



# Cavanaugh Macdonald

CONSULTING, LLC

*The experience and dedication you deserve*

February 18, 2019

Ms. Cynthia Wilkinson  
Policy, Planning and Compliance Director  
Virginia Retirement System  
1200 E. Main Street  
Richmond, VA 23219

Dear Ms. Wilkinson:

Enclosed are 13 original bound copies of the "Report on the Actuarial Valuation of the Line of Duty Act Fund Prepared as of June 30, 2018."

Please let us know if you have any questions concerning the report.

Sincerely yours,

Alisa Bennett, FSA, EA, FCA, MAAA  
Principal and Consulting Actuary

Larry Langer, ASA, EA, FCA, MAAA  
Principal and Consulting Actuary

Bradley R. Wild, ASA, FCA, MAAA  
Senior Actuary

AB/LL/BRW:ab

Enclosure

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**Cavanaugh Macdonald**  
CONSULTING, LLC

*The experience and dedication you deserve*



**Virginia**  
**Retirement**  
**System**

**Report on the Actuarial Valuation of the  
Line of Duty Act Fund**

**Prepared as of June 30, 2018**





# Cavanaugh Macdonald

CONSULTING, LLC

*The experience and dedication you deserve*

February 18, 2019

The Board of Trustees  
Virginia Retirement System  
1200 E. Main Street  
Richmond, VA 23219

Dear Trustees:

We are pleased to submit the results of the annual actuarial valuation of the Virginia Retirement System (VRS) Line of Duty Act Fund (Plan) prepared as of June 30, 2018.

Cavanaugh Macdonald Consulting, LLC (CMC) has relied on the plan provisions and eligibility provisions of the Commonwealth of Virginia's Line of Duty Program (LODA Program) provided by §9.1-400 et seq. of the Virginia Code (Code), including changes resulting from the passage of House Bill 1345 (HB 1345) from the 2016 legislative session, Item 269 of the 2016 Appropriations Act (the Act) and House Bill 2243 (HB 2243) from the 2017 legislative session. Additionally, CMC has received participant data from the Virginia Retirement System (VRS). CMC has reviewed the data for reasonableness only and has not performed a formal audit of the data used for this valuation. Because the census data was collected from a wide range of sources with varying and, at times, limited content, the data is incomplete. Adjustments have been made to account for this incompleteness. Along with the valuation results, commentary is provided regarding the various aspects of developing the cost structure for LODA Program benefits to be financed through the Plan.

The valuation results are provided on a blended, single group cost basis. Health care benefits were assumed to be uniform amongst Plan beneficiaries to reflect the changes brought about by the passage of HB 1345 (2016) and HB 2243 (2017). The legislation revised the Line of Duty Act by transferring overall administration of eligibility determinations to VRS and administration of health insurance benefits to the Department of Human Resource Management (DHRM) and creates state-wide health insurance plans for all LODA beneficiaries, with separate plans based on Medicare eligibility. The legislation became effective July 1, 2017 and is included in this valuation. Here, the assumed health care costs were based upon the premium amounts provided by the DHRM actuaries which used experience of those State Employees currently receiving health care benefits from the Plan.

Contribution rates for participating employer groups are established every two years. Based upon the June 30, 2017 valuation results, the Board approved rate for fiscal years 2019 and 2020 is \$705.77. The results of the June 30, 2018 valuation are for informational purposes only. The informational contribution rates assume Plan participation of 11,394.40 State Employee FTEs and 7,619.25 Political Subdivision Employee FTEs, for a total of 19,013.65 FTEs. The informational contribution rate of \$729.25 represents, in total, the estimated cost of providing benefits payable in fiscal years 2020 and 2021, including administrative expenses, if this were a rate setting year.



The Board of Trustees  
February 18, 2019  
Page 2

The results provided do not account for the potential long-term incurred but not reported claims resulting from a lack of employer or beneficiary education about the Plan's benefits. The potential cost and liability for these claims may be considerable. A margin for these costs may need to be considered as experience develops.

The promised death benefits and postemployment health care benefits provided through the Plan are included in all of the actuarially estimated contribution rates. The Plan is a cost-sharing, multiple-employer plan. The actuarially determined employer contribution rates were developed using the entry age normal cost method with projected benefits. As the Act requires contributions to be determined on a current disbursement basis, the Plan has minimal assets in trust solely to provide benefits. Therefore, the valuation results provided in this report reflect a discount rate of 4.75%. The assumed annual rate of return of 4.75% is assumed to be consistent with the long-term rate of return for Virginia's Local Government Investment Pool (LGIP). As the discount rate used for determining liabilities is based on the expected return on assets, the liability amounts in this report cannot be used to assess a settlement of the obligation. The unfunded accrued liability is being amortized by regular annual contributions as a level percentage of payroll within a 30-year period, on the assumption that payroll will increase by 3.00% annually. The assumptions recommended by the actuary are in the aggregate reasonably related to the experience under the Plan and to reasonable expectations of anticipated experience under the Plan.

Since the prior valuation, this valuation reflects revisions to the assumed per capita health care costs and updates to the assumed rates of health care inflation.

Our organization has only a contractual relationship with the Virginia Retirement System to provide actuarial consulting services, and we do not provide other services to nor have a financial interest in the Virginia Retirement System. There are no known interests or relationships that our firm has with the Virginia Retirement System that may impair or appear to impair the objectivity of our work.

This is to certify that the independent consulting actuary is a member of the American Academy of Actuaries and has experience in performing valuations for public retirement systems, that the valuation was prepared in accordance with the Actuarial Standards of Practice issued by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures based on the current provisions of the Plan and on actuarial assumptions that are internally consistent and reasonably based on the actual experience of VRS.

Future actuarial results may differ significantly from the current results presented in this report due to such factors as the following: potential variance in the number and/or type of covered lives; Plan experience differing from that anticipated by the economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the Plan's funded status); and changes in Plan provisions or applicable law. Since the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of results is not presented herein.



The Board of Trustees  
February 18, 2019  
Page 3

The undersigned are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

The Table of Contents, which immediately follows, outlines the material contained in the report.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read 'Alisa Bennett', with a stylized, cursive script.

Alisa Bennett, FSA, EA, FCA, MAAA  
Principal and Consulting Actuary

A handwritten signature in blue ink, appearing to read 'LL', with a stylized, cursive script.

Larry Langer, ASA, EA, FCA, MAAA  
Principal and Consulting Actuary

A handwritten signature in blue ink, appearing to read 'Bradley R. Wild', with a stylized, cursive script.

Bradley R. Wild, ASA, FCA, MAAA  
Senior Actuary

AB/LL/BRW:ab



## **Table of Contents**

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<b><u>Section</u></b>	<b><u>Item</u></b>	<b><u>Page No.</u></b>
I	Summary of Principal Results	1
II	Membership Data	4
III	Assets	7
IV	Comments on Valuation	8
V	Accounting Information	10
VI	Derivation of Experience Gains and Losses	12
 <b><u>Schedule</u></b>		
A	Results of the Valuation and Solvency Test	13
B	Plan Assets	15
C	Outline of Actuarial Assumptions and Methods	16
D	Actuarial Cost Method	47
E	Summary of Main Plan Provisions as Interpreted for Valuation Purposes	48
F	Schedules of Active Member Data	51
G	Projections	52



## Section I – Summary of Principal Results

1. For convenience of reference, the principal results of the valuation and a comparison with the preceding year's results are summarized below.

### LINE OF DUTY ACT FUND

	June 30, 2018	June 30, 2017
Number FTE Employees	19,013.65	18,733.80
Number Receiving Benefits	<u>1,115.00</u>	<u>1,037.00</u>
Total	20,128.65	19,770.80
Assets:		
Market Value	\$ 1,889,000	\$ 3,461,000
Actuarial Value	\$ 1,889,000	\$ 3,461,000
Unfunded Actuarial Accrued	\$291,952,709	\$266,917,941
Amortization Period (Years)		
Accrued Liability	30	30
Annual Required Contribution		
Normal Cost*	\$ 11,654,227	\$ 12,577,907
Accrued Liability	<u>12,293,466</u>	<u>11,239,385</u>
Total ARC	\$ 23,947,693	\$ 23,817,292
Contribution Per FTE Employee		
Normal Cost	\$ 586.65	\$ 650.05
Administrative Expenses	<u>26.29</u>	<u>21.35</u>
Total Adjusted Normal Cost	\$ 612.94	\$ 671.40
Accrued Liability	<u>646.56</u>	<u>599.95</u>
Total ARC	\$ 1,259.50	\$ 1,271.35
Expected Benefits Paid**:		
Total	\$ 13,056,015	\$ 12,321,577
Per FTE Employee	\$ 686.67	\$ 657.72
Discount Rate	4.75%	4.75%

\* Includes administrative expenses of \$500,000 as of June 30, 2018 and \$400,000 as of June 30, 2017.

\*\* Excludes administrative expenses.



## ***Section I – Summary of Principal Results (continued)***

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2. Results are based upon a blended, single group cost basis and the demographic assumptions specific to each employer group. Please refer to Schedule C for additional detail regarding the full set of actuarial assumptions used in the valuation.
3. The valuation as of June 30, 2018 indicates that the Actuarially Determined Employer Contribution is \$1,259.50 per FTE employee payable for the fiscal year ending June 30, 2018. Comments on the valuation results as of June 30, 2018 are given in Section IV.
4. The cost of the lump-sum death benefit for members who die in active service (payment for death occurring as a direct or proximate result of the performance of duty, or by presumptive clause, if still actively employed by a participating employer at the time of death) is payable by the Plan and is included in the actuarial valuation. The liability for the lump-sum benefit paid for death in active service could be segregated from the OPEB liability and assets could be split for active and post-employment purposes. As this may be administratively burdensome, VRS may desire to treat the Plan's entire liability as an OPEB liability for funding and/or accounting purposes.
5. Schedule C and Schedule D of this report outline the full set of actuarial assumptions and the actuarial cost method used in the current valuation. For this purpose, participants have been divided into five groups: VRS State Employees, VRS VaLORS, VRS SPORS, Group A, and Group B. Group A consists of the following VRS political subdivisions: City of Virginia Beach, City of Chesapeake, and the City of Portsmouth. Group B consists of all remaining employer groups, including the National Guard.
6. The main provisions of the Plan, as summarized in Schedule E, were taken into account in the current valuation. In accordance with the passage of HB 1345 (2016) and HB 2243 (2017), starting with the June 30, 2017 valuation, the following is considered:
  - Change in health care cost basis by using the DHRM actuary's estimates of the health care costs of the LODA Health Benefit Plans that provide health care benefits to all LODA Program beneficiaries.





