Cavanaugh Macdonald
CONSULTING, LLC

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ACTUARIAL REVIEW REPORT FOR

UTAH RETIREMENT SYSTEM

Prepared September 8, 2021

Cavaugh Macdonald
C O N S U L T I N G, L L C
The experience and dedication you deserve

September 8, 2021

Utah State Retirement Board
540 East 200 South
Salt Lake City, UT 84102

Dear Members of the Board:

Cavanaugh Macdonald Consulting, LLC has performed an independent review of the January 1, 2020 actuarial valuations of the Utah Retirement System. As an independent reviewing or auditing actuary, we have been asked to express an opinion regarding the reasonableness and accuracy of the actuarial assumptions, actuarial cost methods, and valuation results.

Our opinion on the valuation results was based on a replication valuation of the January 1, 2020 actuarial valuations. The retained actuary for the System is Gabriel, Roeder, Smith & Company (GRS). We would like to thank GRS for their cooperation and assistance in providing the required information to us. **We find the actuarial valuation results to be generally reasonable and accurate based on the assumptions used. The valuation was performed by qualified actuaries and was performed in accordance with the principles and practices prescribed by the Actuarial Standards Board.** This report documents the detailed results of our review.

If you need anything else, please do not hesitate to give us a call. The undersigned are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.

Sincerely,

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

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Wendy Ludbrook, FSA, FCA, MAAA, EA
Consulting Actuary

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1. EXECUTIVE SUMMARY

As an independent auditing actuary, Cavanaugh Macdonald Consulting, LLC (CMC) has been tasked to provide a general overview and express an opinion of the reasonableness and soundness of the work performed by Gabriel, Roeder, Smith & Company (GRS) for the Utah Retirement System (URS). The work to be reviewed included the January 1, 2020 valuation.

We requested full participant and financial data of the pertinent employee groups from URS along with reports, plan descriptions and applicable statutes pertaining to the plans. We also requested from GRS participant data as reconciled for the 2020 valuations as well as complete descriptions of assumptions, methods and valuation procedures.

It is our belief that an audit should not focus on finding differences between actuarial processes and procedures utilized by two different actuaries, but rather to verify there are no material errors and to find improvements to the process and procedures utilized by the System's actuary. In performing this audit, we attempt to limit discussions concerning differing opinions and focus more on the accuracy of calculations, the completeness and reliability of reporting, and the compliance with generally acceptable actuarial practices and standards of practice in all of the work reviewed.

CONCLUSIONS

As described in our report, we have determined that the actuarial methods, assumptions, processes, and reports are consistent with the applicable Actuarial Standards of Practice and our understanding of GASB Statement 67. Throughout the report, we have noted a few areas where we believe there are opportunities for improvement, but none that we believe would have a material impact on the results of the January 1, 2020 valuation. There is no urgency for change. Therefore, such suggestions and recommendations could be considered when the next experience study is performed or when the 2022 valuation is prepared.

Additional details on our audit findings can be found in the remaining sections of this report. In Section 2 of our report, we analyze the set of actuarial assumptions recommended by GRS. The actuarial assumptions are a critical component of the valuation process and, thus, were reviewed as part of the audit.

In Section 3 of our report, we review the actuarial methods that are used to develop the actuarial contribution rate. In our opinion, these methods are reasonable and appropriate for systematically funding the system.

In Section 4 of our report, we compare the data provided by URS with the data used by GRS. We find that the data is consistent and appropriate.

In Section 5 of our report, we independently calculated the liabilities of URS. We reviewed the cost calculations and accounting calculations and found them to be appropriate.

1. EXECUTIVE SUMMARY

In Section 6, we provide our analysis on the valuation reports produced by GRS. We found them to be substantially in compliance with the ASOPs, but we offered a few suggestions for improvement.

Because of the complexity of actuarial work, we would not expect to match GRS's results exactly, nor would we necessarily expect our opinions regarding the selection of assumptions and methods to be the same as the opinions of GRS. Our differences of opinion are not material.

The remainder of this report provides the basis for our findings for each of the tasks, including our recommendations.

2. ACTUARIAL ASSUMPTIONS

BACKGROUND ON ACTUARIAL ASSUMPTIONS

The actuarial assumptions form the basis of any actuarial valuation or cost study. Since it is not possible to know in advance how each member's career will evolve in terms of salary growth, future service and cause of termination, the actuary must develop assumptions in an attempt to estimate future patterns. These assumptions enable the actuary to value the amount of benefits earned and to reasonably estimate when and how long these benefits will be paid. Similarly, the actuary must make an assumption about future investment earnings of the trust fund. In developing the assumptions, the actuary examines the past experience and considers future expectations to make the best estimate of the anticipated experience under the plan.

There are two general types of actuarial assumptions:

- *Economic assumptions:* These include the valuation interest rate (expected return on plan assets), assumed rates of salary increase, price inflation, wage inflation, and increases in total payroll. The selection of economic assumptions should conform to ASOP No. 27 *"Selection of Economic Assumptions for Measuring Pension Obligations"*.

- *Demographic assumptions:* These include the assumed rates of retirement, mortality, termination, and disability. The selection of demographic assumptions should conform to ASOP No. 35 *"Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations"*.

While we were only asked to opine on the reasonableness of the assumptions used in the January 1, 2020 actuarial valuation, we did review the 2020 Experience Study that GRS prepared for URS to help us better understand the choice of assumptions.

