

**Manchester City Council  
Report for Information**

**Report To:** Audit Committee – 23 June 2017  
**Subject:** Treasury Management Annual Report 2016-17  
**Report of:** City Treasurer

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**Purpose**

To report the Treasury Management activities of the Council 2016-17.

**Recommendations**

The Audit Committee is asked to note the contents of the report.

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**Wards Affected:**

Not Applicable

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**Background documents (available for public inspection):**

Treasury Management Strategy Statement and Borrowing Limits and Annual Investment Strategy Report 2016-17 (Executive Committee 15<sup>th</sup> February 2016, Council 4<sup>th</sup> March 2016).

## **1 Introduction and Background**

- 1.1 Treasury Management in Local Government is regulated by the CIPFA Code of Practice on Treasury Management in Local Authorities. The City Council has adopted the Code and complies with its requirements. A primary requirement of the Code is the formulation and agreement by full Council of a Treasury Policy Statement which sets out Council, Committee and Chief Financial Officer responsibilities, and delegation and reporting arrangements. This was approved by the Council on the 6<sup>th</sup> March 2015 as part of the Treasury Management Strategy Statement for 2016-17.
- 1.2 CIPFA amended the CIPFA Treasury Management in the Public Services Code of Practice in late 2011. The revised Code recommended local authorities include, as part of their Treasury Management Strategy Statement, the requirement to report to members at least twice a year on the activities of the Treasury Management function. This report, along with the Interim Treasury Management report received by the Audit Committee on the 1<sup>st</sup> December 2016, therefore ensures that the Council meets the requirements of the Strategy, and therefore the Code.
- 1.3 Treasury Management in this context is defined as:

‘The management of the organisation’s investments and cash flows, its banking, money market and capital market transactions; the effective control of the risks associated with those activities; and the pursuit of optimum performance consistent with those risks’.

This outturn report covers:

- Section 1: Introduction and Background
  - Section 2: The Council’s Portfolio Position as at 31<sup>st</sup> March 2017
  - Section 3: Core City Benchmarking 2015-16
  - Section 4: Borrowing Strategy for 2016-17
  - Section 5: Borrowing Activities in 2016-17
  - Section 6: Government Lending
  - Section 7: Treasury Borrowing in 2016-17
  - Section 8: Compliance with Treasury Limits and Prudential Indicators
  - Section 9: Investment Strategy for 2016-17
  - Section 10: Temporary Borrowing and Investment Outturn for 2016-17
  - Section 11: Conclusion
- Appendix A: PWLB Interest Rates  
Appendix B: Treasury Management Prudential Indicators  
Appendix C: Glossary of Terms

## **2 The Council’s Portfolio Position as at 31<sup>st</sup> March 2017**

- 2.1 As outlined in the approved Treasury Management Strategy for 2016-17 it was anticipated that there would be a need to undertake some permanent borrowing in 2016-17 to fund the capital programme and to replace some of the internal funds. There was borrowing from the Government in the year from the Homes and Communities Agency (HCA) and for the Housing Investment

Fund (HIF). Beyond this cash balances during the year have been relatively high and, as it remains the policy to keep cash low and minimise temporary investments, no other borrowing activity was undertaken during the year.

2.2 The Council's debt position at the beginning and the end of the year was as follows:

Loan Type	31 March 2016		31 March 2017			
	Principal £m	Average Rate %	GF £m	HRA £m	Principal £m	Average Rate %
PWLB	0.0	0.00	0.0	0.0	0.0	0.00
Temporary Borrowing	7.3	0.50	2.4	0.0	2.4	0.33
Market Loans	480.2	4.71	387.0	71.2	458.2	4.82
Stock	8.1	3.37	7.4	0.0	7.4	3.37
Government Lending	28.6	0.00	68.0	0.0	68.0	0.00
<b>Gross Total</b>	<b>524.2</b>	<b>4.37</b>	<b>464.8</b>	<b>71.2</b>	<b>536.0</b>	<b>4.17</b>
Temporary Deposits	(80.1)	0.34	(83.7)	0.0	(83.7)	0.27
Internal Balances (GF/HRA)	0.0	0.00	39.9	(39.9)	0.00	0.00
<b>Net Total</b>	<b>444.1</b>		<b>421.0</b>	<b>31.3</b>	<b>452.3</b>	

