

# Summary of Asset Allocation & Investment Policy Changes

Wyoming State Loan & Investment Board

*August 31, 2017*



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# Introduction



# Introduction

Periodic review of asset allocation is an important fiduciary duty as investment objectives, constraints and market conditions can change over time.

In light of this, along with the recent/potential adoption of new statutory and constitutional amendments, RVK is here to review the asset allocations of each investment pool. In this review, we will examine the following:

- Investment Pool Characteristics
- Recent/Potential Statutory & Constitutional Amendments
- Long-Term Asset Allocation Changes
- For Permanent Funds, Impact of the Above on Future Purchasing Power



# Synopsis of Asset Allocation Changes

The below asset allocation changes consider each investment pool's unique investment objectives and constraints.

## **Permanent Funds** (*PMTF, PLF, UPLF, CSPLF, Hathaway, and Higher Ed*)

- Improve the likelihood of achieving each pool's long-term return objectives, focusing on long-term total return or income-generation based on respective spending policy goals and needs.

## **State Agency Pool**

- Focus on aligning the risk profile appropriately with the needs of the constituent investors. Emphasis on risk reduction and capital preservation to help mitigate significant short-term draw downs.

## **Workers' Compensation Fund**

- Examine risk in terms of surplus volatility to help preserve the fund's fiscal health with a healthy funded status.

## **Pool A Investment Account** (*Formerly Tobacco Settlement Fund*)

- Introduce public equity and alternative investments in a thoughtful manner such that the overall risk profile remains appropriate.

# Capital Markets Assumptions



# Capital Markets Assumptions

## Philosophy

- Each year, RVK's general consulting and research teams collaborate to review the capital market environment and update long-term, forward-looking capital market (CM) expectations for each asset class utilized by our clients.
- The forecast horizon is for long-term periods over multiple market cycles, typically 10 years or more.
- The components we estimate include:
  - Return
  - Risk (volatility of returns)
  - Correlation (relationship of asset class returns with all other asset classes)
- Return assumptions are generally index-based and assume no investment manager alpha.
- Annual updates are typically gradual and incorporate historical performance, current valuations, as well as the overall economic environment.

# RVK 2017 Capital Market Assumptions

## Year-over-Year Changes

Asset Class	2017				2016				Change (2017-2016)			
	Return (Arithmetic)	Standard Deviation	Return (Compound)	Return/Risk Ratio	Return (Arithmetic)	Standard Deviation	Return (Compound)	Return/Risk Ratio	Return (Arithmetic)	Standard Deviation	Return (Compound)	Return/Risk Ratio
Large/Mid Cap US Equity	7.00%	17.75%	5.56%	0.39	7.00%	17.75%	5.56%	0.39	--	--	--	--
Small Cap US Equity	7.50%	21.25%	5.46%	0.35	7.75%	21.25%	5.71%	0.36	-0.25%	--	-0.25%	-0.01
Broad US Equity	7.05%	17.80%	5.60%	0.40	7.05%	17.80%	5.60%	0.40	--	--	--	--
Broad International Equity	8.85%	20.65%	6.94%	0.43	8.85%	20.60%	6.95%	0.43	--	+0.05%	-0.01%	0.00
Global Equity	7.90%	18.30%	6.38%	0.43	7.90%	18.35%	6.37%	0.43	--	-0.05%	+0.01%	0.00
MLPs	8.50%	22.00%	6.34%	0.39	9.00%	22.00%	6.85%	0.41	-0.50%	--	-0.51%	-0.02
Preferred Stock	5.75%	13.25%	4.93%	0.43	5.75%	13.25%	4.93%	0.43	--	--	--	--
Low Duration Fixed Income	2.50%	3.50%	2.44%	0.71	2.50%	3.50%	2.44%	0.71	--	--	--	--
Intermediate Duration Fixed Income	3.50%	6.00%	3.33%	0.58	3.50%	6.00%	3.33%	0.58	--	--	--	--
Long Duration Fixed Income	4.00%	11.50%	3.37%	0.35	4.25%	11.50%	3.62%	0.37	-0.25%	--	-0.25%	-2.17%
TIPS	3.75%	6.25%	3.56%	0.60	4.00%	6.25%	3.81%	0.64	-0.25%	--	-0.25%	-0.04
High Yield	6.00%	15.00%	4.95%	0.40	6.50%	15.00%	5.46%	0.43	-0.50%	--	-0.50%	-0.03
Bank Loans	5.25%	10.00%	4.78%	0.53	5.25%	10.00%	4.78%	0.53	--	--	--	--
EMD (Local Currency)	6.75%	12.50%	6.03%	0.54	6.75%	12.50%	6.03%	0.54	--	--	--	--
Convertibles	5.80%	13.70%	4.92%	0.42	5.80%	13.70%	4.92%	0.42	--	--	--	--
Core Real Estate	6.25%	12.50%	5.52%	0.50	6.50%	12.50%	5.77%	0.52	-0.25%	--	-0.25%	-0.02
Non-Core Real Estate	9.25%	22.50%	7.00%	0.41	9.50%	22.50%	7.26%	0.42	-0.25%	--	-0.25%	-0.01
Diversified Hedge Funds	6.25%	9.50%	5.83%	0.66	6.50%	9.50%	6.08%	0.68	-0.25%	--	-0.25%	-0.03
Private Equity	10.00%	25.50%	7.16%	0.39	10.25%	25.50%	7.41%	0.40	-0.25%	--	-0.26%	-0.01
Commodities	5.75%	19.75%	3.95%	0.29	6.00%	19.75%	4.21%	0.30	-0.25%	--	-0.26%	-0.01
US Inflation	2.50%	3.00%	2.46%	0.83	2.50%	3.00%	2.46%	0.83	--	--	--	--
Cash Equivalents	2.25%	3.00%	2.21%	0.75	2.25%	3.00%	2.21%	0.75	--	--	--	--

■ Indicates a favorable change to the assumption from 2016 to 2017  
■ Indicates an unfavorable change to the assumption from 2016 to 2017

Blue highlighted cells indicate values are being calculated based on a roll up of underlying asset classes.

Broad US Equity is a combination of 92.6% Large/Mid Cap US Equity and 7.3% Small Cap US Equity.

Broad International Equity is a combination of 68.5% Dev'd Large/Mid Cap Int'l Equity, 10.8% Dev'd Small Cap Int'l Equity, and 20.7% Emerging Markets Equity.

Global Equity is a combination of 52.9% Broad US Equity and 47.1% Broad International Equity.

Convertibles is a combination of 65% Broad US Equity and 35% Intermediate Duration Fixed Income.



# Review of Individual Investment Pools



# Investment Pool Summary Matrix

	Permanent Mineral Trust Fund	Permanent Land Fund	University Permanent Land Fund	Common School Permanent Land Fund	Hathaway Scholarship Endowment Fund	Higher Education Endowment Fund	Workers Compensation Fund	Pool A Investment Account	State Agency Pool
<b>Fund Type</b>	Permanent Fund	Permanent Fund	Permanent Fund	Permanent Fund	Permanent Fund	Permanent Fund	Permanent Fund	Non-Permanent Fund	Non-Permanent Fund
<b>Fund Horizon</b>	Long-Term	Long-Term	Long-Term	Income Focus	Long-Term	Income Focus	N/A	N/A	N/A
<b>Potential Permanent Fund Asset Allocation Grouping</b>	Total Return	Total Return	Total Return		Total Return				
<b>Market Value as of 12/31/2016</b>	\$7,234,348,727	\$188,193,016	\$20,967,729	\$3,386,099,894	\$569,796,087	\$117,594,887	\$1,895,049,150	\$82,907,477	\$5,575,537,356
<b>Percentage of the Total Fund MV</b>	37.9%	1.0%	0.1%	17.8%	3.0%	0.6%	9.9%	0.4%	29.2%
<b>Liquidity &amp; Investment Objectives</b>									
<b>Main Objective</b>	Produce maximized long-term investment return.	Produce maximized long-term investment return.	Produce maximized long-term investment return.	Produce maximized long-term investment return.	Produce maximized long-term investment return.	Produce maximized long-term investment return.	The fund must be managed for the long-term to produce a situation in which the fund is self-funding or nearly self-funding in order to substantially reduce or eliminate the need for employer contributions.	Managed for investment of payments received pursuant to the Master Settlement Agreement.	Produce an investment return so that State agencies have the advantage of better income from their invested funds, while maintaining liquidity.
<b>Primary Investment Goal</b>	Capital appreciation, total return, and protection against inflation.	Capital appreciation, total return, and protection against inflation.	Capital appreciation, total return, and protection against inflation.	Capital appreciation, total return, and protection against inflation.	Capital appreciation, total return, and protection against inflation.	Capital appreciation, total return, and protection against inflation.	Safety of capital, yield, and capital appreciation.	Safety of capital, yield and liquidity.	Safety of capital, yield and liquidity.
<b>Treatment of income and capital gains</b>	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.	This fund retains income and capital gains.	This fund dispenses income and capital gains.	This fund dispenses income and capital gains.
<b>Noted Liquidity Constraints</b>	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.	Liquidity must be maintained to move money between asset classes and to meet cash needs as determined by the State Treasurer's Office.	Liquidity must be maintained to move money between asset classes and to meet cash needs as determined by the State Treasurer's Office.	Liquidity must be maintained to move money between asset classes and to meet cash needs as determined by the State Treasurer's Office.
<b>Funding</b>									
<b>Funding Source</b>	Constitutional and statutory mineral severance tax revenues, and occasional direct legislative appropriations.	Royalties, leases, fees and permits, and other revenue generated from State lands.	Royalties, leases, fees and permits, and other revenue generated from State lands.	Royalties, leases, fees and permits, and other revenue generated from State lands.	Federal mineral royalties.	Federal mineral royalties.	Employer premiums.	Settlement proceeds received under the 1998 Master Settlement Agreement between States and tobacco companies.	Monies from all other State funds pooled for investment.
<b>Spending Policy</b>									
<b>Spending Policy</b>	Maximum of 5% of the five-year rolling average MV, calculated on the first day of the fiscal year.	Not available to RVK.	Not available to RVK.	Maximum of 5% of the five-year rolling average MV, calculated on the first day of the fiscal year.	Investment earnings are transferred to the Expenditure Account.	Maximum of 5% of the five-year rolling average MV, calculated on the first day of the fiscal year.	Exact cash level shall be determined annually by the WC staff and dependent on liquidity needs.	Investment earnings are put towards health improvement programs.	Income is distributed back to a specific state agency or to the general fund.
<b>Guaranteed Annual Spending Policy Amount</b>	2.50%	N/A	N/A	2.50%	N/A	N/A	N/A	N/A	N/A
<b>Equity Allocation</b>									
<b>Equity Maximum Allocation</b>	70%	70%	70%	70%	70%	70%	45%	N/A	N/A
<b>New Equity Target Allocation</b>	56%	56%	56%	44%	56%	44%	27%	23%	0%
<b>Current Return Expectation</b>									
<b>Long-Term Return Expectation</b>	CPI + 3%	CPI + 3%	CPI + 3%	CPI + 3%	CPI + 3%	CPI + 3%	CPI + 3%	CPI + 2%	CPI + 2%
<b>Current Policy Target</b>									
<b>Probability of Achieving Long-Term Return Expectation Over 10 Years</b>	36%	36%	36%	36%	31%	31%	37%	29%	29%
<b>Median Real Return Over 10 Years</b>	3.03%	3.06%	3.06%	3.03%	2.76%	2.76%	2.33%	1.42%	1.30%
<b>Estimated Yield as of 12/31/2016</b>	2.89%	2.89%	2.89%	2.89%	3.02%	3.02%	3.05%	3.24%	2.82%

