

London Borough of Havering Pension Fund

2016 Actuarial Valuation

Draft Valuation Report

February 2017

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For and on behalf of Hymans Robertson LLP



Hymans Robertson LLP has carried out an actuarial valuation of the London Borough of Havering Pension Fund (“the Fund”) as at 31 March 2016, details of which are set out in this report (“the Report”), which is addressed to the Administering Authority of the Fund, the London Borough of Havering (“our Client”). The Report was prepared for the sole use and benefit of our Client and not for any other party; and Hymans Robertson LLP makes no representation or warranties to any third party as to the accuracy or completeness of the Report.

The Report was not prepared for any third party and it will not address the particular interests or concerns of any such third party. The Report is intended to advise our Client on the past service funding position of the Fund as at 31 March 2016 and employer contribution rates from 1 April 2017, and should not be considered a substitute for specific advice in relation to other individual circumstances.

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Executive summary

We have carried out an actuarial valuation of the London Borough of Havering Pension Fund ('the Fund') as at 31 March 2016. The results are presented in this report and are briefly summarised below.

Funding position

The table below summarises the funding position of the Fund as at 31 March 2016 in respect of benefits earned by members up to this date (along with a comparison at the last formal valuation at 31 March 2013).

Past Service Position	31 March 2013 (£m)	31 March 2016 (£m)
Past Service Liabilities	752	857
Market Value of Assets	461	573
Surplus / (Deficit)	(292)	(284)
Funding Level	61%	67%

The improvement in funding position between 2013 and 2016 is mainly due to strong investment performance over the inter-valuation period. The liabilities have also increased due to a reduction in future expected investment returns, although this has been partially been offset by lower than expected pay and benefit growth.

Contribution rates

The table below summarises the Whole Fund Primary and Secondary Contribution rates at this triennial valuation. These rates are the payroll weighted average of the underlying individual employer primary and secondary rates, calculated in accordance with the Regulations and CIPFA guidance.

Primary rate (%)	Secondary Rate (£)		
1 April 2017 - 31 March 2020	2017/18	2018/19	2019/20
TBC	TBC	TBC	TBC

The rates above include an allowance for administration expenses of 0.8% of pay.

At the previous formal valuation at 31 March 2013, a different regulatory regime was in force. Therefore a contribution rate that is directly comparative to the rates above is not provided.

Broadly, contributions required to be made by employers in respect of new benefits earned by members (the primary contribution rate) have increased as future expected investment returns have fallen. Changes to employer contributions targeted to fund the deficit have been variable across employers.

The minimum contributions to be paid by each employer from 1 April 2017 to 31 March 2020 are shown in the Rates and Adjustments Certificate in **Appendix H**.

1 Introduction

We have carried out an actuarial valuation of the London Borough of Havering Pension Fund (“the Fund”) as at 31 March 2016 under Regulation 62 of The Local Government Pension Scheme Regulations 2013 (“the Regulations”). The purpose of the valuation is to assess the value of the assets and liabilities of the Fund as at 31 March 2016 and to calculate the required rate of employers’ contributions payable to the Fund for the period from 1 April 2017 to 31 March 2020.

Valuation Report

This report records the high level outcomes of the actuarial valuation as at 31 March 2016. The valuation report is prepared by the actuary to the Fund and is addressed to London Borough of Havering as the Administering Authority to the Fund.

Component reports

This document is part of an “aggregate” report, i.e. it is the culmination of various “component” reports and discussions, in particular:

- Correspondence relating to data including the Data Report;
- The Initial Results report (dated 31 August 2016) which outlined the whole fund results;
- The formal agreement by the Administering Authority of the actuarial assumptions used in this document, at a meeting TBC;
- The contribution modelling carried out for employers, as detailed in our report and presentation to the Administering Authority on 13 December 2016;
- The Funding Strategy Statement, confirming the different contribution rate setting approaches for different types of employer; and
- The initial results schedules for individual employers in the Fund.

2 Valuation Approach

The valuation is a planning exercise for the Fund, to assess the monies needed to meet the benefits owed to its members as they fall due. As part of the valuation process, the Fund reviews its funding and investment strategies to ensure that an appropriate contribution plan is in place.

It is important to realise that the actual cost of members' benefits is unknown. This cost will not be known with certainty until the last benefit is paid to the last pensioner. The purpose of this valuation is to estimate what this cost will be, so that the Fund can then develop a funding strategy to meet it.

Setting the funding strategy for an open defined benefit pension fund such as the London Borough of Havering Pension Fund is complex. Firstly, the time period is very long; benefits earned in the LGPS today will be paid out over a period of the next 80 years or more and it remains open to new joiners and accrual of benefits. Secondly, the LGPS remains a defined benefit scheme so there are significant uncertainties in the final cost of the benefits to be paid. Finally, in order to reduce employer costs, the Fund has a return seeking investment strategy which can result in high levels of asset volatility.

Such a valuation can only ever be an estimate – as the future cannot be predicted with certainty. However, as actuaries, we can use our understanding of the Fund and the factors that affect it to set the pace of funding in conjunction with the Administering Authority. The pace of this funding can vary according to the level of prudence that is built into the valuation method and assumptions.

The valuation approach adopted recognises the uncertainties and risks posed to funding by the factors discussed above and follows the process outlined below.

- Step 1: The Fund sets a funding target (or funding basis) which defines the target amount of assets to be held to meet the future cashflows. The assumptions underlying the funding target are discussed further in the next section. A measurement is made at the valuation date to compare the assets held with the funding target.
- Step 2: The Fund sets the time horizon over which the funding target is to be reached.
- Step 3: The Fund sets contributions that give a sufficiently high likelihood of meeting the funding target over the set time horizon. More detail on this risk based approach to setting contribution rates can be found in **Appendix C**.

For this valuation, as for the previous valuation, our calculations identify separately the expected cost of members' benefits in respect of scheme membership completed before the valuation date ("past service") and that which is expected to be completed after the valuation date ("future service").

Past service

The principal measurement here is the comparison of the funding position at the valuation date against the funding target. The market value of the Fund's assets as at the valuation date are compared against the value placed on the Fund's liabilities in today's terms (calculated using a market-based approach). By maintaining a link to the market in both cases, this helps ensure that the assets and liabilities are valued in a consistent manner. Our calculation of the Fund's liabilities also explicitly allows for expected future pay and pension increases. The assumptions used in the assessment of the funding position at the valuation date are detailed in the next section.

The funding level is the ratio of assets to liabilities at the valuation date. A funding level of less/more than 100% implies that there is a deficit/surplus in the Fund at the valuation date against the funding target.

Funding plans are set to eliminate any deficit (or surplus) over the set time horizon and therefore get back to a funding level of 100%. To do so, additional contributions may be required to be paid into the Fund; these contributions are included in each employer's "secondary rate".

Future service

In addition to benefits that have already been earned by members prior to the valuation date, employee members will continue to earn new benefits in the future. The cost of these new benefits must be met by both employers and employees. The employers' share of this cost is known as the "primary rate".

The primary rates for employers are determined with the aim of meeting the funding target in respect of these new benefits at the end of the set time horizon with an appropriate likelihood of success. The primary rate will depend on the profile of the membership (amongst other factors). For example, the rate is higher for older members as there is less time to earn investment returns before the member's pension comes into payment.

The methodology for calculating the primary rate will also depend on whether an employer is open or closed to new entrants. A closed employer will have a higher rate as we must allow for the consequent gradual ageing of the workforce.

For the reasons outlined above regarding the uncertainty of the future, there is no guarantee that the amount paid for the primary rate will be sufficient to meet the cost of the benefits that accrue. Similarly, there is no guarantee that the secondary contributions will result in a 100% funding level at the end of each employers' respective time horizon. Further discussion of this uncertainty is set out in **Appendix C**.

3 Assumptions

Due to the long term nature of the Fund, assumptions about the future are required to place a value on the benefits earned to date (past service) and the cost of benefits that will be earned in the future (future service).

Broadly speaking, our assumptions fall into two categories when projecting and placing a value on the future benefit payments and accrual – financial and demographic.

Financial assumptions typically try to anticipate the **size** of these benefits. For example, what members' final salaries will be at retirement and how their pension will increase over time. In addition, the financial assumptions also help us to estimate how much all these benefits will cost the Fund in today's money by making an assumption about future anticipated returns on the Fund's investments.

Demographic assumptions typically try to forecast **when** benefits will come into payment and what form these will take. For example, when members will retire (e.g. at their normal retirement age or earlier), how long they will then survive and whether a dependant's pension will be paid. In this valuation of the Fund, we use a single agreed set of demographic assumptions which is set out below and in more detail in **Appendix E**.

For measuring the funding position, the liabilities of the Fund are reported on a single constant set of financial assumptions about the future, based on financial market data as at 31 March 2016.

However, when we assess the required employer contributions, we use a model that calculates the contributions required under 5000 different possible future economic scenarios. Under these 5000 different economic scenarios, key financial assumptions about pension increases and Fund investment returns vary across a wide range. More information about these types of assumptions is set out in **Appendix F**.

Financial assumptions

Discount rate

In order to place a current value on the future benefit payments from the Fund, an assumption about future investment returns is required to "discount" future benefit payments back to the valuation date. In setting the discount rate the Fund is determining the extent to which it relies on future investment returns required to meet benefit payments in excess of the monies already held at the valuation date.

For a funding valuation such as this, the discount rate is required by the Regulations to incorporate a degree of prudence. The discount rate is therefore set by taking into account the Fund's current and expected future investment strategy and, in particular, how this strategy is expected to outperform the returns from Government bonds over the long term. The additional margin for returns in excess of that available on Government bonds is called the Asset Outperformance Assumption (AOA).

