuries	2.25%	2.00%	+0.25%
US 10 Yr. Treasury	2.25%	2.00%	+0.25%
Long Treasuries	2.00%	1.75%	+0.25%
20+ Year STRIPS	1.75%	1.50%	+0.25%
Short Credit	2.75%	2.75%	-
Long Credit	4.00%	4.25%	-0.25%
Long Government/Credit*	3.26%	3.33%	-0.07%
Non-US Cash**	0.50%	0.25%	+0.25%
Non-US Inflation-Linked Bonds	1.75%	1.00%	+0.75%
Short High Yield	4.25%	5.00%	-0.75%
Municipal Bonds (1-10 Year)	2.50%	-	-
High Yield Municipal Bonds	3.75%	4.25%	-0.50%
Global Equity*	6.88%	7.21%	-0.33%
MLPs	7.25%	7.00%	+0.25%
REITs	6.50%	6.50%	-
Real Assets (Liquid)**	5.87%	5.92%	-0.05%
Non-Core Real Estate	7.00%	N/A	N/A
Private Real: Energy/Metals	8.00%	8.25%	-0.25%
Private Real: Infrastructure/Land	6.00%	6.00%	-
Hedge Funds - Long/Short	6.25%	6.25%	-
Hedge Funds – Credit	5.00%	5.25%	-0.25%
Hedge Funds – Macro	6.25%	6.25%	-

* Assumption based on market weighted blend of index components

** Custom weighted blend of underlying asset classes

2018 VOLATILITY FORECASTS

Volatility			
Asset Class	2018	2017	2018-2017
Cash	1.00%	1.00%	-
Treasuries	5.50%	5.50%	-
IG Corp Credit	7.50%	7.50%	-
MBS	7.00%	7.00%	-
Core Bonds*	5.99%	6.03%	-0.04%
TIPS	6.50%	6.50%	-
High-Yield Bonds	13.00%	13.00%	-
Bank Loans	9.00%	9.00%	-
Non-US Bonds (Unhedged)	10.00%	8.50%	+1.50%
Non-US Bonds (Hedged)	4.50%	5.00%	-0.50%
EMD External	13.00%	13.00%	-
EMD Local Currency	13.00%	15.00%	-2.00%
Large Cap Equities	17.50%	17.50%	-
Small/Mid Cap Equities	21.00%	21.00%	-
Int'l Equities (Unhedged)	21.00%	21.00%	-
Int'l Equities (Hedged)	18.00%	18.00%	-
Emerging Int'l Equities	28.00%	28.00%	-
Private Equity	23.00%	23.00%	-
Private Debt	13.00%	14.00%	-1.00%
Core Real Estate	13.00%	15.00%	-2.00%
Commodities	19.00%	19.00%	-
Hedge Funds**	9.07%	8.74%	-0.33%

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

** Hedge Funds is a calculated blend of 40% Equity, 40% Credit, 20% Macro-related strategies.

2018 VOLATILITY FORECASTS

Volatility			
Asset Class	2018	2017	2018-2017
Short Treasuries	2.50%	2.50%	-
US 10 Yr. Treasury	7.50%	7.50%	-
Long Treasuries	12.00%	12.00%	-
20+ Yr. STRIPS	19.00%	19.00%	-
Short Credit	3.50%	3.50%	-
Long Credit	12.00%	13.00%	-1.00%
Long Government/Credit*	11.26%	12.01%	-0.75%
Non-US Cash**	1.00%	1.00%	-
Non-US 10 Yr. Sovereigns**	6.50%	6.50%	-
Non-US Inflation-Linked Bonds (H)	5.50%	6.00%	-0.50%
Short High Yield	8.50%	9.00%	-0.50%
Municipal Bonds (1-10 Year)	5.50%	-	-
Global Equity***	18.22%	18.26%	-0.04%
MLPs	19.00%	20.00%	-1.00%
REITs	21.00%	21.00%	-
Real Assets (Liquid)****	13.06%	12.83%	+0.23%
Non-Core Real Estate	17.00%	N/A	N/A
Private Real: Energy/Metals	21.00%	21.00%	-
Private Real: Infrastructure/Land	12.00%	14.00%	-2.00%
Hedge Funds - Long/Short	11.00%	11.00%	-
Hedge Funds – Credit	9.50%	9.50%	-
Hedge Funds – Macro	9.50%	9.50%	-

* Assumption based on market weighted blend of index components

** Custom weighted blend of underlying asset classes

2018 30 YEAR RETURN FORECASTS

Geometric Expected Return			
Asset Class	2018	2017	2018-2017
Cash	2.75%	3.00%	-0.25%
Treasuries	3.25%	3.50%	-0.25%
IG Corp Credit	4.75%	5.00%	-0.25%
MBS	3.25%	3.50%	-0.25%
Core Bonds*	3.75%	4.00%	-0.25%
TIPS	3.75%	3.75%	-
High-Yield Bonds	5.50%	5.75%	-0.25%
Bank Loans	5.50%	6.00%	-0.50%
Non-US Bonds (Unhedged)	2.50%	2.75%	-0.25%
Non-US Bonds (Hedged)	2.77%	2.87%	-0.10%
EMD External	5.00%	5.75%	-0.75%
EMD Local Currency	6.50%	6.50%	-
Large Cap Equities	7.50%	7.50%	-
Small/Mid Cap Equities	7.75%	7.75%	-
Int'l Equities (Unhedged)	7.75%	7.75%	-
Int'l Equities (Hedged)	8.14%	8.14%	-
Emerging Int'l Equities	9.25%	9.50%	-0.25%
Private Equity	9.50%	9.50%	-
Private Debt	7.50%	8.00%	-0.50%
Core Real Estate	6.50%	6.50%	-
Commodities	5.50%	5.50%	-
Hedge Funds**	6.34%	6.47%	-0.13%

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

** Hedge Funds is a calculated blend of 40% Equity, 40% Credit, 20% Macro-related strategies.

2018 30 YEAR RETURN FORECASTS

Geometric Expected Return			
Asset Class	2018	2017	2018-2017
Short Treasuries	3.00%	3.00%	-
US 10 Yr. Treasury	3.50%	3.50%	-
Long Treasuries	3.50%	3.75%	-0.25%
20+ Yr. STRIPS	3.50%	3.75%	-0.25%
Short Credit	3.75%	3.75%	-
Long Credit	5.25%	5.75%	-0.50%
Long Government/Credit*	4.62%	5.04%	-0.42%
Non-US Cash**	2.00%	2.00%	-
Non-US 10 Yr. Sovereigns**	2.50%	2.50%	-
Non-US Inflation-Linked Bonds	3.00%	2.75%	+0.25%
Short High Yield	5.25%	5.75%	-0.50%
Municipal Bonds (1-10 Year)	3.25%	-	-
Global Equity***	8.24%	8.35%	-0.11%
MLPs	7.50%	7.50%	-
REITs	6.75%	6.75%	-
Real Assets (Liquid)****	6.75%	6.79%	-0.04%
Non-Core Real Estate	7.50%	N/A	N/A
Private Real: Energy/Metals	7.75%	7.75%	-
Private Real: Infrastructure/Land	6.25%	6.00%	+0.25%
Hedge Funds - Long/Short	7.25%	7.25%	-
Hedge Funds – Credit	5.25%	5.50%	-0.25%
Hedge Funds – Macro	6.25%	6.25%	-