# State Agency Pool: *Asset Allocation Changes*



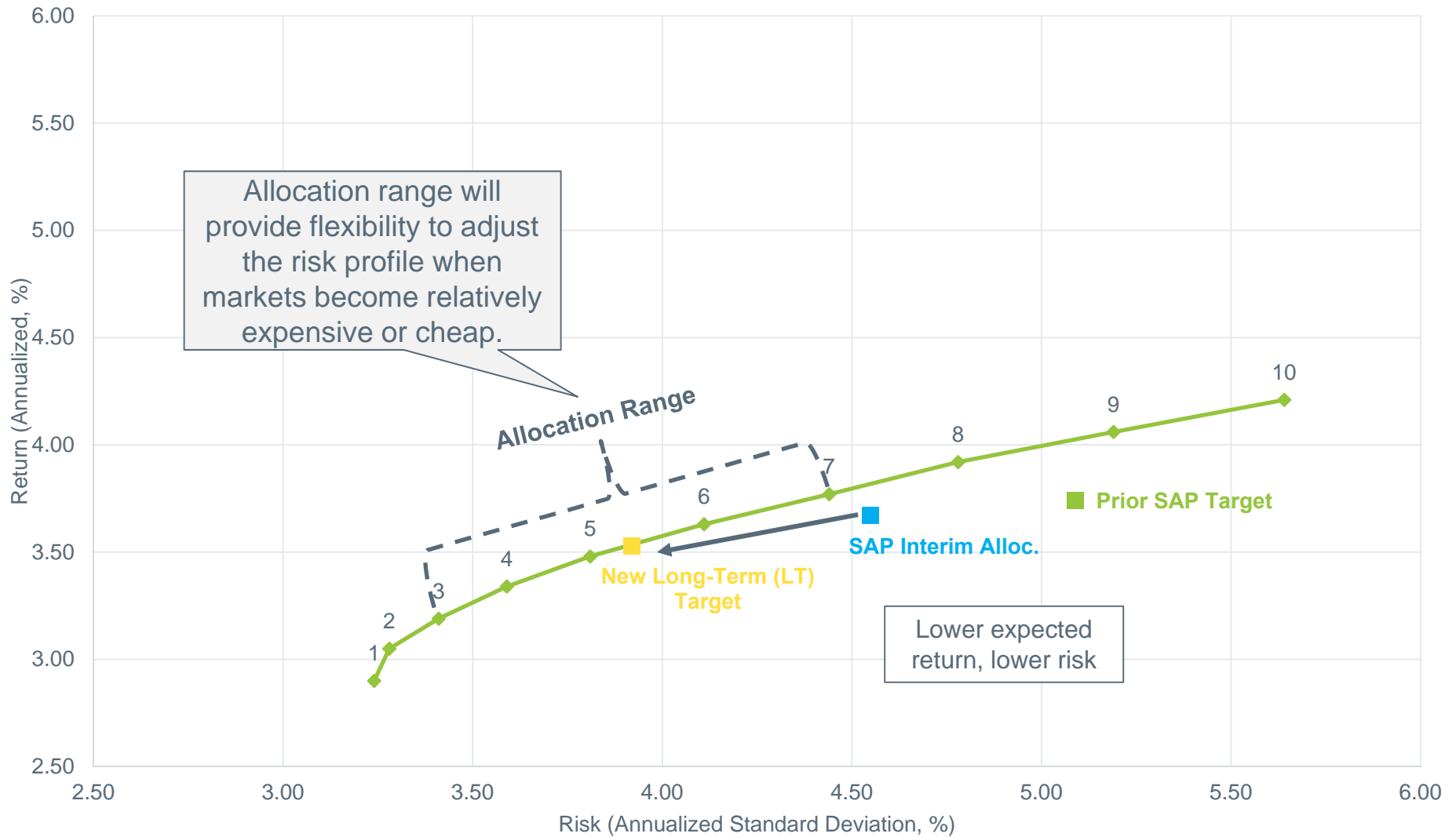
# State Agency Pool

<b>Purpose:</b>	This fund dispenses income and capital gains. Pooling of money from many different agencies which are not specifically invested for that agency.
<b>Fund Horizon:</b>	Non-Permanent Fund
<b>Return Objective:</b>	Prior: CPI + 2% New: CPI + 2%
<b>Primary Investment Goal:</b>	Safety of capital, yield and liquidity.
<b>Spending Policy:</b>	Income is distributed back to a specific state agency or to the state general fund.
<b>Liquidity Requirements:</b>	Liquidity must be maintained to move money between asset classes and to meet cash needs as determined by the State Treasurer's Office.
<b>Investment Constraints:</b>	Cannot invest in "common stocks". "Common stocks" is currently interpreted to include all public equity and alternative investments.



# Asset Allocation Changes: *State Agency Pool*

## Efficient Frontier

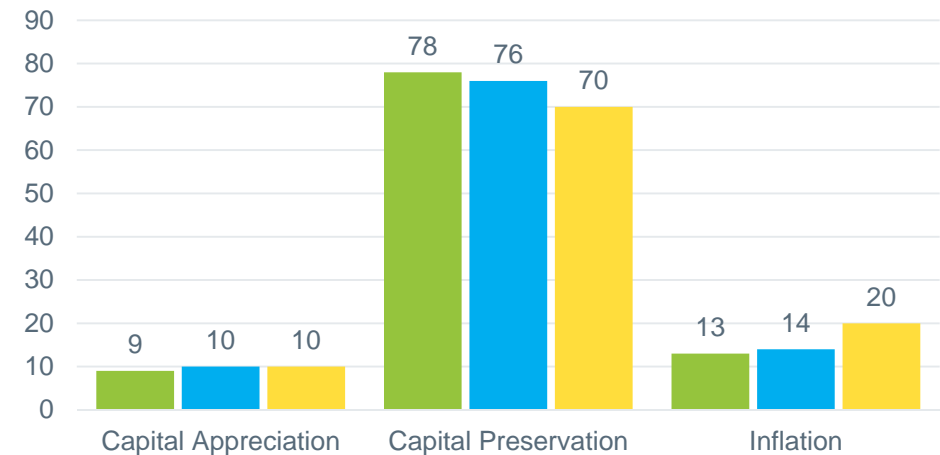


# Asset Allocation Changes: State Agency Pool

## Key Observations:

- The New LT Target portfolio replaces some of the exposure to intermediate duration fixed income with low duration fixed income and internally managed fixed income.
- Exposure to inflationary assets increases, while exposure to capital preservation thematic allocation declines.

Thematic Allocation (%)



	Prior SAP Target	SAP Interim Alloc.	Difference	New LT Target	Difference
<b>Total Fixed Income &amp; Cash</b>	<b>100.0</b>	<b>100.0</b>	--	<b>100.0</b>	--
Convertibles	3.0	3.0	--	5.0	+2.0
Int. Duration Fixed Income	65.4	29.1	-36.3	10.0	-55.4
Internal Fixed Income	3.6	37.1	+33.5	20.0	+16.4
Low Duration Fixed Income	0.0	0.0	--	30.0	+30.0
High Yield Fixed Income	1.8	4.0	+2.2	0.0	-1.8
Bank Loans	5.5	12.0	+6.5	15.0	+9.5
EMD (Local)	4.6	3.0	-1.6	5.0	+0.4
TIPS	7.2	2.1	-5.1	5.0	-2.2
Cash Equivalents	9.0	9.8	+0.8	10.0	+1.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	--	<b>100.0</b>	--

Allocations may not sum exactly to totals due to rounding. The credit fixed income portfolio is split out into its underlying components.

# Asset Allocation Changes:

## State Agency Pool

The New LT Target portfolio significantly reduces downside and interest rate risk, while earning a similar yield.

	Prior SAP Target	SAP Interim Alloc.	Difference	New LT Target	Difference
Expected Return (%)	3.74	3.67	-0.07	3.53	-0.21
Risk (Standard Deviation, %)	5.09	4.55	-0.54	3.92	-1.17
Return (Compound, %)	3.62	3.57	-0.05	3.46	-0.16
Return/Risk Ratio	0.73	0.81	+0.08	0.90	+0.17
RVK Liquidity Metric	83	80	-3	80	-3
Estimated Duration (Int. Rate Risk)	4.94	3.73	-1.21	2.72	-2.22
Estimated Yield (%)	2.82	2.92	+0.10	2.66	-0.16
<b>Portfolio Stress Testing (Monte Carlo Results)</b>					
1 Year Max Drawdown (2008-Like Event)	-\$579 M (-10.39%)	-\$543 M (-9.74%)	+\$36 M (+0.65%)	-\$463 M (-8.30%)	+\$116 M (+2.09%)
Median 1 Year Return	+\$230 M (+4.12%)	+\$226 M (+4.06%)	-\$4 M (-0.06%)	+\$215 M (+3.85%)	-\$15 M (-0.27%)
<b>Probability of Achieving Various Real Return Targets</b>					
1.00% Real Return Over 10 Years	58%	56%	-2%	52%	-6%
1.50% Real Return Over 10 Years	45%	42%	-3%	38%	-7%
2.00% Real Return Over 10 Years	32%	30%	-2%	24%	-8%

Differences may not sum exactly due to rounding. Expected returns do not assume active manager alpha. Estimated yields are a weighted average of the underlying asset class benchmarks as of 12/31/16. 1 Year Max Drawdown reflects the 1<sup>st</sup> percentile results. Dollar amounts are based on an initial portfolio value of \$5,736 M.

# Efficient Frontier: State Agency Pool

	Min	Max	1	2	3	4	5	6	7	8	9	10	Prior SAP Target	SAP Interim Alloc.	New LT Target
Convertibles	0	5	0	2	5	5	5	5	5	5	5	5	3.0	3.0	5.0
Int. Duration Fixed Income	0	100	0	0	0	0	3	17	27	35	31	38	65.4	29.1	10.0
High Yield Fixed Income	0	10	0	0	0	0	0	0	2	3	8	10	1.8	4.0	0.0
Bank Loans	0	15	12	15	15	15	15	15	15	15	15	15	5.5	12.0	15.0
Emerging Markets Debt (Local)	0	5	0	0	0	2	5	5	5	5	5	5	4.6	3.0	5.0
TIPS	0	7	0	0	4	7	7	7	7	7	7	7	7.2	2.1	5.0
Custom Internal Fixed Income	20	60	20	20	20	20	20	20	20	20	20	20	3.6	37.1	20.0
Low Duration Fixed Income	0	60	58	53	46	41	35	21	10	0	0	0	0.0	0.0	30.0
Cash Equivalents	0	10	10	10	10	10	10	10	10	10	9	0	9.0	9.8	10.0
Total			100	100	100	100	100	100	100	100	100	100	100.0	100.0	100.0
Total Fixed Income & Cash			100	100	100	100	100	100	100	100	100	100	100	100	100
Capital Appreciation			0	2	5	7	10	10	12	13	18	20	9	10	10
Capital Preservation			88	83	76	71	68	68	66	65	60	58	78	76	70
Alpha			0	0	0	0	0	0	0	0	0	0	0	0	0
Inflation			12	15	19	22	22	22	22	22	22	22	13	14	20
Expected Return			2.90	3.05	3.19	3.34	3.48	3.63	3.77	3.92	4.06	4.21	3.74	3.67	3.53
Risk (Standard Deviation)			3.24	3.28	3.41	3.59	3.81	4.11	4.44	4.78	5.19	5.64	5.09	4.55	3.92
Return (Compound)			2.85	3.00	3.13	3.28	3.41	3.55	3.68	3.81	3.93	4.06	3.62	3.57	3.46
Return/Risk Ratio			0.90	0.93	0.94	0.93	0.91	0.88	0.85	0.82	0.78	0.75	0.73	0.81	0.90
RVK Expected Eq Beta (LCUS Eq = 1)			0.06	0.07	0.09	0.10	0.11	0.11	0.12	0.14	0.16	0.17	0.10	0.11	0.11
RVK Liquidity Metric (T-Bills = 100)			82	81	81	81	80	80	79	79	77	75	83	80	80
Estimated Yield (%)			2.31	2.40	2.34	2.40	2.58	2.70	2.89	2.98	3.18	3.47	2.82	2.92	2.66
Estimated Duration of Fixed Income & Cash			1.91	1.86	2.10	2.34	2.56	3.11	3.57	3.89	3.86	4.34	4.94	3.73	2.72



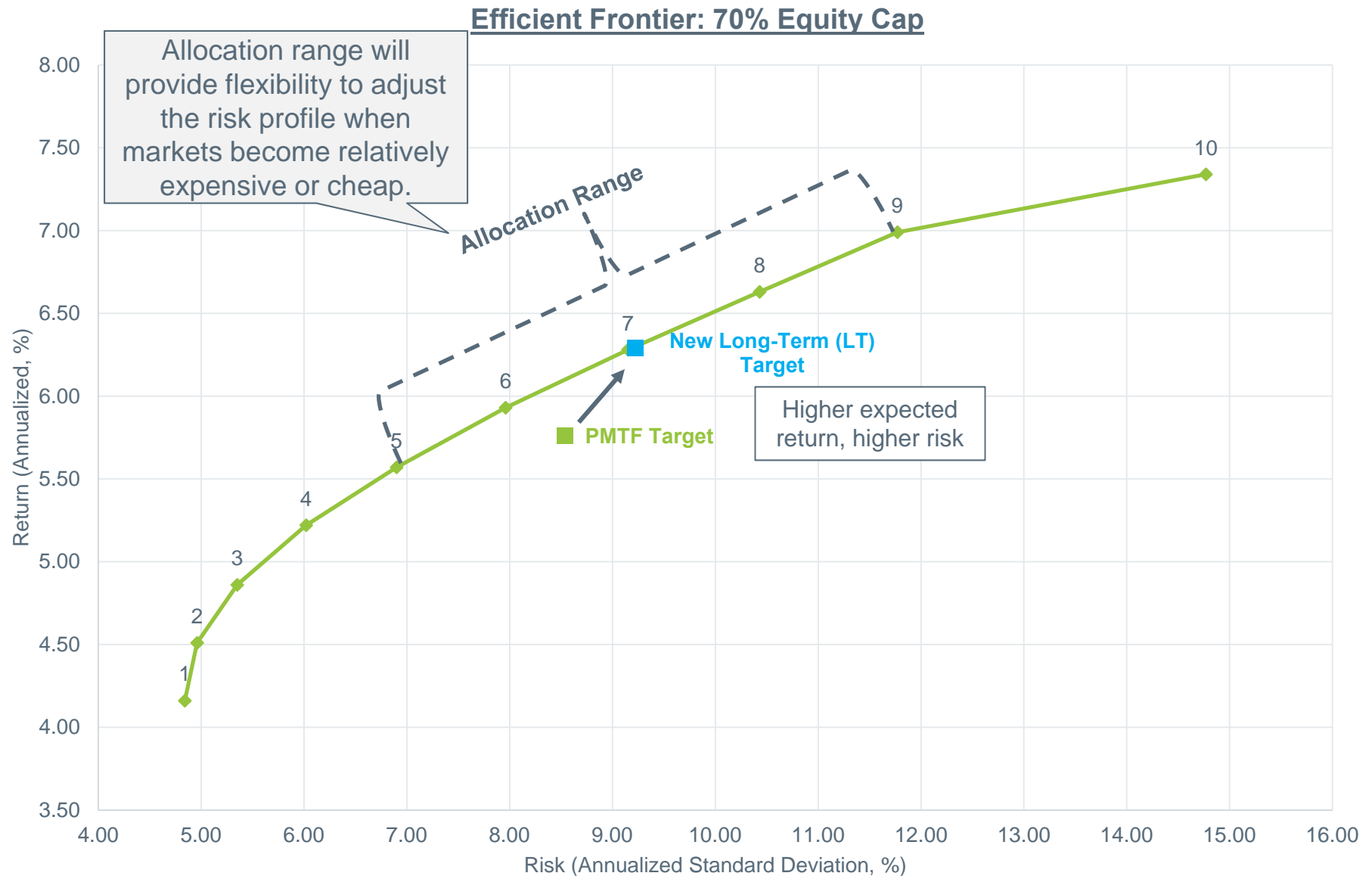
# Permanent Mineral Trust Fund: *Asset Allocation Changes*