### ***Section I – Summary of Principal Results (continued)***

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- Changes in LODA Program and Plan administration by estimating the administrative expenses of VRS as the administrator of the Line of Duty Death and Health Benefits Trust Fund.
- Change in benefits for Plan beneficiaries who become eligible for health care benefits as the result of a death or disability occurring after June 30, 2017, where the health care benefits of disabled employees and covered spouses/surviving spouses are discontinued, if a beneficiary is eligible for Medicare due to age (generally age 65).

Changes associated with HB 1345 (2016) and HB 2243 (2017) that were not considered in the June 30, 2018 valuation include the following. These changes were not considered because they are difficult to quantify with limited experience. These changes will continue to be monitored and will be revisited if and when sufficient experience develops.

- The discontinuance of spouse health care coverage if a covered spouse divorces a disabled employee or a covered surviving spouse remarries.
- The potential for VRS' periodic review of the disability status of a disabled employee.
- For those Plan beneficiaries who become eligible for health care benefits as the result of a disability occurring after June 30, 2017, the suspension of health care benefits in years when VRS verifies current income exceeds salary at the time of the disability, indexed for inflation.

Changes associated with HB 1345 (2016) and HB 2243 (2017) that are included in the plan provisions and assumed to be included in the premium rates as of June 30, 2018 include:

- The extension of health care benefits for dependent children to age 26.
- The expansion of the definition of presumption of death or disability to include infectious diseases.

7. The valuation reflects changes in the actuarial assumptions since the prior valuation, including:

- Updates to the assumed rates of health care inflation based on analysis of current national average trend studies.



## ***Section II – Membership Data***

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1. Data regarding the membership of the Plan for use as a basis of the valuation were furnished by VRS.

VRS collected active Plan participant data for the following participating employer groups:

- Virginia Law Enforcement Officers Retirement System (VaLORS)
  - State Police Officers Retirement System (SPORS)
  - Virginia State Lottery
  - Virginia Department of Conservation and Recreation
  - Virginia Department of Forestry
  - Virginia Department of Motor Vehicles
  - Virginia Department of Emergency Management
  - Virginia Air National Guard
  - Virginia Army National Guard
  - Virginia Port Authority
  - Fire companies or departments that provide fire protection services to Virginia National Guard or Virginia Air National Guard facilities
  - VRS Local Employers' Law Enforcement Officers of participating political subdivisions
  - VRS Local Employers' members performing hazardous duties for participating political subdivisions
  - Arlington County, Town of Appalachia, Town of Boones Mill and Town of Pocahontas (independent from VRS)
  - Law Enforcement, Firefighters, and EMTs of associated participating political subdivisions
2. For the eligible full-time equivalent employee estimate, various employee types are assumed to represent a fraction of a full-time employee.



***Section II – Membership Data (continued)***

3. The number of unique active lives used in the valuation and the estimate of covered lives is provided in the following table:

**THE NUMBER OF ACTIVE LIVES**

	Fiscal Year Ending 2017		Fiscal Year Ending 2018			
Group	Number	FTE Employees	Number	Weight	FTE Employees	Estimated Contributions
State/VaLORS/SPORS	9,734	9,734.00	9,830	100%	9,830.00	\$ 6,937,719
National Guard						
Full-Time	724	1,483.30	827	100%	1,564.40	\$ 1,104,107
Part-Time	7,593		7,374	10%		
<i>State Employees</i>	<i>18,051</i>	<i>11,217.30</i>	<i>18,031</i>		<i>11,394.40</i>	<i>\$ 8,041,826</i>
Participating Political Subdivisions						
Full-Time	6,812	6,812.00	6,930	100%	6,930.00	\$ 4,890,986
Volunteer	2,818	704.50	2,757	25%	689.25	\$ 486.452
<i>Political Subdivision Employees</i>	<i>9,630</i>	<i>7,516.5</i>	<i>9,687</i>		<i>7,619.25</i>	<i>\$ 5,377,438</i>
<b><i>Total</i></b>	<b><i>27,681</i></b>	<b><i>18,733.80</i></b>	<b><i>27,718</i></b>		<b><i>19,013.65</i></b>	<b><i>\$13,419,264</i></b>

Based upon 27,718 total lives, the valuation provides results for a group comprised of 19,013.65 FTE employees.

Schedule F shows the distribution by age and service of the number of active lives included in the valuation.



## Section II – Membership Data (continued)

4. The following table shows the number of current health care beneficiaries identified as of June 30, 2018 and for the prior valuation date of June 30, 2017.

### NUMBER OF HEALTH CARE BENEFICIARIES

AS OF JUNE 30, 2018			
Type	State	Political Subdivisions	Total
Disabled Participants	238	381	619
Spouses of Currently Disabled Participants	155	258	413
Surviving Spouses	<u>37</u>	<u>46</u>	<u>83</u>
Total	430	685	1,115

AS OF JUNE 30, 2017			
Type	State	Political Subdivisions	Total
Disabled Participants	224	342	566
Spouses of Currently Disabled Participants	150	244	394
Surviving Spouses	<u>33</u>	<u>44</u>	<u>77</u>
Total	407	630	1,037

As some beneficiaries elect to cover dependents, assumed adult per capita health care costs include the additional costs for the coverage of dependent children.

5. The following table shows a history of health care beneficiary valuation data from the Plan's inception.

### SCHEDULE OF HEALTH CARE BENEFICIARIES ADDED TO AND REMOVED FROM ROLLS

Valuation Date	Health Care Beneficiaries					
	Number Added to Rolls	Annual Health Care Benefit Valued	Number Removed from Rolls	Annual Health Care Benefit Valued	Number on Rolls as of the Valuation Date	Annual Health Care Benefit Valued
6/30/2018	127	\$2,136,689	49	\$ 875,112	1,115	\$12,780,492
6/30/2017	80	2,996,579	83	947,054	1,037	11,518,915
6/30/2016	57	1,053,997	11	79,027	1,040	9,469,390
6/30/2015	70	1,091,255	12	104,397	994	8,494,420
6/30/2014	69	1,188,244	16	105,575	936	7,485,997
6/30/2013	128	1,069,073	66	448,046	883	6,403,328
6/30/2012	99	527,654	500	3,611,321	821	5,782,301
6/30/2011	128	1,230,701	117	845,499	1,222	8,865,969



### ***Section III – Assets***

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As of June 30, 2018, \$1,889,000 is assumed to be held in a qualified trust solely to provide benefits to disabled employees and their beneficiaries in accordance with the terms of the Plan. Schedule B shows the additions and deductions of the Plan for the year preceding the valuation date and a reconciliation of the available fund balances at market value.



#### ***Section IV – Comments on Valuation***

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1. The June 30, 2018 valuation shows the Plan has prospective benefit liabilities to be paid on account of the present active membership of \$150,590,715. The prospective benefit liabilities for the Plan on account of benefits payable to current beneficiaries amounts to \$257,076,114. The total prospective benefit liabilities of the Plan amounts to \$407,666,829. Against these liabilities, the Plan has present assets of \$1,889,000 for valuation purposes. Therefore, the present value of contributions to be made in the future on account of benefits is \$405,777,829 for the Plan. Schedule A of this report outlines the results of the actuarial valuation.
2. The normal contribution is equal to the actuarial present value of benefits accruing during the current year, as well as the annual administrative expenses of the Plan, and the annual cost of benefits incurred and reported to the administrator but awaiting processing (additional reserves). The normal contribution for the Plan is determined to be \$11,654,227.
3. Prospective normal contributions have a present value of \$113,825,120. When this amount is subtracted from \$405,777,829, which is the present value of the total future contributions to be made by the employers, there remains \$291,952,709 as the amount of future accrued liability contributions.
4. An accrued liability contribution of \$12,293,466 is sufficient to liquidate the unfunded actuarial accrued liability over 30 years for the balance of the unfunded accrued liability, based on a 4.75% investment rate of return and the assumption that the payroll will increase by 3.00% annually.
5. The contributions for advance funding the Plan on account of benefits consist of normal contributions and accrued liability contributions. The resulting contribution is \$23,947,693. This amount is equivalent to an annual amount of \$1,259.50 per FTE employee.
6. The valuation was prepared in accordance with the actuarial assumptions and the actuarial cost method, which are described in Schedule C and Schedule D.
7. The Plan is funded on a pay as you go basis with projected costs and contributions shown in Schedule G. This valuation also determines the cost of advance funding the post-retirement benefits under the Plan as



#### ***Section IV – Comments on Valuation***

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shown in the Summary of Principal Results on page 1. The cost of lump-sum death benefits for members who die in active service is also included in the actuarial valuation.

8. The Plan experienced a liability loss of \$10.1 million, primarily due to an increase in the number of members receiving benefits. Offsetting this loss was a \$0.6 million gain on assets, leaving a \$9.5 million loss on the unfunded actuarial accrued liability.



## Section V – Accounting Information

1. A distribution of the number of members by type of membership, as follows:

### NUMBER OF ALL MEMBERS AS OF JUNE 30, 2018

Group	Count
Active Members (FTE Employees)	19,014
Disabled Members	619
Spouses of Disabled Members	413
Surviving Spouses	83
Total	20,129

2. The Schedule of Funding Progress, shown in the following table:

### SCHEDULE OF FUNDING PROGRESS (\$ IN THOUSANDS)

Actuarial Valuation Date	Actuarial Value of Assets ( a )	Actuarial Accrued Liability (AAL)* ( b )	Unfunded AAL (UAAL) ( b - a )	Funded Ratio ( a / b )
6/30/2018	\$ 1,889	\$ 293,842	\$ 291,953	0.64%
6/30/2017	3,461	270,379	266,918	1.28%
6/30/2016	2,708	224,683	221,975	1.21
6/30/2015	728	245,808	245,080	0.30
6/30/2014	0	225,816	225,816	0.00
6/30/2013	0	204,084	204,084	0.00
6/30/2012	0	226,174	226,174	0.00
6/30/2011	0	398,956	398,956	0.00

\*Actuarial cost method of Projected Unit Credit prior to 6/30/2013, Entry Age Normal (Level Dollar) for 6/30/2014 and 6/30/2015, and Entry Age Normal (Level Percent of Pay) thereafter.





***Section V – Accounting Information (continued)***

3. The information presented was determined as part of the actuarial valuation at June 30, 2018. Additional information as of the latest actuarial valuation follows:

Valuation Date	June 30, 2018
Actuarial Cost Method	Entry Age Normal
Amortization Method	
Accrued Liability	Level Percentage of Pay, Open
Payroll Growth Rate	3.00%
Remaining Amortization Period	
Accrued Liability	30 Years
Asset Valuation Method	Market Value of Assets
Actuarial Assumptions:	
Investment Rate of Return*	4.75%
*Includes Inflation at	2.50%
Medical Trend Assumption (Under Age 65)	7.25% - 4.75%
Medical Trend Assumption (Ages 65 and Older)	5.50% - 4.75%
Year of Ultimate Trend Rate (Under Age 65)	Fiscal Year Ended 2028
Year of Ultimate Trend Rate (Ages 65 and Older)	Fiscal Year Ended 2023

The assumed investment rate of return reflects the fact that the Plan is to be funded on a current disbursement basis.

