

DAVID Y. IGE
GOVERNOR



DEPT. COMM. NO. 209

CRAIG K. HIRAI
DIRECTOR
ROBERT YU
DEPUTY DIRECTOR

EMPLOYEES' RETIREMENT SYSTEM
HAWAII' EMPLOYER-UNION HEALTH BENEFITS TRUST FUND
OFFICE OF THE PUBLIC DEFENDER

STATE OF HAWAII'
DEPARTMENT OF BUDGET AND FINANCE
P.O. BOX 150
HONOLULU, HAWAII' 96810-0150

ADMINISTRATIVE AND RESEARCH OFFICE
BUDGET, PROGRAM PLANNING AND
MANAGEMENT DIVISION
FINANCIAL ADMINISTRATION DIVISION
OFFICE OF FEDERAL AWARDS MANAGEMENT (OFAM)

December 26, 2019

The Honorable Ronald D. Kouchi
President and Members
of the Senate
Thirtieth State Legislature
State Capitol, Room 409
Honolulu, Hawaii 96813

The Honorable Scott K. Saiki
Speaker and Members of the
House of Representatives
Thirtieth State Legislature
State Capitol, Room 431
Honolulu, Hawaii 96813

Dear President Kouchi, Speaker Saiki and Members of the Legislature:

For your information and consideration, I am transmitting a copy of the Actuarial Asset and Liability Stress Test 2019 report, as required by Act 85, Session Laws of Hawaii 2017. In accordance with Section 93-16, Hawaii Revised Statutes, a copy of this report has been transmitted to the Legislative Reference Bureau and the report may be viewed electronically at <http://ers.ehawaii.gov/resources/reports-to-legislature>.

Sincerely,

CRAIG K. HIRAI
Director of Finance

Enclosure

c: Legislative Reference Bureau

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Legislative Auditor: auditors2@auditor.state.hi.us
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December 24, 2019

Board of Trustees
Employees' Retirement System of
The State of Hawaii
City Financial Tower
201 Merchant St., Ste. 1400
Honolulu, HI 96813-2980

Re: Stress Test Annual Report

Dear Members of the Board:

The purpose of this report is to provide the Employees' Retirement System of the State of Hawaii (ERS) with the information it must submit to the legislature as required by ACT – 85 (2017). Act – 85 (2017) requires that the actuary of the ERS perform an annual stress test as defined by the legislation and described below.

Requirements of Annual Stress Test Report

The annual stress test must address the following scenarios:

1. A 30-year projection of the ERS's assets, liabilities, pension debt, service costs, employee contributions, employer contributions, net amortization, benefit payments, payroll, and funded ratio assuming the current actuarial assumptions are met. See Stress Test Exhibit 1.
2. Two 30-year projections of the same items above assuming the actual investment performance in future years is 2% less than the assumed rate of return, but with two different contribution policies.
 - a. The first scenario shows the projected items assuming that the employer contribution rate in future years would increase if necessary to meet the current funding policy. In other words, if the funding period in a future year exceeds 30 years, the contribution rates would be adjusted to bring the funding period down to 30 years. See Stress Test Exhibit 2A.
 - b. The second scenario shows the projected items assuming no change in the current statutory contribution rates. See Stress Test Exhibit 2B.

3. Two 30-year projections of the same items above assuming the actual investment performance in the first year is a negative 20% followed by a 20-year period where investment performance is 2% less than the assumed rate of return, but with two different contribution policies.
 - a. The first scenario shows the projected items assuming that the employer contribution rate in future years would increase if necessary to meet the current funding policy. In other words, if the funding period in a future year exceeds 30 years, the contribution rates would be adjusted to bring the funding period down to 30 years. See Stress Test Exhibit 3A.
 - b. The second scenario shows the projected items assuming no change in the current statutory contribution rates. See Stress Test Exhibit 3B.
4. The estimated actuarial accrued liability, the total normal cost for each benefit tier, and the employer normal cost for each benefit tier under the current investment return assumption and using the 10-year average of the 30-year treasuries notes as of the valuation date. See Stress Test Exhibit 4.

Stress Test Summary Results

The information required by the legislation is contained in the tables that follow this letter. The following is some brief commentary concerning the results themselves.

