ARIZONA STATE
RETIREMENT SYSTEM

COMPREHENSIVE ANNUAL FINANCIAL REPORT

2020

For fiscal year ended June 30, 2020

A component unit of the State of Arizona

An agency of the State of Arizona

ARIZONA STATE RETIREMENT SYSTEM | Delivering service with

PRIDE

OUR **VALUES**

Professionalism
A highly capable workforce will promote a professional and respectful environment and lead the organization.

Results
A results-oriented approach to operations will energize the organization.

Improvement
A climate of continuous quality improvement and enhanced efficiencies will drive the organization.

Diversity
Engagement of diversity by the appreciation, recognition and support for all people will propel the organization to ever greater achievement.

Excellence
A commitment to service excellence will permeate the organization.

OUR **VISION**

For the benefit of our members, the Arizona State Retirement System will be a leading state benefit plan administrator in the areas of:

- Core Member Services
- Investment Performance
- Funded Status
- Operational Effectiveness

This will be accomplished while keeping program benefits and associated costs relatively aligned and maintaining actuarial and fiscal integrity.

An agency of the State of Arizona

ARIZONA STATE RETIREMENT SYSTEM

A component unit of the State of Arizona

Mr. James Hillyard, Chair
Paul Matson, Executive Director

Report prepared by the staff of the
Arizona State Retirement System

Comprehensive Annual Financial Report for
fiscal year ended June 30, 2020

2020

An agency of the State of Arizona

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Schedules and information are derived from ASRS internal sources unless otherwise noted.

INTRODUCTORY SECTION

An agency of the State of Arizona

Government Finance Officers Association

Certificate of Achievement for Excellence in Financial Reporting

Presented to

Arizona State Retirement System

For its Comprehensive Annual
Financial Report
for the Fiscal Year Ended

June 30, 2019

Christopher P. Morrill

Executive Director/CEO

The Government Finance Officers Association of the United States and Canada (GFOA) awarded a Certificate of Achievement for Excellence in Financial Reporting to the Arizona State Retirement System for its Comprehensive Annual Financial Report for the fiscal year ended June 30, 2019. This was the 31st consecutive year that the Arizona State Retirement System has received this prestigious award.

Public Pension Coordinating Council

Public Pension Standards Award
For Funding and Administration
2020

Presented to

Arizona State Retirement System

In recognition of meeting professional standards for
plan funding and administration as
set forth in the Public Pension Standards.

Presented by the Public Pension Coordinating Council, a confederation of

National Association of State Retirement Administrators (NASRA)
National Conference on Public Employee Retirement Systems (NCPERS)
National Council on Teacher Retirement (NCTR)

Alan H. Winkle
Program Administrator

The National Association of State Retirement Administrators (NASRA), National Conference on Public Employee Retirement Systems (NCPERS) and the National Council on Teacher Retirement (NCTR) awarded a Public Pension Standards Award to the Arizona State Retirement System for plan design and administration as set forth in the Public Pension Standards for 2020. The Public Pension Standards are intended to reflect minimum expectations for public retirement system management and administration, as well as serve as a benchmark by which all defined benefit public plans should be measured. This is the 16th consecutive year that the Arizona State Retirement System has received this prestigious award.

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TUCSON: 4400 East Broadway Boulevard, Suite 200 Tucson, AZ 85711-3554 | 520.239.3100
TOLL FREE: 1.800.621.3778 | AzASRS.gov
ASRS DIRECTOR: Paul Matson

November 10, 2020

To: The Arizona State Retirement System Board of Trustees

We are pleased to present, on behalf of the ASRS staff, the Comprehensive Annual Financial Report (CAFR) of the Arizona State Retirement System (ASRS), a component unit of the State of Arizona, for the fiscal year ended June 30, 2020.

Title 38 of the Arizona Revised Statutes requires the ASRS Board of Trustees (ASRS Board) to submit an annual report to the Governor and the Legislature within eight months of the close of each fiscal year. This report complies with the legal requirements governing the preparation and content of annual reports.

Responsibility for both the accuracy of the data, and the completeness and fairness of the presentation, rests with the ASRS management. Management relies on a comprehensive framework of internal controls to provide reasonable, rather than absolute, assurance that the financial statements are free of any material misstatements. Cost/benefit considerations, the risk of management override, and the risk of collusion are inherent limitations on any system of internal control.

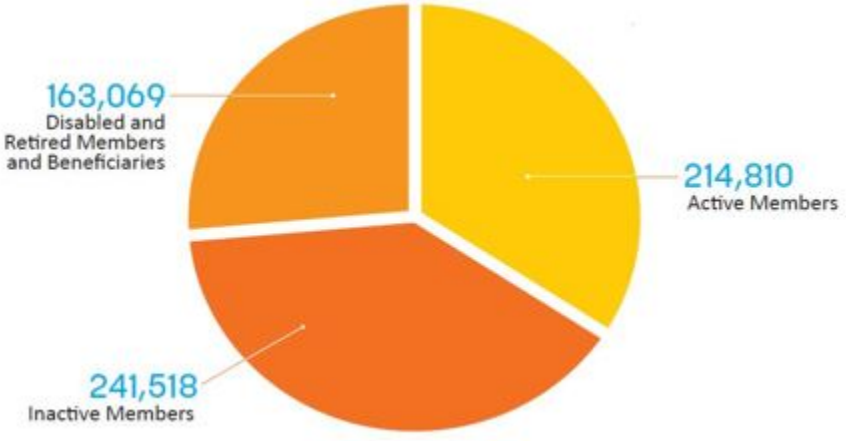
CliftonLarsonAllen LLP has issued an unmodified ("clean") opinion on the ASRS financial statements for the year ended June 30, 2020. The Independent Auditors' Report is located at the front of the Financial Section of this report.

Management's Discussion and Analysis (MD&A) immediately follows the Independent Auditors' Report and provides a narrative introduction, overview, and analysis of the basic financial statements. MD&A complements this letter of transmittal and should be read in conjunction with it.

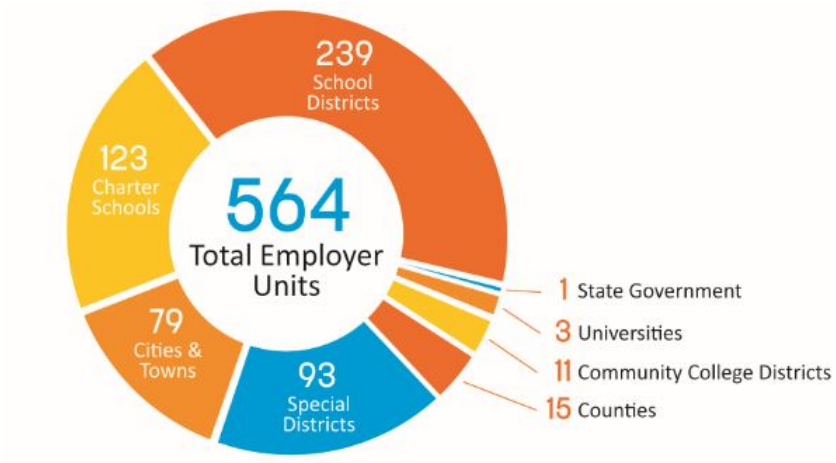
History and Overview

The ASRS was established in 1953 to provide defined contribution retirement benefits to employees of the State of Arizona, Arizona universities and political subdivisions. Over the years, the ASRS has grown and developed to include Arizona public schools and provide additional benefits including the addition of a defined benefit plan, health insurance premium benefits and long term disability benefits.

At June 30, 2020, total ASRS membership was 619,397, including active, inactive, disabled and retired members which is broken down in the below chart.



There are 564 employer units participating in the ASRS, including school districts, charter schools, state colleges and universities, and local, county and state governments, which are broken out as follows:



In addition to pension benefits, the ASRS provides a health insurance premium benefit supplement (Health Benefit Supplement, HBS) and sponsors medical and dental coverage for retired and disabled members and their eligible dependents. Active members also receive long term disability insurance coverage equal to two-thirds of pay at the time of disablement.

Active non-state employees are also eligible to participate in an ASRS sponsored Supplemental Salary Deferral Plan (SSDP) and/or Supplemental Retirement Savings Plan (SRSP) if their employer has joined the plan. The SSDP is a qualified supplemental defined contribution plan under § 403(b) and § 457(b) of the Internal Revenue Code. In addition, the SRSP is a qualified supplemental defined contribution plan under § 401(a) of the Internal Revenue Code.

During fiscal year 2020, 163,069 retired annuitants, their survivors, and 3,214 disabled members received approximately $3.5 billion in benefits. As of June 30, 2020, there were 49,303 members and their families enrolled in

the ASRS-sponsored medical program and 83,812 retired members and their families enrolled in dental plans through the ASRS.

Major Initiatives for Fiscal Year 2020

Investments

Strategic Asset Allocation ("SAA"):

- Implemented stress tests and portfolio modifications during pandemic to ensure continuous adequate liquidity for equities rebalance and opportunistic investments.

Benefits Processing and Customer Service Improvements

Retrospective Rate Agreement (RRA):

- The ASRS Board approved a policy to distribute accumulated RRA funds to eligible participants through reduced premiums in the ASRS Health Insurance Program beginning with calendar year 2019. During calendar year 2019, medical premiums were reduced by over $41 million and are projected to be reduced by over $51 million in calendar year 2020

Administration

Information Security and Privacy:

- The ASRS continues to invest in information security and privacy improvements including infrastructure advancements.

Technology Systems:

- The ASRS has completed a multi-year project to modernize and decommission its legacy PERIS applications, written in Oracle Forms, to a Java-based environment. The Oracle Modernization Project completed the conversion of the modules listed below during fiscal year 2020:
  - Benefits accounting
  - Contributions accounting
  - Accounts ledger and fiscal year end close

Health Insurance:

- In fiscal year 2020, the ASRS issued a formal Request for Proposal (RFP) for its retiree dental and medical insurance providers. The new contracts will be effective for calendar year 2021.

Risk Management:

- Implemented a new Risk Management Tool (SWORD) to house a database of risks and mitigation strategies across all divisions.

Annualized Time-Weighted Rates of Return (Net of Fees)

	1 Year	3 Year	5 Year	10 Year	Since Inception (June 30, 1975)
Total Fund	0.8 %	5.5 %	6.1 %	8.9 %	9.5 %

The ASRS has implemented investment guidelines for its internal and external investment managers, which includes a set of policies, procedures and compliance requirements, as well as oversight by the internal investment management division to ensure that investment assets are prudently managed. Both internal and external generated compliance procedures are in place. Details of the ASRS investment policies and investments are contained in the Investment Section of this report.

Funding

Any excess of additions, which include contributions and investment earnings, over deductions, including benefits and administrative expenses, is accumulated by the ASRS in order to meet future benefit obligations due to retirees and beneficiaries. The Arizona Revised Statutes require the ASRS to conduct an annual actuarial valuation of its plan assets and liabilities.

The funding objective of the ASRS is to maintain reasonably stable contribution rates and to achieve a funded status of 100%. According to the most recently available actuarial valuation, dated June 30, 2019, the total actuarial value of the retirement fund and the HBS fund assets was $40,568 million. The total actuarial accrued liability of these funds was $56,127 million. The unfunded actuarial accrued liability of $15,559 million results in an actuarial funding ratio of 72.3% for the total plan, which is an increase from 71.2% at June 30, 2018, due to positive investment performance.

A detailed discussion of funding is provided in the Actuarial Section of this report.

Contribution Rate Projections

The ASRS has taken steps to significantly mitigate contribution rate volatility, while ensuring that contribution rates plus investment earnings continue to fund the pension, health, and disability benefits earned. By amortizing unfunded actuarial accrued liabilities over a 25 year period for the pension plan (and over a 15 year period for the health insurance and long term disability plans), by allocating investment gains and losses over a ten year period, by phasing in significant assumption changes including lower economic growth expectations, and by developing a very diversified investment portfolio, the ASRS has been able to obtain greater stability in contribution rates while funding the benefits earned. Consequently, contribution rates are expected to continue to increase, but only gradually each year, before flattening and then gradually beginning to fall.

Awards

The Government Finance Officers Association of the United States and Canada (GFOA) awarded a Certificate of Achievement for Excellence in Financial Reporting to the ASRS for its CAFR for the fiscal year ended June 30, 2019. The ASRS has received this prestigious award in each of the last 31 years.

To be awarded a Certificate of Achievement, a government must publish an easily readable and efficiently organized CAFR that satisfies both accounting principles generally accepted in the United States of America and applicable legal requirements. A Certificate of Achievement is valid for one year only. We believe this report

continues to conform to the Certificate of Achievement Program requirements and we are submitting it to the GFOA to determine its eligibility for another certificate.

The GFOA also presented the ASRS with the Award for Outstanding Achievement for its June 30, 2019 Popular Annual Financial Report (PAFR). A PAFR must be readily accessible and easily understandable to the general public and other interested parties without a background in public finance. To qualify for the Award for Outstanding Achievement, a government must have received the Certificate of Achievement for Excellence for its CAFR for the previous year or current year. This is the eighth year the ASRS has received this award.

In addition, the Public Pension Coordinating Council bestowed the Pension Standards Award for 2020 to the ASRS for meeting professional standards, plan design and administration. To qualify for the Pension Standards Award, a public employee retirement system must certify that it meets requirements in six areas of assessment. The areas assessed are comprehensive benefits program, funding adequacy, actuarial, audit, investments and communications. The Pension Standards Award is valid for one year. This is the 16th year the ASRS has received this award.

Acknowledgements

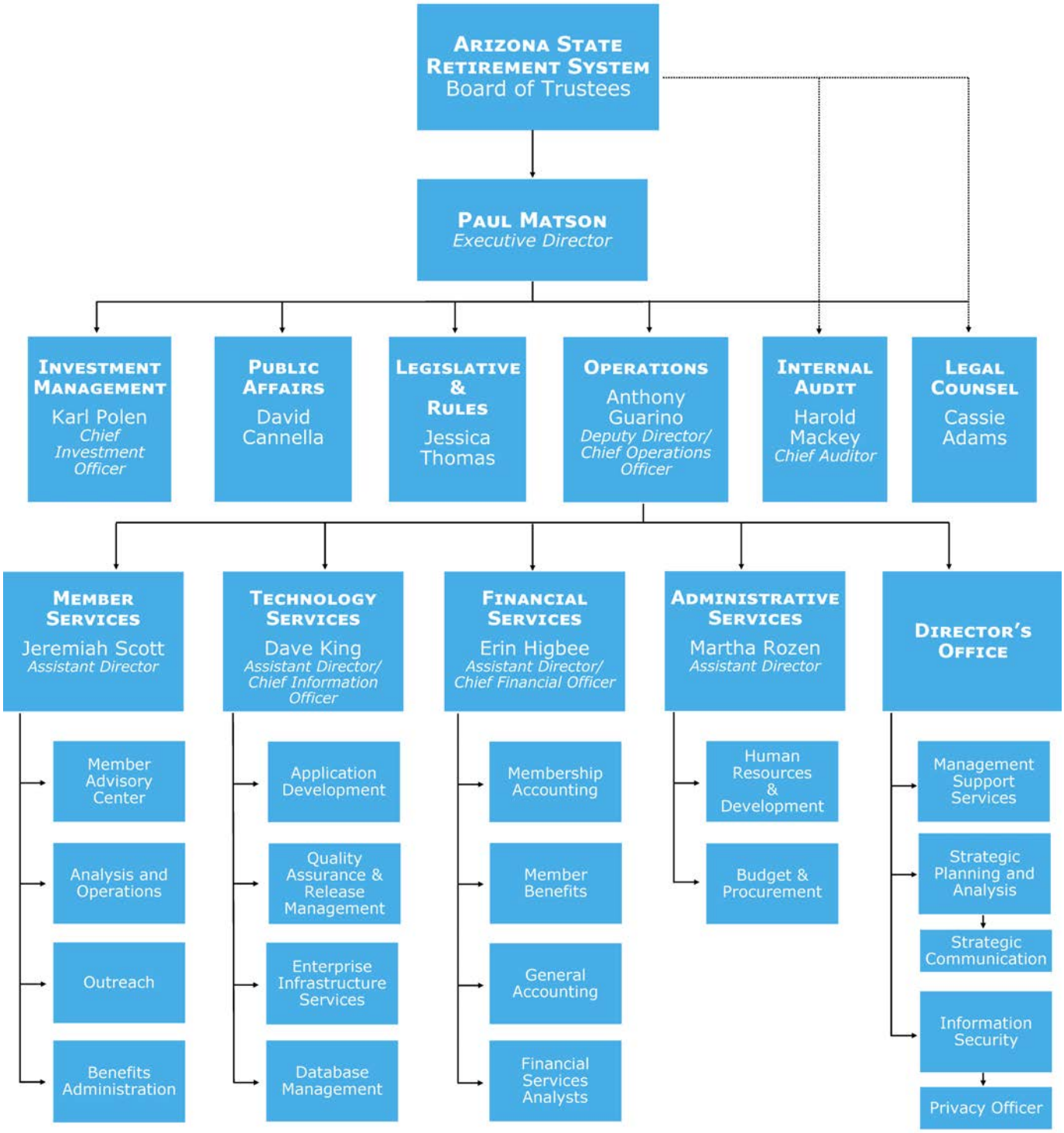
This report represents the culmination of hours of hard work by the ASRS General Accounting and Investment Management Division staff. It is intended to provide complete and reliable information for decision making, to ensure compliance with legal requirements, and is a means of measuring the responsible stewardship of the assets of the ASRS.

We would like to express our gratitude to the ASRS board for its support and leadership in overseeing the financial affairs of the ASRS in a responsible and progressive manner. The ASRS board, along with the ASRS' executive and senior management, and the entire staff of the ASRS has been instrumental in maintaining the high quality of service and performance, which has become the standard for the ASRS.

Respectfully submitted,

Paul Matson, Executive Director
Erin Higbee, Chief Financial Officer

Organizational Chart



As of June 30, 2020

Investments are managed both internally by the ASRS, and externally through investment managers. Please refer to the Schedule of Broker Commissions, which begins on page 85 in the Investment Section, and the Schedule of Investment Fees on page 87 in the Investment Section.

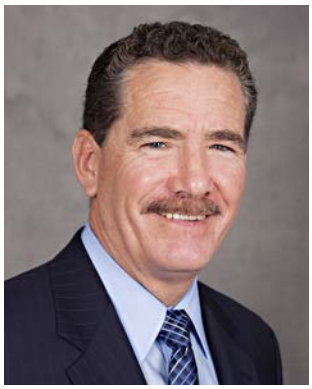
Jim Hillyard
Chair
State Employees

David (Clark) Partridge
Vice-Chair
Member At Large

René Guillen
Political Subdivisions

Michael Lofton
Public

Tom Manos
Retirees



Kevin McCarthy
Public

Michael Miller
Educator

As of June 30, 2020

Paul Matson
Executive Director

Anthony Guarino
Deputy Director,
Chief Operations Officer

Karl Polen
Chief Investment Officer

Outside Professional Consultants

Actuarial Services	**Gabriel Roeder Smith & Company** Irving, TX
Long Term Disability Benefits	**Broadspire, A Crawford Company** Lexington, KY
Custodial Bank	**State Street Bank and Trust Co.** Boston, MA
Independent Auditors	**CliftonLarsonAllen, LLP** Baltimore, MD
General Investment Consultant	**NEPC, LLC** Cambridge, MA
Private Real Estate Consultant	**RCLCO** Bethesda, MD
Private Equity Consultant	**Meketa Investment Group** Boston, MA

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FINANCIAL SECTION

An agency of the State of Arizona

CliftonLarsonAllen LLP
CLAconnect.com

INDEPENDENT AUDITORS' REPORT

The Honorable Douglas A. Ducey, Governor
State of Arizona and Board of Trustees
Arizona State Retirement System

Report on the Financial Statements

We have audited the financial statements of the Arizona State Retirement System (ASRS), a component unit of the State of Arizona, which comprise the combined statements of fiduciary net position as of June 30, 2020, the related combined statements of changes in fiduciary net position for the year then ended, and the related notes to the basic financial statements, as listed in the table of contents.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the fiduciary net position of the ASRS as of June 30, 2020, and the respective changes in its fiduciary net position for the year then ended in accordance with accounting principles generally accepted in the United States of America.

A member of Nexia International

The Honorable Douglas A. Ducey, Governor
State of Arizona and Board of Trustees
Arizona State Retirement System

Other Matters

Required Supplementary Information

Accounting principles generally accepted in the United States of America require that the management's discussion and analysis and the schedules of changes in the net pension liability – retirement, net pension liability – retirement, employer contributions – retirement, investment returns – retirement, changes in the net OPEB liability – HBS, net OPEB liability – HBS, employer contributions – HBS, investment returns – HBS, changes in the net OPEB liability – LTD, net OPEB liability – LTD, employer contributions – LTD, investment returns – LTD, and related notes, as listed in the table of contents, be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board who considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Other Information

Our audit was conducted for the purpose of forming an opinion on the ASRS' financial statements. The additional supplementary information and the introductory, investment, actuarial, and statistical sections, as listed in the table of contents, are presented for purposes of additional analysis and are not a required part of the financial statements.

The additional supplementary information, as listed in the table of contents, is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the financial statements. Such information has been subjected to the auditing procedures applied in the audit of the financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the financial statements or to the financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the Additional Supplementary Information is fairly stated, in all material respects, in relation to the basic financial statements as a whole.

The Introductory, Investment, Actuarial, and Statistical sections, as listed in the table of contents, have not been subjected to the auditing procedures applied in the audit of the basic financial statements and, accordingly, we do not express an opinion or provide any assurance on them.

Other Reporting Required by *Government Auditing Standards*

In accordance with *Government Auditing Standards*, we have also issued our report dated November 10, 2020 on our consideration of the ASRS' internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is solely to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on the effectiveness of the ASRS' internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the ASRS' internal control over financial reporting and compliance.

CliftonLarsonAllen LLP

Baltimore, Maryland
November 10, 2020

This section presents management's discussion and analysis (MD&A) of the Arizona State Retirement System's (ASRS) fiduciary net position and changes in fiduciary net position for the fiscal year ended June 30, 2020. It is presented as a narrative overview and analysis. The discussion and analysis should be read in conjunction with the letter of transmittal, the basic financial statements, and notes to the basic financial statements presented in the financial section of the ASRS Comprehensive Annual Financial Report (CAFR).

Financial Highlights

During fiscal year 2020, the net position of the ASRS decreased, as actual investment returns were below expected returns. This was primarily driven by the volatile markets in the wake of the COVID-19 pandemic that began in the third quarter of the fiscal year and carried over to the fourth quarter. While a recovery quickly ensued in the capital markets, it was not enough to offset all losses sustained near the end of the fiscal year. The underperformance resulted in benefit payments exceeding contributions and investment earnings.

- At June 30, 2020, the ASRS held investments of $42,192 million (excluding securities lending balances), an increase of $537 million from fiscal year 2019.
- The combined investment portfolio experienced a time-weighted rate of return (net of fees) of 0.8%, compared to 6.6% in fiscal year 2019.

Overview of the Financial Statements

The MD&A is intended to serve as an introduction and overview of the financial section of the CAFR, which is comprised of the following components: 1) basic financial statements, 2) notes to the basic financial statements, 3) required supplementary information and 4) additional supplementary schedules. Collectively, this information presents the combined fiduciary net position held in trust for benefits for each of the funds administered by the ASRS, which includes the Retirement fund, Health Benefit Supplement fund and Long Term Disability fund, as of June 30, 2020. This financial information also summarizes the combined changes in fiduciary net position held in trust for benefits, for the year then ended. The information available in each of these sections is briefly summarized as follows:

Basic financial statements - For the fiscal year ended June 30, 2020, financial statements are presented for the funds administered by the ASRS. These fiduciary funds are held in trust for the benefit of the ASRS members.

- The Combined Statements of Fiduciary Net Position are presented as of June 30, 2020. This financial statement reflects the resources available to pay benefits to members, including retirees and beneficiaries, as of the end of the fiscal year.
- The Combined Statements of Changes in Fiduciary Net Position are presented for the year ended June 30, 2020. This statement reflects the changes in resources available to pay benefits to retirees and other beneficiaries for the year.

Notes to the Basic Financial Statements - The notes to the basic financial statements provide additional information, which is essential to a full understanding of the data provided in the basic financial statements. The notes to the basic financial statements can be found on pages 23-44 of this report.

Required Supplementary Information – The schedules included in the required supplementary information section present information about the changes in the net pension and other postemployment benefits (OPEB) liabilities, employer contributions, actuarial assumptions used to calculate the actuarially determined contributions, historical trends, and other required supplementary information. This information is required by the Governmental Accounting Standards Board (GASB).

The money-weighted rate of return expresses investment performance, net of investment expense, and is disclosed per the requirements of GASB 67 and GASB 74.

Additional Supplementary Schedules - These schedules include the Combining Schedules of Retirement Fiduciary Net Position, and Changes in Retirement Fiduciary Net Position for the ASRS Plan and System retirement programs. The ASRS Plan, a defined benefit plan, and the System, a defined contribution plan with guaranteed benefits, are separate components administered within the same pension plan and trust.

Detailed information about administrative expenses, consultant fees and investment expenses are also included in this section.

Financial Analysis of the ASRS Funds

The ASRS administers retirement, health and long term disability benefits for teachers, state, county and other public municipal employees. The ASRS benefits are funded by member and employer contributions and by earnings on investments. The ASRS has three funds, retirement, health benefit supplement (HBS) and long term disability (LTD), to which the contributions are distributed according to actuarially determined contribution rates.

Fiduciary Net Position – The ASRS' total fiduciary net position held in trust for benefits at June 30, 2020 was $41,096 million, a 1.8% decrease from $41,839 million at June 30, 2019. The retirement fund's fiduciary net position was $39,168 million compared to $39,825 million last year, a 1.7% decrease. The HBS fund's net position was $1,767 million at year end compared to $1,839 million at fiscal year 2019, a 3.9% decrease. The LTD fund's fiduciary net position was $161 million at year end compared to $175 million last year, an 8.0% decrease. Additionally, payables for investment purchases increased 3,196.6% at fiscal year end due to changes in investment strategy resulting in the transitioning of funds from one investment manager to another at fiscal year end. The decrease in the total fiduciary net position and the fiduciary net position of the retirement, HBS and LTD funds was because benefit payments exceeded both actuarially determined contributions and investment earnings.

Changes in Fiduciary Net Position - For the 2020 fiscal year, member and employer contributions totaled $2,616 million, a 6.5% increase compared to $2,456 million for fiscal year 2019. Multiple factors attributed to the increase in contribution revenue, including an increase in active plan members, an increase in covered payroll and a slight increase in contribution rates. The number of active plan members increased by 1.4%, and covered payroll increased by 3.9%. Retirement and HBS combined employer and employee contribution rates were 23.39% and 0.49%, respectively, in fiscal year 2020, and 22.82% and 0.46%, respectively, in 2019. LTD combined employer and employee contribution rates were 0.34% in fiscal year 2020, and 0.32% in fiscal year 2019. For employers, the alternate contribution rate decreased from 10.53% in fiscal year 2019, to 10.41% in fiscal year 2020.

For fiscal year 2020, the ASRS recognized total net investment income of $373 million. The time-weighted rate of return on investment assets was 0.8%.

Deductions from the ASRS net position held in trust for benefits consist primarily of retirement, disability, health insurance, survivor benefits, member refunds and administrative expenses. For the 2020 fiscal year, retirement, disability, health insurance and survivor benefits totaled $3,472 million, an increase of 4.1% over the $3,335 million paid during fiscal year 2019. The increase is attributed to an increase in total members and beneficiaries receiving retirement benefits from 159,569 in fiscal year 2019, to 163,069 in fiscal year 2020.

Refunds and transfers to other plans totaled $243.2 million in fiscal year 2020, a 7.2% decrease from the $262.1 million paid out in fiscal year 2019. In fiscal year 2020, the cost of administering the ASRS benefits totaled $30.55 million, an increase of 1.9% from the $29.98 million paid in fiscal year 2019. In the current year the ASRS invested more in information security, which resulted in an increase in overall administrative spending. However, this additional spending for information security was offset significantly by savings incurred through reduced banking fees, which was a result of moving pension disbursement operations to an internal process, when it had previously been managed by the custodial bank.

The following chart and tables show the ASRS fiduciary net position for fiscal year 2020 and the condensed summary of fiduciary net position and changes in fiduciary net position for fiscal years 2020 and 2019:

Exhibit F-1: ASRS Fiduciary Net Position by Fund

As of June 30, 2020
(Dollars in thousands)

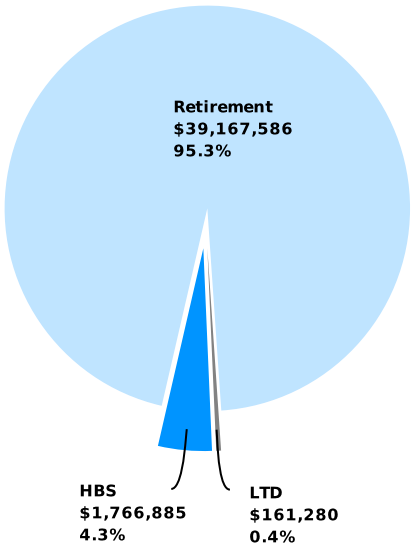

Exhibit F-2: Condensed Summary of Fiduciary Net Position

(Dollars in thousands)

	2020	2019	Change	% Change
Assets				
Cash and receivables	$ 191,559	$ 223,333	$ (31,774)	(14.2)%
Investments	42,191,703	41,655,165	536,538	1.3 %
Securities lending	103,249	143,604	(40,355)	(28.1)%
Total assets	42,486,511	42,022,102	464,409	1.1 %
Liabilities				
Payables and other liabilities	1,287,511	39,056	1,248,455	3,196.6 %
Securities lending	103,249	143,604	(40,355)	(28.1)%
Total liabilities	1,390,760	182,660	1,208,100	661.4 %
Fiduciary Net Position Restricted for Pension/OPEB Benefits	$ 41,095,751	$ 41,839,442	$ (743,691)	(1.8)%

Exhibit F-3: Condensed Summary of Changes in Fiduciary Net Position

(Dollars in thousands)

	2020	2019	Change	% Change
Additions				
Member contributions	$ 1,290,249	$ 1,210,534	$ 79,715	6.6 %
Employer contributions	1,325,419	1,244,985	80,434	6.5 %
Other income	16	9,969	(9,953)	(99.8)%
Service credit purchase and transfers in	13,403	17,610	(4,207)	(23.9)%
Investment and security lending income	579,107	2,712,837	(2,133,730)	(78.7)%
Investment and security lending expense	(206,567)	(195,098)	(11,469)	5.9 %
Total additions	3,001,627	5,000,837	(1,999,210)	(40.0)%
Deductions				
Retirement and disability benefits	3,418,602	3,288,147	130,455	4.0 %
Survivor benefits	52,949	47,335	5,614	11.9 %
Refunds and transfers	243,214	262,138	(18,924)	(7.2)%
Administration and other	30,553	29,975	578	1.9 %
Total deductions	3,745,318	3,627,595	117,723	3.2 %
Net Change	(743,691)	1,373,242	(2,116,933)	(154.2)%
Fiduciary Net Position Restricted for Pension/OPEB Benefits				
Net position beginning of year	41,839,442	40,466,200	1,373,242	3.4 %
Net position end of year	$ 41,095,751	$ 41,839,442	$ (743,691)	(1.8)%

Funded Status - GASB 67 and 74 require public employee pension and OPEB plans that have certain characteristics and whose assets are administered through trusts, to use a prescribed accounting methodology for financial reporting purposes. As a result, the ASRS conducts two actuarial valuations each year, one for accounting purposes and one for funding purposes. The difference between the two actuarial valuations is the assets are valued at market value for financial reporting purposes and a smoothed value is used for funding purposes.

In order to determine the retirement fund's funded status under Generally Accepted Accounting Principles (GAAP), the ASRS used the most recently available actuarial valuation, dated June 30, 2019, and rolled it forward to June 30, 2020. The notes to the basic financial statements, as well as the required supplementary information, disclose more detailed information about the retirement fund's net pension liability.

A detailed discussion of the funded status of the retirement fund, the HBS fund and the LTD fund, based on the ASRS funding methodology, is contained in the actuarial section of this report.

Exhibit F-4: Pension Valuation For Financial Reporting Purposes

Funded Status - Retirement	2020	2019
Retirement fiduciary net position as a percentage of total pension liability	69.33 %	73.24 %

In order to determine the HBS and LTD funds' funded status under GAAP, the ASRS used the most recently available actuarial valuation, dated June 30, 2019, and rolled it forward to June 30, 2020. The notes to the basic financial statements as well as the required supplementary information disclose more detailed information about the HBS and LTD funds' net OPEB liability.