# Permanent Mineral Trust Fund

<b>Purpose:</b>	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.
<b>Fund Horizon:</b>	Permanent Fund (Perpetual)
<b>Return Objective:</b>	Prior: CPI + 4% New: CPI + 3%
<b>Primary Investment Goal:</b>	Capital appreciation, total return, and protection against inflation.
<b>Spending Policy:</b>	<p>Maximum of 5% of trailing 5-year average market value.</p> <ul style="list-style-type: none"><li>- 2.5% of earnings guaranteed to the General Fund.</li><li>- Up to 2.5% of remaining earnings will be split evenly amongst the Legislative Stabilization Reserve Account (“LSRA”) and Strategic Investments and Projects Account (“SIPA”).</li></ul> <p>Earnings in excess of 5% are appropriated to the reserve account. When the reserve account balance exceeds 90% of the spending policy amount, the excess funds are transferred back to the corpus.</p>
<b>Liquidity Requirements:</b>	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.
<b>Investment Constraints:</b>	<p>Maximum of 70% may be invested in “common stocks”.</p> <p>“Common stocks” is currently interpreted to include all public equity and alternative investments.</p>

# Asset Allocation Changes: *Permanent Mineral Trust Fund*



Group Constraints: (i) Broad US Equity must be at least 80% of total US equity. (ii) Total US equity must be at least one-half (1/2) of total public equity. (iii) Total equity (including MLPs, private equity, core and value-added real estate, and diversified hedge funds) must not exceed 70% of the total portfolio. (iv) Total Real Estate must not exceed 10% of the total portfolio. (v) Core Real Estate must be at least one-half (1/2) of total Real Estate.

# Asset Allocation Changes: *Permanent Mineral Trust Fund*

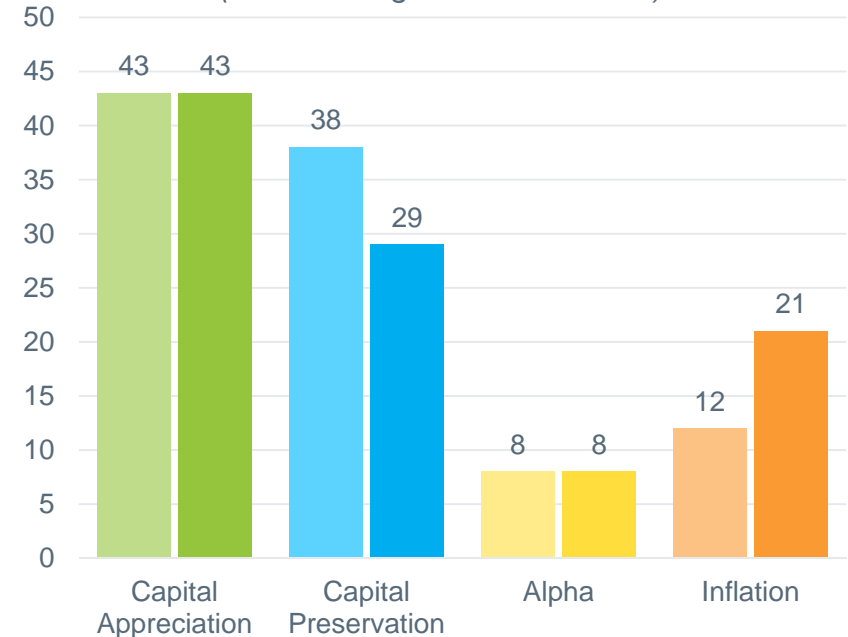
	Prior PMTF Target	New LT Target	Difference
<b>Total Public Equity</b>	<b>31.0</b>	<b>26.0</b>	<b>-5.0</b>
Broad US Equity	16.7	10.0	-6.7
Small Cap US Equity	1.3	3.0	+1.7
Broad Int'l Equity	13.1	13.0	-0.1
<b>Total Alternatives</b>	<b>19.0</b>	<b>30.0</b>	<b>+11.0</b>
MLPs	0.0	4.5	+4.5
Private Equity	4.0	8.0	+4.0
Core Real Estate	5.2	6.0	+0.8
Non-Core Real Estate	2.3	4.0	+1.7
Diversified Hedge Funds	7.5	7.5	--
<b>Total Fixed Income &amp; Cash</b>	<b>50.0</b>	<b>44.0</b>	<b>-6.0</b>
Convertibles	2.0	0.0	-2.0
Int. Duration Fixed Income	35.2	29.0	-6.2
High Yield Fixed Income	0.9	0.0	-0.9
Bank Loans	2.8	5.0	+2.2
EMD (Local)	2.4	5.0	+2.6
TIPS	3.7	5.0	+1.3
Cash Equivalents	3.0	0.0	-3.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>--</b>

## Key Observations:

- The New LT Target portfolio increases the allocation to alternatives from 19% to 30%.
- Exposure to inflationary assets increases, while exposure to capital preservation thematic allocation declines.

## Thematic Allocation (%)

(New LT Target = Darker Color)



Allocations may not sum exactly to totals due to rounding. PMTF target allocation to global equity is assumed to be 50% Broad US Equity and 50% Broad Int'l Equity. The credit fixed income portfolio is split out into its underlying components.



# Asset Allocation Changes: Permanent Mineral Trust Fund

The New LT Target portfolio increases the probability of achieving the current long-term expected return target to 44% over a 10 year period.

	Prior PMTF Target	New LT Target	Difference
Expected Return (%)	5.76	6.29	+0.53
Risk (Standard Deviation, %)	8.54	9.22	+0.68
Return (Compound, %)	5.42	5.89	+0.47
Return/Risk Ratio	0.67	0.68	+0.01
Estimated Duration (Int. Rate Risk) (Fixed Income & Cash Only)	5.43 (50% of Total)	5.34 (44% of Total)	-0.09 (-6% of Total)
Estimated Yield (%)	2.89	3.22	+0.33
<b>Portfolio Stress Testing (Monte Carlo Results)</b>			
1 Year Max Drawdown (2008-Like Event)	-\$1,414 M (-19.55%)	-\$1,495 M (-20.67%)	-\$81 M (-1.12%)
Median 1 Year Return	+\$448 M (+6.19%)	+\$483 M (+6.68%)	+\$35 M (+0.49%)
<b>Probability of Achieving Various Real Return Targets</b>			
3.0% Real Return Over 10 Years	51%	59%	+8%
3.5% Real Return Over 10 Years	43%	51%	+8%
4.0% Real Return Over 10 Years	36%	44%	+8%

## Range of Monte Carlo Stress Test Results

1<sup>st</sup> & 99<sup>th</sup> Percentiles = Darker Color  
5<sup>th</sup> to 95<sup>th</sup> Percentiles = Lighter Color

### Prior PMTF Target



### New LT Target



Differences may not sum exactly due to rounding. Expected returns do not assume active manager alpha. Estimated yields are a weighted average of the underlying asset class benchmarks as of 12/31/16. 1 Year Max Drawdown reflects the 1<sup>st</sup> percentile results. Dollar amounts are based on an initial portfolio value of \$7,234 M.

# Efficient Frontier:

## Permanent Mineral Trust Fund

	Min	Max	1	2	3	4	5	6	7	8	9	10	PMTF Target	New LT Target
Broad US Equity	0	50	0	0	0	1	4	7	10	13	16	23	16.7	10.0
Small Cap US Equity	0	10	0	0	0	0	1	2	3	3	4	6	1.3	3.0
Broad International Equity	0	50	0	0	0	1	5	9	13	17	20	29	13.1	13.0
MLPs	0	5	0	2	4	5	5	5	5	5	5	5	0.0	4.5
Private Equity	0	8	1	3	5	8	8	8	8	8	8	8	4.0	8.0
Core Real Estate	0	10	9	6	6	6	6	6	6	6	6	0	5.2	6.0
Non-Core Real Estate	0	4	1	4	4	4	4	4	4	4	4	0	2.3	4.0
Diversified Hedge Funds	0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0	7.5	7.5
Convertibles	0	5	3	2	0	0	0	0	0	0	0	5	2.0	0.0
Int. Duration Fixed Income	0	100	64	60	53	49	45	37	29	21	13	5	35.2	29.0
High Yield Fixed Income	0	5	0	0	0	0	0	0	0	0	2	5	0.9	0.0
Bank Loans	0	5	5	5	5	5	5	5	5	5	5	5	2.8	5.0
Emerging Markets Debt (Local)	0	5	0	0	5	5	5	5	5	5	5	5	2.4	5.0
TIPS	0	5	5	5	5	5	5	5	5	5	5	5	3.7	5.0
Cash Equivalents	0	5	5	5	5	3	0	0	0	0	0	0	3.0	0.0
Total			100	100	100	100	100	100	100	100	100	100	100	100
Total Fixed Income & Cash			82	77	73	67	60	52	44	36	30	30	50	44
Capital Appreciation			4	9	14	19	26	34	42	50	59	80	43	43
Capital Preservation			69	65	58	52	45	37	29	21	13	5	38	29
Alpha			8	8	8	8	8	8	8	8	8	0	8	8
Inflation			19	18	20	21	21	21	21	21	21	15	12	21
Expected Return			4.16	4.51	4.86	5.21	5.57	5.92	6.27	6.63	6.98	7.33	5.76	6.29
Risk (Standard Deviation)			4.84	4.96	5.35	6.02	6.89	7.95	9.14	10.41	11.75	14.75	8.54	9.22
Return (Compound)			4.05	4.39	4.72	5.04	5.35	5.62	5.88	6.13	6.34	6.33	5.42	5.89
Return/Risk Ratio			0.86	0.91	0.91	0.87	0.81	0.74	0.69	0.64	0.59	0.50	0.67	0.68
RVK Expected Eq Beta (LCUS Eq = 1)			0.12	0.15	0.18	0.24	0.31	0.38	0.45	0.52	0.59	0.76	0.44	0.45
RVK Liquidity Metric (T-Bills = 100)			74	71	68	66	66	66	67	67	67	77	74	67
Estimated Yield (%)			3.13	3.17	3.41	3.36	3.34	3.30	3.26	3.21	3.26	3.04	2.89	3.22
Estimated Duration of Fixed Income & Cash			5.46	5.47	5.49	5.49	5.49	5.42	5.34	5.22	4.96	4.19	5.43	5.34

Group Constraints: (i) Broad US Equity must be at least 80% of total US equity. (ii) Total US equity must be at least one-half (1/2) of total public equity. (iii) Total equity (including MLPs, private equity, core and value-added real estate, and diversified hedge funds) must not exceed 70% of the total portfolio. (iv) Total Real Estate must not exceed 10% of the total portfolio. (v) Core Real Estate must be at least one-half (1/2) of total Real Estate.

# Remaining Permanent Funds: *Asset Allocation Changes*



# Grouping of Permanent Funds

Although each Permanent Fund has unique objectives, they are grouped into two buckets for purposes of asset allocation.