1. As shown in Stress Test Exhibit 1, the ERS is expected to be fully funded (100% funded ratio) in fiscal year ending 2045.
2. Stress Test Exhibits 2A and 2B are nearly identical. This is because the funding period at future valuation dates under both scenarios is never expected to exceed 30 years. The impact of the underperformance is a lengthening of the period of time until the plan is fully funded, but it is never expected to be more than 30 years from a future valuation date. Please note that while it is true that in aggregate the funding period would not exceed 30 years, if the Police and Firefighters were calculated independently, the funding period would barely exceed 30 years in 2040. A small increase in the Police and Firefighter rates is the difference between the two projections.
3. Under the first part of the 3rd Stress Test (see Stress Test Exhibit 3A) the employer contribution rates would ultimately increase to 26.00% of pay for All Other Employees and 48.50% of pay for Police and Firefighters in 2024 and remain at those levels for the foreseeable future. As shown in Stress Test Exhibit 3B (Employer Contributions remain at statutory rates) the funded ratio would decline below 35% but the trust is never exhausted. The funded ratio would begin to slowly climb once the 20-year period of 5% returns ends.
4. The 10-year average of the 30-year treasury notes is 3.29% as of July 1, 2019.

Based on the information reviewed for this report, the stress test shows that the System is sustainable in return environments much lower than currently assumed.

Disclosures

The information contained in this report is based on the preliminary valuation results of the ERS as of June 30, 2019. While the actual valuation results may be slightly different, it is not expected that those changes will have any material impact on the information contained herein.

Except as noted, the data, financial information, and actuarial methods and assumptions are those used in the June 30, 2019 actuarial valuation. These assumptions are detailed in the actuarial valuation report dated January 2020. The results of the actuarial valuation and this "Stress Test" are dependent on the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. Based on the scope of this engagement, we have not performed analysis on the potential range of future measurements based on other factors. The actuarial calculations are intended to provide information for rational decision making.

Joe Newton is a member of the American Academy of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

We look forward to discussing the results of this analysis with the Board.

Sincerely,



Lewis Ward
Consultant



Joseph P. Newton
Pension Market Leader and Actuary

Enclosures

Hawaii Employees' Retirement System

Stress Test Exhibit 1

(Dollar Amounts in \$ Millions)