Exhibit F-5: OPEB Valuation For Financial Reporting Purposes

Funded Status - HBS	2020	2019
HBS program assets as a percentage of total HBS OPEB liability	104.33 %	101.62 %

Funded Status - LTD	2020	2019
LTD fund fiduciary net position as a percentage of total LTD liability	68.01 %	72.85 %

Investments - During the fiscal year 2020, the ASRS investments were broadly diversified in equities, credit and interest rate sensitive instruments, real estate investments and cash equivalent instruments. A few highlights of the year are as follows:

- As of June 30, 2020, the fund held investments of $42,192 million, (excluding securities lending balances), an increase of $537 million from the prior year.
- The combined investment portfolio generated approximately $373 million in net investment earnings during the year.
- The combined investment portfolio experienced a time-weighted rate of return of 0.8% compared to the Interim Total Fund Benchmark return of 0.0% **.**
- The increase in investments during the year is primarily due to a slight gain in investments due to the sharp pullback caused by the COVID-19 pandemic and subsequent economic rebound prior to year end.

A detailed discussion of investments is provided in the notes to the basic financial statements and the Investment Section of this report.

Information Requests

Request for Information – This financial report is designed to provide a general overview of the Arizona State Retirement System's finances. Questions concerning any of the information provided in this report or requests for additional information should be addressed to:

ASRS Financial Services Division
3300 North Central Avenue
Phoenix, AZ 85012

Combined Statements of Fiduciary Net Position

As of June 30, 2020
(Dollars in thousands)

	Retirement Fund	Health Benefit Supplement Fund	Long Term Disability Fund	Combined
Assets				
Cash	$ 11,136	$ 483	$ 99	$ 11,718
Receivables				
Accrued interest and dividends	27,949	1,228	109	29,286
Securities sold	7,667	332	30	8,029
Futures contracts	5,714	248	22	5,984
Contributions	86,441	1,544	1,088	89,073
Due from other funds	—	8,705	1,302	10,007
Other	30,150	1,300	6,012	37,462
Total receivables	157,921	13,357	8,563	179,841
Investments				
Cash and short-term investments	984,400	105,404	3,854	1,093,658
Equity	20,942,282	907,482	81,995	21,931,759
Fixed Income - Interest Rate Sensitive	3,556,903	154,130	13,926	3,724,959
Fixed Income - Credit	8,309,458	360,070	32,534	8,702,062
Real estate	6,435,215	278,854	25,196	6,739,265
Total investments	40,228,258	1,805,940	157,505	42,191,703
Securities lending collateral	98,591	4,272	386	103,249
Total assets	40,495,906	1,824,052	166,553	42,486,511
Liabilities				
Securities purchased	1,210,481	52,453	4,739	1,267,673
Securities lending collateral	98,591	4,272	386	103,249
Futures contracts	1,531	66	6	1,603
Due to other funds	10,007	—	—	10,007
Other	7,710	376	142	8,228
Total liabilities	1,328,320	57,167	5,273	1,390,760
Net position restricted for pension/OPEB benefits	$ 39,167,586	$ 1,766,885	$ 161,280	$ 41,095,751

The accompanying notes are an integral part of these statements.

Combined Statements of Changes in Fiduciary Net Position

For the Year Ended June 30, 2020
(Dollars in thousands)

	Retirement Fund	Health Benefit Supplement Fund	Long Term Disability Fund	Combined
Additions				
Contributions				
Member contributions	$ 1,272,080	$ —	$ 18,169	$ 1,290,249
Employer contributions	1,254,651	52,371	18,397	1,325,419
Transfers from other plans	1,094	—	—	1,094
Purchased Service	12,276	22	11	12,309
Total Contributions	2,540,101	52,393	36,577	2,629,071
Investment Activity				
Investment activity income:				
Net appreciation in fair value of investments	127,220	5,517	656	133,393
Interest	65,448	4,241	266	69,955
Dividends	322,811	14,013	1,310	338,134
Other income	31,972	1,388	130	33,490
Total investment activity income	547,451	25,159	2,362	574,972
Investment activity expense:				
Management fees	(182,005)	(7,907)	(738)	(190,650)
Custody fees	(2,415)	(105)	(9)	(2,529)
Consultant and legal fees	(8,617)	(373)	(34)	(9,024)
Internal investment activity expense	(4,549)	(197)	(18)	(4,764)
Total investment activity expenses	(197,586)	(8,582)	(799)	(206,967)
Net income from investment activities	349,865	16,577	1,563	368,005
Securities lending activities:				
Securities lending income	3,948	171	16	4,135
Interest rebate	910	39	4	953
Management fees	(528)	(23)	(2)	(553)
Net income from securities lending activities	4,330	187	18	4,535
Total net investment income	354,195	16,764	1,581	372,540
Other income	15	1	—	16
Total additions	2,894,311	69,158	38,158	3,001,627
Deductions				
Retirement and disability benefits	3,228,368	140,619	49,615	3,418,602
Survivor benefits	52,949	—	—	52,949
Refunds to withdrawing members, including interest	242,252	—	—	242,252
Administrative expenses	26,845	1,163	1,524	29,532
Transfers to other plans	962	—	—	962
Other	491	—	530	1,021
Total deductions	3,551,867	141,782	51,669	3,745,318
Net increase (decrease) in net position	(657,556)	(72,624)	(13,511)	(743,691)
Net position restricted for pension/OPEB benefits				
Beginning of year	39,825,142	1,839,509	174,791	41,839,442
End of year	$ 39,167,586	$ 1,766,885	$ 161,280	$ 41,095,751

The accompanying notes are an integral part of these statements.

Note 1. Plan Description

Organization – The Arizona State Retirement System (ASRS) is a component unit of the State of Arizona. The ASRS is a cost-sharing, multiple-employer, pension plan established by the State of Arizona to provide pension benefits for employees of the State and employees of participating political subdivisions and school districts. The ASRS is administered in accordance with Title 38, Chapter 5, Articles 2 and 2.1 of the Arizona Revised Statutes (A.R.S.).

The ASRS is a qualified governmental pension plan pursuant to I.R.C. § 414. The ASRS pension plan has two components, the Plan and the System (collectively, Retirement Fund). The assets of the Retirement Fund are utilized to pay benefits to members of both Plan and System. The Plan is a defined benefit plan and the System is a closed defined contribution plan, with guaranteed benefits. These plans are administered through a trust.

The System was established by the Arizona Legislature in 1953 to provide retirement and other benefits for state employees, teachers, and employees of political subdivisions that elected coverage. In 1943, the Legislature established the Arizona Teachers' Retirement System (the Teachers' System) to provide benefits for teachers. After the establishment of the ASRS, teachers who were, or later became, eligible through employment covered by the ASRS were transferred to the System. The Teachers' System then became inactive, except for continuation of retirement benefits already being paid and obligations to teacher members who did not become eligible for the ASRS.

The Plan, enacted by the Legislature in 1970, became effective July 1, 1971. Effective July 1, 1981, all non-retired members of the System became members of the Plan, as prescribed by Laws of 1980, Chapter 238.

In addition to retirement benefits, the ASRS provides retired members access to health insurance and a health insurance premium supplement benefit. The ASRS also provides a long term disability program for actively contributing members. The Health Benefit Supplement (HBS) program is administered in accordance with Title 38, Chapter 5, Article 2. The Long Term Disability (LTD) program is administered in accordance with Title 38, Chapter 5, Article 2.1.

A.R.S. § 38-783 and A.R.S. § 38-797 establish the health insurance premium benefits (HBS) program and the long term disability benefits program (LTD), respectively. Effective July 1, 1995, the ASRS established a trust for each benefit program and has reported those funds in the basic financial statements. Both the Health Benefit Supplement (HBS) Program and the Long Term Disability (LTD) Program are cost-sharing, multiple-employer postemployment benefit plans. The LTD and HBS funds' assets or income may be utilized solely for the payment of eligible member benefits of each respective fund.

Plan Administration – The operations and administration of the ASRS are vested with the ASRS Board, which is comprised of nine members, who are appointed by the Governor and confirmed by the Arizona Senate pursuant to A.R.S. § 38-211. The ASRS Board is responsible for establishing and maintaining the funding policy.

The composition of the ASRS Board, their qualifications and term are defined in A.R.S. § 38-713. Five of the trustees must be ASRS members each representing one of the following member groups: an educator, an employee of a political subdivision, a retired member, an employee of the State and an at large member who may represent any ASRS member group. Each trustee representing an ASRS member group must have no less than five years of administrative management experience. Additionally, four trustees, who are not ASRS members, are appointed to represent the public. Four trustees of the ASRS Board must have a minimum of 10 years of investment experience. There is no limit on the number of terms a trustee may serve.

Pursuant to the Arizona Revised Statutes, contribution requirements for active members and their participating employers are established and may be amended by the ASRS Board. Contribution rates are actuarially determined and are expected to finance the costs of benefits earned by members during the year and any unfunded accrued liability. The cost of administering the Plan is financed through employer contributions, member contributions and investment earnings.

Health Insurance - Pursuant to A.R.S. § 38-782, the Retiree Group Insurance Program makes available group health insurance coverage to eligible retired and disabled members and their dependents. Retired and disabled members of the ASRS, University Optional Retirement Plans, the Public Safety Personnel Retirement System, the Elected Officials' Retirement Plan, the Elected Officials Defined Contribution Plan, the Community College District Optional Retirement Plans and the Corrections Officer Retirement Plan are eligible for health insurance benefits through the ASRS.

The ASRS, and eligible retirees, pay premiums on a monthly basis to a contracted health insurance provider as consideration for health insurance coverage provided. The ASRS contract with the insurance provider allows for a portion of the difference between the total revenues and total claims expenses incurred by the provider to be distributed back to the ASRS in the form of a Retrospective Rate Agreement (RRA) rebate. The amount is calculated based on a targeted retention ratio as agreed upon per the contract and may fluctuate from year-to-year. The ASRS is not due an RRA rebate for revenue and claims expense activity that occurred during fiscal year 2020. RRA assets are reported in the HBS fund but are not restricted to pay HBS program benefits.

Health Benefit Supplement Program - Pursuant to A.R.S. § 38-783, retired and disabled members, with at least five years of credited service, are eligible to participate in the HBS program. This assistance is provided to those members who elect group coverage through either the ASRS Retiree Group Insurance Program or their former member employer. For a more detailed summary of benefits, refer to the Summary of Plan Provisions in the Actuarial Section of this report.

In accordance with the funding policy as of June 30, 2020, the required contribution rate for employers for their active members was 0.49% of covered payroll. There were 79,677 retired members or beneficiaries receiving benefits as of June 30, 2020.

Long Term Disability Program - Pursuant to A.R.S. § 38-797, members of the ASRS are eligible for LTD benefits in the event they become unable to perform their work. The monthly benefit is equal to two-thirds of their monthly compensation. Participants continue to earn service credit up to their normal retirement dates. Members with LTD commencement dates after June 30, 1999, are limited to 30 years of service or the service on record as of the effective disability date, if their service is greater than 30 years.

In accordance with the funding policy as of June 30, 2020, the required contribution rate for employers and active members was 0.17% of covered payroll. There were 3,214 disabled members receiving long term disability benefits as of June 30, 2020.

Reporting Entity – The financial statements of the ASRS include the financial activities of the Retirement Fund, HBS Fund and LTD Fund. The ASRS is considered a component unit of the State of Arizona reporting entity and is included in the State's financial reports as a pension trust fund.

ASRS Membership – at June 30, 2020 ASRS membership and employer units consisted of the following:

Exhibit F-6: Plan Members

Member Status	Retirement Plan	Retirement HBS[1]	Retirement LTD
Inactive plan members or beneficiaries receiving benefits	163,069	79,677	3,214
Inactive plan members entitled to, but not yet receiving benefits	241,518	38,175	—
Active plan members	214,810	214,810	214,810
Total membership	619,397	332,662	218,024

[1]The count of inactive plan members entitled to HBS Program benefits is less than that of the Retirement Program, because members must have at least 5 years of service to receive HBS benefits.

Exhibit F-7: Employer Units

Member Type	Employer Unit Count
School districts	239
Charter schools	123
Cities and towns	79
Counties	15
Special districts	93
Community college districts	11
Universities	3
State government	1
Total employer units	564

Note: The 564 employer units represent 667 total employers.

Retirement Benefits – The ASRS provides benefits under formulas and provisions described in Arizona State law. Benefits and administrative expenses are paid from monies contributed by members and employers and from earnings on investments. The ASRS provides for retirement, disability, health insurance premium supplemental benefits and survivor benefits.

Retirement benefits are calculated on the basis of total credited service, average monthly compensation, and graded multiplier, which is established on a fiscal year basis (July 1 to June 30). Members with an initial membership date before July 1, 2011, are eligible for full retirement benefits upon the earliest of attaining:

- Age 65;
- Age 62 with 10 years of credited service;
- Age plus credited service equaling 80 or more

Members with initial membership dates on or after July 1, 2011, are eligible for full retirement benefits upon the earliest of attaining:

- Age 65;
- Age 62 with 10 years of credited service;
- Age 60 with 25 years of credited service;
- Age 55 with 30 years of credited service

Average monthly compensation is determined by a 60-month or 36-month calculation depending on the membership date.

Termination pay includes vacation/sick pay (except for state and county employees), compensation time pay, termination incentive pay (excludes payments made after retirement begins, such as VIP or ESP), or any other payments paid at the time of termination.

Exhibit F-8: Average Monthly Compensation Calculation

Membership Date	Calculation	
Prior to January 1, 1984	*Greater of the following calculations:*	
	36 Months	This is calculated by taking the highest consecutive 36 months of contributions within the last 120 months (10 years) of contributions reported. Termination Pay is excluded.
	60 Months	This is calculated by taking the highest consecutive 60 months of contributions within the last 120 months (10 years) of contributions reported. Termination Pay is included.
January 1, 1984 - June 30, 2011	36 Months	This is calculated by taking the highest consecutive 36 months of contributions within the last 120 months (10 years) of contributions reported. Termination Pay is excluded.
July 1, 2011, or after	60 Months	This is calculated by taking the highest consecutive 60 months of contributions within the last 120 months (10 years) of contributions reported. Termination Pay is excluded.

The graded multiplier is a percentage set by Arizona State statute. It is the percentage of the average monthly compensation members will receive for each year of credited service they have accrued at retirement. This percentage is based on their total years of service at retirement based on the following graded multiplier schedule:

Exhibit F-9: Graded Multiplier

Years of Service	Multiplier
0.00 to 19.99	2.10 %
20.00 to 24.99	2.15 %
25.00 to 29.99	2.20 %
30.00 or more years	2.30 %

Permanent Benefit Increase (PBI) – Pursuant to A.R.S. § 38-767, retired members who have been retired for at least one year, and members receiving LTD benefits, are eligible for a benefit increase adjustment annually up to a maximum of 4%, if funds are available.

The PBI is paid when the average investment return is in excess of 8% over a rolling 10 year period from a reserve of excess actuarial investment earnings. Funds are reserved when the yield rate on the actuarial value of ASRS assets for the fiscal year that ended June 30 of the year prior to the year for which an increase would be paid exceeds 8%. If there are no excess investment earnings in the reserve, then no additional benefit increase is paid. As of June 30, 2020, there is a $115.8 million balance in the reserve for future PBIs however, this amount will not create a PBI in the current year per the above statute.

Enhanced Permanent Benefit Increase (EPBI) – Pursuant to A.R.S. § 38-767, retired members with at least 10 years of service who have been retired five or more years are eligible for an enhanced permanent benefit increase.

For each complete five-year period the member has been retired, an incremental benefit is paid if monies to pay the benefit are available. This benefit is funded by an interest credit of 8% of the reserve for future PBIs.

Due to legislation enacted in the 2013 legislative session, PBIs and EPBIs will not be awarded to members hired after September 13, 2013.

For a more detailed summary of benefits, refer to the Summary of Plan Provisions in the Actuarial Section of this report.

HBS Benefits – Pursuant to A.R.S. § 38-783, retired and disabled members, with at least five years of credited service, are eligible to receive HBS program benefits. The benefits are payable only with respect to allowable health insurance premiums for which the member is responsible. The maximum monthly benefits for members with 10 or more years of service range from $150 to $260, depending on age and number of dependents. For members with five to nine years of service, the benefits are the same dollar amounts as above multiplied by a vesting fraction equal to 10% for each completed year of service (i.e., 50% to 90%).

LTD Benefits – Pursuant to A.R.S. § 38-797, members of the ASRS are eligible for LTD benefits in the event they become unable to perform their work. The monthly benefit is equal to two-thirds of their monthly compensation. Participants continue to earn service credit up to their normal retirement dates. Members with LTD commencement dates after June 30, 1999 are limited to 30 years of service or the service on record as of the effective disability date, if their service is greater than 30 years.

Contributions – Per the Arizona Revised Statutes, contribution requirements for active members and their participating employers are established, and may be amended, by the ASRS Board. Contribution rates are actuarially determined and are expected to finance the costs of benefits accrued by plan members during the year and any unfunded accrued liability. The cost of administering the pension and other postemployment benefits is financed through employer contributions, member contributions and investment earnings.

Employers are also required to pay an Alternate Contribution Rate (ACR) for retired members who return to work. ACR contributions totaling $34.0 million were received during the 2020 fiscal year and are included in Employer Contributions on the Combined Statements of Changes in Fiduciary Net Position.

The contractually required contribution rates of employers as a percentage of covered payroll and the employees' matching contributions were as follows for fiscal year 2020:

Exhibit F-10: Contribution Rates

Contribution Rates	Employer	Member
Retirement	11.45 %	11.94 %
Health benefit supplement	0.49 %	0.00 %
Long term disability	0.17 %	0.17 %
Total required	12.11 %	12.11 %

Exhibit F-11: Alternate Contribution Rates

Alternate Contribution Rates	Employer	Member
ACR Retirement	10.29 %	0.00 %
ACR Health benefit supplement	0.05 %	0.00 %
ACR Long term disability	0.07 %	0.00 %
Total ACR required	10.41 %	0.00 %

The Arizona Revised Statutes allow the purchase of eligible service credit for which no benefit can be paid by another qualified plan. Purchasable services include leave of absence, military service, other public service employment and previously forfeited service under the ASRS. The Arizona Revised Statutes also allow purchase of military service regardless of whether a benefit may be paid.

Termination of Employment – Upon termination of employment, members may elect to receive their contributions made to the Plan, plus accrued interest.

Members with an initial membership date before July 1, 2011, may receive a percentage of employer contributions to the Plan based on years of service as follows:

Exhibit F-12: Vesting Period
(Initial membership date before July 1, 2011)

Years of Service	Vesting
5 to 5.9	25 %
6 to 6.9	40 %
7 to 7.9	55 %
8 to 8.9	70 %
9 to 9.9	85 %
10 or more	100 %

Members with an initial membership date on or after July 1, 2011 will not receive any portion of the employer contributions if they withdraw their account balance prior to retirement. This does not apply to terminations due to an employer reduction in force or position elimination, in which case the above ASRS vesting schedule will apply.

Withdrawal of accumulated contributions results in forfeiture of the member's accrued benefits in the Plan; however, state law allows for reinstatement of a member's forfeited service upon repayment of the accumulated contributions, plus interest if a former member returns to covered service.

Note 2. Summary of Significant Accounting Policies

Basis of Accounting – The financial statements of the Arizona State Retirement System are prepared using the accrual basis of accounting. The accompanying financial statements are prepared in accordance with accounting principles generally accepted in the United States of America that apply to government accounting of fiduciary funds issued by the GASB.

Contributions are recognized as revenues when due, pursuant to statutory and contractual requirements. Benefits and refunds are recognized when due and payable and expenses are recorded when the corresponding liabilities are incurred, regardless of when contributions are received or payment is made. Administrative expenses are recognized when incurred.

Investments – Publicly traded investments are reported at fair values determined by the custodial agent. The agent's determination of fair values includes, among other things, utilization of pricing services or prices quoted by independent brokers at current exchange rates.

See Note 4 for a schedule of investments measured at fair value and additional information regarding the inputs used to determine the fair value of investments.

The derivative instruments held by ASRS may consist of futures contracts, forward contracts, options, swaps, rights and warrants. Fair values of derivative instruments are determined by the custodial agent and reported on the Statement of Fiduciary Net Position. Changes in fair values of derivative instruments are reported as net appreciation of fair value on the Statement of Changes in Fiduciary Net Position.

The fair value of limited partnership investments are estimated current values based on acceptable industry practices. Fair value is based on estimates and assumptions from information and representations provided by the respective general partners, in the absence of readily ascertainable market values.

Retirement, HBS and LTD investments are pooled. Each program's respective ownership percentage of the pool is determined based on the daily cash flows related to each program by virtue of purchases and redemption of shares of the pooled asset fund. Realized and unrealized gains are allocated daily using the same methodology.

Income derived from investments is recognized when earned. Investment expenses are recognized when incurred. Performance fees are reported net with the appreciation in the fair value of investments. Net appreciation in the fair value of investment assets is determined by calculating the change in the fair value of investments between the end of the year and the beginning of the year, adjusting for cash flows related to investment purchases and sales. Interest income is recorded on the accrual basis and dividends are recorded on the ex-dividend date. Security transactions and any resulting gains or losses are accounted for on a trade date basis.

Public market investment managers, and some private market investment managers, are paid directly for manager fees. Private market investment managers, whose manager fees are not paid directly, report account valuations on a net of fee basis. The ASRS made a good faith effort to identify and separately report manager fees as investment expense by requesting a confirmation of fees from the managers and reviewing investment capital account statements.

Capital Assets – Capitalization thresholds have been established as follows:

Exhibit F-13: Capitalization Thresholds

Capitalizable Assets		Threshold
Furniture and fixtures	$	1,000,000
Computers and other equipment	$	1,000,000
Internally developed computer software	$	10,000,000
Externally purchased software	$	1,000,000
Websites	$	1,000,000

As of June 30, 2020, there were no capitalizable expenditures at or above the stated thresholds.

Accounts Receivable – Accounts receivable are comprised of employer contributions that are expected to be received within 60 days of year end, member overpayments, and member service purchase payroll deduction amounts (PDAs) that are expected to be collected within one year.

Federal Income Tax Status – The Plan is organized as a qualified retirement plan under the Internal Revenue Code (IRC). The ASRS is an integral part of the State of Arizona, and accordingly is not subject to U.S. federal income tax.

Actuarial Valuation – The actuarial information presented for the retirement, HBS and LTD funds are based on the June 30, 2019 actuarial valuation, which was rolled forward to June 30, 2020. Significant actuarial assumptions used in the valuations are included in the notes to the financial statements and required supplementary schedules.

Use of Estimates – The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and changes therein, disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Note 3. Cash and Investments

Cash – Cash deposits are subject to custodial risk. Custodial risk is the risk that deposits owned by ASRS will not be returned in the event of a bank failure. The Arizona Revised Statutes do not require ASRS deposits to be collateralized. The ASRS Board has not adopted a more restrictive policy. Cash on deposit with the Arizona State Treasurer in excess of FDIC coverage is collateralized at 100% of the deposit balance. In addition, the FDIC insures ASRS cash deposits up to $250,000 per member based on the ratio of the member's account balance to the ASRS net position.

Investments – The Arizona Revised Statutes authorize the ASRS to make investments in accordance with the "Prudent Person" rule. Section 38-718 (E) of the Arizona Revised Statutes interprets the rule to be that investment management shall discharge the duties of their position with the care, skill, prudence and diligence, under the circumstances then prevailing, that a prudent person acting in a like capacity and familiar with the same matters would use in the conduct of an enterprise of a like character and with like aims as that of the ASRS. Within this broad framework, the ASRS has chosen to invest in short-term securities, obligations of the U.S. government or agencies of the U.S. government, corporate bonds, common and preferred stocks (domestic and foreign), mortgages, derivatives, commodities, real estate, loans, and direct investments in partnerships.

The Arizona Revised Statutes place the following restrictions on the ASRS investment fund portfolio:

- No more than 80% of the assets held by the ASRS may be invested at any given time in equities, measured at market value.

- No more than 5% of the assets held by the ASRS may be invested in securities issued by any one institution, agency or corporation, other than securities issued as direct obligations of or fully guaranteed by the U.S. government or mortgage backed securities and agency debentures issued by federal agencies, measured at market value.
- No more than 40% of the assets held by the ASRS may be invested in non-U.S. public equity investments, measured at market value.
- No more than 60% of the assets held by the ASRS may be invested internally, measured at market value.
- No more than 10% of the assets held by the ASRS may be invested in bonds or other evidences of indebtedness of those multinational development banks in which the U.S. is a member nation, including the International Bank for Reconstruction and Development, the African Development Bank, the Asian Development Bank, and the Inter-American Development Bank, measured at fair value.

The ASRS Board has not formally adopted more restrictive policies than required by state statute for the various types of risks. The management of the ASRS believes it has complied with the above guidelines. Management does expect external money managers to abide by contract requirements, which are considerably more restrictive than the statute.

Due to the flow of securities to and from transfer agents and the security lending program, securities occasionally cannot be delivered for a sale or received for a purchase, resulting in a "failed" transaction. Securities with trade dates in June and settlement dates in July result in "outstanding" transactions. Since these securities have contractually changed ownership, receivables and payables result from these transactions. Such transactions resulted in a receivable for securities sold of $8.0 million and a payable for securities purchased of $1.3 billion at June 30, 2020.

Investment Policy – The ASRS policy in regard to the allocation of invested assets is established and may be amended by the ASRS Board. Plan assets are managed on a total return basis with a long-term objective of achieving and maintaining a fully funded status for benefits to be provided. The following is the asset allocation policy adopted by the ASRS Board and in place as of June 30, 2020:

Exhibit F-14: Target Asset Allocation

Asset Class	Target Allocation
Equity	50 %
Credit	20 %
Interest Rate Sensitive	10 %
Real Estate	20 %
Total	100 %

Rate of Return – For the year ended June 30, 2020, the annual money-weighted rate of return on Retirement Fund, HBS Fund and LTD Fund investments held by the ASRS, net of investment expense, was 0.76%, 0.76% and 0.75%, respectively. The money-weighted rate of return expresses investment performance, net of investment expense, adjusted for the changing amounts actually invested.

Investments are subject to a number of risks including custodial credit risk, concentration of credit risk, credit quality risk, interest rate risk and foreign currency risk.

Custodial Credit Risk – For an investment, custodial credit risk is the risk that, in the event of a failure of a counter party, the ASRS will not be able to recover the value of its investment or the collateral securities that are in the possession of an outside party. Publicly traded securities are registered in the name of the ASRS, including loaned securities.

Credit Quality Risk – Credit quality risk is the risk that the issuer will not fulfill its obligations to the purchaser of its debt instruments. The Arizona Revised Statutes are not specific as to the credit ratings of the investments of the ASRS. The statutes require the "Prudent Person" rule. The ASRS Board has not adopted a formal policy on credit ratings. The present management policy is to set standards for each portfolio manager based on an assessment of their expertise.

Concentration of Credit Risk – Concentration of credit risk is the risk of substantial loss if investments are concentrated in one issuer. The Arizona Revised Statutes require that no more than 5% of the assets can be invested in one issuer, except for the U.S. government and its agencies. The ASRS Board has not adopted a more restrictive policy.

The following table presents the fixed income investments at June 30, 2020, categorized to give an indication of the level of credit quality risk assumed by the ASRS:

Exhibit F-15: Credit Quality Risk

Fixed Income Securities
(Dollars in thousands)

Credit Rating		Fair Value	Fair Value as a Percent of Total Debt Securities Investments
AAA[1]	$	1,429,634	70.32 %
AA		66,734	3.28 %
A		259,006	12.74 %
BBB		276,467	13.60 %
BB		866	0.04 %
Not rated		456	0.02 %
Total	$	2,033,163	100.00 %
Commingled Funds - Fixed Income[2]		1,696,399	
Private Market Investments		8,701,606	
Total Fixed Income Investments	$	12,431,168	

[1] Includes $4.1 million of U.S. Treasury Bills classified as short-term investments on the Statements of Fiduciary Net Position

[2] The fair value and fund level credit quality ratings as reported by the commingled fund managers are as follows: $1,150,734--AA; $541,049--A; $4,616--Not Rated.

Note: Excluded from the table above are investments in commingled funds - fixed income (see footnote 2) and private market fixed income investments. Although private market investments are exposed to credit risk, credit rating information for these funds is not available.

Interest Rate Risk – Interest rate risk is the risk that debt securities will lose value due to rising interest rates. The Arizona Revised Statutes are silent regarding interest rate risk. The ASRS Board has not adopted a specific formal policy for interest rate risk, however it does set more restrictive requirements in its contracts with external money managers.

Exhibit F-16 presents the weighted average maturity on fixed income securities. The weighted average maturity method measures the interest rate sensitivity of fixed income securities. Longer periods indicate a higher degree of interest rate risk due to the longer period of exposure the portfolio will experience.

The following table shows the weighted average maturity by investment type as of June 30, 2020:

Exhibit F-16: Interest Rate Risk

Fixed Income Securities
(Dollars in thousands)

Fixed Income Security Type	Fair Value	Weighted Average Maturity (in years)
Commercial Mortgage Backed Securities	$ 40,314	29.1
Government Mortgage Backed Securities	558,181	25.3
Government Related	5,278	19.9
Corporate Bonds	595,546	11.8
Municipal/Provincial Bonds	32,474	9.5
Government Agencies	10,011	9.0
Government Bonds[1]	791,359	8.5
Commingled Funds - Fixed Income	1,696,399	8.0
Total	$ 3,729,562	
Private Market Fixed Income Investments	8,701,606	
Total Fixed Income Investments	$12,431,168	

[1] Includes $4.1 million of U.S.Treasury Bills is presented as short-term investments on the Statements of Fiduciary Net Position.

Note: Excluded from the table above are private market fixed income investments. While such investments are exposed to interest rate risk, weighted average maturity information for these funds is not available.

Foreign Currency Risk – Foreign currency risk is the risk that changes in the foreign exchange rate will adversely impact the fair value of an investment. The ASRS is authorized to invest part of its assets in foreign investments. According to the Arizona Revised Statutes, no more than 40% of the assets held by the ASRS may be invested in foreign securities and the investments must be made by investment managers with expertise in those investments. The ASRS Board has not adopted a formal policy that is more restrictive. Management does have certain policies in the contracts with the money managers permitted to invest in foreign denominated securities.

Exhibit F-17: Foreign Currency Risk
(Dollars in thousands)

The following table shows exposure to foreign currency risk (U.S. dollars) as of June 30, 2020:

Currency Type	Short-term Investments	Equity Securities	Private Equity	Real Estate	Total
Australian Dollar	$ 702	$ 346,830	$ —	$ —	$ 347,532
Brazilian Real	47	—	—	—	47
Canadian Dollar	2,135	487,538	—	—	489,673
Danish Krone	432	111,980	—	—	112,412
Euro Currency	3,645	1,727,078	222,654	—	1,953,377
Hong Kong Dollar	2,349	152,126	—	—	154,475
Japanese Yen	7,646	1,306,985	—	—	1,314,631
Mexican Peso	—	1,574	—	902	2,476
New Israeli Sheqel	208	24,511	—	—	24,719
New Taiwan Dollar	1,203	—	—	—	1,203
New Zealand Dollar	148	20,736	—	—	20,884
Norwegian Krone	427	37,097	—	—	37,524
Pound Sterling	2,621	726,179	—	—	728,800
Qatari Rial	(232)	—	—	—	(232)
Singapore Dollar	1,319	61,391	—	—	62,710
Swedish Krona	850	177,908	—	—	178,758
Swiss Franc	2,142	479,773	—	—	481,915
Thailand Baht	840	—	—	—	840
Total	$ 26,482	$ 5,661,706	$ 222,654	$ 902	$ 5,911,744

Note 4. Fair Value Measurements

Fair value measurements are categorized within the fair value hierarchy established by generally accepted accounting principles. The hierarchy is based on the valuation inputs used to measure the fair value of the asset and give the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1 measurements) and the lowest priority to unobservable inputs (Level 3 measurements).

Level 1 - Unadjusted quoted prices for identical instruments in active markets.

Level 2 - Quoted prices for similar instruments in active markets; quoted prices for identical or similar instruments in markets that are not active; and model-derived valuations in which all significant inputs are observable.

Level 3 - Valuations derived from valuation techniques in which significant inputs are unobservable.

Investments that are measured at fair value using the net asset value per share (or its equivalent) as a practical expedient are not classified in the fair value hierarchy.

In instances where inputs used to measure fair value fall into different levels in the fair value hierarchy, fair value measurements in their entirety are categorized based on the lowest level input that is significant to the valuation. The assessment of the significance of particular inputs to these fair value measurements requires judgment and consideration of factors specific to each asset or liability.

Equity securities classified in Level 1 are valued using prices quoted in active markets for those securities. Equity securities classified as Level 2 are valued using most recent trade price available in inactive markets. Equity securities classified in Level 3 are valued using unobservable inputs, including situations where there is little market activity, if any.

