Appendix 5.3.A.8 – Annex 3 – Lead Strategy

Wessex Water

September 2018

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Annex 3. Lead Strategy

Annex: Proposals to carry out improvements for drinking water quality reasons – submission of information

An up to date regulation 28 risk assessment report must be appended with all submissions.

This annex lists all of the information that companies should provide to the Inspectorate with PR19 proposals for drinking water quality. If the information is already included in the regulation 28 reports submitted with proposals, or in other documents appended to the submission, there is no need for companies to provide the information again separately.

Scheme details:

Water Company:	Wessex Water
Date of submission:	28 December 2017
Name of supply system & Reg. 28 Report ref. number:	All Wessex Water water quality zones (listed below)
Name of Water Treatment Works/Distribution System/Service Reservoir/Other asset:	Lead Strategy
Water quality hazard/drivers identified:	Lead
Reference to outcome in company's long-term strategy:	*Our Strategic Direction'* Strategic Direction Statement Page 11 ' Excellent Quality Drinking Water'

Stage One – Details of water treatment works and associated supply system
Provide supply arrangements and treatment works details:
A description and diagram of the supply system related to the treatment works [In many cases, companies include this information, including schematic diagrams, in regulation 28 risk assessment reports, in which case it is acceptable to refer here to the report, which should be appended]
The strategy will apply to all Wessex Water Water Quality Zones: 
Design capacity Ml/d
N/A - policy applies to water quality zones
Volume supplied: Daily average and daily maximum Ml/d [Please include a commentary if there are any constraints on deployable output due to limitations associated with any part of the treatment process]
N/A – policy applies to water quality zones
Sources of raw water, continuous, seasonal or standby [Include names of individual sources, nature of the source (e.g. surface direct abstraction; surface impounding reservoir; borehole; spring; type of aquifer)
N/A - policy applies to water quality zones
Treatment processes currently employed (including pre-treatment of raw waters)

[In this case, blending is defined as treatment. This includes blending of raw waters prior to treatment. Please also indicate if bankside storage of raw water is utilised, and average retention time in the reservoir]
No water treatment processes or chemicals used by Wessex Water introduce lead into water intended for supplying to consumers. Dosing of orthophosphoric acid (phosphate dosing) into treated and distribution water to a target residual takes place at 19 sites.      The concentration of lead dissolved in water depends on the characteristics of the water with pH and water hardness/alkalinity the principal influences on its potential to be corrosive. Soft, acidic water is generally considered potentially plumbosolvent. Maundown WTW is Wessex Waters' softest supply and for this reason the water is conditioned as part of treatment in order to provide a mildly alkaline pH thereby reducing its potential to promote metal pipe corrosion.
Service reservoirs/booster pump details
N/A – policy applies to water quality zones
Water supply zones supplied [If the supply is blended with waters from other treatment works in the zone, please indicate the relative proportions (as %)]
The strategy will apply to all Wessex Water Water Quality Zones - see list above.
Population of each water supply zone supplied
The strategy will apply to all Wessex Water Water Quality Zones - see list above.
Stage Two – Hazard identification and Risk Characterisation
Provide details of methodology used to identify hazard i.e. historic data, events/incidents including near miss situations, operator knowledge, modelling and site visits/technical audits
Summary of historical data on the values and concentrations of the organism, substance(s) or parameter(s) associated with the hazard in the raw water source and the water entering supply from the relevant treatment works from compliance, investigative, or operational sampling

The prescribed concentration value for lead is 10µgPb/l. The point of compliance is at consumer's taps.

Statutory and operational data set

Lead all zones	2012	2013	2014	2015	2016	2017 YTD
Number of samples	2241	4502	4545	4584	4477	4159
Average lead concentration (µgPb/l)	0.84	1.02	1.84	0.84	0.78	0.79
Max lead concentration (µgPb/l)	66.0	513.8	4437.6	86.7	81.3	120.0
Median lead concentration (µgPb/l)	0.42	0.44	0.39	0.40	0.30	0.30
Number of samples with lead concentration >=3	101	180	185	211	174	157
Number of samples with lead concentration >=7	27	54	51	62	54	50
Number of samples with lead concentration >=10	10	30	28	35	31	31
% of samples with lead concentration >=3	4.5	4.0	4.1	4.6	3.9	3.8
% of samples with lead concentration >=7	1.2	1.2	1.1	1.4	1.2	1.2
% of samples with lead concentration >=10	0.4	0.7	0.6	0.8	0.7	0.7

Investigatory Samples

Lead all zones	2012	2013	2014	2015	2016	2017 YTD
Number of samples	2084	2023	2386	2007	2436	1704
Average lead concentration (µgPb/l)	6.16	35.75	8.12	27.44	15.95	19.64
Max lead concentration (µgPb/l)	7583.8	64607.4	8480.0	39000.0	23000.0	23000.0
Median lead concentration (µgPb/l)	0.75	0.75	0.80	0.60	0.70	0.50
Number of samples with lead concentration >=3	371	354	525	400	538	308
Number of samples with lead concentration >=7	166	144	214	216	274	159
Number of samples with lead concentration >=10	93	97	124	163	192	113
% of samples with lead concentration >=3	17.8	17.5	22.0	19.9	22.1	18.1
% of samples with lead concentration >=7	8.0	7.1	9.0	10.8	11.2	9.3
% of samples with lead concentration >=10	4.5	4.8	5.2	8.1	7.9	6.6

Details of any existing contraventions of regulatory requirements and whether they are likely to recur (at WTW, SR and/or at consumers taps)

The presence of the hazard is normally attributed to the historic use of lead as a plumbing, service and communication pipe material so contraventions of regulatory requirements are therefore only likely to occur at the consumer tap.