Valuation Date (1)	Market Value of Assets (2)	Actuarial Value of Assets (3)	Actuarial Accrued Liability (4)	Unfunded		Normal Cost (6)	Projected Employee Contributions (7)	Projected Employer Contributions (8)	Net Amortization (9)	Benefit Payments (10)	Covered Payroll (11)	Funded Ratio (12)
				Actuarial Accrued Liability (5)								
30-Jun-19	\$ 17,227	\$ 17,322	\$ 31,396	\$ 14,074	\$ 656	\$ 281	\$ 1,067	\$ 270	\$ 1,568	\$ 4,520	55.2%	
30-Jun-20	\$ 18,291	\$ 18,291	\$ 32,614	\$ 14,324	\$ 670	\$ 296	\$ 1,202	\$ 146	\$ 1,662	\$ 4,633	56.1%	
30-Jun-21	\$ 19,385	\$ 19,385	\$ 33,833	\$ 14,448	\$ 686	\$ 312	\$ 1,235	\$ 121	\$ 1,758	\$ 4,761	57.3%	
30-Jun-22	\$ 20,506	\$ 20,506	\$ 35,054	\$ 14,547	\$ 703	\$ 328	\$ 1,269	\$ 93	\$ 1,855	\$ 4,893	58.5%	
30-Jun-23	\$ 21,657	\$ 21,657	\$ 36,275	\$ 14,618	\$ 721	\$ 345	\$ 1,305	\$ 62	\$ 1,954	\$ 5,033	59.7%	
30-Jun-24	\$ 22,840	\$ 22,840	\$ 37,498	\$ 14,657	\$ 739	\$ 362	\$ 1,342	\$ 27	\$ 2,056	\$ 5,176	60.9%	
30-Jun-25	\$ 24,057	\$ 24,057	\$ 38,718	\$ 14,661	\$ 758	\$ 380	\$ 1,380	\$ (11)	\$ 2,159	\$ 5,326	62.1%	
30-Jun-26	\$ 25,308	\$ 25,308	\$ 39,935	\$ 14,626	\$ 777	\$ 398	\$ 1,420	\$ (54)	\$ 2,263	\$ 5,483	63.4%	
30-Jun-27	\$ 26,601	\$ 26,601	\$ 41,148	\$ 14,548	\$ 798	\$ 417	\$ 1,462	\$ (101)	\$ 2,367	\$ 5,647	64.6%	
30-Jun-28	\$ 27,937	\$ 27,937	\$ 42,359	\$ 14,422	\$ 819	\$ 437	\$ 1,506	\$ (153)	\$ 2,471	\$ 5,818	66.0%	
30-Jun-29	\$ 29,325	\$ 29,325	\$ 43,567	\$ 14,243	\$ 841	\$ 457	\$ 1,552	\$ (211)	\$ 2,574	\$ 5,998	67.3%	
30-Jun-30	\$ 30,770	\$ 30,770	\$ 44,775	\$ 14,005	\$ 865	\$ 478	\$ 1,600	\$ (274)	\$ 2,677	\$ 6,186	68.7%	
30-Jun-31	\$ 32,281	\$ 32,281	\$ 45,984	\$ 13,703	\$ 890	\$ 499	\$ 1,650	\$ (344)	\$ 2,781	\$ 6,382	70.2%	
30-Jun-32	\$ 33,865	\$ 33,865	\$ 47,195	\$ 13,330	\$ 915	\$ 522	\$ 1,702	\$ (421)	\$ 2,885	\$ 6,586	71.8%	
