



NEPC, LLC

YOU DEMAND MORE. *So do we.*<sup>SM</sup>

## Rhode Island State Investment Commission / ERSRI

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### Investment Consulting Presentation

December 6, 2017

Doug Moseley, Partner  
Kevin Leonard, Partner  
Will Forde, CAIA, Consultant  
Phil Nelson, CFA, Principal, Director of Asset Allocation

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- **Douglas W. Moseley, Partner**

- Twenty-two years' investment experience
- Member: Discretionary Committee; Traditional Due Diligence Committee;
- Fixed Income Advisory Group
- Previous affiliations: Massachusetts PRIM Board; State Street Bank & Trust
- MBA, Bentley College; BS, University of Massachusetts
- Board Affiliations: NCPERS Executive Board, Quincy Community Action Program



- **William Forde, CAIA, Consultant**

- Seven years' investment experience
- Member: Asset Allocation Committee
- Previous affiliation: Brown Brothers Harriman
- BA, Tufts University



- **Kevin M. Leonard, Partner**

- Twenty-five years' investment experience
- Head of the Public Fund Consulting Practice
- MML Public Fund Consultant of the Year (2012)
- Member: Traditional Due Diligence Committee; Large Cap Equity Advisory Group
- Previous affiliations: Segal Advisors; The Hannah Consulting Group; State Street Bank and Trust Company
- BA, Assumption College



- **Phillip R. Nelson, CFA**  
**Principal, Director of Asset Allocation**



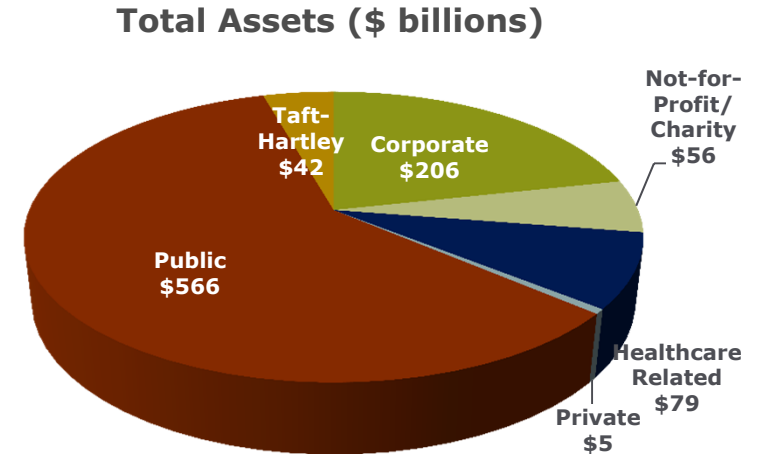
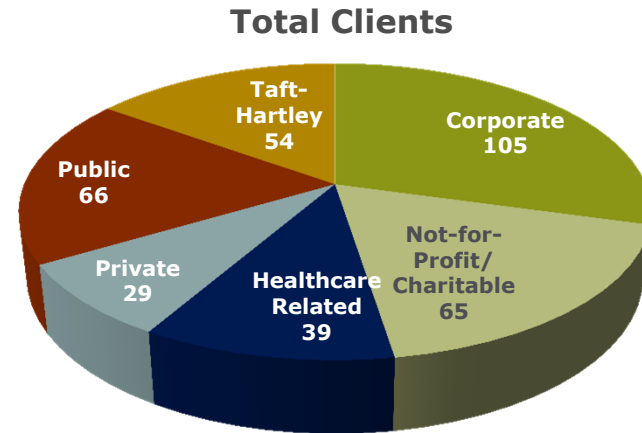
- Fifteen years' investment experience
- Member: Asset Allocation Committee; Traditional Due Diligence Committee; Liability-Driven Investment (LDI) Advisory Group
- Previous affiliations: Pinnacle West Capital Corporation; Yoshikami Capital Management; Merrill Lynch
- BA, University of California Irvine

<sup>1</sup> Please see Appendix for important disclosures related to Awards. Past performance is no guarantee of future results.

# Introduction to NEPC



- **Established in 1986 in Boston, MA**
- **270 employees in 8 regional offices**
- **Employee-owned with 36 partners**
- **100% of revenue from advisory and discretionary consulting services**
- **358 institutional clients<sup>1</sup>**
- **\$954 billion assets under advisement<sup>1</sup>**
  - Public funds account for over 59% of total assets
- **Practice groups within NEPC deliver expertise by client type**



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

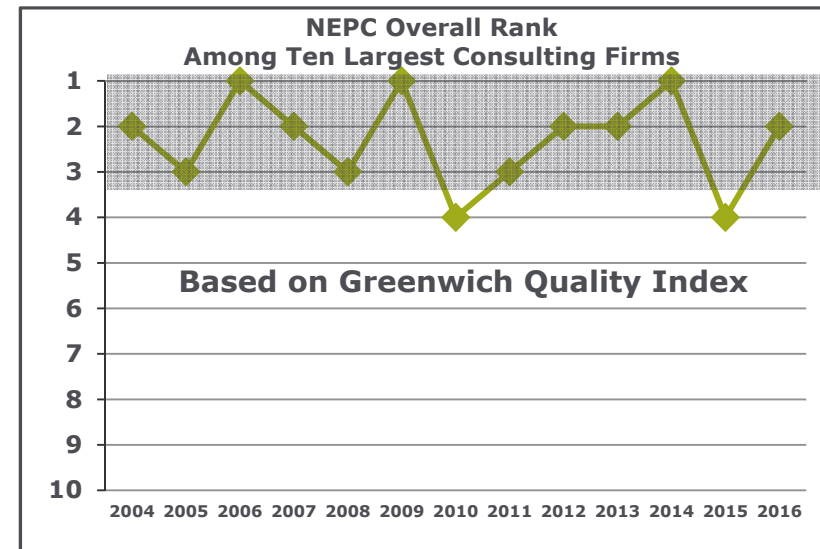
<sup>1</sup> As of 9/30/2017, includes 49 clients with discretionary assets of \$16.1 billion.

- **NEPC was named a “Greenwich Quality Leader” by Greenwich Associates in 2016**



- **NEPC has consistently achieved favorable client satisfaction ratings among the ten largest firms:**
  - Greenwich Quality Index (GQI) ranking in the top three in 11 of the last 13 years

- **NEPC compensates its non-partner employees with a supplemental Quality Bonus whenever our client ratings rank us in the top three among the ten largest investment consulting firms.**
- **Greenwich Associates surveys over 1,000 large plan sponsors regarding their investment consulting relationships.**

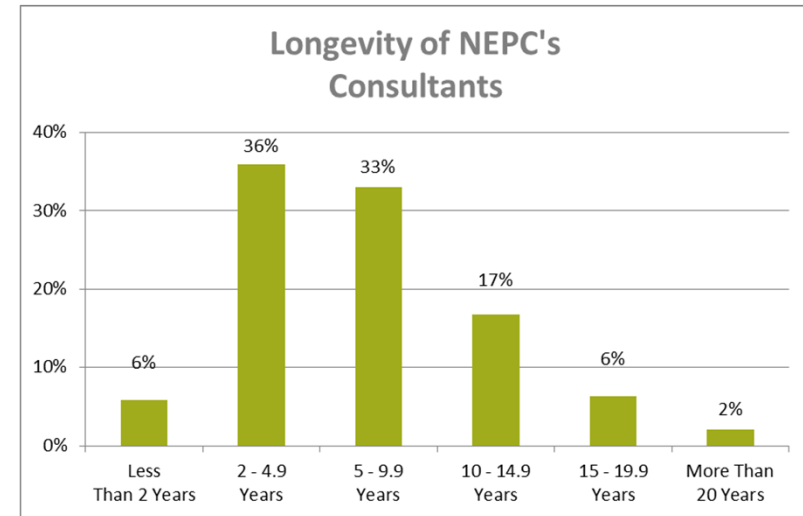


Source: Greenwich Associates, 2016 Evaluations by U.S. Institutional Investors.

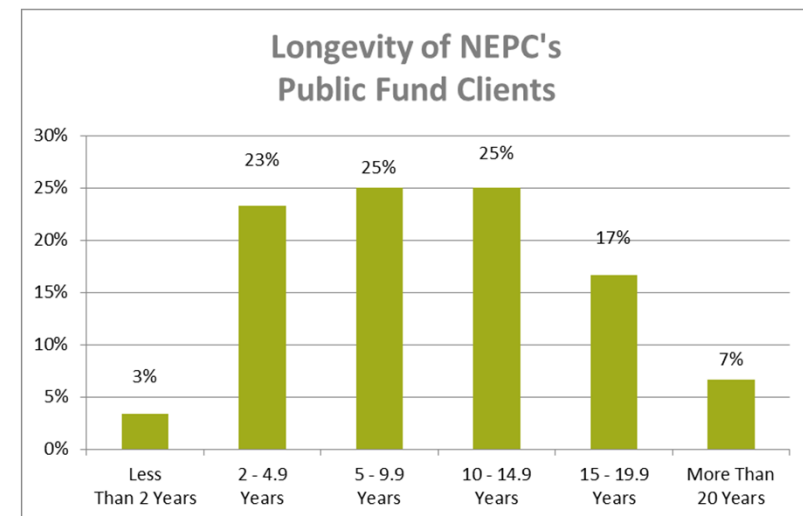
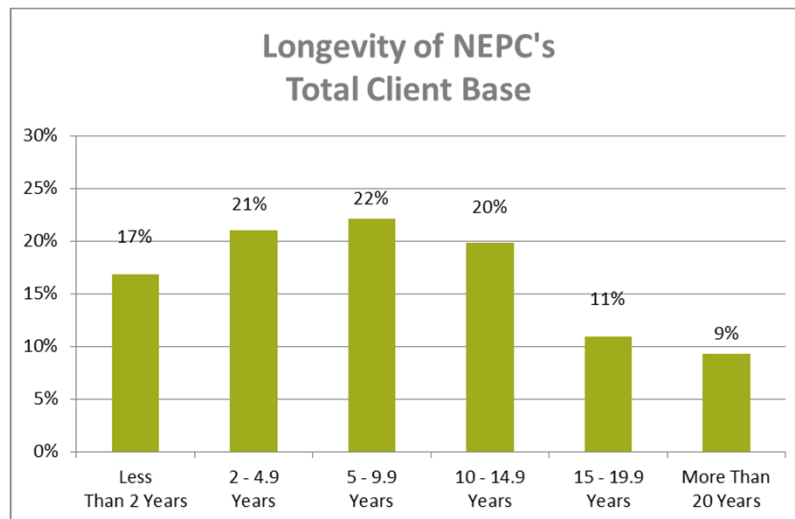
- Greenwich Associates is an independent research firm. Their rankings do not represent an endorsement of NEPC.
- Past performance is no guarantee of future results.
- See Disclosures for important disclosures that should be viewed in connection with this exhibit.