If evidence of likely to contravene any regulatory requirement, details of when this is likely to occur (at WTW, SR and/or at consumers taps) including trend analysis & prediction modelling

The presence of the hazard is attributed to the historic use of lead as a plumbing material so is contraventions are therefore only likely to occur at the consumer tap.

An ambitious increase in the number of metallic service pipe replacements will form an integral aspect of the proposed lead strategy. As the replacement of service and communication pipes progresses, this will ultimately result in a reduction in the number of lead contraventions, and thereby minimise consumers' exposure.

Our aim is to have replaced all lead service and communication pipes by 2045.

Details of any other data relevant to the hazard identified

Summary of phosphate dosing sites and target doses:

If appropriate, summary of data/information on consumer complaints

Number of domestic and non-household lead check requests:

Type	2014	2015	2016	2017
Lead check	4	305	644	439
Non household lead check	0	0	2	44
Grand Total	4	305	646	483

Summary of lead related customer contacts:

Type	2014	2015	2016	2017
Bits/particles	-	-	-	1
Bitter	-	-	1	-
Chlorine internal	-	-	4	-
Disc – brown/black/orange/internal	-	-	1	1
Disc – brown/black/orange unplanned	-	1	1	1
Disc – chalk/white sediment unplanned	1	-	-	-
Gastroenteritis	-	3	1	1
General conditions	-	1	-	-
H Info/ advice	8	42	26	19
Hardness	-	2	1	1
Info/advice	-	19	14	11
Medical opinion	-	1	-	1
Metallic	-	3	-	2
N Info/ Advice	8	51	58	44
N Third Party Damage	4	5	5	7
NHH Info/ Advice	-	-	1	7
NHH Info/ Advice	-	-	-	10
NHH Water Quality Info/Advice	-	-	1	2
O Info/ Advice	331	502	512	382
Request WQ check	-	2	4	3
TCP internal	-	-	-	1
Water Quality Report	-	1	-	-

Grand Total	352	633	630	493

Details of any events that have occurred in catchment, at treatment works and in supply that are associated with hazard identified

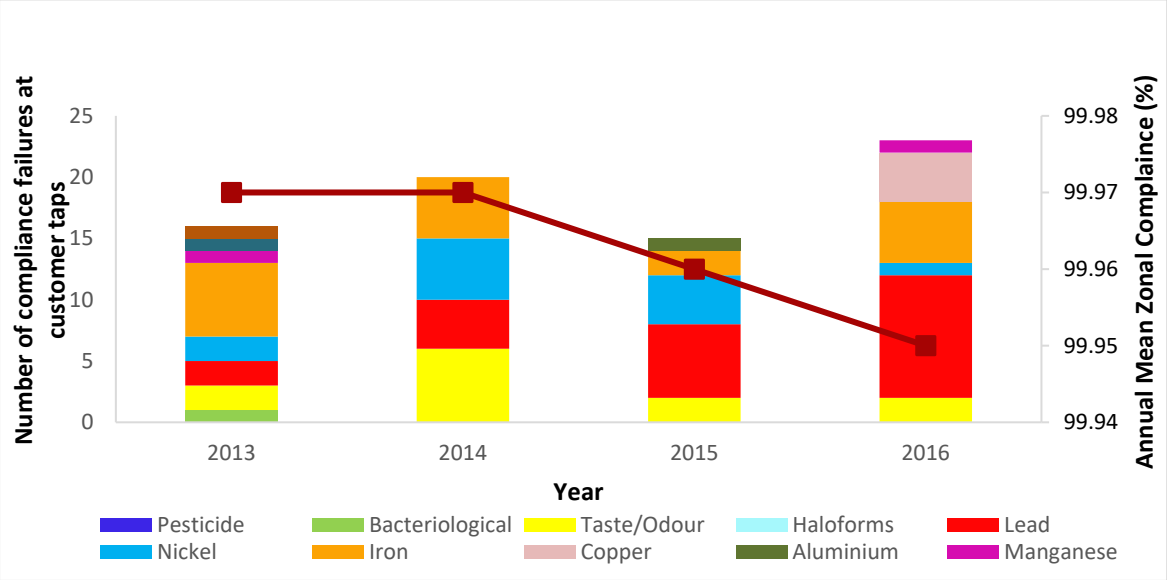
All notified events and compliance failures to date have occurred in distribution at consumer's taps.

One event has been notified to the Inspectorate since 2014 regarding lead.

Process Stage	Event associated with hazard (2014 – present)
Catchment	N/A
Treatment	N/A
Supply	2016-5854 Bridgwater Lead Do Not Drink – notified 25/11/16

As shown on the graph below, lead (shown in red) represents a large proportion of compliance failures 2013-2016. This justifies the continued need for investment and an enhanced lead strategy.