* Assumption based on market weighted blend of index components

** Custom weighted blend of underlying asset classes

2018 CORRELATIONS

Asset Class	Cash	US Lev	Tsy	IG	MBS	TIPS	HY	Non-US Bonds (U)	Non-US Bonds (H)	EMD (Ext)	EMD (Loc)	Large Cap	SMID	Int'l (U)	Int'l (H)	EME	PE	PD	PRA - Egy/Met	PRA: Infra/Land	Core RE	Commodities
Cash	1.00	0.90	0.20	0.10	0.25	0.35	-0.05	0.10	0.15	0.05	0.05	-0.10	-0.15	-0.10	-0.10	-0.10	-0.20	0.00	-0.05	0.15	0.10	0.10
US Lev	0.90	1.00	0.20	0.10	0.25	0.35	-0.05	0.10	0.15	0.05	0.05	-0.10	-0.15	-0.10	-0.10	-0.10	-0.25	0.00	-0.05	0.15	0.10	0.10
Treasuries	0.20	0.20	1.00	0.65	0.85	0.65	0.10	0.45	0.70	0.20	0.10	-0.10	-0.15	-0.10	-0.10	-0.20	-0.15	-0.35	-0.20	-0.05	0.10	-0.10
IG	0.10	0.10	0.65	1.00	0.75	0.65	0.55	0.45	0.60	0.60	0.50	0.25	0.25	0.30	0.30	0.35	0.30	0.15	0.20	0.10	0.15	0.15
MBS	0.25	0.25	0.85	0.75	1.00	0.65	0.30	0.45	0.60	0.35	0.25	0.10	0.10	0.05	0.05	-0.10	0.10	-0.15	-0.05	-0.05	0.05	0.00
TIPS	0.35	0.35	0.65	0.65	0.65	1.00	0.20	0.40	0.65	0.30	0.25	-0.10	-0.10	-0.05	-0.05	-0.10	-0.10	-0.10	-0.05	0.05	0.10	0.30
HY	-0.05	-0.05	0.10	0.55	0.30	0.20	1.00	0.10	0.20	0.70	0.55	0.65	0.70	0.65	0.65	0.70	0.60	0.65	0.50	0.40	0.35	0.20
Non-US Bonds (U)	0.10	0.10	0.45	0.45	0.45	0.40	0.10	1.00	0.40	0.30	0.35	0.00	-0.05	0.35	0.05	0.25	-0.15	-0.10	-0.10	0.05	0.15	0.10
Non-US Bonds (H)	0.15	0.15	0.70	0.60	0.60	0.65	0.20	0.40	1.00	0.30	0.20	-0.10	-0.15	-0.10	-0.10	-0.20	-0.20	-0.10	-0.15	0.00	0.05	-0.10
EMD (Ext)	0.05	0.05	0.20	0.60	0.35	0.30	0.70	0.30	0.30	1.00	0.75	0.55	0.55	0.60	0.60	0.70	0.35	0.50	0.40	0.35	0.25	0.35
EMD (Local)	0.05	0.05	0.10	0.50	0.25	0.25	0.55	0.35	0.20	0.75	1.00	0.60	0.50	0.70	0.65	0.80	0.40	0.60	0.40	0.40	0.40	0.50
Large Cap	-0.10	-0.10	-0.10	0.25	0.10	-0.10	0.65	0.00	-0.10	0.55	0.60	1.00	0.90	0.70	0.75	0.65	0.70	0.60	0.65	0.50	0.40	0.30
SMID Cap	-0.15	-0.15	-0.15	0.25	0.10	-0.10	0.70	-0.05	-0.15	0.55	0.50	0.90	1.00	0.65	0.70	0.65	0.75	0.65	0.70	0.50	0.40	0.30
Int'l Eqty (U)	-0.10	-0.10	-0.10	0.30	0.05	-0.05	0.65	0.35	-0.10	0.60	0.70	0.70	0.65	1.00	0.85	0.70	0.60	0.75	0.55	0.45	0.35	0.40
Int'l Eqty (H)	-0.10	-0.10	-0.10	0.30	0.05	-0.05	0.65	0.05	-0.10	0.60	0.65	0.75	0.70	0.85	1.00	0.70	0.65	0.75	0.60	0.45	0.40	0.30
EM	-0.10	-0.10	-0.20	0.35	-0.10	-0.10	0.70	0.25	-0.20	0.70	0.80	0.65	0.65	0.70	0.70	1.00	0.45	0.80	0.50	0.40	0.30	0.55
PE	-0.20	-0.25	-0.15	0.30	0.10	-0.10	0.60	-0.15	-0.20	0.35	0.40	0.70	0.75	0.60	0.65	0.45	1.00	0.65	0.85	0.60	0.50	0.25
PD	0.00	0.00	-0.35	0.15	-0.15	-0.10	0.65	-0.10	-0.10	0.50	0.60	0.60	0.65	0.75	0.75	0.80	0.65	1.00	0.65	0.50	0.40	0.30
PRA - Egy/Met	-0.05	-0.05	-0.20	0.20	-0.05	-0.05	0.50	-0.10	-0.15	0.40	0.40	0.65	0.70	0.55	0.60	0.50	0.85	0.65	1.00	0.75	0.45	0.35
PRA - Infra/Land	0.15	0.15	-0.05	0.10	-0.05	0.05	0.40	0.05	0.00	0.35	0.40	0.50	0.50	0.45	0.45	0.40	0.60	0.50	0.75	1.00	0.70	0.40
Core RE	0.10	0.10	0.10	0.15	0.05	0.10	0.35	0.15	0.05	0.25	0.40	0.40	0.40	0.35	0.40	0.30	0.50	0.40	0.45	0.70	1.00	0.30
Commodities	0.10	0.10	-0.10	0.15	0.00	0.30	0.20	0.10	-0.10	0.35	0.50	0.30	0.30	0.40	0.30	0.55	0.25	0.30	0.35	0.40	0.30	1.00

INFORMATION DISCLAIMER

- Past performance is no guarantee of future results.
- The goal of this report is to provide a basis for substantiating asset allocation recommendations. The opinions presented herein represent the good faith views of NEPC as of the date of this report and are subject to change at any time.
- Information on market indices was provided by sources external to NEPC. While NEPC has exercised reasonable professional care in preparing this report, we cannot guarantee the accuracy of all source information contained within.
- All investments carry some level of risk. Diversification and other asset allocation techniques do not ensure profit or protect against losses.
- This report is provided as a management aid for the client's internal use only. This report may contain confidential or proprietary information and may not be copied or redistributed to any party not legally entitled to receive it.

UNIVERSITY OF WISCONSIN SYSTEM
(Wis. Stat. § 25.17(9)(m))

Description: The University of Wisconsin System (System) trust funds consist primarily of monies that have been gifted directly to a UW institution, rather than to one of the separate, supporting foundations. The Trust Funds Office works externally with donors and other related parties, and internally with the benefiting campuses and colleges, to facilitate the receipt and proper use (compliant with donor terms and conditions) of all gifts and bequests. The majority of the trust funds are invested by SWIB. The System's spending policy targets annual expenditures of 4% of the market value of the assets (calculated using a three-year rolling average) for payment to beneficiaries.

Investment Objective: To achieve, net of administrative and investment expenses, reasonable, attainable and sustainable returns over and above the rate of inflation. SWIB seeks to achieve this objective through the use of passive, externally-managed, public markets funds.

Investment Guidelines:

1. See *VI. General Investment Guidelines* above
2. Make any other legal investment that is specifically approved by the Board

Asset Allocation, Benchmarks and Rebalancing:

The target allocation and benchmarks for the liquid portion of the portfolio shall be:

<u>Target</u>	<u>Rebalance Range</u>	<u>Asset Class</u>	<u>Benchmark</u>
48%	44-52%	Global Equities	MSCI ACWI IMI Index
20%	18-22%	US Government / Credit Fixed Income	BBG/Barclays US Government/Credit Index
20%	18-22%	US TIPS	BBG/Barclays US TIPS Index, Series L
6%	5-7%	Hedged Developed Market Equities	MSCI EAFE Index Net 100% USD Hedged Index
3%	2-4%	Emerging Market Equities	MSCI Emerging Markets Index
3%	2-4%	REITS	FTSE EPRA/NAREIT Developed Index

In addition, the portfolio has an allocation to private equity through a legacy portfolio that is expected to roll off over time.

	<u>Asset Class</u>	<u>Benchmark</u>
<i>\$60M estimated NAV as of December 31, 2017</i>	Private Equity	Custom Burgiss Universe

Rebalancing:

The asset allocation of fund investments shall be reviewed at the end of each quarter. Quarterly net capital flows to the System shall be utilized to rebalance to the target allocation. If the allocation by asset class falls outside the rebalance range following quarterly cash flows, assets will be systematically rebalanced back to the target allocation as soon as practicable and in any event prior to the next quarterly net capital flows.