30-Jun-33	\$ 35,528	\$ 35,528	\$ 48,407	\$ 12,879	\$ 942	\$ 544	\$ 1,757	\$ (504)	\$ 2,988	\$ 6,797	73.4%	
30-Jun-34	\$ 37,279	\$ 37,279	\$ 49,623	\$ 12,344	\$ 969	\$ 568	\$ 1,813	\$ (596)	\$ 3,090	\$ 7,019	75.1%	
30-Jun-35	\$ 39,130	\$ 39,130	\$ 50,846	\$ 11,716	\$ 998	\$ 592	\$ 1,872	\$ (697)	\$ 3,192	\$ 7,248	77.0%	
30-Jun-36	\$ 41,090	\$ 41,090	\$ 52,077	\$ 10,987	\$ 1,028	\$ 618	\$ 1,934	\$ (807)	\$ 3,292	\$ 7,487	78.9%	
30-Jun-37	\$ 43,173	\$ 43,173	\$ 53,319	\$ 10,146	\$ 1,059	\$ 643	\$ 1,998	\$ (926)	\$ 3,390	\$ 7,736	81.0%	
30-Jun-38	\$ 45,391	\$ 45,391	\$ 54,576	\$ 9,185	\$ 1,092	\$ 670	\$ 2,065	\$ (1,056)	\$ 3,486	\$ 7,997	83.2%	
30-Jun-39	\$ 47,762	\$ 47,762	\$ 55,854	\$ 8,092	\$ 1,127	\$ 698	\$ 2,136	\$ (1,199)	\$ 3,580	\$ 8,269	85.5%	
30-Jun-40	\$ 50,303	\$ 50,303	\$ 57,159	\$ 6,856	\$ 1,163	\$ 726	\$ 2,209	\$ (1,353)	\$ 3,671	\$ 8,552	88.0%	
30-Jun-41	\$ 53,031	\$ 53,031	\$ 58,495	\$ 5,464	\$ 1,201	\$ 754	\$ 2,286	\$ (1,521)	\$ 3,759	\$ 8,847	90.7%	
30-Jun-42	\$ 55,967	\$ 55,967	\$ 59,870	\$ 3,903	\$ 1,240	\$ 784	\$ 2,366	\$ (1,703)	\$ 3,846	\$ 9,155	93.5%	
30-Jun-43	\$ 59,133	\$ 59,133	\$ 61,291	\$ 2,158	\$ 1,281	\$ 815	\$ 2,449	\$ (1,900)	\$ 3,929	\$ 9,474	96.5%	
30-Jun-44	\$ 62,549	\$ 62,549	\$ 62,765	\$ 216	\$ 1,325	\$ 846	\$ 2,536	\$ (2,113)	\$ 4,012	\$ 9,806	99.7%	
30-Jun-45	\$ 66,240	\$ 66,240	\$ 64,297	\$ (1,943)	\$ 1,369	\$ 878	\$ 2,626	\$ (2,344)	\$ 4,095	\$ 10,150	103.0%	
30-Jun-46	\$ 70,228	\$ 70,228	\$ 65,895	\$ (4,332)	\$ 1,416	\$ 911	\$ 2,718	\$ (2,593)	\$ 4,178	\$ 10,507	106.6%	
30-Jun-47	\$ 74,537	\$ 74,537	\$ 67,564	\$ (6,973)	\$ 1,464	\$ 944	\$ 2,814	\$ (2,861)	\$ 4,261	\$ 10,877	110.3%	
30-Jun-48	\$ 79,196	\$ 79,196	\$ 69,312	\$ (9,884)	\$ 1,515	\$ 980	\$ 2,914	\$ (3,153)	\$ 4,344	\$ 11,260	114.3%	
30-Jun-49	\$ 84,232	\$ 84,232	\$ 71,144	\$ (13,088)	\$ 1,567	\$ 1,015	\$ 3,017	\$ (3,466)	\$ 4,430	\$ 11,658	118.4%	