## 1. Long-Term Total Return Focus

- Example: Permanent Mineral Trust Fund
- Emphasis on maximizing total return over the long-term with an appropriate level of risk, while meeting annual spending needs.
- Higher long-term total return and corpus growth.
- Works best under a sustainable spending rate with a guaranteed amount that is not higher than the natural rate of income

## 2. Income Focus

- Example: Higher Education Endowment Fund
- Emphasis on generating sufficient levels of income to meet annual spending needs.
  - Secondary focus on maximizing total return over the long-term with an appropriate level of risk
- Lower long-term total return and corpus growth.
- Appropriate for increasing the natural rate of income due to higher guaranteed annual spending amounts.
- Note of caution: Lower probability of preserving long-term purchasing power

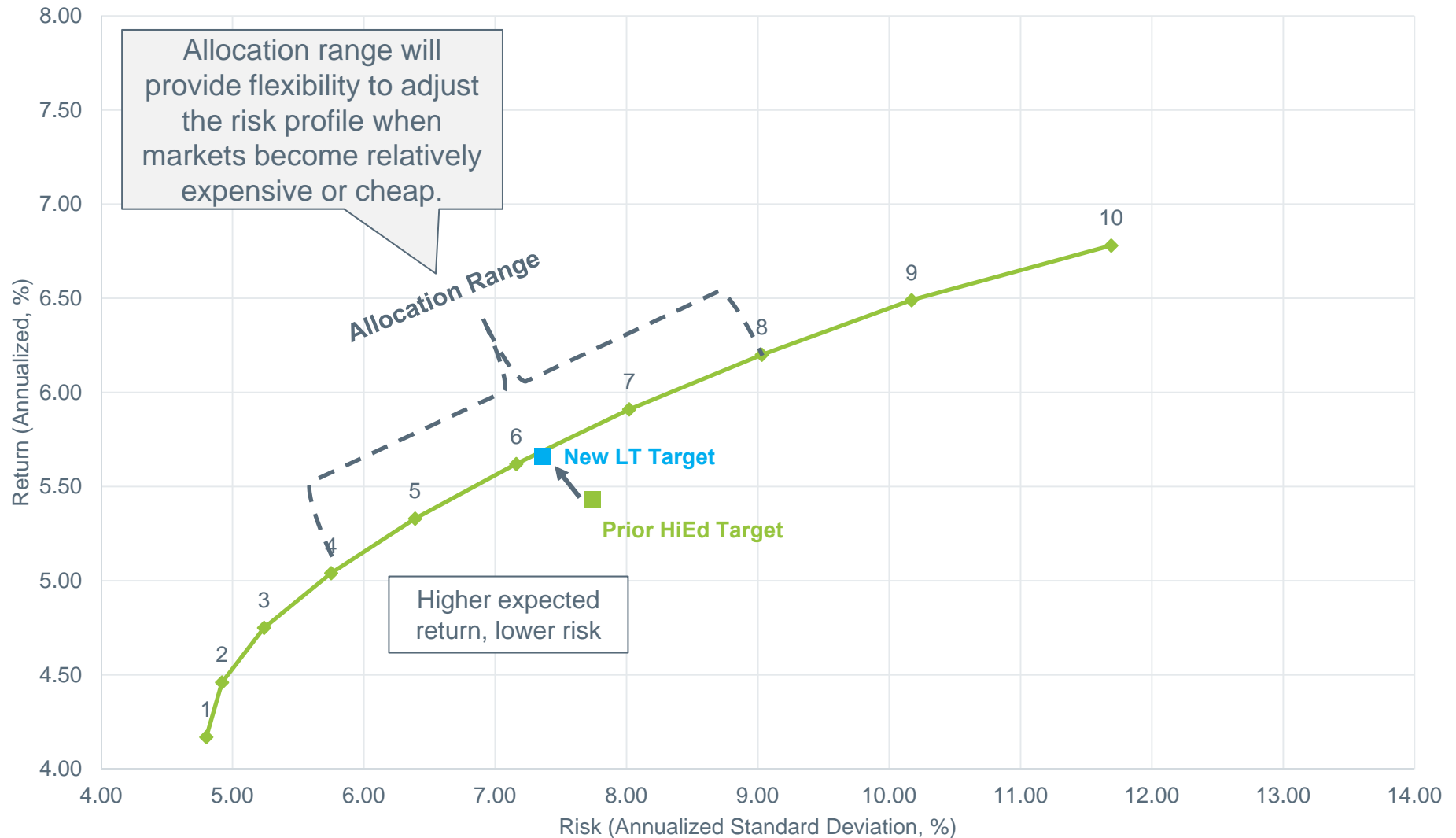


# Excellence in Higher Education Endowment Fund

<b>Purpose:</b>	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.
<b>Fund Horizon:</b>	Permanent Fund (Perpetual)
<b>Return Objective:</b>	Prior: CPI + 4% New: CPI + 3%
<b>Primary Investment Goal:</b>	Capital appreciation, total return, and protection against inflation.
<b>Spending Policy:</b>	<p>Maximum of 5% of trailing 5-year average market value.</p> <ul style="list-style-type: none"><li>- 2/3 of investment earnings will be transferred to the University of Wyoming.</li><li>- 1/3 of investment earnings will be transferred equally to 7 community colleges.</li></ul> <p>Earnings in excess of 5% are appropriated to the reserve account. When the reserve account balance exceeds 75% of the spending policy amount, the excess funds are transferred back to the corpus.</p>
<b>Liquidity Requirements:</b>	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.
<b>Investment Constraints:</b>	<p>Maximum of 70% may be invested in “common stocks”.</p> <p>“Common stocks” is currently interpreted to include all public equity and alternative investments.</p>

# Asset Allocation Changes: *Excellence in Higher Education Endowment Fund*

## Efficient Frontier: 70% Equity Cap



Group Constraints: (i) Broad US Equity must be at least three-fourths (3/4) of total US equity. (ii) Total US equity must be at least one-half (1/2) of total public equity. (iii) Total equity (including MLPs, private equity, core and value-added real estate, and diversified hedge funds) must not exceed 70% of the total portfolio. (v) Core Real Estate must be at least one-half (1/2) of total Real Estate.

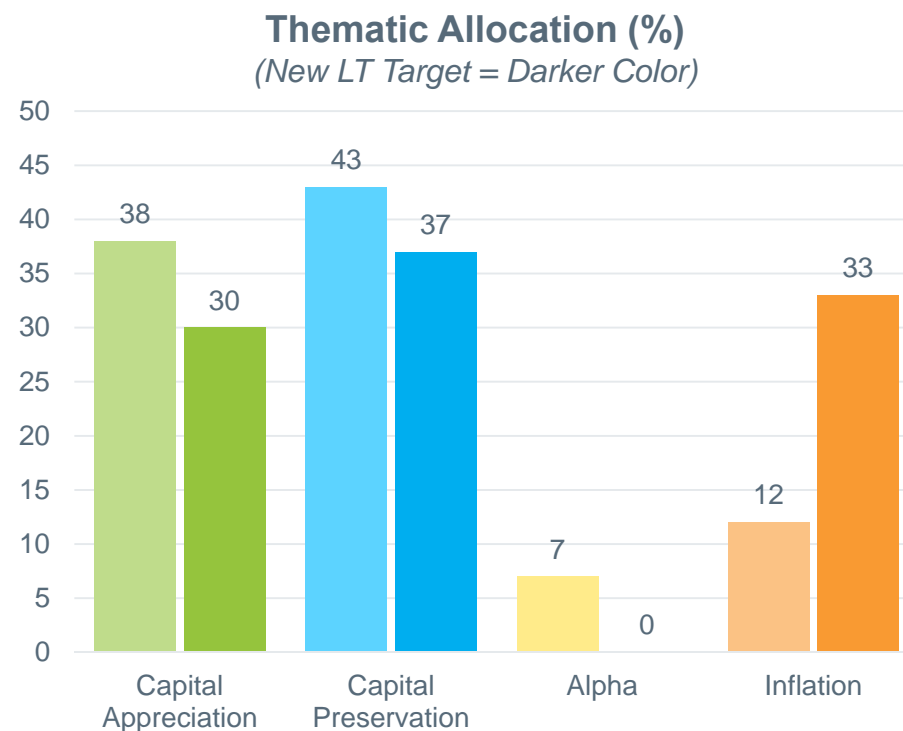
# Asset Allocation Changes:

## *Excellence in Higher Education Endowment Fund*

	Prior HiEd Target	New LT Target	Difference
<b>Total Public Equity</b>	<b>30.4</b>	<b>21.0</b>	<b>-9.4</b>
Broad US Equity	16.4	8.0	-8.4
Small Cap US Equity	1.3	2.0	+0.7
Broad Int'l Equity	12.7	9.0	-3.7
Preferred Stock	0.0	2.0	+2.0
<b>Total Alternatives</b>	<b>14.6</b>	<b>23.0</b>	<b>+8.4</b>
MLPs	0.0	6.0	+6.0
Core Real Estate	5.2	15.0	+9.8
Non-Core Real Estate	2.1	2.0	-0.1
Diversified Hedge Funds	7.3	0.0	-7.3
<b>Total Fixed Income &amp; Cash</b>	<b>55.0</b>	<b>56.0</b>	<b>+1.0</b>
Convertibles	2.0	0.0	-2.0
Int. Duration Fixed Income	37.7	37.0	-0.7
High Yield Fixed Income	1.0	0.0	-1.0
Bank Loans	3.0	12.0	+9.0
EMD (Local)	2.5	7.0	+4.5
TIPS	3.9	0.0	-3.9
Cash Equivalents	5.0	0.0	-5.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>--</b>

### Key Observations:

- The New LT Target portfolio increases the allocation to alternatives from 15% to 23%.
- Exposure to inflationary assets increases, while exposure to other thematic allocations declines.



Allocations may not sum exactly to totals due to rounding. HiEd target allocation to global equity is assumed to be 50% Broad US Equity and 50% Broad Int'l Equity. The credit fixed income portfolio is split out into its underlying components.

# Asset Allocation Changes:

## *Excellence in Higher Education Endowment Fund*

The New LT Target portfolio increases the probability of achieving the current long-term expected return target to 35% over a 10 year period.

	Prior HiEd Target	New LT Target	Difference
Expected Return (%)	5.43	5.66	+0.23
Risk (Standard Deviation, %)	7.74	7.36	-0.38
Return (Compound, %)	5.15	5.40	+0.25
Return/Risk Ratio	0.70	0.77	+0.07
Estimated Duration (Int. Rate Risk) (Fixed Income & Cash Only)	5.42 (55% of Total)	4.52 (56% of Total)	-0.90 (+1% of Total)
Estimated Yield (%)	3.02	4.12	+1.10
<b>Portfolio Stress Testing (Monte Carlo Results)</b>			
1 Year Max Drawdown (2008-Like Event)	-\$22.1 M (-18.80%)	-\$23.5 M (-19.96%)	-\$1.4 M (-1.16%)
Median 1 Year Return	+\$6.7 M (+5.67%)	+\$7.3 M (+6.22%)	+\$0.6 M (+0.55%)
<b>Probability of Achieving Various Real Return Targets</b>			
3.0% Real Return Over 10 Years	46%	50%	+4%
3.5% Real Return Over 10 Years	39%	42%	+3%
4.0% Real Return Over 10 Years	31%	35%	+4%

### Range of Monte Carlo Stress Test Results

1<sup>st</sup> & 99<sup>th</sup> Percentiles = Darker Color  
5<sup>th</sup> to 95<sup>th</sup> Percentiles = Lighter Color



Differences may not sum exactly due to rounding. Expected returns do not assume active manager alpha. Estimated yields are a weighted average of the underlying asset class benchmarks as of 12/31/16. 1 Year Max Drawdown reflects the 1<sup>st</sup> percentile results. Inflation is assumed to be 3.50% (2.50% standard assumption + 1.00% additional inflation of higher education prices). Dollar amounts are based on an initial portfolio value of \$117.6 M.

