



Office of the State Actuary

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September 16, 2015

Mr. Steve Nelsen
Executive Director
LEOFF 2 Retirement Board
PO Box 40918
Olympia, Washington 98504-0918

SUBJECT: LEOFF 2 ADMINISTRATIVE FACTORS UPDATE

Dear Steve:

We have completed our update of several administrative factors for use in the Washington Administrative Code (WAC). We amended them as a result of the changes to the demographic assumptions adopted by the Law Enforcement Officers' and Fire Fighters' Plan 2 (LEOFF 2) Retirement Board (Board) during the 2014 Interim.

As a result of this project, please find attached the following updated actuarial tables for the Board's approval.

- ❖ Early Retirement Factors (ERFs) for [WAC 415-02-320](#) (**Appendix B**).
- ❖ Monthly Benefit per \$1.00 of Accumulation for [WAC 415-02-340](#) (**Appendix C**).
- ❖ Joint and Survivor Option Factors (J&S) for [WAC 415-02-380](#) (**Appendix D**).
- ❖ Service Credit Restoration Factors (SCRF) for [WAC 415-02-370](#) (**Appendix E**).

Administrative factors should be reviewed and, if necessary, updated any time the underlying demographic or economic assumptions for the plan change. The tables will be updated again after our next *Demographic Experience Study (DES)*, which will review experience from the 2013-2017 period. They could also change with new member options or benefit changes in the future.

The attached appendices contain supporting information for each factor we updated. **Appendix A** supplies general information about data, assumptions, and methods used to develop the early retirement factors, the monthly benefit per \$1.00 of accumulation factors, and the J&S option factors. **Appendices B through D** provide more detailed information about each of these factors, respectively. **Appendix E** supplies general information about



data, assumptions, and methods used to develop SCRF. All of the appendices, including the attached Excel Spreadsheet, should be used together with this cover letter to form a complete actuarial communication.

We developed the administrative factors based on our understanding of how the Department of Retirement Systems (DRS) applies them and according to policy decisions made by the Board. The policy decisions were documented in a letter from our office dated August 26, 2009, and have been updated to reflect more current data. We intend this communication to be used by the Board and DRS only. If a party other than the Board or DRS reads this communication, they should address questions to the Board or DRS and seek professional guidance with the content and interpretation of this communication.

The economic and demographic assumptions we used for updating the factors were adopted by the Board consistent with RCW 41.26.720.

In my opinion, all of the data, assumptions, and methods we used in developing the factors are reasonable and appropriate for this project and are in conformity with generally accepted actuarial principles and standards of practice as of the date of this letter. The use of another set of assumptions and methods, however, could also be reasonable and could produce materially different results.

The undersigned, with actuarial credentials, meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. While this letter and supporting attachments are intended to be complete, we are available to offer extra advice and explanations as needed.



Mr. Steve Nelsen
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Please let me know if you have any questions concerning these administrative factors or the assumptions and methods used to develop them.

Sincerely,

Lisa A. Won, ASA, FCA, MAAA
Deputy State Actuary

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Attachments

Appendix A – General Data, Assumptions, and Methods
Appendix B – Early Retirement Factors
Appendix C – Monthly Benefit Per \$1.00 of Accumulation
Appendix D – Joint and Survivor Option Factors
Appendix E – Service Credit Restoration Factors
Excel Spreadsheet – SCRF for LEOFF2 – OSA 9-15-15.xlsx

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APPENDIX A – GENERAL DATA, ASSUMPTIONS, AND METHODS

Purpose

Unless otherwise noted, the information contained in this appendix applies to all factors developed in this project.

Data

We relied on the [2014 Actuarial Valuation Report](#) (AVR) data whenever necessary to develop the administrative factors. Please see the *Actuarial Certification Letter* in the 2014 AVR for further considerations on the data we used.

Assumptions

We relied on the following key assumptions in the 2014 AVR to develop the administrative factors.

❖ **Economic Assumptions.**

System	Interest	Annual COLA
LEOFF 2	7.50%	3%

- ❖ **Mortality Assumptions:** We used the mortality improvement method developed in our [2007-2012 DES](#) to project the RP-2000 table to the year 2017 (“RP-2017”) for the underlying mortality assumption for the plan. We use 2017 because it’s the approximate midpoint between the current and next expected update to administrative factors.

