

**Minnesota
Legislative Commission on
Pensions and Retirement**

Review of July 1, 2020 Actuarial Valuation Reports

PERA – Police & Fire

PERA – Local Correctional

MSRS – State Patrol

MSRS – State Correctional

April 30, 2021

April 30, 2021

Minnesota Legislative Commission on Pensions and Retirement
55 State Office Building
100 Rev. Dr. Martin Luther King, Jr. Blvd.
St. Paul, MN 55155

Attn: Susan Lenczewski, Executive Director

Re: Review of July 1, 2020 Actuarial Valuation Reports

Commission Members:

This report presents our review of the July 1, 2020 actuarial valuation reports for the following four pension plans:

- **Public Employees Retirement Association of Minnesota**
 - Public Employees Police & Fire Plan (**PERA Police & Fire**)
 - Local Government Correctional Service Retirement Plan (**PERA Local Correctional**)
- **Minnesota State Retirement System**
 - State Patrol Retirement Fund (**MSRS State Patrol**)
 - Correctional Employees Retirement Fund (**MSRS State Correctional**)

We found the valuation reports to be reasonable, reliable, and in compliance with applicable Minnesota Statutes, LCPR Standards for Actuarial Work (“Standards”), and relevant Actuarial Standards of Practice (ASOPs). Additional results and commentary can be found in the Executive Summary section of the report and subsequent sections.

Purpose of the Study

This study was prepared at the request of the Legislative Commission on Pensions and Retirement (LCPR). Its purpose is to review the July 1, 2020 actuarial valuation reports for reasonability, accuracy, and compliance with applicable Minnesota Statutes, LCPR standards for actuarial work, and relevant Actuarial Standards of Practice.

The report is intended to comply with Minnesota Statute 356.214 Subd. 4(b) which states that the auditing actuary shall:

“audit the valuation reports submitted by the actuary retained by each governing or managing board or administrative official, and provide an assessment of the reasonableness, reliability, and areas of concern or potential improvement in the specific reports reviewed, the procedures utilized by any particular reporting actuary, or general modifications to standards, procedures, or assumptions that the commission may wish to consider.”

This report may not be used for any other purpose, and Van Iwaarden Associates is not responsible for the consequences of any unauthorized use. Its content may not be modified, incorporated into or used in other material, or otherwise provided, in whole or in part, to any other person or entity, without our permission.

Data Used in the Analysis

The results and recommendations in this report are based on the following data sources:

- July 1, 2020 actuarial valuation reports prepared by the retained actuaries for PERA Police & Fire, PERA Local Correctional, MSRS State Patrol, and MSRS State Correctional;
- Census data files provided by the retirement systems;
- “Scrubbed” census data files provided by the retained actuaries; and
- Asset data from the systems’ Annual Financial Reports and the State Board of Investment (SBI).

Although we reviewed all data sources for reasonability, we have not audited the underlying data and are relying on its substantial accuracy. If any data supplied are not accurate and complete, our conclusions in this actuarial valuation review may differ significantly.

Actuarial Certification

To the best of our knowledge, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices.

Upon receipt of the report, the LCPR should notify us if you disagree with any information contained in the report or if you are aware of any information that would affect the results that has not been communicated to us. The report will be deemed final and acceptable to the LCPR unless you immediately notify us otherwise.

The undersigned credentialed actuaries are Members of the American Academy of Actuaries and meet the Academy’s Qualification Standards to render the actuarial opinion contained herein. We are available to answer questions on the material contained in the report or to provide explanations or further detail, as may be appropriate. We are not aware of any financial interest or relationship that could create a conflict of interest or impair the objectivity of our work.



Mark W. Schulte, FSA, EA, MAAA
Consulting Actuary



Emily M. Knutson, FSA, EA, MAAA
Consulting Actuary



James A. van Iwaarden, FSA, EA, MAAA
Consulting Actuary

L/D/C/R:5/emk/mws/jvi

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Executive Summary

Details of our review of the July 1, 2020 PERA Police & Fire, PERA Local Correctional, MSRS State Patrol, and MSRS State Correctional actuarial valuation reports are presented later in this report. The table below summarizes the important conclusions.

In our opinion, the valuations are reasonable and reliable. We also believe that the reports comply with applicable Minnesota Statutes, LCPR Standards for Actuarial Work (“Standards”), and relevant Actuarial Standards of Practice (ASOPs).

For each valuation, the census data used in the actuarial valuation is reasonable compared to the plan data.

The assumptions and methods used in the reports are consistent with those specified in the Standards as well as recent experience studies. Based on the information available to us, we believe the assumptions and methods used are reasonable.

The plan provisions valued in the reports accurately reflect those described in Statutes.

Primary results were easy to identify and information was presented well. We have included some formatting recommendations we believe would further enhance the report presentation and understanding of pension risk measurements.

Summary of Overall Reasonability

One way to check for overall reasonability is to compare each plan’s actual vs. expected liabilities. The table below summarizes the non-investment actuarial (gains)/losses over the past five years for each of the four plans reviewed.

% by which Actual Liabilities were Higher or (Lower) than Expected				
Valuation Date	PERA Police & Fire	PERA Local Correctional	MSRS State Patrol	MSRS State Correctional
7/1/2020	0.3%	(1.5%)	(0.1%)	0.4%
7/1/2019	0.1%	(0.3%)	0.3%	0.5%
7/1/2018	0.1%	(0.3%)	(0.8%)	(0.3%)
7/1/2017	0.1%	(0.8%)	(0.4%)	(0.1%)
7/1/2016	(1.5%)	0.0%	(1.0%)	(0.2%)

The actual liabilities were within 1.5% of the expected liabilities each year, which suggests that the overall valuation assumptions and liabilities are reasonable.