The selection of an appropriate AOA is a matter of judgement and the degree of risk inherent in the Fund's investment strategy should always be considered as fully as possible.

There has been a downward shift in the expected returns on many asset classes held by the Fund since the 2013 valuation. The Fund is satisfied that an AOA of 1.8% p.a. is a prudent assumption for the purposes of this valuation.

Price inflation / pension increases

Pension (both in payment and deferment) benefit increases and the revaluation of career-average earnings are in line with Consumer Price Inflation (CPI). As there continues to be no suitable market for CPI linked financial instruments, the Fund derives the expected level of future CPI with reference to Retail Prices Inflation (RPI).

Due to further analysis of CPI since 2013, the Fund expects the average long term difference between RPI and CPI to be 1.0% p.a. compared with 0.8% p.a. at the 2013 valuation.

At the previous valuation, the assumption for RPI was derived from market data as the difference between the yield on long-dated fixed interest and index-linked government bonds. At this valuation, the Fund continues to adopt a similar approach.

Salary increases

Due to the change to a CARE scheme from 2014, there is now a closed group of membership in the Fund with benefits linked to final salary. The run-off of this final salary linked liability was modelled, taking into account the short-term restrictions in public sector pay growth.

The results of this modelling and analysis were reported in the “2016 valuation pay growth assumption” document dated 10 March 2016. Based on the results of this modelling the Fund set a salary growth assumption of RPI – 0.7%. This reflects both short term pay constraints and the belief that general economic growth and hence pay growth may be at a lower level than historically experienced for a prolonged period of time.

Note that this assumption is made in respect of the general level of salary increases (e.g. as a result of inflation and other macroeconomic factors). We also make a separate allowance for expected pay rises granted in the future as a result of promotion. This assumption takes the form of a set of tables which model the expected promotional pay awards based on each member’s age and class. Please see **Appendix E**.

A summary of the financial assumptions underpinning the target funding basis and adopted during the assessment of the liabilities of the Fund as at 31 March 2016 (alongside those adopted at the last valuation for comparison) are shown below.

Financial assumptions	31 March 2013	31 March 2016
Discount rate		
Return on long-dated gilts	3.0%	2.2%
Asset Outperformance Assumption	1.8%*	1.8%**
Discount rate	4.8%	4.0%
Benefit increases		
Retail Prices Inflation (RPI)	3.3%	3.2%
Assumed RPI/CPI gap	(0.8%)*	(1.0%)**
Benefit increase assumption (CPI)	2.5%	2.1%
Salary increases		
Retail Prices Inflation (RPI)	3.3%	3.2%
Increases in excess of RPI	0.0%*	(0.7%)**
Salary increase assumption	3.3%	2.4%

*Arithmetic addition

**Geometric addition

Demographic assumptions

Longevity

The main demographic assumption to which the valuation results are most sensitive is that relating to the longevity of the Fund's members. For this valuation, the Fund has adopted assumptions which give the following sample average future life expectancies for members:

		31 March 2013	31 March 2016
Male	Pensioners	22.1 years	22.0 years
	Non-pensioners	24.2 years	23.9 years
Female	Pensioners	24.1 years	24.2 years
	Non-pensioners	26.7 years	26.3 years

Further details of the longevity assumptions adopted for this valuation can be found in **Appendix E**. Note that the figures above for actives and deferreds assume that they are aged 45 at the valuation date.

Other demographic assumptions

We are in the unique position of having a very large local authority data set from which to derive our other demographic assumptions. We have analysed the trends and patterns that are present in the membership of local authority funds and tailored our demographic assumptions to reflect LGPS experience.

Details of the other demographic assumptions adopted by the Fund are set out in **Appendix E**.

Further comments on the assumptions

As required for Local Government Pension Scheme valuations, our approach to this valuation must include a degree of prudence. This has been achieved by explicitly allowing for a margin of prudence in the AOA.

For the avoidance of doubt, we believe that all other proposed assumptions represent the "best estimate" of future experience. This effectively means that there is a 50% chance that future experience will be better or worse than the chosen assumption.

Taken as a whole, we believe that our proposed assumptions are more prudent than the best estimate.

The actuarial assumptions underlying the Scheme Advisory Board's Key Performance Indicators may be viewed as best estimate. Using these assumptions, the assessed funding position as at 31 March 2016 would have been 78%.

Assets

We have taken the assets of the Fund into account at their bid value as provided to us by the Administering Authority.

In our opinion, the basis for placing a value on members' benefits is consistent with that for valuing the assets - both are related to market conditions at the valuation date.

4 Results

The Administering Authority has prepared a Funding Strategy Statement which sets out its funding objectives for the Fund. In broad terms, the main valuation objectives are to hold sufficient assets in the Fund to meet the assessed cost of members' accrued benefits on the target funding basis ("the Funding Objective") and to set employer contributions which ensure both the long term solvency and the long term cost efficiency of the Fund ("the Contribution Objective").

Funding Position Relative to Funding Target

In assessing the extent to which the Funding Objective was met at the valuation date, we have used the actuarial assumptions described in the previous section of this report for the target funding basis and the funding method, also earlier described. The table below compares the value of the assets and liabilities at 31 March 2016. The 31 March 2013 results are also shown for reference.

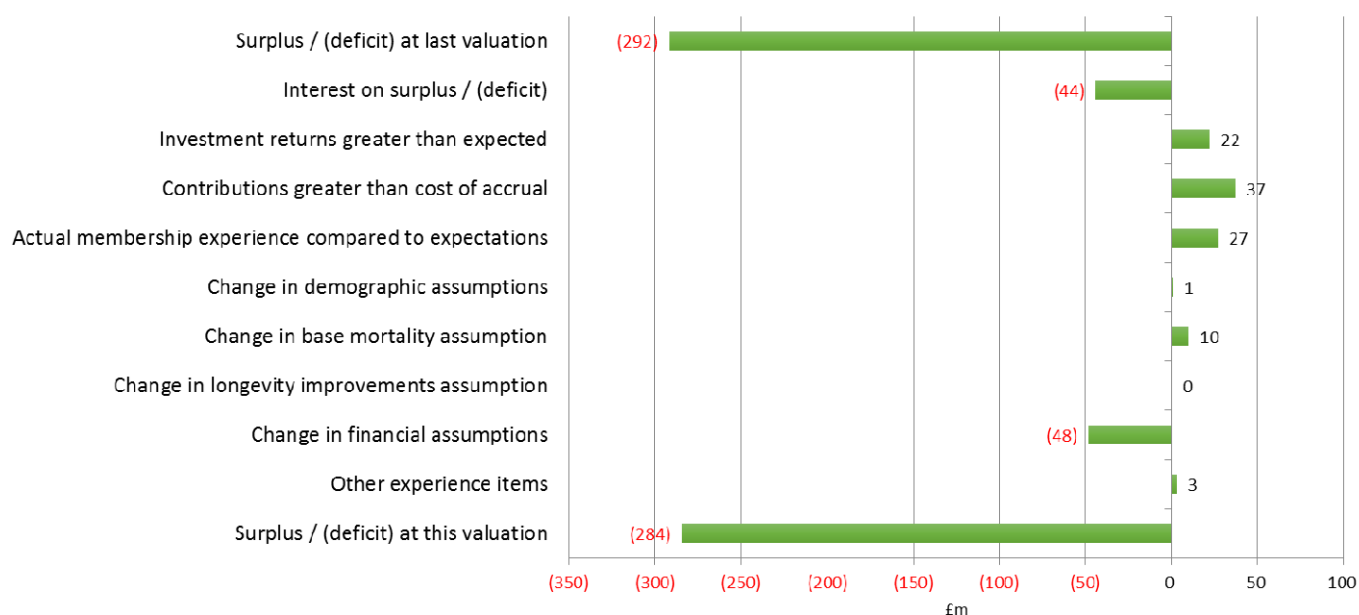
A funding level of 100% would correspond to the Funding Objective being met at the valuation date.

Valuation Date	31 March 2013	31 March 2016
Past Service Liabilities	(£m)	(£m)
Employees	266.2	271.9
Deferred Pensioners	114.5	157.3
Pensioners	371.4	428.1
Total Liabilities	752.1	857.3
Assets	460.6	572.9
Surplus / (Deficit)	(291.5)	(284.4)
Funding Level	61%	67%

The Funding Objective was not met at this Valuation: there was a shortfall of assets relative to the assessed cost of members' benefits on the target funding basis of around £284m.

Summary of changes to the funding position

The chart below illustrates the factors that caused the changes in the funding position between 31 March 2013 and 31 March 2016:



Further comments on some of the items in this chart:

- There is an interest cost of £44m. This is broadly three years of compound interest at 4.8% p.a. applied to the previous valuation deficit of £292m (and can be thought of as the investment return that would have been achieved on the extra assets the Fund would have held if fully funded).
- Investment returns being higher than expected since 2013 lead to a gain of £22m. This is roughly the difference between the actual three-year return (19.6%) and expected three-year return (15.1%) applied to the Whole Fund assets from the previous valuation of £461m, with a further allowance made for cashflows during the period.
- The membership experience of the Fund has differed to the assumptions made at the 2013 valuation leading to gain of £27m. The table below summarises the significant factors that underlie these differences:

	Expected	Actual	Difference	Impact
Pre-retirement experience				
Early leavers (no.of lives)	3,392	2,238	(1,154)	Positive
Ill-health retirements* (no.of lives)	103	46	(57)	Positive
Salary increases** (p.a.)	3.7%	2.4%	(1.3%)	Positive
Post-retirement experience				
Benefit increases (p.a.)	2.5%	1.2%	(1.3%)	Positive
Pensions ceasing (£m)	2.3	2.3	0	Nil

*Tier1 and Tier 2 ill-health retirements only

**Includes allowances for promotional increases

- The impact of the change in demographic assumptions has been a gain of around £1m.
- The change in mortality assumptions (baseline and improvements) has given rise to a gain of £10m.
- The change in financial conditions since the previous valuation has led to a loss of £48m. This is due to a decrease in the real discount rate between 2013 and 2016. The estimated impact of this is a loss of around £103m. This has partially been offset by the increase to the assumed gap between RPI and CPI and the reduction in the expected future salary growth for benefits linked to final salary (a combined estimated gain of £55m).
- Other experience items, such as changes in the membership data, have served to decrease the deficit at this valuation by around £3m.

