Wilshire

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Managing Director & Principal

September 25, 2015

Mr. Henry Jones
Chair of the Investment Committee
California Public Employees' Retirement System
400 P Street
Sacramento, CA 95814

Re: Comprehensive Divestment Analysis

Dear Henry:

This document provides an updated comprehensive summary of past and present divestment activities by the CalPERS Global Equity portfolios.

This analysis presents the calculated impacts of the following divestment activities:

- The present value of the impact of the divestment of South African securities from the 1980s,
- Calculations of the historical impact and potential future impact of the divestment of tobacco-related securities,
- Calculations of the historical impact of excluding certain Emerging Markets countries,
- An estimation of the historical impact and potential future impacts of the Emerging Markets Principles,
- Calculations of the historical impact and potential future impact of the divestment of companies on the Iran and Sudan lists,
- Calculations of the historical impact and potential future impact of the divestment of certain firearm-related companies.

This report does not pass judgment or comment on the political, social, health, or moral merits of any of these divestment activities, but simply calculates or estimates their gain or loss to the CalPERS investment portfolio.

The Investment Committee has discussed who "owns" the performance for any "Board-directed policies" during the work with Towers Watson on Investment Beliefs. Wilshire believes that the divestment activities captured in this report give some clear indication of prior practices. For example, when CalPERS divested of tobacco, the Global Equity benchmark was changed to be "ex-Tobacco." Similarly, other exclusions and divestments have resulted in analogous changes to the Global Equity benchmark. This permits Staff to fully implement the Board-directed or Legislatively-directed mandates and focus fully on the resulting portfolio. Thus, from a historical perspective, the Investment Committee has typically "owned" such decisions. Staff is aligned with the Investment Committee decisions in this manner, as incentive compensation is tied to implementing the portfolio against the adjusted benchmark.

Summary of Findings

In the pages that follow, we present detailed data and / or calculations to estimate the past and projected future costs of the various divestment activities. This section presents a summary of our results.

Total present value of historical exclusions to date:

- High Estimate: -$8.315 billion
- Low Estimate: -$3.790 billion

Present value of impact of South Africa Divestment

- High Estimate: -$4.266 billion
- Low Estimate: -$1.099 billion

Present value of transaction costs from Tobacco Divestment

- High Estimate: -$3.230 million
- Low Estimate: -$1.867 million

Present value of impact of Tobacco exclusion through 12/31/2014

- High Estimate: -$3.037 billion
- Low Estimate: -$2.084 billion

Projected annual impact of continuing exclusion of Tobacco

- 1 in 5 Years: ± $112.6 million
- 1 in 10 Years: ± $144.4 million
- 1 in 20 Years: ± $172.1 million

Present value of impact of Permissible Markets Country exclusions (2002-2007)

- High Estimate: -$1.105 billion
- Low Estimate: -$0.715 billion

Present value of impact of Emerging Markets Principles (2008-2014)

- High Estimate: +$159.569 million (a positive impact on performance)
- Low Estimate: +$168.592 million (a positive impact on performance)

Projected annual impact of continuing Emerging Markets Principles
- 1 in 5 Years: ± $68.3 MM
- 1 in 10 Years: ± $87.7 MM
- 1 in 20 Years: ± $104.5 MM

Present value of transaction costs from Iran/Sudan Divestment
- High Estimate: -$3.213 million
- Low Estimate: -$2.497 million

Present value of impact of Iran/Sudan Exclusion through 12/31/2014
- High Estimate: -$46.925 million
- Low Estimate: -$44.387 million

Projected annual impact of continuing Exclusion of Iran/Sudan
- 1 in 5 Years: ± $72.4 million
- 1 in 10 Years: ± $92.9 million
- 1 in 20 Years: ± $110.6 million

Present value of transaction costs from Firearms Divestment
- High Estimate: -$9.593 million
- Low Estimate: -$8.171 million

Present value of impact of Firearms Exclusion through 12/31/2014
- High Estimate: -$4.738 million
- Low Estimate: -$4.481 million

Projected annual impact of continuing Exclusion of Firearms
- 1 in 5 Years: ± 4.0 million
- 1 in 10 Years: ± $5.2 million
- 1 in 20 Years: ± $6.1 million