4. On June 2, 2015, GASB Statement No. 74 and GASB Statement No. 75 (GASB 74 and 75) were unanimously adopted by the Governmental Accounting Standards Board. The disclosure requirements of GASB 74 and 75 are similar to the disclosure requirements for pension benefits under GASB Statement No. 67 and GASB Statement No. 68. GASB 74 relates to accounting disclosures for plan sponsors and, as such, replaces GASB 43 beginning with fiscal years ending June 30, 2017. GASB 75 relates to accounting disclosures for contributing employers and, as such, replaces GASB 45 beginning with fiscal years ending June 30, 2018. GASB 74 and 75 reports, when applicable, will be provided under separate cover.



**Section VI – Derivation of Experience Gains and Losses**

**CHANGES IN UNFUNDED ACTUARIAL ACCRUED LIABILITIES (UAAL)  
(\$ IN MILLIONS)**

Fiscal Year Ended 2018		
<b>1. Beginning of Year:</b>		
(a) Actuarial Accrued Liability (AAL)		\$ 270.4
(b) Normal Cost		\$ 12.6
(c) Benefit Payments		\$ 12.4
<b>2. End of Year:</b>		
(a) Expected AAL		\$ 283.7
$[(1a) + (1b)] \times 1.0475 - [(1c) \times (1 + [0.0475 \times 0.50])]$		
(b) (Gains) or Losses		10.1
<b>3. End of Year AAL</b>		\$ 293.8
$(2a) + (2b)$		
<b>4. Beginning of Year Actuarial Value of Assets (AVA)</b>		\$ 3.5
<b>5. Net External Cash Flow During the Year</b>		\$ (2.3)
<b>6. End of Year:</b>		
(a) Expected AVA		\$ 1.3
$[(4) \times 1.0475] + [(5) \times (1 + [0.0475 \times 0.50])]$		
(b) Actual AVA		\$ 1.9
<b>7. AVA Gain (or Loss)</b>		\$ 0.6
$(6b) - (6a)$		
<b>8. Expected UAAL at End of Year</b>		\$ 282.4
$(2a) - (6a)$		
<b>9. Actual UAAL at End of Year</b>		\$ 291.9
$(3) - (6b)$		
<b>10. UAAL Gain (or Loss)</b>		\$ (9.5)
$(8) - (9)$		



**Schedule A – Results of the Valuation**

**LINE OF DUTY ACT FUND**

	Valuation Date	
	June 30, 2018	June 30, 2017
<b>1. NUMBER OF FTE EMPLOYEES</b>	19,013.65	18,733.80
<b>2. ACTUARIAL ACCRUED LIABILITY</b> Present value of prospective benefits payable in respect of:		
(a) Present active members	\$150,590,715	\$163,097,025
(b) Present beneficiaries	<u>257,076,114</u>	<u>233,192,910</u>
(c) Total present value of prospective benefits	\$407,666,829	\$396,289,935
(d) Present value of future normal contributions	<u>113,825,120</u>	<u>125,910,994</u>
(e) Total actuarial accrued liability (2c) – (2d)	\$293,841,709	\$270,378,941
<b>3. PRESENT ASSETS FOR VALUATION PURPOSES</b>	<u>\$ 1,889,000</u>	<u>\$ 3,461,000</u>
<b>4. UNFUNDED ACTUARIAL ACCRUED LIABILITY (2e) – (3)</b>	\$291,952,709	\$266,917,941
<b>5. AMORTIZATION PERIOD</b>	30	30
<b>6. NORMAL CONTRIBUTION*</b>	\$ 11,654,227	\$ 12,577,907
<b>7. ACCRUED LIABILITY CONTRIBUTION</b>	<u>12,293,466</u>	<u>11,239,385</u>
<b>8. TOTAL CONTRIBUTION (6) + (7)</b>	\$ 23,947,693	\$ 23,817,292
<b>9. NORMAL CONTRIBUTION PER FTE EMPLOYEE* (6) ÷ (1)</b>	\$ 612.94	\$ 671.40
<b>10. ACCRUED LIABILITY CONTRIBUTION PER FTE EMPLOYEE (7) ÷ (1)</b>	<u>646.56</u>	<u>599.95</u>
<b>11. TOTAL CONTRIBUTION PER FTE EMPLOYEE</b>	\$ 1,259.50	\$ 1,271.35
<b>12. DISCOUNT RATE</b>	4.75%	4.75%

\* Includes administrative expenses.



***Schedule A – Solvency Test***

**SOLVENCY TEST  
(\$ IN THOUSANDS)**

Valuation Date	Aggregate Accrued Liabilities For				Actuarial Value of Assets	Portion of Accrued Liabilities Covered by Actuarial Value of Assets		
	(1) Active Member Contributions	(2) Retirees, Survivors, and Inactive Members	(3) Active Members (Employer Financed Portion)	Total		(1)	(2)	(3)
6/30/2018	n/a	\$257,076	\$36,766	\$293,842	\$ 1,889	n/a	0.73%	0.00%
6/30/2017	n/a	233,193	37,186	270,379	3,461	n/a	1.48	0.00
6/30/2016	n/a	192,578	32,105	224,683	2,708	n/a	1.41	0.00
6/30/2015	n/a	169,288	76,520	245,808	728	n/a	0.43	0.00
6/30/2014	n/a	152,120	73,696	225,816	0	n/a	0.00	0.00
6/30/2013	n/a	139,835	64,249	204,084	0	n/a	0.00	0.00
6/30/2012	n/a	131,501	94,673	226,174	0	n/a	0.00	0.00
6/30/2011	n/a	207,186	191,770	398,956	0	n/a	0.00	0.00



***Schedule B – Plan Assets***

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For valuation purposes, the market value of assets is used. The market value of assets used for the valuation of the Plan is \$1,889,000.

**RECONCILIATION OF ASSETS  
LINE OF DUTY ACT FUND**

VALUATION DATE	June 30, 2018	June 30, 2017
1. Funds available at beginning of year	\$ 3,461,000	\$ 2,708,000
Revenue for the year		
Employer contributions	\$ 10,035,000	\$ 11,024,000
Miscellaneous income	855,000	584,000
Net investment income	<u>678,000</u>	<u>683,000</u>
2. Total revenue	\$ 11,568,000	\$ 12,291,000
Expenditures for the year		
Benefit payments	\$ 12,398,000	\$ 10,320,000
Administrative expenses	742,000	739,000
Other expenses	<u>0</u>	<u>479,000</u>
3. Total expenditures	\$ 13,140,000	\$ 11,538,000
4. Revenue less expenditures (2) - (3)	\$ (1,572,000)	\$ 753,000
5. Funds available at end of year (1) + (4)	\$ 1,889,000	\$ 3,461,000



## **Schedule C – Outline of Actuarial Assumptions and Methods**

### **Assumptions and Methods Applicable to All Line of Duty Act Fund Employer Groups**

The basis for the assumptions is the Virginia Retirement System Experience Study for the Four-Year Period July 1, 2012 to June 30, 2016 issued February 21, 2018 and presented and adopted by the Board at its April 2017 meeting. These assumptions comply with Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations* and ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*.

**Investment Return Rate:** 4.75% per annum, compounded annually,

**Inflation Assumption:** 2.50% per year.

**Actuarial Cost Method:** Entry age normal cost method, allocated as a level percent of payroll, from first funding age to last age before terminal retirement age. Actuarial gains and losses, as they occur, are reflected in the unfunded actuarial accrued liability. See Schedule D for a detailed explanation.

**Funding Period:** For the Summary of Principal Results shown on page 1, amortization is as a level percentage of payroll over a 30 year period. For the Projected Costs and Contributions shown in Schedule G, funding is pay as you go.

**Payroll Growth Rate:** 3.00% per annum.

**Asset Valuation Method:** Market Value of Assets

**Service Related Disabilities:** Disabilities are assumed to be service related and result in coverage under the Plan based on the following:

<b>Group</b>	<b>Qualifying Disability %</b>
State	10%
SPORS	70%
VaLORS	10%
Non Top 10 LEOS	65%
Top 10 LEOS	70%

**Service Related Deaths:** 25% of active employee deaths. Of the service related deaths, 42% are assumed to be paid as a direct or proximate result of the performance of duty, with the remainder paid under the presumptive clause.

**Retirement Eligibility:** VRS State Employees (including those of the Virginia Port Authority) hired prior to January 1, 2010 and vested by January 1, 2013 are assumed to be eligible to retire at age 55 with 5 years of creditable service or age 50 with 10 years of creditable service. VRS State Employees hired after January 1, 2010 and not vested by January 1, 2013 are assumed to be eligible to retire at age 60 with 5 years of creditable service or upon the sum of their age and their service being 90 (Rule of 90). All other employees are assumed to be eligible for retirement at age 50 with 5 years of creditable service.



## **Schedule C – Outline of Actuarial Assumptions and Methods**

### **Assumptions and Methods Applicable to All Line of Duty Act Fund Employer Groups**

**Spouse Health Care Coverage:** Actual data provided is used for current beneficiaries. 67% of service-related deaths and 80% of service-related disabilities are assumed to result in spouse coverage, with wives assumed to be three years younger than husbands.

**Administrative Expenses:** Assumed to be \$500,000 for fiscal year 2019 with 3% increases in the future.

**VRS Health Insurance Credit:** Health care costs of the Plan are assumed to be reduced by an amount equal to the disabled health insurance credit paid by the VRS Health Insurance Credit Program for eligible disabled employees. An annual credit of \$1,440 or \$48 per year of service, whichever is greater, is assumed for those employees who are members of the VRS State, VaLORS, or SPORS plans and an annual credit of \$540 is assumed for those employees who are members of a VRS political subdivision participating in the VRS Health Insurance Credit Program.

**Health Care Cost Trend Rate:** The initial per capita health care costs are expected to increase each year with inflation (trend). The following chart details the trend assumption.

Fiscal Year Ended	Under Age 65	Ages 65 and Older
2018	7.25%	5.500%
2019	7.00%	5.375%
2020	6.75%	5.250%
2021	6.50%	5.125%
2022	6.25%	5.000%
2023	6.00%	4.750%
2024	5.75%	4.750%
2025	5.50%	4.750%
2026	5.25%	4.750%
2027	5.00%	4.750%
2028 and Beyond	4.75%	4.750%

**Eligibility for Medicare Due to Age:** For Plan beneficiaries who become eligible for health care benefits as the result of a death or disability occurring after June 30, 2017, 80% of disabled employees who become disabled 29 or more months prior to their sixty-fifth birthday are assumed to be eligible for Medicare due to age (age 65). 100% of all other Plan beneficiaries who become eligible for health care benefits as the result of a death or disability occurring after June 30, 2017 are assumed to be eligible for Medicare due to age.