Hawaii Employees' Retirement System

Stress Test Exhibit 2A - Actual Returns are 5% (2% Less than Assumed)

Scenario A - Contribution Rates Adjusted if Necessary to Keep Future Valuations' Funding Periods at 30 Years or Less
(Dollar Amounts in \$ Millions)

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Unfunded			Normal Cost	Projected Employee Contributions	Projected Employer Contributions	Net Amortization	Benefit Payments	Covered Payroll	Funded Ratio
			Actuarial Accrued Liability	Actuarial Accrued Liability	Actuarial Accrued Liability							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
30-Jun-19	\$ 17,227	\$ 17,322	\$ 31,396	\$ 14,074	\$ 656	\$ 281	\$ 1,067	\$ 270	\$ 1,568	\$ 4,520	55.2%	
30-Jun-20	17,947	18,205	32,614	14,410	670	296	1,202	152	1,662	4,633	55.8%	
30-Jun-21	18,659	19,113	33,833	14,720	686	312	1,235	140	1,758	4,761	56.5%	
30-Jun-22	19,359	19,935	35,054	15,119	703	328	1,269	133	1,855	4,893	56.9%	
30-Jun-23	20,045	20,659	36,275	15,616	721	345	1,305	132	1,954	5,033	57.0%	
30-Jun-24	20,718	21,361	37,498	16,136	739	362	1,342	131	2,056	5,176	57.0%	
30-Jun-25	21,375	22,043	38,718	16,675	758	380	1,380	130	2,159	5,326	56.9%	
30-Jun-26	22,016	22,707	39,935	17,228	777	398	1,420	129	2,263	5,483	56.9%	
30-Jun-27	22,642	23,354	41,148	17,795	798	417	1,462	127	2,367	5,647	56.8%	
30-Jun-28	23,254	23,986	42,359	18,373	819	437	1,506	124	2,471	5,818	56.6%	
30-Jun-29	23,854	24,607	43,567	18,961	841	457	1,552	120	2,574	5,998	56.5%	
30-Jun-30	24,445	25,218	44,775	19,557	865	478	1,600	115	2,677	6,186	56.3%	
30-Jun-31	25,031	25,823	45,984	20,161	890	499	1,650	108	2,781	6,382	56.2%	
30-Jun-32	25,613	26,424	47,195	20,771	915	522	1,702	100	2,885	6,586	56.0%	
30-Jun-33	26,192	27,023	48,407	21,384	942	544	1,757	91	2,988	6,797	55.8%	
30-Jun-34	26,773	27,623	49,623	22,000	969	568	1,813	79	3,090	7,019	55.7%	
30-Jun-35	27,361	28,230	50,846	22,616	998	592	1,872	66	3,192	7,248	55.5%	
30-Jun-36	27,958	28,845	52,077	23,231	1,028	618	1,934	51	3,292	7,487	55.4%	
30-Jun-37	28,569	29,477	53,319	23,842	1,059	643	1,998	33	3,390	7,736	55.3%	
30-Jun-38	29,202	30,130	54,576	24,447	1,092	670	2,065	12	3,486	7,997	55.2%	
30-Jun-39	29,864	30,812	55,854	25,043	1,127	698	2,136	(12)	3,580	8,269	55.2%	
30-Jun-40	30,562	31,531	57,159	25,628	1,163	726	2,210	(40)	3,671	8,552	55.2%	
30-Jun-41	31,305	32,297	58,495	26,198	1,201	754	2,287	(71)	3,759	8,847	55.2%	
30-Jun-42	32,103	33,119	59,870	26,751	1,240	784	2,368	(105)	3,846	9,155	55.3%	
30-Jun-43	32,965	34,007	61,291	27,285	1,281	815	2,452	(143)	3,929	9,474	55.5%	
30-Jun-44	33,900	34,969	62,765	27,796	1,325	846	2,538	(185)	4,012	9,806	55.7%	
30-Jun-45	34,916	36,015	64,297	28,283	1,369	878	2,628	(230)	4,095	10,150	56.0%	
30-Jun-46	36,021	37,152	65,895	28,743	1,416	911	2,720	(280)	4,178	10,507	56.4%	
30-Jun-47	37,224	38,390	67,564	29,174	1,464	944	2,816	(333)	4,261	10,877	56.8%	
30-Jun-48	38,533	39,737	69,312	29,574	1,515	980	2,915	(391)	4,344	11,260	57.3%	
30-Jun-49	39,958	41,204	71,144	29,940	1,567	1,015	3,017	(454)	4,430	11,658	57.9%	