## Longevity of NEPC Consultants and Clients

- **NEPC consultants have shown commitment to our clients and to our firm.**
- **58% of our consultants have been with NEPC for 5 years or longer.**



- **62% of clients (73% Public Funds) have retained NEPC for 5 years or longer.**



## Proposed Team's Client Profile & Experience

- **Public Fund Team is experienced working with staff & Boards in various roles or mandates.**
  - Dedicated Investment Staffs
  - Partnering with specialty alternative asset consultants
  - Committee and staff-driven implementation decision-making

Plan/Client Name	Length of Relationship	Asset Size (\$million)	Consultant	Role	Mandate	Notes
New York City Fire Pension	11 years	\$11,000	Moseley	Primary	General & Private Credit	Work with Townsend, Aksia & Stepstone
Fairfax Teachers	9 years	\$2,330	Moseley	Primary	General & Alternatives	Dedicated Investment staff. <b>Actuary is GRS</b>
Fairfax County Uniformed RS	14 years	\$1,641	Moseley	Primary	General & Alternatives	Overlay account
Hampshire County	11 years	\$290	Moseley	Primary	General & Alternatives	No Dedicated Investment Staff, outsource RE to Mass PRIM
1199 SEIU Greater NY	15 years	\$620	Moseley	Primary	General & Hedge Fund	Work with Townsend, Hamilton Lane
Detroit General RS	23 years	\$	Leonard	Primary	General & Alternatives	Dedicated Investment Staff
IL SURS	3 years	\$17,000	Leonard	Primary	General & Alternatives	Dedicated Investment Staff, Overlay account, <b>Actuary is GRS</b>
MoDOT / MPERS	6 years	\$2,114	Leonard	Primary	General & Private Credit	Work with Albourne
New Hampshire Retirement System	9 years	\$7,936	Leonard	Primary	General & Private Equity, Debt	Work with Townsend. <b>Actuary is GRS</b>
City of Orlando	9 years	\$650	Leonard	Primary	General & Alternatives	Multiple Plans
City of Richmond RS	9 years	\$556	Leonard	Primary	General & Alternatives	
Philadelphia Housing	18 years	\$196	Leonard	Primary	General & Alternatives	No Dedicated Investment Staff
Boston Ret. System	13 years	\$4,548	Forde	Secondary	General & Alternatives	
City of Hartford, CT	6 years	\$1,022	Forde	Secondary	General & Alternatives	Work with PCA for PE
Government of Bermuda	10 years	\$1,756	Forde	Secondary	General & Alternatives	
MoDOT / MPERS	6 years	\$2,114	Forde	Secondary	General & Private Credit	Work with Albourne, <b>Actuary is GRS</b>
New Castle County	9 years	\$419	Forde	Secondary	General & Alternatives	No Dedicated Investment Staff
St. Louis Public Schools	15 years	\$849	Forde	Secondary	General & Alternatives	No Dedicated Investment Staff
WMATA Local 922	13 year	\$202	Forde	Secondary	General & Alternatives	No Dedicated Investment Staff

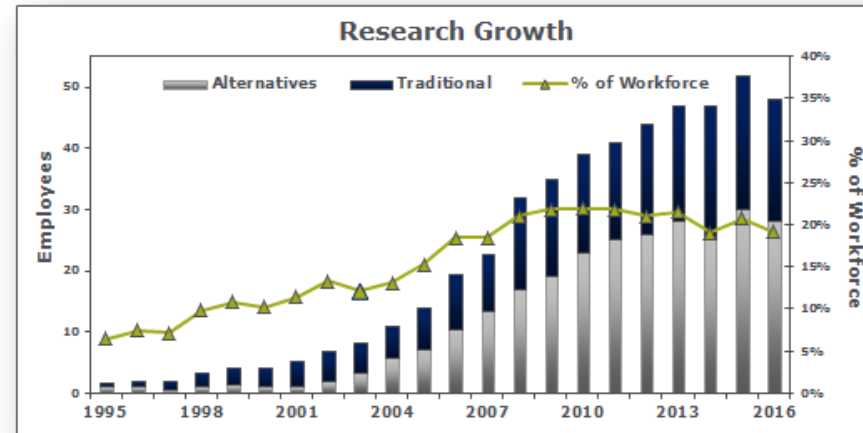




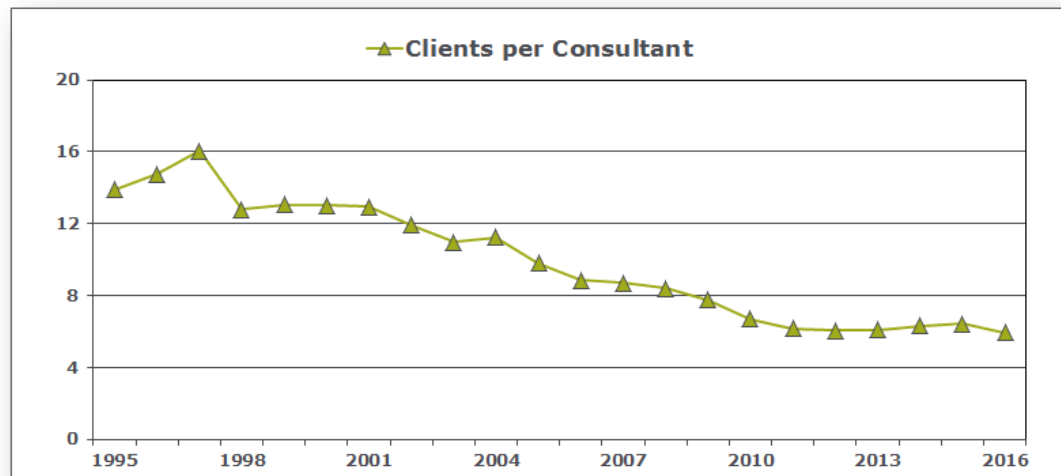
## Dedicated Consulting and Research Teams

### NEPC employs 47 dedicated research professionals<sup>1</sup>

- Traditional manager research is a cornerstone of our efforts
- One of the largest alternative asset research groups in the industry
- Four actuaries on staff, one consultant with formal actuarial training, and one PhD specializing in risk budgeting and asset allocation



## Client Commitment



### Selective growth

- Balance resources, product and services
- Recognize increased servicing requirements
- Declined 178 RFPs in 2016

# Our Consulting Process



### All investors face the same fundamental challenge

Capital + Investment Earnings must be equal to or greater than Obligations + Expenses

### If Investment Return is lower than expected, adjustments are required to balance the equation

Contributions must be higher

Obligations + Expenses must be lower, or

More risk must be taken to earn a similar return or risk must be taken more efficiently

### Adjusting investment return and risk is the most fluid of these factors

Requires an understanding of both assets and liabilities to determine the "right" amount of risk in a portfolio

A key input is assessing the efficiency of a portfolio's implementation of the risk target

Requires any potential structural challenges from future cash flow dynamics be addressed and understood

The portfolio's macro economic bias must be evaluated and recognized



# Asset Allocation – Broad Scope and Capabilities



## Asset Allocation Philosophy and Differentiators

### Goals Based Asset Allocation

Long-term **strategic asset allocation**, customized to your needs, is the cornerstone of the investment program

We believe in a multi-faceted asset allocation process that incorporates the **dynamics of the markets** and considers various time horizons and events

### Risk Identification

We believe in a well-balanced collection of long-term risk premiums as a starting point for identifying sources of risk for an organization

We are constantly monitoring market conditions so that we can be **proactive and opportunistic** to identify opportunities for enhancing portfolio structure

### Portfolio Positioning

We believe in a constant **pursuit of best ideas across markets**, asset classes and structures with favorable investor terms

To do this, we research execution strategies by considering opportunities and risks across asset classes and liquidity spectrum and communicate these insights to you with actionable ideas

### Implement Portfolio

We favor managers that are flexible and seek to **uncover or build opportunistic and dynamic strategies**

Our implementation tools help size strategies appropriately and understand each strategy's contribution to tracking error, or active risk, within your portfolio



## Asset Allocation Team – Dedicated Resources

- **Dedicated Asset Allocation Team**
  - Portfolio construction analysis
  - Asset/Liability studies
  - Portfolio liquidity studies
  - Time series analysis
  - Tax aware asset allocation recommendations
- **Ongoing Market Outlook**
  - Publish quarterly tactical views and outlook
  - Publish monthly commentary
  - Discuss roles of investments in portfolios
  - Glide path recommendations
- **Development of asset allocation tools**
  - Risk budgeting development
  - Scenario testing development
  - Efficient frontier construction
  - Asset class risk factor exposures

### Asset Allocation Team

**Phillip Nelson, CFA**  
*Principal, Director of Asset Allocation<sup>+</sup>*

**Mark Cintolo, CAIA**  
*Senior Consultant*

**Lynda Dennen, ASA, EA**  
*Senior Consultant*

**Ian Spencer**  
*Consultant*

**Jennifer Appel**  
*Research Analyst*

<sup>+</sup> Principal designation for leadership within the Firm.