Please note that there are some slight differences between the mortality improvement assumptions used in the PERA Police & Fire and Local Correctional actuarial reports versus those specified in the 2018 Appendix to the LCPR’s Actuarial Standards. Details are described later in this report. However, the assumptions used in the actuarial reports were adopted by the systems as allowed by Minnesota Statute 356.215 Subd. 9. We recommend that the Appendix be updated to be less prescriptive and/or reflect the new valuation assumptions.

Executive Summary (*continued*)

Summary of Recommendations for Improving Report Presentation

The reports were laid out well and results were presented clearly and accurately. However, we do have several suggestions for improving the presentation and communication of important results in the reports.

Add charts and graphical illustrations of key results, especially historical and pension risk information, to make the results more understandable to non-technical report readers. Making some of these valuation trends more prominent in the report would also be helpful.

All the reports provide a thorough discussion of pension risks, including sensitivity of results to changes in the investment return assumption. We also recommend measuring the sensitivity of required contribution rates to changes in the payroll growth assumption, since the contribution rates are highly responsive to this factor.

Show a reconciliation of the plans' market value of assets with those reported by the State Board of Investments (SBI). This could be in the actuarial valuation reports or, preferably, in each system's Annual Financial Report. For illustrative purposes, we have shown an SBI reconciliation in Appendix A for each of the four plans reviewed.

The rest of this report provides more detail on our review of each actuarial valuation report.

Process Overview

Pension actuarial valuations usually involve two main phases:

- Calculating liabilities for a specific purpose; and
- Using the actuarial liabilities and plan assets to determine various results that fulfill the purpose (e.g., contributions or accounting disclosures).

This report reviews the inputs, calculations, and presentation of results involved in each of these phases. Note that we are not attempting to replicate the underlying liability calculations (that's a separate project for select plans each year).

Since the Minnesota Statutes' actuarial review requirements are broad, we are focusing on six areas we believe are most useful:

1. Review of the valuation census data;
2. Review for compliance with Minnesota Statutes, LCPR Standards for Actuarial Work, and relevant Actuarial Standards of Practice (ASOPs);
3. Review of actuarial assumptions other than those specified in the Statutes and Standards;
4. Review of the plan provisions reflected in the valuation;
5. Review of the required contribution rate calculations; and
6. Review of how results are presented in the reports.

Review of valuation inputs

Actuarial calculations are based on four primary inputs:

- Data (census and assets)
- Assumptions
- Methods
- Plan provisions

The table below summarizes how our valuation review incorporates each of these items.

Data	<ul style="list-style-type: none"> ▪ Compare census data provided by the retained actuary to the data summaries in the valuation reports and the data files provided by each plan. ▪ Compare asset summaries and Actuarial Value of Assets (AVA) calculations in the actuarial reports to asset data in the audited financial statements and assets in the SBI Annual Financial Report. These comparisons are shown in Appendix A.
Assumptions	Review actuarial assumptions disclosed in the reports to ensure they are consistent with Statutes, the LCPR's Standards, and relevant ASOPs.
Methods	Review actuarial methods disclosed in the reports to ensure they are consistent with Statutes, the LCPR's Standards, and relevant ASOPs.
Plan Provisions	Verify that plan provisions summarized in the actuarial valuation reports are representative of the benefit provisions described in Minnesota Statutes.

Process Overview (continued)

Review for compliance with Statutes, Standards, and ASOPs

The MSRS and PERA actuarial valuations must comply with a number of requirements. These are summarized in the tables below.

Minnesota Statutes

The applicable Minnesota Statutes include Sections 356.214 (actuarial valuation preparation) and 356.215 (actuarial valuations and experience studies). The Statutes prescribe:

- The actuarial cost method (Entry Age method; 356.215 Subd.1(b) and (d));
- The asset valuation method (five-year smoothing of gains and losses; 356.215 Subd.1(f));
- The investment return assumption (currently 7.5% for the four plans reviewed; 356.215 Subd.8);
- Calculation of the Normal Cost as a level percentage of payroll per 356.215 Subd.5;
- Amortization of unfunded liabilities (ending in 2048 for the four plans reviewed; 356.215 Subd.11(f) and (h));
- Measurement of actuarial gains and losses (356.215 Subd.12); and
- Report contents (356.215 Subd.4 through 18).

LCPR Standards for Actuarial Work

These Standards, including the July 1, 2018 Appendix, specify several actuarial methods and assumptions. These include:

- Actuarial assumptions (other than the investment return assumption);
- Details for application of the Entry Age Actuarial Cost Method; and
- Detailed report contents.

Actuarial Standards of Practice

ASOP 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*. ASOP 4 is a broad standard that overlaps with the LCPR Standards and provides guidance on:

- Measurement of pension obligations,
- Funded status measurement,
- Contribution allocation procedures,
- Evaluation of actuarial assumptions, and
- Required disclosures.

ASOP 23, *Data Quality*. ASOP 23 provides guidance on:

- Selection of data,
- Reliance on data supplied by others, and
- Required disclosures, including limitations on data quality.

Process Overview (continued)

ASOP 27, Selection of Economic Assumptions for Measuring Pension Obligations. ASOP 27 provides guidance on:

- Selecting economic assumptions like investment return, inflation, and compensation increases; and
- Required disclosure of the rationale for the assumptions chosen.

ASOP 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations. ASOP 35 provides guidance on:

- Selecting demographic assumptions like retirement, turnover, disability, benefit election, and mortality; and
- Required disclosure of the rationale for the assumptions chosen.

ASOP 41, Actuarial Communications. ASOP 41 is a broad standard that affects all actuarial practice areas. ASOP 41 provides guidance on:

- Appropriate form and content;
- Identifying the data, assumptions, methods, and plan provisions used;
- Responsibility for assumptions and methods; and
- Required disclosures.