Roles and Responsibilities:

SWIB. SWIB's roles and responsibilities are detailed in an investment management agreement with the System, which provides the definitive terms of SWIB's engagement. SWIB's responsibilities include the following (references to the trust funds in this section refer solely to the trust funds delegated to SWIB's management by the System):

- Serve as the outsourced investment manager for the trust funds
- Determine and set appropriate asset allocation targets and ranges based on the return and risk objectives of the System
- Implement the asset allocation by selecting appropriate external investment managers or funds
- Determine performance benchmarks
- Determine or review investment guidelines for managers and/or funds to which trust funds are allocated
- Provide for the third-party custody of all trust funds assigned to SWIB's direct management
- Rebalance the trust funds to the asset allocation targets on a periodic basis as described above
- Coordinate cash distributions for the System's liquidity/cash flow requirements
- Regularly communicate with, and provide quarterly investment-related reports to, the System
- Consult with the System regarding investment risk and return objectives and long-term asset class expectations to allow the System to set an appropriate endowment distribution/spending policy as market conditions change
- Provide various reports and information reasonably needed for the System to compile financial statements and complete all audits

University of Wisconsin System. The System, including its Board of Regents, remains responsible for the implementation, oversight and monitoring of all aspects of the management and administration of the trust funds, other than those which have been specifically delegated to SWIB, including responsibility for monitoring its delegation of investment management authority to SWIB. Primary responsibilities of the System and its Board of Regents include:

- Approve the investment management agreement with SWIB
- Consult with SWIB in setting asset allocation targets, ranges and benchmarks
- Determine the endowment distribution/spending policy
- Communicate to SWIB liquidity/cash flow requirements
- Work with donors, estates, and trusts in taking in and properly establishing new trust funds accounts
- Maintain all accounting and recordkeeping systems related to the trust funds, and for all trust funds accounts
- Assist benefiting campuses and departments in their utilization of trust funds accounts
- Monitor and oversee the investment of all trust funds not delegated to SWIB's management
- Direct and oversee the System's cash flows in and out of the State Investment Fund

Date: March 27, 2017

To: Investment Committee

From: Rochelle Klaskin, Chief Legal Counsel

Re: Investment Committee WRS Investment Guidelines

The restrictions on options that had originally only restricted the active and passive public equities portfolios were consolidated to the general guidelines in connection with the Investment Guidelines review and restatements in 2017. No portfolios are out of compliance relating to this change. However, this restriction creates a conflict with any option overlay strategy and could unnecessarily restrict the multi-asset portfolios. The suggested change is as follows:

III. DERIVATIVES USE POLICY

Derivatives Guidelines Applicable to all WRS Internal Portfolios:

3. Investments may be made in put option contracts and call option contracts on securities, futures or an index of a group of securities. Put and call options may be purchased or sold on investments that could be held in the portfolio if the options were exercised. For internal public equities portfolios, the aggregate notional value of put options sold and not covered by portfolio cash is limited to 10% of the market value of the portfolio. For internal public equity portfolios, the aggregate notional value of call options sold and not covered by the underlying security positions is limited to 10% of the market value of the portfolio. These limits do not apply to the multi-asset portfolios or any option overlay investment strategies.



Enterprise Risk Management Quarterly Report

Mike Bress, Chief Financial Officer

Dev Desai, Enterprise Risk Manager

April 11, 2018

ERM Dashboard

April 2018

Managing the External Environment				Managing the Assets				Managing the Organization								Managing the Strategy			
Risk Category	Prior*	Current*	Trend**	Risk Category	Prior*	Current*	Trend**	Risk Category	Prior*	Current*	Trend**	Risk Category	Prior*	Current*	Trend**	Risk Category	Prior*	Current*	Trend**
COMMUNICATIONS & EXTERNAL RELATIONS			➔	INVESTMENT STRATEGY & POLICY DESIGN			➔	BUSINESS CONTINUITY			➔	DATA MANAGEMENT			➔	ENTERPRISE GOVERNANCE / LEADERSHIP			➔
<u>Risk Areas</u> - Corporate Governance - Industry / External Surveys - Internal Communication - Media Relations - Public Relations - Reputational				<u>Risk Areas</u> - Benchmarking - Investment Assumptions - Investment Strategy & Guidelines - New Strategy Design - Risk Budgeting				<u>Risk Areas</u> - Planning & Testing - Disaster Recovery				<u>Risk Areas</u> - Data Governance - Data Infrastructure - Data Quality				<u>Risk Areas</u> - Delegation & Accountability - Ethical Practices & Standards of Conduct - Key Person Dependency - Litigation Oversight			
PHYSICAL SECURITY & INFRASTRUCTURE			➔	INVESTMENT RISK MANAGEMENT			➔	INVESTMENT OPERATIONS & CONTROLS			➔	FINANCIAL SYSTEMS & CONTROLS			➔	STRATEGIC			➔
<u>Risk Areas</u> - Facilities Management - Health & Safety - Datacenter				<u>Risk Areas</u> - Exposure Management - Investment Governance - Investment Monitoring - Investment Reporting - Liquidity Management - Transitioning & Rebalancing				<u>Risk Areas</u> - Cash Management - Collateral Management - Investment Accounting (ABOR / IBOR) - Reconciliation Oversight - Trade Support				<u>Risk Areas</u> - Accounts Payable - Budgeting & Forecasting - Cost Allocation & Analysis - Financial Accounting & Reporting - Performance Reporting - Procurement - Travel				<u>Risk Areas</u> - Achievability & Horizon - Organizational Alignment - Strategic Objective Development - Trustee Alignment			
MACRO / EMERGING / GEOPOLITICAL			➔	INVESTMENT IMPLEMENTATION			➔	WORKFORCE			➔	COMPLIANCE			➔	BUSINESS CAPABILITIES & PLANNING			➔
<u>Risk Areas</u> - ARIES Program Management - Cybersecurity - Senior Management Tenure - Spreadsheet / Model Management				<u>Risk Areas</u> - Asset Allocation - Investment Due Diligence - Portfolio Management - Research & Idea Generation - Transaction Execution				<u>Risk Areas</u> - Benefits - Compensation & Incentive Compensation - Employee Conduct - Hiring / Onboarding - Talent & Succession Planning - Termination / Separation				<u>Risk Areas</u> - Ethics Policy - Investment Guidelines - Operating Guidelines - Regulatory Reporting				<u>Risk Areas</u> - Project Management - Process Management - Transition Management			
LEGISLATIVE / REGULATORY			➔	MARKET RISKS	NR	NR		TECHNOLOGY & SYSTEMS MANAGEMENT			➔	THIRD-PARTY STAKEHOLDER			➔	FRAUD DETECTION & PREVENTION / FIDUCIARY			➔
<u>Risk Areas</u> - Delegated Authority - External Counsel - Legislative Relations - Records Retention				<u>Risk Areas</u> - Counterparty - Credit - Currency - Inflation - Interest Rate - Liquidity - Volatility				<u>Risk Areas</u> - Business Systems Management - Design, Development, & Testing - Information Security - Infrastructure Management				<u>Risk Areas</u> - Contract Management - Critical Vendor - Relationship Management - Vendor Performance				<u>Risk Areas</u> - External Audit - Fiduciary Duty - Insurance / Indemnification - Internal Audit - Internal Control Framework - Legal Malpractice			