## **Schedule C – Outline of Actuarial Assumptions and Methods**

### **Assumptions and Methods Applicable to All Line of Duty Act Fund Employer Groups**

**Initial Per Capita Health Care Costs:** Paid claims and cost data were provided by the DOA. CMC accepted this information without audit and has relied upon the sources for the accuracy of the data.

Assumed adult per capita costs are based on past experience and trended forward to the valuation period. Experience for Medicare eligible participants was limited, particularly for Political Subdivision Employees, and future experience may differ materially. As some beneficiaries elect to cover dependents, the assumed adult costs include the additional costs for the coverage of dependent children.

<b>Initial Monthly Per Capita Adult Health Care Costs</b>		
<b>Valuation Date</b>	<b>Under Age 65*</b>	<b>Ages 65 and Older</b>
June 30, 2017	\$1,065.70	\$505.00
June 30, 2018	\$1,186.01	\$506.50

\*Includes the assumed additional cost for the coverage of dependent children.

### **Age Related Morbidity:**

All health care costs assumed not to be related to covered dependent children are age-adjusted. The following chart details the expected health care claims, age-adjusted to age 65, and the associated assumed increases to the net incurred claims:

<b>Beneficiary Attained Age</b>	<b>Annual Increase</b>
<30	0.0%
30 – 34	1.0%
35 – 39	1.5%
40 – 44	2.0%
45 - 49	2.6%
50 – 54	3.3%
55 – 59	3.6%
60 – 64	4.2%
65 – 69	3.0%
70 – 74	2.5%
75 – 79	2.0%
80 – 84	1.0%
85 – 89	0.5%
90 and Older	0.0%





**Schedule C – Outline of Actuarial Assumptions and Methods**

**VRS STATE EMPLOYEES**

**Plan Specific Assumptions and Methods**

**MORTALITY RATES:**

**Pre-Retirement:**

RP-2014 Employee Rates to age 80, Healthy Annuitant Rates at ages 81 and older  
Projected BB to 2020; M SB 1yr, 85% of rates; F SB 1yr

**Post-Retirement:**

RP-2014 Employee Rates to age 49, Healthy Annuitant Rates at ages 50 and older  
Projected BB to 2020; M SF 1yr; F SB 1yr, 1.5% compounding increase from ages 70 to 85

**Post-Disablement:**

RP-2014 Disabled Mortality Rates Projected BB to 2020; M 115% of rates; F 130% of rates

State Employees Mortality Rates						
Age	Male			Female		
	Pre Retirement	Post Retirement	Post Disablement	Pre Retirement	Post Retirement	Post Disablement
20	0.00031	0.00044	0.00803	0.00016	0.00016	0.00285
25	0.00043	0.00045	0.00957	0.00017	0.00017	0.00304
30	0.00037	0.00046	0.00894	0.00020	0.00020	0.00383
35	0.00042	0.00053	0.01035	0.00027	0.00027	0.00503
40	0.00050	0.00066	0.01242	0.00036	0.00036	0.00696
45	0.00073	0.00107	0.01925	0.00058	0.00058	0.01155
50	0.00127	0.00431	0.02304	0.00098	0.00098	0.01520
55	0.00211	0.00599	0.02639	0.00151	0.00333	0.01827
60	0.00345	0.00789	0.02933	0.00214	0.00454	0.02081
65	0.00587	0.01102	0.03389	0.00315	0.00684	0.02522
70	0.00970	0.01677	0.04238	0.00527	0.01104	0.03410
75		0.02704	0.05702		0.01930	0.04963
80		0.04548	0.08047		0.03437	0.07380
85		0.07920	0.11900		0.06378	0.10933
90		0.14247	0.18618		0.11280	0.16137

Mortality improvement is anticipated under the post-retirement mortality assumption as projected with Scale BB.



### Schedule C – Outline of Actuarial Assumptions and Methods

**RETIREMENT RATES:** The following rates of retirement are assumed for members eligible to retire from Plan 1.

State Employees Retirement Rates, Plan 1 Male							
Age	Years of service						
	0-4	5	6-9	10	11-29	30	>=31
<=49	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.033	0.033	0.125	0.125
51	0.000	0.000	0.000	0.033	0.030	0.080	0.090
52	0.000	0.000	0.000	0.033	0.030	0.080	0.090
53	0.000	0.000	0.000	0.033	0.030	0.050	0.090
54	0.000	0.000	0.000	0.033	0.030	0.050	0.090
55	0.000	0.045	0.045	0.045	0.035	0.050	0.090
56	0.000	0.045	0.040	0.040	0.040	0.050	0.090
57	0.000	0.045	0.040	0.040	0.040	0.075	0.090
58	0.000	0.045	0.040	0.040	0.040	0.100	0.090
59	0.000	0.045	0.040	0.040	0.040	0.100	0.090
60	0.000	0.045	0.050	0.050	0.050	0.115	0.090
61	0.000	0.150	0.075	0.075	0.075	0.165	0.150
62	0.000	0.150	0.100	0.100	0.100	0.200	0.200
63	0.000	0.150	0.100	0.100	0.100	0.200	0.175
64	0.000	0.150	0.135	0.135	0.135	0.200	0.175
65	0.000	0.250	0.250	0.250	0.250	0.250	0.250
66	0.000	0.275	0.250	0.250	0.250	0.250	0.250
67	0.000	0.275	0.220	0.220	0.220	0.220	0.220
68	0.000	0.200	0.220	0.220	0.220	0.220	0.220
69	0.000	0.200	0.220	0.220	0.220	0.220	0.220
70	0.000	0.200	0.220	0.220	0.220	0.220	0.220
71	0.000	0.200	0.220	0.220	0.220	0.220	0.220
72	0.000	0.200	0.220	0.220	0.220	0.220	0.220
73	0.000	0.200	0.220	0.220	0.220	0.220	0.220
74	0.000	0.200	0.220	0.220	0.220	0.220	0.220
>=75	0.000	1.000	1.000	1.000	1.000	1.000	1.000



***Schedule C – Outline of Actuarial Assumptions and Methods***

State Employees Retirement Rates, Plan 1 Female							
Age	Years of service						
	0-4	5	6-9	10	11-29	30	>=31
<=49	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.030	0.030	0.075	0.075
51	0.000	0.000	0.000	0.035	0.030	0.075	0.060
52	0.000	0.000	0.000	0.035	0.030	0.075	0.060
53	0.000	0.000	0.000	0.035	0.035	0.100	0.090
54	0.000	0.000	0.000	0.050	0.035	0.100	0.090
55	0.000	0.050	0.050	0.050	0.040	0.100	0.090
56	0.000	0.050	0.050	0.050	0.050	0.100	0.090
57	0.000	0.050	0.050	0.050	0.050	0.100	0.090
58	0.000	0.050	0.050	0.050	0.050	0.100	0.090
59	0.000	0.050	0.050	0.050	0.050	0.100	0.090
60	0.000	0.050	0.050	0.050	0.050	0.120	0.125
61	0.000	0.075	0.080	0.080	0.080	0.165	0.175
62	0.000	0.100	0.120	0.120	0.120	0.225	0.250
63	0.000	0.175	0.120	0.120	0.120	0.225	0.175
64	0.000	0.175	0.150	0.150	0.150	0.225	0.175
65	0.000	0.275	0.275	0.275	0.275	0.275	0.300
66	0.000	0.300	0.300	0.300	0.300	0.300	0.300
67	0.000	0.300	0.250	0.250	0.250	0.250	0.250
68	0.000	0.250	0.250	0.250	0.250	0.250	0.250
69	0.000	0.250	0.250	0.250	0.250	0.250	0.250
70	0.000	0.250	0.250	0.250	0.250	0.250	0.250
71	0.000	0.250	0.250	0.250	0.250	0.250	0.250
72	0.000	0.250	0.250	0.250	0.250	0.250	0.250
73	0.000	0.250	0.250	0.250	0.250	0.250	0.250
74	0.000	0.250	0.250	0.250	0.250	0.250	0.250
>=75	0.000	1.000	1.000	1.000	1.000	1.000	1.000



### Schedule C – Outline of Actuarial Assumptions and Methods

**RETIREMENT RATES:** The following rates of retirement are assumed for members eligible to retire from Plan 2 and the Hybrid Plan.

State Employees Retirement Rates, Plan 2 and Hybrid Male																		
Age	Years of service																	
	0-4	5	6-25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	>=40
<=49	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.125
51	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.080
52	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.080	0.090
53	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.050	0.090	0.090
54	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.050	0.090	0.090	0.090
55	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.050	0.090	0.090	0.090	0.090
56	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.050	0.090	0.090	0.090	0.090	0.090
57	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.075	0.075	0.090	0.090	0.090	0.090	0.090	0.090
58	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.100	0.090	0.090	0.090	0.090	0.090	0.090	0.090
59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.100	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
60	0.000	0.045	0.045	0.045	0.045	0.045	0.045	0.115	0.115	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
61	0.000	0.150	0.075	0.075	0.075	0.075	0.165	0.165	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
62	0.000	0.150	0.100	0.100	0.100	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
63	0.000	0.150	0.100	0.100	0.200	0.200	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175
64	0.000	0.150	0.135	0.200	0.200	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175
65	0.000	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
66	0.000	0.275	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
67	0.000	0.275	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220
68	0.000	0.200	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220
69	0.000	0.200	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220
70	0.000	0.200	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220
71	0.000	0.200	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220
72	0.000	0.200	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220
73	0.000	0.200	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220
74	0.000	0.200	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220	0.220
>=75	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000



***Schedule C – Outline of Actuarial Assumptions and Methods***

State Employees Retirement Rates, Plan 2 and Hybrid Female																		
Age	Years of service																	
	0-4	5	6-25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	>=40
<=49	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.075
51	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.075	0.075
52	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.075	0.075	0.060
53	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.100	0.090	0.090
54	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.100	0.090	0.090	0.090
55	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.100	0.090	0.090	0.090	0.090
56	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.100	0.090	0.090	0.090	0.090	0.090
57	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.100	0.090	0.090	0.090	0.090	0.090	0.090
58	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.100	0.090	0.090	0.090	0.090	0.090	0.090	0.090
59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.100	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
60	0.000	0.050	0.050	0.050	0.050	0.050	0.050	0.120	0.120	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125
61	0.000	0.075	0.080	0.080	0.080	0.080	0.165	0.165	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175
62	0.000	0.100	0.120	0.120	0.120	0.225	0.225	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
63	0.000	0.175	0.120	0.120	0.225	0.225	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175
64	0.000	0.175	0.150	0.225	0.225	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175
65	0.000	0.275	0.275	0.275	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
66	0.000	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
67	0.000	0.300	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
68	0.000	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
69	0.000	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
70	0.000	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
71	0.000	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
72	0.000	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
73	0.000	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
74	0.000	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
>=75	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

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**DISABILITY RATES:** As shown below for selected ages.