Fixed income securities classified in Level 2 are valued using the matrix pricing technique. Matrix pricing is used to value securities based on the securities' relationship to benchmark quoted prices, including U.S. Treasury Bills contained in the Interest Rate Sensitive Portfolio.

Real estate investments classified in Level 1 are valued using prices quoted in active markets. Real estate assets classified in Level 3 are real estate investments valued by external appraisals. An external appraisal is generally obtained at least annually and performed by an independent appraiser. The appraisals are performed using generally accepted valuation approaches applicable to the property type.

Cash and short-term investments generally include cash, foreign currencies and short-term investment funds (STIF). These investments are reported at cost.

Reinvested cash collateral held related to securities lending activities is reported based on the cash deposit value of the collateral held, which approximates fair value. Accordingly, securities lending cash collateral held is not categorized within the fair value level hierarchy. See Note 5 for a discussion of the ASRS' securities lending activities.

The schedule on the following page presents investments categorized according to the fair value hierarchy and is followed by a schedule with additional information regarding investments measured at the net asset value as of June 30, 2020.

Exhibit F-18: Investments and Derivative Instruments Measured at Fair Value

(Dollars in thousands)

Investments by Fair Value Level	As of June 30, 2020	Fair Value Measurements Using: Quoted Prices in Active Markets Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Public Equity securities				
U.S. Large Cap	$ 6,836,341	$ 6,836,310	$ —	$ 31
U.S. Mid Cap	854,677	854,677	—	—
U.S. Small Cap	718,922	718,061	466	395
International - Developed Markets Large Cap	4,700,059	4,698,675	1,384	—
International - Developed Markets Small Cap	776,027	775,588	438	1
Total equity securities	13,886,026	13,883,311	2,288	427
Interest Rate Sensitive[1]	2,032,707	—	2,032,707	—
Public Credit	456	—	456	—
Real estate	139,486	94,633	—	44,853
Total investments by fair value level	16,058,675	13,977,944	2,035,451	45,280
Investments not subject to fair value leveling				
(at cost or amortized cost)				
Cash and short-term instruments[2]	1,089,511			
Total Investments not subject to fair value leveling	1,089,511			
Investments measured at the net asset value (NAV)				
Commingled funds - U.S. equity	1,970,730			
Commingled funds - international emerging markets	2,055,287			
Commingled funds - fixed income	1,696,399			
Private equity funds	4,019,716			
Distressed debt funds	1,506,710			
Private debt funds	6,276,961			
Real estate funds	6,599,779			
Other credit funds	917,935			
Total investments measured at the NAV	25,043,517			
Total investments	$ 42,191,703			

[1] $4.1 million of U.S. Treasury Bills classified as short-term investments on the Statements of Fiduciary Net Position are presented in Interest Rate Sensitive.

[2] The ASRS exposes cash assets to the market through derivative instruments. See Note 6 for information regarding the ASRS' use of derivative instruments.

Exhibit F-19: Investments Measured at the NAV

(Dollars in thousands)

Investment	Fair Value at June 30, 2020	Unfunded Commitments	Redemption Frequency (if Currently Eligible)	Redemption Notice Period
Commingled funds - U.S. equity	$ 1,970,730	$ —	Monthly	5 days
Commingled funds - international emerging markets	2,055,287	—	Daily	1 - 2 days
Commingled funds - fixed income	1,696,399	—	Daily	2 days
Private equity funds	4,019,716	2,377,773	N/A	N/A
Distressed debt funds	1,506,710	1,164,917	N/A	N/A
Private debt funds	6,276,961	2,668,362	N/A	N/A
Real estate funds	6,599,779	4,096,645	N/A	N/A
Other credit funds	917,935	1,084,029	N/A	N/A
Total investments measured at the NAV	$ 25,043,517	$ 11,391,726		

Commingled Funds – The types of strategies within commingled funds can include investments in fixed income, public equity, real estate, commodities, and multi-asset type funds. Investments in the commingled multi-asset fund are invested in liquid public securities. Multi-asset class strategies invest tactically within and across asset classes, seeking to exploit quantitative or fundamental drivers of asset class returns or risk allocations as market conditions warrant. The funds have a perpetual life. Redemption frequencies range from daily to monthly. There are no plans to liquidate the total portfolio.

Private Equity and Distressed Debt Funds – Private Equity and Distressed Debt investments are invested primarily within limited partnerships. The types of investment strategies within these partnerships include: buyouts, distressed debt, special situations, secondaries, mezzanine and venture capital. These investments have an approximate life of 10 years and are considered illiquid. Redemptions are restricted over the life of the partnerships. During the life of the partnerships, distributions are received as underlying partnership investments are realized. There are no plans to liquidate the total portfolio.

Private Debt and Other Credit – Private Debt and Other Credit investments are invested within limited partnerships or limited liability companies. The types of investment strategies within these structures consist of corporate debt, asset backed securities and special situations. These investments have an approximate life of 7 to 10 years and are generally illiquid. Redemption restrictions are generally in place throughout the life of the investment unless an early termination right exists. If the early termination right is exercised, the result is an acceleration of distributions and the approximate life of the investment would be reduced. Distributions are received as investments are realized. There are no plans to liquidate the portfolio.

Real Estate Funds – Investments in real estate funds are invested within limited partnerships or limited liability companies. Real estate investments include opportunistic, stabilized and development assets within multi-family and senior housing, industrial, retail, office, and self-storage, with a North America focus. Redemption restrictions are generally in place throughout the life of the investment unless an early termination right exists. If the early termination right is exercised, the result is an acceleration of distributions and the approximate life of the investment would be reduced. Distributions are received as investments are realized. There are no plans to liquidate the portfolio.

Note 5. Securities Lending Program

The Arizona Revised Statutes § 38-718(G) allows the ASRS to participate in a securities lending program. The custodial bank used by ASRS enters into agreements with borrowers to loan securities and have the same securities redelivered at a later date. Securities eligible for loan include U.S. fixed income securities and U.S. and international equities.

The ASRS currently receives as collateral at least 102% of the fair value of the loaned securities and maintains collateral at no less than 100% for the duration of the loan. At year end, the ASRS had limited counter party risk to borrowers because the collateral held by the ASRS for each loan exceeded the fair value owed to the ASRS. Securities loaned are initially fully collateralized by cash (USD), U.S. government or agency securities, sovereign debt, corporate bonds and/or equities.

Cash collateral may be reinvested (under certain constraints) in:

- Instruments issued or fully guaranteed by the U.S. government, federal agencies, or sponsored agencies or sponsored corporations;
- Repurchase agreements;
- Money market mutual funds;
- Commercial paper;
- Certificates of deposit;
- Bank notes

The ASRS records the reinvested cash collateral as an asset, and the cash collateral received as an obligation for securities on loan on the Combined Statements of Fiduciary Net Position. The maturities of the investments are closely matched to those of the security loans to avoid interest rate exposure. The ASRS receives a spread for its lending activities. The obligation for securities on loan is recorded as a liability because the ASRS must return the cash collateral to the borrower upon expiration of the loan.

At June 30, 2020, the fair value of securities on loan was $777.1 million, of which $99.7 million was cash collateralized loans. Cash of $103.2 million received as collateral for securities loaned was reinvested and had a net asset value of $103.3 million as of June 30, 2020. The securities lending payable at June 30, 2020, was $103.2 million.

The ASRS does not have the ability to pledge or sell the collateral unless there is a borrower default. There are no statutory restrictions on the dollar amount of security loans that may be made by the ASRS. The ASRS is indemnified against gross negligence and borrower default by the lending agents, but is not indemnified against cash collateral reinvestment risk.

Note 6. Derivatives

A derivative instrument is a financial instrument or other contract with all three of the following characteristics:

- Settlement Factors: It has one or more reference rates and one or more notional amounts or payment provisions or both. Those terms determine the amount of the settlement or settlements, and, in some cases, whether or not a settlement is required.
- Leverage: It requires no initial net investment or an initial net investment that is smaller than would be required for other types of contracts that would be expected to have a similar response to changes in market factors.
- Net Settlement: Its terms require or permit net settlement, it can readily be settled net by means outside the contract, or it provides for delivery of an asset that puts the recipient in a position not substantially different from net settlement.

Derivatives are considered "Investment Derivative Instruments" as defined in GASB 53 "Accounting and Financial Reporting for Derivative Instruments".

Derivative instruments, which can consist of futures contracts, forward contracts, options, swaps, rights and warrants are measured at fair value and reported on the Statement of Combined Fiduciary Net Position. Changes in fair value of derivative instruments are reported as net appreciation of fair value on the Combined Statement of Changes in Fiduciary Net Position.

The fair value balances and notional amounts of derivative instruments outstanding at June 30, 2020, classified by type, and the changes in fair value of derivative instruments for the year then ended as reported in the June 30, 2020, financial statements are as follows:

Exhibit F-20: Investment Derivatives by Type

(Dollars in thousands)

	Changes in Fair Value[1]		At June 30, 2020		
Investment Derivatives	**Classification**	**Amount[2]**	**Classification**	**Fair Value**	**Notional Value**
Commodity Futures Long	Net Appreciation in Fair Value	$ (4,134)	Not Applicable	$ —	$ —
Commodity Futures Short	Net Appreciation in Fair Value	(222)	Not Applicable	—	—
Foreign Currency Forwards	Net Appreciation in Fair Value	25	Futures Receivable	—	—
Index Futures Long	Net Appreciation in Fair Value	151,482	Not Applicable	—	764,829
Index Futures Short	Net Appreciation in Fair Value	60,861	Not Applicable	—	(155,817)
Rights	Net Appreciation in Fair Value	(53)	Equity Securities	702	—
Total		$ 207,959		$ 702	$ 609,012

[1] Excludes futures margin payments.

[2] Brackets refer to losses.

The fair value of derivative instruments reported by the ASRS is based on quoted market prices off national exchanges. The fair values of foreign currency forward contracts are based on mathematical models and are valued using a pricing service, which uses published Reuters' foreign currency rates as the primary source for the calculation.

Credit Risk – The maximum amount of loss due to credit risk that the ASRS would incur if the counterparties to the derivative instrument failed to perform according to the terms of the contract, without respect to any collateral or other security or netting arrangement, is the total unrealized gain of derivatives at the end of the reporting period.

The ASRS has no general investment policy requiring collateral or other security to support derivative instruments. Each investment manager hired has discretion with respect to derivative investments and risk control. Each investment manager is governed by its Investment Manager Agreement.

The ASRS has no general investment policy with respect to netting arrangements. Investment managers used by the ASRS have master netting arrangements to allow net settlement with the same counterparty in the event the counterparty defaults on its obligations.

As of June 30, 2020, investing activity in derivative futures consisted of exchange traded contracts. The ASRS did not have any over-the-counter investment derivative instruments as of June 30, 2020. Accordingly, the ASRS was not exposed to loss in case of default of all counterparties of over-the-counter positions as of June 30, 2020.

Interest Rate Risk – The ASRS has exposure to interest rate risk due to the investments in fixed income futures. The required risk disclosures are included in the Interest Rate Risk schedule in Note 3.

As noted in Exhibit F-21: Derivative Instruments Highly Sensitive to Interest Rate Changes, the ASRS did not have any derivative instruments highly sensitive to interest rate changes as of the year ended June 30, 2020.

Foreign Currency Risk – The ASRS is exposed to foreign currency risk on its foreign currency forward contracts and future contracts. See Exhibit F-22: Derivative Instruments Foreign Currency Risk for a summary of foreign currency risk from derivative instruments. See the Foreign Currency Risk schedule in Note 3 for additional information on currency risk exposure as of June 30, 2020.

Exhibit F-21: Derivative Instruments Highly Sensitive to Interest Rate Changes

(Dollars in thousands)

Asset ID	Asset Description	Interest Rate	Fair Value	Total Exposure
As of June 30, 2020, the ASRS did not hold any derivative instruments that were highly sensitive to interest rate changes				

Exhibit F-22: Derivative Instruments Foreign Currency Risk

(Dollars in thousands)

Currency Name	Options	Total Exposure
Australian Dollar	$ 4	$ 4
Euro Currency	681	681
Total	$ 685	$ 685

Note 7. Expected Long-Term Rate of Return

The expected long-term rate of return on investments was determined using a building-block method in which best-estimate ranges of expected future real rates of return (expected returns, net of investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the expected long-term rate of return by weighting the expected future real rates of return by the target asset allocation percentage.

On June 29, 2018, the ASRS Board approved updated strategic asset allocation targets to be effective beginning July 2018. The ASRS' estimates of geometric real rates of return for each major asset class are summarized in the following table:

Exhibit F-23: Expected Return, Geometric Basis

Asset Class	Target Asset Allocation Effective July 1, 2018	Real Return Geometric Basis	Long-term Contribution to Expected Real Return
Equity	50 %	6.39 %	3.20 %
Fixed Income - Credit	20 %	5.44 %	1.09 %
Fixed Income - Interest Rate Sensitive	10 %	0.22 %	0.02 %
Real estate	20 %	5.85 %	1.17 %
Total	100 %		5.48 %

Actual returns may be different due to volatility of returns.

Note 8. Net Pension Liability of Employers

The components of the net pension liability of the participating employers at June 30, 2020, were as follows:

Exhibit F-24: Net Pension Liability of Employers
(Dollars in thousands)

Net Pension Liability	
Total pension liability	$ 56,494,106
Retirement fiduciary net position	(39,167,586)
Employers' net pension liability	$ 17,326,520
Retirement fiduciary net position as a percentage of total pension liability	69.33 %

Actuarial Assumptions – The total pension liability was determined by an actuarial valuation as of June 30, 2019, and rolled forward to June 30, 2020, by incorporating the expected value of benefit accruals, the actual plan benefit payments, and interest accruals during the year.

Exhibit F-25: Actuarial Assumptions - Pension

Assumptions	
Actuarial valuation date	June 30, 2019
Actuarial roll forward date	June 30, 2020
Actuarial cost method	Entry age normal
Asset valuation	Fair value
Discount rate	7.5 %
Projected salary increases	2.7 - 7.2%
Inflation	2.3 %
Permanent benefit increase	Included
Mortality rates	2017 SRA Scale U-MP

These actuarial assumptions that pertain to assumptions utilized for financial reporting requirements are very similar to the assumptions utilized for funding purposes. The principal difference between the actuarial assumptions for financial reporting purposes and those utilized for funding purposes is the valuation of the Retirement Fund assets.

The actuarial assumptions related to funding appear in the Notes to Required Supplementary Information and the Actuarial Section. The actuarial assumptions related to financial reporting and funding were selected on the basis of an experience study which was performed for the five-year period ending June 30, 2016. The ASRS Board adopted the experience study, which recommended changes, and those changes were effective as of the June 30, 2017, actuarial valuation. Details of the assumptions resulting from the experience study performed as of June 30, 2016, appear in the Actuarial Section beginning on page 91.

Discount rate – The discount rate used to measure the total pension liability was 7.5%. The projection of cash flows used to determine the discount rate assumed that contributions from participating employers will be made based on the actuarially determined rates based on the funding policy of the ASRS Board, which establishes the contractually required rate under Arizona statute. Based on those assumptions, the Retirement Fund's fiduciary net position was projected to be available to make all the projected future benefit payments of current members. Therefore, the long-term expected rate of return on investments was applied to all periods of projected benefit payments to determine the total pension liability.

Sensitivity of the net pension liability to changes in the discount rate – The table below presents the net pension liability of the participating employers calculated using the discount rate of 7.5%, as well as the employers' net pension liability if it were calculated using a discount rate that is 1% lower (6.5%) or 1% higher (8.5%) than the current rate at June 30, 2020.

Exhibit F-26: Discount Rate Sensitivity - Pension
(Dollars in thousands)

1% Decrease (6.50)%	Current Discount Rate (7.50)%	1% Increase (8.50)%
$ 23,693,781	$ 17,326,520	$ 12,003,817

Note 9. Net OPEB Liability of Employers

The components of the net OPEB liability of the participating employers at June 30, 2020 for the HBS fund were as follows:

Exhibit F-27: Net OPEB Liability (Asset) of Employers - HBS

(Dollars in thousands)

Net OPEB Liability - HBS		
Total HBS program OPEB liability	$	1,633,322
HBS program assets		(1,704,122)
Employers' net HBS program OPEB liability (asset)	$	(70,800)
HBS program assets as a percentage of total HBS OPEB liability		104.33 %
Reconciliation of HBS Program Assets to HBS Fund fiduciary Net Position:		
HBS program assets	$	1,704,122
Health insurance RRA rebate assets [1]		62,763
HBS Fund fiduciary net position	$	1,766,885

[1] Represents premium rebates returned to ASRS held for future benefit of members. Assets excluded from HBS Plan assets for valuation purposes, as the assets are not restricted for use to pay HBS Program benefits. See page 24 for further details.

The components of the net OPEB liability of participating employers at June 30, 2020, for the LTD fund were as follows:

Exhibit F-28: Net OPEB Liability of Employers - LTD

(Dollars in thousands)

Net OPEB Liability - LTD		
Total LTD liability	$	237,141
LTD fiduciary net position		(161,280)
Employers' net LTD OPEB liability	$	75,861
LTD fund fiduciary net position as a percentage of total LTD OPEB liability		68.01 %

Actuarial Assumptions – The total OPEB liabilities were determined by an actuarial valuation as of June 30, 2019, and rolled forward to June 30, 2020, by incorporating the expected value of benefit accruals, the actual plan benefit payments, and interest accruals during the year. The actuarial assumptions used to determine the total OPEB liabilities are based on the same experience study discussed in Note 8.

Exhibit F-29: Actuarial Assumptions - HBS

Assumptions	
Actuarial valuation date	June 30, 2019
Actuarial roll forward date	June 30, 2020
Actuarial cost method	Entry Age Normal
Asset valuation method	Fair Value
Inflation	2.3 %
Investment Rate of Return	7.5 %
Mortality rates	2017 SRA Scale U-MP
Healthcare Trend Rates	N/A

Exhibit F-30: Actuarial Assumptions - LTD

Assumptions	
Actuarial valuation date	June 30, 2019
Actuarial roll forward date	June 30, 2020
Actuarial cost method	Entry Age Normal
Asset valuation method	Fair Value
Inflation	2.3 %
Investment Rate of Return	7.5 %
Recovery rates	2012 GLDT
Healthcare Trend Rates	N/A

Sensitivity of the net HBS and LTD OPEB liability (asset) to changes in the discount rate – The table below presents the net OPEB liability (asset) of the participating employers calculated using the discount rate of 7.5%, as well as the employers' net HBS and LTD OPEB liabilities (assets) if they were calculated using a discount rate that is 1% lower (6.5%) or 1% higher (8.5%) than the current rate at June 30, 2020:

Exhibit F-31: Discount Rate Sensitivity

(Dollars in thousands)

		1% Decrease (6.50)%		Current Single Assumption Discount Rate (7.50)%		1% Increase (8.50)%
HBS	$	92,897	$	(70,800)	$	(210,111)
LTD		82,828		75,861		69,099

Note 10. Contingent Liabilities

The ASRS is a party in various litigation matters. While the final outcome cannot be determined at this time, management is of the opinion that the final obligation, if any, resulting from these legal actions will not have a material adverse effect on the financial position or results of operations of the ASRS.

Note 11. Commitments

The ASRS has unfunded capital commitments in connection with the purchase of various limited partnership interests in private equity, private debt, distressed debt, real estate and other credit portfolios. See Note 4 for additional information regarding these commitment amounts.

Note 12. Due To and From Other Funds

Due to/from other funds includes amounts that need to be transferred after the year end resulting from allocations of contribution revenue as well as allocations of pooled investments.

Note 13. Required Supplementary Schedules

Required supplementary information prepared in accordance with the parameters of GASB Statement No. 67 and GASB Statement No. 74 is included immediately following the Notes to the Financial Statements.

Note 14. Other Postemployment Benefits

In fiscal year 2018, the Arizona Department of Administration (ADOA) implemented GASB Statement No. 75 - Accounting and Financial Reporting for Postemployment Benefits Other Than Pensions. The ADOA maintains medical and accident benefits to retired state employees and their dependents. The ASRS participates in the plan, and the ASRS' proportionate share of the state's OPEB liability is included in the state's CAFR. The liability has not been included in these financial statements as it is insignificant to the ASRS plans.

Note 15. Subsequent Events

The ASRS has evaluated subsequent events through November 10, 2020, the date the financial statements were available to be issued. Events or transactions occurring after June 30, 2020, but prior to November 10, 2020, that provided additional evidence about conditions that existed at June 30, 2020, have been recognized in the financial statements for the year ended June 30, 2020. Events or transactions that provided evidence about conditions that did not exist at June 30, 2020, but arose before the financial statements were available to be issued, have not been recognized in the financial statements for the year ended June 30, 2020.

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Exhibit F-32: Schedule of Changes in the Net Pension Liability - Retirement

Fiscal Years Ended June 30,
(Dollars in thousands)

	2020	2019	2018	2017
Total Pension Liability:				
Service cost	$ 1,396,954	$ 1,356,048	$ 1,360,306	$ 1,137,270
Interest	4,056,330	3,905,584	3,764,172	3,883,789
Differences between expected and actual experience[1]	188,086	108,006	576,321	(43,772)
Changes of assumptions[1]	—	—	(1,738,368)	984,132
Benefit payments	(3,523,569)	(3,431,763)	(3,304,808)	(3,181,407)
Net change in total pension liability	2,117,801	1,937,875	657,623	2,780,012
Total pension liability - beginning	54,376,305	52,438,430	51,780,807	49,000,795
Total pension liability - ending (a)	56,494,106	54,376,305	52,438,430	51,780,807
Retirement Fiduciary Net Position:				
Contributions - employers	$ 1,254,651	$ 1,180,966	$ 1,085,033	$ 1,053,197
Contributions - employees	1,272,080	1,194,100	1,099,663	1,079,256
Net investment income	354,195	2,398,937	3,414,623	4,406,943
Benefit payments, including refunds of member contributions	(3,523,569)	(3,431,763)	(3,304,808)	(3,181,407)
Administrative expenses	(26,845)	(26,802)	(26,878)	(27,895)
Other	11,932	17,755	21,560	12,871
Net change in retirement fiduciary net position	(657,556)	1,333,193	2,289,193	3,342,965
Retirement fiduciary net position - beginning	39,825,142	38,491,949	36,202,756	32,859,791
Retirement fiduciary net position - ending (b)	39,167,586	39,825,142	38,491,949	36,202,756
Retirement net pension liability - ending (a) - (b)	$ 17,326,520	$ 14,551,163	$ 13,946,481	$ 15,578,051

[1] The total pension liability is adjusted each year to reflect the potential for future PBIs based on actual asset returns through each year end. The impact of this change has been shown as a change in assumption for fiscal years ended June 30, 2016, 2017 and 2018. For fiscal years ended June 30, 2014 and 2015, the impact of these changes were included in the differences between expected and actual experience.

Note: This schedule is intended to show information for 10 years. Additional years will be displayed as they become available.

See Notes to Required Supplementary Information.

Figure F-32: Schedule of Changes in the Net Pension Liability - Retirement (Continued)

Fiscal Years Ended June 30,
(Dollars in thousands)

	2016	2015	2014
	$ 1,144,436	$ 1,013,854	$ 966,705
	3,906,808	3,832,255	3,607,440
	(967,522)	(1,187,231)	1,078,966
	(1,242,164)	—	—
	(3,062,846)	(2,927,102)	(2,812,573)
	(221,288)	731,776	2,840,538
	49,222,083	48,490,307	45,649,769
	49,000,795	49,222,083	48,490,307
	$ 1,015,974	$ 1,004,747	$ 965,969
	1,036,714	1,031,954	995,284
	222,906	849,160	5,514,246
	(3,062,846)	(2,927,102)	(2,812,573)
	(22,965)	(26,400)	(26,107)
	24,362	19,582	31,456
	(785,855)	(48,059)	4,668,275
	33,645,646	33,693,705	29,025,430
	32,859,791	33,645,646	33,693,705
	$ 16,141,004	$ 15,576,437	$ 14,796,602

Exhibit F-33: Schedule of Net Pension Liability - Retirement

Fiscal Years Ended June 30,
(Dollars in thousands)

Net Pension Liability	2020	2019	2018	2017
Total pension liability - ending (a)	$ 56,494,106	$ 54,376,305	$ 52,438,430	$ 51,780,807
Retirement fiduciary net position - ending (b)	39,167,586	39,825,142	38,491,949	36,202,756
Retirement's net pension liability - ending (a) - (b)	$ 17,326,520	$ 14,551,163	$ 13,946,481	$ 15,578,051
Retirement fiduciary net position as a percentage of the total pension liability	69.33 %	73.24 %	73.40 %	69.92 %
Covered payroll [1]	$ 10,663,535	$ 10,264,999	$ 9,697,173	$ 9,518,309
Net pension liability as a percentage of covered payroll	162.48 %	141.76 %	143.82 %	163.66 %

[1] The covered payroll is an estimate of the actual payroll, imputed from individual employer contributions.

Note: This schedule is intended to show information for 10 years. Additional years will be displayed as they become available.

See Notes to Required Supplementary Information.

Figure F-33: Schedule of Net Pension Liability - Retirement (Continued)

Fiscal Years Ended June 30,
(Dollars in thousands)

2016	2015	2014
$ 49,000,795	$ 49,222,083	$ 48,490,307
32,859,791	33,645,646	33,693,705
$ 16,141,004	$ 15,576,437	$ 14,796,602
67.06 %	68.35 %	69.49 %
$ 9,125,089	$ 9,226,319	$ 9,027,752
176.89 %	168.83 %	163.90 %

Exhibit F-34: Schedule of Employer Contributions - Retirement

Last 10 Fiscal Years
(Dollars in thousands)

Fiscal Year Ended June 30,	Actuarial Determined Contribution	Contributions In Relation To The Actuarially Determined Contributions[1]	Contribution Deficiency (Excess)	Covered Payroll	Contributions As A Percentage Of Covered Payroll
2020	$ 1,220,979	$ 1,220,979	$ —	$ 10,663,535	11.45 %
2019	1,147,646	1,147,646	—	10,264,999	11.18 %
2018	1,056,995	1,056,995	—	9,697,173	10.90 %
2017	1,026,079	1,026,079	—	9,518,309	10.78 %
2016	990,072	990,072	—	9,125,089	10.85 %
2015	1,004,746	1,004,746	—	9,226,319	10.89 %
2014	965,969	965,969	—	9,027,752	10.70 %
2013 [2]	889,580	889,580	—	8,678,829	10.25 %
2012 [3]	850,456	850,456	—	8,616,575	9.87 %
2011 [4]	782,347	782,347	—	8,149,448	9.60 %

[1] Beginning with fiscal year 2016, the required employer contributions to the retirement fund presented above reflect total employer contributions less ACR contributions. ACR is not part of the required contribution rate. Employers were required to pay ACR contributions beginning in 2013 for retired members who returned to work.

[2] The 2013 required contributions from the employer for the retirement fund reflect total employer contributions of $911,300 less $931 of unfunded employer liabilities.

[3] The 2012 required contributions from the employer for the retirement fund reflect total employer contributions of $852,167 less $1,711 of unfunded employer liabilities.

[4] The 2011 required contributions from the employer for the retirement fund reflect total employer contributions of $786,662 less $4,315 of unfunded employer liabilities.

See Notes to Required Supplementary Information.

Exhibit F-35: Schedule of Investment Returns - Retirement

Fiscal Year Ended June 30,	Annual Money-Weighted Rate of Return, Net of Investment Expenses
2020	0.76 %
2019	6.53 %
2018	9.30 %
2017	13.89 %
2016	0.29 %
2015	3.04 %
2014	17.78 %

Note: This schedule is intended to show information for 10 years. Additional years will be displayed as they become available.

See Notes to Required Supplementary Information.

Exhibit F-36: Schedule of Changes in the Net OPEB Liability - HBS

Fiscal Years Ended June 30,
(Dollars in thousands)

	2020	2019	2018	2017
Total OPEB liability:				
Service cost	$ 47,278	$ 46,994	$ 47,331	$ 43,540
Interest on the total OPEB liability	117,022	121,992	117,414	116,594
Changes of benefit terms	—	—	—	—
Differences between expected and actual experience	(140,870)	(8,586)	(40,460)	—
Changes of assumptions	—	—	84,540	—
Benefit payments, including refunds of employee contributions	(94,153)	(95,241)	(96,098)	(95,720)
Net change in total OPEB liability	(70,723)	65,159	112,727	64,414
Total OPEB liability - beginning	1,704,045	1,638,886	1,526,159	1,461,745
Total OPEB liability - ending (a)	1,633,322	1,704,045	1,638,886	1,526,159
Plan Fiduciary Net Position:				
Contributions - employers	$ 52,371	$ 47,386	$ 42,976	$ 53,914
Contributions - employees	—	—	—	—
OPEB plan net investment income	15,364	105,788	148,652	190,870
Benefit payments, including refunds of employee contributions	(94,154)	(95,240)	(96,098)	(95,720)
OPEB plan administrative expenses	(1,163)	(1,161)	(1,234)	(1,294)
Other	23	13	—	—
Net change in plan fiduciary net position	(27,559)	56,786	94,296	147,770
Plan fiduciary net position - beginning	1,731,681	1,674,895	1,580,599	1,432,829
Plan fiduciary net position - ending (b)	1,704,122	1,731,681	1,674,895	1,580,599
Net OPEB liability (asset) - ending (a) - (b)	$ (70,800)	$ (27,636)	$ (36,009)	$ (54,440)

Note: This schedule is intended to show information for 10 years. Additional years will be displayed as they become available.
Retrospective Rate Adjustment assets are not included in this table.

See Notes to Required Supplementary Information.

Exhibit F-37: Schedule of Net OPEB Liability - HBS

Fiscal Years Ended June 30,
(Dollars in thousands)

Net OPEB Liability	2020	2019	2018	2017
Total OPEB liability - ending (a)	$ 1,633,322	$ 1,704,045	$ 1,638,886	$ 1,526,159
Plan fiduciary net position - ending (b)	1,704,122	1,731,681	1,674,895	1,580,599
Net OPEB liability (asset) - ending (a) - (b)	$ (70,800)	$ (27,636)	$ (36,009)	$ (54,440)
Plan fiduciary net position as a percentage of the total OPEB liability	104.33 %	101.62 %	102.20 %	103.57 %
Covered payroll [1]	$ 10,663,535	$ 10,264,999	$ 9,697,173	$ 9,518,309
Net OPEB liability as a percentage of covered payroll	(0.66) %	(0.27) %	(0.37) %	(0.57) %

[1] The covered payroll is an estimate of the actual payroll, imputed from individual employer contributions.

Note: This schedule is intended to show information for 10 years. Additional years will be displayed as they become available.

See Notes to Required Supplementary Information.

Exhibit F-38: Schedule of Employer Contributions - HBS

(Dollars in thousands)

Fiscal Year Ended June 30,	Actuarial Determined Contribution	Actual Contributions[1]	Contribution Deficiency (Excess)	Covered Payroll	Contributions As A Percentage Of Covered Payroll
2020	$ 52,207	$ 52,207	$ —	$ 10,663,535	0.49 %
2019	47,190	47,190	—	10,264,999	0.46 %
2018	42,668	42,668	—	9,697,173	0.44 %
2017	53,298	53,298	—	9,518,309	0.56 %

[1] The required employer contributions to the HBS fund presented above reflect total employer contributions less ACR contributions. ACR is not part of the required contribution rate. Employers were required to pay ACR contributions beginning in 2013 for retired members who returned to work.

Note: This schedule is intended to show information for 10 years. Additional years will be displayed as they become available.

See Notes to Required Supplementary Information.

Exhibit F-39: Schedule of Investment Returns - HBS

Fiscal Year Ended June 30,	Annual Money-Weighted Rate of Return, Net of Investment Expenses
2020	0.76 %
2019	6.52 %
2018	9.32 %
2017	13.85 %

Note: This schedule is intended to show information for 10 years. Additional years will be displayed as they become available.

See Notes to Required Supplementary Information.