# Efficient Frontier:

## *Excellence in Higher Education Endowment Fund*

	Min	Max	1	2	3	4	5	6	7	8	9	10	PHOT HiEd Target	New LT Target
Broad US Equity	0	15	0	0	0	2	4	6	8	12	15	15	16.4	8.0
Small Cap US Equity	0	5	0	0	0	1	1	2	3	4	5	5	1.3	2.0
Broad International Equity	0	10	0	0	0	3	5	8	10	10	10	10	12.7	9.0
Preferred Stock	0	10	0	0	0	0	0	2	6	10	10	10	0.0	2.0
MLPs	0	7	0	1	4	7	7	7	7	7	7	7	0.0	6.0
Core Real Estate	0	15	15	15	15	15	15	15	15	15	15	15	5.2	15.0
Non-Core Real Estate	0	2	0	2	2	2	2	2	2	2	2	2	2.1	2.0
Diversified Hedge Funds	0	0	0	0	0	0	0	0	0	0	0	0	7.3	0.0
Convertibles	0	10	2	3	4	0	0	0	0	0	1	10	2.0	0.0
Int. Duration Fixed Income	0	100	63	56	48	44	44	36	28	19	9	0	37.7	37.0
High Yield Fixed Income	0	15	0	0	0	0	0	0	0	0	4	15	1.0	0.0
Bank Loans	0	15	15	15	15	15	15	15	15	15	15	4	3.0	12.0
Emerging Markets Debt (Local)	0	7	0	3	7	7	7	7	7	7	7	7	2.5	7.0
TIPS	0	0	0	0	0	0	0	0	0	0	0	0	3.9	0.0
Cash Equivalents	0	5	5	5	5	5	0	0	0	0	0	0	5.0	0.0
Total			100	100	100	100	100	100	100	100	100	100	100.0	100.0
Total Fixed Income & Cash			85	82	79	71	66	58	50	41	36	36	55	56
Capital Appreciation			2	8	13	15	19	27	35	44	54	74	38	30
Capital Preservation			68	61	53	49	44	36	28	19	9	0	43	37
Alpha			0	0	0	0	0	0	0	0	0	0	7	0
Inflation			30	31	34	37	37	37	37	37	37	26	12	33
Expected Return			4.17	4.46	4.75	5.04	5.33	5.62	5.91	6.20	6.49	6.78	5.43	5.66
Risk (Standard Deviation)			4.80	4.92	5.24	5.75	6.39	7.16	8.02	9.03	10.17	11.69	7.74	7.36
Return (Compound)			4.06	4.34	4.62	4.88	5.14	5.38	5.61	5.82	6.01	6.15	5.15	5.40
Return/Risk Ratio			0.87	0.91	0.91	0.88	0.83	0.78	0.74	0.69	0.64	0.58	0.70	0.77
RVK Expected Eq Beta (LCUS Eq = 1)			0.11	0.14	0.17	0.21	0.26	0.31	0.34	0.39	0.46	0.53	0.39	0.33
RVK Liquidity Metric (T-Bills = 100)			71	69	67	68	67	68	69	69	68	68	78	69
Estimated Yield (%)			3.67	3.88	4.15	4.31	4.27	4.29	4.41	4.48	4.54	4.44	3.02	4.12
Estimated Duration of Fixed Income & Cash			4.71	4.59	4.46	4.50	4.47	4.27	4.01	3.60	2.98	3.34	5.42	4.53

Group Constraints: (i) Broad US Equity must be at least three-fourths (3/4) of total US equity. (ii) Total US equity must be at least one-half (1/2) of total public equity. (iii) Total equity (including MLPs, private equity, core and value-added real estate, and diversified hedge funds) must not exceed 70% of the total portfolio. (v) Core Real Estate must be at least one-half (1/2) of total Real Estate.



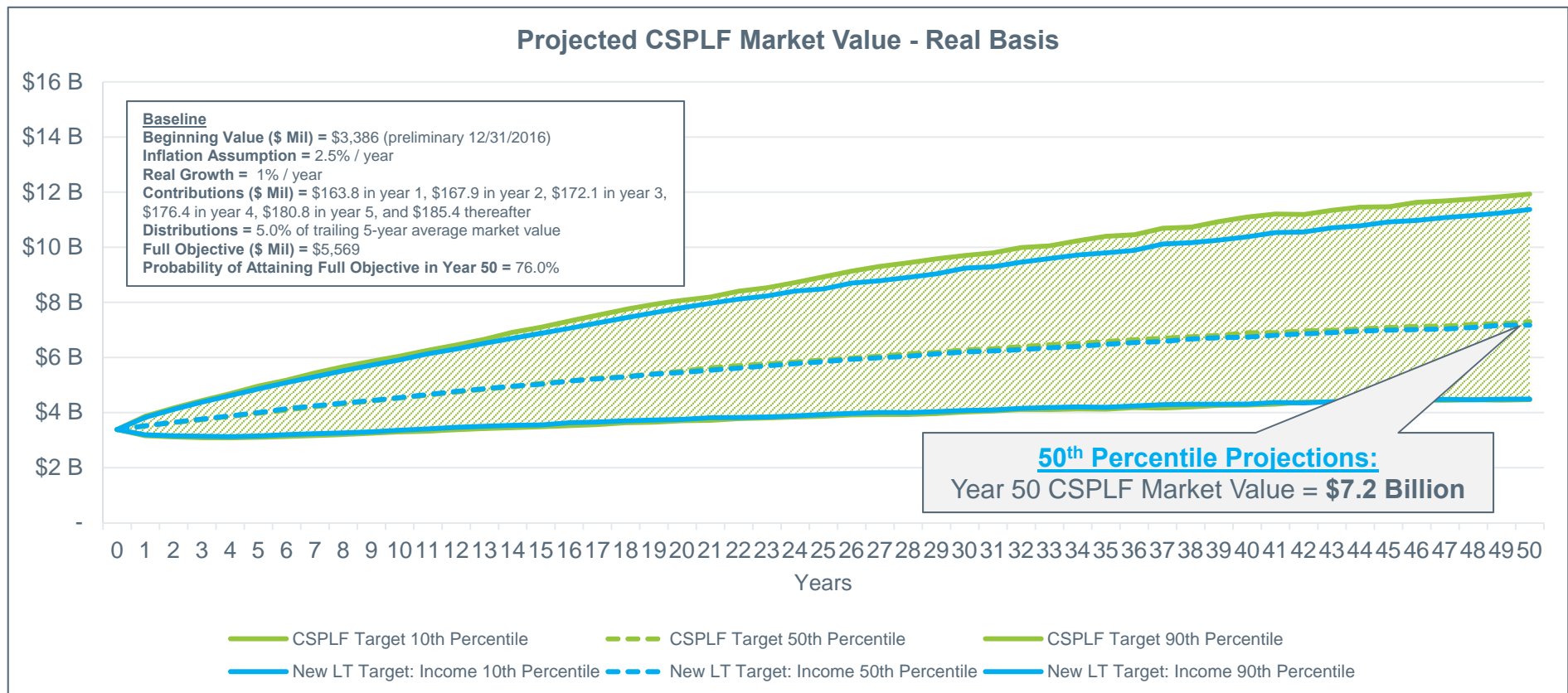
# Common School Permanent Land Fund

<b>Purpose:</b>	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.
<b>Fund Horizon:</b>	Permanent Fund (Perpetual)
<b>Return Objective:</b>	Prior: CPI + 4% New: CPI + 3%
<b>Primary Investment Goal:</b>	Capital appreciation, total return, and protection against inflation.
<b>Spending Policy:</b>	<p>Maximum of 5% of trailing 5-year average market value.</p> <ul style="list-style-type: none"><li>- At least 2.5% and up to 3% of earnings guaranteed to the School Foundation Program (“SFP”).</li><li>- Up to 2% of remaining earnings will be appropriated to the SFP Reserve Account.</li></ul> <p>Earnings in excess of 5% are appropriated to the reserve account. When the reserve account balance exceeds 90% of the spending policy amount, the excess funds are transferred back to the corpus.</p>
<b>Liquidity Requirements:</b>	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.
<b>Investment Constraints:</b>	<p>Maximum of 70% may be invested in “common stocks”.</p> <p>“Common stocks” is currently interpreted to include all public equity and alternative investments.</p>

# Intergenerational Equity Analysis: *Common School Permanent Land Fund*

Under the new income portfolio, the median probability of achieving the Full Objective (preserving long-term purchasing power) in Year 50 decreases modestly from 76.0% to **75.6%**.

The projected market value at Year 50 decreases modestly from \$7.3 Billion to **\$7.2 Billion**.



All data is shown in real terms (after 2.50% annual inflation). Model assumes investment earnings always meet or exceed annual spending policy amount. Contribution assumptions were provided by the Consensus Revenue Estimating Group.

# Intergenerational Equity Analysis: Common School Permanent Land Fund

	Prior CSPLF Target (Current Policy)	New LT Target: Income (Change from Current Policy)
<b>Current Framework: 5% of trailing 5-year average market value</b>		
Cumulative 50 Year Distributions (\$B)	\$13.9	\$13.7 (-0.2)
Volatility of Annual Spending Changes (% YoY St. Dev.)	8.7%	8.6% (-0.1%)
Projected 50 Year Market Value (\$B)	\$7.3	\$7.2 (-0.1)
Probability of Achieving Full Objective	76.0%	75.6% (-0.4%)
<b>Sensitivity Analysis</b> (+/- vs. Current Framework)		
Impact of Higher Contributions (growing at 1%/year beyond near-term forecasts)	91.5% (+15.5%)	92.0% (+16.4%)
Impact of Lower Contributions (declining at 1%/year beyond near-term forecasts)	57.3% (-18.7%)	56.0% (-19.6%)
Impact of 6% Annual Spending Policy Rate	51.6% (-24.4%)	49.8% (-25.8%)
Impact of 4% Annual Spending Policy Rate	90.9% (+14.9%)	91.4% (+15.8%)

All data is shown in real terms (after 2.50% annual inflation). Model assumes investment earnings always meet or exceed annual spending policy amount. Contribution assumptions were provided by the Consensus Revenue Estimating Group.

# Permanent Land Fund

<b>Purpose:</b>	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.
<b>Fund Horizon:</b>	Permanent Fund (Perpetual)
<b>Return Objective:</b>	Prior: CPI + 4% New: CPI + 3%
<b>Primary Investment Goal:</b>	Capital appreciation, total return, and protection against inflation.
<b>Spending Policy:</b>	Not available to RVK
<b>Liquidity Requirements:</b>	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.
<b>Investment Constraints:</b>	Maximum of 70% may be invested in “common stocks”. “Common stocks” is currently interpreted to include all public equity and alternative investments.

# University Permanent Land Fund

<b>Purpose:</b>	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.
<b>Fund Horizon:</b>	Permanent Fund (Perpetual)
<b>Return Objective:</b>	Prior: CPI + 4% New: CPI + 3%
<b>Primary Investment Goal:</b>	Capital appreciation, total return, and protection against inflation.
<b>Spending Policy:</b>	Not available to RVK
<b>Liquidity Requirements:</b>	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.
<b>Investment Constraints:</b>	Maximum of 70% may be invested in “common stocks”. “Common stocks” is currently interpreted to include all public equity and alternative investments.



# Hathaway Scholarship Endowment Fund

<b>Purpose:</b>	The corpus must be held inviolate and cannot be spent but only invested for income and capital gains.
<b>Fund Horizon:</b>	Permanent Fund (Perpetual)
<b>Return Objective:</b>	Prior: CPI + 4% New: CPI + 3%
<b>Primary Investment Goal:</b>	Capital appreciation, total return, and protection against inflation.
<b>Spending Policy:</b>	Earnings are transferred to the Expenditure Account. <ul style="list-style-type: none"><li>- If funds in the Expenditure Account are insufficient to cover payment for the scholarships, funds are to be transferred from the Reserve Account to the Expenditure Account.</li></ul> If the Reserve Account exceeds the greater of \$12 million or 3.75% of the previous trailing five-year average market value of corpus, the excess is transferred to the Hathaway corpus.
<b>Liquidity Requirements:</b>	Liquidity must be maintained to move income and capital gains generated during the year out of the fund.
<b>Investment Constraints:</b>	Maximum of 70% may be invested in “common stocks”. “Common stocks” is currently interpreted to include all public equity and alternative investments.