2.3 Long term borrowing of £22m matured in the year and was repaid.

2.4 At 31<sup>st</sup> March 2017 £26.2m was advanced for the HCA and £41.8m for the HIF.

2.5 The temporary borrowing and deposit figures fluctuate daily to meet the daily cash flow requirements of the Council. The figures for these categories in the table above are therefore only a snapshot at a particular point in time.

2.6 An assumed borrowing need of £225m was identified in the budget for 2016-17. Borrowing however, other than that from the HCA and for the HIF, became unnecessary in the year. This positive change is explained by favourable movements in the levels of receipts and payments together with the net £68.0m total advances from the HCA and for the HIF.

2.7 Several local public sector organisations invest funds with the Council in order to reduce counterparty risk and to achieve an investment return. Such facilities are not available to them through their banks. The Council has borrowed £2.4m in this way, which is deemed to be temporary borrowing due to the facility offered. At 31<sup>st</sup> March 2017 this comprised £2.2m from the Manchester International Festival, £0.1m from the Manchester Mortgage Corporation Ltd and £0.1m from the Manchester Federation of Schools.

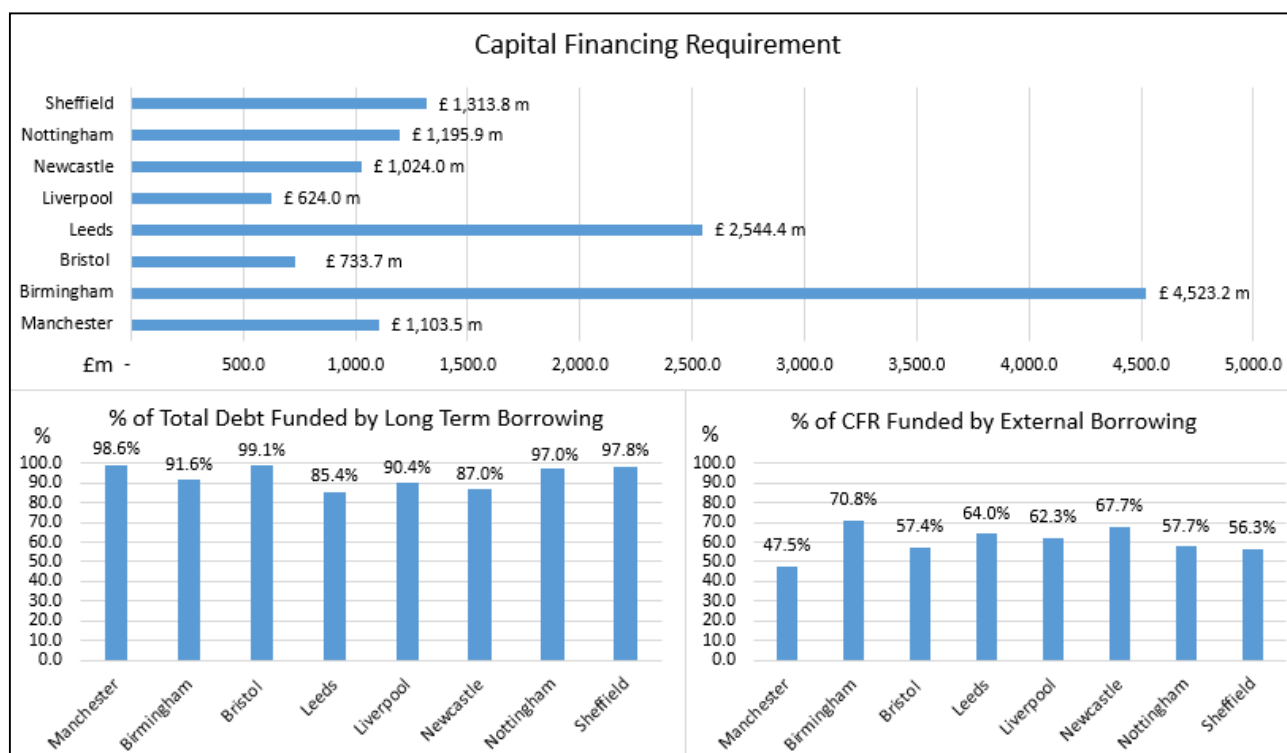
2.8 The value of stock has changed in the year as an exercise has commenced to redeem the historical stock holding. By the year end £0.7m of stock had been redeemed. Redemption of the Council's stock was approved by the Audit Committee on the 1<sup>st</sup> December 2016. The Council's current positive cash flow affords an opportunity to redeem the long standing stock holding which dates back to 1874 and 1891. Redemption has the benefit of removing the annual payment of interest and will increase staff capacity by avoiding the considerable overhead involved in administering the stock.