2. ACTUARIAL ASSUMPTIONS

ECONOMIC ASSUMPTIONS

Actuarial Standards of Practice (ASOPs) are issued by the Actuarial Standards Board to provide guidance to actuaries with respect to certain aspects of performing their work. As mentioned earlier, ASOP 27 is the actuarial standard that addresses the selection of or recommendations regarding economic assumptions for measuring pension obligations (liabilities) under defined benefit plans. Because of concerns that the impact of Covid-19 might change the analysis, the economic assumptions were not reviewed in the 2020 experience study but were studied in 2021, with some adjustments made that will be used in the 2021 valuation.

Price Inflation: Price inflation impacts the assumptions for investment return, salary and payroll growth, and cost-of-living-adjustments (COLA). The underlying price inflation component in all of these must be consistent in accordance with the guidance provided in ASOP 27.

URS has adopted a 2.50% inflation assumption. We believe this is a reasonable assumption. We know that many systems have been lowering this assumption over recent years in response to prolonged low inflation, but there has also been higher observed inflation in recent months. Consequently, the decision in 2021 to not change inflation is appropriate.

Investment Return Assumption: The investment return assumption should represent the long-term compound rate of return expected on the plan assets, considering the asset allocation, the real rate of return on each asset class, and the underlying inflation rate, all net of expenses paid from the Trust.

The long-term relationship between price inflation and investment return has long been recognized by economists. The basic principle is that the investor demands a more or less level "real return" – the excess of actual investment return over price inflation. If inflation rates are expected to be high, investment return rates are also expected to be high, while low inflation rates will result in lower expected investment returns, at least in the long run.

The period considered for pension funding represents a very long time horizon. In reviewing this assumption, the actuary should consider asset allocation policy, historical returns, and expectations of future returns. Frequently, asset advisors focus on no more than the next 5 to 10 years since they are most concerned with how to invest the funds currently to maximize returns. While actuaries are projecting benefits to be paid for the next 50 to 100 years, the short term is also relevant, especially for funds with negative cash flows. This difference in perspective can significantly influence how investment advisors and actuaries derive an investment return assumption.

For the 2020 valuation, the discount rate was 6.95%. At their August 12, 2021 meeting, the Board adopted the recommendation by GRS to use 6.85% for the 2021 actuarial valuation and then re-evaluate when the 2022 capital market assumptions are available. While we did not review the

detail that went into this recommendation, we note that these proposed rates are very much in the range of rates being used for other diversified pension funds.

Use of Investment Return Assumption for GASB Discount Rate: The investment return assumption used in the funding valuation is net of both investment and administrative expenses. GASB requires the use of an expected return on assets assumption that is net of investment expenses, but not administrative expenses. Administrative expenses are directly modeled in the projection of the Fiduciary Net Position for purposes of determining whether there is a depletion date of the plan assets in the future (called the crossover test). This information drives whether the expected return on assets may be used for the GASB discount rate.

We note that it would be appropriate to use a discount rate for GASB purposes that is net of investment expenses, but not administrative expenses. This would result in a slightly higher discount rate and slightly lower liabilities and pension expense. Alternatively, the funding valuation could also use this slightly higher rate with an explicit funding of expenses.

COLA: Closely related to the inflation assumption is the COLA assumption. URS provisions provide a CPI-based COLA of up to a cap of 2.5% or 4%, based on the plan/tier of the member. When actual CPI is below the applicable cap, an increase up to the cap may be granted for any cumulative difference between actual COLAs and cumulative CPI. GRS assumes that the COLAs will be 2.5%, the same as inflation. Because of the catch-up provision, this is a reasonable assumption.

General Wage Increases: The general wage growth or wage inflation assumption consists of price inflation and real wage growth (also called productivity). As the price of goods and services increase, we expect wages to increase as well. Productivity is a measure of how much wages increase across the whole labor pool in excess of the rate of price inflation. Both of these items tend to be a function of the general economy rather than system specific. GRS assumes 3.25%, which implies a real wage growth of 0.75%. Based on our experience with public employment, we find this to be a reasonable assumption.

Individual Salary Scale: There are two factors that generally affect salary increases and are typically reflected in the individual salary scale. First is wage inflation or the total wage growth assumption. The other component, frequently identified as merit scale, reflects the portion of salary increases provided at the individual level, including promotion, increased skills, longevity pay, and other similar items. The combination of these components is reflected in the total individual salary scale.

GRS has developed merit scales for various groups of members, reflecting that different groups of members experience different patterns of pay increases. The assumptions are also service based, reflecting that members typically receive their largest pay increases in their early years. In our opinion, the merit scales are reasonable. In particular, we note that for judges, there is no merit

component assumed, which is generally appropriate since typically all judges of a given rank are paid the same salary and there is very little promotion amongst judges.

Payroll Growth Assumption: The UAAL is amortized as a level percentage of payroll over the amortization period for most groups. As a result, a payroll growth assumption is necessary to develop the UAAL contribution rate. GRS assumes that payroll will grow at 2.90% (reduced to 2.80% for the 2021 valuation), which is slightly less that the general wage inflation assumption. This is reasonable because as members retire or terminate, they are replaced by new members with lower salaries on average. This is especially pronounced in the current environment in which a lot of Baby Boomers are retiring. Using a lower payroll growth assumption also provides for a small degree of conservatism. We find the assumption reasonable.

2. ACTUARIAL ASSUMPTIONS

DEMOGRAPHIC ASSUMPTIONS

The major demographic assumptions are the assumed rates of retirement, withdrawal (with or without a vested benefit), disability, and mortality (death before or after retirement). There are also various minor assumptions that sometimes are developed with a significant component of professional judgment since useful data is not always readily available.

In the following paragraphs, we make specific comments on the demographic assumptions.