# Workers' Compensation Fund: *Asset Allocation Changes*

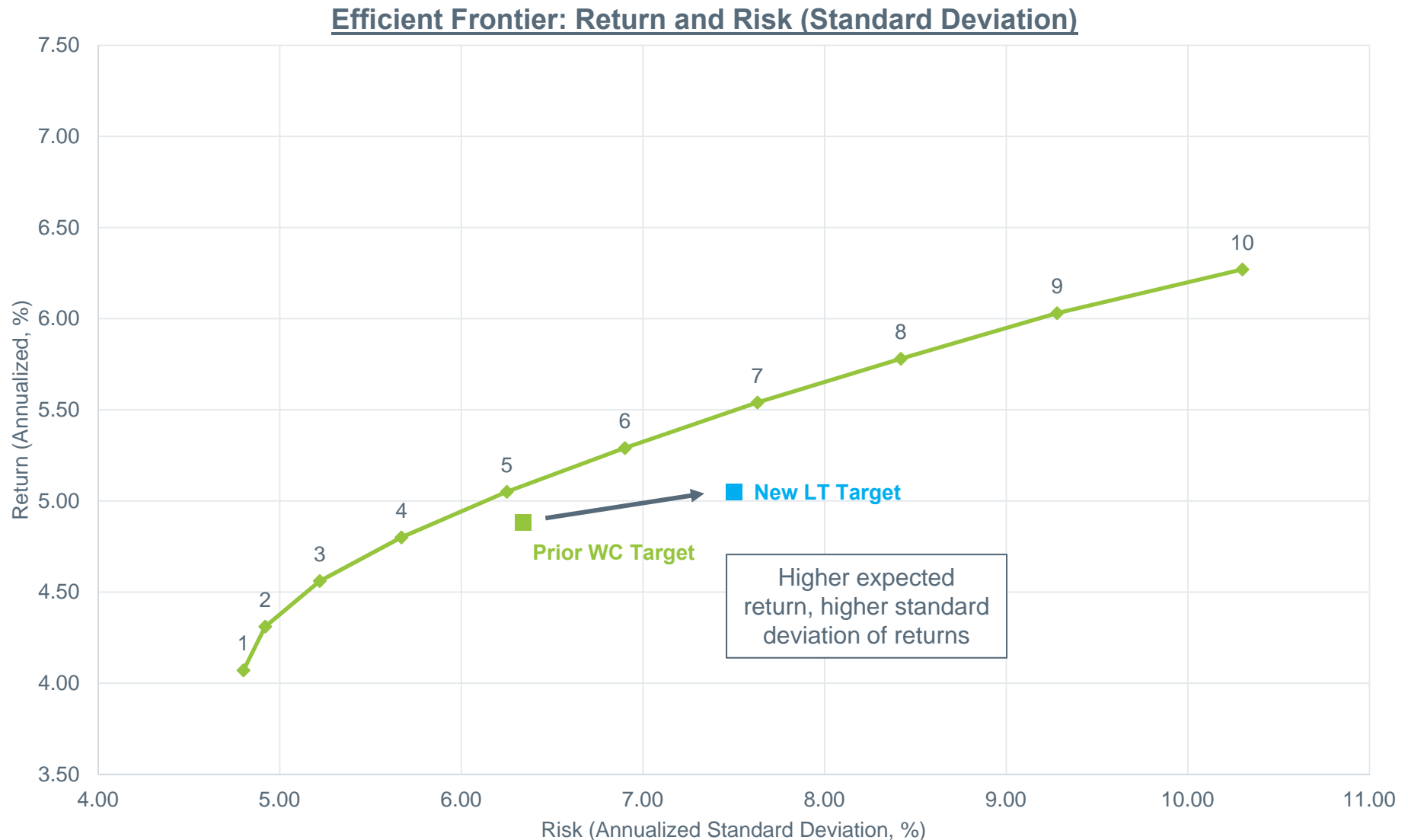


# Workers' Compensation Fund

<b>Purpose:</b>	This fund retains income and capital gains. The funds are to be invested for the very long-term to produce a situation in which the fund is self-funding or nearly self-funding in order to substantially reduce or eliminate the need for employer contributions.
<b>Fund Horizon:</b>	Permanent Fund
<b>Return Objective:</b>	Prior: CPI + 3% New: CPI + 3%
<b>Actuarial Discount Rate:</b>	2.5%
<b>Duration of Liabilities</b>	11.4 years
<b>Primary Investment Goal:</b>	Safety of capital, yield, and capital appreciation.
<b>Spending Policy:</b>	The exact cash level shall be determined annually by the Workers' Compensation staff and dependent on the liquidity needs of the fund.
<b>Liquidity Requirements:</b>	Liquidity must be maintained to move money between asset classes and to meet cash needs.
<b>Investment Constraints:</b>	Maximum of 45% may be invested in "common stocks". "Common stocks" is currently interpreted to include all public equity and alternative investments.

# Asset Allocation Changes: *Workers' Compensation Fund*

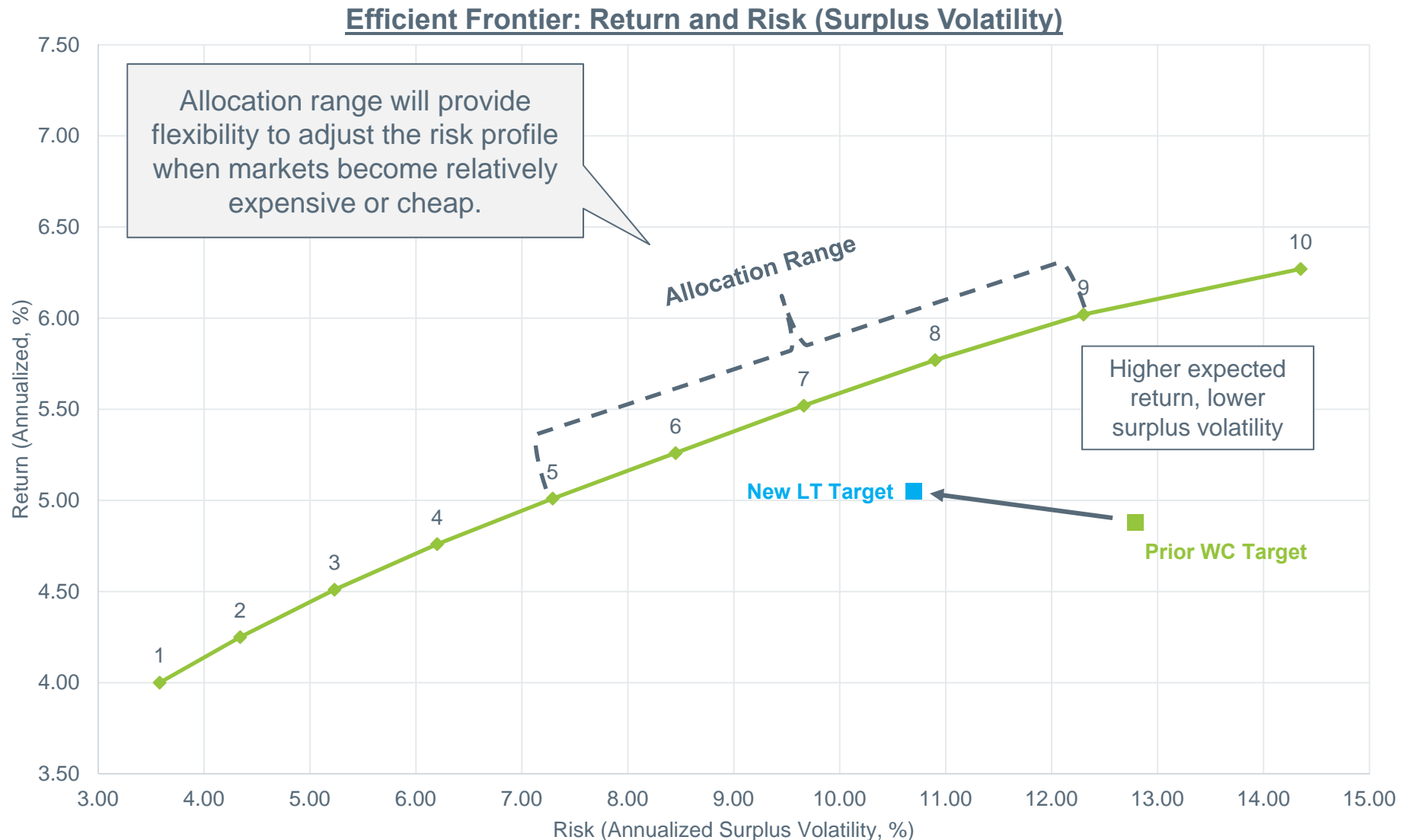
The prior policy target is relatively close to the efficient frontier, when considering return and risk in terms of standard deviation of returns.



Group Constraints: (i) Broad US Equity must be at least three-fourths (3/4) of total US equity. (ii) Total US equity must be at least one-half (1/2) of total public equity. (iii) Total public equity must not exceed 35% of the total portfolio. (iv) Total real estate must not exceed 5% of the total portfolio. (v) Core Real Estate must be at least one-half (1/2) of total real estate.

# Asset Allocation Changes: *Workers' Compensation Fund*

When considering return and risk in terms of surplus volatility (changes in funded status), the prior policy target is much further away from the efficient frontier.



The plan is assumed to be 100% funded as of December 31, 2016 and long duration fixed income is considered the liability-matching asset class. The duration of plan liabilities is assumed to be 11.4 years and the duration of long duration fixed income is assumed to be 15 years.



# Asset Allocation Changes: Workers' Compensation Fund

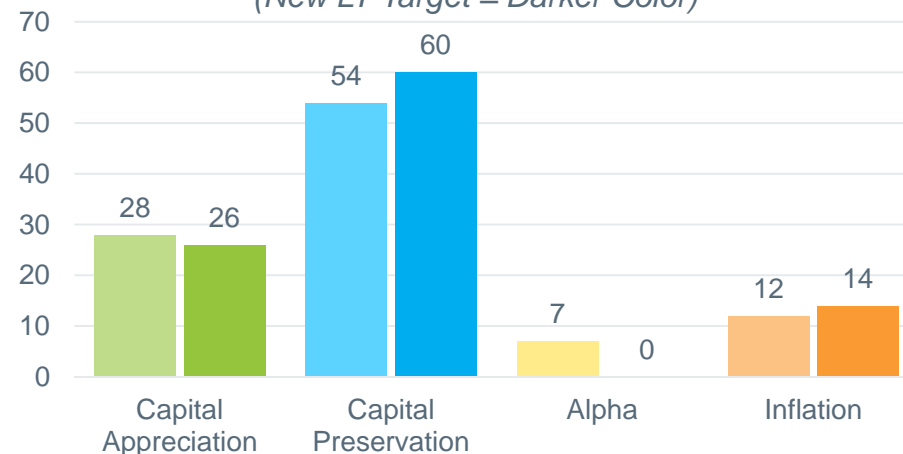
	Prior WC Target	New LT Target	Difference
<b>Total Public Equity</b>	<b>19.0</b>	<b>20.0</b>	<b>-1.0</b>
Broad US Equity	10.2	9.0	-1.2
Small Cap US Equity	0.8	1.0	+0.2
Broad Int'l Equity	8.1	10.0	+1.9
<b>Total Alternatives</b>	<b>11.0</b>	<b>7.0</b>	<b>-4.0</b>
MLPs	0.0	3.0	+3.0
Core Real Estate	2.9	3.0	+0.1
Non-Core Real Estate	1.1	1.0	-0.1
Diversified Hedge Funds	7.0	0.0	-7.0
<b>Total Fixed Income &amp; Cash</b>	<b>70.0</b>	<b>73.0</b>	<b>+3.0</b>
Convertibles	3.0	0.0	-3.0
Long Duration Fixed Income	0.0	27.0	+27.0
Int. Duration Fixed Income	48.5	33.0	-15.5
High Yield Fixed Income	1.3	0.0	-1.3
Bank Loans	3.8	3.0	-0.8
EMD (Local)	3.2	5.0	+1.8
TIPS	5.2	5.0	-0.2
Cash Equivalents	5.0	0.0	-5.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>--</b>

## Key Observations:

- The New LT Target portfolio adds exposure to long duration fixed income to help protect the relatively healthy funded status.
- Allocations to growth assets remain such that the fund remains self-funding or nearly self-funding.
- Exposure to inflationary and capital preservation assets increases, while exposure to alpha thematic allocations is eliminated through the removal of hedge funds.

## Thematic Allocation (%)

(New LT Target = Darker Color)



Allocations may not sum exactly to totals due to rounding. WC target allocation to global equity is assumed to be 50% Broad US Equity and 50% Broad Int'l Equity. The credit fixed income portfolio is split out into its underlying components.

# Asset Allocation Changes: Workers' Compensation Fund

The New LT Target portfolio increases the probability of achieving the current long-term expected return target to 50% over a 10 year period.

	Prior WC Target	New LT Target	Difference
Expected Return (%)	4.88	5.05	+0.17
Risk (Standard Deviation, %)	6.34	7.50	+1.16
Return (Compound, %)	4.69	4.78	+0.09
Return/Risk Ratio	0.77	0.67	-0.10
Assumed Funded Status (%)	100.00	100.00	--
Risk (Surplus Volatility, %)	12.79	10.70	-2.09
Estimated Interest Hedge Ratio	0.30	0.57	+0.27
Estimated Duration (Int. Rate Risk) (Fixed Income & Cash Only)	5.42 (70% of Total)	9.08 (73% of Total)	+3.66 (+3% of Total)
Estimated Yield (%)	3.05	3.54	+0.49

## Portfolio Stress Testing (Monte Carlo Results)

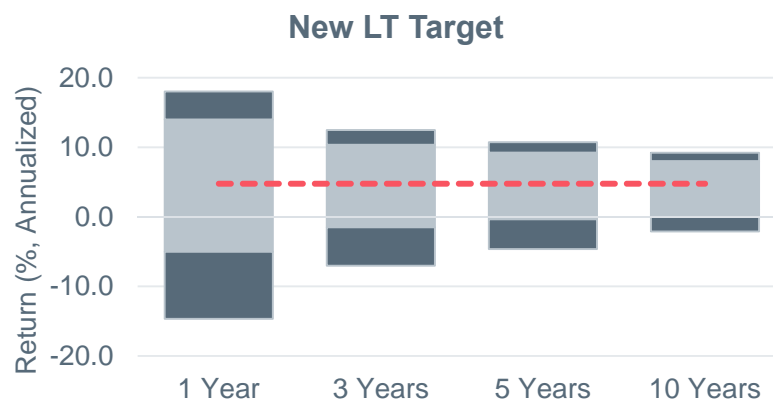
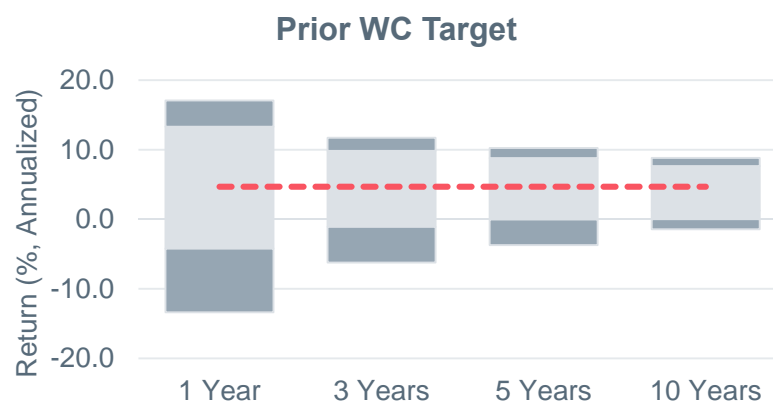
1 Year Max Drawdown (2008-Like Event)	-\$256 M (-13.52%)	-\$272 M (-14.33%)	-\$16 M (-0.81%)
Median 1 Year Return	+\$99 M (+5.24%)	+\$104 M (+5.48%)	+\$5 M (+0.24%)

## Probability of Achieving Various Real Return Targets

2.5% Real Return Over 10 Years	51%	53%	+2%
3.0% Real Return Over 10 Years	48%	50%	+2%
3.5% Real Return Over 10 Years	44%	46%	+2%

## Range of Monte Carlo Stress Test Results

1<sup>st</sup> & 99<sup>th</sup> Percentiles = Darker Color  
5<sup>th</sup> to 95<sup>th</sup> Percentiles = Lighter Color



Differences may not sum exactly due to rounding. Expected returns do not assume active manager alpha. Estimated yields are a weighted average of the underlying asset class benchmarks as of 12/31/16. 1 Year Max Drawdown reflects the 1<sup>st</sup> percentile results.