### 3 Core City Benchmarking for 2015-16

3.1 Comparison data is noted below for Manchester and the other core cities. The latest data available relates to 2015-16 as currently Authorities are finalising their 2016-17 Accounts. It should be noted that each of the Core Cities may have differing approaches to risk management with their Treasury Management Strategies. These factors make direct comparison of Treasury Management Portfolios difficult.

3.2 The Council's debt position compared to the other Core Cities:

31st March 2016	Manchester	Birmingham	Bristol	Leeds	Liverpool	Newcastle	Nottingham	Sheffield
<b>Capital Financing Requirement</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>
CFR	1,103.5	4,523.2	733.7	2,544.4	624.0	1,024.0	1,195.9	1,313.8
<b>Borrowings</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>
Long Term Borrowings	516.8	2,934.8	417.8	1,390.8	351.2	603.4	669.5	724.0
Temporary Borrowings	7.4	267.6	3.6	237.7	37.3	90.3	20.9	16.0
<b>Gross Total</b>	<b>524.2</b>	<b>3,202.4</b>	<b>421.4</b>	<b>1,628.5</b>	<b>388.5</b>	<b>693.7</b>	<b>690.4</b>	<b>740.0</b>
<b>Investments</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>	<b>£m</b>
Temporary Deposits	(80.1)	(266.2)	(141.9)	(8.0)	(45.3)	(13.2)	(80.4)	(86.7)
<b>Net Total</b>	<b>444.1</b>	<b>2,936.2</b>	<b>279.5</b>	<b>1,620.5</b>	<b>343.2</b>	<b>680.5</b>	<b>610.0</b>	<b>653.3</b>



- 3.3 Manchester's registered population was 530,300 on the 31<sup>st</sup> of March 2016, making the city the fourth largest out of the eight cities listed in terms of residency. Manchester, Newcastle, Nottingham, and Sheffield have a similar Capital Financing Requirement (CFR). Bristol and Liverpool have a lower CFR, whereas Leeds and Birmingham have almost double and four times the CFR respectively to that of Manchester. This is due to decisions taken on capital financing in prior years.
- 3.4 All the Authorities have a relatively similar high level of long term borrowings compared to total debt. Manchester has the second highest percentage of long term debts to that of total external borrowings. This enables Manchester to have relative certainty over debt as well as helping to manage risk.
- 3.5 Manchester's strong financial position means that the Council has the opportunity to maximise internal borrowing. This is consistent with Manchester's borrowing strategy where the maximisation of internal borrowing is pursued firstly to minimise external borrowing costs. As a result of this approach, Manchester has the lowest percentage of external borrowing to CFR.