South Africa Divestment

Wilshire's 1991 analysis calculated a total cost of South African equity divestment through 12/31/1989 of $590million. In the table below, we have calculated the present value of that amount using two different methodologies: CalPERS' total fund returns, and CPI. While CPI is the most commonly accepted way to estimate dollar effects over long periods of time, in this case a reasonable argument could be made that had CalPERS not experienced the $590 million costs and been able to reinvest that amount, it would have earned the Total Fund return over that time. This calculation, however, ignores the impact that greater assets would have potentially had on contributions, benefits, etc. over time. As a result, both of these methodologies are generally indicative of the estimated value of those costs in present terms.

Table 1 – Present Value of South African Divestment

	Total Fund		CPI	
	Return	Value (MM)	Return	Value (MM)
1990	-0.79%	$585.54	6.12%	$626.32
1991	22.96%	$719.98	3.08%	$645.61
1992	6.94%	$769.94	2.88%	$664.20
1993	13.42%	$873.27	2.75%	$682.47
1994	-0.94%	$865.06	2.67%	$700.69
1995	25.39%	$1,084.70	2.54%	$718.49
1996	12.81%	$1,223.65	3.33%	$742.42
1997	19.04%	$1,456.63	1.70%	$755.04
1998	18.44%	$1,725.24	1.60%	$767.12
1999	15.99%	$2,001.10	2.68%	$787.68
2000	-1.24%	$1,976.29	3.39%	$814.38
2001	-6.12%	$1,855.34	1.55%	$827.00
2002	-9.55%	$1,678.15	2.39%	$846.77
2003	23.23%	$2,067.99	1.88%	$862.69
2004	13.21%	$2,341.17	3.25%	$890.72
2005	10.41%	$2,584.89	3.42%	$921.19
2006	15.47%	$2,984.77	2.55%	$944.68
2007	9.99%	$3,282.95	4.06%	$983.03
2008	-27.12%	$2,392.61	0.10%	$984.01
2009	11.84%	$2,675.99	2.72%	$1,010.78
2010	12.46%	$3,009.38	1.50%	$1,025.94
2011	1.11%	$3,042.84	2.96%	$1,056.31
2012	13.26%	$3,446.19	1.74%	$1,074.69
2013	16.21%	$4,004.81	1.50%	$1,090.81
2014	6.52%	$4,265.93	0.76%	$1,099.10

Depending on the methodology used, the initial cost of $590 million as of year-end 1989 would have grown to $1.10 billion (CPI) or $4.27 billion (reinvestment into total fund) by the end of 2014.

Tobacco

There are three components to calculating the costs of the Tobacco divestment:

- Actual explicit and implicit costs of divestment of securities,
- Actual impact of divested securities versus the non-divested securities for the period 1/1/2001 to 12/31/2012,
- Projected future tracking error of tobacco-free portfolio versus the standard portfolio.

On February 19, 2002, Staff presented an agenda item to the Investment Committee detailing the transactions costs (commissions) and market impact costs of the divestment of the securities over the course of 2001, totaling $1,404,601. Using the same methodology as for the South African divestment, above, we can calculate the present day value of these costs.

Table 2 – Present Value of Initial Tobacco Divestment Transactions Costs

	Total Fund		CPI	
	Return	Value	Return	Value
2002	-9.55%	$1,270,462	2.39%	$1,438,171
2003	23.23%	$1,565,590	1.88%	$1,465,209
2004	13.21%	$1,772,404	3.25%	$1,512,828
2005	10.41%	$1,956,912	3.42%	$1,564,567
2006	15.47%	$2,259,646	2.55%	$1,604,463
2007	9.99%	$2,485,384	4.06%	$1,669,604
2008	-27.12%	$1,811,348	0.10%	$1,671,274
2009	11.84%	$2,025,884	2.72%	$1,716,732
2010	12.46%	$2,278,279	1.50%	$1,742,483
2011	1.11%	$2,303,609	2.96%	$1,794,061
2012	13.26%	$2,608,966	1.74%	$1,825,278
2013	16.21%	$3,031,879	1.50%	$1,852,657
2014	6.52%	$3,229,558	0.76%	$1,866,737

Depending on the methodology used, the initial cost of $1,404,601 as of year-end 2001 would have grown to between $1.87 million and $3.23 million by the end of 2014.