Exhibit F-40: Schedule of Changes in the Net OPEB Liability - LTD

Fiscal Years Ended June 30,
(Dollars in thousands)

	2020	2019	2018	2017
Total OPEB Liability:				
Service cost	$ 30,883	$ 28,477	$ 27,713	$ 27,792
Interest on the total OPEB liability	18,162	18,372	18,288	19,349
Changes of benefit terms	—	—	—	—
Differences between expected and actual experience	(2,224)	7,455	1,522	—
Changes of assumptions	—	—	12,889	—
Benefit payments, including refunds of employee contributions	(49,615)	(50,063)	(57,664)	(56,525)
Net change in total OPEB liability	(2,794)	4,241	2,748	(9,384)
Total OPEB liability - beginning	239,935	235,694	232,946	242,330
Total OPEB liability - ending (a)	237,141	239,935	235,694	232,946
Plan Fiduciary Net Position:				
Contributions - employers	$ 18,397	$ 16,633	$ 15,902	$ 13,606
Contributions - employees	18,169	16,434	15,512	13,342
OPEB plan net investment income	1,581	10,318	14,760	22,021
Benefit payments, including refunds of employee contributions	(49,615)	(50,063)	(57,664)	(56,525)
OPEB plan administrative expenses	(1,524)	(1,504)	(1,555)	(1,782)
Other	(519)	(471)	(209)	(358)
Net change in plan fiduciary net position	(13,511)	(8,653)	(13,254)	(9,696)
Plan fiduciary net position - beginning	174,791	183,444	196,698	206,394
Plan fiduciary net position - ending (b)	161,280	174,791	183,444	196,698
Net OPEB pension liability - ending (a) - (b)	$ 75,861	$ 65,144	$ 52,250	$ 36,248

Note: This schedule is intended to show information for 10 years. Additional years will be displayed as they become available.

See Notes to Required Supplementary Information.

Exhibit F-41: Schedule of Net OPEB Liability - LTD

Fiscal Years Ended June 30,
(Dollars in thousands)

Net OPEB Liability	2020	2019	2018	2017
Total OPEB liability - ending (a)	$ 237,141	$ 239,935	$ 235,694	$ 232,946
Plan fiduciary net position - ending (b)	161,280	174,791	183,444	196,698
Net OPEB liability - ending (a) - (b)	$ 75,861	$ 65,144	$ 52,250	$ 36,248
Plan fiduciary net position as a percentage of the total OPEB liability	68.01 %	72.85 %	77.83 %	84.44 %
Covered payroll [1]	$ 10,663,535	$ 10,264,999	$ 9,697,173	$ 9,518,309
Net OPEB liability as a percentage of covered payroll	0.71 %	0.63 %	0.54 %	0.38 %

[1] The covered payroll is an estimate of the actual payroll, imputed from individual employer contributions.

Note: This schedule is intended to show information for 10 years. Additional years will be displayed as they become available.

See Notes to Required Supplementary Information.

Exhibit F-42: Schedule of Employer Contributions - LTD

(Dollars in thousands)

Fiscal Year Ended June 30,	Actuarial Determined Contribution	Actual Contributions[1]	Contribution Deficiency (Excess)	Covered Payroll	Contributions As A Percentage Of Covered Payroll
2020	$ 18,169	$ 18,169	$ —	$ 10,663,535	0.17 %
2019	16,434	16,434	—	10,264,999	0.16 %
2018	15,512	15,512	—	9,697,173	0.16 %
2017	13,342	13,342	—	9,518,309	0.14 %

[1]The required employer contributions to the LTD fund presented above reflect total employer contributions less ACR contributions. ACR is not part of the required contribution rate. Employers were required to pay ACR contributions beginning in 2013 for retired members who returned to work.

Note: This schedule is intended to show information for 10 years. Additional years will be displayed as they become available.

See Notes to Required Supplementary Information.

Exhibit F-43: Schedule of Investment Returns - LTD

Fiscal Year Ended June 30,	Annual Money-Weighted Rate of Return, Net of Investment Expenses
2020	0.75 %
2019	6.45 %
2018	9.69 %
2017	11.26 %

Note: This schedule is intended to show information for 10 years. Additional years will be displayed as they become available.

See Notes to Required Supplementary Information.

Actuarial Methods and Assumptions Used in Determining Contribution Rates

The actuarial assumptions and methods used to determine the fiscal year 2020 contribution rates are described below based on the actuarial valuation study for the year ended June 30, 2018, reflecting the 2017 experience study results.

Exhibit F-44: Actuarial Assumptions - Retirement

Assumptions	
Actuarial valuation date	June 30, 2018
Actuarial cost method	Entry age normal
Amortization Method	2.5% growth
Remaining amortization period	30 years each new layer
Asset valuation	10-Year smoothed market
Discount rate	7.5%
Projected salary increases	2.7 - 7.2%
Inflation	2.3%
Permanent benefit increase	Included, 0.30%
Mortality rates	2017 SRA Scale U-MP

Exhibit F-45: Actuarial Assumptions - HBS

Assumptions	
Actuarial valuation date	June 30, 2018
Actuarial cost method	Entry age normal
Amortization method	2.5% growth
Asset valuation method	10-Year smoothed market
Inflation	2.3%
Investment Rate of Return	7.5%
Mortality rates	2017 SRA Scale U-MP
Healthcare Trend Rates	N/A

Exhibit F-46: Actuarial Assumptions - LTD

Assumptions	
Actuarial valuation date	June 30, 2018
Actuarial cost method	Entry age normal
Amortization method	2.5% growth
Asset valuation method	10-Year smoothed market
Inflation	2.3%
Investment Rate of Return	7.5%
Mortality rates	2017 SRA Scale U-MP
Healthcare Trend Rates	N/A

Transition to New Experience Study

The ASRS commissioned a new Actuarial Experience Study dated October 18, 2017, in order to update actuarial assumptions and thereby more accurately portray its actuarial condition. The contribution rates for fiscal year 2020 are based on the 2017 Experience Study. The major changes in assumptions were the discount rate, the actuarial cost method, the inflation rate, the investment rate, and the mortality table. See Notes 8 and 9 for the assumptions used for pension and OPEB liabilities.

Significant Factors Affecting Identification of Trends

The following information is an executive summary of the 2017 Experience Study conducted by an independent actuary. The purpose of this experience study is to review actual experience in relation to the actuarial assumptions currently in effect. This study covers the experience of active, inactive, and retired members for the period July 1, 2011, through June 30, 2016.

The ASRS Board adopted all of the proposed assumptions at its meeting on October 27, 2017. The assumptions adopted by the ASRS Board were included in the June 30, 2019, valuation. With respect to the retirement fund, the June 30, 2019, values were rolled forward to June 30, 2020.

Summary of Process

In determining liabilities and contribution rates for retirement plans, actuaries must make assumptions about the future. The assumptions that must be made include:

- Retirement rates
- Mortality rates
- Turnover rates
- Disability rates

- Disability recovery rates
- Investment return rate
- Salary increase rates
- Inflation rate
- Future permanent benefit increases (PBIs)

For some of these assumptions, such as the mortality rates, past experience provides important evidence about the future. For others, such as the investment return rate, the link between past experience and future expectation is much weaker. In either case, actuaries should review the retirement plan's assumptions periodically and determine whether these assumptions are consistent with actual past experience and with future expectation.

Summary of Results for Assumptions – Plan, HBS and LTD

The results of the 2017 Experience Study, adopted by the ASRS Board in its meeting on October 27, 2017, are summarized as follows:

Economic Assumptions

- We recommend decreasing the nominal investment return assumption from 8.00%. A rate of 7.50% is close to the expected return in our independent capital market analysis over a longer time horizon. A rate of 7.75% is close to the midpoint of the two sets of results provided by NEPC (7.20% short-term and 8.50% long-term). Based on the much lower probability of achieving the rate of return assumption over the shorter term, our preferred assumption would be 7.50%.
- We recommend decreasing the inflation assumption from 3.00% to 2.30%.
- We recommend a general wage inflation (GWI) assumption of 2.50%, made up of price inflation and general productivity. This assumption is used primarily to index each cohort of new entrants used in the projections and as a starting point for the payroll growth assumption (amortization payment growth rate).
- We recommend a nominal annual salary increase assumption for long-service members of 2.70%, made up of a 2.30% price inflation and a 0.40% for general productivity and individual merit and promotion.
- We recommend a payroll growth assumption equal to the GWI assumption of 2.50%. This is the rate amortization payments are anticipated to grow in the future.
- The valuation currently assumes there will be no PBIs provided to retirees. We recommend future PBIs be reflected in the funding calculations at a rate of 0.30% per year in conjunction with a 7.50% investment return assumption.

Mortality Assumptions

- We recommend updating the post-retirement mortality tables for non-disabled retirees to reflect recent ASRS member experience. We also recommend assuming that mortality rates will improve in the future using a fully generational approach, but with the ultimate rates of the most recently published projection scale ("U-MP").
- We recommend updating post-retirement mortality tables for disabled retirees to the most recently published national tables, the RP-2014 tables for disabled lives. We also recommend continuing to assume mortality rates will improve in the future using a fully generational approach, but with the ultimate rates of the most recently published projection scale ("U-MP").

Other Demographic Assumptions

- We recommend small adjustments in the overall termination rates consistent with ASRS member experience and future expectations.
- We recommend small adjustments in the overall retirement rates consistent with ASRS member experience and future expectations.
- We recommend small decreases to the disability patterns for members consistent with ASRS experience and future expectations.

Actuarial Methods and Policies

- We recommend continuing to use the asset smoothing method that recognizes each year's gain or loss over a closed 10-year period. However, we recommend a small modification to the method to allow for direct offsetting of unrecognized gains and losses.
- We recommend changing to the Entry Age Normal (EAN) actuarial cost method. Further, the normal cost rate would be based on the benefits payable to each individual active member, sometimes referred to as the "Individual" EAN actuarial cost method. The Projected Unit Credit (PUC) actuarial cost method is the current funding method being used to allocate the actuarial costs of ASRS. The EAN actuarial cost method will generally produce level contribution amounts for each member as a percentage of salary from year to year and allocated cost among various generations of taxpayers in a reasonable manner. It is by far the most commonly used actuarial cost method for large public retirement systems and the method used for accounting disclosures. Changing the method will produce more stability in the contribution rates from year to year and allow for one set of liabilities to be used for funding and accounting purposes.

Assumptions Specific to the Long Term Disability Program

- We recommend updating the recovery rates to the 2012 Group Long Term Disability Valuation Table (2012 GLDT) as proposed by the Society of Actuaries' Group Disability Experience Committee for use by the National Association of Insurance Commissioners. Specifically, we recommend the rates applicable to plans with a six-month elimination period, "Own Occupation" definition of disability, initial maximum guaranteed benefit of $2,000 for active members and actual initial maximum guaranteed benefit for current LTD recipients, "No Diagnosis" cause of disability, 15% margin for recovery, 27% margin for deaths.
- We recommend updating the offset methodology for current LTD recipients to assume members will have a minimum offset of 30% within three years of initial receipt of LTD benefits. Offsets due to overpayments will apply until the overpayments are expected to be fully recovered based on the data received from the plan administrator.
- We recommend updating the offset methodology for future LTD recipients such that the benefits, after all applicable offsets, are 60% of the benefits before the offsets.

Combining Schedule of Retirement Fiduciary Net Position

As of June 30, 2020
(Dollars in thousands)

	Retirement Plan	Retirement System	Total Retirement Fund
Assets			
Cash	$ 11,078	$ 58	$ 11,136
Receivables:			
Accrued interest and dividends	27,805	144	27,949
Securities sold	7,627	40	7,667
Futures contracts	5,684	30	5,714
Contributions	86,441	—	86,441
Other	30,004	146	30,150
Total receivables	157,561	360	157,921
Investments:			
Cash and short-term investments	979,315	5,085	984,400
Equity	20,834,111	108,171	20,942,282
Fixed Income - Interest Rate Sensitive	3,538,531	18,372	3,556,903
Fixed Income - Credit	8,266,538	42,920	8,309,458
Real estate	6,401,976	33,239	6,435,215
Total investments	40,020,471	207,787	40,228,258
Securities lending collateral	98,082	509	98,591
Total assets	40,287,192	208,714	40,495,906
Liabilities			
Securities purchased	1,204,229	6,252	1,210,481
Securities lending collateral	98,082	509	98,591
Futures contracts	1,523	8	1,531
Due to other funds	(4,920)	14,927	10,007
Other	7,654	56	7,710
Total Liabilities	1,306,568	21,752	1,328,320
Net position restricted for pension benefits	$ 38,980,624	$ 186,962	$ 39,167,586

In accordance with GASB 34, for financial reporting purposes the Retirement Plan and the Retirement System are presented in one column, Retirement Fund, in the Basic Financial Statements because they are administered within a single pension plan within a trust. The Combining Schedule of Retirement Fiduciary Net Position and Changes in Retirement Fiduciary Net Position are presented here to provide members with more detailed information about the two plan components.

Combining Schedule of Changes in Retirement Fiduciary Net Position

For the Year Ended June 30, 2020
(Dollars in thousands)

	Retirement Plan	Retirement System	Total Retirement Fund
Additions			
Contributions:			
Member contributions	$ 1,272,080	$ —	$ 1,272,080
Employer contributions	1,254,651	—	1,254,651
Transfers from other plans	1,094	—	1,094
Purchased Service	12,276	—	12,276
Total Contributions	2,540,101	—	2,540,101
Investment Activity:			
Investment activity income:			
Net appreciation in fair value of investments	126,461	759	127,220
Interest	65,083	365	65,448
Dividends	321,003	1,808	322,811
Other income	31,793	179	31,972
Total investment activity income	544,340	3,111	547,451
Investment activity expense:			
Management Fees	(181,005)	(1,000)	(182,005)
Custody fees	(2,403)	(12)	(2,415)
Consultant and legal fees	(8,572)	(45)	(8,617)
Internal investment activity expense	(4,526)	(23)	(4,549)
Total investment activity expense	(196,506)	(1,080)	(197,586)
Net income from investment activities	347,834	2,031	349,865
Securities lending activities:			
Securities lending income	3,926	22	3,948
Interest rebate	905	5	910
Management fees	(525)	(3)	(528)
Net income from securities lending activities	4,306	24	4,330
Total net investment income	352,140	2,055	354,195
Other income	14	1	15
Total additions	2,892,255	2,056	2,894,311
Deductions			
Retirement and disability benefits	3,190,077	38,291	3,228,368
Survivor benefits	52,938	11	52,949
Refunds to withdrawing member, including interest	242,250	2	242,252
Administrative expenses	26,706	139	26,845
Transfers to to other plans	962	—	962
Other	491	—	491
Total deductions	3,513,424	38,443	3,551,867
Net (decrease) in net position	(621,169)	(36,387)	(657,556)
Net position restricted for pension benefits			
Beginning year	39,601,793	223,349	39,825,142
End of year	$ 38,980,624	$ 186,962	$ 39,167,586

In accordance with GASB 34, for financial reporting purposes the Retirement Plan and the Retirement System are presented in one column, Retirement Fund, in the Basic Financial Statement because they are administered within a single pension plan within a trust. The Combining Schedule of Retirement Fiduciary Net Position and Changes in Retirement Fiduciary Net Position are presented here to provide members with more detailed information about the two plan components.

Exhibit F-47: Schedule of Administrative Expenses

For the Year Ended June 30, 2020
(Dollars in thousands)

Administrative Expense		
Personnel services:		
Salaries	$	13,851
Retirement contributions		1,562
Other employee related expenses		3,555
Total personnel services		18,968
Professional services:		
Actuarial services		599
Attorney services		565
Auditing services		137
Banking services		23
LTD administrative services		1,418
Staffing services		2,405
Other professional services		259
Total professional services		5,406
Communications:		
Telephone		351
Printing		85
Postage and mailing		253
Total communications		689
Facilities:		
Lease expense		1,517
Total facilities		1,517
Software and equipment:		
Computer supplies and software		1,790
Maintenance agreements		42
Equipment and equipment rental		362
Total software and equipment		2,194
Education, meetings, and travel:		
Professional development		40
Travel		34
Tuition reimbursement		16
Total education, meetings, and travel		90
General:		
Advertising		3
Insurance		282
Membership dues		121
Office supplies		64
Periodicals and publications		192
Miscellaneous		6
Total general		668
Total administrative expenses	$	29,532

Exhibit F-48: Schedule of Professional Consultant Fees

For the Year Ended June 30, 2020
(Dollars in thousands)

Professional/Consultant		
Actuarial services:		
Segal Co	$	393
Gabriel, Roeder, Smith & Company (GRS)		206
Total actuarial services		599
Attorney & Legal services:		
Fennemore Craig, P.C.		271
Arizona Office of the Attorney General		211
Gallagher & Kennedy P.A.		67
Charles W. Whetstine, P.C.		14
Atkinson-Baker, Inc.		2
Total attorney services		565
Auditing services:		
CliftonLarsonAllen, LLP		137
Total auditing services		137
Banking services:		
State Street Bank And Trust Company		23
Total banking services		23
LTD program administrative services:		
Broadspire Management		1,418
Total LTD program administrative services		1,418
Staffing services:		
Guidesoft Inc.		2,405
Total staffing services		2,405
Other professional services:		
Guidesoft Inc.		186
CliftonLarsonAllen, LLP		45
Fennemore Craig, P.C.		8
Staples, Inc.		8
MBI Industrial Medicine, Inc.		4
Info-Tech Research Group		4
Arizona Department Of Administration		4
Total other professional services		259
Total professional and consulting services	$	5,406

Exhibit F-49: Schedule of Investment Expenses

For the Year Ended June 30, 2020
(Dollars in thousands)

	Management Fees	Other Expenses	Total
Investing Activity			
Public Investments Management Fees:			
Public Equity	$ 2,903	$ —	$ 2,903
Public Opportunistic Equity	10	—	10
Public Interest Rate Sensitive	412	—	412
Public Credit	9	—	9
Commodities	52	—	52
Total Public Investments Management Fees	3,386	—	3,386
Private Investments Management Fees:			
Private Equity	54,174	—	54,174
Private Debt	59,727	—	59,727
Real Estate	48,926	—	48,926
Distressed Debt	20,445	—	20,445
Other Credit	3,992	—	3,992
Total Private Investments Management Fees	187,264	—	187,264
Total Management Fees	190,650	—	190,650
Investment custodial fees:			
State Street Bank and Trust Company	—	2,529	2,529
Total investment custodial fees	—	2,529	2,529
Investment consultant fees:			
RCLCO	—	4,691	4,691
State Street Bank And Trust Company	—	509	509
Meketa Investment Group	—	441	441
Aksia LLC	—	438	438
NEPC, LLC	—	400	400
Torreycove Capital Partners LLC	—	86	86
Institutional Shareholder Svcs Inc.	—	68	68
Guidesoft Inc.	—	29	29
Glass, Lewis & Co.	—	20	20
Chicago Clearing Corporation	—	6	6
Total investment consultant fees	—	6,688	6,688
Outside investment legal fees:			
Fried Frank Harris Shriver & Jacobson	—	1,096	1,096
Cox, Castle & Nicholson LLP	—	590	590
Foley & Lardner LLP	—	334	334
Ballard Spahr LLP	—	277	277
Ropes & Gray LLP	—	21	21
Reinhart Boerne Van Deuren s.c.	—	18	18
Total outside investment and legal fees	—	2,336	2,336
Internal investment activity expenses - see detailed schedule	—	4,764	4,764
Total Investing Activity	$ 190,650	$ 16,317	$ 206,967
Securities Lending Activity			
Securities Lending Borrower Rebates (Income)	$ —	$ (953)	$ (953)
Securities Lending Management Fees	553	—	553
Total Securities Lending Activity Expenses (Income)	$ 553	$ (953)	$ (400)

Exhibit F-50: Schedule of Internal Investment Activity Expenses

For Year Ended June 30, 2020
(Dollars in thousands)

Expense		Total
Personnel services:		
Salaries	$	1,378
Employee Insurance		136
Retirement Contributions - ASRS		152
Other Personnel Expense		108
Total Personnel Services		1,774
Facilities:		
Lease expense		37
Total Facilities		37
Education, meetings and travel:		
Professional development		5
Travel		8
Total Education, Meetings and Travel		13
General administrative expense:		
Research and information services		2,910
Membership dues		10
Equipment		6
Miscellaneous		14
Total general administrative expense		2,940
Total internal investment activity expense	$	4,764

INVESTMENT SECTION

An agency of the State of Arizona

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TUCSON: 4400 East Broadway Boulevard, Suite 200 Tucson, AZ 85711-3554 | 520.239.3100
TOLL FREE: 1.800.621.3778 | AzASRS.gov
ASRS DIRECTOR: Paul Matson

November 10, 2020

Dear Members,

It is a privilege to deliver this Investment Section to the Comprehensive Annual Financial Report of the Arizona State Retirement System. In this section we will discuss our investment strategy, the investment environment and our investment results. We will also discuss our commitment to compliance, governance, rigorous measurement, and transparent reporting. Finally, we will deliver various documents and schedules providing detailed information about the ASRS investment program.

Investment Strategy

ASRS manages its investments in accordance with a strategic asset allocation. The ASRS investment team seeks to enhance returns compared to strategic asset allocation benchmarks through its implementation of the investment program and tactical positioning relative to strategic targets.

Fundamentally, investment returns are rewards for risks taken. ASRS manages its risk in a highly diversified program across multiple global markets including equities, real estate and credit. The diversity of the program expands opportunities for gain and reduces risk that would be present in a more concentrated approach.

ASRS is a long-term investor with a multi-decade horizon for its decisions. We will tolerate short-term market fluctuations in order to position ourselves for long run gains. We are a value oriented investor and, at times, will buy in markets out of favor and patiently await their recovery.

ASRS maintains a high level of liquidity with assets totaling forty times the net cash required to fund benefits. As a pension fund, the cash requirements for benefits are highly stable and predictable. These two facts combine to give ASRS an advantage in the market allowing it to provide liquidity to market participants with less flexibility and unpredictable cash needs. ASRS capitalizes on this by participating in less liquid private markets for equities, real estate and credit. These programs have significantly enhanced the diversity of our investments and have increased our returns.

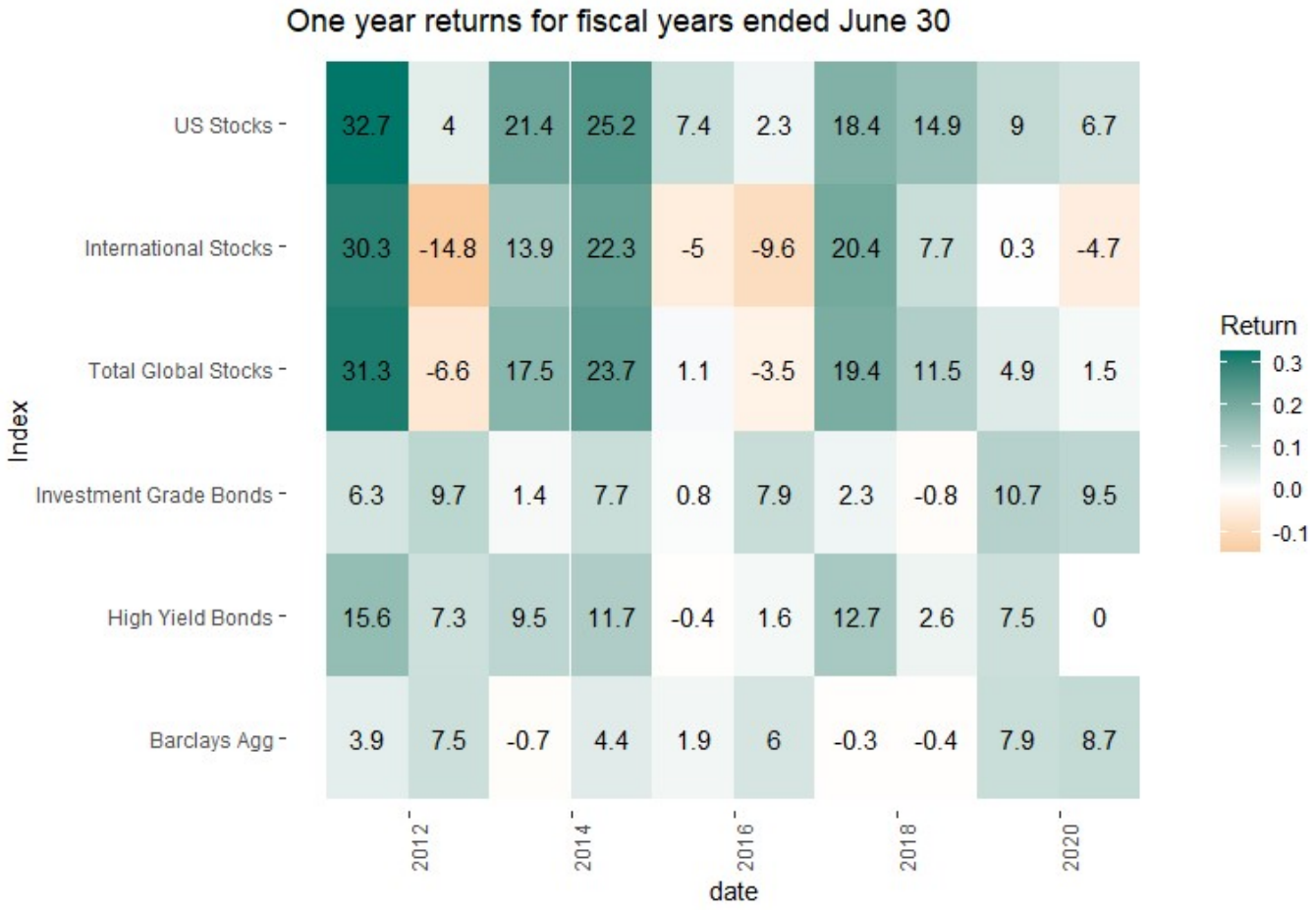
According to our independent investment consultant NEPC, the combined effect of these efforts has been to place the ASRS among the top 10% of investment returns earned by U.S. public pension plans over the last ten years. I offer thanks and congratulations to my colleagues whose thoughtful, diligent and tireless efforts have led to these results.

Investment Environment

The Coronavirus pandemic has caused dramatic changes in financial markets. Stock markets moved up or down more than 20% in three consecutive quarters in the fiscal year just ended, a level of volatility not seen since the 1930's. The global financial markets were under tremendous stress in March of 2020 as the world came to grips with the implications of the health crisis. Quick and decisive action by major central banks to inject liquidity maintained

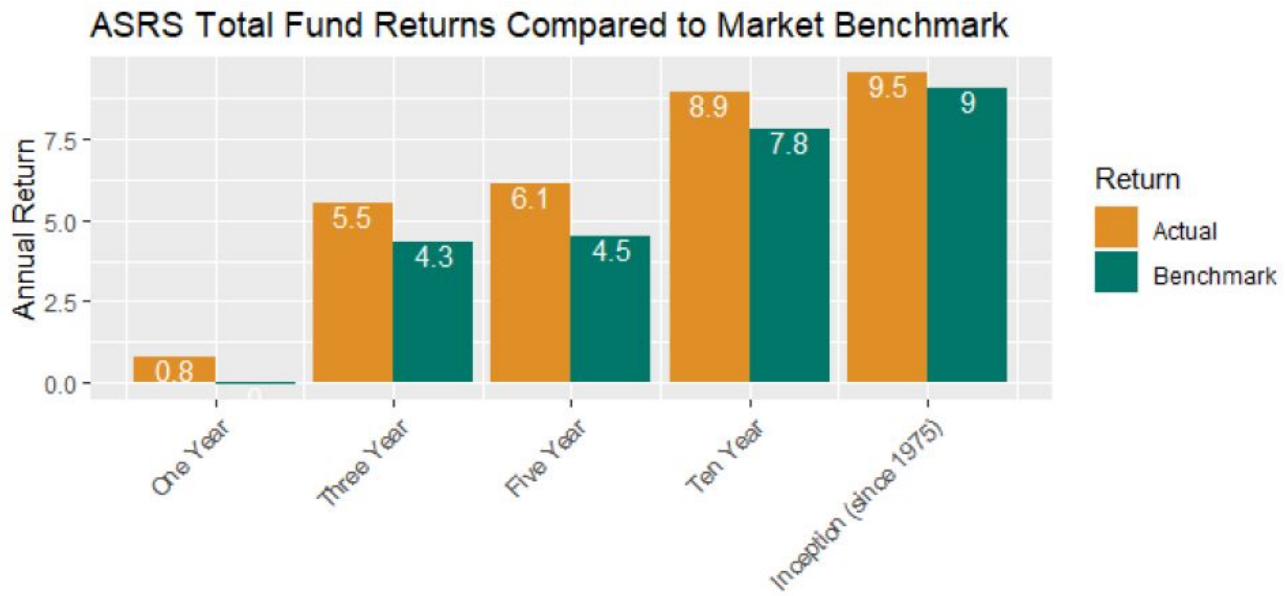
order in financial markets. National governments stabilized the economy with appropriate stimulus and support for individuals and firms under stress from the pandemic. As a result of these actions, financial markets largely recovered in the second and third quarters of this calendar year.

The following chart shows market returns for the last 10 years for major public market asset classes.



Investment Results

The ASRS investment program continues to perform well in spite of the challenges of the current environment. Investment returns of .8%, 5.5%, 6.1%, and 9.5% for the one, three, five and ten year periods exceeded our benchmarks by .8%, 1.2%, 1.6% and 1.1%, respectively. While market conditions have not allowed us to earn the current 7.5% or previous 8% actuarial return in recent periods, ASRS ten year returns exceeded the current actuarial target by 1.4% per year. On a very long run basis, ASRS has earned compound returns of 9.5% per year for the last 45 years.



Stated in terms of dollars, small differences in returns compounded over a number of years have a big impact on the value of the total fund. The .8% out performance compared to benchmark in the most recent year translates to an additional $290 million added to the value of the fund. Over ten years, the 1.1% out performance added an additional $3.6 billion in value to the fund.

Governance and Compliance

ASRS operates the investment program in accordance with statutory requirements under the direction of the ASRS Board and Executive Director. ASRS has adopted a formal and well documented governance process as set forth in the Board Governance Policy Handbook and various Strategic Investment Policies and Standard Operating Procedures which have been adopted by the ASRS Board and ASRS management.

The investment program is further guided by an Investment Policy Statement, which incorporates Investment Beliefs, which are adopted by the ASRS Board. As noted above, the investments are implemented in accordance with a Strategic Asset Allocation, which is adopted by the ASRS Board with input from investment staff and the external investment consultant. Copies of the Investment Policy Statement and Strategic Asset Allocation are included in the materials for this Investment Section.

Investments are implemented by the ASRS investment team under the direction of the Executive Director and with oversight by the external investment consultant and the board investment committee. In accordance with written policies, investment decisions are made by asset class committees which meet weekly and are documented by formal minutes and meeting materials which consist of staff reports and external consultant reports. The external investment consultant attends the asset class committee meetings to remain informed on investment matters and to monitor that all governance procedures are followed.

Compliance with statutes and policies is further monitored by our custody bank which checks every trade and reports daily on the compliance status of the portfolio. Additionally, external consultants monitor the private markets program reviewing partnerships annually to confirm that fees are correctly calculated and reported,

valuation policies are observed and that partnerships are being administered in accordance with the terms of the partnership agreement.

Cost

While cost management is not an investment strategy per se, cost reduction is one of the most important ways to improve investment performance. ASRS aggressively manages costs to help ensure the highest value is achieved for all our investment expenditures.

In the case of public markets where research and experience indicate that the prospects for adding value through management are limited, we are parsimonious in the payment of fees. We manage approximately 50% of public market assets in house at effectively zero incremental cost. Internally managed assets are implemented in enhanced index strategies designed to earn a premium compared to market returns.

In private markets, costs are necessarily higher to implement these programs and we carefully monitor investments to ensure these costs are appropriate. We are extremely cost conscious in the implementation of the private markets program. We reduce costs by concentrating our relationships with a smaller number of highly qualified managers who agree to enter in to custom negotiated partnerships at reduced fees. These partnerships, called "separate accounts", provide benefits to ASRS beyond reduced fees including custom investment criteria and favorable liquidity terms that give ASRS rights to influence or determine the pace of investment and liquidation of the partnership. ASRS plans to continue to grow the separate account program to around 80% of private market assets.

Reporting and Performance Measurement

ASRS has implemented a comprehensive and transparent system of reports to keep the ASRS Management, ASRS Board and the public informed on ASRS investments. ASRS complies with all required reporting under GASB standards and voluntarily complies with recommended disclosures of the Government Financial Officers Association ("GFOA"). All GFOA recommended disclosures are included in this investment section.

Additionally, ASRS has been a leader in adopting rigorous investment performance measurement systems. ASRS believes that sophisticated performance measurement contributes to the efficacy of portfolio management, improves decisions and leads to better results. Starting in 2012, ASRS implemented performance measurement systems in its private markets investments based on new research recommending "public market equivalent" measurements of performance. ASRS extended the performance measurement project to public markets implementing returns and holdings based methods. ASRS portfolio managers now receive daily performance attribution analysis to assist in managing their portfolios.

Conclusion

It is an honor to serve the members and beneficiaries as your Chief Investment Officer. We hope you find the materials in this Investment Section informative and helpful in understanding the investments of the Arizona State Retirement System.

Sincerely,

Karl Polen, Chief Investment Officer

Purpose

The purpose of this Investment Policy Statement (IPS) is to set forth the investment, beliefs, goals & objectives, constraints and establish the guidelines for the development and implementation of the ASRS strategic and tactical asset allocation policy.