Compliance failures at customer taps 2013-2016



Summary of lead compliance failures (2014 – present):

Site number	Sample date	Result (µgPb/l)	Parameter Code	Parameter	Water Quality Zone
44000061	03/04/2014	13.005	4826	Unflushed lead	ZONE 61 MONKSWOOD
44000108	25/08/2014	131.41	4826	Unflushed lead	ZONE 108 SHREWTON
44000094	10/10/2014	13.8	4826	Unflushed lead	ZONE 94 STUBHAMPTON
44000140	17/10/2014	10.1	4826	Unflushed lead	ZONE 140 TROWBRIDGE
44000026	02/04/2015	11.4	4826	Unflushed lead	ZONE 26 HEYTSBURY

44000059	17/04/2015	11.8	4826	Unflushed lead	ZONE 59 HAMPTON DOWN
44000140	04/06/2015	13.4	4826	Unflushed lead	ZONE 140 TROWBRIDGE
44000055	11/08/2015	11.5	4826	Unflushed lead	ZONE 55 NEWTON MEADOWS
44000055	08/10/2015	10.2	4826	Unflushed lead	ZONE 55 NEWTON MEADOWS
44000046	20/11/2015	86.7	4826	Unflushed lead	ZONE 46 CHERHILL
44000036	27/05/2016	12.1	4826	Unflushed lead	ZONE 36 HOLT
44000026	23/06/2016	81.3	4826	Unflushed lead	ZONE 26 HEYTSBURY
44000140	28/07/2016	12.4	4826	Unflushed lead	ZONE 140 TROWBRIDGE
44000155	04/08/2016	12.4	4826	Unflushed lead	ZONE 155 BRINKWORTH
44000059	10/08/2016	14	4826	Unflushed lead	ZONE 59 HAMPTON DOWN
44000036	19/08/2016	15.2	4826	Unflushed lead	ZONE 36 HOLT
44000026	15/09/2016	22.5	4826	Unflushed lead	ZONE 26 HEYTSBURY
44000108	22/09/2016	28.1	4826	Unflushed lead	ZONE 108 SHREWTON
44000029	05/10/2016	10.9	4826	Unflushed lead	ZONE 29 WESTBURY
44000066	19/12/2016	10.5	4826	Unflushed lead	ZONE 66 HOOKE

Details of any existing control measures that might influence the values and concentrations of the organism, substance(s) or parameter(s) associated with the hazard in catchment, treatment and in supply

Process Stage	Control Measure
Catchment	N/A
Treatment	Phosphate dosing, pH correction
Supply	Phosphate dosing in 27 water quality zones (as shown on map below) /mains replacement across the whole region

Details of monitoring of the control measure (including validation monitoring)

In our existing and proposed strategy, all routine distribution samples, both for regulatory and operational monitoring include flushed and unflushed lead analysis. Should there be an exceedance above our internal trigger value (currently 7µg) then this will be flagged up on our daily exceedance report. We then write to the customer advising them of the sample result and offering a free lead pipe replacement service.

Where phosphate dosing is undertaken, phosphate is monitored in regulatory and operational samples taken in treated water and distribution. Phosphate dosing plants are able to be monitored remotely via our online telemetry system and are connected to the site auto-shutdown systems.

Details of any changes in practices or policy which might have influenced the values and concentrations of the organism, substance(s) or parameter(s) associated with the hazard in water supplied to consumers, i.e. in relation to resources, blending arrangements, treatment or supply arrangements and the dates of those changes

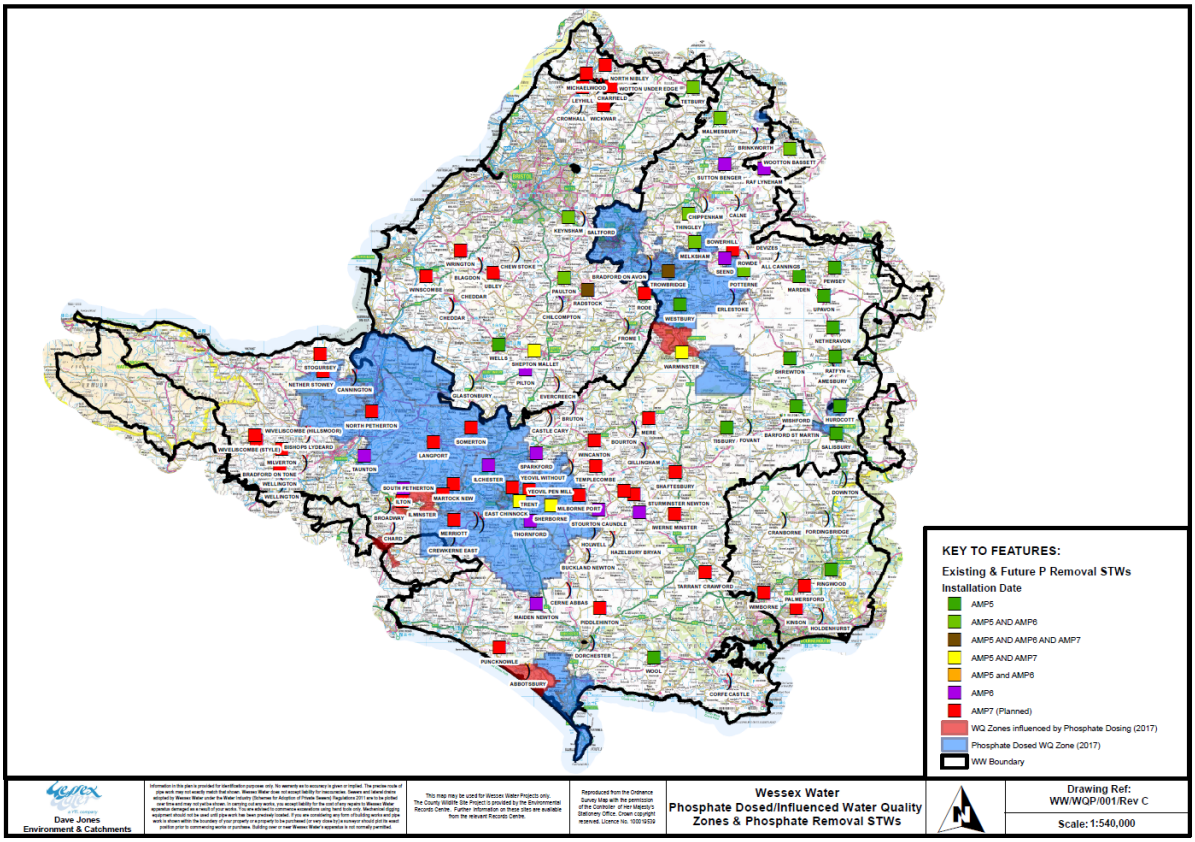
In 2017 we increased our internal trigger for investigations from 3µg/l to 7µg/ in order to facilitate a more strategic planned work approach to lead pipe replacement.