Between 12/31/2001 and 12/31/2014, we can calculate the value of the impact of the exclusion of tobacco by comparing the tobacco-free benchmarks that CalPERS uses against the performance of the tobacco-inclusive standard benchmarks. Multiplying the performance difference between these benchmarks by the assets in the CalPERS tobacco-free portfolio on a frequent basis results in an approximate value of the dollar impact of the tobacco exclusion.

In previous versions of this report, Wilshire calculated the effect of the tobacco exclusion by region – U.S., non-U.S. developed, and emerging markets. Beginning with this update, Wilshire calculated the quarterly impacts on the total global equity portfolio rather than by regions, starting with the 2013 calculation. For years prior to 2013, Wilshire used the previously calculated estimates to be consistent with what was presented to the Investment Committee and the public. , While quarterly calculations are available, Wilshire is presenting the calculated effects on an annual basis for brevity and simplicity.

Table 3 – Present Value of all Impacts of Tobacco Security Exclusion[i]

	Total Annual Impact of Tobacco Exclusion		Total Fund		CPI
2001	($9,268,139)	-6.12%	($8,700,929)	1.55%	($9,411,795)
2002	($144,495,258)	-9.55%	($138,565,951)	2.39%	($157,585,432)
2003	($124,820,405)	23.23%	($324,571,006)	1.88%	($287,715,066)
2004	($217,534,279)	13.21%	($613,717,393)	3.25%	($521,669,948)
2005	($293,862,535)	10.41%	($1,002,058,999)	3.42%	($843,423,695)
2006	($109,788,962)	15.47%	($1,283,850,840)	2.55%	($977,519,579)
2007	($172,471,382)	9.99%	($1,601,808,812)	4.06%	($1,196,680,594)
2008	($102,201,289)	-27.10%	($1,242,223,363)	0.10%	($1,300,180,765)
2009	$116,528,156	11.84%	($1,259,022,547)	2.72%	($1,215,847,959)
2010	($103,113,204)	12.46%	($1,531,837,433)	1.50%	($1,338,745,581)
2011	($423,305,832)	1.11%	($1,976,880,548)	2.96%	($1,814,208,134)
2012	($283,623,621)	13.26%	($2,560,147,560)	1.74%	($2,134,334,028)
2013	$174,292,901	16.21%	($2,772,601,699)	1.50%	($1,989,441,743)
2014	($78,736,399)	6.52%	($3,037,245,342)	0.76%	($2,083,896,296)

The impact of the Tobacco Exclusion over the fourteen years it has been in place is between $2.08 billion and $3.04 billion by the end of 2014, depending on the methodology used.

On a forward looking basis, we have also calculated the probable impact of a tobacco-free portfolio relative to an all-inclusive portfolio by calculating an expected tracking error, or variance in return between the exclusionary portfolio and a market portfolio. Please note that in any given period, this tracking error is equally likely to generate outperformance as underperformance.

Using index data as of December 31, 2014, Wilshire calculated the estimated tracking error (excess risk) that would occur from excluding prohibited tobacco securities. All calculations were performed using Wilshire's Atlas GR6 global risk model, a software system that is generally recognized as an industry-leading risk system.

We calculated that the prohibited 22 tobacco-related companies comprise 0.66% of the benchmark ($1.0 billion of a $156.8 billion global equity portfolio). The tracking error of the constrained index compared to the unconstrained index is 0.056%. On a base of $156.8 billion, the risk to the portfolio is expected to lead to a performance discrepancy greater than:

- $112.6 million 1 out of every 5 years (1.282 standard deviations)
- $144.4 million 1 out of every 10 years (1.645 standard deviations)
- $172.1 million 1 out of every 20 years (1.960 standard deviations)

Emerging Markets – Permissible Countries and Principles

There are three parts to the calculation of the historic exclusion of "non-permissible" emerging markets countries and the ongoing "principles-based" investment guidelines.

First, from late 2002 through 2007, Wilshire conducted on CalPERS' behalf an annual study that assessed the "investibility" of each Emerging Markets country based on a number of market, legal, and human rights factors. The end result of this annual report was the prohibition of certain countries from investment by CalPERS' external managers.