The ASRS recognizes that a well-articulated investment policy is important to the long-term success of achieving the ASRS investment objectives. As such, the ASRS has developed this IPS with the following goals in mind:

- To clearly and explicitly establish the objectives and parameters that govern the investments of the ASRS' assets;
- To establish a target asset allocation that is long term in nature but dynamic to allow the ASRS to take advantage of market opportunities which is expected to achieve its investment rate of return objectives;
- To help protect the financial health of the ASRS through the implementation of this policy statement;
- To establish a framework for monitoring investment activity, and promote effective communication between the ASRS Board, staff, and other involved parties.

Investment Goals & Objectives

The ASRS has established a set of Investment Goals and Objectives that describe the macro-level expected outcomes that the ASRS seeks to achieve.

Goals

1. Maximizes Fund Rates of Return for Acceptable Levels of Fund Risk.

   This goal has an asset-oriented focus. Here, the returns generated or earned by the investment Fund should be considered in conjunction with the risk or volatility that the Fund will support, where risk is essentially the possibility of a change in the value of the ASRS Fund attributed to changes in economic conditions, interest rates, dividend policy and other variables in any given year.

2. Achieves 75th Percentile Rates of Return Compared to Peers.

   This goal compares the performance of the ASRS' aggregate investment portfolio to other public pension funds with over $1 billion of assets under management. Though the ASRS' asset allocation policy will differ from other public pension funds given its risk return profile and investment beliefs, it is common practice to compare returns between comparable public pension funds.

3. Achieves Long-term Fund Rates of Return Equal to or Greater than the Actuarial Assumed Interest Rate.

   This goal has a liability oriented focus. Here, the returns generated or earned by the investment Fund should be considered in conjunction with the actuarial assumed interest rate, where this interest rate is essentially an estimate of the long-term average of the combination of expected inflation rates and expected real rates of return. The actuarial assumed interest rate is also the discount rate used to calculate the present value of liabilities.

4. Achieves Long-term Economic and Actuarial Funded Statuses of 100 percent.

   This goal has a funded-status oriented focus. Here, the structuring of the investment Fund should be considered in conjunction with the level, volatility, and direction of the economic and actuarial funded status of the Fund. Although both actuarial and economic funded status levels are valuable for discussion and decision-making, economic-funded status is more reflective of financial condition and long-term policy implications. Economic-funded status is defined as the actual or market value of investments as a percentage of the actual or market value of liabilities and excludes such accounting constructs as smoothing and amortization.

5. Mitigates Contribution Rate Volatility.

   This goal has a contribution-rate orientation focus. Here, the structuring of the investment Fund should be considered in conjunction with the level, volatility, and direction of the contribution rates that will need to be paid by both employees and employers in the Fund. In general, lower levels and volatility in contribution rates are preferred.

   Collectively, the above goals incorporate the following elements that are important for a fund's comprehensive investment structure:

   a. Complementary use of absolute and relative rates-of-return perspectives.

   b. Complementary use of asset-only and asset-liability perspectives.

   c. Complementary use of economic and actuarial perspectives.

Objectives

Total Fund Performance

1. Develop, implement, and maintain an Asset Allocation program that is expected to achieve a 20-year rolling average annual rate of return at or above the actuarial assumed rate.

Twenty-Year Total Fund Net Rate of Return	Twenty Years	
	Actual	Benchmark[1]
Twenty-year rolling annual total fund net rate of return	5.5 %	7.9 %

[1]The benchmark rate was 8.0% for 17 years, and 7.5% for the 3 most recent years, averaging 7.9% over 20 years

2. Achieve 1-year and 3-year rolling annual total fund net rates of return equal to or greater than the return of the ASRS asset allocation policy (SAAP) Benchmark.

One and Three-Year Total Fund Net Rate of Return	One Year		Three Year	
	Actual	Benchmark	Actual	Benchmark
Rolling annual total fund net rate of return	0.8 %	0.0%	5.5 %	4.3 %

Asset Class Performance

3. Achieve 1-year and 3-year rolling annual net rates of return for ASRS strategic asset classes that are equal to or greater than their respective strategic asset class benchmarks.

Net Rate of Return by Asset Class	One Year		Three Year	
	Actual	Benchmark	Actual	Benchmark
Equity	(1.6)%	(1.3)%	5.0%	4.8%
Interest Rate Sensitive	9.0 %	8.7 %	5.4%	5.3%
Credit	4.4 %	(6.9)%	7.3%	1.5%
Real Estate	(0.7)%	3.8 %	4.6%	5.0%

Cash Flow Performance

4. Ensure sufficient monies are available to meet pension benefits, health insurance, member refunds, administrative payments, and other cash-flow requirements.

Investment Beliefs

Frame of Reference

The following Investment Beliefs have been established to ensure the development of congruent and synergistic investment strategies, and to ensure the effective and efficient allocation of resources. These Investment Beliefs determine the general paradigm within which investment strategies are developed, investment ideas are reviewed, and investment decisions are implemented.

Modifications to these Investment Beliefs will occur if experiential, academic, conceptual, and/or practical perspectives suggest that a superior belief system exists.

Investment Beliefs

1. **Asset Class Decisions are Key:** In general, decisions with respect to which asset classes and sub-asset classes to invest in, and the allocations to these asset classes and sub-asset classes, have a greater impact on total fund investment returns than decisions in which specific securities to invest.

2. **Theories and Concepts Must be Sound:** Over longer periods of time, investment outcomes (e.g. rates of return, volatility) conform to logical theories and concepts. Significant deviations (e.g. internet bubble, pre-subprime erosion of risk premiums) from theoretically and conceptually sound investment constructs are usually not sustainable and are typically self-reverting.

3. **House Capital Market Views Are Imperative:** The development and articulation of sound *House Views* (e.g. views on interest rates, corporate spreads, asset valuations) will ensure consistency among investment decisions, clarity of investment direction, baselines for debates, and conformity of understanding.

4. **Investment Strategies Must be Forward Looking:** Investment strategies will be developed based on forward-looking insights, rather than simply on successful strategies of the past.

   Asset class valuations and security valuations are significantly affected by endogenous outcomes (e.g. earnings, GDP growth rates, competitive barriers) that are probabilistic, and these outcomes are typically well analyzed by the investment industry.

   Asset class valuations and security valuations are also significantly affected by random outcomes (e.g. natural disasters, certain supply & demand shocks) that are virtually unpredictable, and these outcomes are typically not analyzed directly by the investment industry.

   Asset class valuations and security valuations are also significantly affected by exogenous outcomes (e.g. foreign policies, global cultural interactions) that can possibly be modeled, and these outcomes are typically not analyzed by the investment industry.

5. **Public Markets are Generally Informationally Efficient:**

   Asset Class Valuations

   Asset class valuations (e.g. stock market levels versus interest rate levels) are often in equilibrium with one another, but anomalous situations do occur which result in disequilibria between asset class valuations. These disequilibria offer valuable investment opportunities which we will pro-actively seek and capitalize on.

   Security Valuations

   Security valuations (e.g. IBM versus Cisco) are often in equilibrium with one another, but private markets and anomalous public market situations do occur which result in disequilibria between security valuations. These disequilibria offer valuable investment opportunities which we will pro-actively seek and capitalize on.

   The extent of informational efficiency varies across asset classes.

   Private markets offer significant opportunities for asset mispricing and manager excellence which we will pro-actively seek and capitalize on.

6. **Market Frictions are Highly Relevant:** Market frictions (e.g. management fees, carried interest, revenue sharing, expenses, costs, transaction spreads, market impacts, taxes, commissions) can be significantly detrimental to investment performance and as a result transactions will be initiated only to the extent there is a strong level of conviction that they will result in increased investment returns or decreased risks net of all market frictions.

7. **Internal Investment Professionals are the Foundation of a Successful Investment Program:** In-house investment management capability engaged in direct portfolio management results in superior investment decision-making.

   In-house investment management pro-actively monitors capital markets in order to determine mispricing opportunities & allocate capital and will successfully increase risk adjusted returns.

In-house investment professionals are more closely aligned with, and have a better understanding of, the purpose and risk & reward tolerance of the ASRS than external parties.

In-house investment professionals will impact direct investment negotiations, better align economic interests, and influence investment industry conditions (e.g. private deal structures, fee levels, introduction of innovative products & strategies).

8. **External Investment Management is Beneficial:** External investment organizations can often offer greater expertise, resources, and/or flexibility than internal personnel for various investment strategies.

9. **Investment Consultants:** Investment consultants will be effectively utilized in the following four general categories, and utilization of consultants will be focused on situations where there is a demonstrable need in at least one of the four areas:

   - Independence: When oversight or controls should be enhanced.
   - Perspective: When internal perspectives are not broad enough.
   - Special Skills: When internal skills are not deep enough.
   - Resource Allocation: When Investment Management's resources can be enhanced.

10. **Trustee Expertise:** Trustees often have expertise in various areas of investment management, and this expertise should be utilized while ensuring separation between ASRS Board oversight and staff management.

Investment Considerations

1. **Arizona State Statutes**

ASRS investments may be limited by Arizona Revised Statutes. To ensure compliance, checks and balances have been established which both reside within and external to the ASRS Investment Management Division. Reporting processes are implemented and, as appropriate, disseminated to the Director, ASRS Board Committees, and ASRS Board.

2. **Time Horizon**

The ASRS is managed on a going-concern basis. The following timeframes are utilized for portfolio construction decisions and contribution rate determination:

<u>Portfolio Construction Decisions:</u>

- Strategic asset allocations focus on medium term (3-5 years) capital market expectations, subject to the constraint of meeting the long-term assumed actuarial rate based on long-term (30 year) Capital Market Assumptions.
- Tactical deviation decisions are based on shorter term (less than 3-5 years) capital market expectations.

Contribution Rate Determination:

- Liabilities are discounted based upon long-term (30 year) capital market expectations.
- Contribution rates are set based upon longer term (currently 10 year) investment valuation smoothing periods, and longer term (currently 30 years 'closed') deficit/surplus amortization periods.

The impact on contribution rates of any realized short-term volatility of returns will be mitigated through actuarial time-series diversification (smoothing & amortizing), rather than by lowering short-term expected return volatility at the expense of lower expected returns (and therefore higher aggregate contribution rates).

Contribution rates are the realized cash flow financial outputs, and based upon the above, they are relatively insensitive to shorter term portfolio volatilities. This enables the ASRS to combine the traditional cross-sectional diversification benefits of a large employee pooled plan with time-series diversification benefits of a multi-generational plan, resulting in higher expected short-term return volatility which enables higher expected long-term returns.

3. Liquidity and Cash-Flow

The ASRS maintains a long-term investment horizon; however, managing short-term liquidity and cash flow is paramount to ensure that pension obligations, health insurance, member refunds, administrative payments and other cash flow requirements are made. This requires Investment Management and Financial Services Divisions to anticipate internal and external cash flow needs, and to efficiently manage transactions in order to mitigate the costs of ensuring adequate liquidity.

Risk Management, Monitoring and Reporting

The ASRS applies a risk management framework for identifying, managing and reporting on ASRS Investments. These include, but are not limited to, operational risk (e.g., internal and external portfolio(s) guideline compliance, cash management, securities lending, Investment Management business continuity, etc.) and investment risk (e.g., deviations from target allocation, manager oversight, performance measurement/attribution, ability to achieve investment objectives, etc.).

In conjunction with the agency risk management program, appropriate steps are taken to provide reasonable assurance to Executive Management and the ASRS Board that investment management programs are designed, implemented and maintained to achieve investment goals and objectives as referenced in the ASRS Strategic Plan.

Responsibilities reside with the ASRS investment staff, custody bank, general consultant, project consultants, investment managers, and ASRS Internal Audit.

Reporting periodicity and the level of investment information dissemination vary depending upon target audience. Daily report generation and investment monitoring reside with the custody bank and Investment Management / Internal Audit; Quarterly/Annual aggregate, portfolio positions, and asset class performance are reported to the Investment Committee/ASRS Board.

The use of leverage is defined in the applicable ASRS investment documentation. For separate account public market investments (internally or externally managed portfolios), authorization to permit or not permit leverage is

explicitly denoted in the managers' Letter of Direction and Clarification; monitoring is conducted by Investment Management and ASRS consultants. For commingled public and private markets investments, authorization to permit or not permit leverage is explicitly denoted in the managers' contracts or partner agreements; monitoring is conducted by the designated partnership agreement external auditor and, as applicable, reviewed at limited partnership advisory meetings.

The use of derivatives is defined in the applicable ASRS investment documentation. For separate account public market investments (internally or externally managed portfolios), authorization to permit or not permit derivatives is explicitly denoted in the managers' Letter of Direction and Clarification; monitoring is conducted by Investment Management and ASRS consultants. For commingled public and private markets investments, authorization to permit or not permit derivatives is explicitly denoted in the managers' contracts or partner agreements; monitoring is conducting by the designated partnership agreement external auditor and, as applicable, reviewed at limited partnership advisory meetings.

The management of currency exposure is defined in the applicable ASRS investment documentation. For separate account public market investments (internally or externally managed portfolios), authorization to permit or not permit currency hedging is explicitly denoted in the managers' Letter of Direction and Clarification; monitoring is conducted by Investment Management and ASRS consultants. For commingled public and private markets investments, authorization to permit or not permit currency hedging is explicitly denoted in the managers' contracts or partner agreements; monitoring is conducting by the designated partnership agreement external auditor and, as applicable, reviewed at limited partnership advisory meetings.

Asset Allocation

As part of strategic asset allocation development, the ASRS asset mix will reflect investments in strategic and tactical asset classes and strategies whose collective risk/return profile are anticipated to achieve its long-term investment rate of return goals and objectives.

The ASRS employs a dynamic strategic asset allocation study approach whose initiation and periodicity will primarily be a function of market dynamics. The strategic asset allocation is used to determine the long-term policy asset weights. Investment opportunities and asset classes are constantly evolving and developing, such that they may become attractive and suitable for institutional investment portfolios before the next scheduled policy review. Therefore, asset allocation reviews in addition to periodic studies are conducted as warranted or triennially, whichever is shorter.

The strategic asset allocation study may include, but not be limited to, the following:

- Discussion and analysis of existing and evolving asset classes and investment strategies.
- Evaluation of expected sources of investment returns, risk and diversification (quantitatively/qualitatively).
- Reviewing investment industry developments (academic and pragmatic).
- Utilization of quantitative tools (e.g., efficient frontier mean-variance optimization, risk budgeting) and evaluation of multiple scenarios.
- Reviewing and engaging discussions regarding capital market assumptions.

- Reviewing asset allocation policies from other public and non-public entities.

Rebalancing

The ASRS has established and maintains an asset class rebalancing policy(s) which encompasses the guidelines and processes for identifying and determining potential courses of action precipitated by the ASRS asset class over/under weight deviations relative to its broad strategic asset allocation policy (SAAP), ASRS cash-flow needs and/or to take tactical positions between and within SAAP asset classes.

The frequency and magnitude of portfolio rebalancing is determined by the Investment Rebalancing Committee consisting of the Director, CIO, and Investment Management Asset Class Portfolio Managers. The CIO reports asset class rebalancing activities to the Director and, through the Director, to the Investment Committee and full ASRS Board.

Voting of Portfolio Proxies

The ASRS votes its ownership interest with an objective of maximizing the present value of its investment. Proxy voting for the ASRS internally-managed equity ("E") portfolios and those assigned to external U.S. and non-U.S. equity managers shall not be influenced or directed by political or social prerogatives that may diminish or impair the economic value of an investment.

The ASRS currently engages Glass-Lewis & Co., LLC (GLC) and employs its research and voting guidelines for the voting of proxies for the "E" portfolios. This process is not applicable to ASRS externally-managed equity portfolios.

The ASRS external equity managers use their discretion to vote their portfolio proxies; voting records are monitored for consistency with both the individual external manager's voting policy and the GLC proxy voting policy. External equity manager voting records found to be inconsistent with or different from the GLC proxy voting policy are researched and documented. Investment Management retains the right to direct external equity managers' voting on any issue(s) if doing so is deemed beneficial to the Fund.

Securities Litigation

The ASRS monitors and participates in securities litigations when appropriate to protect the ASRS interests. From time to time, class action lawsuits are brought against companies, their directors, and/or their officers, as well as third parties such as the companies' independent public accountants, for alleged violations of federal and state securities laws relating to various disclosure obligations and breaches of fiduciary or other duties. As a shareholder or bondholder, the ASRS may join or initiate a securities class action or pursue a private action when securities fraud and other acts of wrongdoing have taken place.

Monitoring and reporting is carried out by the ASRS contracted outside counsel who may make recommendations to the ASRS and depending on the merits of the recommendation are discussed by the Securities Litigations Oversight Committee (SLOC). In the event the SLOC recommends the ASRS consider pursuing lead plaintiff or private action, ASRS Board approval is required before such action can be taken.

Securities Lending

The ASRS is allowed to lend securities with either the custody bank or tri-party in a separate account or commingled security lending structure. The CIO and Director will determine the ASRS securities lending program parameters (risk profile, aggregate lending balance, types of securities on loan, collateral requirements, etc.). The ASRS securities lending program primarily focuses on identifying loan intrinsic value.

Management of Investment Management Fees (Cost)

The ASRS strives to maintain an efficient and relatively low aggregate investment management fee structure. The ASRS internally-managed public market portfolios are managed to provide beta-like market returns with low management fees (approximately 1 bps); external public and private portfolios are anticipated to generally provide alpha, take active risk and enable the ASRS the ability to access market capital opportunities which may not be available through ASRS internal investment program.

To the extent possible, the ASRS negotiates and monitors investment fees for external public and private investment managers. For external public equity managers, securities-level transaction(s) cost analyses will be evaluated by Investment Management staff. Those managers whose transaction costs appear high relative to the market in which they trade or who use soft dollars may be subject to participation in the ASRS commission recapture program.

The ASRS Investment Management staff will oversee public manager portfolio transitions, e.g., securities from one public manager to another. These transactions may be executed on a security-level basis by either Investment Management staff or through an intermediary who may possess skills and/or can execute transactions on a more effective cost basis. Pre- and post-transaction cost analyses (commission, trading costs, market impact, etc.) are evaluated by the Investment Management staff.

Roles & Responsibilities

The ASRS Board governance structure provides the Investment Committee with general investment oversight responsibilities. In addition, the Director's Asset Class Committees implement ASRS Board policies and provide detail oversight of the ASRS investments. Specific duties of the Investment Committee and Asset Class Committees are outlined in the ASRS Board Governance Policy Handbook.

Exhibit I-1: Asset Allocation Targets

During fiscal year 2020, the ASRS asset allocation policy targets and ranges were as follows:

Asset Class	Current Allocation Target as of June 30, 2020	Policy Range as of June 30, 2020
Equity	50 %	35-65%
Credit	20 %	10-30%
Interest Rate Sensitive	10 %	0-20%
Real Estate	20 %	10-30%
Other	0 %	0-10%
Cash	0 %	0-5%
Total	100 %	

Exhibit I-2: Schedule of Investment Portfolios by Asset Class

(Dollars in thousands)

Investment Portfolios by Asset Class[2]		Fair Value	Percentage of Investments at Fair Value
Cash and Short-Term Investments[1]	$	1,089,511	2.6 %
Interest Rate Sensitive[3]		3,729,106	8.8 %
Credit			
Public Credit		456	0.1 %
Private Debt		6,276,961	14.8 %
Distressed Debt		1,506,710	3.6 %
Other Credit		917,935	2.2 %
Total Credit		8,702,062	20.7 %
Equity			
U.S. Equity		10,380,670	24.6 %
International Equity		7,531,373	17.8 %
Private Equity		4,019,716	9.5 %
Total Equity		21,931,759	51.9 %
Real Estate		6,739,265	16.0 %
Total	$	42,191,703	100 %

[1] The ASRS utilizes short-term investments as collateral for its derivative investing activities. See Note 6 to the financial statements for more information on the notional value of derivative instruments.

[2] A detailed listing of investments is available upon request. Direct inquiries to: ASRS, 3300 North Central Avenue, Phoenix, AZ 85012

[3] Includes $4.1M of U.S. Treasury Bills in the Interest Rate Sensitive Portfolio classified as short-term investments on the Statements of Fiduciary Net Position

Performance Accounting / Computation Standards

The ASRS investment performance rates of return for public market asset classes are calculated on a total return basis, using time-weighted rates of return, net of all fees and based on market values. Returns presented for private market asset classes are on an internal rate of return (IRR), net of all fees and based on market values. The fair value of real estate, private equity and opportunistic investments are based on estimated values. Fair value is based on estimates and assumptions from information and representations provided by the respective general partners, in the absence of readily ascertainable market values.

Performance is calculated on an accrual basis provided that the accrual information is available from the custodian or record-keeper. The rates of return are generated by asset class and include cash holdings.

Below are the rates of return on the overall portfolio, as well as specific asset classes, along with the benchmark used to compare performance.

Exhibit I-3: Annualized Rates of Return On Publicly Traded Investments (Net of Fees)

	Time-Weighted Rates of Return			
Asset Class / Benchmark	**1 Year**	**3 Year**	**5 Year**	**Inception**
Total Fund	**0.8%**	**5.5%**	**6.1%**	**9.5%**
Interim SAA Policy Benchmark	0.0%	4.3%	4.5%	9.0%
Public Equity	**(0.2%)**	**4.8%**	**5.8%**	**6.6%**
Custom Total Public Equity Benchmark	1.5%	5.9%	6.6%	6.3%
Domestic Equity	**3.6%**	**8.2%**	**9.0%**	**11.0%**
Custom Domestic Equity Benchmark	6.7%	10.2%	10.4%	11.3%
International Equity	**(4.8%)**	**0.9%**	**2.1%**	**5.6%**
Custom International Equity Benchmark	(4.7%)	0.9%	2.3%	5.4%
Interest Rate Sensitive Fixed Income	**9.0%**	**5.4%**	**4.6%**	**7.9%**
Bloomberg Barclays US Aggregate TR	8.7%	5.3%	4.3%	0.0%

Exhibit I-4: Annualized Rates of Return On Private Market Investments (Net of Fees)

	Money-Weighted Rates of Return[1]			
Asset Class / Benchmark	**1 Year**	**3 Year**	**5 Year**	**Inception**
Private Equity	**(7.3%)**	**6.5%**	**8.6%**	**10.2%**
MSCI ACWI Blended	(13.0%)	0.0%	2.8%	8.4%
Private Credit	**4.0%**	**6.9%**	**9.3%**	**9.0%**
S&P LSTA/Leveraged Loan Index + 2.5%	(6.9%)	1.4%	3.4%	5.2%
Real Estate	**(0.7%)**	**4.6%**	**7.1%**	**7.5%**
NCREIF ODCE	3.8%	5.0%	6.8%	6.5%

[1] Performance of private market portfolios and corresponding benchmarks are reported on a one quarter lag.

Exhibit I-5: Equity Sub-Sector Allocation

June 30, 2020
(Dollars in thousands)

Sub-Sector	% of Equity Portfolio	Fair Value
Domestic Equity		
U.S. Large Cap	31.17 %	$ 6,836,341
U.S. Mid Cap	3.90 %	854,677
U.S. Small Cap	3.28 %	718,922
Total Domestic Equity	38.35 %	8,409,940
International - Developed Markets	24.97 %	5,476,086
Commingled - U.S. Equity	8.99 %	1,970,730
Commingled - Int'l Emerging Markets	9.37 %	2,055,287
Private Equity	18.32 %	4,019,716
Total Equity	100.00 %	$ 21,931,759

Note: Schedule does not include securities lending collateral investments.

Exhibit I-6: Ten Largest Stock Holdings

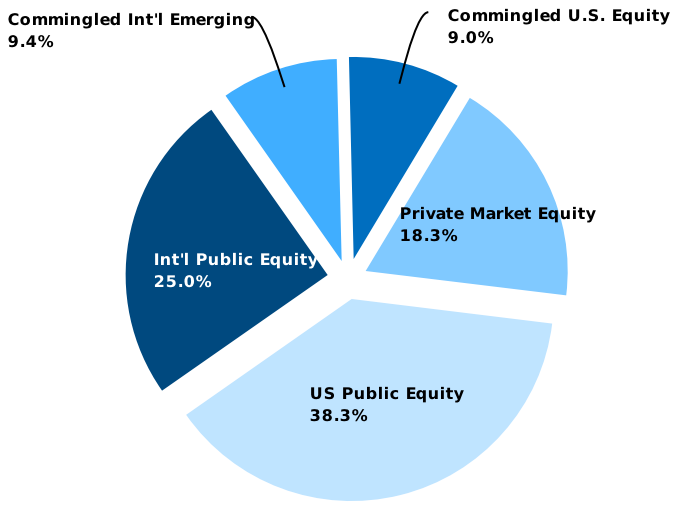
June 30, 2020
(Dollars in thousands)

Company	Shares	Fair Value
APPLE INC	1,260,298	$ 459,757
MICROSOFT CORP	2,081,278	423,561
AMAZON.COM INC	121,879	336,242
FACEBOOK INC CLASS A	692,943	157,347
ALPHABET INC CL C	88,392	124,952
ALPHABET INC CL A	86,381	122,493
NESTLE SA REG	970,733	107,302
JOHNSON + JOHNSON	758,897	106,724
VISA INC CLASS A SHARES	491,397	94,923
PROCTER + GAMBLE CO	711,293	85,049
Total	7,263,491	$ 2,018,350

Note: A detail listing of investments is available upon request.

Direct inquiries to: ASRS, 3300 North Central Avenue, Phoenix, AZ 85012

Equity Allocation



Stock Holdings

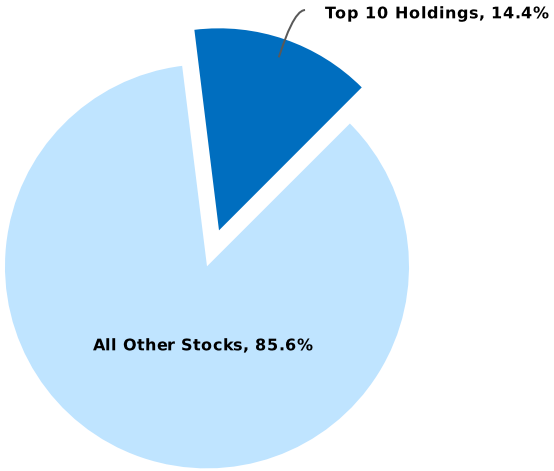


Exhibit I-7: Fixed Income Sub-Sector Allocation

June 30, 2020
(Dollars in thousands)

Sub-Sector	% of Fixed Income Portfolio	Fair Value
Fixed Income Securities		
Public Credit	0.01 %	$ 456
Public Interest Rate Sensitive	16.35 %	2,032,707
Total U.S. Fixed Income	16.36 %	2,033,163
Commingled funds - Fixed Income	13.65 %	1,696,399
Private Debt funds	50.49 %	6,276,961
Distressed Debt funds	12.12 %	1,506,710
Other Credit funds	7.38 %	917,935
Total Fixed Income	100.00 %	$ 12,431,168

Note: Schedule does not include securities lending collateral investments.

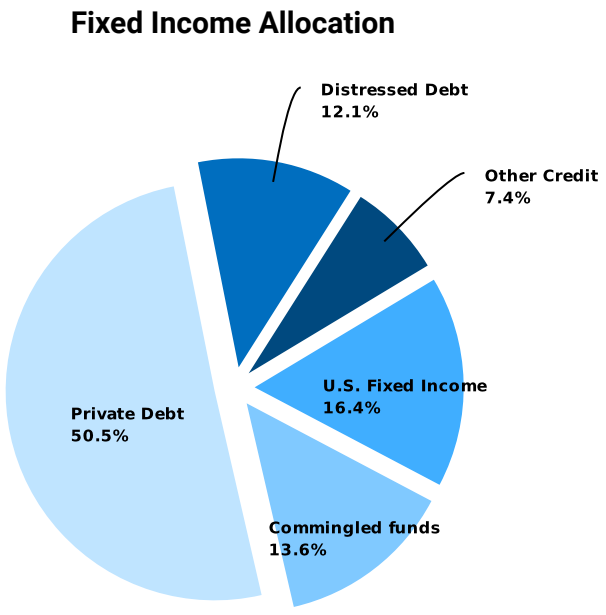


Exhibit I-8: Ten Largest Bond Holdings

Year Ended June 30, 2020
(Dollars in thousands)

Holding	Coupon	Maturity	Rating	Par Value	Fair Value
US TREASURY N/B	2.75	11/15/2023	AAA	$ 48,000	$ 52,121
US TREASURY N/B	2.5	2/28/2026	AAA	30,000	33,586
US TREASURY N/B	2.75	2/15/2028	AAA	25,000	29,164
FNMA POOL MA3833	2.5	11/1/2049	AAA	23,229	24,226
US TREASURY N/B	4.75	2/15/2041	AAA	14,200	23,556
US TREASURY N/B	2.375	5/15/2029	AAA	20,000	23,081
US TREASURY N/B	3.75	11/15/2043	AAA	15,000	22,327
FNMA POOL AV0691	4	12/1/2043	AAA	19,997	22,022
US TREASURY N/B	2.65	2/28/2023	AAA	20,000	21,303
FNMA POOL BP4327	2.5	6/1/2050	AAA	19,999	20,865
Total				$ 235,425	$ 272,251

Note: A detail listing of investments is available upon request.

Direct inquiries to: ASRS, 3300 North Central Avenue, Phoenix, AZ 85012

Exhibit I-9: Domestic Trade Commissions

Year Ended June 30, 2020

(Dollars and shares/instruments in thousands)

Equity Broker Name	Dollar Amount of Commission	Number of Shares	Commission per Share
INSTINET, LLC	$ 268	71,037	$ 0.0038
PERSHING, LLC	181	33,949	0.0053
COWEN EXECUTION SERVICES, LLC	163	30,465	0.0054
BOFA SECURITIES, INC.	156	21,740	0.0072
CITIGROUP GLOBAL MARKETS, INC.	118	11,789	0.0100
GOLDMAN SACHS + CO, LLC	111	22,314	0.0050
J.P. MORGAN SECURITIES, LLC	12	300	0.0400
BARCLAYS CAPITAL INC./LE	4	816	0.0049
MORGAN STANLEY CO INCORPORATED	3	873	0.0034
UBS SECURITIES, LLC	1	163	0.0061
VARIOUS OTHER BROKERS[1]	5	1,859	0.0027
Total Equity	$ 1,022	195,305	$ 0.0052

Derivative Broker Name	Dollar Amount of Commission	Number of Instruments	Commission per Instrument
RBS SECURITIES INC.	$ 725	$ 91	$ 7.9670
RJ O'BRIEN	403	42	9.5952
NEWEDGE USA, LLC	13	5	2.6000
GOLDMAN SACHS + CO, LLC	5	3	1.6667
Total Derivatives	$ 1,146	$ 141	$ 8.1277
Total Domestic Trade Commissions	$ 2,168	N/A	N/A

Note: A detailed listing of broker commissions is available upon request.

[1] Brokers with commissions under $1,000 have been grouped into "Various Other Brokers"

Direct inquiries to: ASRS, 3300 North Central Avenue, Phoenix, AZ 85012

Exhibit I-10: Foreign Trade Commissions

Year Ended June 30, 2020

(Dollars and shares/instruments in thousands)

Equity Broker Name	Dollar Amount of Commission	Number of Shares	Commission Per Share
GOLDMAN SACHS INTERNATIONAL	$ 152	35,649	$ 0.0043
UBS AG	130	19,434	0.0067
CREDIT SUISSE SECURITIES (USA), LLC	107	39,261	0.0027
J.P. MORGAN SECURITIES PLC	81	52,499	0.0015
CITIGROUP GLOBAL MARKETS LIMITED	62	24,039	0.0026
GOLDMAN SACHS + CO, LLC	40	24,889	0.0016
MERRILL LYNCH INTERNATIONAL	36	15,728	0.0023
CREDIT SUISSE SECURITIES (EUROPE), LTD	29	16,292	0.0018
INSTINET AUSTRALIA CLEARING SRVC PTY, LTD	19	7,525	0.0025
CLSA SINGAPORE PTE, LTD.	18	14,638	0.0012
MORGAN STANLEY AND CO. INTERNATIONAL	16	11,529	0.0014
UBS AG LONDON BRANCH	13	624	0.0208
BANK OF AMERICA MERRILL LYNCH SECUR, INC	13	2,042	0.0064
JEFFERIES INTERNATIONAL, LTD	11	4,243	0.0026
INSTINET U.K., LTD	10	3,880	0.0026
INVESTMENT TECHNOLOGY GROUP, LTD	10	2,946	0.0034
J.P. MORGAN SECURITIES LIMITED	9	1,294	0.0070
EXANE S.A.	9	4,601	0.0020
CANADIAN IMPERIAL BANK OF COMMERCE	9	2,051	0.0044
MORGAN STANLEY CO INCORPORATED	9	3,895	0.0023
CITIGROUP GLOBAL MARKETS INC.	8	848	0.0094
TORONTO DOMINION SECURITIES INC	8	2,478	0.0032
JPMORGAN SECURITIES(ASIA PACIFIC), LTD	7	6,919	0.0010
CLSA AUSTRALIA PTY, LTD	7	11,072	0.0006
COWEN EXECUTION SERVICES, LLC	7	2,289	0.0031
BARCLAYS CAPITAL	6	8,223	0.0007
VARIOUS OTHER BROKERS[1]	38	38,756	0.0010
Total Equity	$ 864	357,644	$ 0.0024

Derivative Broker Name[2]	Dollar Amount of Commission	Number of Instruments	Commission Per Instrument
SOCIETE GENERALE	$ 15	7	$ 2.1429
Total Derivatives	$ 15	7	$ 2.1429
Total Foreign Trade Commissions	$ 879	N/A	N/A

Note: A detailed listing of broker commissions is available upon request.