ERM RISK REGISTER			Top 5 risk categories by average residual scores			As of 03/16/2018
ID	Risk Category	Risk Description	Related Risk Areas	Res. Rating	Trend	Comments
1	Workforce	Workforce Risks are risks that may impact the availability of an adequate knowledgeable workforce with sufficient training and skills to meet organizational goals and objectives.	<ul style="list-style-type: none"> - Benefits - Compensation & Incentive Compensation - Employee Conduct - Hiring / Onboarding - Talent & Succession Planning - Termination / Separation 	3.05	↘	- Some of the top risks include: * Data error; incorrect performance data received/used. * Reporting error - incentive comp letters issued incorrectly. * Excessive turnover - inadequate market level pay. * Interviewers asking illegal questions.
2	Investment Operations & Controls	Investment Operations & Controls Risks are risks that may impact SWIB's investment control framework to effectively manage and oversee performance measurement and investment operations processes.	<ul style="list-style-type: none"> - Cash Management - Collateral Management - Investment Accounting (ABOR/IBOR) - Reconciliation Oversight - Trade Support 	2.87	➡	- Some of the top risks include: * Cash management problems (eg incorrect amount received, timing off, daily cash settlement incorrect, etc). * Margin call errors including timing and miscommunication errors.. * Counterparty fails to deliver adequate and appropriate collateral. * Incorrect beginning of day currency and equity positions.
3	Compliance	Compliance Risks are risks that may impact SWIB's ability to implement, monitor and enforce compliance management. Includes risks that may impact policy compliance.	<ul style="list-style-type: none"> - Ethics Policy - Investment Guidelines - Operating Guidelines - Regulatory Reporting 	2.81	➡	- Some of the top risks include: * Ethics training is not sufficient. * Staff uses material non-public information for personal trading purposes. * Failure to file regulatory filings in a timely manner.
4	Legislative / Regulatory	Legislative / Regulatory Risks are risks that may impact SWIB and staff resulting from a failure to comply with state and federal laws, rules and regulations, monitor regulatory trends, perform contract due diligence, obtain external counsel, etc.	<ul style="list-style-type: none"> - Delegated Authority - External Counsel - Legislative Relations - Records Retention 	2.75	➡	- Some of the top risks include: * Inconsistent information provided to the legislature. * Board and/or senior management is not aware of legislative actions that impact SWIB. * Records retention problems (eg not all records destroyed when the original is destroyed, inability to provide open-records requests).
5	Business Continuity	Business Continuity Risks are risks that may impact SWIB's ability to effectively plan for recovery and business continuity in the event of a disaster, hazard situation, or other business	<ul style="list-style-type: none"> - Planning & Testing - Disaster Recovery 	2.65	➡	Some of the top risks include: * Business continuity plan is not tested frequently enough. * Staff are unaware of their respective business resumption plans and/or procedures in disaster situation. * Inability to notify key staff in an emergency. * Loss of internet for an extended period of time. * Loss of data and/or critical systems due to intentional malicious activity.

* Note: This register is preliminary and does not incorporate recent senior manager discussions on top risks at SWIB as the discussions are still on-going. A revised and updated register will be available during the next ERM quarterly update.

Private Equity Commitments*

January 2018 – March 2018

<i>Investment</i>	<i>Commitment (millions)</i>
American Securities Partners VIII, L.P.	\$75.0
Bridgepoint Europe VI L.P.	€75.0
Lake Pacific Fund II, L.P.	\$50.0
Sentinel Capital Partners VI, L.P.	\$50.0
The Resolute Fund IV, L.P.	\$75.0
Financials Co-Investment	\$25.0
Information Technology Co-Investment	\$15.6

**Includes Current Return Portfolio and Co-Investments*

Private Debt Investments/Commitments

January 2018 – March 2018

<i>Investment</i>	<i>Commitment</i>
Jacobs Engineering	\$17,000,000
OSI	\$10,000,000
CareSource Holdings	\$6,000,000
Total	\$33,000,000

Real Estate Commitments

January 2018 – March 2018

<i>Investment</i>	<i>Commitment (millions)</i>
Wilson HCF Wisconsin holdings 7, LLC	\$150.0
CASA Partners VIII, LP	\$100.0
Security Capital Preferred Growth, LLC	\$20.0
Total	\$270.0

Funds Alpha Commitments*

January 1 2018 – March 31 2018

<i>Investment</i>	<i>Commitment (millions)</i>
Stone Milliner	\$50
Highbridge	\$100
King Street	\$100
Davidson Kempner	\$35
Dorsal	\$15
Blue Mountain	\$50
Acadian	\$300
Alliance Bernstein	\$400
DE Shaw	\$1,100
LACAPM	\$700
Fidelity	\$500
Total	\$3,350

**Includes Hedge Funds and Beta One*

Private Equity Commitments*

October 2017 – December 2017

<i>Investment</i>	<i>Commitment (millions)</i>
Alchemy Special Opportunities Fund IV, L.P.	£30.0
Charlesbank Equity Fund IX, L.P.	\$65.0
Charlesbank Credit Opportunities Fund, L.P.	\$50.0
Clearlake Capital Partners V, L.P.	\$70.0
EQT VIII	€50.0
Patria Private Equity Fund VI, L.P.	\$75.0
Providence Strategic Growth III L.P.	\$75.0
TPG Growth IV, L.P.	\$50.0
Information Technology Co-Investment	\$10.0

**Includes Current Return Portfolio and Co-Investments*

February 15, 2018

Senator Alberta Darling, Co-Chair
Joint Committee on Finance
P.O. Box 7882
Madison WI 53707-7882

Representative John Nygren, Co-Chair
Joint Committee on Finance
P.O. Box 8953
Madison WI 53708-8953

Senator Robert Cowles, Co-Chair
Joint Legislative Audit Committee
P.O. Box 7882
Madison WI 53707-7882

Representative Samantha Kerkman, Co-Chair
Joint Legislative Audit Committee
P.O. Box 8952
Madison WI 53708-8952

Mr. Scott Neitzel, Secretary
Department of Administration
101 East Wilson Street
P.O. Box 7864
Madison, WI 53707-7864

Dear Senator Darling, Senator Cowles, Representative Nygren, Representative Kerkman, and Secretary Neitzel:

State statutes require the State of Wisconsin Investment Board (SWIB) to submit a report on all expenses charged to the trust funds under management during the prior calendar quarter and on the number of full-time equivalent positions created or abolished during the quarter¹. The information contained in this report is for the quarter ending December 31, 2017.

Total Cost of Management – 4th Quarter 2017

SWIB Cost of Management Summary	1st Quarter 2017 Cost	2nd Quarter 2017 Cost	3rd Quarter 2017 Cost	4th Quarter 2017 Cost	One-year Ending 12/31/2017	% of Costs
Internal Operating Costs:						
Agency Operating Expenses	\$ 9,630,079	\$ 24,378,413	\$ 7,267,584	\$ 7,230,847	\$ 48,506,923	11.3%
Custodial, Investment Operations & Banking Fees	\$ 594,776	\$ 497,365	\$ 1,623,174	\$ 1,656,348	\$ 4,371,663	1.0%
Legal Fees	\$ 242,341	\$ 184,940	\$ 496,471	\$ 577,251	\$ 1,501,003	0.4%
Investment Research & Consulting Fees	\$ 9,659,335	\$ 10,284,702	\$ 6,222,700	\$ 7,984,342	\$ 34,151,079	8.0%
Total Internal Operating Costs	\$ 20,126,531	\$ 35,345,420	\$ 15,609,929	\$ 17,448,788	\$ 88,530,668	20.7%
External Management Fees:						
Real Estate Advisory/Asset Management	\$ 11,603,165	\$ 11,571,917	\$ 10,190,659	\$ 15,588,423	\$ 48,954,164	11.5%
Private Equity Management	\$ 34,390,491	\$ 33,065,953	\$ 34,175,755	\$ 31,497,752	\$ 133,129,951	31.1%
Public Market Separate Accounts	\$ 8,598,003	\$ 4,604,686	\$ 8,382,767	\$ 4,835,455	\$ 26,420,911	6.2%
Public Market Commingled Accounts	\$ 31,735,026	\$ 28,128,239	\$ 39,563,355	\$ 30,939,949	\$ 130,366,569	30.5%
Total External Management Fees	\$ 86,326,685	\$ 77,370,795	\$ 92,312,536	\$ 82,861,579	\$ 338,871,595	79.3%
Total Cost of Management	\$ 106,453,216	\$ 112,716,215	\$ 107,922,465	\$ 100,310,367	\$ 427,402,263	
Average Assets Under Management (in billions)	\$ 108.3	\$ 110.1	\$ 113.3	\$ 117.0	\$ 112.2	
Cost in Basis Points (all trust funds)					38.1	

¹Wisconsin Statutes Section 25.17 (13m): All investment related expenses for the WRS Trust Funds, State Investment Fund, State Life Insurance Fund, Historical Society Endowment Fund, Injured Patients and Families Compensation Fund, and EdVest Funds.