Second, beginning January 1, 2008, CalPERS elucidated a set of principles governing Emerging Markets investments to both the external managers and internal portfolio managers. These principles were intended to guide managers in their selection of companies that comply with the principles and no longer excluded entire countries en masse. Staff enlisted the aid of KLD, a socially-responsible investment specialist data firm, to apply these principles to the entirety of CalPERS' index (opportunity set) to calculate which companies should ideally be excluded from investment consideration. In our analysis, below, we compare the broad index to an index that excludes these companies that fail the principles test to calculate the performance impact of the principles from 2008 through 2014.

Finally, using the KLD list of excluded companies outlined above, we calculate the projected tracking error that should result from the exclusion of these companies over time. As is the case with Tobacco, this tracking error means that the restrictions can lead the portfolio to outperform or underperform an unconstrained portfolio at any time.

Wilshire has obtained from the three external managers employed over this time period their performance of both the CalPERS portfolio and a representative composite portfolio for other clients who did not have the same country restrictions as CalPERS. We then re-scaled the portfolio holdings on a pro rata basis to simulate the hypothetical portfolio performance CalPERS would have had over this time period, without the "non-permissible" country

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restriction. The table below indicates the quarterly gain or loss both the actual portfolio and hypothetical portfolio experienced.

Table 4 – Quarterly Comparison of Manager Gains and Losses

	AllianceBernstein		DFA		Genesis	
	Actual Appreciation	Unrestricted Appreciation	Actual Appreciation	Unrestricted Appreciation	Actual Appreciation	Unrestricted Appreciation
4Q2002	$28,973,206	$22,772,651	$28,307,398	$22,662,217	$18,504,266	$19,813,341
1Q2003	($28,282,335)	($10,480,663)	($22,409,165)	($11,956,559)	($36,364,772)	($19,083,091)
2Q2003	$109,582,152	$109,641,998	$101,746,807	$103,673,182	$77,399,067	$99,681,993
3Q2003	$73,245,303	$86,719,858	$63,749,471	$60,646,004	$59,806,629	$88,176,985
4Q2003	$119,995,269	$178,354,276	$116,574,003	$116,487,750	$64,548,719	$113,657,652
1Q2004	$54,083,391	$38,472,591	$67,569,379	$59,271,189	$71,430,007	$69,379,986
2Q2004	($57,022,255)	($58,384,661)	($48,950,151)	($52,695,692)	($43,603,753)	($56,410,751)
3Q2004	$111,204,227	$119,865,147	$69,034,872	$76,732,765	$43,668,666	$73,633,311
4Q2004	$227,740,883	$246,297,736	$226,329,109	$198,218,973	$184,756,832	$170,516,623
1Q2005	$24,049,455	$21,215,567	$21,327,180	$13,220,826	$11,909,152	$28,127,940
2Q2005	$32,984,459	$28,975,704	$42,625,000	$48,371,023	$62,429,054	$81,762,986
3Q2005	$275,922,641	$257,015,687	$249,783,975	$216,052,778	$221,654,526	$234,785,197
4Q2005	$76,819,934	$82,149,309	$119,492,440	$124,248,227	$94,251,791	$106,850,000
1Q2006	$190,255,080	$229,421,860	$134,458,334	$170,429,194	$160,845,619	$203,866,936
2Q2006	($110,406,140)	($107,754,994)	($99,340,983)	($99,967,055)	($98,689,832)	($115,942,072)
3Q2006	$118,157,422	$72,733,134	$101,622,465	$95,852,661	$78,626,048	$117,882,819
4Q2006	$217,279,858	$267,964,091	$265,248,875	$257,392,121	$204,631,033	$269,187,465
1Q2007	$66,796,635	$68,125,909	$94,153,569	$78,693,079	$30,986,303	$42,003,650
2Q2007	$239,865,704	$286,523,554	$244,608,155	$257,516,188	$222,335,351	$294,147,270
3Q2007	$145,047,812	$173,107,800	$135,446,600	$123,496,661	$109,397,737	$142,475,654
4Q2007	($6,861,247)	$1,327,124	$58,185,960	$44,747,979	$50,254,517	$73,726,349

The next table calculates the quarterly performance difference between the actual and hypothetical portfolios.