We included additional mortality improvement projections for the plan developed specifically for retirement-age members as shown in the table below.

Plan	Average Retirement Age	Projection Year
LEOFF 2	56	2039

Note that we project mortality improvements generationally in the 2014 AVR (see the DES for more information on generational mortality improvement projections). Generational mortality improvement means mortality rates get smaller every year in the future for every age. However, in order to calculate administrative factors, we must project mortality improvements to a selected static year. We developed the static projection year by matching the life expectancy of a retirement-age member in 2017 calculated under generational mortality, to the life expectancy calculated under a static projection year. We calculated 2039 as the matching static year.



See the **Methods** section below for a description of the development of projected mortality assumptions.

- ❖ **Mortality Blending:** We used the retirement and disability rates as disclosed in the 2014 AVR and RP-2017 mortality rates to blend healthy and disabled mortality assumptions (see the **Methods** section below for a description of the process).
- ❖ **Percent Male/Female:** We assumed percent male/female for primary members as shown in the table below. These percentages match the DES.

System	Percent Male	Percent Female
LEOFF	90%	10%

Methods

Development of Underlying Mortality Assumptions

Consistent with the Board's 2009 policy decisions, we blended healthy and disabled mortality assumptions using the following method.

- ❖ We multiplied the RP-2017 healthy mortality rates by the probability that benefit commencement is from a healthy cause. Healthy causes include service retirement and the death of a member from active service.
- ❖ We multiplied the RP-2017 disabled mortality rates by the probability a member will take a disability benefit. In other words, we multiplied the RP-2017 disabled mortality rates by the probability of a benefit commencing due to a non-healthy cause.
- ❖ We added the weighted rates above to come up with male and female RP-2017 blended mortality assumptions by age for the plan.

We incorporated mortality improvements for each year after 2017 as follows.

- ❖ We used data from the 2014 AVR to find the historical average retirement age of the service and disability retirees for the plan.
- ❖ We project mortality improvements based on the plan's expected retirement age rather than the plan's average member age.
- ❖ We projected the blended mortality rates from RP-2017 to the projected mortality improvement year. We incorporated expected mortality improvements using 100 percent of Scale BB, as developed in the DES and applied in the 2014 AVR.



APPENDIX B – EARLY RETIREMENT FACTORS

Purpose

DRS uses ERFs to reduce an annuitant’s lifetime benefit for early commencement. We have provided actuarially equivalent ERFs for LEOFF 2

We intend these ERFs to be used for benefits that receive actuarially equivalent reductions for early commencement. The ERFs developed in this section do not apply to members eligible for “alternate” ERFs, such as 3 percent ERFs, who have reached specific age and service combinations as mandated in statute.

Data and Assumptions

We used the data and assumptions described in Appendix A along with the assumed Normal Retirement Age (NRA) of 53 for LEOFF 2.

Methods

Development of ERFs

To develop the ERFs, we divided annuity factors deferred to NRA by the immediate annuity factors for each age level. The ratio of these two factors at each age level is the ERF that solves the actuarial equivalence relation.

$$PV(\text{accrued benefits deferred to NRA}) = \text{ERF} \times PV(\text{benefits started immediately})$$

Where “PV” denotes Present Value and includes the annuity factors produced for this project. “Benefits” means the sum of all expected lifetime benefits.

The next table displays detailed information about the annuity factors we used to develop the ERFs.

Annuity Factor Details		
	Immediate Annuity	Deferred Annuity
Annuity Type	Single-Life	Single-Life
Payment Commencement	Immediate	Deferred to 53
Payment Frequency	Monthly	Monthly
Payment Timing	End of Period	End of Period
Certain Period (Years)	None	None
COLA Percent	3%	3%
COLA Increase Frequency	Annual	Annual



We rounded the ERFs to three decimal places (one-tenth of a percent).

Using the factors from each whole age, we used linear interpolation to find the monthly factors. That is, we moved from one whole age factor to the next in 12 straight-line increments.