Rates of Mortality: One of the most important demographic assumptions in the pension valuation is mortality because it projects how long benefit payments are expected to be made. The longer retirees live and receive benefits, the larger the liability of the system, thus increasing the contributions required to fund the system. In addition, if members live longer than expected based on the assumption, the true cost of future benefit obligations will be understated, and contributions will increase as the unfavorable experience unfolds.

GRS has developed a mortality table based on URS experience that serves as a basis with adjustments for non-disabled in-pay members. For disabled members and active members, where the limited number of deaths makes it difficult to develop a custom retirement table, GRS uses tables prepared by the Society of Actuaries (SOA) for public retirement plans. Mortality improvement in the future is based on a mortality projection scale prepared by the SOA but modified to reflect less improvement.

While we did not review the development process in depth, we note that the general approach used by GRS is reasonable and reflects what is commonly done. We agree that using less improvement than is reflected in the SOA projection scales is a reasonable assumption.

Rates of Retirement: GRS has developed retirement rates that vary by employment type and tier. Within those groups, rates are age-based, possibly varying by eligibility for reduced versus unreduced retirement or bands of service earned. There are also adjustments made in some cases for higher rates to be assumed in the first year of eligibility.

The basis of retirement rates developed by GRS is appropriate in light of the URS benefit structure and plan coverage. We did not review the development in detail, but we do find the rates seem reasonable based on our experience with systems similar to URS.

Rates of Termination: The termination rates developed by GRS are sex-distinct service-based tables that vary by employment type. In our experience, such a set of tables is commonly done and very appropriate. Typically, termination rates decline with longer service, and termination patterns frequently vary between males and females. Variations by category (schools, public safety, etc.) are also common. We note that no termination before retirement is assumed for judges, also a common practice. The termination assumption for the governor and legislators group is

10% each year, regardless of sex or service duration. This is reasonable in light of the unique nature of these positions.

While we did not review the development of these rates in depth, the termination rates used by GRS are similar to those of comparable retirement systems we work with. We believe that these assumptions are reasonable.

Rates of Disability: In most retirement systems, disability retirements are relatively rare, making it difficult to set rates. The rates used by GRS are age based, with separate tables for employment groups. Separate rates are considered for males and females, but only the public educator group actually has rates that differ by sex. No disability is assumed for judges or the governor and legislators plan, a common assumption for these groups.

We do not have any concerns with the incidence of disability rates based on our experience. We do note that for public safety and firefighters, there is an assumption that 25% of the disabilities are service related. Because the definition of service-related can vary significantly between systems, we believe this could be possible, but we do find the proportion to be somewhat low in our experience. We did not find any discussion of this in the experience report, so we do not know how this proportion was determined. We would recommend that this be examined directly in the next experience study.

Refund of Employee Contributions: In the valuation process, this assumption is applied to active members who terminate employment. It anticipates the election of a refund of accumulated employee contributions by the member and the forfeiture of any vested monthly benefit at retirement eligibility. GRS has developed a service-based assumption separately for males and females depending upon employment group for Tier 1 members. For Tier 2 members, each individual is assumed to choose a refund or an annuity based upon which has the greatest value at the time of termination.

The Tier 1 tables are reflective of groups who often have different experience and the rates of refund seem plausible based on our experience. We believe the approach used for Tier 2 is also logical with a margin of conservatism. We think the approach for Tier 2 could also be applied to Tier 1 for consistency and likely without much impact, but this is a matter of preference.

Probability of Marriage/Age Difference of Spouse (Pre-retirement): Note that this assumption is typically used to value pre-retirement death benefits so its impact on the valuation results is very small. GRS assumes all members are married and that there are no children. Further, females are assumed to be three years younger than their spouses, while males are assumed to be three years older. These are typical assumptions, and creditable data is generally hard to come by. The assumption that all members are married is conservative, but because pre-retirement death rates are low, this is a reasonable approach.

3. ACTUARIAL METHODS

BACKGROUND ON ACTUARIAL METHODS

Actuarial methods are used to provide for a systematic funding of a retirement plan. There are four broad considerations when establishing a funding policy for a pension plan:

- *Sufficiency:* The funding target should be the value of benefits accrued to date so that benefits can be paid when due.
- *Intergenerational equity*: Taxpayers and member should pay for workers' pensions while those workers are providing their services. The goal is to fund for the worker's benefits over the worker's career.
- *Stability of contributions:* Generally governmental entities prefer predictable funding patterns. While stable contributions are easy to budget for, stability should not be achieved at the expense of the first two considerations.
- *Accountability and transparency*: Each component of the funding policy should be clear on the intent and effect.

Generally, a funding policy is composed of the following actuarial methods:

- Actuarial Cost Method
- Asset Valuation Method
- Amortization of Unfunded Actuarial Accrued Liability Method

We discuss each component of the actuarial methods for URS and how these components satisfy the four broad considerations when establishing a funding policy below.

ACTUARIAL COST METHOD

For all pension plans, whether defined benefit or defined contribution, the basic retirement funding equation is:

$$C + I = B + E$$

Where:

- C = employer and member contributions
- I = investment income
- B = benefits paid
- E = expenses paid from the fund, if any.

As can be seen from the formula, for a given level of benefits and expenses the greater "I" is, the smaller "C" is. This is the underlying reason for advance funding a pension plan, and historically investment income pays for 75% to 80% of the benefit dollars received by plan members. In other words, for every dollar paid to a member only 20 to 25 cents comes from contributions.