## Be Dynamic

Build a **long-term** strategic allocation that can meet long-term objectives


Look for **medium-term** “opportunistic ideas” to tilt away from the strategic allocation to add value, protect against drawdowns, and take advantage of **short-term** market dislocations

## Build a Mosaic

No single asset allocation approach or model has all the answers

Minimize exposure to the shortcomings of any individual approach by using multiple perspectives and approaches

All analytical tools have the potential to provide useful insights but also including shortcomings



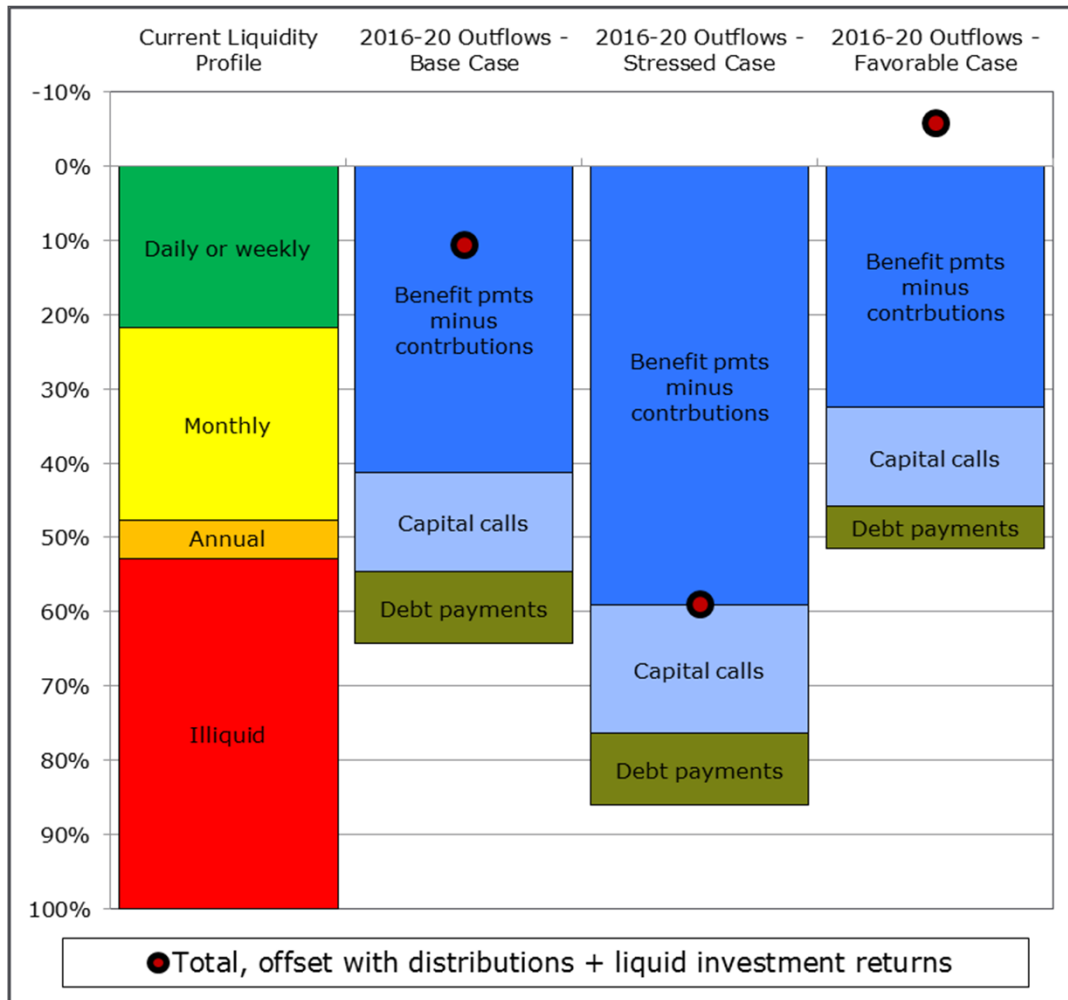
### NEPC uses a variety of proprietary tools developed to assess strategic asset allocation changes and the impact of tactical adjustments

Approach	Advantages	Shortcomings
Mean-Variance	<ul style="list-style-type: none"> <li>Calculates most efficient portfolio for given volatility</li> <li>Produces range of portfolios</li> </ul>	<ul style="list-style-type: none"> <li>Relies on static assumptions and assumes normal distribution</li> <li>Chosen constraints can drive results</li> <li>Limits risk definition to volatility</li> </ul>
Liquidity Analysis	<ul style="list-style-type: none"> <li>Recognizes a “risk” not captured in traditional tools: illiquidity</li> <li>Highlights impact of changing cash flows (both investment-driven and exogenous)</li> </ul>	<ul style="list-style-type: none"> <li>Requires portfolio specific cash flow and partnership details</li> <li>Long-term planning tool – cannot easily adjust portfolio or compare different portfolios</li> </ul>
Scenario Analysis	<ul style="list-style-type: none"> <li>Focuses on low-probability, high magnitude economic environments (tail risks)</li> <li>Recognizes environmental biases of each asset class</li> </ul>	<ul style="list-style-type: none"> <li>Offers opportunity to test risk tolerance to various outcomes but should not be used to construct best portfolio for each environment</li> </ul>
Risk Budgeting	<ul style="list-style-type: none"> <li>Provides risk allocations</li> <li>Recognizes that less efficient portfolios may have better risk balance</li> </ul>	<ul style="list-style-type: none"> <li>Relies on mean-variance optimization assumptions</li> <li>Defines risk as standard deviation</li> <li>Ignores tail risks</li> </ul>
Factor Analysis	<ul style="list-style-type: none"> <li>Recognizes underlying economic drivers of asset class volatility</li> <li>Can identify risk concentrations across asset classes</li> </ul>	<ul style="list-style-type: none"> <li>Requires intuitive belief of asset class relationships to underlying factors – less quantitative and more qualitative</li> </ul>
Active Risk Budgeting	<ul style="list-style-type: none"> <li>Assesses which managers are driving risk-budget and calculates correlation of alpha’s across manager line-up</li> </ul>	<ul style="list-style-type: none"> <li>Relies on historical manager returns to set expectations of risk and correlation</li> </ul>
Stochastic Forecasting	<ul style="list-style-type: none"> <li>Shows range of results based on Monte Carlo simulation</li> <li>Includes natural feedback loops</li> </ul>	<ul style="list-style-type: none"> <li>Percentiled results show ranges but not reasons</li> <li>Each simulated trial represents a possible but highly unlikely path</li> </ul>

Please note that all investments carry some level of risk. No investment strategy or risk management technique can guarantee returns or eliminate risk in any market environment.



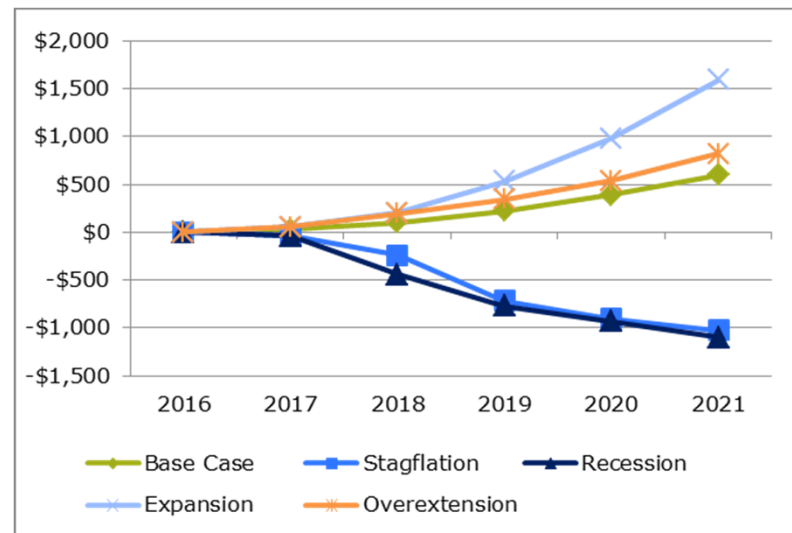
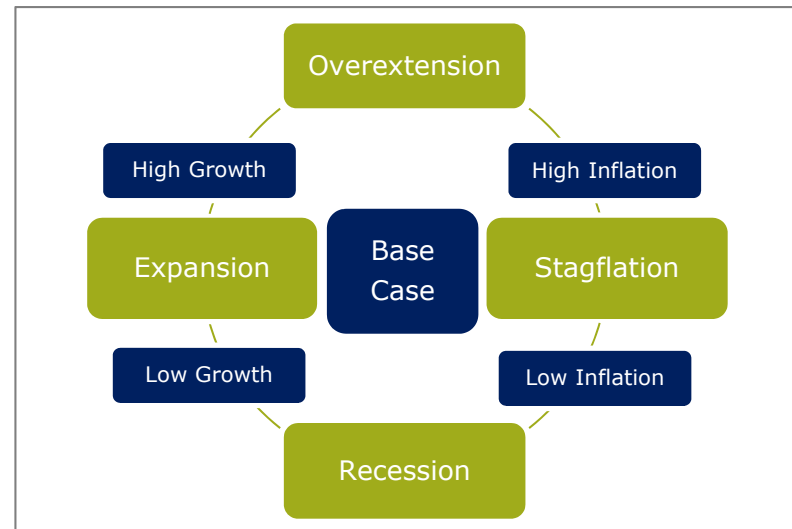
## Liquidity Analysis: Possible Range of 5-Year Cash Outflows (Example)