If following a lead exceedance above our internal trigger level, the investigation confirms our communication pipe to be metallic then the pipe is replaced.

It is anticipated the new strategic approach will be more cost effective and enable targeted pipe replacement. Our internal trigger exceeds the requirements outlined by the Inspectorate.

To minimise the dissolution of lead we currently dose around 300 tonnes of phosphoric acid per year across 27 water quality zones. The figure below shows the areas within our region that are either phosphate dosed or influenced by phosphate dosing.

Map of phosphate dosed water quality zones and zones influenced by phosphate dosing



Details of any licensed abstraction issues which might influence the values and concentrations of the organism, substance(s) or parameter(s) associated with the hazard in raw water
N/A – policy applies to water quality zones

Reasons for the presence of the hazard, if known, otherwise details of what is being done to identify source of hazard
Lead does not occur naturally in raw water sources within the Wessex Water region (springs, boreholes or surface waters), it may be present in drinking water primarily as a result of corrosive effects on household plumbing systems. The principal sources are lead and galvanised iron service pipes. Other recognised sources are lead-based solders (banned for new installations) and brass fittings present in domestic plumbing systems such as stop taps, meter casings, manifolds (e.g. for service splitting between flats) and chromium plated taps. Whilst these individual sources may not significantly elevate lead levels in drinking water, they can contribute to the cumulative concentration and result in a breach of the PCV.

Elevated lead levels can also occur in water as a result of galvanic action between incompatible metallic materials used within domestic plumbing causing accelerated corrosion and the release of lead.

The concentration of lead dissolved in water depends on the characteristics of the water with pH and water hardness/alkalinity the principal influences on its potential to be corrosive. Soft, acidic water is generally considered potentially plumbosolvent. Maundown WTW is Wessex Waters' softest supply and for this reason the water is conditioned at source as part of treatment in order to provide a mildly alkaline pH thereby reducing its potential to promote metal pipe corrosion. The temperature of the water is another factor, with lead levels more likely to be elevated during the warmer summer months. Standing/residence time (stagnation) of the water in contact with the plumbing containing lead will affect the concentration measured in a sample.

Outline Risk characterisation i.e.

Details and score arising from consequence v likelihood matrix,

The hazardous event of 'high risk lead zone' is in place for all water quality zones to reflect the ongoing risk of lead across our region.

Lead has a fixed consequence score within our DWSP system of 4 for public health. The likelihood score varies by zone, according to our assessment of the number of properties affected.

The consequence score is then multiplied by the likelihood score to give the overall risk score.

Within the public health risk matrix the consequence score for lead is fixed at 4 irrespective of control measures being applied.

Likelihood:

1 – No lead present (below detectable limits <0.10 µg/l), no discernible health risk
2 – Fittings/solder containing lead are present, low health risk (<3 µg/l)
3 – Lead present, but low health risk (unflushed lead ≥3 µg/l but <10 µg/l)
4 – Potentially harmful, following repeated consumption where individuals in vulnerable age groups occupy the affected property (young children, infants) (unflushed lead >10 µg/l)
5 – Illness following longer term consumption of lead in drinking water >10 µg/l

Object Name	Hazardous Event Title	Public Health
Zone 010 - Maundown Central	High risk lead zone	**8**
Zone 013 - Ashford Stowey	High risk lead zone	**4**
Zone 014 - Maundown East	High risk lead zone	**12**
Zone 016 - Fulwood	High risk lead zone	**8**
Zone 021 - Danesborough	High risk lead zone	**12**
Zone 024 - Dunkerton	High risk lead zone	**8**
Zone 026 - Heytesbury	High risk lead zone	**10**
Zone 027 - Chitterne	High risk lead zone	**8**
Zone 028 - Arn Hill	High risk lead zone	**12**