Of course, the problem with the formula is that in order to figure out exactly how much to contribute, the plan would have to be closed to new members and allowed to operate until all retirees were deceased. At that point, the benefits and expenses actually paid out, and the investment income actually earned would be known and, using the equation above, the true cost could be determined. Since the vast majority of plans are ongoing and have no intention of closing, and since even with a closed plan it takes a very long time before all benefits are finally paid out, plan sponsors hire actuaries to estimate the cost of their plans and to create a budget for systematic contributions to meet that cost.

In order to determine the contributions needed, the actuary's first step is to estimate on a given date (the valuation date) the value of all benefits (and expenses) that will be paid to the existing active and retired membership over their remaining lifetimes based on the plan's current benefit structure. This estimation requires the use of assumptions regarding both future events (termination, disability, retirement, death, etc.) and future economic conditions (return on assets, inflation, salary growth, etc.). The URS assumptions were covered in the previous section.

By combining the assumptions for future events and the salary growth assumption, the actuary generates an expected benefit payment stream. In other words, a string of annual payments expected to be made to the current active and retired members from the valuation date until all members are no longer living. Then the actuary applies the investment return assumption to discount each year's payments to the valuation date, creating the present value of all future benefits or the total liability of the plan.

The difference between the total liability and the current assets of the plan represents the present value of future contributions (PVFC) that have to be made by either members or the employers. Usually the members and employers cannot contribute the entire difference in one year, but rather desire a relatively smooth contribution pattern over time that also meets any external constraints. In order to budget for the PVFC, the actuary applies an actuarial cost method. There are several acceptable cost methods, but it's important to recognize that they are nothing more than budgeting tools.

Different actuarial cost methods can provide for faster funding earlier in a plan's existence, more level funding over time, or more flexibility in funding. The choice of an actuarial cost method

will determine the pattern or pace of the funding and, therefore, should be linked to the long-term financing objectives of the system and benefit security considerations.

The actuarial cost method used by URS is the entry age normal method. The level percent of pay method is used for URS plans where benefits are pay related; the level dollar method is used for the Legislators and Governors plan, for which benefits are not pay related. This cost method determines the normal cost as a level percentage of pay or dollar amount which, if paid from entry into the plan to the last assumed retirement age, will accumulate to an amount sufficient to pay the expected benefit. Entry age normal tends to result in reasonably stable contribution rates or dollar amounts, a feature that has helped make it the most commonly used cost method for public plans. The use of the entry age normal cost method satisfies the sufficiency and intergenerational equity components discussed above by developing contributions for taxpayers and members for workers' pensions while those workers are providing their services. The goal is to fund for the worker's benefits over the worker's career by paying for the cost of benefit accrued. An additional cost is determined by amortizing the unfunded actuarial accrued liability (discussed later in this section).

In our opinion, the actuarial cost method employed by GRS is appropriate and will systematically fund the prospective pension benefits on an actuarially sound basis if all actuarial assumptions are realized and the actuarial required contributions are made.

3. ACTUARIAL METHODS

ASSET VALUATION METHOD

Since the purpose of actuarial funding is to build up an asset pool (remember the importance of "I" in "C + I = B + E") actuaries need to value the current asset pool on each valuation date. The market value could be used, but it would tend to create too much volatility from valuation date to valuation date, and a single day's measurement is not necessarily indicative of the true underlying value of the investments held by the plan. Thus, most actuaries use an asset valuation method which smoothes out these fluctuations in pursuit of achieving more stable funding measures and (when relevant) developing more level contributions. A good asset valuation method places values on a plan's assets which are related to current market value, but which will also produce a smooth pattern of costs. This is a question of balancing fit (measured against market value) and smoothness.

The goal of the actuarial asset valuation method is thus to smooth or reduce investment market fluctuations. This is particularly important during periods of volatile capital markets in which abrupt changes in asset values, when factored into the funding valuation, produce sudden unnecessary changes in contribution levels. In this case, "unnecessary" implies that the change in asset values is not necessarily a true revaluing of the assets involved, but rather a fluctuation reflecting a current economic climate or a short-term reaction to specific news.

In our opinion, desirable characteristics of an actuarial asset valuation method include the following:

- The method should be simple to operate. It should be readily calculable from financial statements.

- The method should be easy to explain to all interested parties.

- The theoretical underpinnings should be solid and not produce a long-term lag to the fair value of assets. The value produced should account for market values.

- The method should smooth the effect of market fluctuations.

- Investment decisions should not be affected by the actuarial asset valuation method, and vice versa.

- The value produced should be realistic; the price tag placed on assets should be sensible and should not cause other variables to be adjusted to account for unrealistic asset values.

3. ACTUARIAL METHODS

The use of an asset valuation method satisfies the stability of contributions component by providing for contribution stability which is not achieved at the expense of the sufficiency and intergenerational equity components of a sound funding policy.

URS Asset Valuation Method: The asset valuation method used by GRS in the valuation is a method commonly used by other public sector retirement systems. The smoothing method finds the difference between the actual investment return on the market value of assets and the expected investment return on the market value of assets. This difference is then recognized equally over five years. This preliminary actuarial value of assets is further constrained by a corridor to be within 75% and 125% of the market value of assets.