SWIB's total costs, including both internal operating and external management costs, are charged to the trust funds under management. Over a one-year period ending December 31, 2017, SWIB's total cost of management was 38 basis points (0.38%) or 38 cents for every \$100 managed.

To reduce external asset management costs and increase net investment returns, SWIB continues to build internal resources to be able to manage assets internally where it makes sense to do so. For example, as you can see in the table below, managing public market asset classes internally is more cost effective than using external asset management.

Internal vs. External Investment Management Costs

Portfolio	SWIB Internal Cost (Basis Points)	CEM* Peer Median External Management Costs (Basis Points)	Multiple
Active Management			
Global Large Cap Equity	8.0	38.7	4.8X
US Small Cap Equity	22.5	64.3	2.9X
US Fixed Income	6.1	14.7	2.4X
Global Fixed Income	3.6	29.0	8.1X
Passive Management			
US Large Cap Equity	0.1	1.0	10.0X
International (EAFE) Equity	0.2	2.2	11.0X
Fixed Income - Inflation Indexed	0.1	1.1	11.0X

* CEM Benchmarking, Inc. independently benchmarks pension fund investment costs.
Basis Point = 1 basis point equals 0.01%; for example, 100 basis points = 1.0%

For the year ending December 31, 2017, external investment management fees represented 79.3% of SWIB's total costs of management and 36.0% of assets under management, while SWIB's internal operating expenses represented 20.7% of costs and 64.0% of assets (see Attachment A).

Assets Under Management & FTE		
	9/30/2017	12/31/2017
Internal Management	63.3%	64.0%
External Management	36.7%	36.0%
SWIB Internal Positions – FTE	174.00	186.00
SWIB Temporary Project Positions	4.75	2.00
Total SWIB Internal/Temporary Positions	178.75	188.00

Total authorized positions increased in the 4th quarter by a total of 9.25 full-time equivalent positions. Twelve new positions were approved by the Board of Trustees, and 2.75 project positions were eliminated. The new positions will support SWIB's internal asset management infrastructure and will also reduce reliance on more expensive external consulting resources (see Attachment B).

Attachment C and D provide details of services and related quarterly costs.

Internal operating costs include salary and fringe benefits for internal staff, technology, research and market data services, asset custody fees, legal services, and investment consulting. External management fees make up the largest component of the trust funds' costs. This category includes fees paid to asset managers for public market, private market, and real estate asset management.

As new investment strategies are implemented and as markets change, SWIB will continue to evaluate the most efficient means to manage the trust fund assets. We hope this report provides a comprehensive representation of the costs SWIB incurs to manage the assets of the trust funds including the Wisconsin Retirement System. Please contact me if you have any questions or comments about the report.

Sincerely,

A handwritten signature in blue ink, appearing to read "Rick Smirl", is written over a horizontal line.

Rick Smirl
Executive Director

Attachments

cc: Members, Joint Committee on Finance
Members, Joint Committee on Audit
Robert Lang, Legislative Fiscal Bureau
Joe Chrisman, Legislative Audit Bureau

Total Assets Under Management

Wisconsin Retirement System (WRS)	3/31/2017		6/30/2017		9/30/2017		12/31/2017	
	Amount (in millions)	Percent	Amount (in millions)	Percent	Amount (in millions)	Percent	Amount (in millions)	Percent
Internally Managed	\$63,771	63.9%	\$63,932	62.6%	\$65,123	61.9%	\$67,717	62.4%
Externally Managed Dedicated Accounts	12,133	12.2%	13,973	13.7%	14,273	13.6%	14,930	13.8%
Externally Managed Commingled Accounts	23,925	24.0%	24,182	23.7%	25,759	24.5%	25,809	23.8%
1. Passive Index Funds	9,150	9.2%	9,267	9.1%	9,615	9.1%	9,374	8.6%
2. Enhanced Index Commingled Funds	0	0.0%	0	0.0%	0	0.0%	0	0.0%
3. Limited Partnerships	11,511	11.5%	11,517	11.3%	12,121	11.5%	12,212	11.3%
4. Actively Managed Commingled Accounts	3,263	3.3%	3,398	3.3%	4,023	3.8%	4,223	3.9%
TOTAL WRS Assets	\$99,829	100.0%	\$102,087	100.0%	\$105,155	100.0%	\$108,456	100.0%

State Investment Fund - Internally Managed	\$7,090		\$6,511		\$6,303		\$6,991	
Various Funds Internally Managed	\$120		\$122		\$123		\$123	
Various Funds Externally Managed	\$1,320		\$1,343		\$1,369		\$1,388	

Total Assets Under Management	\$108,358		\$110,064		\$112,950		\$116,958	
Total Internal Management	\$70,981	65.5%	\$70,566	64.1%	\$71,549	63.3%	\$74,831	64.0%
Total External Management	\$37,378	34.5%	\$39,498	35.9%	\$41,401	36.7%	\$42,127	36.0%

FTE Changes During the Quarter Ending December 31, 2017

To adequately and efficiently manage investments, process trades, and measure risk, SWIB must continually assess and enhance its systems, resources, and processes. In 2017, SWIB completed a four-year effort to implement new enterprise investment management systems that improve investment accounting, trading, risk, and portfolio management activities. The systems provide SWIB staff access to high quality and timely data, improve SWIB's ability to monitor and manage risk, and increase the capability to manage more assets internally. SWIB also continues to find ways to better diversify the Core Fund to reduce the impact of market volatility. SWIB is incorporating new diversification strategies that will help lower investment return volatility and provide more options for responding to market uncertainty. These investment strategies are part of SWIB's strategic initiatives, are being phased in over time, and require additional resources to implement and manage.

After the completion of the recent investment management system project, SWIB hired a consultant with investment industry experience to review and assess the internal resources necessary to manage the level of assets SWIB currently manages and plans to invest in the future. The consultants concluded SWIB's existing staff resources were short in several key areas. In addition, internal staff assessments and peer resource benchmarking studies indicated that SWIB was understaffed in some areas compared to other funds with similar amounts of assets managed internally and with similar investment strategies.

To address current resource gaps, in December 2017 the Board of Trustees approved a total of 12 additional FTE positions while 2.75 project positions were eliminated, resulting in a net increase of 9.25 FTE. These positions will support SWIB's strategic investment strategies, decrease reliance on more expensive external consultants, and build in-house knowledge and expertise. A list of the new positions is included in the table below.