Zone 030 - Upton Scudamore	High risk lead zone	**12**
Zone 032 - Easterton	High risk lead zone	**8**
Zone 033 - Chirton	High risk lead zone	**8**
Zone 034 - Compton	High risk lead zone	**8**
Zone 035 - Leckford Bridge	High risk lead zone	**8**
Zone 036 - Holt	High risk lead zone	**12**
Zone 037 - Bowden	High risk lead zone	**8**
Zone 038 - Devizes	High risk lead zone	**12**
Zone 039 - Shepherds Shore	High risk lead zone	**8**
Zone 040 - Bourton	High risk lead zone	**4**
Zone 041 - Fiveways	High risk lead zone	**12**
Zone 046 - Cherhill	High risk lead zone	**8**
Zone 047 - Yatesbury	High risk lead zone	**8**
Zone 049 - Allington	High risk lead zone	**12**
Zone 051 - Charlton	High risk lead zone	**8**
Zone 052 - Milbourne	High risk lead zone	**8**
Zone 054 - Chute	High risk lead zone	**8**
Zone 055 - Newton Meadows	High risk lead zone	**12**
Zone 058 - Tucking Mill	High risk lead zone	**8**
Zone 059 - Hampton Down	High risk lead zone	**12**
Zone 060 - Batheaston	High risk lead zone	**8**
Zone 061 - Monkswood	High risk lead zone	**12**
Zone 065 Marshfield	High risk lead zone	**4**
Zone 066 - Hooke	High risk lead zone	**8**
Zone 069 - Litton Cheney	High risk lead zone	**8**
Zone 070 - Maiden Newton	High risk lead zone	**8**
Zone 073 - Cattistock	High risk lead zone	**8**
Zone 076 - Lake	High risk lead zone	**8**
Zone 077 - Castleton	High risk lead zone	**8**
Zone 078 - Forston	High risk lead zone	**8**
Zone 080 - Portesham	High risk lead zone	**8**
Zone 081 - Weymouth	High risk lead zone	**8**
Zone 082 - Portland	High risk lead zone	**8**
Zone 083 - Dorchester	High risk lead zone	**8**
Zone 084 - Empool Direct	High risk lead zone	**8**
Zone 085 - Alton Pancras	High risk lead zone	**8**
Zone 087 - Dewlish Direct	High risk lead zone	**8**
Zone 088 - Milborne St Andrew	High risk lead zone	**8**
Zone 089 - Black Lane	High risk lead zone	**8**
Zone 090 - Purbeck	High risk lead zone	**8**
Zone 092 - Shapwick	High risk lead zone	**8**
Zone 094 - Stubhampton	High risk lead zone	**8**
Zone 095 - Lytchett Matravers	High risk lead zone	**8**

Zone 096 - Poole Town	High risk lead zone	**8**
Zone 098 - Corfe Mullen	High risk lead zone	**8**
Zone 099 - Swanage	High risk lead zone	**8**
Zone 101 - Shaftesbury	High risk lead zone	**8**
Zone 105 - Fovant	High risk lead zone	**8**
Zone 107 - Wylye	High risk lead zone	**8**
Zone 108 - Shrewton	High risk lead zone	**8**
Zone 109 - Bulbridge	High risk lead zone	**8**
Zone 112 - Newton Tony	High risk lead zone	**8**
Zone 113 - Clarendon	High risk lead zone	**8**
Zone 114 - Salisbury	High risk lead zone	**8**
Zone 116 - Pole Rue	High risk lead zone	**8**
Zone 117 - Chard Town	High risk lead zone	**8**
Zone 118 - Tatworth	High risk lead zone	**8**
Zone 121 - Sutton Bingham	High risk lead zone	**8**
Zone 122 - Stocklinch	High risk lead zone	**8**
Zone 124 - Odcombe	High risk lead zone	**8**
Zone 136 - Ashcott	High risk lead zone	**8**
Zone 139 - Zeals	High risk lead zone	**8**
Zone 140 - Trowbridge	High risk lead zone	**8**
Zone 141 - Waterloo Farm	High risk lead zone	**8**
Zone 144 - Dottery	High risk lead zone	**8**
Zone 146 - Charmouth	High risk lead zone	**8**
Zone 155 - Brinkworth	High risk lead zone	**8**

Where score sits in risk profile for supply system

Lead is a widespread risk applied to all zones.

Risk to the water supply chain is the product of both the above i.e. Likelihood x Consequence = Risk. Wessex Water has banded risk scores for internal risk management.

Risk scores are colour coded Green, Amber or Red indicating Low, Medium or High Risks respectively as follows:

- Low risk (Green) = 1 to 6
- Medium risk (Amber) = 8 to 12
- High Risk (Red) = 15 to 25

The majority of lead scores sit within the medium risk area at a water quality zone scale.

Stage 3 – Control Measures Required

Provide details of short, medium and long terms control measures i.e.

Details of short term actions currently in place to mitigate against risk & their effect

All zones where a significant proportion of services are known to be lead (>5%) receive phosphate dosing for plumbosolvency control.

pH correction takes place at Maundown WTW to condition the water, thereby reducing its potential to promote metal pipe corrosion.