#### **4 Borrowing Strategy for 2016-17**

- 4.1 The expectation for interest rates within the 2016-17 strategy was informed by the Council's external Treasury Advisors. Bank Rate was expected to increase to 1.00% in the year from 0.50%. The Bank of England however reduced the rate to 0.25% on the 3<sup>rd</sup> of August 2016.
- 4.2 In this scenario the treasury strategy becomes a balance between postponing borrowing to avoid the cost of holding higher levels of investments and to reduce counterparty risk; and taking borrowing to 'lock-in' long term borrowing at historically low rates and to mitigate against the risk of delaying and borrowing at higher rates.
- 4.3 This further confirmed the assumption that variable or short-term rates were expected to be the cheaper form of borrowing over the period. Continued uncertainty in the aftermath of the 2008 financial crisis promoted a cautious approach, whereby investments would continue to be dominated by low counterparty risk considerations, resulting in relatively low returns compared to borrowing rates. Ultimately, due to continued concerns regarding the level of inflation and the underlying strength of the economy, in the year the Bank of England reduced bank rate to a further historic low of 0.25%.

#### **5 Borrowing Activities in 2016-17**

- 5.1 There was no external borrowing during the year, despite an assumed borrowing need of £225m being identified in the budget for 2016-17. Borrowing became unnecessary in the year because of favourable movements in the levels of receipts and payments. However, there was additional interest free borrowing from the Government of £36.0m in respect of new advances from the HCA and for the HIF.

## **6 Government Lending - Homes & Communities Agency (HCA) and The Housing Investment Fund (HIF)**

- 6.1 The HCA has made funding available to Greater Manchester (GM), which is in effect a 'loan' of the HCA's receipts from the disposal of its land and property within GM. The funds can be used to invest in any project which supports GM City Deal objectives. Some of the funds will be passed on to GM authorities for projects within their areas. The funds received are classified as loans as they will be repaid to the HCA in March 2022, however no interest is charged by the HCA on the advances.
- 6.2 The HCA is also providing £300m funding in total to GM for housing investment in respect of the HIF. Funding for the HIF is similar to, but distinct from that for the HCA arrangements. The HIF advances are also treated as loans as they are ultimately repayable to the DCLG in 2028, and are interest free. Any losses resulting from investment of HIF funds will be met by Government (up to 20%), or by guarantee from the ten Greater Manchester authorities (including Manchester).
- 6.3 The HIF and HCA are Greater Manchester initiatives which will be operated by the Greater Manchester Combined Authority (GMCA). Currently GMCA are waiting to be granted the statutory powers to operate the initiatives, therefore in the interim Manchester City Council are acting as the responsible body for the HIF and HCA.
- 6.4 When the initiatives are transferred to GMCA, there will be no implications for the Council other than the cancellation of its Government lending, together with a reduction in the amount of temporary surplus cash. The latter will impact on income generated from short term deposits and the Council's capacity to internally borrow.

### **Homes & Communities Agency (HCA)**

- 6.5 In the year the Council received a further £8.8m of HCA funding. Further funds will be called down against these arrangements from 2017-18 onwards. The funding from the HCA is held as an interest free loan, until such time as an investment approval is made. At this point, the approved element of the loan becomes risk-based, with the return to the HCA based on the performance of that investment.
- 6.6 The funds are to be used for housing or commercial projects within Greater Manchester. HCA funds passed on by the Council to other authorities within Greater Manchester are treated as investments by the Council.
- 6.7 The funds received are to be repaid to the HCA in March 2022. No interest is charged to the Council for the receipt of the funds; however, should an investment made with HCA funds not be recovered, the loss is deducted from the amount due to HCA. Conversely, should any profit be made by an investment these will be added to the amount due to the HCA. This means the loan is almost risk-free to the Council.

## Housing Investment Funding (HIF)

- 6.8 In the year the Council received £27.2m of this funding which was recorded as a loan at 31st March 2017. Further HIF funding was received in the year, but the uncommitted amount at the year end was returned to the DCLG according to their instructions and will be called own again starting in 2017-18.

## 7 Treasury Borrowing in 2016-17

- 7.1 Public Works Loan Board (PWLB) interest rates have fluctuated during the year. Overall at the year end the rates were around 25 basis points lower than those at the start of the 2016/17 financial year, as shown in the graph at Appendix A.