Hawaii Employees' Retirement System
Stress Test Exhibit 2B - Actual Returns are 5% (2% Less than Assumed)
Scenario B - Contribution Rates Kept at Current Statutory Rates
(Dollar Amounts in \$ Millions)

Valuation Date	Market Value of Assets	Actuarial Value of Assets	Actuarial Accrued Liability	Unfunded		Normal Cost	Projected Employee Contributions	Projected Employer Contributions	Net Amortization	Benefit Payments	Covered Payroll	Funded Ratio
				Actuarial Accrued Liability	Normal Cost							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
30-Jun-19	\$ 17,227	\$ 17,322	\$ 31,396	\$ 14,074	\$ 656	\$ 281	\$ 1,067	\$ 270	\$ 1,568	\$ 4,520	55.2%	
30-Jun-20	17,947	18,205	32,614	14,410	670	296	1,202	152	1,662	4,633	55.8%	
30-Jun-21	18,659	19,113	33,833	14,720	686	312	1,235	140	1,758	4,761	56.5%	
30-Jun-22	19,359	19,935	35,054	15,119	703	328	1,269	133	1,855	4,893	56.9%	
30-Jun-23	20,045	20,659	36,275	15,616	721	345	1,305	132	1,954	5,033	57.0%	
30-Jun-24	20,718	21,361	37,498	16,136	739	362	1,342	131	2,056	5,176	57.0%	
30-Jun-25	21,375	22,043	38,718	16,675	758	380	1,380	130	2,159	5,326	56.9%	
30-Jun-26	22,016	22,707	39,935	17,228	777	398	1,420	129	2,263	5,483	56.9%	
30-Jun-27	22,642	23,354	41,148	17,795	798	417	1,462	127	2,367	5,647	56.8%	
30-Jun-28	23,254	23,986	42,359	18,373	819	437	1,506	124	2,471	5,818	56.6%	
30-Jun-29	23,854	24,607	43,567	18,961	841	457	1,552	120	2,574	5,998	56.5%	
30-Jun-30	24,445	25,218	44,775	19,557	865	478	1,600	115	2,677	6,186	56.3%	
30-Jun-31	25,031	25,823	45,984	20,161	890	499	1,650	108	2,781	6,382	56.2%	
30-Jun-32	25,613	26,424	47,195	20,771	915	522	1,702	100	2,885	6,586	56.0%	
30-Jun-33	26,192	27,023	48,407	21,384	942	544	1,757	91	2,988	6,797	55.8%	
30-Jun-34	26,773	27,623	49,623	22,000	969	568	1,813	79	3,090	7,019	55.7%	
30-Jun-35	27,361	28,230	50,846	22,616	998	592	1,872	66	3,192	7,248	55.5%	
30-Jun-36	27,958	28,845	52,077	23,231	1,028	618	1,934	51	3,292	7,487	55.4%	
30-Jun-37	28,569	29,477	53,319	23,842	1,059	643	1,998	33	3,390	7,736	55.3%	
30-Jun-38	29,202	30,130	54,576	24,447	1,092	670	2,065	12	3,486	7,997	55.2%	
30-Jun-39	29,864	30,812	55,854	25,043	1,127	698	2,136	(12)	3,580	8,269	55.2%	
30-Jun-40	30,562	31,531	57,159	25,628	1,163	726	2,209	(39)	3,671	8,552	55.2%	
30-Jun-41	31,305	32,296	58,495	26,199	1,201	754	2,286	(69)	3,759	8,847	55.2%	
30-Jun-42	32,101	33,117	59,870	26,753	1,240	784	2,366	(103)	3,846	9,155	55.3%	
30-Jun-43	32,961	34,003	61,291	27,288	1,281	815	2,449	(141)	3,929	9,474	55.5%	
30-Jun-44	33,894	34,962	62,765	27,802	1,325	846	2,536	(182)	4,012	9,806	55.7%	
30-Jun-45	34,907	36,006	64,297	28,292	1,369	878	2,626	(227)	4,095	10,150	56.0%	
30-Jun-46	36,010	37,141	65,895	28,754	1,416	911	2,718	(277)	4,178	10,507	56.4%	
30-Jun-47	37,210	38,376	67,564	29,188	1,464	944	2,814	(330)	4,261	10,877	56.8%	
30-Jun-48	38,517	39,721	69,312	29,591	1,515	980	2,914	(389)	4,344	11,260	57.3%	
30-Jun-49	39,940	41,186	71,144	29,958	1,567	1,015	3,017	(453)	4,430	11,658	57.9%	