Using information from the 2016 through 2020 actuarial valuation reports, we replicated the development of the actuarial value of assets below:

3. ACTUARIAL METHODS

Detailed Calcualtion of Actuarial Value of Assets
(All Retirement Systems Combined)

		2016	2017	2018	2019	2020
1	Calendar Year Ending January 1,					
2	Market Value Beginning of Year	$ 26,569,122	$ 26,686,846	$ 28,544,320	$ 31,878,613	$ 31,259,518
3	Contributions	1,095,469	1,124,551	1,154,911	1,185,629	1,274,976
4	Benefit and Refunds	(1,428,528)	(1,504,707)	(1,582,529)	(1,675,448)	(1,770,454)
5	Earnings, net of expesnes	450,783	2,237,630	3,761,912	(129,276)	4,434,506
6	Transfers	-	-	-	-	-
7	Market Value End of Year	$ 26,686,846	$ 28,544,320	$ 31,878,614	$ 31,259,518	$ 35,198,547

8 Development of Expected Investment Income

		2016	2017	2018	2019	2020
a.	Expected Investment Return for Caelndar Year Ended	7.50%	7.20%	6.95%	6.95%	6.95%
b.	Expected Return on:					
i	Market Value Beginning of Year: (8A x 2.)	1,992,684	1,921,453	1,983,830	2,215,564	2,172,537
ii	Contributions: (8a x 1/2 x 3)	41,080	40,484	40,133	41,201	44,305
iii	Benefit and Refunds: (8a x 1/2 x 4)	(53,570)	(54,169)	(54,993)	(58,222)	(61,523)
iv	Total	1,980,194	1,907,768	1,968,970	2,198,543	2,155,319
9	Excess/shortfall expected investment income for year: (5. - 8.b.iv)	(1,529,411)	329,862	1,792,942	(2,327,819)	2,279,187

10 Adjustments to smooth asset values based on excess/shortfallof expected income for:

	Calendar Year Ended	Total Excess/Shortfall (9)		Weight Subtracted		Amount Subtracted
a.	2020	2,279,187	x	80%	=	1,823,350
b.	2019	(2,327,819)	x	60%	=	(1,396,691)
c.	2018	1,792,942	x	40%	=	717,177
d.	2017	329,862	x	20%	=	65,972
e.	2016	(1,529,411)	x	0%	=	-
f.	Total					1,209,808

11	Preliminary actuarial value of assets: (7-10f)	$ 33,988,739
12	Final actuarial value of assets after application of 75%/125% corridor limits	$ 26,398,910
a.	75% of January 1, 2020 market value: (.0.75 x 7)	43,998,184
b.	125% of January 1, 2020 market value: (1.25 x 7)	$ 33,988,739
c.	Actuarial value of assets as of January 1, 2020 (11, not more than 12b, not less than 12 a)	
13	Ratio of actuarial value to market value: (12c ÷ 7)	96.6%

Note: Amounts shown in $ thousands

Compliance with ASOP 44: Actuarial Standard of Practice Number 44, "*Selection and Use of Asset Valuation Methods for Pension Valuations*", provides guidance to the actuary when selecting an asset valuation method for purposes of a defined benefit pension plan actuarial valuation. When considering the use of an asset valuation method other than market value, ASOP 44 states the actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values. Further guidance states that the asset valuation method must satisfy both of the following criteria:

- The asset values fall within a reasonable range around the corresponding market value.

3. ACTUARIAL METHODS

AND

- Any differences between the actuarial value of assets and the market value of assets are recognized within a reasonable period of time.

In lieu of satisfying both (a) and (b) above, an asset valuation method meets ASOP 44 requirements if, <u>in the actuary's professional judgment</u>, the asset valuation method either:

- Produces values within a sufficiently narrow range around market value OR
- Recognizes differences from market value in a sufficiently short period.

Several of the terms in the criteria of ASOP 44 such as "reasonable" and "sufficiently narrow" are not well defined. As we consider the current asset valuation method used by URS in light of ASOP 44, we believe it satisfies these requirements. The asset valuation method includes a 75%/125% corridor which is allowed under ASOP 44. The five-year phase in of the difference between actual and expected returns is sufficiently short enough to not require a corridor. Use of a corridor can result in volatility in the unfunded actuarial accrued liability and resulting contribution. As such, consideration can be given to elimination of the corridor.

The current asset valuation method is reasonable and complies with actuarial standards.

3. ACTUARIAL METHODS

UNFUNDED ACTUARIAL ACCRUED LIABILITY (UAAL) AMORTIZATION METHOD

The UAAL amortization method determines the length of time and the structure of the increase or decrease in contributions required to systematically fund the UAAL. Separate policies exist for the Governors and Legislators Plan and the Higher Education risk pools (referred to as GLP and HERP below) and all other plans. The UAAL amortization method used for the calculated contribution rates is as follows:

Amortization period: The period over which the UAAL is paid off.
- GLP and HERP - 14 years and 17 years respectively
- All other plans – 20 years

Closed or open amortization: Under a closed amortization the amortization period decreases by one each year and the associated UAAL is "paid off"; under an open amortization, the UAAL is amortized over the same amortization period and the associated UAAL is not "paid off".
- GLP and HERP - closed
- All other plans – open

Single base or amortization layers: Under a single base all UAAL is amortized as one component; under amortization layers the UAAL is broken down into several layers, with new layers added each valuation.
- GLP and HERP – single base
- All other plans – single base

Level Dollar or level percent of payroll: Under level dollar the payments are calculated so the payment is the same dollar amount in the future; under level percent of payroll the payments are projected to increase each year.
- GLP and HERP – level dollar, that is no increase in payments
- All other plans – level percent of payroll with payments increasing at 2.90% per year

In addition to the traditional components above, Section 49-11-301(5) of the Utah Code allows the Board to set the employer contribution rate at the prior year's rate, if the rate otherwise would decrease and if the funded ratio is less than 110%. In such a case, the rate set by the Board would be higher than the actuarially determined contribution rate. The purpose of this legislation is to enhance the Board's ability to maintain more level contribution rates while targeting a 100% - 110% funded level. The Board has historically followed this policy, so the certified contribution rate may be greater than the actuarially determined rate.