ASOP 44, Selection and Use of Asset Valuation Methods for Pension Valuations. ASOP 44 overlaps with Minnesota Statutes, with a more principle-based focus. It provides guidance on:

- Selection of asset valuation methods, and
- Required disclosures.

ASOP 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions. ASOP 51 provides standards for assessing and disclosing the risk that future measurements may differ from expectations. It provides guidance on:

- Identifying risks like investment, asset/liability mismatch, interest rates, longevity, and contribution risk;
- Assessment of those risks;
- Plan maturity measures; and
- Required disclosures.

ASOP 56, Modeling. ASOP 56 is a new standard for disclosing the models used to produce valuation results. ASOP 56 provides guidance on:

- Identifying the models used;
- Stating the intended purpose of the models; and
- Required disclosures.

This ASOP is effective for work performed on or after October 1, 2020. All the reports reviewed provide some disclosures about models used in the valuations.

Based on our review, the PERA Police & Fire, PERA Local Correctional, MSRS State Patrol, and MSRS State Correctional actuarial valuation reports comply with the Statutes, Standards, and ASOPs. Additional detail is shown separately for each plan later in this report.

Process Overview (continued)

Other actuarial assumptions

Some of the actuarial assumptions are specified in Minnesota Statutes and LCPR Standards for Actuarial Work. Others, including most of the demographic assumptions, are not. They are generally based on the plans' actuarial experience studies and the retained actuaries' recommendations. We reviewed those assumptions for overall reasonability and consistency with the experience studies.

Plan provisions

Plan provisions are outlined in Minnesota Statutes for each of the four plans reviewed here. We have reviewed the plan provisions described in the actuarial valuation reports to confirm that they accurately reflect the Statutes.

Valuation computations

One of the primary purposes of the valuation reports is to determine the required pension contribution rates under Minnesota Statute 356. The calculations include development of the Actuarial Value of Assets, amortization of the Unfunded Actuarial Accrued Liability, and determination of the contribution sufficiency/(deficiency). We reviewed these calculations to confirm they are reasonable and accurately reflect the Statutes.

Review of valuation report presentation

In addition to summarizing technical information, a valuation report should communicate the results clearly so that it is useful for the intended users.

Our review of valuation report presentation will focus on suggestions for improving the presentation and communication of important results in the report.

Valuation Review – PERA Police & Fire

Review of census data

We obtained July 1, 2020 census data from PERA and its retained actuary, Gabriel Roeder Smith (GRS), and compared statistics from both sources with those shown in the actuarial report:

	System Data	Actuary Data	Report	Difference ¹
Active Members	12,025	12,025	12,025	0.0%
Average Age	40.4	40.4	40.4	0.0%
Average Service	12.4	12.4	12.4	0.0%
Average Earnings	\$ 84,555	\$ 84,555	\$ 86,712 ²	
Service Retirements	8,032	7,793	7,793	3
Average Age	68.5	68.6	68.6	0.0%
Average Annual Annuity	\$ 56,134	\$ 56,361	\$ 56,361	0.4%
Survivors	1,931	1,931	1,931	0.0%
Average Age	73.3	73.3	73.3	0.0%
Average Annual Annuity	\$ 32,813	\$ 32,813	\$ 32,813	0.0%
Disability Retirements	1,238	1,477	1,477	3
Average Age	58.9	60.3	60.3	2.3%
Average Annual Annuity	\$ 47,538	\$ 47,732	\$ 47,732	0.4%
Deferred Retirements	1,686	1,686	1,686	0.0%
Average Age	45.3	45.3	45.3	0.0%
Terminated Non-Vested	894	894	894	0.0%
Total	25,806	25,806	25,806	0.0%

¹ Difference between System and Actuary data files.

² Annual pay was adjusted from the system data for valuation purposes. The adjustments include using either prior year salary, five year average salary, or \$60,000 for those reported with annual pay less than \$100 (24 members) and annualizing pay for those with less than one year of service.

³ PERA reclassifies disabled members as service retirees once they reach Normal Retirement Age. Therefore, the retained actuary adjusted the status for 239 service retirees based on their historical classification as disabled retirees.

Based on the information above, we believe the census data used in the actuarial valuation is reasonable compared to the system data. There were some small data differences, but they were insignificant compared to overall valuation totals. We also believe the retained actuary's data assumptions and adjustments described on pages 27-28 of the valuation report are reasonable.

Valuation Review – PERA Police & Fire (continued)

Compliance with Statutes, Standards, and ASOPs

We reviewed the PERA Police & Fire July 1, 2020 actuarial valuation for compliance with applicable Minnesota Statutes, LCPR Actuarial Standards, and relevant ASOPs. We found that the report satisfactorily complied with all major requirements in these guidance sources. The primary items we reviewed, along with any relevant observations are summarized in the tables below.

Minnesota Statute Compliance – PERA Police & Fire	
Actuarial cost method	Entry age normal per 356.215 Subd.1(b) and (d)
Asset valuation method	Five-year smoothing of investment returns per 356.215 Subd.1(f)
Investment return assumption	7.50% per 356.215 Subd.8
Normal cost	Calculated as a level percentage of payroll per 356.215 Subd.5
Amortization of unfunded liabilities	Amortized as a level percent of payroll ending June 30, 2048 per 356.215 Subd.11
Measurement of actuarial gains and losses	Required gain/loss items measured per 356.215 Subd.12
Report contents	Consistent with the remaining requirements of 356.215 Subd.4 through 18. These include presentation of the accrued liability, membership tabulations, and summary of plan provisions.