FTE Changes	FTE
Funds Alpha Analyst	1.0
Securities Analyst	1.0
Investment Data Specialist – Security Master	1.0
Operations Analyst	4.0
Investment Operations Manager	2.0
Performance Analyst	1.0
Investment Data Specialist	1.0
Human Resources Generalist	1.0
Terminated Project Positions	(2.75)
Net Change in Positions	9.25

STATE OF WISCONSIN INVESTMENT BOARD
Expenses for All Funds Under Management
Quarter Ending 12/31/2017

<u>EXPENSE CATEGORY</u>	<u>SERVICE PROVIDED</u>	<u>EXPENSES</u>
<u>Internal Operating Expenses</u>		
Staff Compensation	Staff Compensation	5,035,289
Fringe Benefits	Fringe Benefits	1,098,880
Equipment, Supplies & Services	General Supplies & Services	1,096,678
Total Internal Operating Expenses ***		\$ 7,230,847
<u>Custodial, Investment Operations and Banking Fees</u>		
Bankers Bank – SIF	Custodial and Banking Fees	5,000
BNY Mellon Asset Servicing - Custody	Master Custody Services	463,106
BNY Mellon Asset Servicing - Investment Operations	Investment Operations Services	1,188,172
US Bank	Banking Fees	70
Total Custodial, Investment Operations and Banking Fees		\$ 1,656,348
<u>Legal Fees</u>		
Andrews Kurth LLP	Legal Work for Investment Strategies	31,471
Chapman & Cutler LLP	Legal Work for Investment Strategies	164,745
Cooley Attorneys At Law	Legal Work for Investment Strategies	503
Cox Castle & Nicholson LLP	Legal Work for Investment Strategies	91,240
Eversheds Sutherland (US) LLP	Legal Work for Investment Strategies	22,793
Godfrey & Kahn SC	Legal Work for Investment Strategies	1,494
Ice Miller LLP	Legal Work for Investment Strategies	12,456
Jackson Walker	Legal Work for Investment Strategies	45,914
Proskauer Rose LLP	Legal Work for Investment Strategies	5,881
Quarles & Brady	Legal Work for Investment Strategies	99,920
Reinhart Boerner Van Deuren SC	Legal Work for Investment Strategies	27,127
Robins Kaplan LLP	Legal Work for Investment Strategies	33,817
Rutherford & Bechtold LLC	Legal Work for Investment Strategies	24,890
Sidley Austin LLP (International)	Legal Work for Investment Strategies	15,000
Total Legal Fees		\$ 577,251
<u>Investment Counsel</u>		
Accenture LLP	Investment Consulting Services	149,600
Adeptyx Consulting	Investment Consulting Services	22,400
Alpha Theory LLC	Investment Research	7,725
Ananth Seshadri	Economic Consulting Services	72,500
AON Risk Services Central Inc	Fidelity Bond	13,309
Argosy	Market Data	2,997
Barclays	US Constituent Data	23,750
BCA Research Inc.	Global & Domestic Fixed Income Strategy Research	24,938
Bloomberg Finance LP	Market, Company, Industry & Benchmark Information	460,086
BNY Mellon Asset Servicing - Eagle/Pace	Investment Consulting Services	330,580
Bruce James Bueno de Mesquita	Investment Consulting Services	25,917
C&A Consulting	Investment Consulting Services	834,905
Callan Associates Inc	Investment Performance Benchmarking	6,250
Capital Economics LTD	Market Research	44,000
CEM Benchmarking	Investment Cost Analysis	70,000
CFRA Research	Investment Research	15,000
Charles River System Inc	Portfolio Management Trading Software & Services	174,034
Citisoft Inc	Enterprise Investment Management System Consulting	1,665,503
Cliffwater LLC	Hedge Fund Investment Consulting	125,000
Clifton Larson Allen	Investment Consulting Services	98,978
Consumer Edge Research LLC	Market Research	3,400
Cornerstone Macro LLC	Macro Economic Research	9,600
CoStar Portfolio Strategy	Real Estate Consulting & Electronic Services	27,500
Council of Institutional Investors	Corporate Governance	37,500
Covenant Review LLC	Corporate Bond Research	6,250
Cowen and Company LLC	Research and Data Services	2,250
CreditSights	Credit Assessments	12,000
Cross Current Research LLC	Healthcare Sector Research	3,800
Cutter Associates	Investment Organization and Systems Consulting	20,769
Data3Sixty Inc	Investment Data Glossary	8,333
Della Strategy Group	Investment Research	5,250
Depository Trust and Clearing Corp	Research and Data Services	5,097
Dow Jones News Service	Company and Industry News Services	49,973
EDM Council	Investment Data & Research	2,750
eFront Financial Solutions Inc	Real Estate Portfolio Management Services	28,920
Energy Aspects LTD	Investment Research	12,500
Euromonitor International	Research and Data Services	23,460

EXPENSE CATEGORY	SERVICE PROVIDED	EXPENSES
FactSet Research Systems Inc	Financial & Economic Database	470,141
Financial Recovery Technologies	Class Action Monitoring	12,500
Fitch Solutions Inc	Credit Rating Services	24,811
Furey Research Partners LLC	Small Cap Research	7,300
Gabriel Roeder Smith & Company	Actuarial Consulting	60,000
GlobalSource Partners Inc	Investment Research	31,250
Green Street Advisor	Real Estate Analytics	24,250
Haver Analytics	Global Macroeconomic Research	18,200
Historical Options Data	Investment Data	214
In Focus Information LLC	Private Placement Investment Research	1,400
Informa Business Intelligence Inc.	Research and Data Services	3,188
Institutional Investor	Investment Data and Research	10,875
Institutional Limited Partners Association	Private Equity Research	5,000
Institutional Shareholder Services Inc	Proxy Voting Analysis	25,667
International Swaps and Derivatives Assn	Derivative Industry Research	9,720
IPD Analytics LLC	Research and Data Services	(6,667)
JMB Capital Group	Investment Consulting Services	9,500
JOC	Research and Data Services	349
Kent Lesandrini	Strategic Planning Consultant	10,500
Keystone Consulting Inc	Investment Consulting Services	143,400
Korn Ferry	Recruitment Consulting for Executive Investment Positions	10,527
Levr Technology Inc	Investment Information Technology Consulting Services	43,360
Lombard Street Research LTD	Global Economic Analysis	7,500
Markit NA	MarkitEDM Software & Implementation Services	185,870
Markit-EDM Limited	Investment Consulting Services	10,000
Maxim Group LLC	Investment Banking, Securities, Wealth Management	5,300
McLagan Partners Inc	Investment Compensation Data and Analysis	45,000
Merrill Lynch	High Yield Index Service	3,750
Moody's Analytics	Economic, Currency & Bond Analysis	23,799
MSCI ESG Research Inc	Corporate Governance Research	9,373
MSCI, Inc. - Risk Metrics Solutions	Research and Data Services	138,591
Ned Davis Research Inc	Investment Research	10,000
NEPC LLC	Investment Consulting Services	50,000
Novus Partners Inc	Profit & Loss Analytics System	47,025
Nuware Technology Corp	Investment Information Technology Consulting Services	347,928
NYSE Market Inc	New York Stock Exchange Data	6,032
Omgeo LLC	Post Trade Settlement Information	530
Options Price Reporting Authority	Quote System for Options Market	1,861
OTR Global LLC	Investment Research	5,300
Pac-Invest	Research and Data Services	1,545
Penserra Transition Management LLC	Transition Reporting Fee Service	20,000
Pivot Inc	Trade Desk Collaboration Services	600
Renaissance Macro Research	Macro Economic Research	10,000
Responsible Investor	Research and Data Services	434
RiskMetrics Solutions Inc	Investment Analytics	140,625
Russell Investment Group	Index Data	8,564
S&P Dow Jones Indices	Research and Data Services	16,697
Sharp Decisions Inc	Investment Information Technology Consulting Services	181,326
Simmons & Simmons	Global Regulatory Services	4,875
SNL Financial	Customized Analysis of Financial Institutions	42,386
Software House Intl	Investment Software	1,470
Standard & Poor's	Industry & Corporate Research	56,148
StepStone Group LLC	Private Equity Consulting	352,000
Strategic Economic Decisions Inc	Investment Research Reports	18,750
Summit Redstone Partners	Industrial Sector Market Research & Analysis	8,500
SystemsAccountants	Investment Information Technology Consulting Services	39,060
Telsey Advisory Group	Consumer Sector Research	37,500
The Bachrach Group	Investment Consulting Services	172,920
The Finlay Group	Investment Consulting Services	194,086
The Institutional View	Industrial Sector Market Research & Analysis	7,500
The Leuthold Group, LLC	Broad Based Market Research	3,800
Thomson Reuters (Baseline and FC)	Investment Research	2,094
Toronto Stock Exchange	Market Data	8,380
Trade Alert LLC	Market Data	1,545
TradeWeb	On-Line Fixed Income Trading Services	9,000
Unit4 Business Software Inc	Financial & Administration Services System	54,880
Unquote	Research and Data Services	2,818
Upstream	Investment Research	1,290
Vertical Research Partners	Industrial Sector Market Research & Analysis	7,500
Verus Advisory Inc	Benchmarking Consulting Services	77,501
V-Soft Consulting Group Inc	Investment Information Technology Consulting Services	139,565
William O'Neil & Co Inc	Industrial Sector Market Research & Analysis	3,800
Wilshire Associates Inc	Performance Measurement, Portfolio Management & Analytics	87,500
WM/Reuters	Research and Data Services	1,575
Wolfe Trahan	Transportation and Macro Economic Research	18,750