We believe these amortization methods are generally reasonable.

The GLP and HERP are closed to new participants. As such, the closed and shorter amortization periods are appropriate. Consideration could be given to introducing amortization layers when the remaining period reduces to ten years or less to allow for contribution stability. For GLP, the use of level dollar is appropriate due to the plan not being pay related.
.
Taken as a whole, the UAAL amortization method *for all other plans* is reasonable. By itself, the 20-year open amortization period is not sufficient to fully fund the benefits of URS. However, when combined with Section 49-11-301(5) of the Utah Code, the amortization method has been sufficient to fund the benefits of URS in a reasonable period of time. The Board has historically followed this policy, so the certified contribution rates have been greater may be greater than the actuarially determined rate. Currently all certified contributions rates are greater than the actuarially determined contribution rate. The sufficiency of these rates to fully fund the benefits can be found on slide 25 of the latest valuation presentation – "Projected Year Attain 100% Funded Ratio". This exhibit should be monitored annually to confirm the policy will result in full funding of the UAAL. Because the effect of Section 49-11-301(5) is not clear without this slide, consideration should be given to including this exhibit in the valuation report to comply with component four above – Accountability and transperancy. If a future exhibit shows that full funding does not occur, the policy should be reviewed and updated. Finally, because the 20 year level percent of pay open amortization serves as a minimum contribution, the introduction of layered amortization or a shorter period as suggested for GLP and HERP is not necessary but could be explored.

DATA ANALYSIS

We requested and received the participant data files that URS provided to GRS for the January 1, 2020 valuation. GRS also supplied us with their processed active, inactive, terminated vested, retired and beneficiary data files as they used the data for the January 1, 2020 valuation. Our review of the data was to assure that the processing performed by GRS results in data sets that may be reasonably used for the intended calculations.

As is typical with most plans, the raw and processed data did not match exactly. There may be elements in the data administration system that need some sort of adjustment in order to be used in an actuarial context or as other items that are needed for the valuation that are not available from the administration system. It is not uncommon to see adjustments made to the same records year after year because the information needed for the valuation is either not contained in the data administration system or is not in the format needed for the actuarial valuation. We observed a very limited number of discrepancies, as would be expected following GRS's screening and review process, which would typically include clarification by URS of certain unusual, missing, or inaccurate data items.

We also considered the data elements provided by URS to determine if the data contained sufficient detail for being able to adequately assess the liabilities of the retirement system. We did not identify any issues that were of concern to us.

Upon review of the data we are comfortable with the processed data that is being used for the actuarial valuation. The following table provides a comparison of the raw data with the data processed by GRS for the valuation.

Raw vs. Processed Data Analysis

	Valuation Count	Values match in both the raw and processed data						
		SSN	Fund	Date of Birth	Gender	Service	Salary[1]	Cont. Balance
Actives	97,606	97,573	97,448	97,569	97,572	97,445	97,382	97,564
		99.97%	99.84%	99.96%	99.97%	99.84%	99.77%	99.96%

[1] Results are for annualized salaries.

	Valuation Count	Values match in both the raw and processed data						
		SSN	Fund	Date of Birth	Gender	Service	Salary	Cont. Balance
LTD	538	527	526	527	527	526	526	527
		97.96%	97.77%	97.96%	97.96%	97.77%	97.77%	97.96%

	Valuation Count	Values match in both the raw and processed data						
		SSN	Fund[2]	Unit[2]	Date of Birth	Gender	Service	Cont. Balance
Vested	57,801	57,780			57,777	57,779	53,910	56,941
		99.96%			99.96%	99.96%	93.27%	98.51%

[2] The processed data manipulates the raw data fields. The resulting data, although correct, does not necessarily match.

	Valuation Count	Values match in both the raw and processed data						
		SSN	Fund[3]	Unit	Date of Birth	Gender	Service	Cont. Balance
NonVested	1,583	1,583		1,578	1,573	1,583	1,582	1,576
		100.00%		99.68%	99.37%	100.00%	99.94%	99.56%

[3] The processed data manipulates the raw data fields. The resulting data, although correct, does not necessarily match.

4. DATA REVIEW

Raw vs. Processed Data Analysis

Retirees	Valuation Count	Values match in both the raw and processed data									
		SSN	Fund	Unit	Date of Birth	Gender[4]	Cont. Balance	Option	Annual Benefit	J&S %	Bny DOB[5]
	61,708	61,708	61,042	61,320	61,708	61,708	61,705	61,607	61,092	61,578	33,034
		100.00%	98.92%	99.37%	100.00%	100.00%	100.00%	99.84%	99.00%	99.79%	99.26%

[4] Beneficiary gender is blank for all retirees in the raw data. In the processed data, it is always the opposite of the member's gender.

[5] Beneficiary Date of Birth counts only include members with a J&S annuity option. There were 33,281 retirees with a J&S annuity option in the processed data.

Disabled Retirees	Valuation Count	Values match in both the raw and processed data									
		SSN	Fund	Unit	Date of Birth	Gender[6]	Cont. Balance	Option	Annual Benefit	J&S %	Bny DOB[7]
	1,297	1,285	1,276	1,284	1,285	1,285	1,285	1,285	1,282	1,285	680
		99.07%	98.38%	99.00%	99.07%	99.07%	99.07%	99.07%	98.84%	99.07%	97.56%

[6] Beneficiary gender is blank for all retirees in the raw data. In the processed data, it is always the opposite of the member's gender.