[1] Brokers with commissions under $5,000 have been grouped into "Various Other Brokers"

[2] Only derivative brokers with total commissions over $1,000 have been included in this table

Direct inquiries to: ASRS, 3300 North Central Avenue, Phoenix, AZ 85012

Exhibit I-11: Schedule of Investment Fees

Year Ended June 30, 2020
(Dollars in thousands)

Asset Class	Assets Managed at Fair Value, as of June 30[1]	Management Fees[2]	Performance Fees[2]	Total
Equity:				
Public Equity	$ 17,912,043	$ 2,903	$ —	$ 2,903
Private Equity	4,019,716	54,174	11,594	65,768
Total Equity	21,931,759	57,077	11,594	68,671
Fixed Income:				
Interest Rate Sensitive	3,729,106	412	—	412
Public Credit	456	9	—	9
Private Debt	6,276,961	59,727	48,050	107,777
Distressed Debt	1,506,710	20,445	29,445	49,890
Other Credit	917,935	3,992	(81)	3,911
Total Fixed Income	12,431,168	84,585	77,414	161,999
Real Estate	6,739,265	48,926	(20,376)	28,550
Other	—	62	—	62
Total Other Asset Classes	6,739,265	48,988	(20,376)	28,612
Total	$ 41,102,192	$ 190,650	$ 68,632	$ 259,282

[1] Does not include short-term investments.

[2] The Investment fee schedule above identifies investment manager fees and performance fees (carried interest and incentive) that are readily separable from investment income.

Public market investment managers, and some private market investment managers, are paid fees directly.

Private market investment managers, whose fees are not paid directly, report account valuations on a net of fee basis. The ASRS made a good faith effort to identify these fees by requesting a confirmation of fees from the managers and reviewing investment capital account statements. Investment manager fees have been reported separately from other investing activity on the Statement of Changes in Fiduciary Net Position, however performance fees are reported net with the appreciation in the fair value of investments. In addition to the fees listed above, the ASRS also incurred other fees including placement fees of approximately $931 thousand.

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ACTUARIAL SECTION

An agency of the State of Arizona

P: 469.524.0000 | www.grsconsulting.com

October 13, 2020

Board of Trustees
Arizona State Retirement System
3300 North Central Avenue, 14th Floor
Phoenix, Arizona 85012

Re: Arizona State Retirement System Actuarial Certification for 401(a) Portion of the Plan

Members of the Board:

At the request of the Arizona State Retirement System (ASRS), Gabriel Roeder Smith & Company (GRS) has performed the actuarial valuation of the benefits associated with the 401(a) (Retirement) portion of the ASRS defined benefit pension plan (the Plan). The information in the Actuarial Section is based on our annual actuarial valuation reports, with the most recent valuations conducted as of June 30, 2019, and is intended to be used in conjunction with the full reports.

This letter and the schedules listed below represent GRS' certification of the funded status as required for the financial report for the fiscal year ended June 30, 2020. GRS prepared the following schedules (information prior to 2016 was provided by ASRS):

- Exhibit F-24: Net Pension Liability of Employers
- Exhibit F-26: Discount Rate Sensitivity - Pension
- Exhibit F-32: Schedule of Changes in the Net Pension Liability - Retirement
- Exhibit F-33: Schedule of Net Pension Liability - Retirement
- Exhibit F-34: Schedule of Employer Contributions - Retirement
- Exhibit A-15: Schedule of Retirees Added to and Removed from Rolls - Retirement
- Exhibit A-17: Schedule of Funding Progress - Retirement and HBS
- Exhibit A-18: Solvency Test - Retirement
- Exhibit A-20: Analysis of Financial Experience - Retirement
- Exhibit S-4: Retired Members by Type of Benefit
- Exhibit S-7: Average Benefit Payments - Retirement

Data

The valuation was based upon information as of June 30, 2019, furnished by ASRS staff, concerning system benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by ASRS staff.

5605 North MacArthur Boulevard | Suite 870 | Irving, Texas 75038-2631

Board of Trustees
October 13, 2020
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Actuarial Assumptions and Methods

The assumptions and methods applied in this actuarial valuation were adopted by the Board of Trustees on October 27, 2017 based on the Report on the Actuarial Experience Study covering a five-year period from July 1, 2011 to June 30, 2016, dated October 18, 2017. The notable assumption and method changes first reflected in the June 30, 2017 actuarial valuation include:

- Changing the actuarial cost method to the Entry Age Normal actuarial cost method,
- Lowering nominal investment return assumption to 7.50%,
- Establishing an explicit administrative expense assumption of 0.25% of payroll,
- Reflecting the potential for future PBI's in the funding calculations, and
- Updating the healthy retiree mortality to the 2017 State Retirees of Arizona mortality table with generational mortality improvements using the Ultimate MP scales.

We believe the assumptions are internally consistent and are reasonable, based on the actual experience of ASRS.

The actuarial assumptions and methods used to develop the Net Pension Liability of Employers, Discount Rate Sensitivity, Schedule of Changes in the Net Pension Liability, and Schedule of Net Pension Liability, noted above, meet the parameters set forth in the disclosures presented in the Financial Section by Government Accounting Standards Board Statement No. 67. Furthermore, the assumptions and methods used for funding purposes meet the parameters set by Actuarial Standards of Practice.

The results of the actuarial valuation are dependent upon the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. A review of the impact of a different set of assumptions on the funded status of ASRS is outside the scope of this actuarial valuation.

The current actuarial assumptions are outlined in the section titled "Statement of Actuarial Methods and Assumptions - Retirement and HBS."

Benefits

There were no changes to the plan provisions during the past year. The current benefit provisions are outlined in the section titled "Summary of Benefit Provisions - Retirement and HBS."

Funding Policy and Objectives

The financial objectives of the Plan are to: (1) maintain reasonably stable contribution rates, and (2) achieve an ultimate funded status of 100%. In order to achieve these objectives, the Board has adopted a closed 25-year amortization period with level percent of pay payments for the 401(a) portion of the Plan. Furthermore, the Board made the policy decision to phase in the impact to the contribution of the assumption changes over a five year period. This policy provides for a smooth transition to the ultimate contribution rates over a reasonable period of time.

GRS

Board of Trustees
October 13, 2020
Page 3

The actuarial valuation includes a calculation of the contribution rates payable by members and participating employers. These rates, when applied to payroll, yield contribution amounts sufficient to fund the normal cost plus the amortization of the unfunded actuarial accrued liability. Contribution rates are set annually, based on the valuation of the preceding year. The rate calculated in this report for the 401(a) benefits (23.69% of payroll) will apply in the fiscal year beginning July 1, 2020. The rate calculated as part of the prior valuation (23.39% of payroll) applied in the fiscal year that began July 1, 2019. Employers and employees share equally in the combined 401(a) and 410(h) contribution rate determined as part of the valuation.

The unfunded actuarial accrued liability (UAAL) of ASRS for the 401(a) benefits increased from $15.56 billion as of June 30, 2018 to $15.68 billion as of June 30, 2019. Additionally, the funded ratio of ASRS for the 401(a) benefits—actuarial value of assets divided by the actuarial accrued liability—increased from 70.4% to 71.3% as of June 30, 2019. The funded status is one of many metrics used to show trends and develop future expectations about the health of a retirement system. The funded status measure itself is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations or assessing the need for or the amount of future contributions since it does not reflect normal cost contributions, the timing of amortization payments, or future experience other than expected.

Certification

All of our work conforms with generally accepted actuarial principles and practices, and to the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of, where applicable, the Governmental Accounting Standards Board, the Internal Revenue Code and ERISA.

The signing actuaries are independent of the plan sponsor. Ryan Falls and Joe Newton are Enrolled Actuaries, Fellows of the Society of Actuaries, and Members of the American Academy of Actuaries and Paul Wood is an Associate of the Society of Actuaries and a Member of the American Academy of Actuaries. All three meet the Qualification Standards of the American Academy of Actuaries. Finally, each of the undersigned are experienced in performing valuations for large public retirement systems.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

R. Ryan Falls, FSA, EA, MAAA
Senior Consultant

Joseph P. Newton, FSA, EA, MAAA
Senior Consultant

Paul T. Wood, ASA, FCA, MAAA
Consultant

P: 469.524.0000 | www.grsconsulting.com

October 13, 2020

Board of Trustees
Arizona State Retirement System
3300 North Central Avenue, 14th Floor
Phoenix, Arizona 85012

Re: Arizona State Retirement System Actuarial Certification for 401(h) Portion of the Plan

Members of the Board:

At the request of the Arizona State Retirement System (ASRS), Gabriel Roeder Smith & Company (GRS) has performed the actuarial valuation of the benefits associated with the 401(h) (Health Benefit Supplement) portion of the ASRS defined benefit pension plan (the Plan). The information in the Actuarial Section is based on our annual actuarial valuation reports, with the most recent valuations conducted as of June 30, 2019, and is intended to be used in conjunction with the full reports.

This letter and the schedules listed below represent GRS' certification of the funded status as required for the financial report for the fiscal year ended June 30, 2020. GRS prepared the following schedules (information prior to 2016 was provided by ASRS):

- Exhibit F-27: Net OPEB Liability (Asset) of Employers - HBS
- Exhibit F-31: Discount Rate Sensitivity
- Exhibit F-36: Schedule of Changes in the Net OPEB Liability - HBS
- Exhibit F-37: Schedule of Net OPEB Liability - HBS
- Exhibit F-38: Schedule of Employer Contributions - HBS
- Exhibit A-16: Schedule of Retirees Added to and Removed from Rolls - HBS
- Exhibit A-17: Schedule of Funding Progress - Retirement and HBS
- Exhibit A-19: Solvency Test - HBS
- Exhibit A-21: Analysis of Financial Experience - HBS

Data

The valuation was based upon information as of June 30, 2019, furnished by ASRS staff, concerning system benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by ASRS staff.

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Board of Trustees
October 13, 2020
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Actuarial Assumptions and Methods

The assumptions and methods applied in this actuarial valuation were adopted by the Board of Trustees on October 27, 2017 based on the Report on the Actuarial Experience Study covering a five-year period from July 1, 2011 to June 30, 2016, dated October 18, 2017. The notable assumption and method changes first reflected in the June 30, 2017 actuarial valuation include:

- Changing the actuarial cost method to the Entry Age Normal actuarial cost method,
- Lowering nominal investment return assumption to 7.50%,
- Establishing an explicit administrative expense assumption of 0.25% of payroll, and
- Updating the healthy retiree mortality to the 2017 State Retirees of Arizona mortality table with generational mortality improvements using the Ultimate MP scales.

We believe the assumptions are internally consistent and are reasonable, based on the actual experience of ASRS. Furthermore, the assumptions and methods used for funding purposes meet the parameters set by Actuarial Standards of Practice.

The results of the actuarial valuation are dependent upon the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. A review of the impact of a different set of assumptions on the funded status of ASRS is outside the scope of this actuarial valuation.

The current actuarial assumptions are outlined in the section titled "Statement of Actuarial Methods and Assumptions - Retirement and HBS."

Benefits

There were no changes to the plan provisions during the past year. The current benefit provisions are outlined in the section titled "Summary of Benefit Provisions - Retirement and HBS."

Funding Policy and Objectives

The financial objectives of the Plan are to: (1) maintain reasonably stable contribution rates, and (2) achieve an ultimate funded status of 100%. In order to achieve these objectives, the Board has adopted a closed 15-year amortization period with level percent of pay payments for the 401(h) portion of the Plan. Furthermore, the Board made the policy decision to phase in the impact to the contribution of the assumption changes over a five year period. This policy provides for a smooth transition to the ultimate contribution rates over a reasonable period of time.

The actuarial valuation includes a calculation of the contribution rates payable by members and participating employers. These rates, when applied to payroll, yield contribution amounts sufficient to fund the normal cost plus the amortization of the unfunded actuarial accrued liability. Contribution rates are set annually, based on the valuation of the preceding year. The rate calculated in this report for the 401(h) benefits (0.39% of payroll) will apply in the fiscal year beginning July 1, 2020. The rate calculated as part of the prior valuation (0.49% of payroll) applied in the fiscal year that began July 1, 2019.

Board of Trustees
October 13, 2020
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Employers and employees share equally in the combined 401(a) and 410(h) contribution rate determined as part of the valuation.

The unfunded actuarial accrued liability (UAAL) of ASRS for the 401(h) benefits decreased from $21.8 million as of June 30, 2018 to a $125.5 million surplus as of June 30, 2019. Additionally, the funded ratio of ASRS for the 401(h) benefits—actuarial value of assets divided by the actuarial accrued liability—increased from 98.7% to 108.0% as of June 30, 2019. The funded status is one of many metrics used to show trends and develop future expectations about the health of a retirement system. The funded status measure itself is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations or assessing the need for or the amount of future contributions since it does not reflect normal cost contributions, the timing of amortization payments, or future experience other than expected.

Certification

All of our work conforms with generally accepted actuarial principles and practices, and to the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of, where applicable, the Governmental Accounting Standards Board, the Internal Revenue Code and ERISA.

The signing actuaries are independent of the plan sponsor. Ryan Falls and Joe Newton are Enrolled Actuaries, Fellows of the Society of Actuaries, and Members of the American Academy of Actuaries and Paul Wood is an Associate of the Society of Actuaries and a Member of the American Academy of Actuaries. All three meet the Qualification Standards of the American Academy of Actuaries. Finally, each of the undersigned are experienced in performing valuations for large public retirement systems.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

R. Ryan Falls, FSA, EA, MAAA
Senior Consultant

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Senior Consultant

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Consultant

Funding Adequacy

The financial objectives of the Plan are to: (1) maintain reasonably stable contribution rates, and (2) achieve an ultimate funded status of 100%. In order to achieve these objectives, the ASRS Board has adopted a closed 25-year amortization period with level percent of pay payments for the 401(a) portion of the plan and a 15-year period for the 401(h) portion. Furthermore, the ASRS Board made the policy decision in 2017 to phase in the impact to the contribution of the assumption changes over a five-year period beginning with fiscal year 2019. This policy provides for a smooth transition to the ultimate contribution rates over a reasonable period of time.

The actuarial valuation includes a calculation of the contribution rates payable by members and participating employers. These rates, when applied to payroll, yield contribution amounts sufficient to fund the normal cost plus the amortization of the unfunded actuarial accrued liability. Contribution rates are set annually, based on the valuation of the preceding year. The rate calculated in this report (24.08% of payroll) will apply in the fiscal year beginning July 1, 2020. The rate calculated as part of the prior valuation (23.88% of payroll) applied in the fiscal year that began July 1, 2019. Employers and employees share equally in the contribution rate determined as part of the valuation.

The unfunded actuarial accrued liability (UAAL) of the ASRS decreased from $15,583 million as of June 30, 2018, to $15,559 million as of June 30, 2019. Additionally, the funded ratio of the ASRS – actuarial value of assets divided by the actuarial accrued liability – increased from 71.2% as of June 30, 2018, to 72.3% as of June 30, 2019.

As of fiscal year 2008, statutory changes require annual actuarial valuations, not the biannual valuation required by a prior statutory change effective in 1998. The rates determined by the Plan, System and HBS (combined) valuations do not include contributions to the LTD program.

Asset Valuation

The ASRS actuary determines the actuarial value of assets by recognizing investment gains and losses over a 10-year period. The gradual recognition of investment gains and losses reduces volatility in the year-to-year level of contribution rates.

Actuarial Schedules

A copy of the June 30, 2019, actuarial valuation report is available at our website, https://azasrs.gov.

Please reference Exhibit F-34 Schedule of Employer Contributions - Retirement in the Required Supplementary Information for a history of actuarially determined and actual contributions for the last 10 years.

The Arizona State Retirement System makes provision for the retirement, disability, and death and survivor benefits to all employees of the State, instrumentalities of the State and certain political subdivisions. Please refer to the Financial Section of this report for an in-depth discussion of plan provisions. The major provisions of the Plan may be summarized as follows:

A. Retirement Benefits

1. Normal Retirement Eligibility

The earliest of the following:

Exhibit A-1: Normal Retirement

Requirement	Hired before Jan. 1, 1984	Hired between Jan. 1, 1984 and June 30, 2011	Hired after July 1, 2011
80 Points (Age + credited years of service)	✔	✔	
Age 55 + 30 years of credited service			✔
Age 60 + 25 years of credited service			✔
Age 62 + 10 years of credited service	✔	✔	✔
Age 65	✔	✔	✔

2. Average Monthly Compensation

The average of the highest consecutive 36 months in the last 120 months for a member whose membership commences before July 1, 2011, and the average of the highest consecutive 60 months in the last 120 months for a member whose membership commences on or after July 1, 2011. Members who commenced membership prior to 1984 can use a 60-month average and include additional types of compensation if doing so produces a larger result.

Exhibit A-2: Benefit Multiplier

Years of Credited Service	Benefit Multiplier
Less than 20	2.10 %
20.0 to 24.99	2.15 %
25.0 to 29.99	2.20 %
30 or more	2.30 %

3. Normal Retirement Benefits

The product of the Benefit Multiplier, the member's Average Monthly Compensation, and years of total credited service and any prior service benefits to which the member was entitled under the System.

4. Early Retirement Eligibility

Age 50 with five or more years of credited service.

5. Early Retirement Benefits

Normal Retirement Benefit reduced according to the following table:

Exhibit A-3: Early Retirement Benefit Reduction Rates, Members Hired before July 1, 2011

	Age At Date Of Retirement															
Years of Service	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
5-9.99	35 %	40 %	45 %	50 %	55 %	60 %	65 %	70 %	75 %	80 %	85 %	88 %	91 %	94 %	97 %	100 %
10-17.99	44 %	49 %	54 %	59 %	64 %	69 %	74 %	79 %	84 %	89 %	94 %	97 %	100 %	100 %	100 %	100 %
18	44 %	49 %	54 %	59 %	64 %	69 %	74 %	79 %	84 %	91 %	94 %	97 %	100 %	100 %	100 %	100 %
19	44 %	49 %	54 %	59 %	64 %	69 %	74 %	79 %	91 %	94 %	97 %	100 %	100 %	100 %	100 %	100 %
20	50 %	55 %	60 %	65 %	70 %	75 %	80 %	91 %	94 %	97 %	100 %	100 %	100 %	100 %	100 %	100 %
21	50 %	55 %	60 %	65 %	70 %	75 %	91 %	94 %	97 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
22	50 %	55 %	60 %	65 %	70 %	91 %	94 %	97 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
23	50 %	55 %	60 %	65 %	91 %	94 %	97 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
24	50 %	55 %	60 %	91 %	94 %	97 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
25	50 %	55 %	91 %	94 %	97 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
26	50 %	91 %	94 %	97 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
27	91 %	94 %	97 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
28	94 %	97 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
29	97 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
30+	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %

If a member has at least 77 points, but less than 80 points, the reduction will be 3% for each unit below 80 for members hired before July 1, 2011.

Exhibit A-4: Early Retirement Benefit Reduction Rates, Members Hired on or after July 1, 2011

	Age At Date Of Retirement															
Years of Service	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
5-9.99	35 %	40 %	45 %	50 %	55 %	60 %	65 %	70 %	75 %	80 %	85 %	88 %	91 %	94 %	97 %	100 %
10-24.99	44 %	49 %	54 %	59 %	64 %	69 %	74 %	79 %	84 %	89 %	94 %	97 %	100 %	100 %	100 %	100 %
25-29.99	44 %	49 %	54 %	59 %	64 %	69 %	74 %	79 %	84 %	89 %	100 %	100 %	100 %	100 %	100 %	100 %
30+	44 %	49 %	54 %	59 %	64 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %

6. Forms of Payment

The normal form of payment is a benefit payable for the life of the member with any remaining member account balance paid at time of death. Joint and contingent, period certain and partial lump sum options are available on an actuarially equivalent basis.

7. Minimum Benefit

The minimum monthly benefit payable to a retired member who is at least age 75 and who has 20 or more years of service is $600.

B. Vesting of Benefits

1. Eligibility

A member is fully vested in his or her accrued benefit.

2. Benefits

Exhibit A-5: Benefits for Vested Members

A fully vested member is entitled to either:

Type of Benefit	Members Who Are Eligible
Enhanced Refund Option	Members hired before July 1, 2011, OR members hired on or after July 1, 2011 that are terminated due to Employer Reduction in Force or position elimination.
Refund Option	Members hired on or after July 1, 2011
Retirement	Members who have reached normal retirement at the date of a member's termination.

The enhanced refund option allows members who terminate prior to eligibility for retirement to receive a refund of their member contributions with interest. In addition, if a member has at least five years of service, he or she is also entitled to a share of the employer contributions with interest. The share is 25% for members with five years of service and increases 15% for each additional year of service up to a maximum of 100% for 10 or more years of service. The ASRS Board reduced the interest rate to be credited on refund of contributions from 8% to 4%, effective June 30, 2005, and from 4% to 2% effective June 30, 2013.

The refund option is the same as the enhanced refund option except it does not include any shares of the employer contributions with interest.

C. Disability Benefits (for disability after June 30, 1988)

1. Long Term Disability Benefit

Monthly benefit equal to two-thirds of monthly compensation, reduced by percentages of other income received payable commencing six months after date of disability until the earlier of:

- Date of cessation of total disability, or
- Normal retirement date.

This benefit is paid by the separate LTD plan.

2. Disability Payments if Member Remains Disabled Through Normal Retirement Date

Monthly benefit member would have received if service had continued to normal retirement date assuming the member's salary remained at the level it was at his or her date of disability, also provided that the amount of total credited service is limited to 30 years unless he or she had more than 30 years at date of disability.

3. Minimum Benefit

The minimum monthly benefit payable to a disabled participant is $50.

D. Pre-Retirement Death Refund Alternative

1. Eligibility

Death prior to retirement.

2. Benefits

Any one of the following, at the option of the beneficiary:

Exhibit A-6: Pre-Retirement Death Refund Alternatives

Type of Benefit	Description
Lump Sum	Equals the sum of a) the sum of the member's combined (member and employer) accumulated contribution balance with compound interest at a rate determined by the board through the day of the payment of the benefit, and b) the amount of the member's combined (member and employer) accumulated account, along with any supplemental credits transferred from the System to the Plan with compound interest at a rate determined by the board through the day of the payment of the benefit.
Retirement	The beneficiary may elect to receive a monthly income, in the single life form, which is actuarially equivalent to the lump sum above.

E. Health Insurance Premium Benefit Supplement (HBS)

1. Eligibility

Retirement or disability after five years of credited service and covered by an employer-sponsored group insurance program for which the retired or disabled member must pay part of the cost. Members who elect a refund option are not eligible for this benefit.

2. Benefits

The benefit is payable only with respect to allowable health insurance premiums for which the member is responsible. The maximum benefits for members with 10 or more years of credited service are:

Exhibit A-7: Premium Benefits, Members with 10 Years of Service

Monthly Premium Benefit Payable	Coverage
$ 150	Member Under 65
$ 100	Member 65 or Over
$ 260	Member and Dependents Under 65
$ 170	Member and Dependents 65 or Over
$ 215	Member Over 65, Dependents Under 65
$ 215	Member Under 65, Dependents Over 65

For members with five to nine years of service, the benefits are the same dollar amounts as above multiplied by a vesting fraction equal to 10% for each completed year of service (i.e., 50% to 90%).

F. Automatic Benefits Adjustments Based on Excess Investment Earnings

1. Permanent Benefit Increase (PBI)

Retirees who have been retired one year are eligible for a PBI up to a maximum of a 4% increase. The PBI is paid from a reserve of "Excess Investment Earnings." If there are no "Excess Investment Earnings" in reserve, then no PBI is paid.

2. Permanent Benefit Increase Enhancement (Enhanced PBI)

Provides retired members with at least 10 years of service who have been retired five or more years an additional benefit. For each complete five-year period the member has been retired, an incremental benefit is paid if monies to pay the benefit are available. This benefit is funded by an interest credit of 8.0% of the reserve for future PBIs.

PBI and enhanced PBI benefits are reflected in the valuation as soon as they are awarded.

Due to legislation enacted in the 2013 legislative session, PBIs and enhanced PBIs will not be awarded to members hired on or after September 13, 2013.

G. Employee and Employer Contributions

The contribution rate for the fiscal year beginning on July 1 is based on the results of the most recent actuarial valuation as of the last day of the preceding plan year. The member's contribution rate is equal to the required employer contribution rate. The contribution rate for fiscal year 2020 is 11.94% for each member and each employer, based on the 2018 actuarial valuation. The member's contribution rate for fiscal year 2021 will be 12.04% based on this valuation. Interest was credited at 8%, until it was lowered to 4% beginning July 1, 2005, and subsequently lowered again to 2% from July 1, 2013, for return of contributions upon withdrawal.

Please reference Exhibit F-38 Schedule of Employer Contributions – HBS in the Required Supplementary Information for a history of actuarially determined and actual contributions for the last 10 years.

The assumptions and methods applied in this actuarial valuation were adopted by the Board of Trustees on October 27, 2017, based on the Report on the Actuarial Experience Study covering a five-year period from July 1, 2011, to June 30, 2016, dated October 18, 2017.

The ASRS retained Gabriel Roeder Smith & Company for its June 30, 2019, and June 30, 2018, funding valuations.

A. Valuation Date

The valuation date is June 30 of each year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

B. Actuarial Cost Method

The actuarial valuation uses the Entry Age Normal actuarial cost method. Under this method, the total contribution rate is the sum of (i) the normal cost rate, and (ii) a rate that will amortize the unfunded actuarial liability.

The valuation is prepared on the projected benefit basis. The present value of each participant's expected benefit payable at retirement or termination is determined, based on age, service, sex, compensation, and the interest rate assumed to be earned in the future (7.5%). The calculations take into account the probability of a participant's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his terminating with a service benefit. Future salary increases are also anticipated. The present value of the expected benefits payable on account of the active participants is added to the present value of the expected future payments to retired participants and beneficiaries to obtain the present value of all expected benefits payable from the Plan on account of the present group of participants and beneficiaries.

The contributions required to support the benefits of the Plan are determined following a level funding approach and consist of a normal cost contribution and an unfunded accrued liability contribution, plus a component to cover administrative expenses.

The normal contribution is determined using the Entry Age Normal method. Under this method, a calculation is made to determine the average uniform and constant percentage rate of employer contribution, which if applied to the compensation of each new participant during the entire period of his anticipated covered service, would be required in addition to the contributions of the participant to meet the cost of all benefits payable on their behalf.

The unfunded accrued liability contributions are determined by subtracting the actuarial value of assets from the actuarial accrued liability. Amortization bases are established each year and amortized based on the funding policy. The current year amortization base is determined by taking the current unfunded liability less the outstanding amounts of prior year bases.

C. Actuarial Value of Assets

The actuarial value of assets is based on the market value of assets with a ten-year phase-in of actual investment return in excess of (less than) expected investment income. Offsetting unrecognized gains and losses are immediately recognized, with the shortest remaining bases recognized first and the net remaining bases continue to be recognized on their original timeframe. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of investment-related expenses. In no event will this amount exceed 130% of market value or be less than 70% of market value.

D. Actuarial Assumptions

1. Investment Return

The investment return rate is 7.50% per year, net of administrative and investment-related expenses (composed of an assumed 2.30% inflation rate and a 5.20% real rate of return). This rate is the same as the rate used to discount the actuarial accrued liability.

2. Mortality Decrements

Service Retirees, Beneficiaries, and Inactive Members

Rates are based on the 2017 State Retirees of Arizona (SRA) mortality table. Generational mortality improvements in accordance with the Ultimate MP (U-MP) scales are projected from the year 2017.

Disability Retirees

Rates are based on the RP-2014 Disabled Retiree Mortality. Generational mortality improvements in accordance with the Ultimate MP scales are projected from the year 2014.

Active Members

Rates are based on the RP-2014 Active Member Mortality table. Generational mortality improvements in accordance with the U-MP scales are projected from the year 2014.

Exhibit A-8: Mortality Decrements

	Males			Females		
Age	Non-disabled	Disabled	Employee	Non-disabled	Disabled	Employee
20	0.000386	0.006762	0.000386	0.000154	0.002122	0.000154
25	0.000461	0.008061	0.000460	0.000165	0.002266	0.000165
30	0.000430	0.007527	0.000430	0.000208	0.002856	0.000207
35	0.000497	0.008710	0.000497	0.000272	0.003746	0.000272
40	0.000597	0.010458	0.000597	0.000376	0.005187	0.000377
45	0.000925	0.016204	0.000925	0.000624	0.008606	0.000625
50	0.001603	0.019395	0.001603	0.001048	0.011323	0.001048
55	0.002651	0.022224	0.002651	0.001591	0.013769	0.001591
60	0.004400	0.025300	0.004458	0.002322	0.016166	0.002322
65	0.007799	0.030132	0.007871	0.004814	0.019838	0.003515
70	0.013823	0.038369	0.013175	0.009026	0.026821	0.006000
75	0.024502	0.051626	0.022052	0.016919	0.039033	0.010240
80	0.043429	0.072861	0.036909	0.031717	0.058045	0.017479

3. Salary Increases

A select-and-ultimate salary scale made up of a merit component and general salary increase component as follows:

Exhibit A-9: Salary Increases

Years of Service	Merit Component	Total Salary Increase[1]
0	4.50 %	7.20 %
1	3.50 %	6.20 %
2	2.75 %	5.45 %
3	2.25 %	4.95 %
4	2.00 %	4.70 %
5	1.75 %	4.45 %
6	1.50 %	4.20 %
7	1.10 %	3.80 %
8	1.00 %	3.70 %
9	0.90 %	3.60 %
10	0.80 %	3.50 %
11	0.70 %	3.40 %
12	0.60 %	3.30 %
13	0.50 %	3.20 %
14	0.40 %	3.10 %
15	0.30 %	3.00 %
16	0.20 %	2.90 %
17	0.20 %	2.90 %
18	0.10 %	2.80 %
19	— %	2.70 %
20 or more	— %	2.70 %

[1] Total salary increase rate is equal to wage inflation (or growth) rate (2.70%) plus merit component.

4. Disability Rates

Exhibit A-10: Disability Retirement Decrements

Age	Annual Unisex Rates per 100 Members
20	0.0454
25	0.0502
30	0.0606
35	0.0925
40	0.1468
45	0.2271
50	0.3384
55	0.3970
60	0.4317

5. Termination Decrements for Reasons Other Than Death or Retirement

Termination rates for members not eligible for service retirement, based on years of completed service (rates are zero for members eligible for service retirement):

Exhibit A-11: Rate of Decrement Due to Withdrawal Based on Years of Completed Service

	Entry Age Less Than or Equal to 35		Entry Age Greater Than 35	
Year of Service	Males	Females	Males	Females
0	23.00 %	24.30 %	17.50 %	21.10 %
1	18.80 %	20.00 %	14.80 %	17.40 %
2	15.70 %	16.90 %	12.60 %	14.60 %
3	13.60 %	14.70 %	11.00 %	12.60 %
4	11.90 %	13.00 %	9.80 %	11.10 %
5	10.50 %	11.70 %	8.80 %	9.90 %
6	9.40 %	10.50 %	8.00 %	8.80 %
7	8.40 %	9.50 %	7.20 %	7.90 %
8	7.50 %	8.60 %	6.60 %	7.10 %
9	6.70 %	7.80 %	6.00 %	6.40 %
10	6.00 %	7.00 %	5.50 %	5.70 %
11	5.30 %	6.40 %	5.10 %	5.10 %
12	4.70 %	5.80 %	4.60 %	4.60 %
13	4.20 %	5.20 %	4.20 %	4.10 %
14	3.70 %	4.70 %	3.80 %	3.60 %
15	3.20 %	4.20 %	N/A	N/A
16	2.70 %	3.70 %	N/A	N/A
17	2.30 %	3.30 %	N/A	N/A
18	1.90 %	2.90 %	N/A	N/A
19	1.50 %	2.50 %	N/A	N/A
20+	1.10 %	2.10 %	N/A	N/A

6. Service Retirement Decrements

Select-and-ultimate retirement rates are used. Rates at representative ages and years of service are shown on the following schedules.