Hawaii Employees' Retirement System

Stress Test Exhibit 3A - Negative 20% Return Followed by 20-Year Period with 5% Returns

Scenario A - Contribution Rates Adjusted if Necessary to Keep Future Valuations' Funding Periods at 30 Years or Less
(Dollar Amounts in \$ Millions)

Valuation Date (1)	Market Value of Assets (2)	Actuarial Value of Assets (3)	Actuarial Accrued Liability (4)	Unfunded		Projected Employee Contributions (7)	Projected Employer Contributions (8)	Net Amortization (9)	Benefit Payments (10)	Covered Payroll (11)	Funded Ratio (12)
				Actuarial Accrued Liability (5)	Normal Cost (6)						
30-Jun-19	\$ 17,227	\$ 17,322	\$ 31,396	\$ 14,074	\$ 656	\$ 281	\$ 1,067	\$ 270	\$ 1,568	\$ 4,520	55.2%
30-Jun-20	13,646	17,129	32,614	15,485	670	296	1,202	227	1,662	4,633	52.5%
30-Jun-21	14,143	16,852	33,833	16,981	686	312	1,278	254	1,758	4,761	49.8%
30-Jun-22	14,661	16,433	35,054	18,621	703	328	1,338	307	1,855	4,893	46.9%
30-Jun-23	15,183	15,858	36,275	20,417	721	345	1,437	332	1,954	5,033	43.7%
30-Jun-24	15,747	16,334	37,498	21,163	739	362	1,478	342	2,056	5,176	43.6%
30-Jun-25	16,295	16,838	38,718	21,879	758	380	1,520	350	2,159	5,326	43.5%
30-Jun-26	16,825	17,360	39,935	22,575	777	398	1,564	354	2,263	5,483	43.5%
30-Jun-27	17,338	17,885	41,148	23,263	798	417	1,610	357	2,367	5,647	43.5%
30-Jun-28	17,836	18,398	42,359	23,961	819	437	1,658	358	2,471	5,818	43.4%
30-Jun-29	18,321	18,899	43,567	24,669	841	457	1,708	357	2,574	5,998	43.4%
30-Jun-30	18,797	19,390	44,775	25,385	865	478	1,761	356	2,677	6,186	43.3%
30-Jun-31	19,265	19,874	45,984	26,111	890	499	1,816	353	2,781	6,382	43.2%
30-Jun-32	19,729	20,353	47,195	26,842	915	522	1,873	348	2,885	6,586	43.1%
30-Jun-33	20,190	20,829	48,407	27,578	942	544	1,933	342	2,988	6,797	43.0%
30-Jun-34	20,651	21,306	49,623	28,317	969	568	1,995	333	3,090	7,019	42.9%
30-Jun-35	21,120	21,789	50,846	29,056	998	592	2,060	323	3,192	7,248	42.9%
30-Jun-36	21,597	22,282	52,077	29,794	1,028	618	2,128	309	3,292	7,487	42.8%
30-Jun-37	22,090	22,790	53,319	30,528	1,059	643	2,198	293	3,390	7,736	42.7%
30-Jun-38	22,604	23,321	54,576	31,255	1,092	670	2,272	274	3,486	7,997	42.7%
30-Jun-39	23,148	23,882	55,854	31,973	1,127	698	2,350	251	3,580	8,269	42.8%
30-Jun-40	23,730	24,481	57,159	32,678	1,163	726	2,431	225	3,671	8,552	42.8%
30-Jun-41	24,828	25,246	58,495	33,249	1,201	754	2,516	186	3,759	8,847	43.2%
30-Jun-42	26,028	26,203	59,870	33,667	1,240	784	2,604	134	3,846	9,155	43.8%
30-Jun-43	27,344	27,381	61,291	33,910	1,281	815	2,696	68	3,929	9,474	44.7%
30-Jun-44	28,790	28,806	62,765	33,959	1,325	846	2,791	(16)	4,012	9,806	45.9%
30-Jun-45	30,382	30,388	64,297	33,910	1,369	878	2,890	(108)	4,095	10,150	47.3%
30-Jun-46	32,134	32,135	65,895	33,760	1,416	911	2,992	(210)	4,178	10,507	48.8%
30-Jun-47	34,060	34,061	67,564	33,503	1,464	944	3,098	(321)	4,261	10,877	50.4%
30-Jun-48	36,179	36,179	69,312	33,133	1,515	980	3,208	(445)	4,344	11,260	52.2%
30-Jun-49	38,508	38,508	71,144	32,636	1,567	1,015	3,321	(580)	4,430	11,658	54.1%

Hawaii Employees' Retirement System
Stress Test Exhibit 3B - Negative 20% Return Followed by 20-Year Period with 5% Returns
Scenario B - Contribution Rates Kept at Current Statutory Rates
(Dollar Amounts in \$ Millions)