LCPR Actuarial Standards Compliance – PERA Police & Fire	
Inflation assumption	2.50% per 2018 Appendix to the Standards
Payroll growth assumption	3.25% per 2018 Appendix to the Standards
Merit and seniority pay increase assumptions	Service-based table per 2018 Appendix to the Standards
Mortality rates	The valuation report uses the RP-2014 tables with age adjustments and MP-2019 mortality improvement scale, based on the experience study dated August 30, 2016 and subsequent updates approved by the system and allowed under MN Statutes 356.215 Subd. 9. The 2018 Appendix to the Standards specifies use of the MP-2017 mortality improvement scale. We recommend the Appendix be updated to be less prescriptive and/or reflect the new valuation assumptions.
Other assumptions	Other actuarial assumptions and asset valuation methods calculated per Standards, Section II
Actuarial cost methods	Entry age cost method, benefits recognized, and contribution rates calculated per Standards, Section III
Report contents	All required elements included per Standards, Section IV

ASOP Compliance – PERA Police & Fire	
We reviewed the report and believe that it adequately complies with all relevant Actuarial Standards of Practice (ASOPs). These include ASOPs 4, 23, 27, 35, 41, 44, 51, and 56. A summary of the primary elements for each of these ASOPs can be found in the Process section of this report.	

Valuation Review – PERA Police & Fire (continued)

Other actuarial assumptions

Some of the actuarial assumptions are specified in Minnesota Statutes and LCPR Standards for Actuarial Work. Others, including most of the demographic assumptions, are not. They are generally based on the plan's experience study dated August 30, 2016. An updated experience study for the 2015-2019 period was issued on July 14, 2020 and we expect those assumption recommendations to be used in the 2021 actuarial valuation.

We reviewed the valuation assumptions and believe they are reasonable given the small deviations from expected liabilities noted in the executive summary.

Plan provisions

PERA plan provisions are outlined in Minnesota Statutes chapter 353. We reviewed the plan provisions described in the actuarial valuation report, and we believe they accurately reflect the Statutes.

Valuation computations

We reviewed the required contribution calculations on page 21 of the valuation report and believe they are reasonable and consistent with MN Statute 356. We also replicated the Actuarial Value of Assets calculation, and details are shown in Appendix A of this report.

Valuation results presentation

Our review of the valuation report found that information was presented well, and primary results were easy to identify. Pension risk information was also prominent and incorporated well.

There are a few items that could improve the presentation of results and understanding of pension risk measurements. These include:

- Using charts and other graphical illustrations, where appropriate, to communicate results for non-technical reports users. Possible exhibits to illustrate include:
 - Funded status sensitivity tests on valuation page 4
 - Historical funded status, investment returns, and other items on valuation page 8
 - Schedule of Funding Progress on valuation page 41
 - Contribution Schedule on valuation page 42
- Including the Schedule of Funding Progress and Contribution Schedule (valuation pages 41 and 42) earlier in the report where they would be more prominent reminders of the Plan's journey towards full funding.
- Split the historical Actuarially Required Contribution rates (shown on page 42) into two pieces: Normal Cost and amortization of Unfunded Accrued Liability. This would help illustrate the source of changes in the overall Actuarially Required Contribution rate.

Valuation Review – PERA Local Correctional

Review of census data

We obtained July 1, 2020 census data from PERA and its retained actuary, Gabriel Roeder Smith (GRS), and compared statistics from both sources with those shown in the actuarial report:

	System Data	Actuary Data	Report	Difference ¹
Active Members	3,855	3,855	3,855	0.0%
Average Age	39.0	39.1	39.0	0.2%
Average Service	7.6	7.6	7.6	0.0%
Average Earnings	\$ 52,121	\$ 52,121	\$ 57,658 ²	
Service Retirements	1,235	1,164	1,164 ³	
Average Age	66.4	66.1	66.1	-0.4%
Average Annual Annuity	\$ 12,418	\$ 12,054	\$ 12,054	-2.9%
Survivors	72	72	72	0.0%
Average Age	61.7	61.7	61.7	0.0%
Average Annual Annuity	\$ 10,212	\$ 10,212	\$ 10,212	0.0%
Disability Retirements	136	207	207 ³	
Average Age	54.4	60.0	60.0	10.2%
Average Annual Annuity	\$ 19,969	\$ 19,425	\$ 19,425	-2.7%
Deferred Retirements	3,637	3,637	3,637	0.0%
Average Age	42.7	42.7	42.7	0.0%
Terminated Non-Vested	2,184	2,184	2,184	0.0%
Total	11,119	11,119	11,119	0.0%

¹ Difference between System and Actuary data files.

² Annual pay was adjusted from the system data for valuation purposes. The adjustments include using either prior year salary, five year average salary, or \$43,000 for those reported with annual pay less than \$100 (49 members) and annualizing pay for those with less than one year of service.

³ PERA reclassifies disabled members as service retirees once they reach Normal Retirement Age. Therefore, the retained actuary adjusted the status for 71 service retirees based on their historical classification as disabled retirees.

Based on the information above, we believe the census data used in the actuarial valuation is reasonable compared to the system data. There were some small data differences, but they were insignificant compared to overall valuation totals. We also believe the retained actuary's data assumptions and adjustments described on page 27 of the valuation report are reasonable.

Valuation Review – PERA Local Correctional (continued)

Compliance with Statutes, Standards, and ASOPs

We reviewed the PERA Local Correctional July 1, 2020 actuarial valuation for compliance with applicable Minnesota Statutes, LCPR Actuarial Standards, and relevant ASOPs. We found that the report satisfactorily complied with all major requirements in these guidance sources. The primary items we reviewed, along with any relevant observations are summarized in the tables below.