Exhibit A-12: Retirement Rates - Members Hired before July 1, 2011

	Years of Service					
Age	5	10	15	20	25	30
50	6.00 %	6.00 %	6.00 %	6.00 %	6.00 %	25.00 %
55	7.00 %	7.00 %	7.00 %	7.00 %	20.00 %	25.00 %
60	10.00 %	10.00 %	10.00 %	20.00 %	15.00 %	25.00 %
62	15.00 %	25.00 %	25.00 %	25.00 %	25.00 %	25.00 %
65	30.00 %	30.00 %	30.00 %	30.00 %	30.00 %	25.00 %
70	25.00 %	27.50 %	25.00 %	25.00 %	25.00 %	25.00 %
75	27.50 %	27.50 %	27.50 %	27.50 %	27.50 %	25.00 %
80	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %

Exhibit A-13: Retirement Rates - Members Hired on or after July 1, 2011

	Years of Service						
Age	5	10	15	20	25	30	35
50	6.00 %	6.00 %	6.00 %	6.00 %	6.00 %	6.00 %	6.00 %
55	7.00 %	7.00 %	7.00 %	7.00 %	7.00 %	50.00 %	90.00 %
60	10.00 %	10.00 %	10.00 %	10.00 %	40.00 %	65.00 %	25.00 %
62	15.00 %	25.00 %	25.00 %	25.00 %	40.00 %	25.00 %	25.00 %
65	30.00 %	30.00 %	30.00 %	30.00 %	30.00 %	25.00 %	25.00 %
70	25.00 %	27.50 %	25.00 %	25.00 %	25.00 %	25.00 %	25.00 %
75	27.50 %	27.50 %	27.50 %	27.50 %	27.50 %	25.00 %	25.00 %
80	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %

7. Withdrawal of Employee Contributions

Active members that terminate with a vested benefit are assumed to choose the most valuable option available to them at the time of termination and deferred vested members are assumed to choose the most valuable option available to them at the time of earliest retirement. The options to choose from are a withdrawal of contributions or deferred annuity. If the member is assumed to elect the enhanced refund option, then it is also assumed that the member forfeits the health insurance premium supplement.

8. Future Retirees Eligible for the Health Insurance Premium Benefit Supplement (HBS)

It is assumed that 60% of future retirees will be eligible to receive the post-retirement health insurance premium supplement and that 40% of those retirees will elect the dependent premium supplement. These assumptions also apply to members who have been retired less than one year and did not elect a health insurance premium supplement.

9. Beneficiary Characteristics

It is assumed that 100% of the members are married. It is also assumed that the husband is three years older than the wife.

10. Census Data and Assets

- The valuation was based on members of ASRS as of June 30, 2019, and does not take into account future members.
- All census data was supplied by ASRS and was subject to reasonable consistency checks.
- There were data elements that were modified for some members as part of the valuation in order to make the data complete. However, the number of missing data items was immaterial.
- Asset data was supplied by ASRS.

11. Other Actuarial Valuation Procedures

- No provision was made in this actuarial valuation for the limitations of Internal Revenue Code § 415. Additionally, Internal Revenue Code § 401(a)17 limits were applied to individual salaries. The limit for 2019 is $280,000 and is assumed to increase annually at the inflation rate.
- Members who elect a single life annuity are assumed to receive accumulated benefit payments equal to their contributions after three years of being in receipt. All beneficiaries of pre-retirement deaths are assumed to elect a return of contributions and not elect 401(h) benefits. Valuation payroll (earnings applied to the current valuation year) is the expected payroll for the fiscal year following the valuation date.
- A load of 0.174% has been added to the non-retired 401(a) liabilities to account for the election of optional forms other than a single life annuity.
- The past service contribution rate is adjusted to consider alternate contribution rate payments. The amortization amount is reduced by the anticipated amount of alternate contributions, adjusted for interest. Contribution rates are increased by ½ of a year's interest to reflect the fact that contributions are made throughout the fiscal year and are further adjusted to reflect the one year lag.
- Future Permanent Benefits are assumed to be 0.30% per year. In an effort to support contribution stability, assumed PBIs are accumulated across successive valuations and reduced when actual PBIs are paid.

Exhibit A-14: Schedule of Active Member Valuation Data - Retirement

Last 10 Years

Valuation as of June 30,	Number of Participating Employers	Active Members	Annual Payroll	Contributing Active Members: Annual Average Pay	Contributing Active Members: Increase in Average Pay
2019	564	208,244	$ 10,340,300,426	$ 49,655	3.7%
2018	568	207,119	9,921,214,513	47,901	2.8%
2017	574	206,055	9,598,270,045	46,581	2.7%
2016	578	204,162	9,263,859,477	45,375	1.7%
2015	577	203,252	9,072,376,682	44,636	1.8%
2014	585	203,201	8,908,620,792	43,841	1.5%
2013	585	202,693	8,752,783,004	43,182	(0.7%)
2012	593	203,994	8,868,678,184	43,475	0.3%
2011	595	208,939	9,060,630,604	43,365	(1.7%)
2010	599	213,530	9,419,951,810	44,115	(0.2%)

Exhibit A-15: Schedule of Retirees Added to and Removed from Rolls - Retirement

Last 10 Years

Valuation as of June 30,	Retirees and Beneficiaries Added to Rolls: No.	Retirees and Beneficiaries Added to Rolls: Annual Allowances	Retirees and Beneficiaries Removed from Rolls: No.	Retirees and Beneficiaries Removed from Rolls: Annual Allowances	Retiree and Beneficiary Rolls End of Year: No.	Retiree and Beneficiary Rolls End of Year: Annual Allowances [1]	% Increase in Annual Allowance	Average Annual Allowances
2019	8,746	$ 179,217,085	3,824	$ 58,010,878	151,878	$ 3,080,541,474	4.1 %	$ 20,283
2018	8,651	174,489,286	3,812	59,196,232	146,956	2,959,335,267	4.1 %	20,138
2017	9,616	200,106,997	3,525	56,592,938	142,117	2,844,042,213	5.3 %	20,012
2016	7,887	155,932,683	3,397	54,560,473	136,026	2,700,528,154	3.9 %	19,853
2015	8,695	169,138,375	3,414	52,490,287	131,536	2,599,155,944	4.7 %	19,760
2014	8,385	160,478,869	3,005	45,575,405	126,255	2,482,507,856	4.9 %	19,663
2013	9,489	175,974,484	3,045	47,326,711	120,875	2,367,604,392	5.7 %	19,587
2012	9,227	171,972,274	2,792	41,695,405	114,431	2,238,956,619	6.2 %	19,566
2011	9,288	179,066,507	2,599	38,511,310	107,996	2,108,679,750	7.1 %	19,526
2010	9,360	176,419,906	2,477	35,666,261	101,307	1,968,124,553	7.7 %	19,427

[1] Includes PBIs

Exhibit A-16: Schedule of Retirees Added to and Removed from Rolls - HBS

Last 10 Years

Valuation as of June 30,	Retirees and Beneficiaries Added to Rolls		Retirees and Beneficiaries Removed from Rolls		Retiree and Beneficiary Rolls End of Year		% Change in Annual Allowances	Average Annual Allowances
	No.	Annual Allowances	No.	Annual Allowances	No.	Annual Allowances		
2019	9,033	$ 11,122,032	6,294	$ 20,892,748	83,936 [7]	$ 99,239,650	(9.0)%	1,182
2018	8,250	17,966,659	8,315	14,688,189	81,197 [6]	109,010,366	3.1 %	1,343
2017	9,895	17,824,796	5,831	11,688,084	81,262 [5]	105,731,896	6.2 %	1,301
2016	8,132	12,166,768	2,430	10,554,272	77,198 [4]	99,595,184	1.6 %	1,290
2015	7,429	15,954,804	3,119	7,965,132	71,496 [3]	97,982,688	8.9 %	1,370
2014	5,609	8,620,656	3,350	8,597,436	67,186 [2]	89,993,016	— %	1,339
2013	5,861	9,434,508	4,159	9,127,908	64,927 [1]	89,969,796	0.3 %	1,386
2012	5,867	9,754,788	3,285	8,936,184	63,225	89,663,196	0.9 %	1,418
2011	6,047	10,459,392	3,199	7,707,744	60,643	88,844,592	3.2 %	1,465
2010	5,689	10,358,376	2,647	6,487,680	57,795	86,092,944	4.7 %	1,490

[1] Includes 627 System members receiving HBS benefits and 1,516 members receiving LTD benefits and HBS benefits.

[2] Includes 608 System members receiving HBS benefits and 1,383 members receiving LTD benefits and HBS benefits.

[3] Includes 595 System members receiving HBS benefits and 1,280 members receiving LTD benefits and HBS benefits.

[4] Includes 562 System members receiving HBS benefits and 1,110 members receiving LTD benefits and HBS benefits.

[5] Includes 526 System members receiving HBS benefits and 1,003 members receiving LTD benefits and HBS benefits.

[6] Includes 379 System members receiving HBS benefits and 622 members receiving LTD benefits and HBS benefits.

[7] Includes 468 System members receiving HBS benefits and 802 members receiving LTD benefits and HBS benefits.

Exhibit A-17: Schedule of Funding Progress - Retirement and HBS

Last 10 Years

Year Ended June 30,	Actuarial Value of Assets (a)	Actuarial Accrued Liabilities (AAL) (b)	Unfunded Actuarial Accrued Liabilities (UAAL) (b - a)	Assets as a % of Accrued Liabilities (a / b)	Covered Payroll (c)	UAAL as a % of Covered Payroll ((b - a) / c)
2019	$ 40,568,589,169	$ 56,127,566,734	$ 15,558,977,565	72.3 %	$ 10,340,300,426	150.5 %
2018	38,592,895,025	54,176,737,273	15,583,842,248	71.2 %	9,921,214,513	157.1 %
2017	36,806,856,334	52,189,000,274	15,382,143,940	70.5 %	9,598,270,045	160.3 %
2016	35,761,373,386	46,104,924,533	10,343,551,147	77.6 %	9,263,859,477	111.7 %
2015	34,559,692,891	44,573,559,015	10,013,866,124	77.5 %	9,072,376,682	110.4 %
2014	32,922,116,667	42,826,013,931	9,903,897,264	76.9 %	8,908,620,792	111.2 %
2013	31,435,228,262	41,396,575,487	9,961,347,225	75.9 %	8,752,783,004	113.8 %
2012	30,229,577,272	39,952,371,191	9,722,793,919	75.7 %	8,868,678,184	109.6 %
2011	29,230,960,267	38,555,369,013	9,324,408,746	75.8 %	9,060,630,604	102.9 %
2010	28,823,144,688	37,557,862,066	8,734,717,378	76.7 %	9,419,951,810	92.7 %

Exhibit A-18: Solvency Test - Retirement

Last 10 Years
(Dollars in thousands)

Year Ended June 30, [1]	Aggregate Accrued Liabilities for: Active Member Contributions (1)	Retirees and Beneficiaries (2)	Active Members (Employer Financed Portion) (3)	Actuarial Value of Assets Available for Benefits	Portion of Actuarial Accrued Liabilities Covered by Assets Available for Benefits (1)	(2)	(3)
2019	$ 15,655,837	$ 31,715,911	$ 7,192,644	$ 38,879,899	100 %	73.0 %	— %
2018	13,582,910	30,602,702	8,360,825	36,984,395	100 %	76.0 %	— %
2017	13,581,097	29,520,335	7,517,329	35,268,099	100 %	73.0 %	— %
2016	12,699,054	26,593,567	5,242,387	34,269,819	100 %	81.0 %	— %
2015	11,714,896	25,757,666	5,495,566	33,112,995	100 %	83.1 %	— %
2014	10,780,694	24,689,078	5,879,545	31,547,987	100 %	84.1 %	— %
2013	9,917,301	23,684,427	6,310,027	30,110,633	100 %	85.3 %	— %
2012	9,110,895	21,699,459	7,639,935	28,948,011	100 %	91.4 %	— %
2011	8,374,150	20,541,082	8,135,948	27,983,517	100 %	95.5 %	— %
2010	7,704,329	19,246,476	9,121,715	27,571,999	100 %	100 %	6.8 %

[1] Values shown include System liabilities and assets for members who retired or will retire on or after July 1, 1981.

Exhibit A-19: Solvency Test - HBS

Last 10 Years
(Dollars in thousands)

Year Ended June 30, [1]	Aggregate Accrued Liabilities for: Active Member Contributions (1)	Retirees and Beneficiaries (2)	Active Members (Employer Financed Portion) (3)	Actuarial Value of Assets Available for Benefits	Portion of Actuarial Accrued Liabilities Covered by Assets Available for Benefits (1)	(2)	(3)
2019	$ —	$ 844,745	$ 718,430	$ 1,688,690	100 %	100 %	117.0 %
2018	—	914,372	715,927	1,608,500	100 %	100 %	97.0 %
2017	—	863,850	706,389	1,538,757	100 %	100 %	96.0 %
2016	—	802,949	766,969	1,491,554	100 %	100 %	90.0 %
2015	—	833,902	771,529	1,446,698	100 %	100 %	79.4 %
2014	—	734,450	742,247	1,374,130	100 %	100 %	86.2 %
2013	—	738,731	746,089	1,324,597	100 %	100 %	78.5 %
2012	—	674,713	827,369	1,281,566	100 %	100 %	73.3 %
2011	—	669,593	834,596	1,247,433	100 %	100 %	69.2 %
2010	—	652,876	832,466	1,251,145	100 %	100 %	71.9 %

[1] Values shown include System liabilities and assets for members who retired or will retire on or after July 1, 1981.

Exhibit A-20: Analysis of Financial Experience - Retirement

Last 10 Years

(Dollars in millions)

Year Ended June 30,[4]	Unfunded Actuarial Accrued Liability (UAAL) Prior Year	Normal Cost forthe Year	Contributions for the Year	Interest at 7.5% on UAAL[3]	Interest at 7.5% on Normal Cost[2,3]	Interest at 7.5% on Contributions[3]	Total Interest	Expected UAAL	Actual UAAL	Gain/(Loss) for the Year[1]
2019	$ 15,562.04	$ 1,431.28	$ (2,482.60)	$1,167.15	$ 52.70	$ (91.41)	$1,128.44	$15,639.17	$15,684.49	$ (45.32)
2018	15,350.66	1,383.49	(2,134.66)	1,151.30	102.89	(80.05)	1,174.14	15,773.64	15,562.04	211.60
2017	10,265.19	1,191.16	(2,094.15)	821.22	95.29	(83.77)	832.74	10,194.94	15,350.66	(5,155.72)
2016	9,855.13	1,128.18	(2,028.74)	788.41	90.25	(81.15)	797.52	9,752.08	10,265.19	(513.11)
2015	9,801.33	1,161.38	(2,056.69)	784.11	46.46	(82.27)	748.30	9,654.32	9,855.13	(200.81)
2014	9,801.12	1,143.11	(1,961.18)	784.09	45.72	(78.45)	751.36	9,734.41	9,801.33	(66.92)
2013	9,502.28	1,164.58	(1,859.21)	760.18	93.17	(74.37)	778.98	9,586.63	9,801.12	(214.49)
2012	9,067.66	1,170.47	(1,758.02)	725.41	93.64	(70.32)	748.73	9,228.84	9,502.28	(273.44)
2011	8,500.52	1,215.14	(1,619.79)	680.04	97.21	(64.79)	712.46	8,808.33	9,067.66	(259.33)
2010	7,196.33	1,234.67	(1,571.82)	575.71	98.77	(62.87)	611.61	7,470.79	8,500.52	(1,029.73)

[1] Includes assumption and plan changes.

[2] Middle of year in 2014 and 2015, beginning of year otherwise.

[3] Values in 2017 and prior were valued at 8% interest.

[4] Values shown include System liabilities and assets for members who retired or will retire on or after July 1, 1981.

Exhibit A-21: Analysis of Financial Experience - HBS

Last 10 Years

(Dollars in millions)

Year Ended June 30,[4]	Unfunded Actuarial Accrued Liability or Surplus (UAAL/ UAAS) Prior Year	Normal Cost for the Year	Contributions for the Year	Interest at 7.5% on UAAL[3]	Interest at 7.5% on Normal Cost[2,3]	Interest at 7.5% on Contributions[3]	Total Interest	Expected UAAL	Actual UAAL or (UAAS)	Gain/(Loss) for the Year[1]
2019	$ 21.80	$ 49.89	$ (55.15)	$ 1.63	$ 1.84	$ (2.03)	$ 1.44	$ 17.98	$ (125.51)	$ 143.49
2018	31.48	48.14	(42.23)	2.36	3.58	(1.58)	4.36	41.74	21.80	19.94
2017	78.36	30.87	(51.05)	6.27	2.47	(2.04)	6.70	64.87	31.48	33.39
2016	158.73	30.95	(51.14)	12.70	2.48	(2.05)	13.13	151.67	78.36	73.31
2015	102.57	33.27	(73.56)	8.20	1.33	(2.14)	7.39	69.67	158.74	(89.07)
2014	160.23	34.05	(53.40)	12.82	1.36	(2.14)	12.04	152.92	102.57	50.35
2013	220.51	35.54	(57.16)	17.64	2.84	(2.28)	18.20	217.09	160.23	56.86
2012	256.75	38.42	(54.46)	20.54	3.07	(2.18)	21.43	262.14	220.51	41.63
2011	234.20	40.28	(51.05)	18.74	3.22	(2.04)	19.92	243.35	256.75	(13.40)
2010	186.05	41.88	(59.39)	14.88	3.35	(2.38)	15.85	184.39	234.20	(49.81)

[1] Includes assumption and plan changes.

[2] Middle of year in 2014 and 2015, beginning of year otherwise.

[3] Values in 2017 and prior were valued at 8% interest.

[4] Values shown include System liabilities and assets for members who retired or will retire on or after July 1, 1981.

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October 13, 2020

Board of Trustees
Arizona State Retirement System
3300 North Central Avenue, 14th Floor
Phoenix, Arizona 85012

Re: Arizona State Retirement System Actuarial Certification for the Long Term Disability Program

Members of the Board:

At the request of the Arizona State Retirement System (ASRS), Gabriel Roeder Smith & Company (GRS) has performed the actuarial valuation of the benefits associated with the ASRS Long Term Disability Program (LTD Program) as of June 30, 2019. The information in the Actuarial Section is based on our annual actuarial valuation reports, with the most recent valuations conducted as of June 30, 2019, and is intended to be used in conjunction with the full reports.

This letter and the schedules listed below represent GRS' certification of the funded status as required for the financial report for the fiscal year ended June 30, 2020. GRS prepared the following schedules (information prior to 2016 was provided by ASRS):

- Exhibit F-28: Net OPEB Liability of Employers - LTD
- Exhibit F-31: Discount Rate Sensitivity
- Exhibit F-40: Schedule of Changes in the Net OPEB Liability - LTD
- Exhibit F-41: Schedule of Net OPEB Liability - LTD
- Exhibit F-42: Schedule of Employer Contributions - LTD
- Exhibit A-24: Schedule of Benefit Recipients Added to and Removed from Rolls - LTD
- Exhibit A-25: Schedule of Funding Progress - LTD
- Exhibit A-26: Solvency Test - LTD
- Exhibit A-27: Analysis of Financial Experience - LTD

Data

The valuation was based upon information as of June 30, 2019, furnished by ASRS staff, concerning system benefits, financial transactions, plan provisions, active members, and benefit recipients. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by ASRS staff.

The active member data used for the LTD Program valuation is the same as the active member data used in the June 30, 2019 actuarial valuation of the ASRS Plan.

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Actuarial Assumptions and Methods

The assumptions and methods applied in this actuarial valuation were adopted by the Board of Trustees on October 27, 2017 based on the Report on the Actuarial Experience Study covering a five-year period from July 1, 2011 to June 30, 2016, dated October 18, 2017. The notable assumption and method changes first reflected in the June 30, 2017 actuarial valuation include:

- Changing the actuarial cost method to the Entry Age Normal actuarial cost method,
- Lowering nominal investment return assumption to 7.50%,
- Updating the recovery rates to a version of the 2012 Group Long Term Disability Valuation Table (2012 GLDT)
- Updating the offset methodology for current LTD recipients to assume members will have a minimum offset of 30% within three years of initial receipt of LTD benefits. Offsets due to overpayments will apply until the overpayments are expected to be fully recovered based on the data received from the plan administrator.
- Updating the offset methodology for future LTD recipients such that the benefits, after all applicable offsets, are 60% of the benefits before the offsets.

We believe the assumptions are internally consistent and are reasonable, based on the actual experience of ASRS. Furthermore, the assumptions and methods used for funding purposes meet the parameters set by Actuarial Standards of Practice.

The results of the actuarial valuation are dependent upon the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. A review of the impact of a different set of assumptions on the funded status of ASRS is outside the scope of this actuarial valuation.

The current actuarial assumptions are outlined in the section titled "Statement of Actuarial Methods and Assumptions - LTD."

Benefits

There were no changes to the plan provisions during the past year. The current benefit provisions are outlined in the section titled "Summary of Benefit Provisions - LTD."

Funding Policy and Objectives

The financial objectives of the LTD Program are to: (1) maintain reasonably stable contribution rates, and (2) achieve an ultimate funded status of 100%. In order to achieve these objectives, the Board has adopted a closed 15-year amortization period with level percent of pay payments. Furthermore, the Board made the policy decision to phase in the impact to the contribution of the assumption changes over a five year period. This policy provides for a smooth transition to the ultimate contribution rates over a reasonable period of time.

The actuarial valuation includes a calculation of the contribution rates payable by members and participating employers. These rates, when applied to payroll, yield contribution amounts sufficient to

GRS

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fund the normal cost plus the amortization of the unfunded actuarial accrued liability. Contribution rates are set annually, based on the valuation of the preceding year. The rate calculated in this report (0.36% of payroll) will apply in the fiscal year beginning July 1, 2020. The rate calculated as part of the prior valuation (0.34% of payroll) applied in the fiscal year that began July 1, 2019. Employers and employees share equally in the contribution rate determined as part of the valuation. The primary source of increase in the total contribution rate is the demographic losses on the disabled members which include emerging benefit offsets that are reducing the benefit less than currently assumed in the valuation.

The unfunded actuarial accrued liability (UAAL) of the LTD Program increased from $58.9 million as of June 30, 2018 to $59.9 million as of June 30, 2019. Additionally, the funded ratio—actuarial value of assets divided by the actuarial accrued liability—decreased from 75.8% to 74.8% as of June 30, 2019. The funded status is one of many metrics used to show trends and develop future expectations about the health of an advanced funded program. The funded status measure itself is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations or assessing the need for or the amount of future contributions since it does not reflect normal cost contributions, the timing of amortization payments, or future experience other than expected.

Certification

All of our work conforms with generally accepted actuarial principles and practices, and to the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of, where applicable, the Governmental Accounting Standards Board, the Internal Revenue Code and ERISA.

The signing actuaries are independent of the plan sponsor. Ryan Falls and Joe Newton are Enrolled Actuaries, Fellows of the Society of Actuaries, and Members of the American Academy of Actuaries and Paul Wood is an Associate of the Society of Actuaries and a Member of the American Academy of Actuaries. All three meet the Qualification Standards of the American Academy of Actuaries. Finally, each of the undersigned are experienced in performing valuations for large public retirement systems.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

R. Ryan Falls, FSA, EA, MAAA
Senior Consultant

Joseph P. Newton, FSA, EA, MAAA
Senior Consultant

Paul T. Wood, ASA, FCA, MAAA
Consultant

The ASRS LTD Program began on July 1, 1995. The program covers ASRS LTD Program participants who became disabled on or after July 1, 1995. The ASRS members who were receiving LTD benefits prior to July 1, 1995, were transferred to the program on October 1, 1995. Contributions began July 1, 1995, and are paid 50% by employers and 50% by active members.

Participation

To be eligible, members must be actively at work and engaged to work at least 20 weeks in a fiscal year and at least 20 hours each week. Coverage is contingent on payment of premiums.

Member and Employer Contributions

The contribution rate for the fiscal year beginning on July 1 is based on the results of the most recent actuarial valuation as of the last day of the preceding plan year. The member's contribution rate is equal to the required employer contribution rate. The contribution rate for fiscal year 2020 is 0.17% for each member and each employer, based on the 2018 actuarial valuation.

Monthly Compensation

The member's monthly compensation as of the date of disability is determined based on the contributions remitted to the ASRS.

Qualifications for Benefit

Monthly benefits are not payable until a member has been totally disabled for a period of six consecutive months. Monthly benefits are not payable to a member whose disability is due to the following:

- an intentionally self-inflicted injury,
- war, whether declared or not,
- an injury incurred while engaged in a felonious criminal act or enterprise,
- for employees hired on or after July 1, 1988, any injury, sickness, or pregnancy for which you received medical treatment within three months prior to the effective date coverage began under the LTD Income Plan. Except for any employee who becomes an active contributing member on or after July 1, 2008, and receives medical treatment within six months prior to the date coverage begins under the LTD Income Plan. This exclusion does not apply to a disability commencing after a person has been an active contributing member of a participating employer for twelve continuous months.

Monthly benefits are not payable to a member who is receiving retirement benefits from the ASRS.

Totally Disabled

A member is considered totally disabled if:

- during the first 30 months of a period of disability, the member is unable to perform all duties of the position held by the member when the member became totally disabled; and
- for a member who has received monthly benefits for 24 or more total months, that a member is unable to perform any work for compensation or gain for which the member is reasonably qualified by education, training, or experience.

Benefit Amount

Benefits payable from the LTD Fund equal two-thirds of a member's monthly compensation at the time of disability. Benefits are offset by:

- 85% of Social Security disability benefits that the member or the member's dependents are eligible to receive;
- 85% of social security retirement benefits that the member is eligible to receive;

- all of any worker's compensation benefits;
- all of any payments for a veteran's disability if both of the following apply:
  - the veteran's disability payment is for the same condition or a condition related to the condition currently causing the member's total disability; and
  - the veteran's disability is due to service in the armed forces of the United States;
- all of any other benefits by reason of employment that are financed partly or wholly by an employer, including payments for sick leave; and
- 50% of any salary, wages, commissions, or similar pay that the member receives or is entitled to receive from any gainful employment in which the member engages.

Benefit Period

Monthly benefits cease to be payable to a member at the earliest of the following:

- the date the member ceases to be totally disabled;
- the date the member ceases to be under the direct care of a doctor or refuses to undergo any medical examination requested by the company selected by the ASRS Board to administer the LTD Program;
- the date the member withdraws employee contributions with interest and ceases to be a member; and
- the later of following:
  - the member's normal retirement date;
  - the month following 60 months of payments if disability occurs before age 65;
  - the month following attainment of age 70 if disability occurs at age 65 or after but before age 69; or
  - the month following 12 months of payments if disability occurs at or after age 69.

Administrative Expenses

Administrative expenses associated with the operation of the LTD Program are payable by the LTD Program. The fee schedule is as follows:

Exhibit A-22: LTD Program Fees

Account Management Fee:	$174,000 per year
New Claims Fee:	$364 per claim
Claims Management Fee:	$26 per claim per month

A. Valuation Date

The valuation date is June 30 of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

B. Actuarial Cost Method

The actuarial valuation uses the Entry Age Normal actuarial cost method. Under this method, the total contribution rate is the sum of (i) the normal cost rate, and (ii) a rate that will amortize the unfunded actuarial liability.

The valuation is prepared on the projected benefit basis. The present value of each participant's expected benefit payable at retirement or termination is determined based on age, service, sex, compensation, and the interest rate assumed to be earned in the future (7.50%). The calculations take into account the probability of a participant's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his terminating with a service benefit. Future salary increases are also anticipated. The present value of the expected benefits payable on account of the active participants is added to the present value of the expected future payments to retired participants and beneficiaries to obtain the present value of all expected benefits payable from the Plan on account of the present group of participants and beneficiaries.

The contributions required to support the benefits of the LTD Program are determined following a level funding approach and consist of a normal cost contribution, an unfunded accrued liability contribution, plus a component to cover administrative expenses.

The normal contribution is determined using the Entry Age Normal method. Under this method, a calculation is made to determine the average uniform and constant percentage rate of employer contribution which, if applied to the compensation of each new participant during the entire period of his anticipated covered service, would be required in addition to the contributions of the participant to meet the cost of all benefits payable on their behalf.

The unfunded accrued liability contributions are determined by subtracting the actuarial value of assets from the actuarial accrued liability. Amortization bases are established each year and amortized based on the funding policy. The current year amortization base is determined by taking the current unfunded liability less the outstanding amounts of prior year bases.

C. Actuarial Value of Assets

The actuarial value of assets is based on the market value of assets with a ten-year phase-in of actual investment return in excess of (less than) expected investment income. Offsetting unrecognized gains and losses are immediately recognized, with the shortest remaining bases recognized first and the net remaining bases continue to be recognized on their original timeframe. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of investment-related expenses. In no event will this amount exceed 130% of market value or be less than 70% of market value.

D. Actuarial Assumptions

1. Investment Return

7.50% per year, net of investment related expenses (composed of an assumed 2.30% inflation rate and a 5.20% real rate of return).

2. Decrement Timing

All decrements are assumed to occur at the middle of the valuation year.

3. Disability Retirement Decrements

Exhibit A-23: Disability Retirement Decrements

	Annual Rates per 100 Members
Age	Unisex
20	0.0454
25	0.0502
30	0.0606
35	0.0925
40	0.1468
45	0.2271
50	0.3384
55	0.3970
60	0.4317

4. Termination of Claims in Payment Due to Death or Recovery

The 2012 Group Long Term Disability Valuation Table (2012 GLDT) as proposed by the Society of Actuaries' Group Disability Experience Committee for use by the National Association of Insurance Commissioners. Specifically, rates applicable to plans with a six-month elimination period, "Own Occupation" definition of disability, initial maximum guaranteed benefit of $2,000 for active members and actual initial maximum guaranteed benefit for current LTD recipients , "No Diagnosis" cause of disability, 15% margin for recovery, 27% margin for deaths.

5. Offsets for Disabled Members

Members will have a minimum offset of 30% within three years of initial receipt of LTD benefits. Offsets due to overpayments will apply until the overpayments are expected to be fully recovered based on the data received from the plan administrator.

6. Offsets for Active Members

The valuation assumes that LTD Program benefits, after all applicable offsets, are 60% of the benefits before the offsets.

7. Incurred But Not Reported (IBNR)

The liability for new LTD recipients was loaded by 20% to reflect IBNR.

8. Census Data and Assets

- The valuation was based on members of ASRS as of June 30, 2019, and does not take into account future members.
- All census data was supplied by ASRS and was subject to reasonable consistency checks and asset data was supplied by ASRS.

9. Administrative Expenses

Administrative expenses, based on the amounts outlined in the Plan Provisions, are incorporated into the normal cost and actuarial accrued liability as follows:

- The account management fee is explicitly included with the normal cost,
- The new claims fee is included in the active member liability, and the claims management fee is included in both the active member liability and the reserve for open claims.

10. Other Actuarial Valuation Procedures

- No provision was made in this actuarial valuation for the limitations of Internal Revenue Code § 415 and Internal Revenue Code § 401(a)17 limits were applied to individual salaries.
- Valuation payroll (earnings applied to the current valuation year) is the expected payroll for the fiscal year following the valuation date.
- Adjustment for Contribution Timing – Contribution rates are increased by ½ of a year's interest to reflect the fact that contributions are made throughout the fiscal year and are further adjusted to reflect the one year lag.

Exhibit A-24: Schedule of Benefit Recipients Added to and Removed from Rolls - LTD

Last 10 Years

Valuation as of June 30,	Members Added to Rolls		Members Removed from Rolls		Members Rolls End of Year		% Change in Annual Allowance	Average Annual Allowance
	No.	Annual Allowance[1]	No.	Annual Allowance[2]	No.	Annual Allowance[1]		
2019	449	$ 10,869,605	618	$ 13,714,530	3,189	$ 54,466,761	(5.0)%	$ 17,080
2018	471	11,101,908	647	13,706,082	3,358	57,311,686	(4.3)%	17,067
2017	461	11,239,256	724	12,619,897	3,534	59,915,860	(2.3)%	16,954
2016	538	11,688,516	743	13,500,123	3,797	61,296,501	(2.9)%	16,143
2015	522	10,914,070	726	13,155,382	4,002	63,108,108	(3.4)%	15,769
2014	658	13,947,128	759	14,675,124	4,206	65,349,420	(1.1)%	15,537
2013	735	15,094,316	868	17,168,470	4,307	66,077,416	(3.0)%	15,342
2012	709	14,394,030	878	16,419,214	4,440	68,151,570	(2.9)%	15,349
2011	752	15,000,150	867	18,071,429	4,609	70,176,754	(4.2)%	15,226
2010	789	17,200,407	777	15,066,829	4,724	73,248,033	3.0 %	15,506

[1] Reflects actual, but not assumed, benefit offsets. Does not include overpayment offsets.