Employer Contribution Rates

The Contribution Objective is achieved by setting employer contributions which are likely to be sufficient to meet both the cost of new benefits accruing and to address any funding deficit relative to the funding target over the agreed time horizon. A secondary objective is to maintain, where possible, relatively stable employer contribution rates.

For each employer in the Fund, to meet the Contribution Objective, a Primary Contribution Rate has been calculated in order to fund the cost of new benefits accruing in the Fund. Additionally, if required, a secondary contribution rate has also been calculated to target a fully funded position within the employer's set time horizon. These rates have been assessed using a financial model that assesses the funding outcome for the employer under 5000 different possible future economic scenarios, where the key financial assumptions about pension increases and investment returns vary. The employer contribution rates have been set to achieve the funding target over the agreed time horizon and with the appropriate likelihood of success. The time horizon and the likelihood parameters vary by employer according to each employer's characteristics. These parameters are set

out in the Funding Strategy Statement and have been communicated to employers. More information about the methodology used to calculate the contribution rates is set out in **Appendix C**.

The employer contributions payable from 1 April 2017 are given in **Appendix H**, and these have been devised in line with the Funding Strategy Statement: see **section 6**.

The table below summarises the Whole Fund Primary and Secondary Contribution rates at this valuation. These rates are the payroll weighted average of the underlying individual employer primary and secondary rates, calculated in accordance with the Regulations and CIPFA guidance.

Primary rate (%)		Secondary Rate (£)	
1 April 2017 - 31 March 2020	2017/18	2018/19	2019/20
TBC	TBC	TBC	TBC

The rates above include an allowance for administration expenses of 0.8% of pay.

The table below shows the Fund ‘Common Contribution rate’ as at 31 March 2013 for information purposes.

The change in regulatory regime and guidance on contribution rates means that a direct comparison to the Whole Fund rate at 2016 is not appropriate.

Contribution Rates	31 March 2013 (% of pay)
Employer future service rate (incl. expenses)	20.1%
Past Service Adjustment	17.5%
Total employer contribution rate (incl. expenses)	37.6%
Employee contribution rate	6.3%
Expenses	0.7%

5 Risk Assessment

The valuation results depend critically on the actuarial assumptions that are made about the future of the Fund. If all of the assumptions made at this valuation were exactly borne out in practice then the results presented in this document would represent the true cost of the Fund as it currently stands at 31 March 2016.

However, no one can predict the future with certainty and it is unlikely that future experience will exactly match the assumptions. The future therefore presents a variety of risks to the Fund and these should be considered as part of the valuation process. In particular:

- The main risks to the financial health of the Fund should be **identified**;
- Where possible, the financial significance of these risks should be **quantified**;
- Consideration should be given as to how these risks can then be **controlled** or **mitigated**; and
- These risks should then be **monitored** to assess whether any mitigation is actually working.

This section investigates the potential implications of the actuarial assumptions not being borne out in practice.

Sensitivity of past service funding position results to changes in assumptions

The table below gives an indication of the sensitivity of the funding position to changes in two of the main financial assumptions used:

Benefit Increases & CARE Revaluation					
Discount Rates		2.5%	2.1%	1.7%	
	3.2%	1,032	975	922	Liabilities (£m)
		573	573	573	Assets (£m)
		(459)	(403)	(349)	(Deficit) (£m)
		55%	59%	62%	Funding Level
	4.0%	907	857	810	Liabilities (£m)
		573	573	573	Assets (£m)
		(334)	(284)	(238)	(Deficit) (£m)
		63%	67%	71%	Funding Level
	4.8%	799	755	714	Liabilities (£m)
		573	573	573	Assets (£m)
		(226)	(182)	(141)	(Deficit) (£m)
		72%	76%	80%	Funding Level

The valuation results are also very sensitive to unexpected changes in future longevity. All else being equal, if longevity improves in the future at a faster pace than allowed for in the valuation assumptions, the funding level will decline and the required employer contribution rates will increase.

Recent medical advances, changes in lifestyle and a greater awareness of health-related matters have resulted in life expectancy amongst pension fund members improving in recent years at a faster pace than was originally foreseen. It is unknown whether and to what extent such improvements will continue in the future.

For the purposes of this valuation, we have selected assumptions that we believe make an appropriate allowance for future improvements in longevity, based on the actual experience of the Fund since the previous valuation.

The table below shows how the valuation results at 31 March 2016 are affected by adopting different longevity assumptions.

	Peaked improvements	Non-peaked improvements
	(£m)	(£m)
Liabilities	857	878
Assets	573	573
(Deficit)	(284)	(305)
Funding Level	67%	65%

The “further improvements” are a more cautious set of improvements that, in the short term, assume the ‘cohort effect’ of strong improvements in life expectancy currently being observed amongst a generation born around the early and mid 1930s will continue to strengthen for a few more years before tailing off. This is known as “non-peaked”.

This is not an exhaustive list of the assumptions used in the valuation. For example, changes to the assumed level of withdrawals and ill health retirements will also have an effect on the valuation results.

Note that the tables show the effect of changes to each assumption in isolation. In reality, it is perfectly possible for the experience of the Fund to deviate from more than one of our assumptions simultaneously and so the precise effect on the funding position is therefore more complex. Furthermore, the range of assumptions shown here is by no means exhaustive and should not be considered as the limits of how extreme experience could actually be.

Sensitivity of contribution rates to changes in assumptions

The employer contribution rates are dependent on a number of factors including the membership profile, current financial conditions, the outlook for future financial conditions, and demographic trends such as longevity. Changes in each of these factors can have a material impact on the contribution rates (both primary and secondary rates). We have not sought to quantify the impact of differences in the assumptions because of the complex interactions between them.

Investment risk

The Fund holds some of its assets in return seeking assets such as equities to help reduce employers’ costs. However, these types of investments can result in high levels of asset volatility. Therefore, there is a risk that future investment returns are below expectations and the funding target is not met. This will require additional contributions from employers to fund any deficit.

Whilst the Fund takes steps to ensure that the level of investment risk is managed and monitored via strategy reviews and performance monitoring, it can never be fully mitigated.

Regulatory risk

One further risk to consider is the possibility of future changes to Regulations that could materially affect the benefits that members become entitled to. It is difficult to predict the nature of any such changes but it is not inconceivable that they could affect, not just the cost of benefits earned after the change, but could also have a retrospective effect on the past service position.

Managing the risks

Whilst there are certain things, such as the performance of investment markets or the life expectancy of members, that are not directly within the control of the Fund, that does not mean that nothing can be done to understand them further and to mitigate their effect. Although these risks are difficult (or impossible) to eliminate, steps can be taken to manage them.

Ways in which some of these risks can be managed could be:

- Set aside a specific reserve to act as a cushion against adverse future experience (possibly by selecting a set of actuarial assumptions that are deliberately more prudent).
- Take steps internally to monitor the decisions taken by members (e.g. 50:50 scheme take-up, commutation) and employers (e.g. relating to early / ill health retirements or salary increases) in a bid to curtail any adverse impact on the Fund.
- Pooling certain employers together at the valuation and then setting a single (pooled) contribution rate that they will all pay. This can help to stabilise contribution rates (at the expense of cross-subsidy between the employers in the pool during the period between valuations).
- Carrying out a review of the future security of the Fund's employers (i.e. assessing the strength of employer covenants) and ultimately their ability to continue to pay contributions or make good future funding deficits.
- Carry out a bespoke analysis of the longevity of Fund members and monitor how this changes over time, so that the longevity assumptions at the valuation provide as close a fit as possible to the particular experience of the Fund.
- Undertake an asset-liability modelling exercise that investigates the effect on the Fund of possible investment scenarios that may arise in the future. An assessment can then be made as to whether long term, secure employers in the Fund can stabilise their future contribution rates (thus introducing more certainty into their future budgets) without jeopardising the long-term health of the Fund.
- Purchasing ill health liability insurance to mitigate the risk of an ill health retirement impacting on solvency and funding level of an individual employer where appropriate.
- Monitoring different employer characteristics in order to build up a picture of the risks posed. Examples include membership movements, cash flow positions and employer events such as cessations.
- Regularly reviewing the Fund's membership data to ensure it is complete, up to date and accurate.

6 Related issues

The Fund's valuation operates within a broader framework, and this document should therefore be considered alongside the following:

- the Funding Strategy Statement, which in particular highlights how different types of employer in different circumstances have their contributions calculated;
- the Investment Strategy Statement, which sets out how the Fund invests the assets;
- the general governance of the Fund, such as meetings of the Pensions Committee, decisions delegated to officers, the Fund's business plan, etc;
- the Fund's risk register; and
- the information the Fund holds about participating employers.

Further recommendations

Valuation frequency

Under the provisions of the LGPS regulations, the next formal valuation of the Fund is due to be carried out as at 31 March 2019. In light of the uncertainty of future financial conditions, we recommend that the financial position of the Fund (and for individual employers in some cases) is monitored by means of interim funding reviews in the period up to this next formal valuation. This will give early warning of changes to funding positions and possible revisions to funding plans.