Minnesota Statute Compliance – PERA Local Correctional	
Actuarial cost method	Entry age normal per 356.215 Subd.1(b) and (d)
Asset valuation method	Five-year smoothing of investment returns per 356.215 Subd.1(f)
Investment return assumption	7.50% per 356.215 Subd.8
Normal cost	Calculated as a level percentage of payroll per 356.215 Subd.5
Amortization of unfunded liabilities	Amortized as a level percent of payroll ending June 30, 2048 per 356.215 Subd.11
Measurement of actuarial gains and losses	Required gain/loss items measured per 356.215 Subd.12
Report contents	Consistent with the remaining requirements of 356.215 Subd.4 through 18. These include presentation of the accrued liability, membership tabulations, and summary of plan provisions.

LCPR Actuarial Standards Compliance – PERA Local Correctional	
Inflation assumption	2.50% per 2018 Appendix to the Standards
Payroll growth assumption	3.25% per 2018 Appendix to the Standards
Merit and seniority pay increase assumptions	Service-based table per 2018 Appendix to the Standards
Mortality rates	The valuation report uses the RP-2014 tables with age adjustments and MP-2019 mortality improvement scale, based on the PERA Police & Fire experience study dated August 30, 2016 and subsequent updates approved by the system and allowed under MN Statutes 356.215 Subd. 9. The 2018 Appendix to the Standards specifies use of the MP-2017 mortality improvement scale. We recommend the Appendix be updated to be less prescriptive and/or reflect the new valuation assumptions.
Other assumptions	Other actuarial assumptions and asset valuation methods calculated per Standards, Section II
Actuarial cost methods	Entry age cost method, benefits recognized, and contribution rates calculated per Standards, Section III
Report contents	All required elements included per Standards, Section IV

ASOP Compliance – PERA Local Correctional	
We reviewed the report and believe that it adequately complies with all relevant Actuarial Standards of Practice (ASOPs). These include ASOPs 4, 23, 27, 35, 41, 44, 51, and 56. A summary of the primary elements for each of these ASOPs can be found in the Process section of this report.	

Valuation Review – PERA Local Correctional (continued)

Other Actuarial Assumptions

Some of the actuarial assumptions are specified in Minnesota Statutes and LCPR Standards for Actuarial Work. Others, including most of the demographic assumptions, are not. They are generally based on the plan's February 2012 experience study, along with a mortality update based on the PERA Police and Fire experience study dated August 30, 2016. An updated experience study for the 2015-2019 period was issued on July 10, 2020 and we expect those assumption recommendations to be used in the 2021 actuarial valuation.

We reviewed the valuation assumptions and believe they are reasonable given the small deviations from expected liabilities noted in the executive summary.

Plan provisions

PERA plan provisions are outlined in Minnesota Statutes chapter 353E. We reviewed the plan provisions described in the actuarial valuation report, and we believe they accurately reflect the Statutes.

Valuation computations

We reviewed the required contribution calculations on page 22 of the valuation report and believe they are reasonable and consistent with MN Statute 356. We also replicated the Actuarial Value of Assets calculation, and details are shown in Appendix A of this report.

Valuation results presentation

Our review of the valuation report found that information was presented well, and primary results were easy to identify. Pension risk information was also prominent and incorporated well.

There are a few items that could improve the presentation of results and understanding of pension risk measurements. These include:

- Using charts and other graphical illustrations, where appropriate, to communicate results for non-technical reports users. Possible exhibits to illustrate include:
 - Funded status sensitivity tests on valuation page 5
 - Historical funded status, investment returns, and other items on valuation page 9
 - Schedule of Funding Progress on valuation page 35
 - Contribution Schedule on valuation page 36
- Including the Schedule of Funding Progress and Contribution Schedule (valuation pages 35 and 36) earlier in the report where they would be more prominent reminders of the Plan's journey towards full funding.
- Split the historical Actuarially Required Contribution rates (shown on page 36) into two pieces: Normal Cost and amortization of Unfunded Accrued Liability. This would help illustrate the source of changes in the overall Actuarially Required Contribution rate.

Valuation Review – MSRS State Patrol

Review of census data

We obtained July 1, 2020 census data from MSRS and its retained actuary, Gabriel Roeder Smith (GRS), and compared statistics from both sources with those shown in the actuarial report:

	System Data	Actuary Data	Report	Difference ¹
Active Members	937	937	937	0.0%
Average Age	40.7	40.7	40.7	0.0%
Average Service	11.1	11.1	11.1	0.0%
Average Earnings	\$ 89,628	\$ 89,628	\$ 89,271 ²	
Service Retirements	891	891	891	0.0%
Average Age	68.9	68.9	68.9	0.0%
Average Annual Annuity	\$ 60,076	\$ 60,076	\$ 60,076	0.0%
Survivors	152	152	152	0.0%
Average Age	73.7	73.7	73.7	0.0%
Average Annual Annuity	\$ 37,427	\$ 37,427	\$ 37,427	0.0%
Disability Retirements	64	64	64	0.0%
Average Age	59.9	59.9	59.9	0.0%
Average Annual Annuity	\$ 44,951	\$ 44,951	\$ 44,951	0.0%
Deferred Retirements	63	63	63	0.0%
Average Age	45.2	45.2	45.2	0.0%
Average Annual Annuity	\$ 20,021	\$ 20,021	\$ 23,011	0.0%
Terminated Non-Vested	30	30	30	0.0%
Total	2,137	2,137	2,137	0.0%

¹ Difference between System and Actuary data files.

² Annual pay was adjusted from the system data for valuation purposes by annualizing pay for those with less than one year of service.

Based on the information above, we believe the census data used in the actuarial valuation is reasonable compared to the system data. We also believe the retained actuary's data assumptions and adjustments described on page 25 of the valuation report are reasonable.

Valuation Review – MSRS State Patrol (continued)

Compliance with Statutes, Standards, and ASOPs

We reviewed the MSRS State Patrol July 1, 2020 actuarial valuation for compliance with applicable Minnesota Statutes, LCPR Actuarial Standards, and relevant ASOPs. We found that the report satisfactorily complied with all major requirements in these guidance sources.