<b>PWLB Borrowing Rates 2016-17 for 1 to 50 years</b>					
	1 Year	5 Year	10 Year	25 Year	50 Year
Low	0.96%	1.15%	1.62%	2.28%	2.07%
Date	20/12/2016	10/08/2016	10/08/2016	12/08/2016	30/08/2016
High	1.40%	2.00%	2.71%	3.48%	3.28%
Date	27/04/2016	27/04/2016	27/04/2016	27/04/2016	27/04/2016
Average	1.13%	1.56%	2.21%	2.92%	2.69%

- 7.2 The rates above reflect the standard PWLB rate. The Government, after 1<sup>st</sup> November 2012, reduced by 0.2% the interest rates on loans from the PWLB to local authorities who provide information to Government on their plans for long-term borrowing and associated capital spending. The Council provided the required information, and can therefore access this Certainty Rate.
- 7.3 The Council has agreed a £100m facility with the European Investment Bank (EIB) which will form part of the Council's future overall borrowing strategy. The EIB's rates for sterling borrowing continue to be favourable compared to PWLB, allowing for existing planned future borrowing from PWLB to be replaced by cheaper funding from the EIB. The latest expectation is that the facility will start to be drawn down in 2017-18 to 2018-19. The EIB appraises its funding plans against individual schemes, particularly around growth and employment and energy efficiency. Any monies borrowed are part of the Council's overall pooled borrowing.

## 8 Compliance with Treasury Limits and Prudential Indicators

- 8.1 During the financial year, the Council operated within the treasury limits and prudential indicators set out in the Treasury Management Strategy Statement. This is with the exception of ten breaches of the daily current account limit and one breach of the Barclays call account limit which are described below. Performance against the treasury targets is shown in Appendix B.

- 8.2 In the year there were ten breaches of the daily £400k limit on the Barclays current account. The causes of the breaches can be classified into three categories:
- i. Barclays issues with their on-line system meaning Treasury Management staff were unable to obtain information on balances and therefore arrange transfers to maintain accounts within limits. This occurred on two occasions resulting in the current account being overdrawn.
  - ii. Receipts did not arrive on six occasions that Treasury Management staff had previously been advised were due, resulting in the current account being overdrawn. Each occurrence was late in the day meaning there was no opportunity to transfer funds from the call account to remain within limits.
  - iii. On six occasions there were late receipts that Treasury Management staff had not been previously advised of. These resulted in the current account being above the £400k limit. Each occurrence was late in the day meaning there was no opportunity to transfer funds to the call account to remain within limits.
- 8.3 There was one breach of the Barclays £10m call account limit where the balance was exceeded by £19m. This was due to an issue with the Barclays bank on-line system where the bank changed their usual procedure and timing for running update reports in the morning. Treasury Management staff only became aware of this after the deadline had passed for the daily deposit of surplus funds with the Bank of England. Barclays' procedures have been reviewed to avoid a re-occurrence of this in the future.
- 8.4 Each breach was notified to the Treasurer and action taken on the following working day to bring balances back within approved limits.

## **9 Investment Strategy for 2016-17**

- 9.1 The Treasury Management Strategy Statement (TMSS) for 2016-17 was approved by the Executive Committee on 15<sup>th</sup> February 2016, and by Council on 4<sup>th</sup> March 2016.

The Council's Annual Investment Strategy, which is incorporated in the TMSS, outlines the Council's investment priorities as:

- a) the security of capital; and
- b) the liquidity of investments.

- 9.2 In order to achieve a higher level of security the City Treasurer introduced the following measures:
- Investments to be restricted to UK banks, building societies, local authorities and Government institutions.
  - Diversify the investment portfolio into more secure UK Government and



Government backed institutions.

- Although the investment strategy allows investments up to 364 days, restrict deposits to as short a time period as feasible.

9.3 The Council's temporary cash balances are managed by the Council Treasurer in-house and invested with those institutions listed in the Council's Approved Lending List. Officers can confirm these institutions meet the security criteria set out in the Annual Investment Strategy.

## 10 Temporary Borrowing and Investment Outturn 2016-17

10.1 Investment rates available in the market continue to be at an historic low point. The average level of funds available for investment purposes in 2016-17 was just over £150m. These funds were available on a temporary basis and the level of funds available was mainly dependent on the timing of precept payments, the receipt of grants, and progress on the capital programme.