Investment strategy and risk management

We recommend that the Administering Authority continues to regularly review its investment strategy and ongoing risk management programme.

New employers joining the Fund

Any new employers or admission bodies joining the Fund should be referred to the Fund Actuary for individual calculation as to the required level of contribution. Depending on the number of transferring members the ceding employer's rate may also need to be reviewed.

Additional payments

Employers may make voluntary additional contributions to recover any funding shortfall over a shorter period, subject to agreement with the Administering Authority and after receiving the relevant actuarial advice.

Further sums should be paid to the Fund by employers to meet the capital costs of any unreduced early retirements, reduced early retirements before age 60 and/or augmentation (i.e. additional membership or additional pension) using the methods and factors issued by me from time to time or as otherwise agreed.

In addition, payments may be required to be made to the Fund by employers to meet the capital costs of any ill-health retirements that exceed those allowed for within our assumptions.

Cessations and bulk transfers

Any employer who ceases to participate in the Fund should be referred to us in accordance with Regulation 64 of the Regulations.

Please notify us if there is any bulk movement of scheme members:

- involving 10 or more scheme members being transferred from or to another LGPS fund, or
- involving 2 or more scheme members being transferred from or to a non-LGPS pension arrangement.

7 Reliances and limitations

Scope

This document has been requested by and is provided to the London Borough of Havering in its capacity as Administering Authority to the London Borough of Havering Pension Fund. It has been prepared by Hymans Robertson LLP to fulfil the statutory obligations in accordance with regulation 62 of the Regulations. None of the figures should be used for accounting purposes (e.g. under FRS102 or IAS19) or for any other purpose (e.g. a termination valuation under Regulation 64).

This document should not be released or otherwise disclosed to any third party without our prior written consent, in which case it should be released in its entirety. Hymans Robertson LLP accepts no liability to any other party unless we have expressly accepted such liability in writing.

The results of the valuation are dependent on the quality of the data provided to us by the Administering Authority for the specific purpose of this valuation. We have previously issued a separate report confirming that the data provided is fit for the purposes of this valuation including comments on the quality of the data provided. However, if any material issues with the data provided are identified at a later date, then the results stated in this report may change.

Actuarial Standards

The following Technical Actuarial Standards¹ are applicable in relation to this report and have been complied with where material:

- TAS R – Reporting;
- TAS D – Data;
- TAS M – Modelling; and
- Pensions TAS.

Steven Law

Fellow of the Institute and Faculty of Actuaries

For and on behalf of Hymans Robertson LLP

3 March 2017

Barry McKay

Fellow of the Institute and Faculty of Actuaries

For and behalf of Hymans Robertson LLP

3 March 2017

¹ Technical Actuarial Standards (TASs) are issued by the Financial Reporting Council (FRC) and set standards for certain items of actuarial work, including the information and advice contained in this report.

Appendix A: About the pension fund

The purpose of the Fund is to provide retirement and death benefits to its members. It is part of the Local Government Pension Scheme (LGPS) and is a multi-employer defined benefit pension scheme.

Defined benefit pension scheme

In a defined benefit scheme such as this, the nature of retirement benefits that members are entitled to is known in advance. For example, it is known that members will receive a pension on retirement that is linked to their salary (final salary and/or career average) and pensionable service (for service before 1 April 2014) according to a pre-determined formula.

However, the precise cost to the Fund of providing these benefits is **not** known in advance. The estimated cost of these benefits represents a liability to the Fund and assets must be set aside to meet this. The relationship between the value of the liabilities and the value of the assets must be regularly assessed and monitored to ensure that the Fund can fulfil its core objective of providing its members with the retirement benefits that they have been promised.

Liabilities

The Fund's liabilities are the benefits that will be paid in the future to its members (and their dependants).

The precise timing and amount of these benefit payments will depend on future experience, such as when members will retire, how long they will live for in retirement and what economic conditions will be like both before and after retirement. Because these factors are not known in advance, assumptions must be made about future experience. The valuation of these liabilities must be regularly updated to reflect the degree to which actual experience has been in line with these assumptions.

Assets

The Fund's assets arise from the contributions paid by its members and their employers and the investment returns that they generate. The way these assets are invested is of fundamental importance to the Fund. The selection, monitoring and evolution of the Fund's investment strategy are key responsibilities of the Administering Authority.

As the estimated cost of the Fund's liabilities is regularly re-assessed, this effectively means that the amount of assets required to meet them is a moving target. As a result, at any given time the Fund may be technically in surplus or in deficit.

A contribution strategy must be put in place which ensures that each of the Fund's employers pays money into the Fund at a rate which will target the cost of its share of the liabilities in respect of benefits already earned by members and those that will be earned in the future.

The long-term nature of the Fund

The pension fund is a long-term commitment. Even if it were to stop admitting new members today, it would still be paying out benefits to existing members and dependants for many decades to come. It is therefore essential that the various funding and investment decisions that are taken now recognise this and come together to form a coherent long-term strategy.

In order to assist with these decisions, the Regulations require the Administering Authority to obtain a formal valuation of the Fund every three years. Along with the Funding Strategy Statement, this valuation will help determine the funding objectives that will apply from 1 April 2017.

Appendix B: Summary of the Fund's benefits

Provided below is a brief summary of the non-discretionary benefits that we have taken into account for active members at this valuation. This should not be taken as a comprehensive statement of the exact benefits to be paid. For further details please see the Regulations.

Provision	Benefit Structure To 31 March 2008	Benefit Structure From 1 April 2008	Benefit Structure From 1 April 2014
Normal retirement age (NRA)	Age 65.	Age 65.	Equal to the individual member's State Pension Age (minimum 65).
Earliest retirement age (ERA) on which immediate unreduced benefits can be paid on voluntary retirement	As per NRA (age 65). Protections apply to active members in the scheme immediately prior to 1 October 2006 who would have been entitled to immediate payment of unreduced benefits prior to 65, due to: The benefits relating to various segments of scheme membership are protected as set out in Schedule 2 to the Local Government Pension Scheme (Transitional Provisions) Regulations 2008 and associated GAD guidance.		As per NRA (minimum age 65). Protections apply to active members in the scheme for pensions earned up to 1 April 2014, due to: a) Accrued benefits relating to pre April 2014 service at age 65. b) Continued 'Rule of 85' protection for qualifying members. c) Members within 10 yrs of existing NRA at 1/4/12 – no change to when they can retire and no decrease in pension they receive at existing NRA.
Member contributions	Officers - 6% of pensionable pay Manual Workers – 5% of pensionable pay if has protected lower rates rights or 6% for post 31 March 1998 entrants or former entrants with no protected rights.	Banded rates (5.5%-7.5%) depending upon level of full-time equivalent pay. A mechanism for sharing any increased scheme costs between employers and scheme members is included in the LGPS regulations.	Banded rates (5.5%-12.5%) depending upon level of actual pay.
Pensionable pay	All salary, wages, fees and other payments in respect of the employment, excluding non-contractual overtime and some other specified amounts. Some scheme members may be covered by special agreements.		Pay including non-contractual overtime and additional hours.
Final pay	The pensionable pay in the year up to the date of leaving the scheme. Alternative methods used in some cases, e.g. where there has been a break in service or a drop in pensionable pay. Will be required for the statutory underpin and in respect of the final salary link that may apply in respect of certain members of the CARE scheme who have pre April 2014 accrual.		N/A

Provision	Benefit Structure To 31 March 2008	Benefit Structure From 1 April 2008	Benefit Structure From 1 April 2014
Period of scheme membership	Total years and days of service during which a member contributes to the Fund. (e.g. transfers from other pension arrangements, augmentation, or from April 2008 the award of additional pension). For part time members, the membership is proportionate with regard to their contractual hours and a full time equivalent). Additional periods may be granted dependent on member circumstances.		N/A
Normal retirement benefits at NRA	<p>Annual Retirement Pension - 1/80th of final pay for each year of scheme membership.</p> <p>Lump Sum Retirement Grant - 3/80th of final pay for each year of scheme membership.</p>	<p>Scheme membership from 1 April 2008:</p> <p>Annual Retirement Pension - 1/60th of final pay for each year of scheme membership.</p> <p>Lump Sum Retirement Grant – none except by commutation of pension.</p>	<p>Scheme membership from 1 April 2014:</p> <p>Annual Retirement Pension - 1/49th of pensionable pay (or assumed pensionable pay) for each year of scheme membership revalued to NRA in line with CPI.</p> <p>Lump Sum Retirement Grant - none except by commutation of pension.</p>
Option to increase retirement lump sum benefit	In addition to the standard retirement grant any lump sum is to be provided by commutation of pension (within overriding HMRC limits). The terms for the conversion of pension in to lump sum is £12 of lump sum for every £1 of annual pension surrendered.	No automatic lump sum. Any lump sum is to be provided by commutation of pension (within overriding HMRC limits). The terms for the conversion of pension in to lump sum is £12 of lump sum for every £1 of annual pension surrendered.	No automatic lump sum. Any lump sum is to be provided by commutation of pension (within overriding HMRC limits). The terms for the conversion of pension in to lump sum is £12 of lump sum for every £1 of annual pension surrendered.
Voluntary early retirement benefits (non ill-health)	On retirement after age 60, subject to reduction on account of early payment in some circumstances (in accordance with ERA protections).		On retirement after age 55, subject to reduction on account of early payment in some circumstances (in accordance with ERA protections).
Employer's consent early retirement benefits (non ill-health)	<p>On retirement after age 55 with employer's consent.</p> <p>Benefits paid on redundancy or efficiency grounds are paid with no actuarial reduction.</p> <p>Otherwise, benefits are subject to reduction on account of early payment, unless this is waived by the employer.</p>		<p>Benefits paid on redundancy or efficiency grounds are paid with no actuarial reduction.</p> <p>Employer's consent is no longer required for a member to retire from age 55. However, benefits are subject to reduction on account of early payment, unless this is waived by the employer.</p>