[7] Beneficiary Date of Birth counts only include members with a J&S annuity option. There were 697 disabled retirees with a J&S annuity option in the processed data.

Beneficiaries	Valuation Count	Values match in both the raw and processed data							
		SSN	Fund	Unit	Date of Birth	Gender	Cont. Balance	Option[8]	Annual Benefit
	7,700	7,700	7,468	7,582	7,700	7,700	7,700		7,526
		100.00%	96.99%	98.47%	100.00%	100.00%	100.00%		97.74%

[8] All of the beneficiary records have a J&S annuity option in the raw data, but are valued with the remaining life annuity.

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5. ACTUARIAL VALUATION RESULTS REVIEW

REASONABLENESS OF THE ACTUARIAL VALUATION RESULTS

This section of our review discusses the reasonableness and accuracy of the valuation liabilities and costs.

Generally accepted actuarial standards and practices provide actuaries with the basic mathematics and the framework for calculating the actuarial results. When it comes to applying those actuarial standards to complex calculations, differences may exist due to individual opinion on the best way to make those complex calculations. Differences may also arise from the actuarial software used to make these calculations, especially in the allocation of liabilities between past and future service for active members. Although these factors may lead to differences in the calculated results, these differences should not be material. Generally, differences in the present value of benefits of 1% to 2% or less and differences in the actuarial liabilities of 5% or less are considered reasonable. The normal cost rate should generally be within 5% as well, but it is also important that it be consistent with the relationship of the present value of benefits and the actuarial liability.

As part of the actuarial audit, CMC used the data provided by GRS to reproduce the valuation liabilities used for the cost calculations. We have presented a summary of results at the end of this section. While the results are generally very close, we also looked at a finer level of detail than is displayed. We examined results by status (in-pay, beneficiaries, actives, etc.) and decreemnet status (retirement, disability, etc.) within each subgroup This allowed us to make sure that there were not situations in which there was a proportionately large difference that would not be detectable in total. ***Based on the results of our review, overall, we find the actuarial liabilities and normal cost measures to be reasonable.***

As the following tables indicate, we matched most subgroups within very reasonable tolerances. We do note that on the judges group, we did not match as well on the normal cost and actuarial liability. We did, however, match the present value of benefits reasonably well. This is an indication that the method we used and the method GRS used are allocating the liability somewhat differently across service. While we have a higher normal cost rate, we have a lower actuarial liability which translates into a lower required amortization payment. In our experience, the net result on the contribution rate is small as these differences tend to offset. We want to emphasize that because the present value of benefits match, we do not believe that GRS is misvaluing anything – we are simply using two different plausible methods.

Comparison of January 1, 2020 Liability Measures

Actuarial Present Value of Future Benefits			
	GRS	**CMC**	**CMC/GRS**
Public EEs Contributory			
Local Government	468,100,000	469,051,392	1.002
State and School	659,486,000	663,119,417	1.006
Higher Education	161,877,000	161,345,334	0.997
Subtotal	1,289,463,000	1,293,516,143	1.003
Public EEs Noncontributory			
Local Government	6,704,839,000	6,750,578,991	1.007
State and School	24,527,950,000	24,737,360,518	1.009
Higher Education	2,198,792,000	2,212,733,450	1.006
Subtotal	33,431,581,000	33,700,672,959	1.008
Public Safety Contributory			
Other Div A (2.5% COLA)	121,327,000	121,782,015	1.004
Other Div A (4% COLA)	22,152,000	22,445,070	1.013
Other Div B (2.5% COLA)	32,914,000	33,266,389	1.011
Other Div B (4% COLA)	9,077,000	9,119,550	1.005
Subtotal	185,470,000	186,613,025	1.006
Public Safety Noncontributory			
State	1,654,457,000	1,659,465,296	1.003
Other Div A (2.5% COLA)	1,432,080,000	1,433,916,721	1.001
Other Div A (4% COLA)	423,639,000	423,696,547	1.000
Salt Lake City	456,014,000	456,455,993	1.001
Ogden	93,153,000	93,647,922	1.005
Provo	77,242,000	77,057,942	0.998
Logan	40,100,000	40,059,235	0.999
Bountiful	31,903,000	32,186,363	1.009
Other Div B (2.5% COLA)	617,196,000	615,827,957	0.998
Other Div B (4% COLA)	63,647,000	62,373,595	0.980
Subtotal	4,889,431,000	4,894,687,571	1.001
Firefighters			
Division A	323,258,000	324,943,355	1.005
Division B	1,258,846,000	1,253,698,874	0.996
Subtotal	1,582,104,000	1,578,642,229	0.998
Judges	309,512,000	301,800,727	0.975
Governors and Legislature	13,649,000	13,504,942	0.989
Tier II - Hybrid Plans			
Public EEs	2,159,405,000	2,177,776,007	1.009
Public Safety & Firefighter	502,255,000	517,363,987	1.030
Subtotal	2,661,660,000	2,695,139,994	1.013
Total	44,362,870,000	44,664,577,591	1.007