Details of mid to long term control measures identified for any residual risk:

(i) Options the company has considered which should, where appropriate, include catchment management controls; or communications controls in association with other stakeholders

Option	Description	Cost
Minimum	The minimum scope of work would be to replace the communication pipe only following a sample exceedance. This would be a deterioration in the service we currently offer and would not maximise the public health benefit. It is also likely to result in a deterioration of compliance (which untenable given the drive to achieve 100% compliance or a CRI score of zero). A drawback of this approach could be that there would be pressure to increase the extent of phosphate dosing, with sustainability and environmental implications.	<£1m excluding potential increase on phosphate dosing
Sample driven replacement only	Replacement of the company's communication pipe and free replacement of the customer's supply pipe up to the wall of the property, based samples exceeding a trigger for investigation. This is the approach that we adopted up to 2017.	£2 – 3m (totex)
Enhanced approach – sample driven plus proactive replacement	Replacement of the company's communication pipe and free replacement of the customer's supply pipe up to the wall of the property, based samples exceeding a trigger for investigation. Proactive replacement based on prioritisation of DMAs to target replacement / relining of all lead pipe by 2045. Where practicable, lead service pipe replacement will form part of a customer focused campaign on plumbing issues to maximise synergies with metering and leakage programmes. A further benefit of this approach is that it will enable the phased withdrawal of phosphate dosing over the medium to long term.	£8 – 10m (totex)
Wholesale pipe replacement	Wholesale replacement of all lead communication pipes over a much short timescale. This has the potential to be very disruptive and would not allow the	>£50m

	programme to be phased maximising the public health benefit.	

(ii) Timescale for delivery of each option

In order to meet our revised strategy to replace all lead services within 25 years we need to substantially upscale the rate of lead pipe replacement alongside the existing phosphate dosing.

Our long-term ambition is to replace (or reline) all lead pipes (communication and service pipes) by 2045. This will require us to change our strategy from reactive to planned to help improve our activity. As an indication, in order to achieve the long-term objectives we will aim to replace up to 9000 communication and supply pipes every 5 years.

This is ambitious as will be an over threefold increase of our current replacement rate. Our new strategy will include an annual review of DMAs to identify areas for proactive small scheme replacement. This aspect of the strategy has already commenced and three DMAs have been identified for the proactive replacement within the next year.

There should be a progressive reduction of the likelihood of lead exceedances within all zones as lead service pipes are removed.

(iii) Capital costs and net additional operating costs of each option considered

See table above

(iv) Summary of costs and benefits of each option

See table above

(v) Reasons for choosing the preferred option

Based on a balance of the public health benefit, cost and deliverability, the preferred option is the enhanced approach with a programme of proactive lead pipe replacement.

We want to be able to declare our region a ‘lead free’ area by 2045. To achieve this we want to be able to carry out more work and vastly increase the number of replacements each year.

Our long-term ambition is to replace (or reline) all lead pipes (communication and service pipes) by 2045. This will require us to change our strategy and significantly increase to our activity. As an indication, in order to achieve the long-term objectives we will aim to replace up to 9000 communication and service pipes over each five year business plan period. This is an ambitious target as it is a threefold increase of our current replacement rate. Our new strategy will include an annual review of DMAs to identify areas for proactive small scheme replacement.

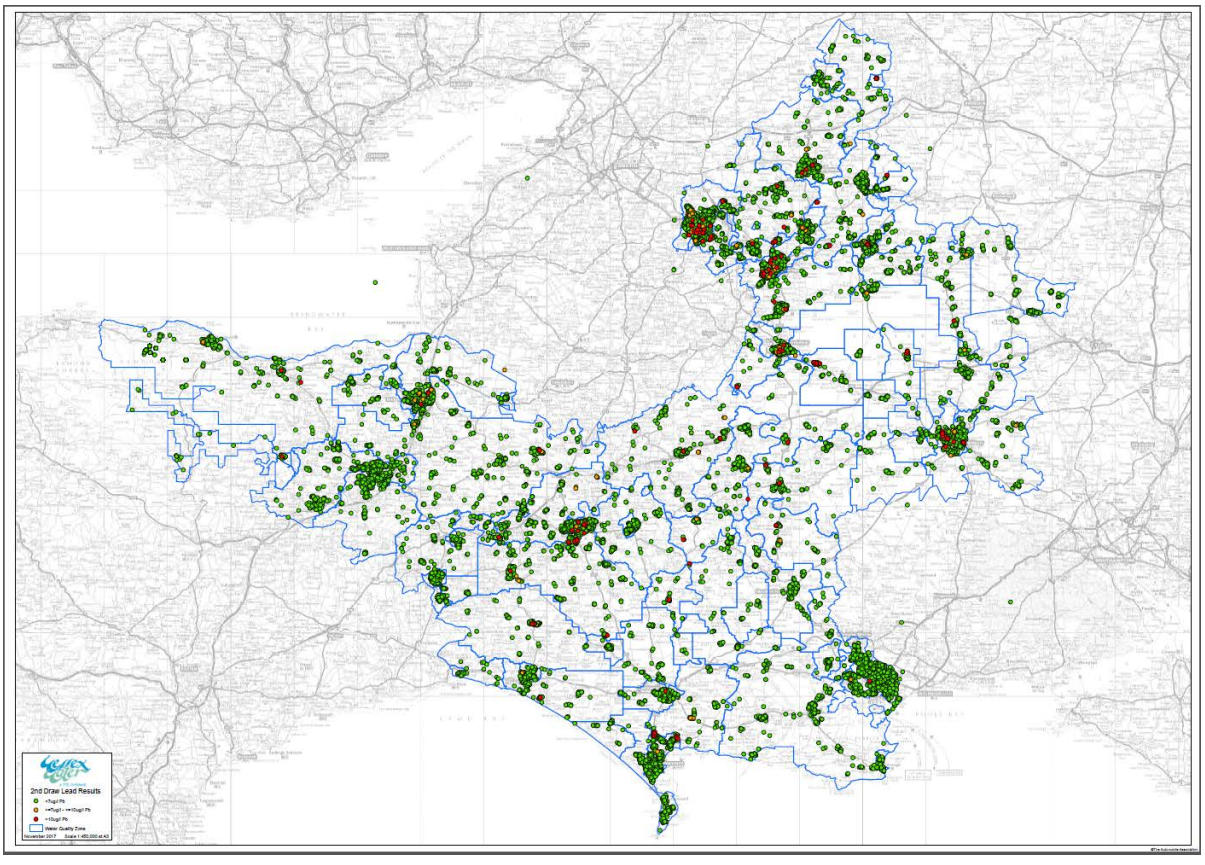
Our proposed strategy also provide an opportunity to form part of a consumer focused water quality campaign about plumbing issues. Where practicable we will remove all lead/metallic pipe up to at least point of entry into the property and maximise synergies with metering and leakage programmes in order to maximise our investment for the benefit of consumers.