Table 5 – Quarterly Gain / Loss Impact of Permissible Country Report

	AllianceBernstein	DFA	Genesis
4Q2002	$6,200,555	$5,645,181	($1,309,075)
1Q2003	($17,801,672)	($10,452,606)	($17,281,681)
2Q2003	($59,846)	($1,926,375)	($22,282,926)
3Q2003	($13,474,555)	$3,103,467	($28,370,356)
4Q2003	($58,359,007)	$86,253	($49,108,933)
1Q2004	$15,610,800	$8,298,190	$2,050,021
2Q2004	$1,362,406	$3,745,541	$12,806,998
3Q2004	($8,660,920)	($7,697,893)	($29,964,645)
4Q2004	($18,556,853)	$28,110,136	$14,240,209
1Q2005	$2,833,888	$8,106,354	($16,218,788)
2Q2005	$4,008,755	($5,746,023)	($19,333,932)
3Q2005	$18,906,954	$33,731,197	($13,130,671)
4Q2005	($5,329,375)	($4,755,787)	($12,598,209)
1Q2006	($39,166,780)	($35,970,860)	($43,021,317)
2Q2006	($2,651,146)	$626,072	$17,252,240
3Q2006	$45,424,288	$5,769,804	($39,256,771)
4Q2006	($50,684,233)	$7,856,754	($64,556,432)
1Q2007	($1,329,274)	$15,460,490	($11,017,347)
2Q2007	($46,657,850)	($12,908,033)	($71,811,919)
3Q2007	($28,059,988)	$11,949,939	($33,077,917)
4Q2007	($8,188,371)	$13,437,981	($23,471,832)

Finally, we calculate the present value of the permissible country analysis in the table below.

Table 6 –Present Value of Impacts of Permissible Country Report

	Total Annual Impact of Permissible Markets Report		Total Fund		CPI
4Q2002	10,536,661	-9.55%	9,530,410	2.39%	10,788,487
2003	(215,928,237)	23.23%	(254,344,042)	1.88%	(208,996,377)
2004	21,343,990	13.21%	(263,779,359)	3.25%	(193,751,090)
2005	(9,525,637)	10.41%	(301,756,046)	3.42%	(210,228,791)
2006	(198,378,381)	15.47%	(577,505,223)	2.55%	(419,026,655)
2007	(195,674,121)	9.99%	(850,419,961)	4.06%	(639,657,627)
2008	0	-27.10%	(619,956,151)	0.10%	(640,297,285)
2009	0	11.84%	(693,383,758)	2.72%	(657,713,371)
2010	0	12.46%	(779,768,974)	1.50%	(667,579,071)
2011	0	1.11%	(788,438,445)	2.96%	(687,339,412)
2012	0	13.26%	(892,950,691)	1.74%	(699,299,118)
2013	0	16.21%	(1,037,697,999)	1.50%	(709,788,604)
2014	0	6.52%	(1,105,355,908)	0.76%	(715,182,998)

The present value of the impact of the Permissible Country Report, therefore, cost CalPERS between $715.2 million and $1.10 billion by the end of 2014, depending on the methodology used.

Next, for the period 2008 to 2014, we can calculate the impact of the Emerging Markets principles by comparing the performance of the comprehensive Global Equity index to that which excludes companies on the KLD list.

Again, beginning with this update, Wilshire has calculated the quarterly impacts on the total global equity portfolio, rather than simply for the emerging market equity benchmarks starting with the 2013 calculation. For years prior to 2013, Wilshire used the previously calculated estimates so as to be consistent with what was presented to the Investment Committee and the public.