Other Information

We formatted the ERF table in a way consistent with the current format in [WAC 415-02-320](#). Please see the following attached table for the LEOFF 2 ERFs.

Early Retirement Factor Table

Years Early	Month 0	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11
0	1.0000	0.9931	0.9862	0.9793	0.9724	0.9655	0.9586	0.9517	0.9448	0.9379	0.9310	0.9241
1	0.9176	0.9114	0.9052	0.8990	0.8928	0.8866	0.8804	0.8742	0.8680	0.8618	0.8556	0.8494
2	0.8426	0.8369	0.8312	0.8255	0.8198	0.8141	0.8084	0.8027	0.7970	0.7913	0.7856	0.7799
3	0.7743	0.7692	0.7640	0.7588	0.7536	0.7484	0.7432	0.7380	0.7328	0.7276	0.7224	0.7172
4	0.7120	0.7073	0.7026	0.6979	0.6932	0.6885	0.6838	0.6791	0.6744	0.6697	0.6650	0.6603
5	0.6551	0.6508	0.6465	0.6422	0.6379	0.6336	0.6293	0.6250	0.6207	0.6164	0.6121	0.6078
6	0.6031	0.5991	0.5951	0.5911	0.5871	0.5831	0.5791	0.5751	0.5711	0.5671	0.5631	0.5591
7	0.5555	0.5518	0.5482	0.5446	0.5410	0.5374	0.5338	0.5302	0.5266	0.5230	0.5194	0.5158
8	0.5118	0.5085	0.5052	0.5019	0.4986	0.4953	0.4920	0.4887	0.4854	0.4821	0.4788	0.4755
9	0.4719	0.4688	0.4657	0.4626	0.4595	0.4564	0.4533	0.4502	0.4471	0.4440	0.4409	0.4378
10	0.4352	0.4324	0.4296	0.4268	0.4240	0.4212	0.4184	0.4156	0.4128	0.4100	0.4072	0.4044
11	0.4016	0.3990	0.3964	0.3938	0.3912	0.3886	0.3860	0.3834	0.3808	0.3782	0.3756	0.3730
12	0.3707	0.3684	0.3660	0.3636	0.3612	0.3588	0.3564	0.3540	0.3516	0.3492	0.3468	0.3444
13	0.3424	0.3402	0.3380	0.3358	0.3336	0.3314	0.3292	0.3270	0.3248	0.3226	0.3204	0.3182
14	0.3163	0.3143	0.3123	0.3103	0.3083	0.3063	0.3043	0.3023	0.3003	0.2983	0.2963	0.2943
15	0.2923	0.2904	0.2886	0.2868	0.2850	0.2832	0.2814	0.2796	0.2778	0.2760	0.2742	0.2724
16	0.2702	0.2685	0.2668	0.2651	0.2634	0.2617	0.2600	0.2583	0.2566	0.2549	0.2532	0.2515
17	0.2498	0.2483	0.2467	0.2451	0.2435	0.2419	0.2403	0.2387	0.2371	0.2355	0.2339	0.2323
18	0.2311	0.2297	0.2283	0.2269	0.2255	0.2241	0.2227	0.2213	0.2199	0.2185	0.2171	0.2157
19	0.2138	0.2125	0.2112	0.2099	0.2086	0.2073	0.2060	0.2047	0.2034	0.2021	0.2008	0.1995
20	0.1979	0.1967	0.1955	0.1943	0.1931	0.1919	0.1907	0.1895	0.1883	0.1871	0.1859	0.1847
21	0.1832	0.1821	0.1810	0.1799	0.1788	0.1777	0.1766	0.1755	0.1744	0.1733	0.1722	0.1711
22	0.1697	0.1686	0.1676	0.1666	0.1656	0.1646	0.1636	0.1626	0.1616	0.1606	0.1596	0.1586
23	0.1571	0.1562	0.1552	0.1542	0.1532	0.1522	0.1512	0.1502	0.1492	0.1482	0.1472	0.1462
24	0.1456	0.1447	0.1438	0.1429	0.1420	0.1411	0.1402	0.1393	0.1384	0.1375	0.1366	0.1357
25	0.1349	0.1341	0.1333	0.1325	0.1317	0.1309	0.1301	0.1293	0.1285	0.1277	0.1269	0.1261
26	0.1250	0.1243	0.1235	0.1227	0.1219	0.1211	0.1203	0.1195	0.1187	0.1179	0.1171	0.1163
27	0.1159	0.1152	0.1145	0.1138	0.1131	0.1124	0.1117	0.1110	0.1103	0.1096	0.1089	0.1082
28	0.1075	0.1068	0.1062	0.1056	0.1050	0.1044	0.1038	0.1032	0.1026	0.1020	0.1014	0.1008
29	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
30+	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000