(vi) Specific supporting evidence that the preferred option will address risk of hazard within the required timescale

Our long-term ambition is to replace (or reline) all lead pipes (communication and service pipes) by 2045. This will require us to change our strategy and significantly increase to our activity. As an indication, in order to achieve the long-term objectives we will aim to replace up to 9000 communication and service pipes over each five year business plan period. This is an ambitious target as it is a threefold increase of our current replacement rate. Our new strategy will include an annual review of DMAs to identify areas for proactive small scheme replacement.

Our prioritisation of lead pipe replacement is principally related to drinking water sample data which highlights where lead is a problem for us. We now ensure sample point location grid references are captured so all data can be plotted to help initialise 'hot spot' areas of elevated lead that can be addressed strategically as shown below.

Scatter plot of lead results (2014-present)



This increased rate of pipe replacement will form part of a holistic strategy where we will promote co-operative partnership working in the short to medium term. In the meantime, a twin track approach of lead pipe replacement in conjunction with phosphate dosing will continue. We plan to extend phosphate dosing by seven additional plants to improve compliance and protect public health in the short to medium term. Lead pipe replacement will ultimately result in a reduced need for phosphate dosing and the ability to turn it off completely in some zones. This will have both financial and environmental benefits.

In addition to our overall goal of declaring our region lead free by 2045, over the next five years we have an industry leading plan to roll out our trial which investigated lead in schools

within the Bath and North East Somerset Area (B&NES) across the whole region. We will implement the lessons learned from this trial and ensure that within the next five years we are able to declare our schools lead free; protecting the school children across our region from exposure to lead.

Full details of how the company intends to assess and measure the benefits delivered (the outcome), including details of proposed sampling programme, number of samples to be taken over the specified period and parameters to be monitored.
All routine distribution samples across all zone, both for regulatory and operational monitoring will continue to include flushed and unflushed lead analysis. From this we will be able to monitor the success of the ongoing strategies as well as progress with meeting the internal and external standards for lead.

PR19 Lead Strategy

Wessex Water

December 2017

Document revisions

Major version number	Details	Lead contact	Date
1	Draft issued for comment	Shaun Jones	6/12/17
2	Final version	Shaun Jones/Steve Reade/Natalie Doran	27/12/17

Contents

1. Lead Poisoning and Health

Lead is a naturally occurring accumulative toxic metal that through widespread use has resulted in human exposure and in some parts of the World is a real public health issue.

Lead causes harm across all age groups and young children are particularly vulnerable and can suffer permanent brain and nervous system developmental issues. Long term exposure in adults leads to heightened risk of high blood pressure and kidney damage. High exposure during pregnancy can cause a variety of very unwelcome effects.

The World Health Organisation (WHO) have declared, there is no known safe level of lead exposure.

2. Drinking Water

There is a long list of sources of lead, many of which through health protecting legislation have been prohibited from manufacture and general levels of exposure have thus reduced with time.

For exposure to lead through the consumption of drinking water, some abstraction points may contain naturally occurring lead. However, it is more usual for exposure to be caused by the conveyance of drinking water through lead pipes, brass fittings and by the dissolution of lead solder. Also, in some circumstances galvanised iron service pipes have been shown to be a source of intermittently high lead levels. The presentation of the toxic metal in drinking water supplies is therefore a risk arising in the homes and premises which we live and work in. This possibly sets this parameter aside from all others likely to cause health impacting water quality issues.

As a result of this exception, water companies were encouraged to implement chemical dosing strategies to treat plumbing systems within homes and premises and in so doing minimise dissolution of lead and reduce exposure. Companies were also encouraged to, where possible modify treated water pH levels to reduce plumbosolvency.

Wessex Water recognised that the removing lead liberating pipes and fittings was the best way to address this problem and since this time have offered a free lead pipe replacement service for the benefit for our consumers.

3. Drinking Water Quality Legislation

The Water Supply (Water Quality) Regulations 1989 set a limit of 50 µg/l until their revocation by those regulations set in 2000 which set a new limit of 25 µg/l from 25th December 2003 for a period of ten years. From 25th December 2013 the lead limit has been 10 µg/l as measured in samples collected from the consumers' tap.

Following the WHO declaration of there being "no safe lead level", it has been anticipated that European and National legislation would drive down the lead limit in order to force the removal of exposure of water to lead bearing surfaces. Some countries such as the USA already have set regulatory action limits for the allowable concentration of lead in drinking water much lower.