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Table 7 – Present Value of Impact of EM Principles for 2008-2012

	Total Annual Impact of Principles		Total Fund		CPI
2008	$8,938,064	-27.10%	$6,515,849	0.10%	$8,947,002
2009	$90,611,951	11.84%	$108,631,617	2.72%	$102,266,957
2010	($68,785,959)	12.46%	$44,809,829	1.50%	$33,983,213
2011	($132,799,284)	1.11%	-$88,967,722	2.96%	-$101,741,027
2012	$15,511,539	13.26%	$ (83,193,242)	1.74%	-$87,729,882
2013	$51,260,159	16.21%	$ (37,109,435)	1.50%	-$37,016,768
2014	$195,382,107	6.52%	$ 168,592,051	0.76%	$159,568,916

A simple summation of the impacts of the Emerging Markets Principles reveals that the Principles added value of $160.1 million between 2008 and 2014 (with more than all of that total occurring in 2014), or generated a gain of $159.6 million to $168.6 million by the end of 2014, depending on the methodology used.

Finally, using the same analysis as we performed for Tobacco, we can estimate the tracking error that should result from the exclusion of the KLD list of companies. Using index data as of December 31, 2014, Wilshire estimated the tracking error (excess risk) that may occur from excluding prohibited securities on the basis of the EM Principles. All calculations were performed using Wilshire's Atlas GR6 global risk model. As noted elsewhere in this report, in any given period this tracking error can generate outperformance or underperformance, since tracking error measures deviation from the benchmark with no prejudice toward positive or negative tracking.

We calculated that the prohibited twenty-one companies comprise 0.29% of the benchmark ($0.5 billion of a $156.8 billion global equity portfolio). The tracking error of the constrained index compared to the unconstrained index is 0.056%. On a base of $156.8 billion, the risk to the portfolio is expected to lead to a performance discrepancy greater than:

- $68.3 million 1 out of every 5 years (1.282 standard deviations)
- $87.7 million 1 out of every 10 years (1.645 standard deviations)
- $104.5 million 1 out of every 20 years (1.960 standard deviations).

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Iran and Sudan Divestment

As with Tobacco and Firearms (below) there are three components to calculating the costs of the Iran/Sudan divestment:

- Explicit and implicit costs of divestment of securities,
- Actual impact of divested securities versus the non-divested securities for the period 6/30/2011 to 12/31/2014,
- Projected future tracking error of Iran/Sudan-free portfolio versus the standard portfolio.

At the time of divestment, Staff estimated the transaction costs to divest of the Iran/Sudan securities as $2.4 million, including the transactions costs (commissions) and market impact costs. Using the same methodology as above, we can calculate the present day value of these costs.

Table 8 – Present Value of Initial Iran/Sudan Divestment Transactions Costs

	Total Fund		CPI	
	Return	Value	Return	Value
2H2011	-4.51%	$2,291,760	-0.02%	$2,399,520
2012	13.26%	$2,595,547	1.74%	$2,441,272
2013	16.21%	$3,016,285	1.50%	$2,477,891
2014	6.52%	$3,212,946	0.76%	$2,496,723

Depending on the methodology used, the initial cost of $2.4 million would have grown to between $2.50 million and $3.21 million by the end of 2014, had it not been realized.

Between 6/30/2011 and 12/31/2014, we can calculate the value of the impact of the exclusion of these companies by comparing the Iran/Sudan-free benchmarks that CalPERS uses against the performance of the standard benchmarks. Multiplying the performance difference between these benchmarks by the assets in the portfolio on a frequent basis results in an approximate value of the dollar impact of the Iran/Sudan exclusion.

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Table 9 – Present Value of all Impacts of Iran/Sudan Security Exclusion

	Total Annual Impact of Iran/Sudan Exclusion	Total	Fund		CPI
2H2011	($5,779,270)	-4.51%	($5,518,625)	-0.02%	($5,778,114)
2012	($2,435,361)	13.26%	($2,758,182)	1.74%	($2,477,736)
2013	($84,749,276)	16.21%	($98,487,133)	1.50%	($86,020,515)
2014	($44,052,688)	6.52%	($46,924,924)	0.76%	($44,387,489)

Therefore, the impact of the Iran/Sudan Exclusion over the three and a half years it has been in place has cost the fund between $46.89 million and $50.14 million by the end of 2014, depending on the methodology used.

On a forward looking basis, we have also calculated the probable impact of an Iran/Sudan-free portfolio relative to an all-inclusive portfolio. Using index data as of December 31, 2014, Wilshire calculated the estimated tracking error (excess risk) that would occur from excluding prohibited securities. All calculations were performed using Wilshire's Atlas GR6 global risk model, a software system that is generally recognized as an industry-leading risk system. Please note that in any given period, this tracking error is equally likely to generate outperformance as underperformance.