APPENDIX C – MONTHLY BENEFIT PER \$1.00 OF ACCUMULATION FACTORS

Description

DRS uses monthly benefit per \$1.00 of accumulation tables in two ways. When the factors are multiplied by a lump sum dollar value, a monthly lifetime benefit amount may be obtained. Conversely, the department may divide a monthly benefit amount by a factor in these tables to determine a single lump sum payment for the purchase of an annuity upon retirement.

Data and Assumptions

We used the data and assumptions described in **Appendix A**.

Methods

Development of Monthly Benefit per \$1.00 of Accumulation Tables

The factor at each age equals one divided by an immediate single-life annuity factor divided by 12.

The next table displays additional information we used to develop these factors.

Annuity Factor Details	
Annuity Type	Single-Life
Payment Commencement	Immediate
Payment Frequency	Monthly
Payment Timing	End of Period
Certain Period (Years)	None
COLA Percent	3%
COLA Increase Frequency	Annual

Other Information

We formatted the monthly benefit per \$1.00 of accumulation tables in a way consistent with the current format in [WAC 415-02-340](#). Please see the following attached tables for the resulting monthly benefit per \$1.00 of accumulation factors.



Monthly Benefit per \$1.00 of Accumulation Table

Age	Factor	Age	Factor
20	0.0039000	61	0.0054657
21	0.0039124	62	0.0055731
22	0.0039254	63	0.0056883
23	0.0039390	64	0.0058115
24	0.0039531	65	0.0059433
25	0.0039678	66	0.0060853
26	0.0039832	67	0.0062394
27	0.0039992	68	0.0064060
28	0.0040159	69	0.0065872
29	0.0040333	70	0.0067825
30	0.0040514	71	0.0069937
31	0.0040702	72	0.0072212
32	0.0040899	73	0.0074680
33	0.0041104	74	0.0077358
34	0.0041319	75	0.0080268
35	0.0041543	76	0.0083431
36	0.0041776	77	0.0086877
37	0.0042020	78	0.0090640
38	0.0042275	79	0.0094764
39	0.0042541	80	0.0099298
40	0.0042820	81	0.0104301
41	0.0043114	82	0.0109841
42	0.0043423	83	0.0115971
43	0.0043746	84	0.0122786
44	0.0044086	85	0.0130410
45	0.0044443	86	0.0139008
46	0.0044819	87	0.0148803
47	0.0045210	88	0.0159639
48	0.0045616	89	0.0171594
49	0.0046037	90	0.0184724
50	0.0046475	91	0.0198954
51	0.0047011	92	0.0214186
52	0.0047583	93	0.0230513
53	0.0048185	94	0.0247825
54	0.0048832	95	0.0265923
55	0.0049520	96	0.0284466
56	0.0050250	97	0.0302877
57	0.0051021	98	0.0320177
58	0.0051838	99	0.0340070
59	0.0052716		
60	0.0053653		



APPENDIX D – JOINT AND SURVIVOR OPTION FACTORS

Purpose

Members of LEOFF 2 may elect a reduced monthly benefit amount to provide an ongoing survivor benefit for their designated survivor beneficiary. The department currently offers three J&S choices for these members:

- ❖ Survivor receives 100 percent of the member's benefit (Option 2).
- ❖ Survivor receives 50 percent of the member's benefit (Option 3).
- ❖ Survivor receives 66 2/3 percent of the member's benefit (Option 4).

The J&S option factors presented in this communication can be multiplied by a member's earned monthly benefit amount to find the member's reduced monthly benefit if they select one of these options.