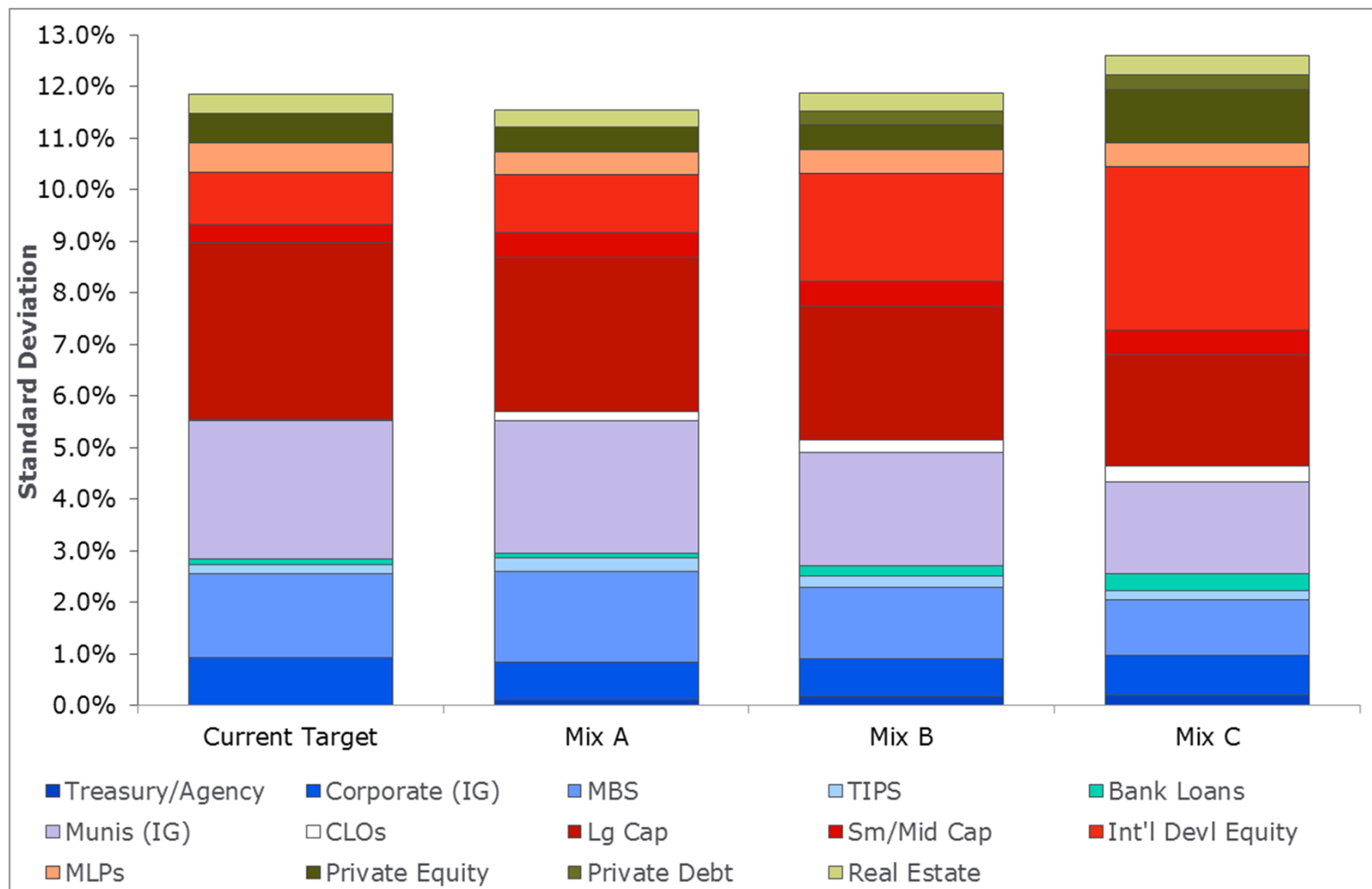
- **Base Case: negative net cash flows; some loss of liquidity**
- **Stressed Case: liquid assets wiped out; forced unwinding of some illiquid positions**
- **Favorable Case: positive cash flows; liquidity profile improves**

## Scenario Analysis

- **Scenario analysis tests the viability of asset mixes under multiple economic scenarios**
- **Advantages**
  - Allows better understanding of risk exposures under contrasting inflation and economic growth regimes
  - Can reveals risk tolerance under various economic environments
  - Scenarios can be customized to examine fund outcomes as markets adjust and specific risks become a concern
- **Disadvantages**
  - Doesn't reflect views on the likelihood of various economic environments



# Risk Budgeting: Risk Allocations By Asset Class (Example)



# Asset Allocation Discussion



- **NEPC’s asset class assumptions provide a 5-7 year and 30-year expected risk/return estimate for clients**
  - Expected returns are annualized and based on a geometric calculation
  - Expected risk (volatility) is also annualized
- **NEPC has leveraged its asset class assumptions to best model Rhode Island’s strategic asset allocation (“SAA”)**
  - Based on the information provided, NEPC used its comparable asset class assumptions to model the expected risk/return of Rhode Island’s SAA categories
- **Based on the preliminary review NEPC believes that the SAA provides an appropriate balance of asset class exposures that are consistent with ERSRI’s actuarial assumptions & profile**
  - Broad structural framework that mixes growth- and income-oriented categories with risk mitigation/hedging is consistent with NEPC’s beta allocation framework
    - Lower public-equity allocation
    - Appropriate use of private markets exposures
    - Strategies designed to perform well in down-markets or inflationary periods

## ERSRI Current Strategic Asset Allocation

Asset Category	Current Target
U.S. Equities	20.6%
Int'l Equities	15.9%
Emerging Int'l Equities	3.5%
<b>Total Equity</b>	<b>40.0%</b>
Private Equity	11.2%
Non-Core Real Estate	2.3%
Opp. Private Credit	1.5%
<b>Private Growth</b>	<b>15.0%</b>
HY Infrastructure/MLP	1.0%
REITs	1.0%
Liquid Credit	2.8%
Private Credit	3.2%
<b>Income</b>	<b>8.0%</b>
Treasury Duration	4.0%
Systematic Trend	4.0%
<b>CPC</b>	<b>8.0%</b>
Core Real Estate	3.6%
Private Infrastructure	2.4%
TIPS	1.0%
Natural Resources	1.0%
<b>Inflation Protection</b>	<b>8.0%</b>
Investment Grade Fixed	11.5%
Absolute Return	6.5%
Cash	3.0%
<b>Volatility Protection</b>	<b>21.0%</b>
<b>Expected Return 5-7 yrs</b>	<b>6.3%</b>
<b>Expected Return 30 yrs</b>	<b>7.4%</b>
<b>Standard Dev</b>	<b>11.5%</b>
<b>Sharpe Ratio (5-7 years)</b>	<b>0.39</b>

- Rhode Island's 5-7 Year expected return is **6.3%** while its 30 Year assumption is **7.4%**
- Rhode Island's Standard Deviation is **11.5%** over both time horizons
- NEPC's believes the SIC has adopted an appropriate Policy framework and targets given its liability assumptions and cash flow profile
  - Lower equity ratio relative to peers
  - Income orientation
  - Appropriate allocation to illiquid assets
  - Recent introduction of Long duration bucket
- Current allocation also seems to reflect market conditions
  - Tight credit spreads

## 2017 5-to-7 Year Return Forecasts

Geometric Expected Return			
Asset Class	2016	2017	2017-2016
Cash	1.50%	1.75%	0.25%
Treasuries	1.75%	2.00%	0.25%
IG Corp Credit	3.75%	3.75%	-
MBS	2.00%	2.25%	0.25%
Core Bonds*	2.46%	2.65%	0.19%
TIPS	2.50%	3.00%	0.50%
High-Yield Bonds	5.25%	4.75%	-0.50%
Bank Loans	5.50%	5.25%	-0.25%
Global Bonds (Unhedged)	1.00%	1.00%	-
Global Bonds (Hedged)	1.09%	1.09%	-
EMD External	4.75%	4.75%	-
EMD Local Currency	6.50%	6.75%	0.25%
Large Cap Equities	6.00%	5.75%	-0.25%
Small/Mid Cap Equities	6.25%	6.00%	-0.25%
Int'l Equities (Unhedged)	7.25%	7.25%	-
Int'l Equities (Hedged)	7.57%	7.57%	-
Emerging Int'l Equities	9.75%	9.50%	-0.25%
Private Equity	8.50%	8.25%	-0.25%
Private Debt	7.50%	7.25%	-0.25%
Real Estate	6.50%	6.00%	-0.50%
Commodities	4.50%	4.75%	0.25%
Hedge Funds**	5.75%	5.95%	0.20%

\* 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.



## 2017 30-Year Return Forecasts

Geometric Expected Return			
Asset Class	2016	2017	2017-2016
Cash	3.00%	3.00%	-
Treasuries	3.25%	3.50%	0.25%
IG Corp Credit	5.00%	5.00%	-
MBS	3.50%	3.50%	-
Core Bonds*	3.89%	4.00%	0.11%
TIPS	4.00%	3.75%	-0.25%
High-Yield Bonds	5.75%	5.75%	-
Bank Loans	6.00%	6.00%	-
Global Bonds (Unhedged)	2.75%	2.75%	-
Global Bonds (Hedged)	2.87%	2.87%	-
EMD External	6.00%	5.75%	-0.25%
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)	8.00%	7.75%	-0.25%
Int'l Equities (Hedged)	8.39%	8.14%	-0.25%
Emerging Int'l Equities	9.50%	9.50%	-
Private Equity	9.50%	9.50%	-
Private Debt	8.00%	8.00%	-
Real Estate	6.50%	6.50%	-
Commodities	5.50%	5.50%	-
Hedge Funds**	6.50%	6.47%	-0.03%

\* 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.





## 2017 Volatility Forecasts

Volatility			
Asset Class	2016	2017	2017-2016
Cash	1.00%	1.00%	-
Treasuries	5.50%	5.50%	-
IG Corp Credit	7.50%	7.50%	-
MBS	7.00%	7.00%	-
Core Bonds*	6.03%	6.03%	-
TIPS	6.50%	6.50%	-
High-Yield Bonds	13.00%	13.00%	-
Bank Loans	9.00%	9.00%	-
Global Bonds (Unhedged)	8.50%	8.50%	-
Global Bonds (Hedged)	5.00%	5.00%	-
EMD External	13.00%	13.00%	-
EMD Local Currency	15.00%	15.00%	-
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	27.00%	28.00%	1.00%
Private Equity	23.00%	23.00%	-
Private Debt	15.00%	14.00%	-1.00%
Real Estate	15.00%	15.00%	-
Commodities	19.00%	19.00%	-
Hedge Funds**	9.00%	8.74%	-0.26%

\* 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.