For almost two decades Wessex Water has applied a far stringent value for action which was set as low as ≥3 µg/l for a period of time. In addition to this, every sample collected from a consumer's tap has been tested for lead over the same period.

4. The Evolution of Our Plumbosolvency Strategy

Following the coming in to force of the Water Supply (Water Quality) Regulations 2000 and the tightening of the prescribed concentration for lead to 25 µg/l, it was recognised that plumbosolvency control and pH optimisation alone were not sufficient control measures to prevent sample failures and remove consumers exposure to lead over the long term.

Very early on in the development of our strategy, it was accepted that simply replacing our communications pipe had little public health benefit. Our Board therefore agreed that a free replacement of the service pipe to the point of entry into the property should be offered to customers. This free replacement was up to the point of entry in to a building or to a point of entry under the structure belonging to the customer e.g. garage or conservatory etc.

The trigger for offering the replacement was initially any random sample exceeding 10 µg/l.

Continuous review of this approach has seen the trigger being adjusted to ensure the greatest benefit can be achieved from the investigation for consumers in the area.

The trigger was progressively lowered from ≥10 µg/l to ≥3 µg/l. However, critical to the evolution of our strategy was an independent internal audit of our lead replacement processes in November 2016, which made a number of recommendations. The audit recognised the reactive nature of our lead replacement work was financially inefficient and identified opportunities for reducing ancillary costs, thereby allowing us invest more in replacement.

Changes to our strategy and lead policy to achieve these benefits were therefore made during 2017, which crucially moved the trigger from ≥3 µg/l to ≥7 µg/l which changed the emphasis of the work we carry out to be predominantly planned and proactive.

5. Leading the Industry Forward

We remain committed to reducing consumers' exposure to lead through drinking water consumption and intend to remove all lead services inter alia within 25 years.

Our ambitious strategy to date has achieved an improved public health outcome for many of our customers. However, we want to achieve more by enhancing the rate of replacements and by investing more in replacements by ensuring ancillary costs are minimised.

This fundamental shift follows two decades of information gathering, trials and continuing improvement based around the lessons we have learned about how best to undertake these activities.

6. Protecting Consumers

We recognise that there isn't one thing to reduce consumers' exposure to lead in drinking water. Our comprehensive strategy therefore encompasses a multitude of options. To better communicate these, we have used the following sections to breakdown the detail behind our overall strategy:

7. Eliminating lead liberating plumbing from premises for our consumers

Our exemplary approach to the replacement of lead contaminating services will continue but we can do better so we have changed our trigger for reactive replacements. This will allow us to completely turn around our approach towards protecting consumer's health. This key change will switch the proportion of reactive to planned replacements around, resulting in a greater number of planned small scheme undertakings which will increase the number of replacements carried out over all.

Reactive and opportunistic replacements will continue alongside planned small scheme District Metered Area (DMA) level schemes but our investment in the removal of lead contaminating services will go much further.

8. Schools

During 2016 to 2017 we carried out a trial with Bath and North East Somerset that focused on educational establishments in the area. This involved a joint sampling and water fittings inspection regime to ensure places of learning in this area are compliant both with the Water Supply and Water Fittings Regulations.

We have rolled this initiative out to the remainder of our region and will within the next five years ensure all educational establishments not only comply with Water Supply and Fittings Regulations but also have a lead free supply of water.

This investment will thereby protect the health of children in our region.

9. Corrosion control

We recognise plumbosolvency control as one of the many options employed to tackle lead exposure, achieving a short-medium term balance between compliance, health and cost; Albeit phosphate dosing is arguably a long-term false economy given dosing would be required in perpetuity.

Having said that, we will continue to maintain and expand corrosion control where appropriate unless it can be shown that pipe replacement is a more beneficial investment for our consumers.

To achieve this, we will determine areas suitable for small scheme works to replace multiple services at a DMA level to avoid the long term false-economy of plumbosolvency dosing. Initially Upwey Village, Heytesbury and Maiden Bradley have been identified for planned DMA level programmes of investment to rid these areas of lead contaminating services. Further DMAs will follow.

pH optimisation will continue alongside these measures to ensure supplies are afforded a level of corrosion control. With each water treatment works upgrade pH optimisation will be a key feature.

10. Going the Extra Mile

We will continue to offer our consumers a free lead check sample. However, this can result in multiple visits and samples because sample variation, as a result of variable usage patterns, causes some samples to contain higher concentrations of lead than others when testing the same sample point.

Whilst many customers are indifferent to the risk of lead exposure in drinking water, others are more apprehensive and want their lead service pipe replaced for peace of mind. Basing our replacement policy on sample results alone does not always result in the outcome our customers want because the result might not trigger replacement of services under our lead replacement policy.

We will therefore look to do more for consumers who want to reduce their households' exposure to lead and will strive to undertake replacements without the expense and intrusion of sample collection. If they have a lead service and want it replaced then we should act on this information alone.

In addition, we have historically replaced services to the point of entry to the property. However, we can do more to encourage householders to allow us to replace the entire length of service from the boundary box through to the cold kitchen tap.

Furthermore, we will continue to identify areas suitable for small scheme replacement using information gathered through our routine activities. Where we identify high-risk areas we will plan programmes of investment to eliminate lead contaminating services from these areas of. This has become a more realistic option since our trials of innovative equipment, such as, pipe pulling and lining to minimise excavations, which significantly reduces the time required on-site.