10.2 Temporary borrowing consists of funds the Council holds for Manchester organisations that work closely with the Council. It was agreed the Council would pay interest on their funds in line with the base rate, which is why the Council are marginally above the benchmark cost as noted in the table at 9.4.

10.3 The average level of temporary borrowing during the financial year, excluding those days when no temporary borrowing was required, was £7.9m.

10.4 Detailed below is the temporary investment and borrowing undertaken by the Council. As illustrated, the Council over performed the benchmark by 7 basis points on investments due to the inter Local Authority market being relatively buoyant.

	Average temporary Investment/borrowing	Net Return/Cost	Benchmark Return / Cost *
Temporary Investments	£150.6m	0.27%	0.20%
Temporary Borrowing	£7.9m	0.33%	0.33%

*\*Average 7-day LIBID / LIBOR rate sourced from Capita*

10.5 None of the institutions in which investments were made showed any difficulty in repaying investments and interest in full during the year. The list of institutions in which the Council invests is kept under continuous review.

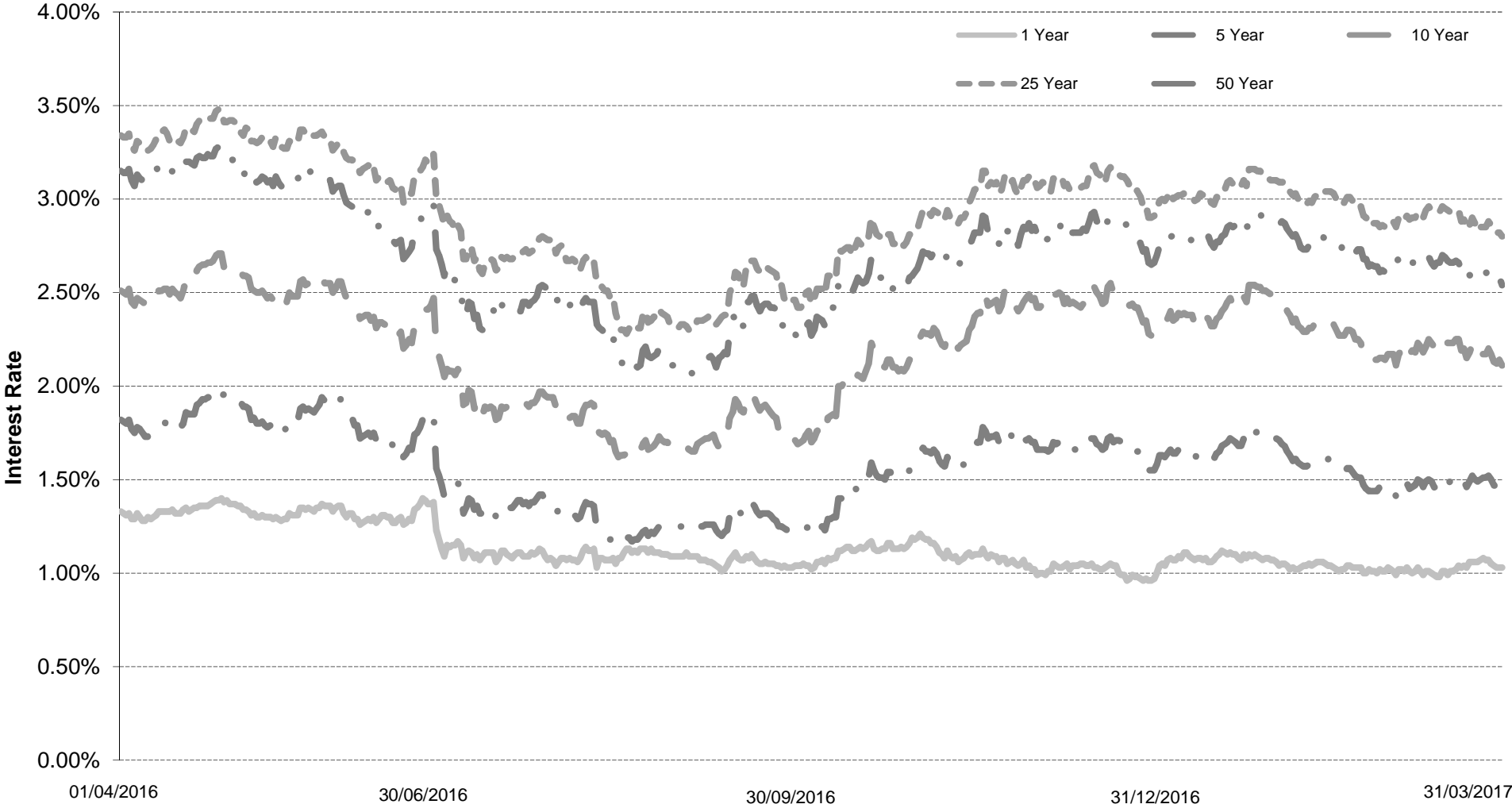
## 11 Conclusion

11.1 The current borrowing position reflects the strong Balance Sheet of the Council. It enables net interest costs to be minimised and reduces credit risk by making temporary use of internal borrowing (sourced from reserves, provisions, positive cash flows, etc.). It remains the Council's policy to keep

cash as low as possible and not to borrow in advance of need for capital purposes. As cash balances have been relatively high, no long term borrowing has been taken during the 2016-17 financial year.

- 11.2 Proactive treasury management during the year has enabled the Council to achieve an average net return on investments of 0.27%, which is slightly higher than the benchmark average 7-day LIBID rate of 0.20%. There was an average net cost of temporary borrowing of 0.33%, equal to the benchmark average 7-day LIBOR rate of 0.33%.