[2] Includes changes in benefit amounts.

Exhibit A-25: Schedule of Funding Progress - LTD

Last 10 Years

(Dollars in thousands)

Year Ended June 30,	Actuarial Value of Assets (a)	Actuarial Accrued Liabilities (AAL) (b)	Unfunded Actuarial AccruedLiabilities (UAAL) (b - a)	Assets as a % of Accrued Liabilities (a / b)	Covered Payroll (c)	UAAL as a % of Covered Payroll ((b - a) / c)
2019	$ 177,827	$ 237,711	$ 59,884	74.8 %	$ 10,340,300	0.6 %
2018	184,272	243,149	58,877	75.8 %	9,921,215	0.6 %
2017	198,883	247,356	48,473	80.4 %	9,598,270	0.5 %
2016	223,464	318,840	95,376	70.1 %	9,263,859	1.0 %
2015	253,470	320,624	67,154	79.1 %	9,072,377	0.7 %
2014	279,560	328,928	49,368	85.0 %	8,908,621	0.6 %
2013	285,018	332,597	47,579	85.7 %	8,752,783	0.5 %
2012	295,786	439,706	143,920	67.3 %	8,868,678	1.6 %
2011	307,537	455,695	148,158	67.5 %	9,060,631	1.6 %
2010	319,308	477,266	157,958	66.9 %	9,419,952	1.7 %

Exhibit A-26: Solvency Test - LTD

Last 10 Years
(Dollars in thousands)

Year Ended June 30,	Aggregate Accrued Liabilities for: Active Member Contributions (1)	Retirees and Beneficiaries (2)	Active Members (Employer Financed Portion) (3)	Actuarial Value of Assets Available for Benefits	Portion of Actuarial Accrued Liabilities Covered by Assets Available for Benefits (1)	(2)	(3)
2019	$ —	$ 179,195	$ 58,516	$ 177,827	100 %	99 %	— %
2018	—	187,100	56,049	184,272	100 %	98 %	— %
2017	—	194,328	53,028	198,883	100 %	100 %	9 %
2016	—	189,940	128,900	223,464	100 %	100 %	26 %
2015	—	193,129	127,495	253,470	100 %	100 %	47 %
2014	—	202,999	125,929	279,560	100 %	100 %	61 %
2013	—	207,331	125,265	285,018	100 %	100 %	62 %
2012	—	224,090	215,616	295,786	100 %	100 %	33 %
2011	—	234,155	221,540	307,537	100 %	100 %	33 %
2010	—	242,098	235,168	319,308	100 %	100 %	33 %

Exhibit A-27: Analysis of Financial Experience - LTD

Last 10 Years
(Dollars in thousands)

Year Ended June 30,	Unfunded Actuarial Accrued Liability (UAAL) Prior Year	Normal Cost for the Year[1]	Contributions for the Year	Interest at 7.5% on UAAL[3]	Interest at 7.5% on Normal Cost[3]	Interest at 7.5% on Contributions[3]	Total Interest	Expected UAAL	Actual UAAL	Gain/(Loss) for the Year[2]
2019	$ 58,877	$ 29,700	$ (35,122)	$ 4,416	$ 1,093	$ (1,293)	$ 4,216	$ 57,671	$ 59,884	$ (2,213)
2018	48,473	27,715	(31,414)	3,636	2,079	(1,178)	4,536	49,310	58,877	(9,567)
2017	95,375	17,985	(26,948)	7,630	1,439	(1,078)	7,991	94,403	48,473	45,930
2016	67,154	16,188	(22,153)	5,372	1,295	(886)	5,781	66,970	95,376	(28,406)
2015	49,368	16,377	(21,624)	3,950	655	(865)	3,740	47,861	67,154	(19,293)
2014	47,579	15,925	(42,779)	3,806	637	(1,711)	2,732	23,457	49,368	(25,911)
2013	143,920	25,723	(42,217)	11,514	2,058	(1,689)	11,883	139,309	47,579	91,730
2012	148,158	28,165	(41,997)	11,853	2,253	(1,680)	12,426	146,752	143,920	2,832
2011	157,958	30,456	(43,379)	12,637	2,437	(1,735)	13,339	158,374	148,158	10,216
2010	165,044	33,520	(71,877)	13,204	2,682	(2,875)	13,011	139,698	157,958	(18,260)

[1] Middle of year in 2014 and 2015, beginning of year otherwise.

[2] Includes plan or assumption changes as well as the gain/(loss) due to the difference between the expected and actual benefit payments. The cumulative net gain since July 1, 2004, is $207,678 (presented in 000s). This gain/(loss) calculation does not include administrative expenses.

[3] Prior to 2018, interest was calculated at 8%.

Legislated Plan Changes Enacted by the 2019 Legislature of the State of Arizona

SB1016 (2019) expands the requirement that an employer pay to the ASRS any unfunded liability resulting from providing benefits or credits to a person who is ineligible by statute for ASRS membership to apply if an employer pays contributions to the ASRS on behalf of any person who is ineligible by rule for ASRS membership, or on compensation that is not eligible by statute or rule for ASRS contributions. The definition of "unfunded liability" is modified to establish a calculation for determining the unfunded liability for contributions on compensation that is not eligible by statute or rule for ASRS contributions. *Effective Date: August 27, 2019*

SB1018 (2019) redefines compensation for members whose membership begins on or after January 1, 2020. *Effective Date: August 27, 2019*

It maintains the current definition of compensation for members whose membership began on or before December 31, 2019.

It modifies the definition of compensation for members whose membership began on or after January 1, 2020 to include only gross wages paid to a member by the employer for services rendered during the period considered as credited service, including amounts reported as other compensation on the member's federal W-2 form, including pretax deductions, except for the following:

- Payments made for accrued leave not being used to replace regular work hours, whether paid in a lump sum or in installments.
- Payments made on termination from employment, whether paid in a lump sum or in installments or as a bonus or incentive for termination or retirement.
- Employer-paid contributions that are made to, and any distributions from, plans, programs or arrangements qualified under certain sections of the Internal Revenue Code.
- Payments for allowances.
- Reimbursements for employee business or personal expenses.
- Employer-paid contributions for coverage under, or distributions from, an accident, health or life insurance plan, program or arrangement.
- Payments made in lieu of any employer-paid insurance coverage.
- Workers' compensation, unemployment compensation and disability payments.
- Merit awards pursuant to statute.
- Payments paid pursuant to a court order or settlement agreement to satisfy a claim even though the amount of the payment is based on previous salary or wage levels, except if the court order or settlement agreement directs salary or wages to be paid for a specific period of time, the payment is compensation for that specific period of time.
- Payments made in the form of goods or services in lieu of gross wages.
- Any other payment that is not reported as other compensation on the member's federal W-2 statement for actual services rendered.
- Payments in excess of the Internal Revenue Code limits established in statute.
- Payments for any other employment benefit.
- Payments for which employer or employee contributions have not been paid.

SB1213 (2019) makes changes to A.R.S. § 38-766.02 to indicate that an employer is not required to pay an Alternate Contribution Rate for a retired member if the employer is remitting contributions on behalf of an active member serving in that same position. *Effective Date: August 27, 2019*

STATISTICAL SECTION

An agency of the State of Arizona

Overview

The Statistical Section presents detailed information as a context for understanding what the information in the financial statements, note disclosures, and required summary information says about the ASRS' overall financial health.

Financial Trends Information

The following schedules contain trend information to help the reader understand how the ASRS' financial performance has changed over the past 10 years.

- Fiduciary Net Position – *Last Ten Fiscal Years*
- Changes in Fiduciary Net Position – *Last Ten Fiscal Years*

Revenues Information

These schedules contain information to help the reader understand the ASRS' funding over the last 10 years.

- Actual Contribution Rates – *Last Ten Fiscal Years*

Operating Information

These schedules contain information about the ASRS' operations.

- Retired Members by Type of Benefit
- HBS Recipients by Benefit Amount
- LTD Recipients by Benefit Amount
- Average Benefit Payments – Retirement – *Last Ten Fiscal Years*
- Average Benefit Payments – HBS – *Last Ten Fiscal Years*
- Average Benefit Payments – LTD – *Last Ten Fiscal Years*
- Principal Participating Employers – *Current Year and Nine Years Ago*

Exhibit S-1: Fiduciary Net Position

Last 10 Fiscal Years
(Dollars in thousands)

Retirement Fund	2020	2019	2018	2017
Assets				
Cash, receivables, and prepaids	$ 169,057	$ 190,852	$ 550,205	$ 415,862
Investments	40,228,258	39,671,759	38,133,864	35,888,458
Securities lending cash collateral	98,591	137,089	104,082	166,870
Total assets	**40,495,906**	**39,999,700**	**38,788,151**	**36,471,190**
Liabilities				
Investments payable	1,212,012	18,830	43,406	35,202
Securities lending payable	98,591	137,089	104,082	166,870
Other payables	17,717	18,639	148,714	66,362
Total liabilities	**1,328,320**	**174,558**	**296,202**	**268,434**
Net position restricted for benefits	**$ 39,167,586**	**$ 39,825,142**	**$ 38,491,949**	**$ 36,202,756**
HBS Fund				
Assets				
Cash, receivables, and prepaids	$ 13,840	$ 24,076	$ 155,594	$ 35,777
Investments	1,805,940	1,816,690	1,657,666	1,677,892
Securities lending cash collateral	4,272	5,939	4,524	7,274
Total assets	**1,824,052**	**1,846,705**	**1,817,784**	**1,720,943**
Liabilities				
Investments payable	52,519	816	1,887	1,534
Securities lending payable	4,272	5,939	4,524	7,274
Other payables	376	441	20,566	19,577
Total liabilities	**57,167**	**7,196**	**26,977**	**28,385**
Net position restricted for benefits	**$ 1,766,885**	**$ 1,839,509**	**$ 1,790,807**	**$ 1,692,558**
LTD Fund				
Assets				
Cash, receivables, and prepaids	$ 8,662	$ 8,405	$ 7,283	$ 9,780
Investments	157,505	166,716	176,825	187,148
Securities lending cash collateral	386	576	483	—
Total assets	**166,553**	**175,697**	**184,591**	**196,928**
Liabilities				
Investments payable	4,745	80	201	—
Securities lending payable	386	576	483	—
Other payables	142	250	463	230
Total liabilities	**5,273**	**906**	**1,147**	**230**
Net position restricted for benefits	**$ 161,280**	**$ 174,791**	**$ 183,444**	**$ 196,698**
Total				
Assets				
Cash, receivables, and prepaids	$ 191,559	$ 223,333	$ 713,082	$ 461,419
Investments	42,191,703	41,655,165	39,968,355	37,753,498
Securities lending cash collateral	103,249	143,604	109,089	174,144
Total assets	**42,486,511**	**42,022,102**	**40,790,526**	**38,389,061**
Liabilities				
Investments payable	1,269,276	19,726	45,494	36,736
Securities lending payable	103,249	143,604	109,089	174,144
Other payables	18,235	19,330	169,743	86,169
Total liabilities	**1,390,760**	**182,660**	**324,326**	**297,049**
Net position restricted for benefits	**$ 41,095,751**	**$ 41,839,442**	**$ 40,466,200**	**$ 38,092,012**

Exhibit S-1: Fiduciary Net Position (Continued)

Last 10 Fiscal Years
(Dollars in thousands)

2016	2015	2014	2013	2012	2011
$ 975,712	$ 261,074	$ 593,804	$ 1,062,311	$ 1,006,349	$ 1,056,204
32,387,540	33,469,479	33,830,285	29,210,762	26,200,038	27,067,837
275,684	301,892	14,784	14,812	47,958	843,461
33,638,936	**34,032,445**	**34,438,873**	**30,287,885**	**27,254,345**	**28,967,502**
469,063	40,795	693,459	1,172,209	747,257	1,242,985
275,684	301,892	14,784	14,812	47,958	843,461
34,398	44,112	36,925	75,434	57,036	41,833
779,145	**386,799**	**745,168**	**1,262,455**	**852,251**	**2,128,279**
$ 32,859,791	**$ 33,645,646**	**$ 33,693,705**	**$ 29,025,430**	**$ 26,402,094**	**$ 26,839,223**
$ 56,133	$ 48,294	$ 60,353	$ 75,951	$ 79,217	$ 52,196
1,509,046	1,528,013	1,527,258	1,313,601	1,175,794	1,199,182
11,805	12,838	643	648	2,112	37,432
1,576,984	**1,589,145**	**1,588,254**	**1,390,200**	**1,257,123**	**1,288,810**
20,226	1,709	30,095	51,288	32,910	55,162
11,805	12,838	643	648	2,112	37,432
886	1,303	1,274	2,930	19,282	1,487
32,917	**15,850**	**32,012**	**54,866**	**54,304**	**94,081**
$ 1,544,067	**$ 1,573,295**	**$ 1,556,242**	**$ 1,335,334**	**$ 1,202,819**	**$ 1,194,729**
$ 8,450	$ 7,807	$ 6,864	$ 7,254	$ 7,172	$ 6,371
198,281	239,711	278,932	255,636	250,594	274,734
—	—	—	—	—	—
206,731	**247,518**	**285,796**	**262,890**	**257,766**	**281,105**
—	—	—	—	—	—
—	—	—	—	—	—
337	245	280	270	443	250
337	**245**	**280**	**270**	**443**	**250**
$ 206,394	**$ 247,273**	**$ 285,516**	**$ 262,620**	**$ 257,323**	**$ 280,855**
$ 1,040,295	$ 317,175	$ 661,021	$ 1,145,516	$ 1,092,738	$ 1,114,771
34,094,867	35,237,203	35,636,475	30,779,999	27,626,426	28,541,753
287,489	314,730	15,427	15,460	50,070	880,893
35,422,651	**35,869,108**	**36,312,923**	**31,940,975**	**28,769,234**	**30,537,417**
489,289	42,504	723,554	1,223,497	780,167	1,298,147
287,489	314,730	15,427	15,460	50,070	880,893
35,621	45,660	38,479	78,634	76,761	43,570
812,399	**402,894**	**777,460**	**1,317,591**	**906,998**	**2,222,610**
$ 34,610,252	**$ 35,466,214**	**$ 35,535,463**	**$ 30,623,384**	**$ 27,862,236**	**$ 28,314,807**

Exhibit S-2: Changes in Fiduciary Net Position

Last 10 Fiscal Years

(Dollars in thousands)

Retirement Fund	2020	2019	2018	2017
Additions				
Member contributions	$ 1,272,080	$ 1,194,100	$ 1,099,663	$ 1,079,257
Employer contributions	1,254,651	1,180,966	1,085,033	1,053,198
Purchased service/transfers/other income	13,385	17,918	22,411	14,649
Net investment income (loss)	354,195	2,398,937	3,414,623	4,406,942
Total additions (reductions)	**2,894,311**	**4,791,921**	**5,621,730**	**6,554,046**
Deductions				
Benefits	$ 3,281,317	$ 3,169,788	$ 3,045,450	$ 2,931,860
Refunds and transfers	243,214	262,138	259,776	250,578
Administration and other	27,336	26,802	27,311	28,643
Total deductions	**3,551,867**	**3,458,728**	**3,332,537**	**3,211,081**
Net change	**(657,556)**	**1,333,193**	**2,289,193**	**3,342,965**
Fiduciary net position, beginning of year	39,825,142	38,491,949	36,202,756	32,859,791
Net position restricted for benefits	**$ 39,167,586**	**$ 39,825,142**	**$ 38,491,949**	**$ 36,202,756**
HBS Fund				
Additions				
Employer contributions	$ 52,371	$ 47,386	$ 42,976	$ 53,914
Purchased service/transfers/other income	23	9,623	2,225	—
Net Investment Income (Loss)	16,764	108,484	150,380	191,591
Total additions (reductions)	**69,158**	**165,493**	**195,581**	**245,505**
Deductions				
Benefits	140,619	115,631	96,098	95,720
Administration and other	1,163	1,160	1,234	1,294
Total deductions	**141,782**	**116,791**	**97,332**	**97,014**
Net change	**(72,624)**	**48,702**	**98,249**	**148,491**
Fiduciary net position, beginning of year	1,839,509	1,790,807	1,692,558	1,544,067
Net position restricted for benefits	**$ 1,766,885**	**$ 1,839,509**	**$ 1,790,807**	**$ 1,692,558**
LTD Fund				
Additions				
Member contributions	$ 18,169	$ 16,434	$ 15,512	$ 13,342
Employer contributions	18,397	16,633	15,902	13,606
Purchased service/transfers/other income	11	—	—	—
Net investment income (loss)	1,581	10,318	14,760	22,021
Total additions (reductions)	**38,158**	**43,423**	**46,174**	**48,969**
Deductions				
Benefits	49,615	50,063	57,664	56,525
Administration and other	2,054	2,013	1,764	2,140
Total Deductions	**51,669**	**52,076**	**59,428**	**58,665**
Net change	**(13,511)**	**(8,653)**	**(13,254)**	**(9,696)**
Fiduciary net position, beginning of year	174,791	183,444	196,698	206,394
Net position restricted for benefits	**$ 161,280**	**$ 174,791**	**$ 183,444**	**$ 196,698**
Total				
Additions				
Member contributions	$ 1,290,249	$ 1,210,534	$ 1,115,175	$ 1,092,599
Employer contributions	1,325,419	1,244,985	1,143,911	1,120,718
Purchased service/transfers/other income	13,419	27,579	24,636	14,649
Net investment income (loss)	372,540	2,517,739	3,579,763	4,620,554
Total additions (reductions)	**3,001,627**	**5,000,837**	**5,863,485**	**6,848,520**
Deductions				
Benefits	$ 3,471,551	$ 3,335,482	$ 3,199,212	$ 3,084,105
Refunds and transfers	243,214	262,138	259,776	250,578
Administration and other	30,553	29,975	30,309	32,077
Total deductions	**3,745,318**	**3,627,595**	**3,489,297**	**3,366,760**
Net change	**(743,691)**	**1,373,242**	**2,374,188**	**3,481,760**
Fiduciary net position, beginning of year	41,839,442	40,466,200	38,092,012	34,610,252
Net position restricted for benefits	**$ 41,095,751**	**$ 41,839,442**	**$ 40,466,200**	**$ 38,092,012**

Exhibit S-2: Changes in Fiduciary Net Position (Continued)

Last 10 Fiscal Years

(Dollars in thousands)

2016	2015	2014	2013	2012	2011
$ 1,036,714	$ 1,031,954	$ 995,284	$ 948,004	$ 905,968	$ 833,287
1,015,974	1,004,747	965,969	911,300	852,167	786,662
25,466	20,702	33,485	72,023	53,659	70,812
222,906	849,160	5,514,246	3,393,599	322,870	5,406,714
2,301,060	**2,906,563**	**7,508,984**	**5,324,926**	**2,134,664**	**7,097,475**
2,804,531	2,671,496	2,566,372	2,445,341	2,327,678	2,190,728
259,323	256,243	247,116	219,332	212,313	186,975
23,061	26,883	27,221	36,917	31,802	27,509
3,086,915	**2,954,622**	**2,840,709**	**2,701,590**	**2,571,793**	**2,405,212**
(785,855)	**(48,059)**	**4,668,275**	**2,623,336**	**(437,129)**	**4,692,263**
33,645,646	33,693,705	29,025,430	26,402,094	26,839,223	22,146,960
$ 32,859,791	**$ 33,645,646**	**$ 33,693,705**	**$ 29,025,430**	**$ 26,402,094**	**$ 26,839,223**
$ 46,046	$ 53,586	$ 53,405	$ 57,154	$ 54,463	$ 51,048
8,455	31,507	29,848	25,826	35,473	—
12,024	39,022	240,538	146,737	13,439	240,994
66,525	**124,115**	**323,791**	**229,717**	**103,375**	**292,042**
94,754	105,913	101,746	95,763	93,915	91,699
999	1,149	1,137	1,439	1,370	1,209
95,753	**107,062**	**102,883**	**97,202**	**95,285**	**92,908**
(29,228)	**17,053**	**220,908**	**132,515**	**8,090**	**199,134**
1,573,295	1,556,242	1,335,334	1,202,819	1,194,729	995,595
$ 1,544,067	**$ 1,573,295**	**$ 1,556,242**	**$ 1,335,334**	**$ 1,202,819**	**$ 1,194,729**
$ 10,990	$ 10,725	$ 21,151	$ 20,881	$ 20,998	$ 21,689
11,162	10,899	21,628	21,336	20,998	21,689
—	—	—	—	—	—
(387)	3,722	44,950	29,540	2,419	56,744
21,765	**25,346**	**87,729**	**71,757**	**44,415**	**100,122**
60,065	61,045	62,044	63,613	65,190	66,124
2,579	2,544	2,789	2,847	2,757	3,522
62,644	**63,589**	**64,833**	**66,460**	**67,947**	**69,646**
(40,879)	**(38,243)**	**22,896**	**5,297**	**(23,532)**	**30,476**
247,273	285,516	262,620	257,323	280,855	250,379
$ 206,394	**$ 247,273**	**$ 285,516**	**$ 262,620**	**$ 257,323**	**$ 280,855**
$ 1,047,704	$ 1,042,679	$ 1,016,435	$ 968,885	$ 926,966	$ 854,976
1,073,182	1,069,232	1,041,002	989,790	927,628	859,399
33,921	52,209	63,333	97,849	89,132	70,812
234,543	891,904	5,799,734	3,569,876	338,728	5,704,452
2,389,350	**3,056,024**	**7,920,504**	**5,626,400**	**2,282,454**	**7,489,639**
$ 2,959,350	$ 2,838,454	$ 2,730,162	$ 2,604,717	$ 2,486,783	$ 2,348,551
259,323	256,243	247,116	219,332	212,313	186,975
26,639	30,576	31,147	41,203	35,929	32,240
3,245,312	**3,125,273**	**3,008,425**	**2,865,252**	**2,735,025**	**2,567,766**
(855,962)	**(69,249)**	**4,912,079**	**2,761,148**	**(452,571)**	**4,921,873**
35,466,214	35,535,463	30,623,384	27,862,236	28,314,807	23,392,934
$ 34,610,252	**$ 35,466,214**	**$ 35,535,463**	**$ 30,623,384**	**$ 27,862,236**	**$ 28,314,807**

Exhibit S-3: Actual Contribution Rates

Last 10 Fiscal Years

Retirement Contribution Rates[1]	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
Member	11.94 %	11.64 %	11.34 %	11.34 %	11.35 %	11.48 %	11.30 %	10.90 %	10.50 %	9.60 %
Employer	11.45 %	11.18 %	10.90 %	10.78 %	10.85 %	10.89 %	10.70 %	10.25 %	9.87 %	9.01 %

HBS Contribution Rates	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
Employer	0.49 %	0.46 %	0.44 %	0.56 %	0.50 %	0.59 %	0.60 %	0.65 %	0.63 %	0.59 %

LTD Contribution Rates	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
Member	0.17 %	0.16 %	0.16 %	0.14 %	0.12 %	0.12 %	0.24 %	0.24 %	0.24 %	0.25 %
Employer	0.17 %	0.16 %	0.16 %	0.14 %	0.12 %	0.12 %	0.24 %	0.24 %	0.24 %	0.25 %

[1] Retirement contribution rates do not include System retirees.

Exhibit S-4: Retired Members by Type of Benefit

As of June 30, 2019

	Number of Retirees by Benefit Option[1]						
Amount of Monthly Benefit	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Under $300	13,612	178	256	746	3,084	246	999
$300 - $499	9,920	153	277	553	2,480	298	921
$500 - $999	19,746	378	596	984	4,820	794	2,059
$1,000 - $1,499	13,638	245	424	605	3,795	873	1,856
$1,500 - $1,999	9,890	167	306	450	3,033	898	1,625
$2,000 - $2,499	7,812	132	240	395	2,745	770	1,572
$2,500 - $2,999	6,154	107	214	327	2,268	636	1,199
$3,000 - $3,499	4,949	82	145	248	1,981	611	988
$3,500 - $3,999	3,351	40	84	194	1,414	455	682
$4,000 & Over	5,888	46	149	240	2,547	932	1,376
Totals	94,960	1,528	2,691	4,742	28,167	6,513	13,277

[1]Options:

1. Life Annuity — Refund provision
2. Life Annuity — 5 years certain and life
3. Life Annuity — 10 years certain and life
4. Life Annuity — 15 years certain and life
5. Joint Annuity — 100 percent to contingent survivor
6. Joint Annuity — 66 2/3 percent to contingent survivor
7. Joint Annuity — 50 percent to contingent survivor

Source: 2019 actuarial valuation report

Note: The 2019 actuarial valuation report is the most recent report available.

Exhibit S-5: HBS Recipients by Benefit Amount

As of June 30, 2020

HBS Monthly Benefits	Members Receiving Benefits
$1-199	67,779
$200-299	13,054
$300-399	559
$400 & Over	0
Total	81,392

Source: ASRS pension administration system

Exhibit S-6: LTD Recipients by Benefit Amount

As of June 30, 2020

LTD Monthly Benefits	Members Receiving Benefits
<$299	355
$300-499	183
$500-999	713
$1,000-1,499	661
$1,500-1,999	477
$2,000 & over	825
Total	3,214

Source: Long term disability program administrator

Note: Amounts are based on gross benefits, before social security income adjustments.

Exhibit S-7: Average Benefit Payments - Retirement

Last 10 Fiscal Years

		Years of Credited Service									
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45+
2019	Average Monthly Benefit	$ 156	$ 370	$ 755	$ 1,152	$ 1,755	$ 2,542	$ 3,498	$ 4,129	$ 4,981	$ 5,647
	Number of Retirees	6,880	21,200	25,713	21,164	26,123	24,235	21,971	3,791	710	91
2018	Average Monthly Benefit	$ 151	$ 366	$ 748	$ 1,140	$ 1,741	$ 2,524	$ 3,476	$ 4,110	$ 4,870	$ 5,577
	Number of Retirees	6,511	20,588	24,971	20,467	25,152	23,540	21,290	3,685	666	86
2017	Average Monthly Benefit	$ 146	$ 362	$ 741	$ 1,131	$ 1,728	$ 2,515	$ 3,453	$ 4,092	$ 4,861	$ 5,533
	Number of Retirees	6,250	20,057	24,117	19,648	24,271	22,914	20,556	3,598	628	78
2016	Average Monthly Benefit	$ 140	$ 357	$ 734	$ 1,123	$ 1,717	$ 2,498	$ 3,432	$ 4,077	$ 4,829	$ 5,454
	Number of Retirees	6,003	19,379	23,074	18,709	23,192	21,882	19,652	3,473	590	72
2015	Average Monthly Benefit	$ 136	$ 354	$ 730	$ 1,119	$ 1,711	$ 2,486	$ 3,424	$ 4,049	$ 4,769	$ 5,340
	Number of Retirees	5,801	18,799	22,279	18,076	22,431	21,166	19,002	3,357	559	66
2014	Average Monthly Benefit	$ 131	$ 347	$ 723	$ 1,116	$ 1,702	$ 2,478	$ 3,411	$ 4,048	$ 4,744	$ 5,344
	Number of Retirees	5,626	18,060	21,325	17,327	21,563	20,332	18,199	3,235	526	62
2013	Average Monthly Benefit	$ 125	$ 344	$ 721	$ 1,113	$ 1,694	$ 2,468	$ 3,397	$ 4,022	$ 4,809	$ 5,229
	Number of Retirees	5,422	17,223	20,406	16,637	20,540	19,522	17,448	3,121	495	61
2012	Average Monthly Benefit	$ 124	$ 341	$ 718	$ 1,112	$ 1,685	$ 2,464	$ 3,383	$ 3,980	$ 4,768	$ 5,224
	Number of Retirees	4,864	16,228	19,419	15,867	19,447	18,547	16,564	2,979	458	58
2011	Average Monthly Benefit	$ 121	$ 339	$ 716	$ 1,111	$ 1,681	$ 2,457	$ 3,368	$ 3,944	$ 4,661	$ 5,134
	Number of Retirees	4,420	15,231	18,329	15,157	18,371	17,557	15,608	2,840	426	57
2010	Average Monthly Benefit	$ 119	$ 338	$ 714	$ 1,108	$ 1,674	$ 2,445	$ 3,342	$ 3,900	$ 4,533	$ 5,040
	Number of Retirees	4,011	14,223	17,233	14,418	17,150	16,581	14,549	2,691	399	52

Notes:

This schedule does not include System retirees.

Average final salary information is not available.

The 2019 actuarial valuation report is the most recent report available.

Source: Historical actuarial valuation reports

Exhibit S-8: Average Benefit Payments - HBS

Last 10 Fiscal Years

		Years of Credited Service					
		5	6	7	8	9	10+
2020	Average Monthly Benefit	$ 54	$ 59	$ 63	$ 70	$ 72	$ 97
	Number of HBS Participants	1,671	1,305	1,320	1,346	1,293	74,450
2019	Average Monthly Benefit	$ 54	$ 59	$ 63	$ 69	$ 74	$ 100
	Number of HBS Participants	1,627	1,270	1,275	1,340	1,253	73,473
2018	Average Monthly Benefit	$ 53	$ 57	$ 63	$ 70	$ 74	$ 106
	Number of HBS Participants	1,547	1,209	1,240	1,318	1,217	69,767
2017	Average Monthly Benefit	$ 53	$ 57	$ 63	$ 70	$ 75	$ 106
	Number of HBS Participants	1,545	1,207	1,245	1,318	1,215	69,853
2016	Average Monthly Benefit	$ 52	$ 57	$ 61	$ 68	$ 72	$ 103
	Number of HBS Participants	1,619	1,251	1,355	1,440	1,337	72,525
2015	Average Monthly Benefit	$ 57	$ 62	$ 68	$ 74	$ 81	$ 116
	Number of HBS Participants	1,580	1,286	1,356	1,399	1,299	70,703
2014	Average Monthly Benefit	$ 58	$ 63	$ 71	$ 77	$ 83	$ 116
	Number of HBS Participants	1,463	1,151	1,188	1,205	1,122	65,159
2013	Average Monthly Benefit	$ 64	$ 72	$ 79	$ 85	$ 95	$ 152
	Number of HBS Participants	1,402	1,120	1,130	1,161	1,074	64,354
2012	Average Monthly Benefit	$ 64	$ 74	$ 78	$ 96	$ 100	$ 144
	Number of HBS Participants	1,352	1,074	1,087	1,094	1,045	62,706
2011	Average Monthly Benefit	$ 59	$ 67	$ 75	$ 87	$ 92	$ 126
	Number of HBS Participants	1,252	1,018	999	1,057	983	58,656

Source: ASRS pension administration system

Exhibit S-9: Average Benefit Payments - LTD

Last 10 Fiscal Years

			LTD
2020	Average Monthly Benefit	$	1,490
	Number of LTD Participants		3,214
2019	Average Monthly Benefit	$	1,465
	Number of LTD Participants		3,327
2018	Average Monthly Benefit	$	1,434
	Number of LTD Participants		3,488
2017	Average Monthly Benefit	$	1,413
	Number of LTD Participants		3,583
2016	Average Monthly Benefit	$	1,297
	Number of LTD Participants		4,032
2015	Average Monthly Benefit	$	1,295
	Number of LTD Participants		4,107
2014	Average Monthly Benefit	$	1,260
	Number of LTD Participants		4,313
2013	Average Monthly Benefit	$	1,244
	Number of LTD Participants		4,443
2012	Average Monthly Benefit	$	1,240
	Number of LTD Participants		4,646
2011	Average Monthly Benefit	$	1,931
	Number of LTD Participants		4,785

Note: Long term disability payments are based on salary and not years of credited service.

Source: Long term disability program administrator

Exhibit S-10: Principal Participating Employers

Current Year and Nine Years Ago

	2020			2011		
Participating Employer	Covered Employees	Rank	Percent of Membership	Covered Employees	Rank	Percent of Membership
State of Arizona	26,664	1	12.41 %	27,687	1	12.80 %
Maricopa County	9,442	2	4.40 %	8,777	2	4.06 %
University Of Arizona	8,129	3	3.78 %	7,110	4	3.29 %
Mesa Unified School District #4	7,937	4	3.69 %	8,414	3	3.89 %
Arizona State University	6,751	5	3.14 %	5,557	7	2.57 %
Tucson Unified School District #1	6,148	6	2.86 %	6,997	5	3.24 %
Maricopa Co Community College District	5,955	7	2.77 %	6,548	6	3.03 %
Chandler Unified School District #80	4,909	8	2.29 %	3,975	10	1.84 %
Pima County	4,806	9	2.24 %	5,548	8	2.57 %
Gilbert Public Schools	4,205	10	1.96 %	4,546	9	2.10 %
All other	129,864		60.46 %	131,057		60.61 %
Total	214,810		100.00 %	216,216		100.00 %

	2020	2011
Total employer units	564	595
Total employers	667	704

Note: All participating employers participate in the Retirement, HBS and LTD plans.

Source: ASRS pension administration system

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