Data

We used the 2014 AVR data as described in **Appendix A**. We also used data from the 2007-2012 DES about service and disability retirees to develop the percent male assumptions and expected retirement ages (see tables in the **Assumptions** section below) for members who select a J&S option.

Assumptions

We relied on the following key assumptions:

- ❖ We used the economic and mortality assumptions shown in **Appendix A**.
- ❖ We assumed percent male assumptions specifically for the J&S factors of 98.23 percent, based on information in the DES. This assumption method is consistent with the method used to develop the J&S administrative factors currently in place.
- ❖ We developed average assumed LEOFF 2 retirement ages based on information about the same service and disability retirees cited in the data section of this appendix. This assumption is consistent with the assumption used to develop the J&S administrative factors currently in place.



Retirement Age*		
Plan	Males	Females
LEOFF	57	54

*Age for members who have selected a J&S option.

Methods

Development of J&S Option Factor Table

J&S option factors reduce members' benefits so that the selection of the option makes the benefits under that option actuarially equivalent to the members' single life benefits.

$$PV(\text{single-life benefits}) = \text{Factor} \times PV(\text{J\&S benefits})$$

Where "PV" denotes Present Value and includes the annuity factors produced for this project. "Benefits" means the sum of all expected lifetime benefits.

The next table displays additional information we used to develop these factors.

Annuity Factor Details		
	Single-Life Annuity	Joint & Survivor Annuity
Annuity Type	Single Life	Joint Life
Payment Commencement	Immediate	Immediate
Payment Frequency	Monthly	Monthly
Payment Timing	End of Period	End of Period
Certain Period (Years)	None	None
COLA Percent	3%	3%
COLA Increase Frequency	Annual	Annual

We developed the J&S option factors to include the probability that a survivor will pre-decease the member, and the member's benefit will "pop up" to its pre-reduction level.

Other Information

We formatted the J&S option factor table in a way consistent with their current format in [WAC 415-02-380](#). Please see the attached table for the resulting J&S option factors.



J&S Option Factor Table

Age Difference	Option 2 100%	Option 3 50%	Option 4 66 2/3%	Age Difference	Option 2 100%	Option 3 50%	Option 4 66 2/3%
(20)	0.958	0.978	0.972	11	0.834	0.909	0.883
(19)	0.955	0.977	0.970	12	0.829	0.907	0.879
(18)	0.953	0.976	0.968	13	0.825	0.904	0.876
(17)	0.950	0.975	0.966	14	0.821	0.901	0.873
(16)	0.948	0.973	0.964	15	0.816	0.899	0.870
(15)	0.945	0.972	0.963	16	0.812	0.896	0.867
(14)	0.942	0.970	0.960	17	0.808	0.894	0.864
(13)	0.939	0.968	0.958	18	0.805	0.892	0.861
(12)	0.936	0.967	0.956	19	0.801	0.889	0.858
(11)	0.932	0.965	0.954	20	0.797	0.887	0.855
(10)	0.929	0.963	0.951	21	0.794	0.885	0.852
(9)	0.925	0.961	0.949	22	0.790	0.883	0.850
(8)	0.922	0.959	0.946	23	0.787	0.881	0.847
(7)	0.918	0.957	0.944	24	0.784	0.879	0.845
(6)	0.914	0.955	0.941	25	0.781	0.877	0.843
(5)	0.910	0.953	0.938	26	0.778	0.875	0.840
(4)	0.905	0.950	0.935	27	0.775	0.874	0.838
(3)	0.901	0.948	0.932	28	0.773	0.872	0.836
(2)	0.896	0.945	0.928	29	0.770	0.870	0.834
(1)	0.892	0.943	0.925	30	0.768	0.869	0.832
0	0.887	0.940	0.922	31	0.765	0.867	0.830
1	0.882	0.937	0.918	32	0.763	0.866	0.829
2	0.877	0.935	0.915	33	0.761	0.864	0.827
3	0.872	0.932	0.911	34	0.759	0.863	0.825
4	0.868	0.929	0.908	35	0.757	0.862	0.824
5	0.863	0.926	0.904	36	0.755	0.860	0.822
6	0.858	0.923	0.900	37	0.753	0.859	0.821
7	0.853	0.921	0.897	38	0.751	0.858	0.819
8	0.848	0.918	0.893	39	0.750	0.857	0.818
9	0.843	0.915	0.890	40	0.748	0.856	0.817
10	0.839	0.912	0.886				

Note: Age difference equals member age minus beneficiary age.