- 11.3 Consideration will be given to borrowing during the 2017-18 financial year. This will be dependent on the interest rates available and the need to borrow to meet the Council's cash needs. All available options will be considered.

PWLB Rates April 2016 - March 2017



**Treasury Management Prudential Indicators: 2016-17**

	<b>Original</b>	<b>Minimum In Year to 31 Mar 2017</b>	<b>Maximum In Year to 31 Mar 2017</b>
	<b>£m</b>	<b>£m</b>	<b>£m</b>
<b>Operational Boundary for External Debt:</b>			
Borrowing	1,018.5	524.2	610.3
Other Long Term Liabilities	216.0	141.7	141.7
<b>Authorised Limit for External Debt:</b>			
Borrowing	1,272.5	524.2	610.3
Other Long Term Liabilities	216.0	141.7	141.7
	<b>Actual as at 31 Mar 2017</b>		
<b>The Council has adopted CIPFA's Code of Practice for Treasury Management in the Public Services</b>	Yes		Yes
<b>Upper Limits for Interest Rate Exposure:</b>			
Net Borrowing at Fixed Rate as a percentage of Total Net Borrowing	92%		57%
Net Borrowing at Variable Rate as a percentage of Total Net Borrowing	90%		43%
<b>Upper Limit for Principal Sums Invested for over 364 days</b>	£0		£0

<b>Maturity structure of Fixed Rate Borrowing</b>	<b>Lower Limit</b>	<b>Upper Limit</b>	<b>Actual as at 31 Mar 2017</b>
	<b>2016-17 Original</b>	<b>2016-17 Original</b>	
under 12 months	0%	70%	0%
12 months and within 24 months	0%	100%	49%
24 months and within 5 years	0%	90%	47%
5 years and within 10 years	0%	70%	1%
10 years and above	0%	70%	3%

## Glossary of Terms

**Authorised Limit** – This Prudential Indicator represents the limit beyond which borrowing is prohibited, and needs to be set and revised by Members. It reflects the level of borrowing which, while not desired, could be afforded in the short term, but is not sustainable. It is the expected maximum borrowing need, with some headroom for unexpected movements.

**Bank Rate** – the rate at which the Bank of England offers loans to the wholesale banks, thereby controlling general interest rates in the economy.