Provision	Benefit Structure To 31 March 2008	Benefit Structure From 1 April 2008	Benefit Structure From 1 April 2014
Ill-health benefits	<p>As a result of permanent ill-health or incapacity.</p> <p>Immediate payment of unreduced benefits.</p> <p>Enhancement to scheme membership, dependent on actual membership.</p> <p>Enhancement seldom more than 6 years 243 days.</p>	<p>As a result of permanent ill-health or incapacity and a reduced likelihood of obtaining gainful employment (local government or otherwise) before age 65.</p> <p>Immediate payment of unreduced benefits.</p> <p>Enhanced to scheme membership, dependent on severity of ill health.</p> <p>100% of prospective membership to age 65 where no likelihood of undertaking any gainful employment prior to age 65;</p> <p>25% of prospective membership to age 65 where likelihood of obtaining gainful employment after 3 years of leaving, but before age 65; or</p> <p>0% of prospective membership where there is a likelihood of undertaking gainful employment within 3 years of leaving employment</p>	<p>As a result of permanent ill-health or incapacity and a reduced likelihood of obtaining gainful employment (local government or otherwise) before NRA.</p> <p>Immediate payment of unreduced benefits.</p> <p>Enhanced to scheme membership, dependent on severity of ill health.</p> <p>100% of prospective membership to age NRA where no likelihood of undertaking any gainful employment prior to age NRA;</p> <p>25% of prospective membership to age NRA where likelihood of obtaining gainful employment after 3 years of leaving, but before age NRA; or</p> <p>0% of prospective membership where there is a likelihood of undertaking gainful employment within 3 years of leaving employment</p>

Provision	Benefit Structure To 31 March 2008	Benefit Structure From 1 April 2008	Benefit Structure From 1 April 2014
Flexible retirement	<p>After 5th April 2006, a member who has attained the age of 50, with his employer's consent, reduces the hours he works, or the grade in which he is employed, may elect in writing to the appropriate Administering Authority that such benefits may, with his employer's consent, be paid to him notwithstanding that he has not retired from that employment.</p> <p>Benefits are paid immediately and subject to actuarial reduction unless the reduction is waived by the employer.</p>	<p>A member who has attained the age of 55 and who, with his employer's consent, reduces the hours he works, or the grade in which he is employed, may make a request in writing to the appropriate Administering Authority to receive all or part of his benefits,</p> <p>Benefits are paid immediately and subject to actuarial reduction unless the reduction is waived by the employer.</p>	
Pension increases	<p>All pensions in payment, deferred pensions and dependant's pensions other than benefits arising from the payment of additional voluntary contributions are increased annually. Pensions are increased partially under the Pensions (Increases) Act and partially in accordance with statutory requirements (depending on the proportions relating to pre 88 GMP, post 88 GMP and excess over GMP).</p>		
Death after retirement	<p>A spouse's or civil partner's pension of one half of the member's pension (generally post 1 April 1972 service for widowers' pension and post 6 April 1988 for civil partners) is payable; plus</p> <p>If the member dies within five years of retiring and before age 75 the balance of five years' pension payments will be paid in the form of a lump sum; plus</p> <p>Children's pensions may also be payable.</p>	<p>A spouse's, civil partner's or nominated cohabiting partner's pension payable at a rate of 1/160th of the member's total membership multiplied by final pay (generally post 1 April 1972 service for widowers' pension and post 6 April 1988 for civil partners and nominated cohabiting partners) is payable; plus</p> <p>If the member dies within ten years of retiring and before age 75 the balance of ten years' pension payments will be paid in the form of a lump sum; plus</p> <p>Children's pensions may also be payable.</p>	

Provision	Benefit Structure To 31 March 2008	Benefit Structure From 1 April 2008	Benefit Structure From 1 April 2014
Death in service	<p>A lump sum of two times final pay; plus</p> <p>A spouse's or civil partner's pension of one half of the ill-health retirement pension that would have been paid to the scheme member if he had retired on the day of death (generally post 1 April 1972 service for widowers' pension and post 6 April 1988 for civil partners); plus</p> <p>Children's pensions may also be payable.</p>	<p>A lump sum of three times final pay; plus</p> <p>A spouse's, civil partner's or cohabiting partner's pension payable at a rate of 1/160th of the member's total (augmented to age 65) membership (generally post 1 April 1972 service for widowers' pension and post 6 April 1988 for civil partners and nominated cohabiting partners), multiplied by final pay; plus</p> <p>Children's pensions may also be payable.</p>	
Leaving service options	<p>If the member has completed three months' or more scheme membership, deferred benefits with calculation and payment conditions similar to general retirement provisions; or</p> <p>A transfer payment to either a new employer's scheme or a suitable insurance policy, equivalent in value to the deferred pension; or</p> <p>If the member has completed less than three months' scheme membership, a return of the member's contributions with interest, less a State Scheme premium deduction and less tax at the rate of 20%.</p>		<p>If the member has completed two years or more scheme membership, deferred benefits with calculation and payment conditions similar to general retirement provisions; or</p> <p>A transfer payment to either a new employer's scheme or a suitable insurance policy, equivalent in value to the deferred pension; or</p> <p>If the member has completed less than two years scheme membership, a return of the member's contributions with interest, less a State Scheme premium deduction and less tax at the rate of 20%.</p>
State pension scheme	<p>From 6th of April 2016, the Fund will no longer be contracted out of the State Second Pension. Until that date, the benefits payable to each member were guaranteed to be not less than those required to enable the Fund to be contracted-out.</p>		
Assumed pensionable pay	N/A		<p>This applies in cases of reduced contractual pay (CPP) resulting from sickness, child related and reserve forces absence, whereby the amount added to the CPP is the assumed pensionable pay rather than the reduced rate of pay actually received.</p>
50/50 option	N/A		<p>Optional arrangement allowing 50% of main benefits to be accrued on a 50% employee contribution rate.</p>

Note: Certain categories of members of the Fund are entitled to benefits that differ from those summarised above.

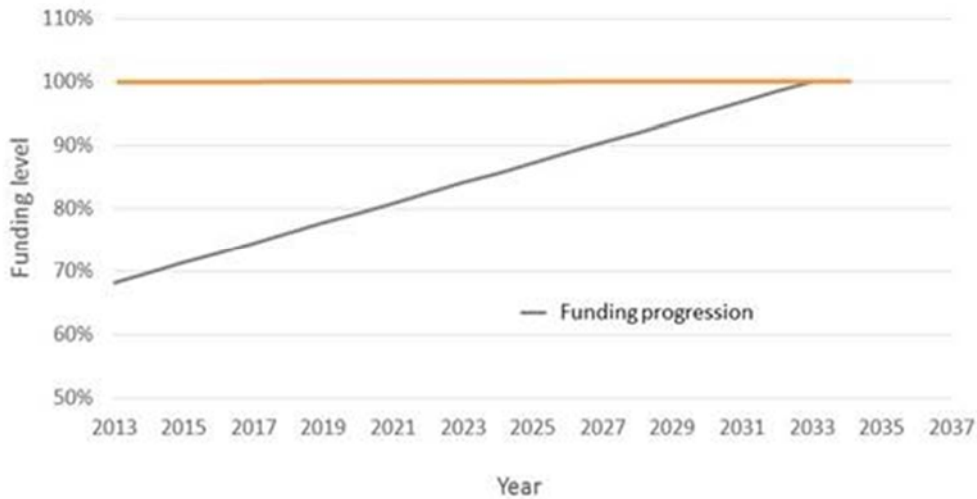
Discretionary benefits

The LGPS Regulations give employers a number of discretionary powers. The effect on benefits or contributions as a result of the use of these provisions as currently contained within the Local Government Pension Scheme Regulations has been allowed for in this valuation to the extent that this is reflected in the membership data provided. No allowance has been made for the future use of discretionary powers that will be contained within the scheme from 1 April 2017.

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Appendix C: Risk based approach to setting contribution rates

At previous valuations we have calculated contribution rates using a single set of assumptions about future economic conditions (a 'deterministic' method). By using this deterministic method, there is an implicit assumption that the future will follow expectations (i.e. the financial assumptions used in the calculation) and the employer will return to full funding via one 'journey'. This approach is summarised in the illustrative chart below.



However, pension funding is uncertain as:

- the Fund's assets are invested in volatile financial markets and therefore they go up and down in value; and
- the pension benefits are linked to inflation which again can go up and down in value over time.

One single set of assumptions is very unlikely to actually match what happens, and therefore, the funding plan originally set out will not evolve in line with the single journey shown above. The actual evolution of the funding position could be one of many different 'journeys', and a sample of these are given below.



