Economic Level of Leakage

Update Report

August 2005

1.0 Introduction

The PR04 SBP assessed the Economic Level of Leakage for London as 604Ml/d by March 2010, a reduction of 209Ml/d from March 2003 levels. This was to be achieved by undertaking 1202km (138Ml/d net) of mains renewal and 71Ml/d (net) of Active Leakage Control (Thames Water, 2004)[1]. The submission also included a 450km risk programme of additional mains renewal to offset uncertainties and improve the likelihood of restoring security of supply.

In line with the 'Agreed Steps', this report is an update of the economic modelling of supply-demand for London and evaluates the impact of the latest data on mains renewal and Active Leakage Control costs on the economic level of leakage. The report is intended to show the impact this data would have had on the PR04 supply-demand analysis and associated ELL had it been available. It is not intended as a full SBP-style supply-demand update.

The analysis was undertaken in house and follows the Tripartite and Economics of Balancing Supply and Demand (EBSD) guidelines. The analysis covers the London Resource Zone only and does not include revised estimates of long run marginal costs (LRMCs).

The report first describes the modelling approach adopted, then the data used and assumptions, then the results including a sensitivity analysis.

2.0 Modelling approach

The analysis followed the same basic approach as used in the PR04 Strategic Business Plan. The base data from this submission was taken as the starting point for the analysis and three principal updates were made:

- Updated Active Leakage Control Costs (2004/05 data)
- Updated Mains Renewal Costs/Benefits (2002-05 data)
- Updated Mains Renewal Environmental/Social Costs (2004/05 data)

These changes are described in Section 3 and a comparison of these data to those used in the SBP is given in Section 4. No other material changes to the data were made.

As per the PR04 SBP approach, the economic length of mains renewal was estimated by calculating the Average Incremental Cost for each DMA in London and selecting all those below a threshold of *(excised).* The ELL was then based on minimising the 30yr NPV to balance supply and demand with mains renewal. A sensitivity analysis was then undertaken to assess the impact of adopting an Active Leakage Control only policy and the impact of changes in base levels.

This approach enables a like-for-like comparison to be made with the original PR04 assessment and allows the impact of current performance on main renewal and leakage control on the ELL targets over AMP4 to be evaluated. The analysis does not include revised demand forecasts – the potential impact of this is discussed in the following section.

.

3.0 Data used and assumptions

The principal changes discussed above are presented in more detail below with the full list of the data used described in Appendices 1, 2 and 3.

Active Leakage Control Costs

- updated to 2004/05 actual detection and repair costs.
- included the impact of the recent changes in contract arrangements which are intended to drive further efficiency improvements. The underlying unit costs of repair

[1] 71Ml/d net = 73Ml/d from ALC plus 4Ml/d from metering less 6Ml/d for new properties

work are now lower than the SBP submission, however, detection costs are marginally higher (See Appendix 2)
- implicitly includes the impact of pressure management, zonal reconfiguration and mains renewal work to date

Mains renewal costs/benefits
- capex costs for renewal were updated using a revised cost model that builds on actual experience to date. This assumed the best productivity rates to date. The update adopted the same 'cost zones' as per the SBP.
- potential leakage savings were updated based on current DMA leakage levels, reflecting better data and the impact of ALC and pressure management on controlling leakage in London
- potential leakage control cost savings were updated to the 2004/05 actuals to reflect current costs.
- DMA leakage data has improved significantly. In the SBP, 26% of the DMAs assessed had to use average Flow Monitoring Zone leakage in order to derive an estimate – this has been reduced to 6%.
- DMA burst rate was updated to JR01 – JR05 average

Mains Renewal Environmental and Social Costs
- Environmental and social costs of network upgrade were updated following a field study completed in 2005.

The mains renewal and ALC data are 2004/05 based values and reflect performance/expectations at that time and exclude items such as any contractor claims which were not resolved at the time of this report. Furthermore, in the case of mains renewal the data set will vary over time as more work is completed in differing areas and hence should only be considered a current snapshot.