EXPENSE CATEGORY**SERVICE PROVIDED****EXPENSES**

Wolverine Execution Services LLC
Total Investment Counsel

Options Trading Platform

1,300
\$ 7,984,342

Real Estate Management Fees

AmCap, Incorporated
Beacon Capital Partners
Berkshire Property Advisors
Blackstone Real Estate Advisors
Blue Vista Capital Management
Bristol Group
Buchanan Street Capital Partners
Callahan Capital Partners
Carson Companies
Cornerstone Real Estate Advisors
Essex Property Trust
Fortress Investment Group
Four Seasons
FPA Multifamily Core Plus
Hawkeye Partners
Heitman
Henderson Global Investors
High Street Realty Company LLC
Hudson Advisors
J.P. Morgan Asset Management
Kensington Realty Advisors
Lowe Enterprises Investors
Morgan Stanley
Normandy Real Estate Partners
O'Connor Capital Partners
Penwood
Prologis
Prudential Global Investment Management (PGIM)
Realterm Global Asset Management
Rockpoint Group
Rockspring Property Investment Managers
RREEF
Security Capital
Teachers Insurance and Annuity Association of America
UBS Realty Investors
Wesco
Westbrook Partners
Total Real Estate Management Fees*

Real Estate Management Fees 4,006,243
Real Estate Management Fees 155,707
Real Estate Management Fees 902
Real Estate Management Fees 2,685,680
Real Estate Management Fees 185,930
Real Estate Management Fees 434,426
Real Estate Management Fees 210,746
Real Estate Management Fees 237,991
Real Estate Management Fees 8,461
Real Estate Management Fees 41,451
Real Estate Management Fees 573,934
Real Estate Management Fees 497,817
Real Estate Management Fees 32,678
Real Estate Management Fees 110,455
Real Estate Management Fees 143,521
Real Estate Management Fees (84,357)
Real Estate Management Fees 335,200
Real Estate Management Fees 147,708
Real Estate Management Fees 216,087
Real Estate Management Fees 822,164
Real Estate Management Fees 4,224
Real Estate Management Fees 46,236
Real Estate Management Fees 84,808
Real Estate Management Fees 607,614
Real Estate Management Fees 254,861
Real Estate Management Fees 252,832
Real Estate Management Fees 456,008
Real Estate Management Fees 799,797
Real Estate Management Fees 186,329
Real Estate Management Fees 38,297
Real Estate Management Fees 28,355
Real Estate Management Fees 241,020
Real Estate Management Fees 310,911
Real Estate Management Fees 148,729
Real Estate Management Fees 699,733
Real Estate Management Fees 71,668
Real Estate Management Fees 594,257
\$ 15,588,423

Private Equity Management Fees

Abor Group
Advent International
Altaris Capital Partners
American Securities
Apollo Management
Ares Management
Ascribe Capital LLC
Atlas Holdings
Avenue Capital Group
Benefit Street Partners
Berkshire Property Advisors
Blackstone Real Estate Advisors
Bridgepoint Capital
Caltius Mezzanine
CapVest Private Equity
Centerbridge Partners
Charlesbank Capital Partners
Chequers Capital
Clearlake Capital Group
Clessidra SGR S.p.A
Coller Capital
Cortec Group
Cressey & Company
CVC Capital Partners
ECM Equity Capital Management GmbH
EnCap Investments
EQT Partners
Excellere Capital Management
Flexpoint Ford
Fortissimo Capital

Private Equity Management Fees 300,000
Private Equity Management Fees 661,749
Private Equity Management Fees 254,794
Private Equity Management Fees 584,478
Private Equity Management Fees 1,014,323
Private Equity Management Fees 565,774
Private Equity Management Fees 225,342
Private Equity Management Fees 125,000
Private Equity Management Fees (33,925)
Private Equity Management Fees 215,994
Private Equity Management Fees 420,655
Private Equity Management Fees 399,923
Private Equity Management Fees 284,379
Private Equity Management Fees 200,286
Private Equity Management Fees 191,881
Private Equity Management Fees 848,637
Private Equity Management Fees 165,567
Private Equity Management Fees 34,945
Private Equity Management Fees 412,232
Private Equity Management Fees 16,539
Private Equity Management Fees 157,103
Private Equity Management Fees 417,259
Private Equity Management Fees 250,000
Private Equity Management Fees 408,831
Private Equity Management Fees 103,992
Private Equity Management Fees 418,199
Private Equity Management Fees 355,316
Private Equity Management Fees 397,425
Private Equity Management Fees 137,585
Private Equity Management Fees 191,752

<u>EXPENSE CATEGORY</u>	<u>SERVICE PROVIDED</u>	<u>EXPENSES</u>
Fortress Investment Group	Private Equity Management Fees	273,935
FountainVest Partners	Private Equity Management Fees	366,403
Gilde	Private Equity Management Fees	292,314
Glendon Capital Management	Private Equity Management Fees	200,713
Golder, Thoma, Cressey	Private Equity Management Fees	766,786
Gores Group	Private Equity Management Fees	148,181
Graphite Capital Management	Private Equity Management Fees	52,748
GSO Capital Partners	Private Equity Management Fees	385,507
Harvest Partners	Private Equity Management Fees	312,457
Hellman & Friedman Investors	Private Equity Management Fees	625,226
HgCapital	Private Equity Management Fees	420,463
Hudson Advisors	Private Equity Management Fees	42,560
Inflexion Private Equity Partners LLP	Private Equity Management Fees	650,309
Insight Equity	Private Equity Management Fees	21,105
JMI Equity	Private Equity Management Fees	371,501
Kohlberg Kravis Roberts & Co	Private Equity Management Fees	(111,775)
KPS Capital Partners	Private Equity Management Fees	124,999
Lake Pacific Partners	Private Equity Management Fees	128,000
Leonard Green & Partners	Private Equity Management Fees	649,447
Lindsay, Goldberg & Bessemer	Private Equity Management Fees	203,904
Merit Capital Partners	Private Equity Management Fees	317,900
Montefiore Investment	Private Equity Management Fees	155,012
New Capital Partners	Private Equity Management Fees	125,002
Oaktree Capital Management	Private Equity Management Fees	200,530
Old Lane	Private Equity Management Fees	26,341
Patria Investimentos	Private Equity Management Fees	251,785
Peninsula Capital Partners, LLC	Private Equity Management Fees	605,632
Pomona Capital	Private Equity Management Fees	4,029
Providence Equity Partners, Inc.	Private Equity Management Fees	680,052
Resource Capital Funds	Private Equity Management Fees	150,000
Ridgemont Partners	Private Equity Management Fees	525,985
Riverstone Holdings	Private Equity Management Fees	421,681
Riverstone/Carlyle	Private Equity Management Fees	57,154
SAIF Partners	Private Equity Management Fees	147,336
Segulah	Private Equity Management Fees	65,774
Sentinel Real Estate Corporation	Private Equity Management Fees	125,000
Shamrock Capital Advisors	Private Equity Management Fees	499,999
Sheridan Production Partners	Private Equity Management Fees	354,000
StepStone Group	Private Equity Management Fees	22,598
Sterling Group	Private Equity Management Fees	443,465
Stone Point Capital, LLC	Private Equity Management Fees	1,283,060
The Jordan Company, LP	Private Equity Management Fees	326,125
TowerBrook Investors	Private Equity Management Fees	337,237
TPG Capital	Private Equity Management Fees	1,232,497
Triton	Private Equity Management Fees	142,091
TSG Consumer Partners, LLC	Private Equity Management Fees	1,048,500
Udata Partners	Private Equity Management Fees	140,625
Venture Capital****	Private Equity Management Fees	3,472,944
Vista Equity Partners	Private Equity Management Fees	1,581,590
Warburg Pincus	Private Equity Management Fees	507,511
Waterland Private Equity	Private Equity Management Fees	208,371
Wayzata Investment Partners	Private Equity Management Fees	(270,420)
Wind Point Partners	Private Equity Management Fees	250,292
WP Global Partners Inc	Private Equity Management Fees	101,036
Total Private Equity Management Fees**		\$ 31,497,752