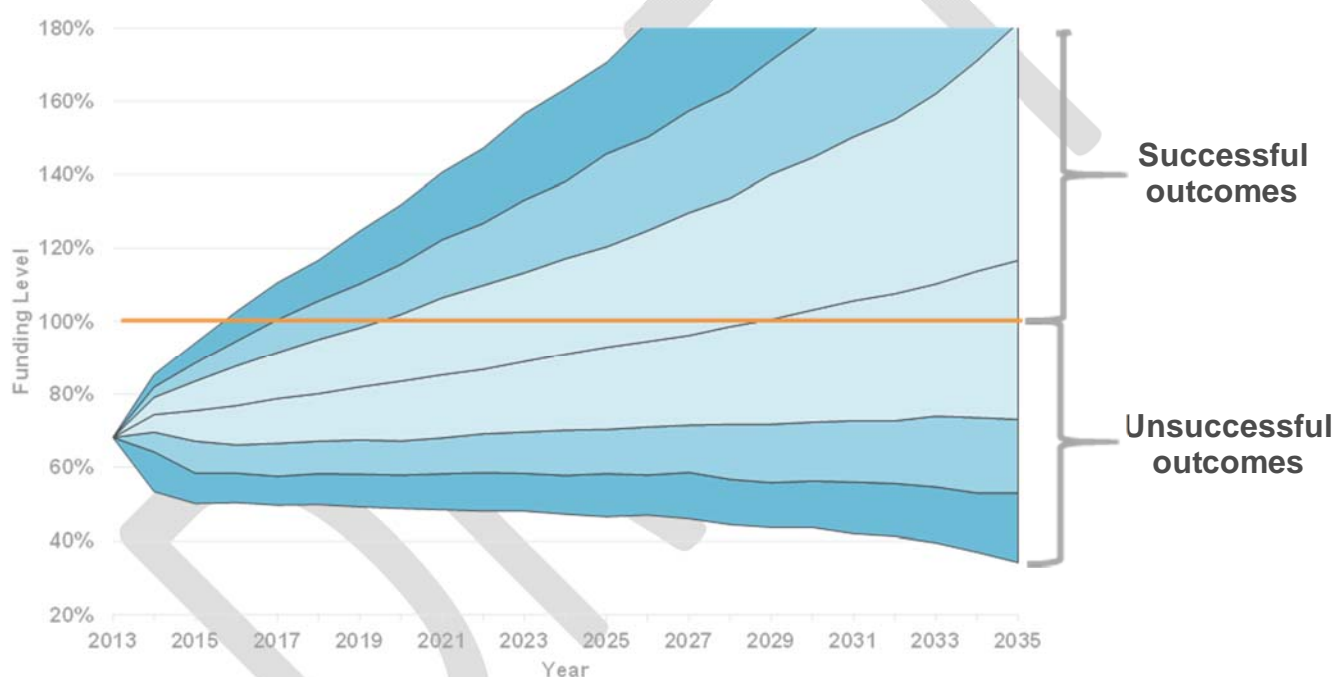
The inherent uncertainty in pension funding creates a risk that a funding plan will not be a success i.e. the funding target will not be reached over the agreed time period.

This risk can never be fully mitigated whilst invested in volatile assets and providing inflation linked benefits, however the main disadvantage of the traditional deterministic method is that it does not allow the Fund, employer, regulators or actuary to assess and understand the risk associated with the proposed funding plan and the likelihood of its success, or otherwise.

Risk Based Approach

At this valuation, we have adopted a 'risk based' approach when setting contribution rates. This approach considers thousands of simulations (or 'journeys') to be projected of how each employer's assets and liabilities may evolve over the future until we have a distribution of funding outcomes (ratio of assets to liabilities). Each simulation represents a different possible journey of how the assets and liabilities could evolve and they will vary due to assumptions about investment returns, inflation and other financial factors. Further technical detail about the methodology underlying these projections is set out in **Appendix F**.

Once we have a sufficient number of outcomes to form a statistically credible distribution (we use 5,000 outcomes), we can examine what level of contribution rate gives an appropriate likelihood of meeting an employer's funding target (usually a 100% funding level) within the agreed timeframe ('time horizon') (i.e. a sufficient number of successful outcomes). The picture below shows a sample distribution of outcomes for an employer.



Having this 'funnel' of outcomes allows the Fund to understand the likelihood of the actual outcome being higher or lower than a certain level. For example, there is 2/3rds chance the funding level will be somewhere within the light shaded area, and there is a 1 in 100 chance that the funding level will be outside the funnel altogether. Using this 'probability distribution', we then set a contribution rate that leads to a certain amount of funding outcomes being successful (e.g. 2/3rds).

Further detail on the likelihoods used in employer's funding plans is set out in the Fund's Funding Strategy Statement.

Appendix D: Data

This section contains a summary of the membership, investment and accounting data provided by the Administering Authority for the purposes of this valuation (the corresponding membership and investment data from the previous valuation is also shown for reference). For further details of the data, and the checks and amendments performed in the course of this valuation, please refer to our separate data report.

Membership data – whole fund

Employee members

	31 March 2013		31 March 2016		
	Number	Pensionable Pay* (£000)	Number	Pensionable Pay* (£000)	CARE Pot (£000)
Total employee membership	6,000	95,701	6,358	106,518	3,863

*actual pay (not full-time equivalent)

Deferred pensioners

	31 March 2013		31 March 2016	
	Number	Deferred pension (£000)	Number	Deferred pension (£000)
Total deferred membership	4,735	6,487	6,212	8,743

The figures above also include any “frozen refunds” and “undecided leavers” members at the valuation date.

Current pensioners, spouses and children

	31 March 2013		31 March 2016	
	Number	Pension (£000)	Number	Pension (£000)
Members	4,570	23,133	4,995	25,631
Dependants	811	2,242	834	3,136
Children	37	72	43	61
Total pensioner members	5,418	25,447	5,872	28,828

Note that the membership numbers in the table above refer to the number of records provided to us and so will include an element of double-counting in respect of any members who are in receipt (or potentially in receipt of) more than one benefit.

Membership Profile	Average Age (years)		FWL (years)	
	2013	2016	2013	2016
Employees (CARE)	-	50.2	7.1	8.8
Employees (Final Salary)	52.5	53.2		
Deferred Pensioners	51.1	51.5	-	-
Pensioners	68.1	69.1	-	-

The average ages are weighted by liability.

The expected future working lifetime (FWL) indicates the anticipated length of time that the average employee member will remain as a contributor to the Fund. Note that it allows for the possibility of members leaving, retiring early or dying before retirement.

Assets at 31 March 2016

A summary of the Fund's assets provided by the Administering Authority (excluding members' money-purchase Additional Voluntary Contributions) as at 31 March 2016 and 31 March 2013 is as follows:

Asset class	31 March 2013 (Market Value) (£000)	Allocation %	31 March 2016 (Market Value) (£000)	Allocation %
UK equities	215	47%	359	63%
UK fixed interest gilts	8	2%	12	2%
UK corporate bonds	56	12%	63	11%
UK index-linked gilts	41	9%	52	9%
Overseas equities	94	20%	19	3%
Overseas bonds	14	3%	13	2%
Property	22	5%	33	6%
Cash and net current assets	11	2%	21	4%
Total	461	100%	573	100%

Accounting data – revenue account for the three years to 31 March 2016

Consolidated accounts (£000)	Year to			Total
	31 March 2014	31 March 2015	31 March 2016	
Income				
Employer - normal contributions	16,294	18,173	18,533	53,000
Employer - additional contributions	21,590	10,056	15,117	46,763
Employer - early retirement and augmentation strain contributions	590	536	396	1,522
Employee - normal contributions	6,457	6,876	6,965	20,298
Employee - additional contributions	76	63	54	193
Transfers In Received (including group and individual)	2,258	1,573	1,390	5,221
Other Income	0	0	0	0
Total Income	47,265	37,277	42,455	126,997
Expenditure				
Gross Retirement Pensions	26,070	27,401	28,190	81,661
Lump Sum Retirement Benefits	5,875	5,676	6,171	17,722
Death in Service Lump sum	442	422	612	1,476
Death in Deferment Lump Sum	0	0	0	0
Death in Retirement Lump Sum	0	0	0	0
Gross Refund of Contributions	2	68	76	146
Transfers out (including bulk and individual)	1,127	1,438	1,906	4,471
Fees and Expenses	1,009	716	867	2,592
Total Expenditure	34,525	35,721	37,822	108,068
Net Cashflow	12,740	1,556	4,633	18,929
Assets at start of year	460,575	506,019	574,669	460,575
Net cashflow	12,740	1,556	4,633	18,929
Change in value	32,704	67,094	-6,361	93,437
Assets at end of year	506,019	574,669	572,941	572,941

Note that the figures above are based on the Fund accounts provided to us for the purposes of this valuation, which were fully audited at the time of our valuation calculations.

Appendix E: Assumptions

Financial assumptions

Financial assumptions	31 March 2013 (% p.a.)	31 March 2016 (% p.a.)
Discount rate	4.8%	4.0%
Price inflation (RPI)	3.3%	3.2%
Pay increases*	3.3%	2.4%
Pension increases:		
pension in excess of GMP	2.5%	2.1%
post-88 GMP	2.5%	2.1%
pre-88 GMP	0.0%	0.0%
Revaluation of deferred pension	2.5%	2.1%
Revaluation of accrued CARE pension	2.5%	2.1%
Expenses	0.7%	0.8%

* An allowance is also made for promotional pay increases (see table below).

Mortality assumptions

Longevity assumptions	31 March 2016
Longevity - baseline	Vita Lite
Longevity - improvements	
CMI Model version used	CMI_2013
Starting rates	CMI calibration based on data from Club Vita using the latest available data as at January 2014.
Long term rate of improvement	Period effects: 1.25% p.a. for men and women. Cohort effects: 0% p.a. for men and for women.
Period of convergence	Period effects: CMI model core values i.e. 10 years for ages 50 and below and 5 years for those aged 95 and above, with linear transition to 20 years for those aged between 60 and 80. Cohort effects: CMI core i.e. 40 years for those born in 1950 or later declining linearly to 5 years for those born in 1915 or earlier.
Proportion of convergence remaining at mid point	50%

As a member of Club Vita, the baseline longevity assumptions that have been adopted at this valuation are a bespoke set of VitaCurves that are specifically tailored to fit the membership profile of the Fund. These curves are based on the data the Fund has provided us with for the purposes of this valuation. Full details of these are available on request.