Valuation Date (1)	Market Value of Assets (2)	Actuarial Value of Assets (3)	Unfunded		Normal Cost (6)	Projected Employee Contributions (7)	Projected Employer Contributions (8)	Net Amortization (9)	Benefit Payments (10)	Covered Payroll (11)	Funded Ratio (12)
			Actuarial Accrued Liability (4)	Actuarial Accrued Liability (5)							
30-Jun-19	\$ 17,227	\$ 17,322	\$ 31,396	\$ 14,074	\$ 656	\$ 281	\$ 1,067	\$ 270	\$ 1,568	\$ 4,520	55.2%
30-Jun-20	13,646	17,129	32,614	15,485	670	296	1,202	227	1,662	4,633	52.5%
30-Jun-21	14,143	16,852	33,833	16,981	686	312	1,235	298	1,758	4,761	49.8%
30-Jun-22	14,617	16,389	35,054	18,665	703	328	1,269	381	1,855	4,893	46.8%
30-Jun-23	15,066	15,740	36,275	20,535	721	345	1,305	476	1,954	5,033	43.4%
30-Jun-24	15,490	16,073	37,498	21,424	739	362	1,342	501	2,056	5,176	42.9%
30-Jun-25	15,886	16,422	38,718	22,296	758	380	1,380	523	2,159	5,326	42.4%
30-Jun-26	16,252	16,775	39,935	23,160	777	398	1,420	544	2,263	5,483	42.0%
30-Jun-27	16,590	17,120	41,148	24,029	798	417	1,462	563	2,367	5,647	41.6%
30-Jun-28	16,899	17,438	42,359	24,921	819	437	1,506	582	2,471	5,818	41.2%
30-Jun-29	17,181	17,730	43,567	25,837	841	457	1,552	601	2,574	5,998	40.7%
30-Jun-30	17,439	17,998	44,775	26,778	865	478	1,600	620	2,677	6,186	40.2%
30-Jun-31	17,674	18,241	45,984	27,743	890	499	1,650	639	2,781	6,382	39.7%
30-Jun-32	17,888	18,463	47,195	28,731	915	522	1,702	657	2,885	6,586	39.1%
30-Jun-33	18,082	18,664	48,407	29,743	942	544	1,757	676	2,988	6,797	38.6%
30-Jun-34	18,257	18,846	49,623	30,777	969	568	1,813	694	3,090	7,019	38.0%
30-Jun-35	18,419	19,014	50,846	31,832	998	592	1,872	711	3,192	7,248	37.4%
30-Jun-36	18,569	19,169	52,077	32,908	1,028	618	1,934	728	3,292	7,487	36.8%
30-Jun-37	18,711	19,316	53,319	34,002	1,059	643	1,998	744	3,390	7,736	36.2%
30-Jun-38	18,851	19,461	54,576	35,115	1,092	670	2,065	759	3,486	7,997	35.7%
30-Jun-39	18,995	19,610	55,854	36,245	1,127	698	2,136	772	3,580	8,269	35.1%
30-Jun-40	19,150	19,769	57,159	37,389	1,163	726	2,209	784	3,671	8,552	34.6%
30-Jun-41	19,697	20,040	58,495	38,455	1,201	754	2,286	789	3,759	8,847	34.3%
30-Jun-42	20,300	20,444	59,870	39,427	1,240	784	2,366	784	3,846	9,155	34.1%
30-Jun-43	20,969	20,999	61,291	40,292	1,281	815	2,449	769	3,929	9,474	34.3%
30-Jun-44	21,714	21,726	62,765	41,038	1,325	846	2,536	744	4,012	9,806	34.6%
30-Jun-45	22,546	22,551	64,297	41,747	1,369	878	2,626	714	4,095	10,150	35.1%
30-Jun-46	23,475	23,477	65,895	42,419	1,416	911	2,718	680	4,178	10,507	35.6%
30-Jun-47	24,513	24,513	67,564	43,051	1,464	944	2,814	640	4,261	10,877	36.3%
30-Jun-48	25,669	25,669	69,312	43,643	1,515	980	2,914	594	4,344	11,260	37.0%
30-Jun-49	26,958	26,958	71,144	44,186	1,567	1,015	3,017	543	4,430	11,658	37.9%

Hawaii Employees' Retirement System
Stress Test Exhibit 4 - Comparison of Cost Items at Current Investment Return Assumption
(7.0%)

All Other Employees

	<u>Valuation Assumptions</u>		<u>10-Year Average of 30-Year Treasuries</u>	
	<u>Hired Prior to July 1, 2012</u>	<u>Hired After June 30, 2012</u>	<u>Hired Prior to July 1, 2012</u>	<u>Hired After June 30, 2012</u>
Membership Tier				
Actuarial Accrued Liability	\$24,792	\$552	\$41,020	\$1,373
Total Normal Cost %	12.22%	11.85%	33.76%	28.99%
Employer Normal Cost %	7.83%	3.79%	29.37%	20.93%

Police and Fire Employees

	<u>Valuation Assumptions</u>		<u>10-Year Average of 30-Year Treasuries</u>	
	<u>Hired Prior to July 1, 2012</u>	<u>Hired After June 30, 2012</u>	<u>Hired Prior to July 1, 2012</u>	<u>Hired After June 30, 2012</u>
Membership Tier				
Actuarial Accrued Liability	\$5,980	\$73	\$10,171	\$183
Total Normal Cost %	27.11%	21.66%	73.05%	57.04%
Employer Normal Cost %	14.91%	7.46%	60.85%	42.84%

Dollar Amounts are in \$ Millions