APPENDIX E – SERVICE CREDIT RESTORATION FACTORS

Purpose

These factors allow DRS to calculate the Actuarial Equivalent (AE) cost for members to restore prior service credit under RCW 41.50.165.

Data and Assumptions

We used the data, economic assumptions, and percent male/female assumptions described in **Appendix A**.

We relied on the following additional assumptions to develop the new SCRF.

- ❖ **Actuarial Equivalence:** We developed the new SCRF assuming members commence receiving their retirement benefits at Normal Retirement Age (NRA), or immediately for post-NRA restorations. We did not include assumptions for pre-retirement mortality, termination, or disability. Also, we applied an adjustment for members who have the opportunity to benefit from subsidized early retirement. Under these circumstances, we increased the age-based SCRF by the weighted average of, (i) the increase in their benefit from more favorable ERFs, and, (ii) the likelihood that they will retire. We used the retirement rates as disclosed in the 2014 AVR.
- ❖ In addition, we’ve added a second step that includes the cost for the increased value of the member’s past service if it is available at an earlier (subsidized) retirement age due to the addition of the restored service. This step will result in no additional cost if the restored service does not change the member’s ability for subsidized or earlier unreduced retirement. Please see the “Part 2” equation of the **Other Information** section below for how this cost is calculated administratively. This additional component also ensures the cost paid by the member is the same whether the service is restored as a single transaction or over multiple transactions.

System	Normal Retirement Eligibility (Age/Service)	Early Retirement Eligibility (Age/Service)	Subsidized Early Retirement (Age/Service)
LEOFF 2	53/5	50/20	50/20

- ❖ **Mortality Assumptions:** We projected mortality to a static year of 2036. Since actives and deferred vested employees will likely be the population purchasing additional service credit in the future, we changed our static projected mortality improvement year to match this group’s liability under generational mortality improvement.



- ❖ **Mortality Blending:** These factors only apply for restorations by active members. Therefore, we did not blend disabled mortality rates with healthy mortality rates in their development.
- ❖ **Retirement Rates:** We used the same retirement rates that were developed in the DES.
- ❖ **Early Retirement Factors:** We applied the new ERFs that were developed in this administrative factor update. Please see **Appendix B** for the table of factors used.
- ❖ **Certain Period:** We apply a certain period to the NRA annuity factors to cover the guaranteed “refund of contributions provision” in the case that a member dies before all of their contributions have been paid out in monthly benefits. This certain period matches the 2007-2012 DES.

System	Certain Period
LEOFF 2	5

Methods

Development of Underlying Annuity Factors

The next table displays detailed information about how we developed the deferred and immediate annuity factors.

Annuity Factor Details		
	Deferred Annuity	Immediate Annuity
Annuity Type	Single-Life	Single-Life
Payment Commencement	Deferred to NRA	Immediate
Payment Frequency	Monthly	Monthly
Payment Timing	End of Period	End of Period
Percent COLA	3%	3%
COLA Increase Frequency	Annual	Annual

Other Information

The format we developed for the SCRF includes a two-dimensional table. Specifically, the dimensions are *Current Age* by *Service*. The cost paid by the member equals their AFC, times the sum of Part 1 plus Part 2.



Part 1. (i) The number of years to be restored, times (ii) the table factor at their current age and service amount with the restoration;

Plus;

Part 2. (iii) Their service prior to the restoration, times (iv) the difference between
(a) The table factor including restored service, minus;
(b) The table factor based upon service before the restoration.

Part 2 of this equation accounts for the cost of receiving benefits on past service at a subsidized or earlier unreduced retirement age resulting from the restored service. For more information, see WAC [415-02-370](#).

Please see the attached spreadsheet for the new SCRF. Note that the factors can be linearly interpolated between each integer age and service value provided in the spreadsheet.