We have used a longevity improvement assumption based on the industry standard projection model calibrated with information from our longevity experts in Club Vita. The starting point for the improvements has been based on observed death rates in the Club Vita data bank over the period up to 2012.

We have used the 2013 version of the Continuous Mortality Investigation (CMI) longevity improvements model, instead of the more recent 2015 version, as we do not believe the increased mortality experience factored into the

2015 model is the start of a new trend. We believe it is more appropriate to use the 2013 version of the model for the 2016 valuation.

In the short term we have assumed that the improvements in life expectancy observed up to 2010 will start to tail off immediately, resulting in life expectancy increasing less rapidly than has been seen over the last decade or two. This could be described as assuming that improvements have 'peaked'.

In the longer term we have assumed that increases in life expectancy will stabilise at a rate of increase of 0.9 years per decade for men and women. This is equivalent to assuming that longer term mortality rates will fall at a rate of 1.25% p.a. for men and women.

However, we have assumed that above age 90 improvements in mortality are hard to achieve, and so the long term rate of improvement declines between ages 90 and 120 so that no improvements are seen at ages 120 and over. The initial rate of mortality is assumed to decline steadily above age 98.

Other demographic valuation assumptions

Retirements in normal health	We have adopted the retirement age pattern assumption as specified by the Scheme Advisory Board for preparing Key Performance Indicators. Further details about this assumption are available on request.
Retirements in ill health	Allowance has been made for ill-health retirements before Normal Pension Age (see table below).
Withdrawals	Allowance has been made for withdrawals from service (see table below).
Family details	A varying proportion of members are assumed to be married (or have an adult dependant) at retirement or on earlier death. For example, at age 60 this is assumed to be 90% for males and 85% for females. Husbands are assumed to be 3 years older than wives.
Commutation	50% of future retirements elect to exchange pension for additional tax free cash up to HMRC limits for service to 1 April 2008 (equivalent to 75% for service from 1 April 2008).
50:50 option	5.0% of members (uniformly distributed across the age, service and salary range) will choose the 50:50 option.

The tables below show details of the assumptions actually used for specimen ages. The promotional pay scale is an annual average for all employees at each age. It is in addition to the allowance for general pay inflation

described above. For membership movements, the percentages represent the probability that an individual at each age leaves service within the following twelve months. The abbreviations FT and PT refer to full-time and part-time respectively.

Males

Age	Salary Scale	Incidence per 1000 active members per annum							
		Death Before Retirement	Withdrawals		Ill Health Tier 1		Ill Health Tier 2		
		FT & PT	FT	PT	FT	PT	FT	PT	
20	105	0.21	219.73	439.47	0.00	0.00	0.00	0.00	
25	117	0.21	145.14	290.28	0.00	0.00	0.00	0.00	
30	131	0.26	102.98	205.93	0.00	0.00	0.00	0.00	
35	144	0.30	80.46	160.88	0.12	0.09	0.10	0.07	
40	150	0.51	64.78	129.48	0.20	0.15	0.16	0.12	
45	157	0.85	60.85	121.60	0.44	0.33	0.35	0.27	
50	162	1.36	50.16	100.12	1.13	0.85	1.14	0.85	
55	162	2.13	39.50	78.88	4.42	3.32	2.56	1.92	
60	162	3.83	35.20	70.28	7.78	5.84	2.20	1.65	
65	162	6.38	0.00	0.00	14.78	11.09	0.00	0.00	

Please note that the withdrawal figures include tier 3 ill health.

Females

Age	Salary Scale	Incidence per 1000 active members per annum							
		Death Before Retirement	Withdrawals		Ill Health Tier 1		Ill Health Tier 2		
		FT & PT	FT	PT	FT	PT	FT	PT	
20	105	0.12	151.58	252.63	0.00	0.00	0.00	0.00	
25	117	0.12	101.99	169.97	0.12	0.09	0.10	0.07	
30	131	0.18	85.50	142.46	0.16	0.12	0.13	0.10	
35	144	0.30	73.79	122.91	0.32	0.24	0.26	0.19	
40	150	0.48	61.42	102.26	0.48	0.36	0.39	0.29	
45	157	0.77	57.31	95.41	0.65	0.48	0.51	0.39	
50	162	1.13	48.32	80.35	1.21	0.91	1.22	0.92	
55	162	1.49	36.05	60.02	4.48	3.36	2.60	1.95	
60	162	1.90	29.06	48.31	9.51	7.14	2.69	2.01	
65	162	2.44	0.00	0.00	17.09	12.82	0.00	0.00	

Appendix F: Technical appendix for contribution rate modelling

This appendix is provided for readers seeking to understand the technical methodology used in assessing the employer contribution rates.

In order to assess the likelihood of the employer's section of the Fund achieving full funding we have carried out stochastic asset liability modelling (ALM) that takes into account the main characteristics and features of each employer's share of the Fund's assets and liabilities. For stabilised employers a full ALM, known as comPASS has been used. For other employers a simplified ALM, known as TARGET has been used. Please refer to the Funding Strategy Statement to determine which method has been applied for each employer.

The following sections provide more detail on the background to the modelling.

Cash flows

In projecting forward the evolution of each employer's section of the Fund, we have used anticipated future benefit cashflows. These cashflows have been generated using the membership data provided for the formal valuation as at 31 March 2016, the demographic and financial assumptions used for the valuation and make an allowance for future new joiners to the Fund (if any employer is open to new entrants).

For comPASS we have estimated future service benefit cash flows and projected salary roll for new entrants (where appropriate) after the valuation date such that payroll remains constant in real terms (i.e. full replacement) unless otherwise stated. There is a distribution of new entrants introduced at ages between 25 and 65, and the average age of the new entrants is assumed to be 40 years. All new entrants are assumed to join and then leave service at SPA, which is a much simplified set of assumptions compared with the modelling of existing members. The base mortality table used for the new entrants is an average of mortality across the LGPS and is not specific to the Fund, which is another simplification compared to the modelling of existing members. TARGET uses a similar but simplified approach to generating new entrants. Nonetheless, we believe that these assumptions are reasonable for the purposes of the modelling given the highly significant uncertainty associated with the level of new entrants.

We do not allow for any variation in actual experience away from the demographic assumptions underlying the cashflows. Variations in demographic assumptions (and experience relative to those assumptions) can result in significant changes to the funding level and contribution rates. We allow for variations in inflation (RPI or CPI as appropriate), inflation expectations (RPI or CPI as appropriate), interest rates, yield curves and asset class returns. Cashflows into and out of the Fund are projected forward in annual increments and are assumed to occur in the middle of each financial year (April to March). Investment strategies are assumed to be rebalanced annually.

Asset liability model (comPASS)

These cashflows, and the employer's assets, are projected forward using stochastic projections of asset returns and economic factors such as inflation and bond yields. These projections are provided by the Economic Scenario Service (ESS), our (proprietary) stochastic asset model, which is discussed in more detail below.

In the modelling we have assumed that the Fund will undergo valuations every three years and a contribution rate will be set that will come into force one year after the simulated valuation date. For 'stabilised' contributions, the rate at which the contribution changes is capped and floored. There is no guarantee that such capping or flooring will be appropriate in future; this assumption has been made so as to illustrate the likely impact of practical steps that may be taken to limit changes in contribution rates over time.

Unless stated otherwise, we have assumed that all contributions are made and not varied throughout the period of projection irrespective of the funding position. In practice the contributions are likely to vary especially if the funding level changes significantly.

Investment strategy is also likely to change with significant changes in funding level, but we have not considered the impact of this.

In allowing for the simulated economic scenarios, we have used suitable approximations for updating the projected cashflows. The nature of the approximations is such that the major financial and investment risks can be broadly quantified. However, a more detailed analysis would be required to understand fully the implications and appropriate implementation of a very low risk or 'cash flow matched' strategy.

We would emphasise that the returns that could be achieved by investing in any of the asset classes will depend on the exact timing of any investment/disinvestment. In addition, there will be costs associated with buying or selling these assets. The model implicitly assumes that all returns are net of costs and that investment/disinvestment and rebalancing are achieved without market impact and without any attempt to 'time' entry or exit.

Asset liability model (TARGET)

TARGET uses a similar, but simplified, modelling approach to that used for comPASS.

Contribution rates are inputs to the model and are assumed not to vary throughout the period of projection, with no valuation every three years or setting of 'stabilised' contribution rates.

In allowing for the simulated economic scenarios, we have used more approximate methods for updating the projected cash flows. The nature of the approximations is such that the major financial and investment risks can be broadly quantified.

When projecting forward the assets, we have modelled a proxy for the Fund's investment strategy by simplifying their current benchmark into growth (UK equity) and non-growth (index-linked gilts) allocations, and then adjusting the volatility of the resultant portfolio results to approximately reflect the diversification benefit of the Fund's investment strategy.

Economic Scenario Service

The distributions of outcomes depend significantly on the Economic Scenario Service (ESS), our (proprietary) stochastic asset model. This type of model is known as an economic scenario generator and uses probability distributions to project a range of possible outcomes for the future behaviour of asset returns and economic variables. Some of the parameters of the model are dependent on the current state of financial markets and are updated each month (for example, the current level of equity market volatility) while other more subjective parameters do not change with different calibrations of the model.

Key subjective assumptions are the average excess equity return over the risk free asset (tending to approximately 3% p.a. as the investment horizon is increased), the volatility of equity returns (approximately 18% p.a. over the long term) and the level and volatility of yields, credit spreads, inflation and expected (breakeven) inflation, which affect the projected value placed on the liabilities and bond returns. The market for CPI linked instruments is not well developed and our model for expected CPI in particular may be subject to additional model uncertainty as a consequence. The output of the model is also affected by other more subtle effects, such as the correlations between economic and financial variables.