State Employees Disability Rates		
Age	Male	Female
20	0.00039	0.00033
25	0.00072	0.00100
30	0.00091	0.00211
35	0.00129	0.00281
40	0.00212	0.00354
45	0.00343	0.00474
50	0.00497	0.00629
55	0.00629	0.00742
60	0.00690	0.00735
65	0.00657	0.00653
70	0.00572	0.00841



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

**TERMINATION RATES:** The following are sample withdrawal rates based on age and years of service (for causes other than death, disability, or retirement).

State Employees Termination Rates, Male											
Age	Years of service										
	0	1	2	3	4	5	6	7	8	9	≥10
20	0.25852	0.25852	0.25694	0.23691	0.19663	0.15321	0.11602	0.09132	0.08331	0.08331	0.08331
25	0.22297	0.22297	0.22056	0.20171	0.16921	0.13670	0.10954	0.09132	0.08251	0.07732	0.07214
30	0.17601	0.17601	0.17095	0.15425	0.13244	0.11401	0.10011	0.08993	0.08095	0.06790	0.05485
35	0.15120	0.14553	0.13631	0.12195	0.10694	0.09577	0.08902	0.08387	0.07574	0.05878	0.04183
40	0.14480	0.12618	0.11198	0.09890	0.08767	0.08029	0.07681	0.07442	0.06799	0.04938	0.03077
45	0.14223	0.11470	0.09617	0.08321	0.07345	0.06888	0.06600	0.06412	0.05934	0.04282	0.02630
50	0.13789	0.10668	0.08617	0.07370	0.06544	0.06362	0.05994	0.05630	0.05128	0.03879	0.02630
55	0.13242	0.10032	0.08050	0.07094	0.06491	0.06348	0.05950	0.05391	0.04470	0.03550	0.02630
60	0.13038	0.09617	0.07857	0.07094	0.06491	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
65	0.13038	0.09477	0.07859	0.07094	0.06491	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
70	0.13038	0.09477	0.07859	0.07094	0.06491	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

State Employees Termination Rates, Female											
Age	Years of service										
	0	1	2	3	4	5	6	7	8	9	≥10
20	0.31434	0.31434	0.30334	0.27392	0.23350	0.18606	0.14708	0.12545	0.12362	0.12362	0.12362
25	0.26747	0.26747	0.25594	0.23170	0.20061	0.16601	0.13663	0.11705	0.11136	0.11136	0.11136
30	0.21874	0.20726	0.19398	0.17630	0.15700	0.13853	0.12163	0.10538	0.09500	0.09045	0.09045
35	0.19257	0.17078	0.15532	0.14101	0.12758	0.11658	0.10633	0.09380	0.08241	0.07177	0.06019
40	0.17770	0.14790	0.12987	0.11685	0.10577	0.09775	0.09030	0.08135	0.07188	0.05904	0.03747
45	0.17029	0.13335	0.11247	0.09984	0.08920	0.08275	0.07531	0.06872	0.06277	0.05214	0.03025
50	0.16721	0.12286	0.09934	0.08763	0.07822	0.07316	0.06479	0.05936	0.05545	0.05088	0.03025
55	0.16695	0.11694	0.09149	0.08236	0.07660	0.07039	0.06175	0.05711	0.05138	0.05088	0.03025
60	0.16695	0.11656	0.09060	0.08236	0.07660	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
65	0.16695	0.11656	0.09060	0.08236	0.07660	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
70	0.16695	0.11656	0.09060	0.08236	0.07660	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

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**SALARY INCREASE RATES:** The following total salary increase rates are used. The total salary increase rate consists of an inflation rate of 2.50%, a productivity component of 1.00%, and a variable merit component that is dependent on years of service.

Pay Increase Assumption	
Years of Service	Total Increase (Next Year)
1	5.35%
2	5.35
3	4.75
4	4.45
5	4.45
6	4.45
7	4.35
8	4.25
9	4.00
10	4.00
11-19	3.65
20 or more	3.50

**DISABILITY ELECTION:** All active members hired on or after January 1, 1999 will enter the Virginia Sickness and Disability Program (VSDP) and will not be eligible to receive non-VSDP disability benefits. For members hired before January 1, 1999 we measure the liabilities based upon the member's actual election contained in the valuation data.





***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

**STATE POLICE**

**Plan Specific Assumptions and Methods**

**MORTALITY RATES:**

**Pre-Retirement:**

RP-2014 Employee Rates to age 80, Healthy Annuitant Rates at ages 81 and older  
Projected BB to 2020; M 90% of Rates; F SF 1yr

**Post-Retirement:**

RP-2014 Employee Rates to age 49, Healthy Annuitant Rates at ages 50 and older  
Projected BB to 2020; M SF 1yr, 1% increase compounded from ages 70 to 90; F SF 3yr.

**Post-Disablement:**

RP-2014 Disabled Mortality Rates Projected BB to 2020; M SF 2yr; Unisex using 100% Male.

SPORS Mortality Rates						
Age	Male			Female		
	Pre Retirement	Post Retirement	Post Disablement	Pre Retirement	Post Retirement	Post Disablement
20	0.00036	0.00044	0.00839	0.00016	0.00016	0.00839
25	0.00043	0.00045	0.00772	0.00018	0.00019	0.00772
30	0.00040	0.00046	0.00820	0.00023	0.00025	0.00820
35	0.00046	0.00053	0.00948	0.00030	0.00033	0.00948
40	0.00056	0.00066	0.01247	0.00043	0.00052	0.01247
45	0.00086	0.00107	0.01810	0.00072	0.00089	0.01810
50	0.00149	0.00431	0.02124	0.00118	0.00317	0.02124
55	0.00246	0.00599	0.02397	0.00174	0.00423	0.02397
60	0.00405	0.00789	0.02682	0.00247	0.00625	0.02682
65	0.00693	0.01102	0.03182	0.00383	0.00989	0.03182
70	0.01139	0.01694	0.04125	0.00653	0.01601	0.04125
75		0.02871	0.05658		0.02631	0.05658
80		0.05074	0.08141		0.04493	0.08141
85		0.09286	0.12299		0.07928	0.12299
90		0.17558	0.19143		0.14077	0.19143

Mortality improvement is anticipated under the post-retirement mortality assumption as projected with Scale BB.



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

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**RETIREMENT RATES:** The following rates of retirement are assumed for members eligible to retire.

SPORS Retirement Rates			
Age	Years of service		
	0-4	5-24	>=25
<=49	0.000	0.000	0.000
50	0.000	0.100	0.100
51	0.000	0.030	0.100
52	0.000	0.030	0.100
53	0.000	0.030	0.100
54	0.000	0.030	0.100
55	0.000	0.060	0.100
56	0.000	0.060	0.100
57	0.000	0.060	0.100
58	0.000	0.100	0.100
59	0.000	0.100	0.100
60	0.000	0.100	0.100
61	0.000	0.100	0.100
62	0.000	0.200	0.200
63	0.000	0.200	0.200
64	0.000	0.200	0.200
>=65	0.000	1.000	1.000



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

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**DISABILITY RATES:** As shown below for selected ages.

SPORS Disability Rates	
Age	Unisex
<=44	0.00194
45	0.00233
50	0.00481
55	0.00770
60	0.00897
65	0.01108
70	0.01368

**TERMINATION RATES:** The following are sample withdrawal rates based on age and years of service (for causes other than death, disability, or retirement).

SPORS Termination Rates	
Service	Unisex
0	0.09750
1	0.04750
2	0.04750
3	0.04750
4	0.04750
5	0.04750
6	0.04750
7	0.03000
8	0.03000
9	0.03000
>=10	0.01750



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

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**SALARY INCREASE RATES:** The following salary increase rates are used. Inflation rate of 2.50% plus productivity component of 1.00% plus step-rate/promotional component as shown:

Pay Increase Assumption	
Years of Service	Total Increase (Next Year)
1	4.75%
2	4.75
3	4.75
4	4.75
5	4.65
6	4.40
7	4.40
8	4.40
9	4.40
10 - 19	4.00
20 or more	3.50

It is assumed members covered under VSDP receive a 3.50% annual increase in pay while disabled and this adjusted pay is used to determine deferred benefits payable from the System.

**DISABILITY ELECTION:** All active members hired on or after January 1, 1999 will enter the Virginia Sickness and Disability Program (VSDP) and will not be eligible to receive non-VSDP disability benefits. For members hired before January 1, 1999 we measure the liabilities based upon the member's actual election contained in the valuation data.



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

**VIRGINIA LAW OFFICERS**

**Plan Specific Assumptions and Methods**

**MORTALITY RATES:**

Pre-Retirement:

RP-2014 Employee Rates to age 80, Healthy Annuitant Rates at ages 81 and older  
Projected BB to 2020; M 90% of Rates; F SF 1yr

Post-Retirement:

RP-2014 Employee Rates to age 49, Healthy Annuitant Rates at ages 50 and older  
Projected BB to 2020; M SF 1yr, 1% increase compounded from ages 70 to 90; F SF 3yr.

Post-Disablement:

RP-2014 Disabled Mortality Rates Projected BB to 2020; M SF 2yr; Unisex using 100% Male.

VaLORS Mortality Rates						
Age	Male			Female		
	Pre Retirement	Post Retirement	Post Disablement	Pre Retirement	Post Retirement	Post Disablement
20	0.00036	0.00044	0.00839	0.00016	0.00016	0.00839
25	0.00043	0.00045	0.00772	0.00018	0.00019	0.00772
30	0.00040	0.00046	0.00820	0.00023	0.00025	0.00820
35	0.00046	0.00053	0.00948	0.00030	0.00033	0.00948
40	0.00056	0.00066	0.01247	0.00043	0.00052	0.01247
45	0.00086	0.00107	0.01810	0.00072	0.00089	0.01810
50	0.00149	0.00431	0.02124	0.00118	0.00317	0.02124
55	0.00246	0.00599	0.02397	0.00174	0.00423	0.02397
60	0.00405	0.00789	0.02682	0.00247	0.00625	0.02682
65	0.00693	0.01102	0.03182	0.00383	0.00989	0.03182
70	0.01139	0.01694	0.04125	0.00653	0.01601	0.04125
75		0.02871	0.05658		0.02631	0.05658
80		0.05074	0.08141		0.04493	0.08141
85		0.09286	0.12299		0.07928	0.12299
90		0.17558	0.19143		0.14077	0.19143

Mortality improvement is anticipated under the post-retirement mortality assumption as projected with Scale BB.