# Traditional & Alternative Asset Research





# Research Team - Client Focused



**Tim McCusker, FSA, CFA, CAIA**  
Chief Investment Officer

**Client Strategy & Asset Allocation**

Christopher Levell, ASA,  
CFA, CAIA, Partner  
Kristi Hanson  
Director of Taxable Research



**Traditional Research**

Timothy Bruce  
Partner



**Alternatives Research:  
Hedge Funds**

Neil Sheth  
Partner



**Alternatives Research:  
Private Markets**

Sean Gill  
Partner

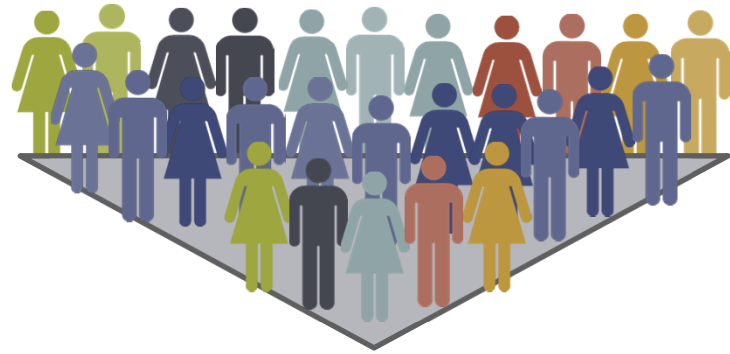


**Operational Due  
Diligence**

William Bogle  
Partner



48 Dedicated Research  
Employees generate  
client output



**Strategic/Dynamic  
Market View**

**Manager Selection  
and Monitoring**

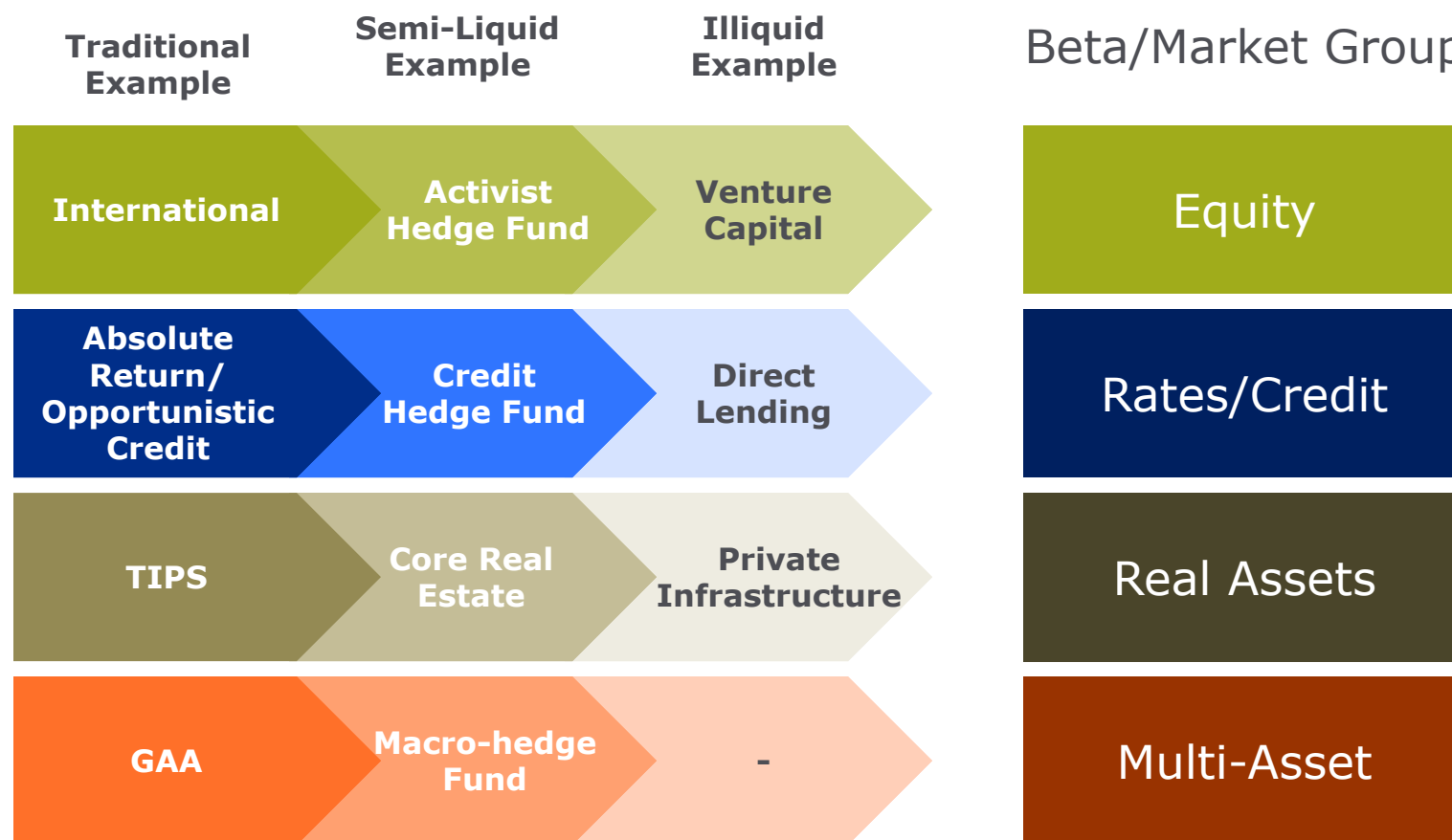
**Optimize  
Positioning**

**Accessibility and  
Communication**

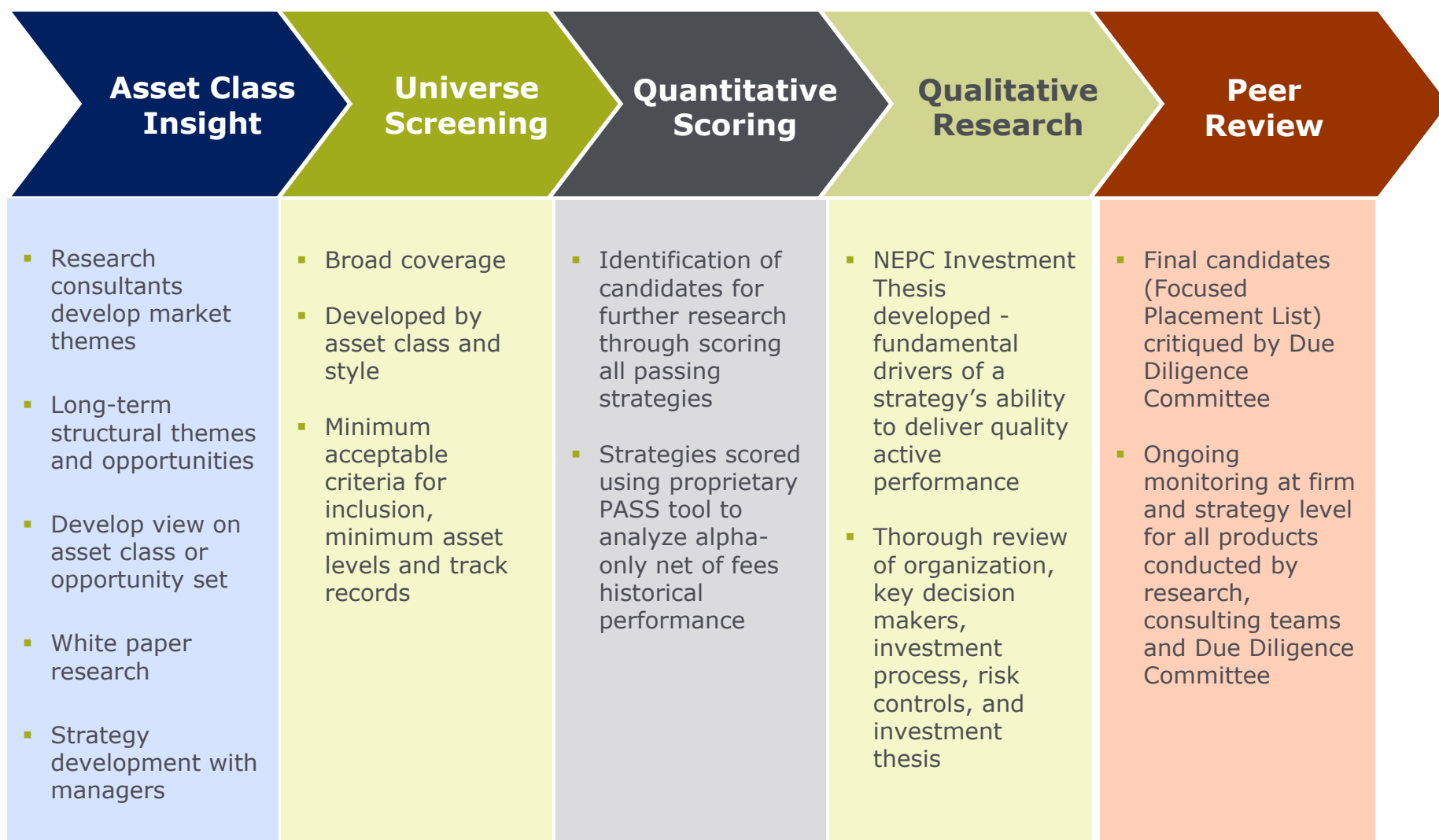
**Education**



**Combining vertical expertise in asset classes with dynamic markets views to provide optimal implementation for each client**



### Our research process is based on continuous innovation and idea sourcing



# Manager Selection: Multiple Benefits NEPC Research Bring to Clients



## NEPC Research: Size | Scale | Depth | Breadth

### Negotiating Power with Managers on Accessibility and Fees

Have provided reduced fees for NEPC clients

.....

Pooling of client assets allows potential for us to access to select funds and hit minimums that could not be achieved individually

### Diverse and Expansive Manager Roster

**Traditional:**  
Preferred List Categories: 52  
Preferred List Strategies: 400+

.....

**Hedge Funds:**  
Preferred List Categories: 11  
Preferred List Managers: 70+  
Assets under Advisement: \$27.8 billion<sup>1</sup>

.....