**Counterparty** – one of the opposing parties involved in a borrowing or investment transaction.

**Credit Rating** – A qualified assessment and formal evaluation of an institution's (bank or building society) credit history and capability of repaying obligations. It measures the probability of the borrower defaulting on its financial obligations, and its ability to repay these fully and on time.

**Discount** – Where the prevailing interest rate is higher than the fixed rate of a long-term loan, which is being repaid early, the lender can refund the borrower a discount, the calculation being based on the difference between the two interest rates over the remaining years of the loan, discounted back to present value. The lender is able to offer the discount, as their investment will now earn more than when the original loan was taken out.

**Fixed Rate Funding** – A fixed rate of interest throughout the time of the loan. The rate is fixed at the start of the loan and therefore does not affect the volatility of the portfolio, until the debt matures and requires replacing at the interest rates relevant at that time.

**Gilts** – The loan instruments by which the Government borrows. Interest rates will reflect the level of demand shown by investors when the Government auctions Gilts.

**High/Low Coupon** – High/Low interest rate.

**LIBID (London Interbank Bid Rate)** – This is an average rate, calculated from the rates at which individual major banks in London are willing to borrow from other banks for a particular time period. For example, 6 month LIBID is the average rate at which banks are willing to pay to borrow for 6 months.

**LIBOR (London Interbank Offer Rate)** – This is an average rate, calculated from the rates which major banks in London estimate they would be charged if they borrowed from other banks for a particular time period. For example, 6 month LIBOR is the average rate which banks believe they will be charged for borrowing for 6 months.

**Liquidity** – The ability of an asset to be converted into cash quickly and without any price discount. The more liquid a business is, the better able it is to meet short-term financial obligations.

**LOBO (Lender Option Borrower Option)** – This is a type of loan where, at various periods known as call dates, the lender has the option to alter the interest rate on the loan. Should the lender exercise this option, the borrower has a corresponding option to repay the loan in full without penalty.

**Market** – The private sector institutions - Banks, Building Societies etc.

**Maturity Profile/Structure** – an illustration of when debts are due to mature, and either have to be renewed or money found to pay off the debt. A high concentration in one year will make the Council vulnerable to current interest rates in that year.

**Monetary Policy Committee** – the independent body that determines Bank Rate.

**Operational Boundary** – This Prudential Indicator is based on the probable external debt during the course of the year. It is not a limit and actual borrowing could vary around this boundary for short times during the year. It should act as an indicator to ensure the Authorised Limit is not breached.

**Premium** – Where the prevailing current interest rate is lower than the fixed rate of a long-term loan, which is being repaid early, the lender can charge the borrower a premium, the calculation being based on the difference between the two interest rates over the remaining years of the loan, discounted back to present value. The lender may charge the premium, as their investment will now earn less than when the original loan was taken out.

**Prudential Code** – The Local Government Act 2003 requires the Council to have regard to the Prudential Code and to set Prudential Indicators for the next three years to ensure that the Council's capital investment plans are affordable, prudent and sustainable.

**PWLB** – Public Works Loan Board. Part of the Government's Debt Management Office, which provides loans to public bodies at rates reflecting those at which the Government is able to sell Gilts.

**Specified Investments** – Sterling investments of not more than one-year maturity. These are considered low risk assets, where the possibility of loss of principal or investment income is very low.

**Non-specified investments** – Investments not in the above, specified category, e.g., foreign currency, exceeding one year or outside our minimum credit rating criteria.

**Variable Rate Funding** – The rate of interest either continually moves reflecting interest rates of the day, or can be tied to specific dates during the loan period. Rates may be updated on a monthly, quarterly or annual basis.

**Volatility** – The degree to which the debt portfolio is affected by current interest rate movements. The more debt maturing within the coming year and needing replacement, and the more debt subject to variable interest rates, the greater the volatility.

**Yield Curve** – A graph of the relationship of interest rates to the length of the loan. A normal yield curve will show interest rates relatively low for short-term loans compared to long-term loans. An inverted Yield Curve is the opposite of this.