Our expectation (i.e. the average outcome) is that long term real interest rates will gradually rise from their current low levels. Higher long-term yields in the future will mean a lower value placed on liabilities and therefore our median projection will show, all other things being equal, an improvement in the current funding position (because of the mismatch between assets and liabilities). The mean reversion in yields also affects expected bond returns.

While the model allows for the possibility of scenarios that would be extreme by historical standards, including very significant downturns in equity markets, large systemic and structural dislocations are not captured by the model. Such events are unknowable in effect, magnitude and nature, meaning that the most extreme possibilities are not necessarily captured within the distributions of results.

Expected Rate of Returns and Volatilities

The following figures have been calculated using 5,000 simulations of the Economic Scenario Service, calibrated using market data as at 31 March 2016. All returns are shown net of fees. Percentiles refer to percentiles of the 5,000 simulations and are the annualised total returns over 5, 10 and 20 years, except for the yields which refer to the (simulated) yields in force at that time horizon. Only a subset of the asset classes are shown below.

The calibration of the model at 31 March 2016 indicates that a period of outward yield movement is expected. For example, over the next 20 years our model expects the 17 year maturity annualised real (nominal) interest rate to rise from -1.0% (2.2%) to 0.8% (4.0%).

		Annualised total returns										Inflation	17 year real yield	17 year yield
		Index Linked Gilts (long dated)	UK Equity	Overseas Equity	Private Equity	Property	Senior Loans	Diversified Credit	Absolute Return Bonds (near zero duration)	Diversified Alternatives	Hedge Funds			
5 years	16th %ile	-2.9%	-3.7%	-5.6%	-7.2%	-3.8%	-0.8%	0.2%	-2.6%	-2.0%	-3.7%	1.2%	-1.6%	1.7%
	50th %ile	0.5%	4.5%	4.1%	5.3%	2.0%	2.2%	2.3%	2.0%	2.6%	2.1%	2.6%	-0.7%	3.0%
	84th %ile	4.1%	12.7%	14.3%	19.4%	8.3%	5.3%	4.5%	6.8%	7.5%	8.2%	4.2%	0.2%	4.5%
10 years	16th %ile	-1.8%	-1.1%	-2.6%	-3.4%	-1.8%	0.7%	1.3%	-0.8%	-0.1%	-1.3%	1.4%	-1.5%	1.9%
	50th %ile	0.3%	5.0%	4.6%	5.9%	2.8%	3.1%	3.0%	2.6%	3.4%	3.0%	2.8%	-0.3%	3.5%
	84th %ile	2.7%	11.1%	12.1%	16.0%	7.5%	5.6%	4.7%	6.2%	7.2%	7.5%	4.5%	0.9%	5.5%
20 years	16th %ile	-1.0%	1.3%	0.2%	0.3%	0.1%	2.1%	2.4%	1.0%	1.8%	0.7%	1.7%	-0.7%	2.3%
	50th %ile	0.5%	5.9%	5.6%	7.0%	3.7%	4.2%	4.0%	3.6%	4.5%	4.1%	3.0%	0.8%	4.0%
	84th %ile	2.2%	10.7%	11.2%	14.0%	7.6%	6.5%	5.8%	6.5%	7.5%	7.8%	4.4%	2.3%	6.3%
Dispersion (1 yr)		9%	16%	19%	29%	14%	6%	6%	10%	10%	12%	1%		

Appendix G: Events since valuation date

Post-valuation events

These valuation results are in effect a snapshot of the Fund as at 31 March 2016. Since that date, various events have had an effect on the financial position of the Fund. Whilst we have not explicitly altered the valuation results to allow for these events, a short discussion of these “post-valuation events” can still be beneficial in understanding the variability of pension funding.

In the period from the valuation date to early March 2017, the Fund asset returns have been significantly better than expected. However, global forward looking expectations for asset returns have fallen in light of events such as the Brexit vote. Both events have roughly cancelled each other out in terms of the impact on the funding position. However, the day to day volatility is significant

Overall, employer contributions continue to be subject to upwards pressure as a result of post-valuation events.

It should be noted that the above is for information only: the figures in this report have all been prepared using membership data, audited asset information and market-based assumptions all as at 31 March 2016. In particular, we do not propose amending any of the contribution rates listed in the Rates & Adjustments Certificate on the basis of these market changes, and all employer contribution rates are based on valuation date market conditions. In addition, these rates are finalised within a risk-measured framework as laid out in the Fund's Funding Strategy Statement (FSS). We do not propose altering the FSS or valuation calculations to include allowance for post-valuation date market changes since a long term view has been taken.

Other events

Other than investment conditions changes above, I am not aware of any material changes at whole fund level or events occurring since the valuation date.

Appendix H: Rates and adjustments certificate

In accordance with regulation 62(4) of the Regulations we have made an assessment of the contributions that should be paid into the Fund by participating employers for the period 1 April 2017 to 31 March 2020 in order to maintain the solvency of the Fund.

The method and assumptions used to calculate the contributions set out in the Rates and Adjustments certificate are detailed in the Funding Strategy Statement dated **TBC** and our report on the actuarial valuation dated **TBC**.

The required minimum contribution rates are set out below.

Employer code	Employer/Pool name	Primary Rate (%) 1 April 2017- 31 March 2020	Secondary Rate (%/£)			Total Contribution Rate (%/£)		
			2017/18	2018/19	2019/20	2017/18	2018/19	2019/20
-	London Borough of Havering Pool*	15.6%	£9,650,000	£11,150,000	£12,650,000	15.6% plus £9,650,000	15.6% plus £11,150,000	15.6% plus £12,650,000
61	Abbs Cross School	20.4%	5.6%	5.6%	5.6%	26.0%	26.0%	26.0%
62	Frances Bardsley School	21.5%	3.3%	3.3%	3.3%	24.8%	24.8%	24.8%
63	Havering Sixth Form College	20.5%	£37,000	£38,000	£39,000	20.5% plus £37,000	20.5% plus £38,000	20.5% plus £39,000
64	Havering College of Further & Higher Education	19.5%	£331,000	£339,000	£347,000	19.5% plus £331,000	19.5% plus £339,000	19.5% plus £347,000
65	Coopers Company & Coborn School	20.9%	4.3%	4.3%	4.3%	25.2%	25.2%	25.2%
66	Sacred Heart of Mary School	21.4%	4.6%	4.6%	4.6%	26.0%	26.0%	26.0%
175	SLM Fitness and Health Ltd	26.0%	-	-	-	26.0%	26.0%	26.0%
176	SLM Community Leisure Ltd	26.0%	-	-	-	26.0%	26.0%	26.0%
179	Chafford School	20.4%	2.5%	2.5%	2.5%	22.9%	22.9%	22.9%
189	Brittons Academy	21.1%	3.7%	3.7%	3.7%	24.8%	24.8%	24.8%
190	Campion Academy	20.7%	3.5%	3.5%	3.5%	24.2%	24.2%	24.2%
191	Hall Mead Academy	21.2%	4.0%	4.0%	4.0%	25.2%	25.2%	25.2%
192	St Edwards Academy	21.2%	4.7%	4.7%	4.7%	25.9%	25.9%	25.9%
193	Emerson Park Academy	20.6%	2.5%	2.5%	2.5%	23.1%	23.1%	23.1%
194	Redden Court Academy	20.4%	3.9%	3.9%	3.9%	24.3%	24.3%	24.3%
199	Albany Academy	19.7%	2.0%	2.0%	2.0%	21.7%	21.7%	21.7%
203	Bower Park	20.7%	4.1%	4.1%	4.1%	24.8%	24.8%	24.8%
205	Langtons Junior Academy	21.9%	0.2%	0.2%	0.2%	22.1%	22.1%	22.1%
206	Oasis Pinewood Academy	20.2%	2.7%	2.7%	2.7%	22.9%	22.9%	22.9%
207	Breyer Group Repairs	23.8%	-	-	-	23.8%	23.8%	23.8%
208	Breyer Group Voids	23.8%	-	-	-	23.8%	23.8%	23.8%
214	Dycotts	19.1%	2.3%	2.3%	2.3%	21.4%	21.4%	21.4%
215	Caterlink	TBC	TBC	TBC	TBC	TBC	TBC	TBC
201, 202	Upminster Academies Trust	21.9%	4.0%	4.0%	4.0%	25.9%	25.9%	25.9%
209, 210	Rise Park Academy Trust	20.6%	4.5%	4.5%	4.5%	25.1%	25.1%	25.1%
180, 204, 213, 216, 218**	Drapers Multi Academy Trust	20.4%	3.4%	3.4%	3.4%	23.8%	23.8%	23.8%
TBC	Accent Catering	TBC	TBC	TBC	TBC	TBC	TBC	TBC
Employers joining after the valuation date								
217	Ravensbourne Academy	19.5%	3.5%	3.5%	3.5%	23.0%	23.0%	23.0%
220	Benhurst Primary	23.0%	3.4%	3.4%	3.4%	26.4%	26.4%	26.4%
221	Concordia Academy	17.5%	-	-	-	17.5%	17.5%	17.5%
222	Olive AP Academy	22.7%	£0	£0	£0	26.7%	26.7%	26.7%

*The London Borough of Havering may 'pre-pay' their primary and/or secondary contribution rates annually or triennially in advance. Given the discounted nature our calculations, the London Borough of Havering Pool rate shown above would be eligible for a reduction where the 'pre-payments' were made in April.

**Brookside Infants joined the fund on 1 April 2016 and have been included in the Drapers Multi Academy Trust for contribution rate purposes.

Signature:

Date: 3 March 2017

3 March 2017

Name: Steven Law

Barry McKay

Qualification: Fellow of the Institute and
Faculty of Actuaries

Fellow of the Institute and
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