**Private Markets:**  
Preferred List Categories: 15  
Preferred List Managers: ~50 Annually  
Assets under Advisement: \$27.3 billion<sup>1</sup>  
Partnerships Tracked: 875

### Identification and Underwriting of New/ Innovative Markets, Managers, and Products

Discovery Platform – Niche Investment Ideas

.....

Early Investor/Underwriter of many new products and strategies in many

.....

Work with managers to establish/develop products and strategies to meet needs

.....

Dedicated Teams to ESG and Diverse Managers

# Wrap-Up





**NEPC is driven by a  
love for investing and consulting  
and serving clients  
without divided loyalties**

Providing **innovative** investment strategies and customized research solutions from professionals **grounded in integrity**.

Attracting and retaining the best investment talent in order to deliver investment advice and insight to meet **unique client needs** and be the **Consultant of Choice**.

*We are big enough to give you the resources that you require yet small enough to give you the service you deserve.*

- **Virtually all of our clients employ our services on a full retainer basis. Our full retainer service commitment is open-ended, and includes:**
  - Development and/or refinement of your Investment Policy Statement, objectives and guidelines and periodic review, thereafter;
  - Liability-based asset allocation studies every three to five years, the length of a typical planning cycle;
  - Asset-based asset allocation studies, as requested;
  - Manager searches for both traditional and alternative assets;
  - Custodian searches;
  - Quarterly investment performance analysis reports and accompanying executive summaries;
  - Monthly investment performance flash reports;
  - Advice on proxy voting services;
  - Educational seminars;
  - Our annual investment conference (not funded or subsidized by investment managers);
  - Attendance at your meetings; and
  - Special projects and reports, as requested.
- **Our revised fee proposal is \$395,000 per year, inflation adjusted on an annual basis. Fee is negotiable pending additional discussions with staff and SIC regarding the scope of the general consulting mandate and specific reporting requirements**
  - Does not include support for private markets investments (pacing plans or manager research)
  - Does not include annual or quarterly reporting on defined contribution plans (457, 401k, etc.)

# Appendix



# Representative Client List

## Public

AC Transit Employees' Retirement  
 Arizona Public Safety Personnel Ret. System  
 Arizona State Retirement System  
 Baltimore County ERS  
 Boston Water and Sewer Commission  
 Chicago Policemen's Annuity & Benefit Fund  
 City of Boston - Trust Funds  
 City of Detroit, Michigan  
 City of Fresno Retirement Systems  
 Fairfax County Uniformed Retirement System  
 Los Angeles County Savings Plan  
 Los Angeles Deferred Compensation Plan  
 Louisiana State Employees Retirement System  
 Massachusetts Water Resource Authority  
 New Hampshire Retirement System  
 New Mexico Educational Retirement Board  
 New York City Fire Dept. Pension  
 Ohio Public Employees Retirement System  
 Philadelphia Housing Authority  
 San Antonio Fire & Police Pension Fund  
 San Bernardino County ERA  
 San Francisco Employees' Retirement System  
 Seattle City Employees' Retirement System  
 St. Louis Public School Retirement System  
 State Boston Retirement System  
 State of Vermont  
 State Universities Retirement System of Illinois  
 State of Wisconsin Investment Board  
 Ventura County ERA  
 West Virginia Board of Treasury Investments

## Taft-Hartley

ABC-NABET  
 Boston Newspaper  
 Boston Plasterers' & Cement Masons' Local 534  
 Boston Shipping Association  
 Desert States UFCW Pension Fund  
 Fulton Fish Market  
 IBEW Local 357  
 IUOE Locals 12 & 324  
 Sheet Metal Workers Local 40  
 Southern California IBEW-NECA  
 Teamsters Local 856  
 UFCW - Northern California  
 Western Pennsylvania Teamsters & Employers

## Healthcare Related

Baylor, Scott & White Health LLC  
 Boston Medical Center  
 Christus Health  
 Henry Ford Health System  
 Johns Hopkins Health System  
 Lahey Clinic  
 Multicare Health System  
 Rochester Regional Health  
 Rush University Medical Center  
 Shriners Hospitals for Children, Inc.  
 St. Barnabas Hospital  
 University of Maryland Medical System

## Corporate

Becton Dickinson and Company  
 Bose Corporation  
 Colgate-Palmolive Co.  
 JM Family Enterprises, Inc.  
 Jones Day  
 Marriott International  
 National Grid  
 Ocean Spray Cranberries, Inc.  
 Southwest Airlines Co.  
 ThermoFisher Scientific, Inc.  
 TimkenSteel Co.

## Endowments & Foundations

Community Foundation for SE Michigan  
 Dartmouth Hitchcock Hospital & Clinic  
 Hebrew Immigrant Aid Society (HIAS)  
 Kaleida Health  
 MaineGeneral Healthcare  
 Several High-Net Worth Foundations  
 Unitarian Universalist Association of Congregations

This client list is only a sample. It is not known whether or not the clients approve of the services received. It should not be considered an endorsement by any individual client listed.

As of 9/30/2017

Client Type	Retainer Clients	Funds less than \$1.5B	Funds greater than \$1.5B	Total Assets	Average Client Size	Median Client Size
Public Fund	66	21	45	\$566 billion	\$8.6 billion	\$2.2 billion