Dollar amounts are based on an initial portfolio value of \$1,895 M.

# Efficient Frontier: Return and Risk (Standard Deviation)

## Workers' Compensation Fund

	Min	Max	1	2	3	4	5	6	7	8	9	10	Prior WC Target	New LT Target
Broad US Equity	0	30	0	1	2	5	6	8	10	12	13	13	10.2	9.0
Small Cap US Equity	0	5	0	0	1	2	2	3	3	4	4	4	0.8	1.0
Broad International Equity	0	30	0	1	2	6	8	11	14	16	18	18	8.1	10.0
MLPs	0	3	0	3	3	3	3	3	3	3	3	3	0.0	3.0
Core Real Estate	0	5	3	3	3	3	3	3	3	3	3	3	2.9	3.0
Non-Core Real Estate	0	2	2	2	2	2	2	2	2	2	2	2	1.1	1.0
Diversified Hedge Funds	0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.0	0.0
Convertibles	0	5	4	5	4	0	0	0	0	0	0	5	3.0	0.0
Int. Duration Fixed Income	0	100	68	62	56	52	50	48	43	36	20	0	48.5	33.0
High Yield Fixed Income	0	5	0	0	0	0	0	0	0	0	3	5	1.3	0.0
Bank Loans	0	5	5	5	5	5	5	5	5	5	5	5	3.8	3.0
Emerging Markets Debt (Local)	0	5	0	0	5	5	5	5	5	5	5	5	3.2	5.0
TIPS	0	5	5	5	5	5	5	5	5	5	5	0	5.2	5.0
Long Duration Fixed Income	0	100	0	0	0	0	0	0	0	1	11	30	0.0	27.0
Cash Equivalents	0	5	5	5	5	5	3	0	0	0	0	0	5.0	0.0
Total			100	100	100	100	100	100	100	100	100	100	100.0	100.0
Total Fixed Income & Cash			87	82	80	72	68	63	58	52	49	50	70	73
Capital Appreciation			6	9	16	19	24	29	34	39	45	52	28	26
Capital Preservation			73	67	61	57	53	48	43	37	32	30	54	60
Alpha			8	8	8	8	8	8	8	8	8	8	7	0
Inflation			13	16	16	16	16	16	16	16	16	11	12	14
Expected Return			4.07	4.31	4.56	4.80	5.05	5.29	5.54	5.78	6.03	6.27	4.88	5.05
Risk (Standard Deviation)			4.80	4.92	5.22	5.67	6.25	6.90	7.63	8.42	9.28	10.30	6.34	7.50
Return (Compound)			3.96	4.19	4.43	4.65	4.86	5.06	5.27	5.45	5.63	5.77	4.69	4.78
Return/Risk Ratio			0.85	0.88	0.87	0.85	0.81	0.77	0.73	0.69	0.65	0.61	0.77	0.67
RVK Expected Eq Beta (LC US Eq = 1)			0.11	0.15	0.18	0.23	0.28	0.32	0.37	0.42	0.46	0.51	0.29	0.30
RVK Liquidity Metric (T-Bills = 100)			77	77	76	76	76	76	77	77	76	75	78	82
Estimated Yield (%)			3.03	3.14	3.35	3.34	3.31	3.30	3.29	3.23	3.45	3.74	3.05	3.54
Estimated Duration of Fixed Income & Cash			5.44	5.37	5.35	5.49	5.49	5.51	5.47	5.60	7.33	10.13	5.42	9.08

Group Constraints: (i) Broad US Equity must be at least three-fourths (3/4) of total US equity. (ii) Total US equity must be at least one-half (1/2) of total public equity. (iii) Total public equity must not exceed 35% of the total portfolio. (iv) Total real estate must not exceed 5% of the total portfolio. (v) Core Real Estate must be at least one-half (1/2) of total real estate.

# Efficient Frontier: Return and Risk (Surplus Volatility)

## Workers' Compensation Fund

	Min	Max	1	2	3	4	5	6	7	8	9	10	Prior WC Target	New LT Target
Broad US Equity	0	30	0	1	1	3	5	8	10	13	13	13	10.2	9.0
Small Cap US Equity	0	5	0	0	0	1	2	3	3	4	4	4	0.8	1.0
Broad International Equity	0	30	0	1	1	4	7	10	14	17	18	18	8.1	10.0
MLPs	0	3	0	2	3	3	3	3	3	3	3	3	0.0	3.0
Core Real Estate	0	5	0	0	2	2	2	2	2	2	3	3	2.9	3.0
Non-Core Real Estate	0	2	0	0	2	2	2	2	2	2	2	2	1.1	1.0
Diversified Hedge Funds	0	7.5	0	0	0	0	0	0	0	0	7.5	7.5	7.0	0.0
Convertibles	0	5	0	0	0	0	0	0	0	0	0	5	3.0	0.0
Int. Duration Fixed Income	0	100	0	0	0	0	0	0	0	0	0	0	48.5	33.0
High Yield Fixed Income	0	5	0	0	0	0	0	0	0	0	0	5	1.3	0.0
Bank Loans	0	5	0	0	0	0	0	0	0	0	0	5	3.8	3.0
Emerging Markets Debt (Local)	0	5	0	3	5	5	5	5	5	5	5	5	3.2	5.0
TIPS	0	5	0	0	0	0	0	0	0	0	0	0	5.2	5.0
Long Duration Fixed Income	0	100	100	93	86	80	73	67	61	55	45	30	0.0	27.0
Cash Equivalents	0	5	0	0	0	0	0	0	0	0	0	0	5.0	0.0
Total			100	100	100	100	100	100	100	100	100	100	100.0	100.0
Total Fixed Income & Cash			100	96	91	85	78	72	66	60	50	50	70	73
Expected Equity Beta (LC US Eq = 1)			0.12	0.15	0.17	0.22	0.27	0.33	0.38	0.44	0.46	0.51	0.29	0.30
RVK Liquidity Metric (Cash = 100)			85	84	81	81	81	82	82	83	78	75	78	82
Expected Return			4.00	4.25	4.51	4.76	5.01	5.26	5.52	5.77	6.02	6.27	4.88	5.05
Risk (Surplus Volatility)			3.58	4.34	5.23	6.20	7.29	8.45	9.66	10.90	12.30	14.35	12.79	10.70
Return (Compound)			3.37	3.69	4.01	4.31	4.58	4.84	5.09	5.31	5.57	5.77	4.69	4.78
Risk (Standard Deviation)			11.50	10.87	10.24	9.78	9.53	9.46	9.58	9.88	9.81	10.30	6.34	7.50
Est. Interest Hedge Ratio			1.32	1.24	1.16	1.07	0.99	0.91	0.83	0.75	0.62	0.44	0.30	0.57
Est. Funded Status -2 STDEV Event (Current = 100%)*			0.93	0.91	0.90	0.88	0.85	0.83	0.81	0.78	0.75	0.71	0.74	0.79
Estimated Yield (%)			3.96	4.07	4.21	4.11	3.97	3.89	3.80	3.72	3.59	3.74	3.05	3.54
Estimated Duration of Fixed Income & Cash			14.97	14.66	14.43	14.39	14.34	14.28	14.22	14.15	13.98	10.13	5.42	9.08

Group Constraints: (i) Broad US Equity must be at least three-fourths (3/4) of total US equity. (ii) Total US equity must be at least one-half (1/2) of total public equity. (iii) Total public equity must not exceed 35% of the total portfolio. (iv) Total real estate must not exceed 5% of the total portfolio. (v) Core Real Estate must be at least one-half (1/2) of total real estate.

# Pool A Investment Account: *Asset Allocation Changes*

- Tobacco Settlement Fund
- Wyoming Public Broadcasting Trust
- Wyoming Wildlife & Natural Resource Trust
- Wyoming Cultural Trust Fund
- Wyoming Game & Fish Trust



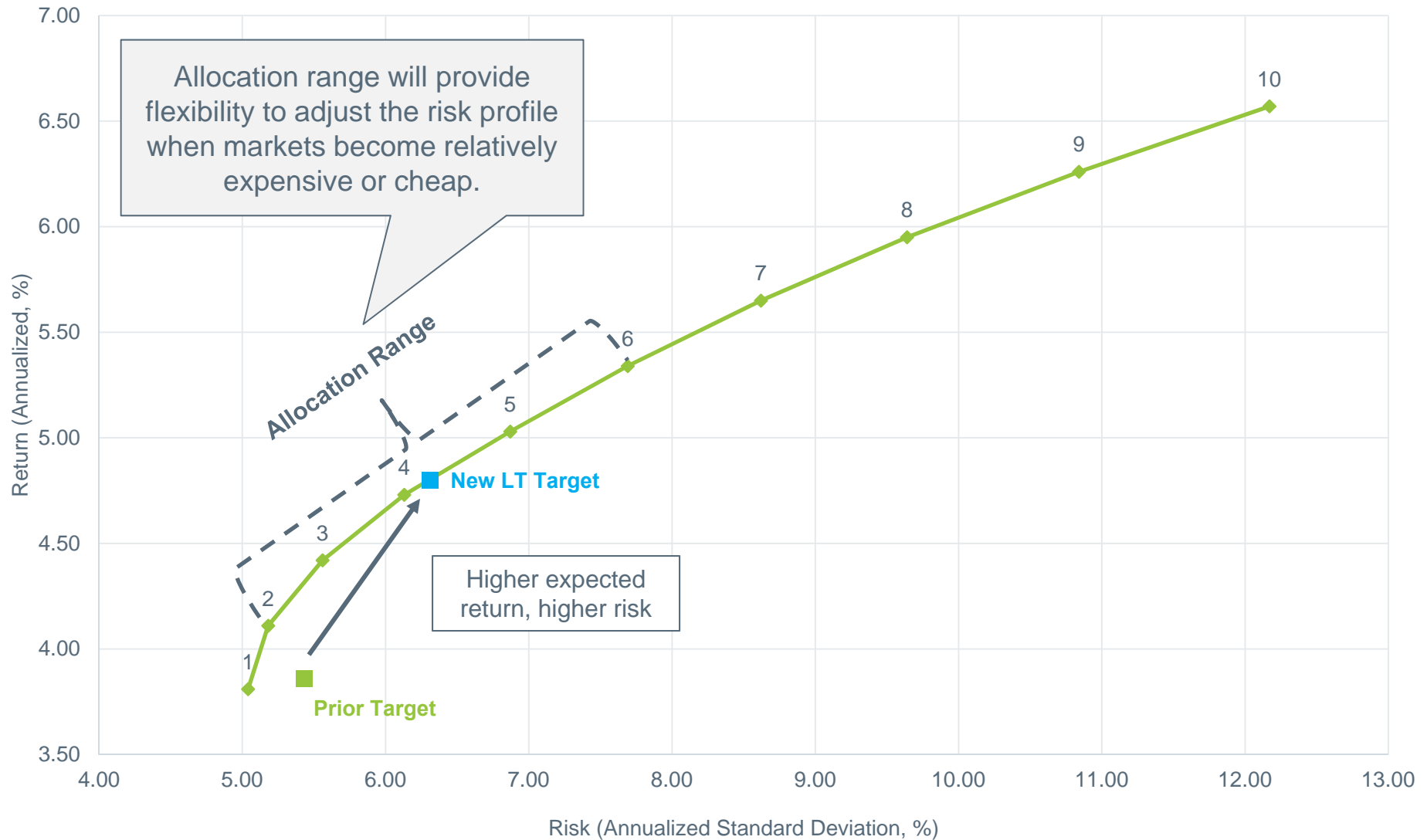
# Pool A Investment Account

## *(Formerly the Tobacco Settlement Fund)*

<b>Purpose:</b>	This fund dispenses income and capital gains.
<b>Fund Horizon:</b>	Non-Permanent Fund
<b>Return Objective:</b>	Prior: CPI + 2.25% New: CPI + 2%
<b>Primary Investment Goal:</b>	Safety of capital, yield and liquidity.
<b>Spending Policy:</b>	Earnings go toward health improvement programs.
<b>Liquidity Requirements:</b>	Liquidity must be maintained to move money between asset classes and to meet cash needs as determined by the State Treasurer's Office.
<b>Investment Constraints:</b>	Per the recent amendment to Wyoming Constitution Article 16 Section 6, can now invest in "common stocks". "Common stocks" is currently interpreted to include all public equity and alternative investments.