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

**RETIREMENT RATES:** The following rates of retirement are assumed for members eligible to retire.

VaLORS Retirement Rates, Male					
Age	Years of service				
	0-4	5	6-24	25	>=26
<=49	0.000	0.000	0.000	0.000	0.000
50	0.000	0.110	0.110	0.350	0.350
51	0.000	0.100	0.080	0.300	0.250
52	0.000	0.100	0.080	0.300	0.250
53	0.000	0.100	0.080	0.300	0.250
54	0.000	0.100	0.080	0.240	0.250
55	0.000	0.100	0.080	0.180	0.250
56	0.000	0.100	0.090	0.180	0.200
57	0.000	0.100	0.100	0.180	0.200
58	0.000	0.100	0.100	0.180	0.200
59	0.000	0.100	0.120	0.180	0.200
60	0.000	0.180	0.180	0.180	0.200
61	0.000	0.180	0.200	0.200	0.200
62	0.000	0.180	0.400	0.400	0.400
63	0.000	0.400	0.250	0.250	0.250
64	0.000	0.150	0.250	0.250	0.250
>=65	0.000	1.000	1.000	1.000	1.000



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

VaLORS Retirement Rates, Female					
Age	Years of service				
	0-4	5	6-24	25	>=26
<=49	0.000	0.000	0.000	0.000	0.000
50	0.000	0.100	0.100	0.375	0.375
51	0.000	0.100	0.080	0.250	0.200
52	0.000	0.100	0.080	0.250	0.200
53	0.000	0.100	0.080	0.250	0.225
54	0.000	0.100	0.080	0.250	0.250
55	0.000	0.100	0.080	0.250	0.275
56	0.000	0.100	0.080	0.250	0.300
57	0.000	0.100	0.080	0.250	0.225
58	0.000	0.100	0.080	0.400	0.225
59	0.000	0.100	0.130	0.300	0.225
60	0.000	0.200	0.200	0.200	0.225
61	0.000	0.200	0.225	0.225	0.225
62	0.000	0.200	0.300	0.300	0.300
63	0.000	0.200	0.250	0.250	0.250
64	0.000	0.200	0.250	0.250	0.250
>=65	0.000	1.000	1.000	1.000	1.000



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

**DISABILITY RATES:** As shown below for selected ages.

VaLORS Disability Rates		
Age	Male	Female
20	0.00143	0.00543
25	0.00322	0.00581
30	0.00584	0.00659
35	0.00720	0.00769
40	0.00793	0.01001
45	0.00913	0.01381
50	0.01165	0.01821
55	0.01501	0.02277
60	0.01782	0.02901
65	0.01916	0.03865
70	0.01920	0.05499

**TERMINATION RATES:** The following are sample withdrawal rates based on age and years of service (for causes other than death, disability, or retirement).

VaLORS Termination Rates, Male											
Age	Years of service										
	0	1	2	3	4	5	6	7	8	9	>=10
20	0.31876	0.28460	0.25466	0.22550	0.19680	0.16134	0.13524	0.12367	0.12367	0.12367	0.12367
25	0.30264	0.26915	0.23838	0.20793	0.17797	0.14758	0.12544	0.11510	0.11510	0.11510	0.11510
30	0.28066	0.24612	0.21425	0.18325	0.15307	0.12980	0.11286	0.10375	0.10098	0.10098	0.10098
35	0.25749	0.21974	0.18823	0.16020	0.13400	0.11603	0.10242	0.09350	0.08615	0.07590	0.06050
40	0.23639	0.19311	0.16185	0.13861	0.11962	0.10471	0.09313	0.08358	0.07325	0.05907	0.04275
45	0.22182	0.17034	0.13792	0.12032	0.11173	0.09580	0.08484	0.07391	0.06240	0.05163	0.04275
50	0.21689	0.15441	0.11855	0.10683	0.10683	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
55	0.21689	0.14708	0.10525	0.09930	0.09930	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
60	0.21689	0.14673	0.09871	0.09787	0.09787	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
65	0.21689	0.14673	0.09796	0.09787	0.09787	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
70	0.21689	0.14673	0.09796	0.09787	0.09787	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000





***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

VaLORS Termination Rates, Female											
Age	Years of service										
	0	1	2	3	4	5	6	7	8	9	>=10
20	0.34816	0.33235	0.29905	0.25161	0.20346	0.15381	0.13567	0.10072	0.09919	0.09919	0.09919
25	0.33633	0.30645	0.27155	0.23161	0.19212	0.15381	0.13567	0.10072	0.09919	0.09919	0.09919
30	0.32698	0.27494	0.23556	0.20432	0.17667	0.15381	0.13567	0.10072	0.09919	0.09066	0.09066
35	0.32025	0.25204	0.20727	0.17948	0.15980	0.14868	0.13534	0.10072	0.09909	0.08073	0.06058
40	0.31390	0.23286	0.18182	0.15417	0.14036	0.13413	0.12530	0.10072	0.09311	0.07057	0.03901
45	0.30589	0.21487	0.15693	0.12720	0.11803	0.10976	0.10134	0.09113	0.07804	0.06036	0.03687
50	0.29483	0.19601	0.13051	0.09760	0.09281	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
55	0.28000	0.17544	0.10155	0.06516	0.06490	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
60	0.26118	0.15309	0.06978	0.02989	0.03440	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
65	0.23879	0.12934	0.03574	0.00004	0.00182	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
70	0.20897	0.10078	0.00000	0.00004	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

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**SALARY INCREASE RATES:** The following salary increase rates are used. Inflation rate of 2.50% plus productivity component of 1.00% plus step-rate/promotional component as shown:

Pay Increase Assumption	
Years of Service	Total Increase (Next Year)
1	4.75%
2	4.75
3	4.75
4	4.75
5	4.65
6	4.40
7	4.40
8	4.40
9	4.40
10 - 19	4.00
20 or more	3.50

It is assumed members covered under VSDP receive a 3.50% annual increase in pay while disabled and this adjusted pay is used to determine deferred benefits payable from the System.

**DISABILITY ELECTION:** All active members hired on or after January 1, 1999 will enter the Virginia Sickness and Disability Program (VSDP) and will not be eligible to receive non-VSDP disability benefits. For members hired before January 1, 1999 we measure the liabilities based upon the member's actual election contained in the valuation data.



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

**GROUP A\***  
**LOCALS – TOP 10, LEO**

**Plan Specific Assumptions and Methods**

**MORTALITY RATES:**

**Pre-Retirement:**

RP-2014 Employee Rates to age 80, Healthy Annuitant Rates at ages 81 and older Projected BB to 2020; M 90% of Rates; F SF 1yr

**Post-Retirement:**

RP-2014 Employee Rates to age 49, Healthy Annuitant Rates at ages 50 and older Projected BB to 2020; M SF 1yr, 1% increase compounded from ages 70 to 90; F SF 3yr.

**Post-Disablement:**

RP-2014 Disabled Mortality Rates Projected BB to 2020; M SF 2yr; Unisex using 100% Male.

Top 10 LEO Mortality Rates						
Age	Male			Female		
	Pre Retirement	Post Retirement	Post Disablement	Pre Retirement	Post Retirement	Post Disablement
20	0.00036	0.00044	0.00839	0.00016	0.00016	0.00839
25	0.00043	0.00045	0.00772	0.00018	0.00019	0.00772
30	0.00040	0.00046	0.00820	0.00023	0.00025	0.00820
35	0.00046	0.00053	0.00948	0.00030	0.00033	0.00948
40	0.00056	0.00066	0.01247	0.00043	0.00052	0.01247
45	0.00086	0.00107	0.01810	0.00072	0.00089	0.01810
50	0.00149	0.00431	0.02124	0.00118	0.00317	0.02124
55	0.00246	0.00599	0.02397	0.00174	0.00423	0.02397
60	0.00405	0.00789	0.02682	0.00247	0.00625	0.02682
65	0.00693	0.01102	0.03182	0.00383	0.00989	0.03182
70	0.01139	0.01694	0.04125	0.00653	0.01601	0.04125
75		0.02871	0.05658		0.02631	0.05658
80		0.05074	0.08141		0.04493	0.08141
85		0.09286	0.12299		0.07928	0.12299
90		0.17558	0.19143		0.14077	0.19143

Mortality improvement is anticipated under the post-retirement mortality assumption as projected with Scale BB.



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

**RETIREMENT RATES:** The following rates of retirement are assumed for members eligible to retire.

Top 10 LEO Retirement Rates, Male					
Age	Years of service				
	0-4	5	6-24	25	>=26
<=49	0.000	0.000	0.000	0.000	0.000
50	0.000	0.070	0.070	0.260	0.260
51	0.000	0.070	0.060	0.150	0.205
52	0.000	0.070	0.060	0.150	0.205
53	0.000	0.070	0.060	0.150	0.205
54	0.000	0.070	0.060	0.150	0.205
55	0.000	0.070	0.060	0.150	0.205
56	0.000	0.070	0.060	0.210	0.205
57	0.000	0.070	0.060	0.210	0.205
58	0.000	0.070	0.060	0.210	0.205
59	0.000	0.070	0.125	0.320	0.275
60	0.000	0.210	0.210	0.210	0.275
61	0.000	0.375	0.275	0.275	0.275
62	0.000	0.500	0.320	0.320	0.320
63	0.000	0.500	0.320	0.320	0.320
64	0.000	0.500	0.400	0.400	0.400
>=65	0.000	1.000	1.000	1.000	1.000



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

Top 10 LEO Retirement Rates, Female					
Age	Years of service				
	0-4	5	6-24	25	>=26
<=49	0.000	0.000	0.000	0.000	0.000
50	0.000	0.050	0.050	0.320	0.320
51	0.000	0.050	0.088	0.250	0.200
52	0.000	0.050	0.075	0.250	0.200
53	0.000	0.050	0.075	0.250	0.275
54	0.000	0.050	0.075	0.250	0.275
55	0.000	0.050	0.075	0.250	0.210
56	0.000	0.050	0.140	0.250	0.210
57	0.000	0.050	0.140	0.250	0.210
58	0.000	0.050	0.140	0.250	0.210
59	0.000	0.050	0.140	0.250	0.400
60	0.000	0.200	0.200	0.200	0.400
61	0.000	0.200	0.200	0.200	0.200
62	0.000	0.200	0.350	0.350	0.350
63	0.000	0.200	0.300	0.300	0.300
64	0.000	0.200	0.300	0.300	0.300
>=65	0.000	1.000	1.000	1.000	1.000



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

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**DISABILITY RATES:** As shown below for selected ages.

Top 10 LEO Disability Rates		
Age	Male	Female
20	0.00019	0.00012
25	0.00022	0.00248
30	0.00052	0.00558
35	0.00133	0.00705
40	0.00267	0.00794
45	0.00405	0.00906
50	0.00500	0.01090
55	0.00657	0.01376
60	0.01055	0.01788
65	0.01786	0.02327
70	0.03085	0.03105

**TERMINATION RATES:** The following are sample withdrawal rates based on age and years of service (for causes other than death, disability, or retirement).