We calculated that the prohibited sixteen Iran/Sudan-related companies comprise 0.23% of the benchmark ($361 million of a $156.8 billion global equity portfolio). The tracking error of the constrained index compared to the unconstrained index is 0.036%. On a base of $156.8 billion, the risk to the portfolio is expected to lead to a performance discrepancy greater than:

- $72.4 million 1 out of every 5 years (1.282 standard deviations)
- $92.9 million 1 out of every 10 years (1.645 standard deviations)
- $110.6 million 1 out of every 20 years (1.960 standard deviations).

Firearms Divestment

As with Tobacco and Iran/Sudan there are three components to calculating the costs of the Iran/Sudan divestment:

- Explicit and implicit costs of divestment of securities,

Wilshire

- Actual impact of divested securities versus the non-divested securities for the period 3/31/2013 to 12/31/2014,
- Projected future tracking error of Firearm-free portfolio versus the standard portfolio.

At the time of divestment, Staff estimated the transaction costs to divest of the Firearms securities as $8.1 million, including the transactions costs (commissions) and market impact costs. Using the same methodology as above, we can calculate the present day value of these costs.

Table 10 – Present Value of Initial Firearms Divestment Transactions Costs

	Total Fund		CPI	
	Return	Value	Return	Value
Partial 2013	11.18%	$9,005,580	0.12%	$8,109,720
2014	6.52%	$9,592,744	0.76%	$8,171,354

Depending on the methodology used, the initial cost of $8.1 million would have grown to between $8.17 million and $9.60 million by the end of 2014.

Between 3/31/2013 and 12/31/2014, we can calculate the value of the impact of the exclusion of these companies by comparing the Firearm-free benchmarks that CalPERS uses against the performance of the standard benchmarks. Multiplying the performance difference between these benchmarks by the assets in the portfolio on a frequent basis results in an approximate value of the dollar impact of the Firearm exclusion.

Table 11 – Present Value of all Impacts of Iran/Sudan Security Exclusion

	Total Annual Impact of Firearms Exclusion	Total Fund		CPI	
Partial 2013	$602,631	11.18%	$670,005	0.12%	$603,354
2014	($4,447,568)	6.52%	($4,737,549)	0.76%	($4,481,369)

Therefore, the impact of the Firearm Exclusion over the one and three-quarters years it has been in place has cost the fund between $12.65 million and $14.33 million by the end of 2014, depending on the methodology used.

On a forward looking basis, we have also calculated the probable impact of a firearm-free portfolio relative to a firearm-inclusive portfolio. Using index data as of December 31, 2014, Wilshire calculated the estimated tracking error (excess risk) that would occur from excluding prohibited these securities. All calculations were performed using Wilshire's Atlas GR6 global risk model, a software system that is generally recognized as an industry-leading risk system. Please note that in any given period, this tracking error is equally likely to generate outperformance as underperformance.

We calculated that the prohibited four Firearm-related companies comprise 0.02% of the benchmark ($31 million of a $156.8 billion global equity portfolio). The tracking error of the constrained index compared to the unconstrained index is 0.002%. On a base of $156.8 billion, the risk to the portfolio is expected to lead to a performance discrepancy greater than:

- $4.0 million 1 out of every 5 years (1.282 standard deviations)
- $5.2 million 1 out of every 10 years (1.645 standard deviations)
- $6.1 million 1 out of every 20 years (1.960 standard deviations).

Conclusion

The generally accepted academic argument is that limiting the opportunity set for investments has a deleterious impact on performance over long periods of time. For example, over a market cycle, a portfolio that can choose from all 500 stocks in the S&P 500 should outperform one that can only select from 450 stocks. The analyses contained in this report generally confirm this argument, with a few exceptions.

Any investor who wishes to divest from certain securities or exclude certain securities should therefore weigh the political, social, or moral benefits of such exclusions against the possible cost of owning a suboptimal portfolio.

If you have any additional questions, please do not hesitate to contact me.

Best regards,

[i] The "Total Global Equity" return for 2001 is the return for Domestic Equities only as there was no non-US tobacco restriction in 2001.