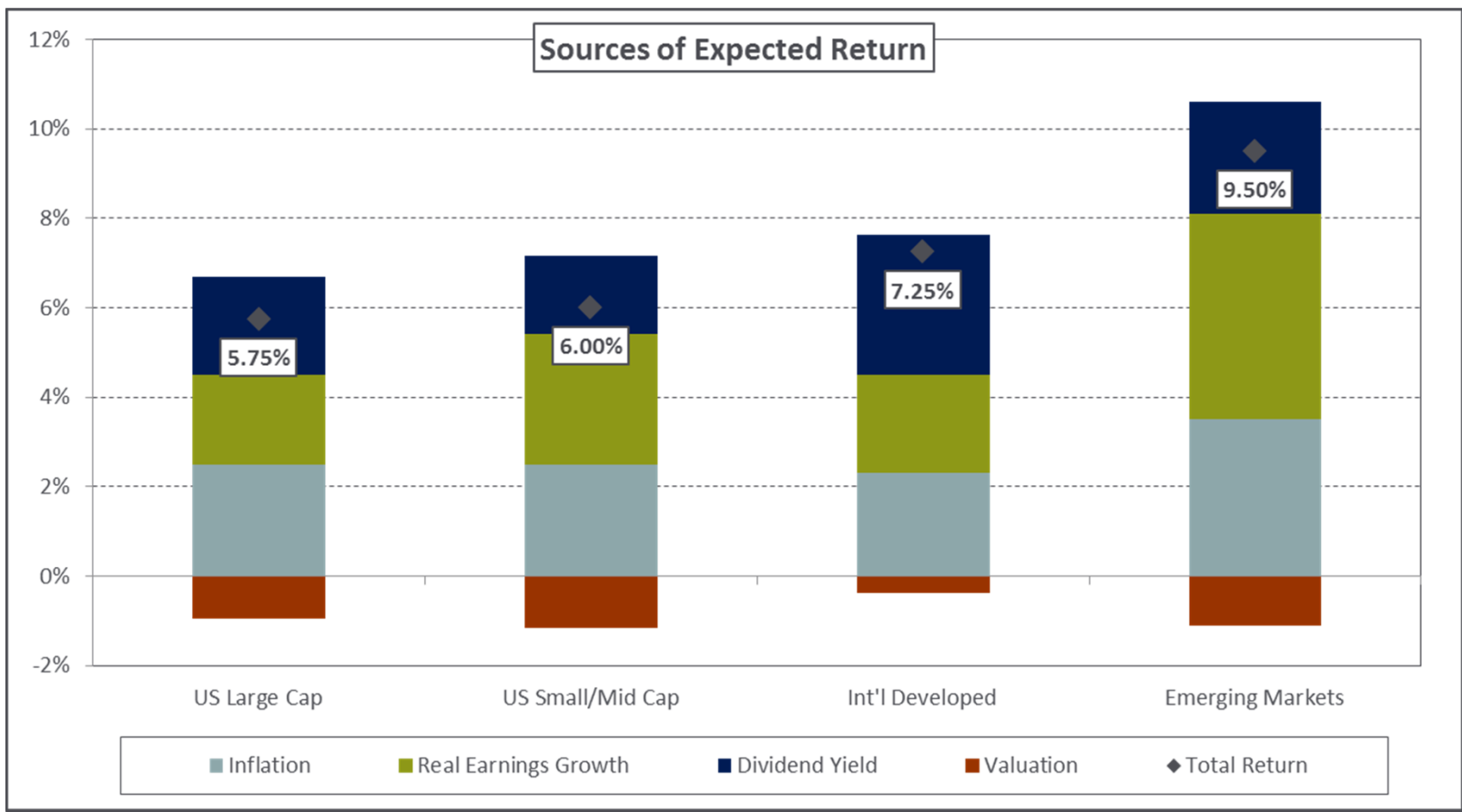
# NEPC's Consulting Services Team

<b>Rhett Humphreys, CFA</b> <i>Partner*</i>		<b>Brad Smith, CFA, CEBS</b> <i>Partner*</i>		<b>KC Connors, CFA, CAIA</b> <i>Partner*</i>	
<b>Taft-Hartley</b>	<b>Public Fund</b>	<b>Defined Contribution</b>	<b>Corporate</b>	<b>Endowment and Foundation</b>	<b>Healthcare</b>
<b>John Elliot</b> <i>Partner*</i>	<b>Kevin Leonard</b> <i>Partner*</i>	<b>Christine Loughlin, CFA, CAIA</b> <i>Partner*</i>	<b>Craig Svendsen, CFA</b> <i>Partner*</i>	<b>Catherine Konicki, CFA, CAIA</b> <i>Partner*</i>	<b>David Moore, ARM, CEBS, CPCU</b> <i>Partner*</i>
<b>Michael Cairns, CEBS</b> <i>Partner*</i>	<b>Samuel Austin, III</b> <i>Partner*</i>	<b>Ross Bremen, CFA</b> <i>Partner*</i>	<b>Jay Roney, CTP</b> <i>Partner*</i>	<b>Chris Klapinsky, CFA</b> <i>Partner, Director of Portfolio Strategy*</i>	<b>Paul Kenney, Jr., CFA</b> <i>Partner*</i>
<b>Michael Sullivan</b> <i>Partner*</i>	<b>John Krimmel, CPA, CFA</b> <i>Partner*</i>	<b>Brian Donoghue</b> <i>Partner*</i>	<b>Andrew Coupe</b> <i>Senior Consultant</i>	<b>Scott Perry, CAIA</b> <i>Partner*</i>	<b>James Reichert, CFA</b> <i>Partner*</i>
<b>Daniel Hennessy, CFA, CAIA</b> <i>Senior Consultant</i>	<b>Allan Martin</b> <i>Partner*</i>	<b>Robert Fishman, CFA</b> <i>Partner, Director of Portfolio Strategy*</i>	<b>Wyatt Crumpler</b> <i>Senior Consultant+</i>	<b>Kristin Reynolds, CFA, CAIA</b> <i>Partner*</i>	<b>Kevin Novak</b> <i>Consultant</i>
<b>John Shanklin, CFA, CAIA</b> <i>Senior Consultant</i>	<b>Douglas Moseley</b> <i>Partner*</i>	<b>Ashwini Apte, CAIA, AIF</b> <i>Senior Consultant</i>	<b>Jeffrey Mitchell, CFA, CAIA</b> <i>Senior Consultant+</i>	<b>Richard Ciccione</b> <i>Senior Consultant</i>	<b>Elton Thomaj, CAIA</b> <i>Consultant</i>
<b>Jack Brodsky, CFA, CAIA</b> <i>Consultant</i>	<b>Carolyn Smith</b> <i>Partner*</i>	<b>Kevin Cress, CFA</b> <i>Senior Consultant</i>	<b>Kelly Regan</b> <i>Senior Consultant</i>	<b>Kristine Pelletier</b> <i>Senior Consultant</i>	<b>Eric Vallo, CFA</b> <i>Senior Consultant</i>
<b>Daniel Runnals, CFA, CAIA</b> <i>Consultant</i>	<b>David Barnes, CFA, CAIA</b> <i>Senior Consultant</i>	<b>Paul Kerry, ASA, EA</b> <i>Senior Consultant</i>	<b>Brian Roberts, CAIA</b> <i>Senior Consultant+</i>	<b>Sebastian Grzejka</b> <i>Senior Consultant</i>	<b>Gary Wyniemko, CFA</b> <i>Senior Consultant</i>
<b>John Teramana, CAIA</b> <i>Consultant</i>	<b>Kristin Finney-Cooke, CAIA</b> <i>Senior Consultant</i>	<b>Daniel Beaton</b> <i>Consultant</i>	<b>Michael Valchine, CAIA, CIPM</b> <i>Senior Consultant+</i>	<b>Rich Harper, CFA, CAIA</b> <i>Senior Consultant+</i>	<b>Private Wealth</b>
<b>Senior Analysts</b> <b>Scott Freeman</b> <b>Peter Haist</b>	<b>Margaret Belmondo</b> <i>Senior Consultant</i>	<b>Thomas Cook</b> <i>Consultant</i>	<b>Richard Chari</b> <i>Consultant</i>	<b>Sam Pollack</b> <i>Senior Consultant</i>	<b>Karen Harding, CFA</b> <i>Partner*</i>
	<b>Don Stracke, CFA, CAIA</b> <i>Senior Consultant</i>	<b>Tim Fitzgerald, CAIA</b> <i>Senior Consultant</i>	<b>Matthew Rowell</b> <i>Consultant</i>	<b>Asher Watson</b> <i>Consultant</i>	<b>Kristi Hanson, CFA</b> <i>Partner*</i>
	<b>Keith Stronkowsky, CFA</b> <i>Senior Consultant</i>	<b>Jason Gerda, CAIA</b> <i>Consultant</i>	<b>Senior Analysts</b> <b>Carrie Bescoe</b>	<b>Chenae White, CPA</b> <i>Consultant</i>	<b>Dan Gimbel, CIMA</b> <i>Senior Consultant+</i>
	<b>Scott Driscoll</b> <i>Consultant</i>	<b>Senior Analysts</b> <b>Deirdre Pomerleau, CFA</b>	<b>Amanda Flemming</b> <b>Daniel Peter, CFA</b>	<b>Stacey Flier, CFA</b> <i>Senior Consultant</i>	<b>Isabelle Campbell</b> <i>Consultant</i>
	<b>William Forde</b> <i>Consultant</i>			<b>Isabelle Campbell</b> <i>Consultant</i>	<b>Brandon Jones</b> <i>Consultant</i>
	<b>Tony Ferrara, CAIA</b> <i>Consultant</i>			<b>Senior Analysts</b> <b>Angela Dawson</b> <b>Colin Hatton</b>	<b>Brandon Parrish, CFA</b> <i>Consultant</i>
	<b>Senior Analysts</b> <b>Shalini Brown</b> <b>DeAnna Jones</b> <b>Kim Kaczor</b> <b>Michael Malchenko</b>				<b>Ryan Warren, CFA, CFP</b> <i>Consultant</i>



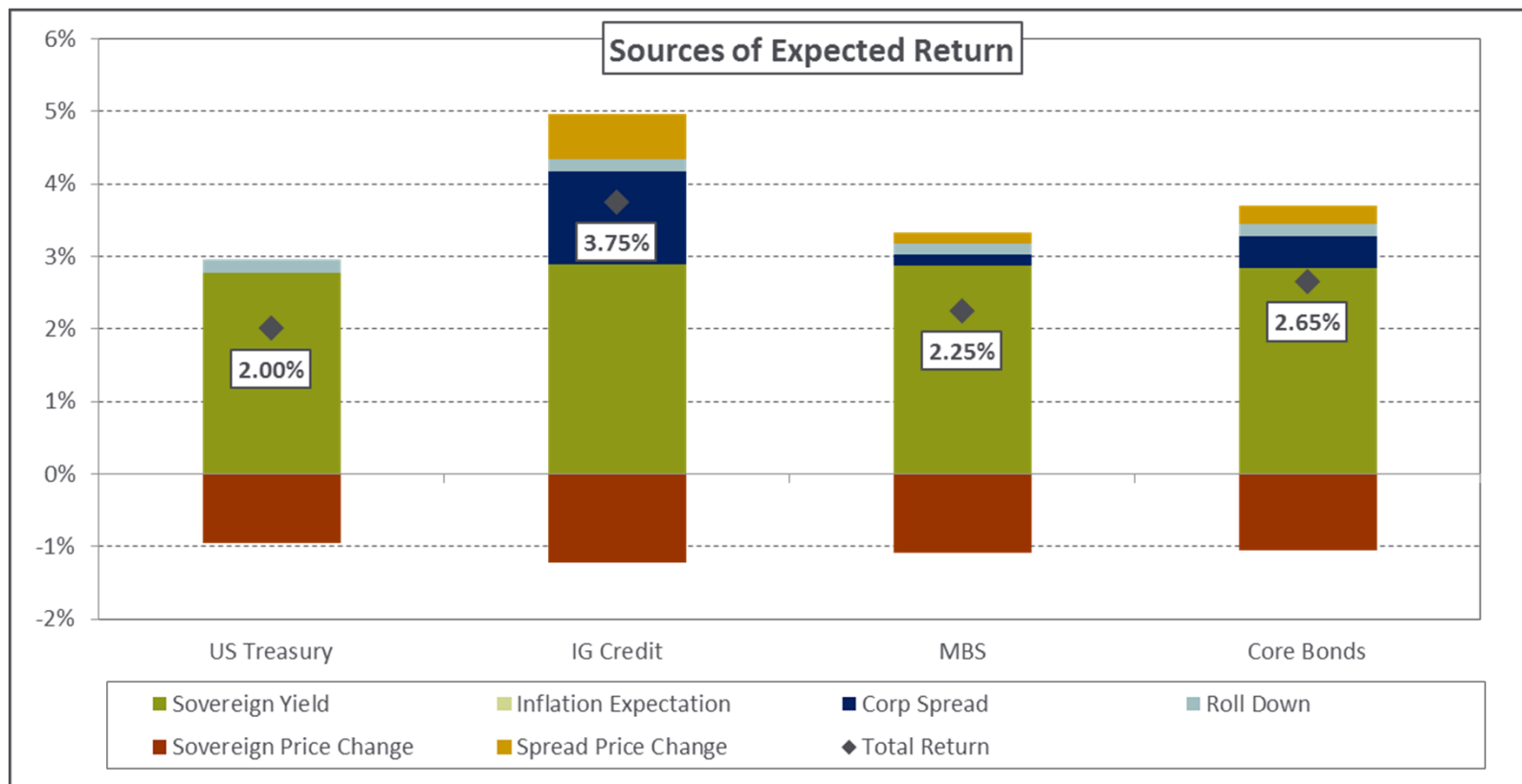
\*Ownership interest in NEPC (Partner) +Principal designation for leadership within the Firm.  
NEPC, LLC

# Assumption Development – Global Equities



Index Current	US Large Cap	US Small/Mid Cap	Int'l Developed	Emerging Markets
Trailing P/E	20.6	31.6	16.9	14.3
Profit Margin	9.5%	4.2%	6.2%	8.0%
Dividend Yield	2.1%	1.7%	3.3%	2.5%

## Assumption Development – Core Bonds



Index Current	US Treasury	US Credit	US MBS	US Aggregate
Yield	1.83	3.3	2.8	2.6
OAS	-	1.2	0.2	0.5
Duration	6.1	7.0	4.5	5.9
Quality	AA+/Aaa	A-/A3	AAA/Aaa	A/Aa2
MV (Millions)	6,861,998	5,942,232	5,353,011	19,034,388