Top 10 LEO Termination Rates		
Service	Male	Female
0	0.10000	0.15000
1	0.08500	0.09000
2	0.08000	0.09000
3	0.07500	0.09000
4	0.05500	0.09000
5	0.05000	0.09000
6	0.04750	0.09000
7	0.04500	0.06000
8	0.04000	0.03500
9	0.03000	0.02000
>=10	0.01800	0.02000



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

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**SALARY INCREASE RATES:** The following salary increase rates are used. Inflation rate of 2.50% plus productivity component of 1.00% plus step-rate/promotional component as shown:

Pay Increase Assumption	
Years of Service	Total Increase (Next Year)
1	4.75%
2	4.75
3	4.75
4	4.75
5	4.65
6	4.40
7	4.40
8	4.40
9	4.40
10 - 19	4.00
20 or more	3.50

As Group A includes volunteers, the Entry Age Normal (Level Percent of Pay) actuarial cost method assumes an initial pay of \$1 for volunteers that increases annually by the assumed rate of inflation, 3.00%.



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

**GROUP B\***  
**LOCALS – NON-TOP 10, LEO**

**Plan Specific Assumptions and Methods**

**MORTALITY RATES:**

Pre-Retirement:

RP-2014 Employee Rates to age 80, Healthy Annuitant Rates at ages 81 and older  
Projected BB to 2020; M 90% of Rates; F SF 1yr

Post-Retirement:

RP-2014 Employee Rates to age 49, Healthy Annuitant Rates at ages 50 and older  
Projected BB to 2020; M SF 1yr, 1% increase compounded from ages 70 to 90; F SF 3yr.

Post-Disablement:

RP-2014 Disabled Mortality Rates Projected BB to 2020; M SF 2yr; Unisex using 100% Male.

Non-Top 10 LEO Mortality Rates						
Age	Male			Female		
	Pre Retirement	Post Retirement	Post Disablement	Pre Retirement	Post Retirement	Post Disablement
20	0.00036	0.00044	0.00839	0.00016	0.00016	0.00839
25	0.00043	0.00045	0.00772	0.00018	0.00019	0.00772
30	0.00040	0.00046	0.00820	0.00023	0.00025	0.00820
35	0.00046	0.00053	0.00948	0.00030	0.00033	0.00948
40	0.00056	0.00066	0.01247	0.00043	0.00052	0.01247
45	0.00086	0.00107	0.01810	0.00072	0.00089	0.01810
50	0.00149	0.00431	0.02124	0.00118	0.00317	0.02124
55	0.00246	0.00599	0.02397	0.00174	0.00423	0.02397
60	0.00405	0.00789	0.02682	0.00247	0.00625	0.02682
65	0.00693	0.01102	0.03182	0.00383	0.00989	0.03182
70	0.01139	0.01694	0.04125	0.00653	0.01601	0.04125
75		0.02871	0.05658		0.02631	0.05658
80		0.05074	0.08141		0.04493	0.08141
85		0.09286	0.12299		0.07928	0.12299
90		0.17558	0.19143		0.14077	0.19143

Mortality improvement is anticipated under the post-retirement mortality assumption as projected with Scale BB.





***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

**RETIREMENT RATES:** The following rates of retirement are assumed for members eligible to retire.

Non-Top 10 LEO Retirement Rates, Male					
Age	Years of service				
	0-4	5	6-24	25	>=26
<=49	0.000	0.000	0.000	0.000	0.000
50	0.000	0.090	0.090	0.275	0.275
51	0.000	0.090	0.075	0.275	0.150
52	0.000	0.090	0.075	0.200	0.150
53	0.000	0.090	0.075	0.200	0.150
54	0.000	0.090	0.075	0.200	0.150
55	0.000	0.090	0.075	0.200	0.180
56	0.000	0.090	0.075	0.200	0.165
57	0.000	0.090	0.075	0.200	0.165
58	0.000	0.090	0.080	0.200	0.165
59	0.000	0.090	0.120	0.200	0.240
60	0.000	0.150	0.150	0.150	0.275
61	0.000	0.150	0.275	0.275	0.275
62	0.000	0.150	0.275	0.275	0.275
63	0.000	0.250	0.300	0.300	0.300
64	0.000	0.200	0.300	0.300	0.300
>=65	0.000	1.000	1.000	1.000	1.000



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

Non-Top 10 LEO Retirement Rates, Female					
Age	Years of service				
	0-4	5	6-24	25	>=26
<=49	0.000	0.000	0.000	0.000	0.000
50	0.000	0.093	0.093	0.500	0.500
51	0.000	0.125	0.090	0.200	0.150
52	0.000	0.125	0.090	0.200	0.150
53	0.000	0.125	0.090	0.200	0.150
54	0.000	0.125	0.090	0.200	0.150
55	0.000	0.125	0.090	0.200	0.180
56	0.000	0.125	0.090	0.200	0.165
57	0.000	0.125	0.090	0.200	0.165
58	0.000	0.125	0.090	0.200	0.165
59	0.000	0.125	0.090	0.200	0.240
60	0.000	0.200	0.200	0.200	0.275
61	0.000	0.200	0.275	0.275	0.275
62	0.000	0.200	0.275	0.275	0.275
63	0.000	0.200	0.300	0.300	0.300
64	0.000	0.200	0.300	0.300	0.300
>=65	0.000	1.000	1.000	1.000	1.000



**Schedule C – Outline of Actuarial Assumptions and Methods (continued)**

**DISABILITY RATES:** As shown below for selected ages.

Non-Top 10 LEO Disability Rates		
Age	Male	Female
20	0.00001	0.00005
25	0.00016	0.00067
30	0.00058	0.00157
35	0.00121	0.00189
40	0.00218	0.00201
45	0.00330	0.00244
50	0.00416	0.00413
55	0.00496	0.00831
60	0.00575	0.01605
65	0.00630	0.02747
70	0.00659	0.04509

**TERMINATION RATES:** The following are sample withdrawal rates based on age and years of service (for causes other than death, disability, or retirement).

Non-Top 10 LEO Termination Rates, Male											
Age	Years of Service										
	0	1	2	3	4	5	6	7	8	9	>=10
20	0.16820	0.15769	0.15265	0.14807	0.13578	0.11182	0.08845	0.07768	0.06899	0.06899	0.06899
25	0.16006	0.14519	0.13807	0.13247	0.12169	0.10519	0.08845	0.07768	0.06899	0.06899	0.06899
30	0.15408	0.13212	0.12044	0.11255	0.10382	0.09687	0.08803	0.07768	0.06849	0.06237	0.05800
35	0.15310	0.12574	0.10924	0.09896	0.09156	0.08897	0.08437	0.07640	0.06609	0.05433	0.04189
40	0.15357	0.12180	0.10118	0.08908	0.08281	0.08025	0.07719	0.07142	0.06199	0.04868	0.03220
45	0.15275	0.11790	0.09478	0.08223	0.07802	0.07022	0.06634	0.06269	0.05626	0.04561	0.03022
50	0.14879	0.11257	0.08908	0.07811	0.07733	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
55	0.14065	0.10547	0.08414	0.07694	0.07694	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
60	0.12791	0.09675	0.08028	0.07694	0.07694	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
65	0.11088	0.08665	0.07763	0.07694	0.07694	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
70	0.08616	0.07353	0.07353	0.07353	0.07353	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Non-Top 10 LEO Termination Rates, Female											
Age	Years of Service										
	0	1	2	3	4	5	6	7	8	9	>=10
20	0.17536	0.15011	0.12899	0.11652	0.11390	0.11329	0.11233	0.09556	0.06591	0.05831	0.05831
25	0.18762	0.15474	0.13049	0.11598	0.11001	0.10648	0.10224	0.08766	0.06591	0.05831	0.05831
30	0.20549	0.16296	0.13433	0.11683	0.10644	0.09874	0.09030	0.07873	0.06591	0.05831	0.05762
35	0.20886	0.16395	0.13402	0.11544	0.10335	0.09327	0.08334	0.07404	0.06591	0.05831	0.05043
40	0.20126	0.15881	0.13026	0.11258	0.10087	0.08968	0.08014	0.07253	0.06591	0.05763	0.04252
45	0.18253	0.14688	0.12276	0.10843	0.09904	0.08818	0.07992	0.07253	0.06587	0.05314	0.03443
50	0.15288	0.12797	0.11154	0.10319	0.09757	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
55	0.11234	0.10212	0.09680	0.09680	0.09599	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
60	0.06089	0.06935	0.06935	0.06935	0.06935	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
65	0.01269	0.03040	0.03040	0.03040	0.03040	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
70	0.01269	0.01185	0.01185	0.01185	0.01185	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000



***Schedule C – Outline of Actuarial Assumptions and Methods (continued)***

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**SALARY INCREASE RATES:** The following salary increase rates are used. Inflation rate of 2.50% plus productivity component of 1.00% plus step-rate/promotional component as shown:

Pay Increase Assumption	
Years of Service	Total Increase (Next Year)
1	4.75%
2	4.75
3	4.75
4	4.75
5	4.65
6	4.40
7	4.40
8	4.40
9	4.40
10 - 19	4.00
20 or more	3.50

As Group B includes volunteers, the Entry Age Normal (Level Percent of Pay) actuarial cost method assumes an initial pay of \$1 for volunteers that increases annually by the assumed rate of inflation, 3.00%.



### ***Schedule D – Actuarial Cost Method***

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The Plan's valuation is prepared on the projected benefit basis, which is used to determine the present value of each member's expected benefit payable at disability or death. The calculations are based on the member's age, years of service, gender, and an assumed future interest earnings rate (currently 4.75%). The calculations consider the probability of a member's death, retirement, or termination of employment prior to becoming eligible for a benefit. The present value of the expected benefits payable to active members is added to the present value of the expected future payments to current benefit recipients to obtain the present value of all expected benefits payable to the present group of members.

The employer contributions required to support the benefits of the Line of Duty Act Fund consist of a normal contribution and an accrued liability contribution.

The normal contribution is determined using the "entry age normal" method (EAN). Under this method, a calculation is made for postemployment benefits to determine the uniform and constant percentage rate of employer contribution that, if applied to the compensation of the average new member during the entire period of his anticipated covered service, would be required to meet the cost of all benefits payable on a member's behalf. As the valuation includes volunteers, the cost method assumes an initial pay of \$1 for volunteers that increases annually by the assumed rate of inflation, 3.00%. Additionally, the normal contribution includes annual administrative expenses and the annual cost of benefits incurred and reported to the administrator but awaiting processing.

The unfunded accrued liability for the Plan is determined by subtracting the current assets from the liability of active employees and current recipients. The accrued liability contribution amortizes the balance of the unfunded accrued liability over a period of 30 years from the valuation date.



## ***Schedule E – Summary of Main Plan Provisions as Interpreted for Valuation Purposes***

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### ***Participating Employers***

Any employer that is a state agency (i.e., employs a State Employee) participates in the Plan. Participating political subdivision employer groups with participants in the LODA Program were required to make an irrevocable election to participate in the Plan on or before July 1, 2012. Political subdivision employer groups who elected to opt-out of the Plan and self-fund LODA Program benefits assume responsibility for all benefit payments made after the election. This includes amounts paid to current beneficiaries for whom the political subdivision employer group is the employer of record.