Commingled Account Public Market Management Fees

AQR Capital	Public Market Management Fees	340,670
Arrowgrass Capital	Public Market Management Fees	(228,511)
Ascend Wilson	Public Market Management Fees	2,221,596
Benefit Street Partners	Public Market Management Fees	763,080
BFAM Asian Opportunities Fund	Public Market Management Fees	1,919,209
Blackrock	Public Market Management Fees	717,292
Blue Mountain Capital Management	Public Market Management Fees	701,594
Bridgewater Associates	Public Market Management Fees	1,152,375
Capula Investment Management	Public Market Management Fees	1,070,389
Coastland Capital	Public Market Management Fees	228,270
DE Shaw & Co.	Public Market Management Fees	3,352,048
Dorsal Capital Partners	Public Market Management Fees	163,723
Dyal Capital Partners	Public Market Management Fees	536,986
Efficient	Public Market Management Fees	171,518
Graham Capital Management	Public Market Management Fees	838,086
Highbridge Capital Management	Public Market Management Fees	1,377,063
Investcorp	Public Market Management Fees	30,224

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<u>EXPENSE CATEGORY</u>	<u>SERVICE PROVIDED</u>	<u>EXPENSES</u>
King Street Capital Management	Public Market Management Fees	905,500
Koppenberg	Public Market Management Fees	577,932
Los Angeles Capital	Public Market Management Fees	1,911,890
Marshall Wace	Public Market Management Fees	4,724,873
Pharo	Public Market Management Fees	1,215,370
PIMCO	Public Market Management Fees	139,119
Scopia PX LLC	Public Market Management Fees	461,707
Senator Global Opportunity	Public Market Management Fees	1,387,153
Standish Mellon	Cash Management	113,318
Stone Milliner Asset Management	Public Market Management Fees	1,130,756
TCW	Public Market Management Fees	570,863
Tourbillon Global Equities, LLC	Public Market Management Fees	286,454
Two Sigma	Public Market Management Fees	1,386,726
Wellington Trust Company	Public Market Management Fees	772,876
Total Commingled Account Public Market Management Fees		\$ 30,939,949
<u>Separate Account Public Market Management Fees</u>		
Acadian Asset Management	Public Market Management Fees	1,037,000
Alliance Bernstein	Public Market Management Fees	(611,735)
Blackrock	Public Market Management Fees	1,056,702
Dodge and Cox	Public Market Management Fees	503,554
Fidelity Investments	Public Market Management Fees	1,016,282
Loomis Sayles & Co	Public Market Management Fees	1,076,029
Parametric	Public Market Management Fees	292,723
Prudential Global Investment Management (PGIM)	Public Market Management Fees	464,900
Total Separate Account Public Market Management Fees		\$ 4,835,455
Total Quarterly Charges to Funds		\$ 100,310,367

*Fees paid to fund managers are established as percentage of the capital committed. As assets in a fund are sold, the management fees paid are typically reimbursed from the profits of the fund.

**Expenses for private equity management fees are estimated and adjusted annually based upon committed capital or assets under management, determined by management contract terms. Total committed capital includes management fees. All capital contributions to the limited partnership must first be returned to the limited partners before any incentive fees are paid to the general partner.

***All costs reported are on an accrual basis except for internal operating costs which are on a cash basis of accounting. Negative expense amounts are due to accrual adjustments and/or other miscellaneous adjustments.

****Pursuant to Wisconsin Statute Section 25.184 Venture Capital investments are recorded in aggregate.

Explanations of Expenses

Internal Operating Expenses

Internal operating expenses consist primarily of staff compensation and fringe benefits. SWIB employs a staff of professional investment and support staff to manage the trust fund assets. Other internal operating expenses consist of office equipment, supplies, business travel, information technology equipment and services, and general services.

Custodial, Investment Operations and Banking Fees

Wisconsin Certificate of Deposit Program: Under a contract with SWIB, Bankers' Bank administers the program under which the State Investment Fund (SIF) purchases certificates of deposit from Wisconsin-based banks and thrifts. Most administrative costs are paid by participating banks. SWIB's expenses help underwrite other administrative costs, such as insurance that SWIB requires to be purchased.

BNY Mellon Custody: Provides master custody services (safekeeping of assets, income collection, valuations, and accounting) for public and private domestic and foreign securities in the Wisconsin Retirement System (WRS), the SIF, and the smaller funds. In addition, SWIB receives performance measurement and analytical services through its custodial contract with BNY Mellon, which serves as the official book of record for SWIB's accounting and performance measurement functions. BNY Mellon provides data and analytical tools used by SWIB for compliance and risk management. These include global collateral management, data management, and hosting services. Fees for these services are established by contract.

BNY Mellon Investment Operations: Provides trade processing and support, corporate action processing and support, investment accounting for all entities, performance returns, reconciliation and reporting, validation of benchmark returns, reporting and data management services for investment book of record. Fees for these services are established by contract.

US Bank: The State of Wisconsin has contracted with US Bank to be the state's working bank. The fees paid to US Bank by the SIF reflect bank service charges that are not directly applicable to the fund participants. These fees are distributed to the fund participants through the monthly SIF earnings process.

Legal Fees

Under authority delegated by the Attorney General, pursuant to s. 25.18 (1) (a) Statutes, SWIB may employ legal counsel for any matters arising out of the scope of its investment authority. This includes legal services relating to bankruptcies, class actions, private markets transactions, fiduciary advice, securities law, investment litigation, and other similar matters. The Attorney General annually reviews and approves a list of law firms to provide investment legal services for SWIB.

Investment Counsel

Current law gives SWIB the authority to employ investment counsel in any matters arising out of the scope of its investment authority. Investment research and services provided include global market, industry, economic and company information, financial and performance analytics, news information, pricing and exchange data, credit ratings, financial modeling, economic forecasting, trading services, and a variety of Board consultations. These services enable SWIB to perform due diligence on current and future holdings and assist in monitoring investments.

Private Equity & Real Estate Investment Management Fees

SWIB hires private equity and real estate advisors to assist with sourcing analysis, due diligence, and management of investments. SWIB also invests in funds, typically limited partnerships. Each fund either has a general partner or, for real estate, engages a fund manager with delegated authority to make real estate investments for the fund. Fees paid to fund managers are typically established as a percentage of the capital committed or assets under management. As assets in a fund are sold, the management fees paid typically are reimbursed from the profits of the fund.

Separate Account Public Market Management Fees

External asset managers have been delegated authority within guidelines established by SWIB to determine investment strategy and purchase securities in SWIB's name under a separate and distinct account. Fees are typically assessed as a percentage of the market value of assets under management, and in some cases, fees are based on investment performance. Standish Mellon invests cash in international and global portfolios that has yet to be invested in stocks or bonds. Due to settlement times around the globe, these funds cannot be effectively managed in the State Investment Fund. The fees are negotiated as part of the custodial contract.

Commingled Account Public Market Management Fees

SWIB has investments in a number of externally-managed funds which seek to replicate the returns of a particular public market index or seek to enhance the return from a particular public market index through the use of quantitative models or other strategies. SWIB's investments are commingled with other investors' and the underlying securities are owned in the name of the fund manager. Fees are typically based on a percentage of assets under management and may include other factors, such as performance. Hedge funds are included in this category as the invested assets are also commingled. Costs incurred from hedge fund investments consist of base fees and performance fees.