# Asset Allocation Changes: *Pool A Investment Account*

## Efficient Frontier



Group Constraints: (i) Broad US Equity must be at least three-fourths (3/4) of total US equity. (ii) Total US equity must be at least one-half (1/2) of total public equity.

# Asset Allocation Changes: *Pool A Investment Account*

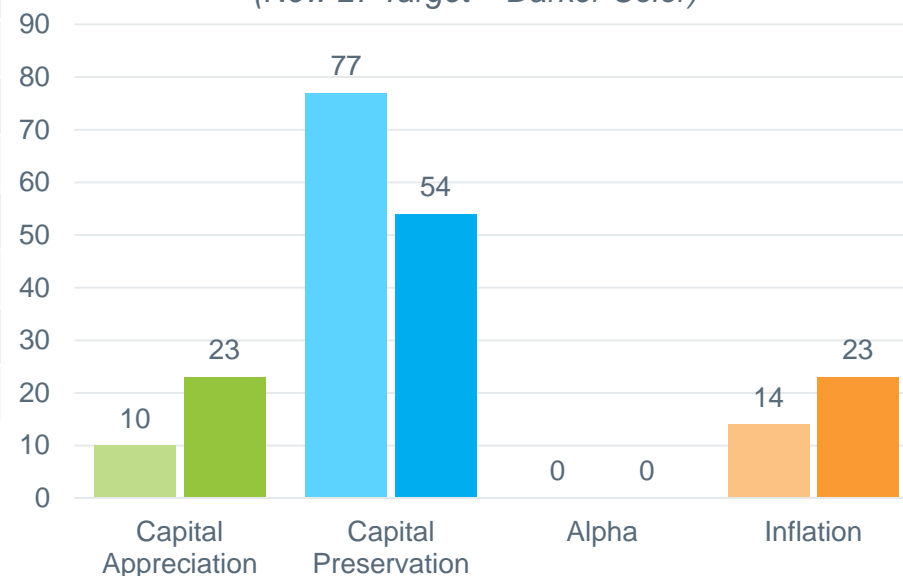
	Prior Target	New LT Target	Difference
<b>Total Public Equity</b>	<b>0.0</b>	<b>18.0</b>	<b>+16.0</b>
Broad US Equity	--	7.5	+7.5
Small Cap US Equity	--	1.0	+1.0
Broad Int'l Equity	--	7.5	+7.5
Preferred Stock	--	2.0	+2.0
<b>Total Alternatives</b>	<b>0.0</b>	<b>5.0</b>	<b>+5.0</b>
MLPs	--	5.0	+5.0
<b>Total Fixed Income &amp; Cash</b>	<b>100.0</b>	<b>77.0</b>	<b>-21.0</b>
Convertibles	3.0	0.0	-3.0
Int. Duration Fixed Income	73.7	49.0	-24.7
High Yield Fixed Income	2.0	0.0	-2.0
Bank Loans	5.8	10.0	+4.2
EMD (Local)	4.9	5.0	+0.1
TIPS	7.7	8.0	+0.3
Cash Equivalents	3.0	5.0	+2.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>--</b>

## Key Observations:

- The New LT Target portfolio adds exposure to public equity and alternatives, comprising 23% of the total portfolio.
- Exposures to inflationary and capital appreciation assets increase, while exposure to capital preservation declines.

## Thematic Allocation (%)

(New LT Target = Darker Color)



Allocations may not sum exactly to totals due to rounding. New target allocation to global equity is assumed to be 50% Broad US Equity and 50% Broad Int'l Equity. The credit fixed income portfolio is split out into its underlying components.

# Asset Allocation Changes:

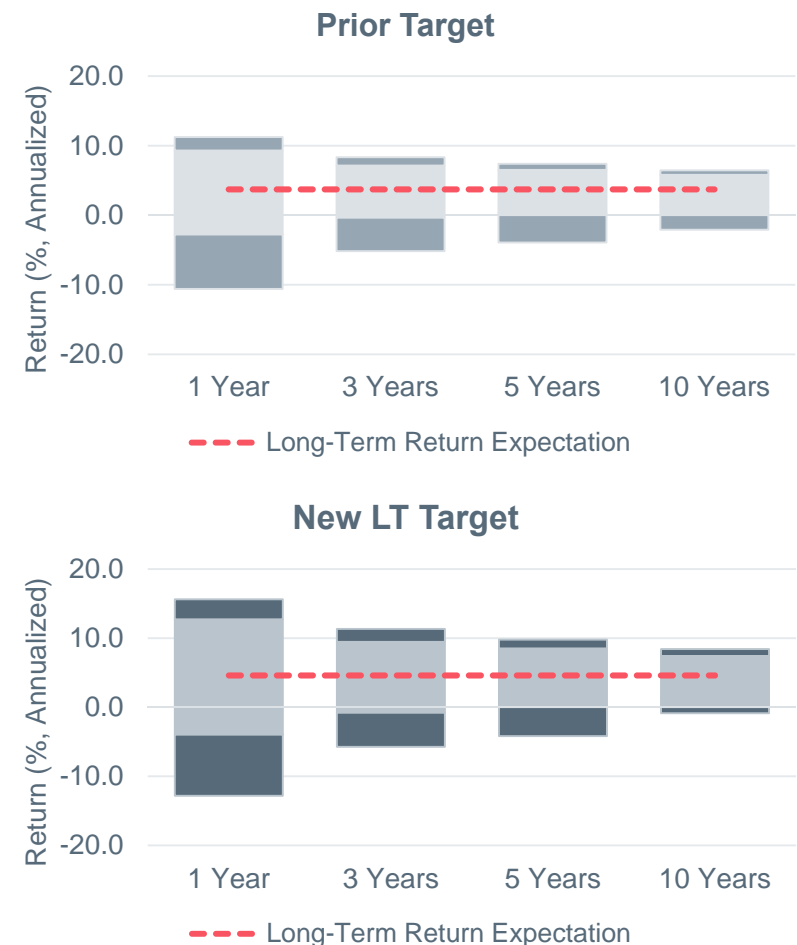
## Pool A Investment Account

The New LT Target portfolio increases the probability of achieving the current long-term expected return target to 51% over a 10 year period.

	Prior Target	New LT Target	Difference
Expected Return (%)	3.86	4.80	+0.94
Risk (Standard Deviation, %)	5.43	6.31	+0.88
Return (Compound, %)	3.72	4.61	+0.89
Return/Risk Ratio	0.71	0.76	+0.05
Estimated Duration (Int. Rate Risk) (Fixed Income & Cash Only)	5.48 (100% of Total)	5.20 (77% of Total)	-0.28 (-23% of Total)
Estimated Yield (%)	3.24	3.55	+0.31
<b>Portfolio Stress Testing (Monte Carlo Results)</b>			
1 Year Max Drawdown (2008-Like Event)	-\$8.5 M (-10.22%)	-\$10.6 M (-12.82%)	-\$2.1 M (-2.60%)
Median 1 Year Return	+\$3.6 M (+4.31%)	+\$4.4 M (+5.34%)	+\$0.8 M (+1.03%)
<b>Probability of Achieving Various Real Return Targets</b>			
2.0% Real Return Over 10 Years	35%	56%	+21%
2.25% Real Return Over 10 Years	29%	51%	+22%
2.5% Real Return Over 10 Years	24%	46%	+22%

### Range of Monte Carlo Stress Test Results

1<sup>st</sup> & 99<sup>th</sup> Percentiles = Darker Color  
5<sup>th</sup> to 95<sup>th</sup> Percentiles = Lighter Color



Differences may not sum exactly due to rounding. Expected returns do not assume active manager alpha. Estimated yields are a weighted average of the underlying asset class benchmarks as of 12/31/16. 1 Year Max Drawdown reflects the 1<sup>st</sup> percentile results. Dollar amounts are based on an initial portfolio value of \$82.9 M.

# Efficient Frontier:

## Pool A Investment Account

	Min	Max	1	2	3	4	5	6	7	8	9	10	Prior Target	New LT Target
Broad US Equity	0	20	0	1	3	6	7	9	12	14	20	20	0.0	7.5
Small Cap US Equity	0	5	0	0	1	2	2	3	4	5	5	5	0.0	1.0
Broad International Equity	0	20	0	2	4	8	10	12	16	19	20	20	0.0	7.5
Preferred Stock	0	5	0	0	0	0	3	5	5	5	5	5	0.0	2.0
MLPs	0	5	1	4	5	5	5	5	5	5	5	5	0.0	5.0
Convertibles	0	5	5	5	4	0	0	0	0	0	0	5	3.0	0.0
Int. Duration Fixed Income	0	100	71	64	57	52	48	42	35	29	20	7	73.7	49.0
High Yield Fixed Income	0	10	0	0	0	0	0	0	0	0	2	10	2.0	0.0
Bank Loans	0	10	10	10	10	10	10	10	10	10	10	10	5.8	10.0
Emerging Markets Debt (Local)	0	5	0	0	4	5	5	5	5	5	5	5	4.9	5.0
TIPS	0	8	8	8	8	8	8	8	8	8	8	8	7.7	8.0
Cash Equivalents	0	5	5	5	5	5	2	0	0	0	0	0	3.0	5.0
Total			100	100	100	100	100	100	100	100	100	100	100.0	100.0
Total Fixed Income & Cash			99	92	88	80	72	65	58	52	45	45	100	77
Capital Appreciation			5	9	15	20	28	35	42	48	57	70	10	23
Capital Preservation			76	69	62	57	49	42	35	29	20	7	77	54
Alpha			0	0	0	0	0	0	0	0	0	0	0	0
Inflation			19	22	23	23	23	23	23	23	23	23	14	23
Expected Return			3.81	4.11	4.42	4.73	5.03	5.34	5.65	5.95	6.26	6.57	3.86	4.80
Risk (Standard Deviation)			5.04	5.18	5.56	6.13	6.87	7.69	8.62	9.64	10.84	12.17	5.43	6.31
Return (Compound)			3.69	3.98	4.27	4.55	4.81	5.06	5.30	5.51	5.71	5.88	3.72	4.61
Return/Risk Ratio			0.76	0.79	0.79	0.77	0.73	0.69	0.66	0.62	0.58	0.54	0.71	0.76
RVK Expected Eq Beta (LCUS Eq = 1)			0.10	0.15	0.20	0.25	0.29	0.34	0.40	0.46	0.54	0.60	0.11	0.26
RVK Liquidity Metric (T-Bills = 100)			83	83	82	82	82	83	83	83	83	80	82	83
Estimated Yield (%)			3.16	3.25	3.48	3.51	3.56	3.56	3.55	3.51	3.54	3.78	3.24	3.55
Estimated Duration of Fixed Income & Cash			5.22	5.17	5.14	5.23	5.21	5.15	5.06	4.97	4.74	4.03	5.48	5.20

Group Constraints: (i) Broad US Equity must be at least three-fourths (3/4) of total US equity. (ii) Total US equity must be at least one-half (1/2) of total public equity.

# Synopsis of Asset Allocation Changes





# Synopsis of Asset Allocation Changes

## **Permanent Funds** (*PMTF, PLF, UPLF, CSPLF, Hathaway, and Higher Ed*)

- Improve the likelihood of achieving each pool's long-term return objectives, focusing on long-term total return or income generation based on respective spending policy goals and needs.

**Increase allocations to public equity and alternatives for pools with a long-term total return focus, increase allocations to higher yielding assets for pools with an income focus.**

## **State Agency Pool**

- Focus on aligning the risk profile appropriately with the needs of the constituent investors. Emphasis on risk reduction and capital preservation to help mitigate significant short-term draw downs.

**Introduce low duration fixed income to reduce portfolio interest rate risk.**

## **Workers' Compensation Fund**

- Examine risk in terms of surplus volatility to help preserve the fund's fiscal health with a healthy funded status.

**Introduce a modest allocation to long duration fixed income to help reduce funded status volatility.**

## **Pool A Investment Account** (*Formerly Tobacco Settlement Fund*)

- Introduce public equity and alternative investments in a thoughtful manner such that the overall risk profile remains appropriate.

**Gradually introduce allocations to risk assets when better entry points are available.**

PORTLAND

CHICAGO

NEW YORK