## 2017 5-to-7 Year Return Forecasts

<b>Geometric Expected Return</b>			
<b>Asset Class</b>	<b>2016</b>	<b>2017</b>	<b>2017-2016</b>
Short Treasuries	1.75%	2.00%	0.25%
US 10 Yr. Treasury	1.75%	2.00%	0.25%
Long Treasuries	2.25%	1.75%	-0.50%
20+ Yr. STRIPS	2.00%	1.50%	-0.50%
Short Credit	2.50%	2.75%	0.25%
Long Credit	5.50%	4.25%	-1.25%
Long Government/Credit*	4.31%	3.33%	-0.98%
Global Cash**	0.00%	0.25%	0.25%
Global 10 Yr. Sovereigns**	0.25%	0.50%	0.25%
Global Inflation-Linked Bonds	2.00%	1.00%	-1.00%
Short High Yield	4.75%	5.00%	0.25%
Municipal Bonds	2.25%	2.25%	-
Global Equity***	7.23%	7.08%	-0.15%
MLPs	7.00%	7.15%	0.15%
REITs	6.75%	6.50%	-0.25%
Real Assets (Liquid)****	5.85%	5.99%	0.14%
Private Real: Energy/Metals	-	8.25%	-
Private Real: Infrastructure/Land	-	6.00%	-
Hedge Funds - Long/Short	6.25%	6.25%	-
Hedge Funds - Credit	5.25%	5.25%	-
Hedge Funds - Macro	6.00%	6.25%	0.25%

\* Assumption based on market weighted blend of index components (Long Treasuries and Long Credit)

\*\* Custom weighted blend of Australia, Canada, Germany, Japan, and United Kingdom

\*\*\* Assumption based on market weighted blend of index components (MSCI ACWI IMI)

\*\*\*\* Real Assets (Liquid) is a custom blend of TIPS, Global Equity, and Commodities





## 2017 30-Year Return Forecasts

Geometric Expected Return			
Asset Class	2016	2017	2017-2016
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	5.75%	5.75%	-
Long Government/Credit*	4.95%	5.04%	0.09%
Global Cash**	1.50%	2.00%	0.50%
Global 10 Yr. Sovereigns**	2.50%	2.50%	-
Global Inflation-Linked Bonds	2.75%	2.75%	-
Short High Yield	5.75%	5.75%	-
Municipal Bonds	3.75%	3.75%	-
Global Equity***	8.32%	8.24%	-0.08%
MLPs	7.50%	7.50%	-
REITs	6.75%	6.75%	-
Real Assets (Liquid)****	7.00%	6.94%	-0.06%
Private Real: Energy/Metals	-	7.75%	-
Private Real: Infrastructure/Land	-	6.00%	-
Hedge Funds - Long/Short	7.25%	7.25%	-
Hedge Funds - Credit	5.50%	5.50%	-
Hedge Funds - Macro	6.25%	6.25%	-

\* Assumption based on market weighted blend of index components (Long Treasuries and Long Credit)

\*\* Custom weighted blend of Australia, Canada, Germany, Japan, and United Kingdom

\*\*\* Assumption based on market weighted blend of index components (MSCI ACWI IMI)

\*\*\*\* Real Assets (Liquid) is a custom blend of TIPS, Global Equity, and Commodities



## 2017 Volatility Forecasts

Volatility			
Asset Class	2016	2017	2017-2016
Short Treasuries	2.50%	2.50%	-
US 10 Yr. Treasury	7.50%	7.50%	-
Long Treasuries	12.00%	12.00%	-
20+ Yr. STRIPS	18.00%	19.00%	1.00%
Short Credit	3.50%	3.50%	-
Long Credit	13.00%	13.00%	-
Long Government/Credit*	12.02%	12.01%	-0.01%
Global Cash**	1.00%	1.00%	-
Global 10 Yr. Sovereigns**	6.50%	6.50%	-
Global Inflation-Linked Bonds	6.00%	6.00%	-
Short High Yield	9.00%	9.00%	-
Municipal Bonds	7.00%	7.00%	-
Global Equity***	17.95%	18.04%	0.09%
MLPs	21.00%	20.00%	-1.00%
REITs	21.00%	21.00%	-
Real Assets (Liquid)****	12.79%	12.86%	0.07%
Private Real: Energy/Metals	-	21.00%	-
Private Real: Infrastructure/Land	-	14.00%	-
Hedge Funds - Long/Short	11.50%	11.00%	-0.50%
Hedge Funds - Credit	8.00%	9.50%	1.50%
Hedge Funds - Macro	9.50%	9.50%	-

\* Assumption based on market weighted blend of index components (Long Treasuries and Long Credit)

\*\* Custom weighted blend of Australia, Canada, Germany, Japan, and United Kingdom

\*\*\* Assumption based on market weighted blend of index components (MSCI ACWI IMI)

\*\*\*\* Real Assets (Liquid) is a custom blend of TIPS, Global Equity, and Commodities



• **Greenwich Associates**

- Greenwich Associates (“Greenwich”) is an independent research firm that has surveyed plan sponsors with assets in excess of \$150 million for many years to document their opinions of their investment consulting relationships.
  - The 2016 survey is based on interviews with 1,216 plan sponsors, 81 of whom retained NEPC.
  - See table for more details

<u>Year</u>	<u>Interviews</u>	<u>Plan Sponsors</u>	<u>NEPC Clients</u>
2016	1,216	1,052	81
2015	1,341	1,128	92
2014	1,277	1,091	94
2013	1,093	923	60
2012	1,181	970	72
2011	1,173	987	66
2010	1,188	1,000	49
2009	1,195	1,009	49
2008	1,254	1,075	45
2007	n/a	1,078	46

- NEPC receives the survey results in exchange for providing Greenwich with evaluations of investment managers. NEPC does not pay Greenwich any compensation for inclusion in this study.
- The Greenwich Quality Index is based on collective client ratings over a number of qualitative categories known as “Key Success Factors”, which represent client perceptions of NEPC’s investment counseling, manager selection, client service and commercial arrangement (fees). More details are available upon request.
  - Study participants are asked to provide qualitative and quantitative evaluations of their consultants. Based on those responses, Greenwich Associates calculates a score on the Greenwich Quality Index for each consultant named. Consultants with scores that top those awarded to competitors by a statistically significant margin are named Greenwich Quality Leaders. Only three large consultants (defined as the 10 firms with the most citations) received this recognition in 2016.
- The rankings are not necessarily representative of any single client’s experience since such rankings reflect the average of client responses to the survey.
- The rankings do not represent an endorsement of NEPC and should not be viewed as an indication of NEPC’s future performance.

## Disclosures - Greenwich Associates Survey - Key Success Factors

### Greenwich Associates U.S. Client Evaluations – Investment Consulting Business 2016 Rankings of 10 Largest Consultants<sup>1</sup>: Key Success Factors

	NEPC	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G	Firm H	Firm I
<b>Market Position (# of Clients)</b>	<b>1</b>	2	3	4	5	6	7	8	9	10
<b>Overall Greenwich Quality Index</b>	<b>2</b>	4	5	7	10	3	9	7	1	6
<b>Investment Counseling</b>										
Understanding Clients' Goals & Objectives	<b>1</b>	5	4	8	10	3	9	7	6	2
Advice on Long-term Asset Allocation	<b>3</b>	5	8	9	10	6	2	4	1	7
Provision of Proactive Advice & Innovative Ideas	<b>3</b>	5	6	8	9	4	10	1	2	7
Capability of Consultant Assigned to Your Fund	<b>1</b>	2	6	4	9	5	3	10	7	8
Credibility with Investment Committee	<b>1</b>	4	9	8	10	3	7	5	2	6
Advice on DC Plan Structure and Design	<b>5</b>	7	8	9	4	6	10	2	1	3
<b>Manager Selection</b>										
Knowledge of Investment Managers	<b>2</b>	7	2	5	6	7	7	2	1	7
Satisfaction with Manager Recommendations	<b>5</b>	4	1	7	10	6	9	8	2	2
<b>Client Servicing</b>										
Responsiveness to Requests for Information	<b>1</b>	5	7	3	8	6	10	9	4	2
Personal Meetings	<b>1</b>	5	6	10	9	4	7	8	3	2
Usefulness of Written Investment Reviews	<b>1</b>	5	4	6	7	8	10	9	2	3
Sufficient Professional Resources to Meet Your Needs	<b>4</b>	6	5	2	8	1	7	10	3	9
Timeliness in Providing Written Information & Reports	<b>1</b>	7	3	5	9	6	10	8	4	2
<b>Commercial Arrangement</b>										
Reasonable Fees (Relative to Value Delivered)	<b>2</b>	6	5	8	10	9	3	7	1	4

<sup>1</sup> Top 10 rankings based on number of clients with assets of \$250 million or greater citing an investment consulting relationship in 2016.

Source: Greenwich Associates, 2016 Evaluations by U.S. Institutional Investors.

Greenwich Associates is an independent research firm. Their rankings do not represent an endorsement of NEPC. Past performance is no guarantee of future results.

- **InvestorForce Plan Universe**
  - As of 3/31/2017 the InvestorForce Universe contained actual, custodian-supplied and audited data on over 2,396 plan sponsors, representing roughly \$3.3 trillion in assets. This data is drawn from 42 independent investment consulting firms, including NEPC.
- **ICC Universe**
  - Through 2011, universe rankings were based on the ICC Universe, which was populated by 12 independent investment consulting firms, including NEPC, and supplemented by many of the performance measurement clients of State Street Bank.
- **Certain information, including that relating to 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.**
- **This document may contain confidential or proprietary information and is intended only for the designated recipient(s). If you are not a designated recipient, you may not copy or distribute this document.**

- **It is important that investors understand the following characteristics of non-traditional investment strategies including hedge funds, real estate and private equity:**
  - Performance can be volatile and investors could lose all or a substantial portion of their investment
  - Leverage and other speculative practices may increase the risk of loss
  - Past performance may be revised due to the revaluation of investments
  - These investments can be illiquid, and investors may be subject to lock-ups or lengthy redemption terms
  - A secondary market may not be available for all funds, and any sales that occur may take place at a discount to value
  - These funds are not subject to the same regulatory requirements as registered investment vehicles
  - Managers are not required to provide periodic pricing or valuation information to investors
  - These funds may have complex tax structures and delays in distributing important tax information
  - These funds often charge high fees
  - Investment agreements often give the manager authority to trade in securities, markets or currencies that are not within the manager's realm of expertise or contemplated investment strategy