The primary items we reviewed, along with any relevant observations are summarized in the tables below.

Minnesota Statute Compliance – MSRS State Patrol	
Actuarial cost method	Entry age normal per 356.215 Subd.1(b) and (d)
Asset valuation method	Five-year smoothing of investment returns per 356.215 Subd.1(f)
Investment return assumption	7.50% per 356.215 Subd.8
Normal cost	Calculated as a level percentage of payroll per 356.215 Subd.5
Amortization of unfunded liabilities	Amortized as a level percent of payroll ending June 30, 2048 per 356.215 Subd.11
Measurement of actuarial gains and losses	Required gain/loss items measured per 356.215 Subd.12
Report contents	Consistent with the remaining requirements of 356.215 Subd.4 through 18. These include presentation of the accrued liability, membership tabulations, and summary of plan provisions.

LCPR Actuarial Standards Compliance – MSRS State Patrol	
Inflation assumption	2.50% per 2018 Appendix to the Standards.
Payroll growth assumption	3.25% per 2018 Appendix to the Standards
Merit and seniority pay increase assumptions	Service-based table per 2018 Appendix to the Standards
Mortality rates	RP-2014 tables with specified age adjustments and MP-2015 improvement scale per 2018 Appendix to the Standards
Other assumptions	Other actuarial assumptions and asset valuation methods calculated per Standards, Section II
Actuarial cost methods	Entry age cost method, benefits recognized, and contribution rates calculated per Standards, Section III
Report contents	All required elements included per Standards, Section IV

ASOP Compliance – MSRS State Patrol	
We reviewed the report and believe that it adequately complies with all relevant Actuarial Standards of Practice (ASOPs). These include ASOPs 4, 23, 27, 35, 41, 44, 51, and 56. A summary of the primary elements for each of these ASOPs can be found in the Process section of this report.	

Valuation Review – MSRS State Patrol (continued)

Other actuarial assumptions

Some of the actuarial assumptions are specified in Minnesota Statutes and LCPR Standards for Actuarial Work. Others, including most of the demographic assumptions, are not. They are generally based on the plan's experience study dated July 26, 2016 and a review of inflation and investment return assumptions dated September 11, 2017. An updated experience study for the 2015-2019 period was issued on June 30, 2020 and we expect those assumption recommendations to be used in the 2021 actuarial valuation.

We reviewed the valuation assumptions and believe they are reasonable given the small deviations from expected liabilities noted in the executive summary.

Plan provisions

MSRS plan provisions are outlined in Minnesota Statutes chapter 352B. We reviewed the plan provisions described in the actuarial valuation report, and we believe they accurately reflect the Statutes.

Valuation computations

We reviewed the required contribution calculations on page 20 of the valuation report and believe they are reasonable and consistent with MN Statute 356. We also replicated the Actuarial Value of Assets calculation, and details are shown in Appendix A of this report.

Valuation results presentation

Our review of the valuation report found that information was presented well, and primary results were easy to identify. Pension risk information was also prominent and incorporated well.

There are a few items that could improve the presentation of results and understanding of pension risk measurements. These include:

- Using charts and other graphical illustrations, where appropriate, to communicate results for non-technical reports users. Possible exhibits to illustrate include:
 - Funded status sensitivity tests on valuation page 3
 - Historical funded status, investment returns, and other items on valuation page 7
 - Schedule of Funding Progress on valuation page 34
 - Contribution Schedule on valuation page 35
- Including the Schedule of Funding Progress and Contribution Schedule (valuation pages 34 and 35) earlier in the report where they would be more prominent reminders of the Plan's journey towards full funding.
- Split the historical Actuarially Required Contribution rates (shown on page 35) into two pieces: Normal Cost and amortization of Unfunded Accrued Liability. This would help illustrate the source of changes in the overall Actuarially Required Contribution rate.

Valuation Review – MSRS State Correctional

Review of census data

We obtained July 1, 2020 census data from MSRS and its retained actuary, Gabriel Roeder Smith (GRS), and compared statistics from both sources with those shown in the actuarial report:

	System Data		Actuary Data		Report	Difference ¹
Active Members	4,523		4,523		4,523	0.0%
Average Age	41.7		41.7		41.7	0.0%
Average Service	9.1		9.1		9.1	0.0%
Average Earnings	\$ 60,444	\$	\$ 60,444	\$	60,194 ²	
Service Retirements	3,013		3,013		3,013	0.0%
Average Age	66.7		66.7		66.7	0.0%
Average Annual Annuity	\$ 22,467	\$	\$ 22,467	\$	22,462	0.0%
Survivors	253		253		253	0.0%
Average Age	66.2		66.2		66.2	0.0%
Average Annual Annuity	\$ 16,323	\$	\$ 16,323	\$	16,323	0.0%
Disability Retirements	320		320		320	0.0%
Average Age	59.1		59.1		59.1	0.0%
Average Annual Annuity	\$ 20,981	\$	\$ 20,981	\$	20,981	0.0%
Deferred Retirements	1,426		1,426		1,426	0.0%
Average Age	46.7		46.7		46.7	0.0%
Average Annual Annuity	\$ 9,484	\$	\$ 9,484	\$	11,321	0.0%
Terminated Non-Vested	1,008		1,008		1,008	0.0%
Total	10,543		10,543		10,543	0.0%

¹ Difference between System and Actuary data files.

² Annual pay was adjusted from the system data for valuation purposes. The adjustments include using either prior year salary, five year average salary, or \$45,000 for those reported with invalid or \$0 annual pay (3 members) and annualizing pay for those with less than one year of service.

Based on the information above, we believe the census data used in the actuarial valuation is reasonable compared to the system data. We also believe GRS' data assumptions and adjustments described on page 25-26 of the actuarial valuation report are reasonable.