### ***Eligibility***

Hazardous duty state and local government employees of the following groups, including volunteers, are eligible for the LODA Program benefits.

- Law-enforcement officers of the Commonwealth or any of its political subdivisions
- Correctional officers
- Jail officers
- Regional jail or jail farm superintendents
- Sheriff, deputy sheriff, city sergeant, or deputy city sergeant of the City of Richmond
- Police chaplains
- Members of fire companies or departments or rescue squads recognized by any county, city, or town of the Commonwealth as an integral part of an official safety program
- Virginia National Guard or the Virginia State Defense Force members, including fire companies or departments providing their fire protection services
- Special agents of the Virginia Alcoholic Beverage Control Board
- Full-time sworn members of the enforcement division of the Department of Motor Vehicles
- Conservation officers of the Department of Conservation and Recreation.
- Commissioned forest wardens
- Members or employees of the Virginia Marine Resources Commission granted the power of arrest
- Department of Emergency Management hazardous materials officers
- Other employees of the Department of Emergency Management if performing duties related to a major disaster or emergency
- Employees of any county, city, or town performing official emergency management or emergency services duties in cooperation with the Department of Emergency Management
- Non-firefighter regional hazardous materials emergency response team members

Some of those covered by the Plan may not be able to be identified in a census (e.g., volunteers) or, if they can be specifically identified, may not have a level of exposure that is on par with other participants (e.g., those serving in a major disaster or emergency versus a full-time firefighter). Experience, if and when available, would be the best method to determine the appropriate "load" to the seriatim liability. The results presented assume no additional margin for unidentifiable employees.

The results provided do not account for the potential, long-term incurred but not reported claims resulting from a lack of employer or beneficiary education about the Plan's benefits. The potential cost and liability for these claims may be considerable. A margin for these costs may need to be considered as experience develops. Additionally, the LODA Program administrator may want to consider this potential risk in regards to its authority to waive the five-year statute of limitation on claims.



***Schedule E – Summary of Main Plan Provisions as Interpreted for Valuation Purposes (continued)***

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The results presented were determined based upon the demographic assumptions (e.g., mortality, disability, retirement, termination) of state employee and law enforcement/fire personnel covered by VRS, and, as such, may not reflect the experience of all participants. If credible experience materializes, the Plan may want to consider developing rates based upon segmented risk pools or other divisions.

***Death Benefit***

A \$100,000 death benefit payment for death occurring as a direct or proximate result of the performance of duty, or a \$25,000 death benefit payment for death by presumptive clause or within five years of retirement. In determining the average death benefit payment, the LODA Program's experience was used to develop an average benefit payment assumption, reflecting the benefit's varying amount based upon the cause of death, and applied to a percentage of active mortality. Presumptive death benefit payments require additional investigation to determine employee status at the time of death.

***Health Care Coverage Period***

For disabilities and deaths occurring prior to July 1, 2017 that result in health care coverage under the Plan, disabled employees, their spouses, and surviving spouses receive lifetime health care benefits. For disabilities and deaths occurring after June 30, 2017 that result in health care coverage under the Plan, disabled employees (except those eligible for Medicare due to disability under Social Security Disability Insurance or a Railroad Retirement Board Disability Annuity), their spouses, and surviving spouses receive health care benefits until becoming eligible for Medicare due to age (age 65). Disabled employees eligible for Medicare due to disability under Social Security Disability Insurance or a Railroad Retirement Board Disability Annuity receive lifetime health care benefits.

***Health Care Benefit (Effective until July 1, 2017)***

The health care benefit is defined as, "the same plan of benefits which the deceased or disabled person was entitled to on the last day of his active duty or comparable benefits established as a result of a replacement plan." The level of coverage offered by various employer groups may be wide-ranging due to the types of coverage provided (e.g., HMO, PPO, dental, vision, individual policies, Medicare Part B premium reimbursement), level of coverage provided (e.g., benefit maximums, Medicare coverage type), and cost-sharing provisions (e.g., premiums, deductibles, copays, out-of-pocket maximums, Medicare coordination of benefits methodology). As a result, the true cost of coverage will vary by health care plan. This may result in a selective advantage for those employer groups providing health care coverage that is richer than the average used to determine the Plan's costs.

In determining initial per capita costs for the Plan, the use of a uniform health care cost assumption based upon the Plan's recent experience was used. As noted above, the use of a uniform health care cost structure may result in selection by employer groups with costs differing greatly from the standard. This selection process may result in higher than expected plan costs. Those payments identified as "self-pay" need to be investigated to determine if the coverage is from a former employer, is from a community rated policy, or is from an individually underwritten policy to determine if these costs need to be age adjusted. The results presented assume 20% of under age 65 health care costs and 40% of health care costs for beneficiaries ages 65 and older are age-adjusted beyond the assumed cost change upon reaching age 65.



***Schedule E – Summary of Main Plan Provisions as Interpreted for Valuation Purposes (continued)***

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***Health Care Benefit (Effective July 1, 2017)***

The health care benefit for the LODA Program is to be provided through the LODA Health Benefits Plans, administered by the Department of Human Resource Management and modeled upon the state employee health benefits program plans (COVA Care). As the cost of the LODA Health Benefits Plans is to be pooled across all beneficiaries of the LODA Program, the cost to the Plan may be higher or lower than the actual health care costs incurred by the Plan's health care beneficiaries.

Per capita costs were based upon the adjusted experience of those State Employees currently receiving health care benefits from the Plan using high-level assumptions and estimates that are likely to change as details regarding the LODA Health Benefit Plans emerge. This includes the demographic adjustments made for the Plan's covered population, the mix of health care plan and coverage elections made by State Employees, and the level of benefits to be provided. As such, future experience may differ significantly from the cost estimates presented in this report, and the valuation's results should be viewed as having a likely range of variability.

Beyond the first projection year, all assumed health care costs not related to covered dependent children were age-adjusted to reflect the full, age-specific cost of providing benefits.

***Cost Offsets***

To the extent the Plan's benefits are paid or reimbursed by other programs such as the VRS Health Insurance Credit Program (HIC), or applicable retirement plans, benefit offsets should be considered in developing the Plan's rate structure. The results provided include estimated HIC receipts and assume the estimated reimbursements from the HIC program are used to decrease costs for all Plan participants.

***Affordable Care Act***

The impact of the Affordable Care Act (ACA) was addressed in this valuation. While the impact of certain provisions such as the excise tax on high-value health insurance plans beginning in 2020 (if applicable), should be recognized in the determination of liabilities, overall future plan costs and the resulting liabilities are driven by amounts employers and retirees can afford (i.e., trend). Given the uncertainty regarding the ACA's implementation, continued monitoring of the ACA's impact on the Plan's liability will be required.





***Schedule F – Schedule of Active Member Data***

**SCHEDULE OF FULL TIME ACTIVE MEMBER DATA  
AS OF JUNE 30, 2018**

Attained Age	Years of Service to Valuation Date									Total
	Less than 1 Year	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 or more	
Under 25	627	535	0	0	0	0	0	0	0	1,162
25 - 29	75	2,121	369	2	0	0	0	0	0	2,567
30 - 34	38	869	1343	385	0	0	0	0	0	2,635
35 - 39	18	286	707	956	221	4	0	0	0	2,192
40 - 44	12	208	216	1,147	589	207	1	0	0	2,380
45 - 49	14	169	203	524	767	741	164	4	0	2,586
50 - 54	7	97	133	302	628	342	316	142	2	1,969
55 - 59	2	80	99	211	434	163	111	163	50	1,313
60 - 64	2	25	42	102	106	145	27	43	112	604
65 - 69	1	4	5	21	12	45	9	7	42	146
70 & Up	0	1	0	6	2	15	1	0	8	33
Total	796	4,395	3,117	3,656	2,759	1,662	629	359	214	17,587



### ***Schedule G – Projections***

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The results of actuarial valuations are a “snapshot” of the financial position on the valuation date, based on the assumed number of active employees and current beneficiaries. Projections simulate future actuarial valuation results over a forecast period (seven years in this case) by “creating” future new hires and performing valuations using the projected membership. The projections provided below assume a stationary active population. In addition, the following items are assumed for the projected results provided in this section of the report:

- Board approved contributions of \$705.77 per FTE employee are made to the LODA Fund for the fiscal years ending June 30, 2019 and June 30, 2020.
- Health Insurance Credit Program (HIC) reimbursements will be used to fund increases to the payment reserve with any excess amounts used to reduce contributions.
- Projected contributions are made at the levels indicated and are paid as scheduled.

All other demographic and economic changes are assumed to occur in accordance with the actuarial assumptions used for the actuarial valuation.



**Schedule G – Projections (continued)**

**PROJECTED COSTS AND CONTRIBUTIONS  
ALL PARTICIPATING EMPLOYER GROUPS  
JUNE 30, 2018 VALUATION BASIS**

All Participating Employer Groups - June 30, 2018 Valuation Basis								
	Actual	Projected						
	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
FTE Employees	17,686.87	19,013.65	19,013.65	19,013.65	19,013.65	19,013.65	19,013.65	19,013.65
Cash Flow (Per FTE Employee)								
Employer Contribution Rate	567.37	\$705.77	\$705.77	\$778.02	\$778.02	\$930.16	\$930.16	\$1,018.78
Benefit Costs	(700.97)	(680.61)	(737.59)	(782.18)	(840.39)	(892.98)	(951.88)	(994.40)
Administrative Expenses	(41.95)	(26.30)	(27.09)	(27.87)	(28.72)	(29.56)	(30.45)	(31.35)
Investment Income and Misc Rev	86.67	21.45	21.05	21.60	19.71	22.27	22.27	24.03
Net Cash Flow	(88.88)	20.31	(37.86)	(10.43)	(71.38)	29.89	(29.90)	17.06
Cash Flow								
Employer Contributions	\$10,035,000	\$13,419,264	\$13,419,264	\$14,793,029	\$14,793,029	\$17,685,770	\$17,685,770	\$19,370,745
Benefit Costs	(12,398,000)	(12,940,944)	(14,024,206)	(14,872,021)	(15,978,944)	(16,978,878)	(18,098,618)	(18,907,127)
Administrative Expenses	(742,000)	(500,000)	(515,000)	(530,000)	(546,000)	(562,000)	(579,000)	(596,000)
Income and Misc Rev	1,533,000	407,920	400,183	410,756	374,671	423,478	423,478	456,911
Net Cash Flow	(\$1,572,000)	\$386,240	(\$719,759)	(\$198,236)	(\$1,357,245)	\$568,370	(\$568,370)	\$324,529
End of Year Net Position	\$1,889,000	\$2,275,240	\$1,555,481	\$1,357,245	(\$0)	\$568,370	\$0	\$324,529