Comparison of January 1, 2020 Liability Measures

Actuarial Accrued Liability			
	GRS	**CMC**	**CMC/GRS**
Public EEs Contributory			
Local Government	459,298,000	457,229,529	0.995
State and School	655,969,000	656,924,965	1.001
Higher Education	160,297,000	158,449,959	0.988
Subtotal	1,275,564,000	1,272,604,453	0.998
Public EEs Noncontributory			
Local Government	6,005,927,000	5,948,824,342	0.990
State and School	22,194,199,000	22,130,275,805	0.997
Higher Education	2,022,583,000	2,008,917,643	0.993
Subtotal	30,222,709,000	30,088,017,790	0.996
Public Safety Contributory			
Other Div A (2.5% COLA)	118,038,000	117,932,532	0.999
Other Div A (4% COLA)	22,016,000	22,263,180	1.011
Other Div B (2.5% COLA)	32,870,000	33,221,130	1.011
Other Div B (4% COLA)	8,989,000	9,031,331	1.005
Subtotal	181,913,000	182,448,174	1.003
Public Safety Noncontributory			
State	1,493,745,000	1,476,528,128	0.988
Other Div A (2.5% COLA)	1,260,544,000	1,239,762,959	0.984
Other Div A (4% COLA)	375,184,000	368,908,928	0.983
Salt Lake City	407,481,000	398,368,425	0.978
Ogden	86,693,000	86,348,933	0.996
Provo	69,778,000	68,902,379	0.987
Logan	37,050,000	36,709,818	0.991
Bountiful	28,912,000	28,522,945	0.987
Other Div B (2.5% COLA)	524,540,000	491,629,573	0.937
Other Div B (4% COLA)	56,568,000	53,679,678	0.949
Subtotal	4,340,495,000	4,249,361,766	0.979
Firefighters			
Division A	249,525,000	236,641,961	0.948
Division B	1,081,284,000	1,056,970,789	0.978
Subtotal	1,330,809,000	1,293,612,750	0.972
Judges	262,996,000	238,669,867	0.908
Governors and Legislature	13,409,000	13,239,318	0.987
Tier II - Hybrid Plans			
Public EEs	649,960,000	577,029,135	0.888
Public Safety & Firefighter	92,397,000	94,139,046	1.019
Subtotal	742,357,000	671,168,181	0.904
Total	38,370,252,000	38,009,122,300	0.991

Comparison of January 1, 2020 Liability Measures

Normal Cost Rates			
	GRS	**CMC**	**CMC/GRS**
Public EEs Contributory			
Local Government	11.46%	12.35%	1.078
State and School	11.42%	11.74%	1.028
Higher Education	11.07%	11.62%	1.050
Public EEs Noncontributory			
Local Government	11.48%	12.71%	1.107
State and School	12.87%	13.81%	1.073
Higher Education	11.98%	13.17%	1.099
Public Safety Contributory			
Other Div A (2.5% COLA)	24.32%	25.07%	1.031
Other Div A (4% COLA)	24.14%	24.56%	1.017
Other Div B (2.5% COLA)	24.54%	23.35%	0.951
Other Div B (4% COLA)	24.02%	23.89%	0.995
Public Safety Noncontributory			
State	23.40%	23.47%	1.003
Other Div A (2.5% COLA)	23.30%	23.49%	1.008
Other Div A (4% COLA)	23.31%	23.55%	1.010
Salt Lake City	23.44%	23.30%	0.994
Ogden	23.53%	23.52%	0.999
Provo	23.57%	23.43%	0.994
Logan	23.63%	23.32%	0.987
Bountiful	23.63%	23.43%	0.991
Other Div B (2.5% COLA)	23.43%	23.83%	1.017
Other Div B (4% COLA)	23.52%	23.73%	1.009
Firefighters			
Division A	26.04%	28.05%	1.077
Division B	25.77%	27.12%	1.053
Judges	31.11%	38.40%	1.234
Tier II - Hybrid Plans			
Public EEs	9.12%	9.51%	1.042
Public Safety & Firefighter	15.55%	15.64%	1.006

CONTENT OF THE ACTUARIAL REPORTS

The American Academy of Actuaries has issued Actuarial Standards of Practice which deal with measuring pension obligations and communicating the results (ASOP No. 4, 23, 27, 35, 41, 44, 51, and 56, although 56 was not applicable at the time of this report being audited). Those standards list specific elements to be included, either directly or by reference to other documents, in pension actuarial communications. Some of the elements would not be pertinent in all communications, but since an actuarial valuation report is the most complete picture of the actuarial status of the plan, all of the elements listed should be covered in the report, even if only briefly.

The January 1, 2020 Actuarial Valuation Reports for URS generally provide sufficient information for another actuary to understand what was done and to assess the reasonableness of the results. We compared the contents of the reports to over 30 specific items detailed for pension actuarial work in ASOPs 4, 41, and 51. ***In our review of the report, we found it to be in compliance with the applicable ASOPs.*** There are some of the requirements of ASOP 4, however, where we think there are opportunities for improvement:

- Section 4.1.k requires disclosing the amortization balance, the amortization payment, and the remaining amortization period for each amortization base. Consideration could be given to including a one page summary of these elements similar to that disclosed in Exhibit 15(a), where the dollar amount of the amortization payment and the payroll over which that payment is financed is disclosed. While this information is included in the report, we believe it could be presented more directly and consolidated.
- Section 4.1.q calls for disclosure as to whether the disclosed funded status is appropriate for assessing the sufficiency of the plan assets to cover the estimated cost of settling the plan's benefit obligations and whether the funded status is appropriate for assessing the need for or the amount of future contributions. We believe this disclosure could be made more clearly, although we also recognize that most readers of the URS report would not find these relevant questions.

We also noted an item in the benefit summaries in Appendix 2 that conflicted with the information it the Benefits Handbooks:
- The description of the lump sum death benefits available for death in the line of duty for Public Safety and Firefighters (item 13 in each section). The benefits handbooks report a lump sum benefit equal to six months of your final average salary. The valution report indicates a lump sum of $1,500.