Valuation Review – MSRS State Correctional (continued)

Compliance with Statutes, Standards, and ASOPs

We reviewed the MSRS State Correctional July 1, 2020 actuarial valuation for compliance with applicable Minnesota Statutes, LCPR Actuarial Standards, and relevant ASOPs. We found that the report satisfactorily complied with all major requirements in these guidance sources.

The primary items we reviewed, along with any relevant observations are summarized in the tables below.

Minnesota Statute Compliance – MSRS State Correctional	
Actuarial cost method	Entry age normal per 356.215 Subd.1(b) and (d)
Asset valuation method	Five-year smoothing of investment returns per 356.215 Subd.1(f)
Investment return assumption	7.50% per 356.215 Subd.8
Normal cost	Calculated as a level percentage of payroll per 356.215 Subd.5
Amortization of unfunded liabilities	Amortized as a level percent of payroll ending June 30, 2048 per 356.215 Subd.11
Measurement of actuarial gains and losses	Required gain/loss items measured per 356.215 Subd.12
Report contents	Consistent with the remaining requirements of 356.215 Subd.4 through 18. These include presentation of the accrued liability, membership tabulations, and summary of plan provisions.

LCPR Actuarial Standards Compliance – MSRS State Correctional	
Inflation assumption	2.50% per 2018 Appendix to the Standards
Payroll growth assumption	3.25% per 2018 Appendix to the Standards
Merit and seniority pay increase assumptions	Service-based table per 2018 Appendix to the Standards
Mortality rates	The valuation report uses the RP-2014 tables with age adjustments and MP-2015 mortality improvement scale per 2018 Appendix to the Standards.
Other assumptions	Other actuarial assumptions and asset valuation methods calculated per Standards, Section II
Actuarial cost methods	Entry age cost method, benefits recognized, and contribution rates calculated per Standards, Section III
Report contents	All required elements included per Standards, Section IV

ASOP Compliance – MSRS State Correctional	
We reviewed the report and believe that it adequately complies with all relevant Actuarial Standards of Practice (ASOPs). These include ASOPs 4, 23, 27, 35, 41, 44, 51, and 56. A summary of the primary elements for each of these ASOPs can be found in the Process section of this report.	

Valuation Review – MSRS State Correctional (continued)

Other actuarial assumptions

Some of the actuarial assumptions are specified in Minnesota Statutes and LCPR Standards for Actuarial Work. Others, including most of the demographic assumptions, are not. They are generally based on the plan's experience study dated July 26, 2016 and a review of inflation and investment return assumptions dated September 11, 2017. An updated experience study for the 2015-2019 period was issued on June 30, 2020 and we expect those assumption recommendations to be used in the 2021 actuarial valuation.

We reviewed the valuation assumptions and believe they are reasonable given the small deviations from expected liabilities noted in the executive summary.

Plan provisions

MSRS plan provisions are outlined in Minnesota Statutes chapter 352. We reviewed the plan provisions described in the actuarial valuation report, and we believe they accurately reflect the Statutes.

Valuation computations

We reviewed the required contribution calculations on page 20 of the valuation report and believe they are reasonable and consistent with MN Statute 356. We also replicated the Actuarial Value of Assets calculation, and details are shown in Appendix A of this report.

Valuation results presentation

Our review of the valuation report found that information was presented well, and primary results were easy to identify. Pension risk information was also prominent and incorporated well.

There are a few items that could improve the presentation of results and understanding of pension risk measurements. These include:

- Using charts and other graphical illustrations, where appropriate, to communicate results for non-technical reports users. Possible exhibits to illustrate include:
 - Funded status sensitivity tests on valuation page 3
 - Historical funded status, investment returns, and other items on valuation page 7
 - Schedule of Funding Progress on valuation page 35
 - Contribution Schedule on valuation page 36
- Including the Schedule of Funding Progress and Contribution Schedule (valuation pages 35 and 36) earlier in the report where they would be more prominent reminders of the Plan's journey towards full funding.
- Split the historical Actuarially Required Contribution rates (shown on page 36) into two pieces: Normal Cost and amortization of Unfunded Accrued Liability. This would help illustrate the source of changes in the overall Actuarially Required Contribution rate.

Appendix A – Plan Asset Review

Plan Asset Reconciliation with SBI

The June 30, 2020 market value of assets reported in each actuarial valuation report matches the audited assets in the systems' Annual Financial Reports. However, it would be helpful to see a breakdown of plan assets between State Board of Investments (SBI) and non-SBI assets so that the SBI portion can be reconciled with the amounts shown in the SBI Annual Financial Report.

The table below shows a reconciliation of the three statewide plans' assets with those reported by the SBI. Going forward, this could be shown in the actuarial valuation reports or, preferably, in each system's Annual Financial Report.

	PERA Police & Fire	PERA Local Correctional	MSRS State Patrol	MSRS State Correctional
SBI investments				
Long-term	\$ 8,576,515	\$ 752,886	\$ 721,249	\$ 1,165,999
Short-term	387,451	33,814	34,560	54,857
SBI subtotal	\$ 8,963,966	\$ 786,700	\$ 755,809	\$ 1,220,856
Other assets				
Cash	\$ 2,204	\$ 255	\$ 113	\$ 285
Receivables	13,148	912	2,034	4,139
Securities lending collateral	630,439	55,343	53,017	85,710
Capital assets	-	-	-	-
Other assets subtotal	\$ 645,791	\$ 56,510	\$ 55,164	\$ 90,134
Total assets	\$ 9,609,757	\$ 843,210	\$ 810,973	\$ 1,310,990
Liabilities	\$ (636,297)	\$ (55,888)	\$ (53,383)	\$ (87,453)
Net position restricted for pensions	<u>\$ 8,973,460</u>	<u>\$ 787,322</u>	<u>\$ 757,590</u>	<u>\$ 1,223,537</u>

Appendix A – Plan Asset Review (continued)

Actuarial Value of Assets Calculations

The exhibits below compare the retained actuary's July 1, 2020 Actuarial Value of Assets (AVA) calculations to ours for each of the four plans being reviewed. The calculations match and are consistent with relevant Minnesota Statutes, Section 356.215, Subd.1(f) and we believe they were prepared correctly. All amounts shown are in \$1,000's.

PERA Police & Fire Actuarial Value of Assets Calculation				
		Retained Actuary	VIA Calculations	
1. Market value of assets available for benefits¹		8,973,460	8,973,460	
2. Determination of average asset balance				
a. Total assets at beginning of year		8,844,552	8,844,552	
b. Total assets at end of year		8,973,460	8,973,460	
c. Net investment income for fiscal year		368,949	368,949	
d. Average balance (a. + b. - c.)/2		<u>8,724,532</u>	<u>8,724,532</u>	
3. Expected return (7.50% x 2.d.)		654,340	654,340	
4. Actual return		<u>368,949</u>	<u>368,949</u>	
5. Current year asset gain/(loss) (4. - 3.)		(285,391)	(285,391)	
6. Unrecognized asset returns				
	Original amounts	Unrecognized percent	Unrecognized amounts	Unrecognized amounts
a. FYE 2020	(285,391)	80%	(228,313)	(228,313)
b. FYE 2019	(17,561)	60%	(10,537)	(10,537)
c. FYE 2018	190,293	40%	76,117	76,117
d. FYE 2017	500,621	20%	<u>100,124</u>	<u>100,124</u>
e. Total unrecognized amount			(62,609)	(62,609)
7. AVA at end of year (1. - 6.e.)		9,036,069	9,036,069	

¹The amount shown under VIA calculations is from the System's Annual Financial Report.

Appendix A – Plan Asset Review (continued)

PERA Correctional Actuarial Value of Assets Calculation				
		Retained Actuary	VIA Calculations	
1. Market value of assets available for benefits¹		787,322	787,322	
2. Determination of average asset balance				
a. Total assets at beginning of year		744,423	744,423	
b. Total assets at end of year		787,322	787,322	
c. Net investment income for fiscal year		31,774	31,774	
d. Average balance (a. + b. - c.)/2		749,986	749,986	
3. Expected return (7.50% x 2.d.)		56,249	56,249	
4. Actual return		31,774	31,774	
5. Current year asset gain/(loss) (4. - 3.)		(24,475)	(24,475)	
6. Unrecognized asset returns				
	Original amounts	Unrecognized percent	Unrecognized amounts	Unrecognized amounts
a. FYE 2020	(24,475)	80%	(19,580)	(19,580)
b. FYE 2019	(671)	60%	(403)	(403)
c. FYE 2018	14,166	40%	5,666	5,666
d. FYE 2017	37,088	20%	7,418	7,418
e. Total unrecognized amount			(6,899)	(6,899)
7. AVA at end of year (1. - 6.e.)		794,221	794,221	

¹The amount shown under VIA calculations is from the System's Annual Financial Report.

Appendix A – Plan Asset Review (continued)

MSRS State Patrol Actuarial Value of Assets Calculation				
		Retained Actuary		VIA Calculations
1. Market value of assets available for benefits¹		757,590		757,590
2. Determination of average asset balance				
a. Total assets at beginning of year		753,144		753,144
b. Total assets at end of year		757,590		757,590
c. Net investment income for fiscal year		31,073		31,073
d. Average balance (a. + b. - c.)/2		739,831		739,831
3. Expected return (7.50% x 2.d.)		55,487		55,487
4. Actual return		31,073		31,073
5. Current year asset gain/(loss) (4. - 3.)		(24,414)		(24,414)
6. Unrecognized asset returns				
	Original amounts	Unrecognized percent	Unrecognized amounts	Unrecognized amounts
a. FYE 2020	(24,414)	80%	(19,531)	(19,531)
b. FYE 2019	(1,844)	60%	(1,106)	(1,106)
c. FYE 2018	16,437	40%	6,575	6,575
d. FYE 2017	43,936	20%	8,787	8,787
e. Total unrecognized amount			(5,275)	(5,275)
7. AVA at end of year (1. - 6.e.)		762,865		762,865

¹The amount shown under VIA calculations is from the System's Annual Financial Report.

Appendix A – Plan Asset Review (continued)

MSRS State Correctional Actuarial Value of Assets Calculation				
		Retained Actuary	VIA Calculations	
1. Market value of assets available for benefits¹		1,223,537	1,223,537	
2. Determination of average asset balance				
a. Total assets at beginning of year		1,183,995	1,183,995	
b. Total assets at end of year		1,223,537	1,223,537	
c. Net investment income for fiscal year		49,608	49,608	
d. Average balance (a. + b. - c.)/2		1,178,962	1,178,962	
3. Expected return (7.50% x 2.d.)		88,422	88,422	
4. Actual return		49,608	49,608	
5. Current year asset gain/(loss) (4. - 3.)		(38,814)	(38,814)	
6. Unrecognized asset returns				
	Original amounts	Unrecognized percent	Unrecognized amounts	Unrecognized amounts
a. FYE 2020	(38,814)	80%	(31,051)	(31,051)
b. FYE 2019	(2,231)	60%	(1,339)	(1,339)
c. FYE 2018	23,925	40%	9,570	9,570
d. FYE 2017	63,837	20%	12,767	12,767
e. Total unrecognized amount			(10,053)	(10,053)
7. AVA at end of year (1. - 6.e.)		1,233,590	1,233,590	

¹The amount shown under VIA calculations is from the System's Annual Financial Report.