The underlying demand forecasts and current supply capability were not updated for this analysis. Whilst there may have been slight movements in each there have been no significant changes. As such to enable the relative impact of the new leakage control and mains renewal data to be assessed these, and all other key data, were held constant.

4.0 Results

This section first steps through a comparison of the updated data on leakage costs, mains renewal and environmental and social costs to those used in the SBP, illustrating how the data have changed. The section then describes the results from the full ELL analysis.

4.1 Comparison of SBP and Updated Data

Leakage Control Costs

Table 1 and Figure 1 present the Average Incremental Cost (AIC) of leakage control. The updated cost of leakage control activity starts from a lower leakage level than that in the SBP analysis as leakage has been reduced since the original analysis was undertaken. The data show

- the current incremental leakage costs are slightly lower than those included in the SBP
- the incremental cost of leakage reduction by 2009/10 is expected to be higher than that predicted in the SBP.

Analysis of the underlying data show the increase in the long term cost is predominantly due to improved data on the split of fixed and variable opex detection costs. The 04-05 variable proportion of detection hours per leak (i.e. those that will vary with the number of leaks found as leaks becomes more difficult to detect) is now significantly higher than at the SBP. As a result the detection activity required for each step of leakage reduction increases more rapidly

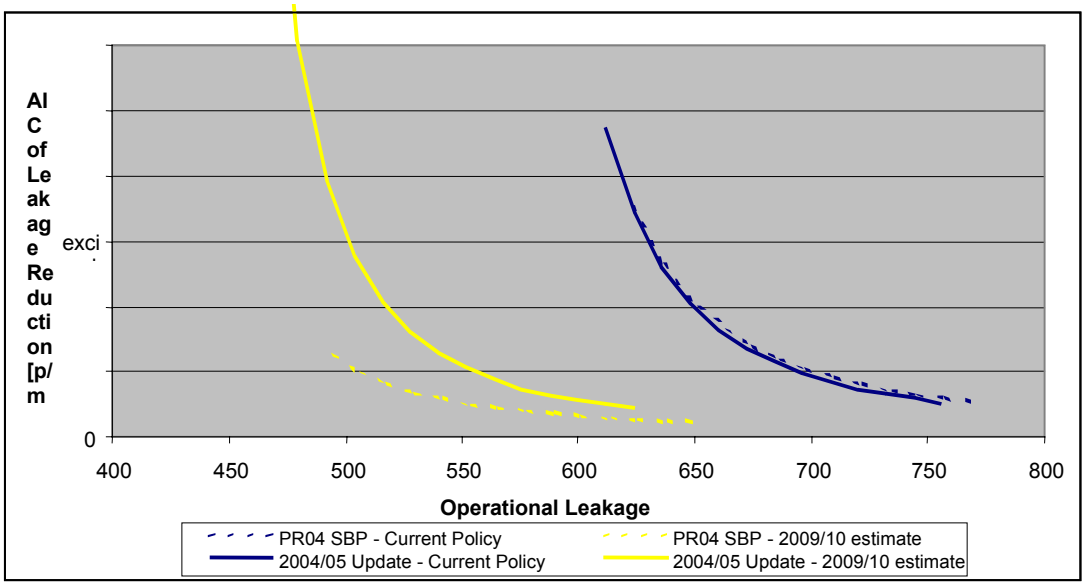
and the associated costs increase the steepness of the cost curves through time as leakage reductions are realised. This manifests itself in the long term due to the interaction of the mains renewal programme on the level of repairs needed. At low leakage levels, the difference between SBP and the updated data in the longer term is large and the impact on the ELL is discussed in Section 4.2.

Table 1 AIC for Active Leakage Control [p/m3]

Operational Leakage Level	Leakage Reduction	AIC – Current Policy[1]		AIC as at 2009/10 with mains replacement[3]	
		PR04 SBP[2]	2004/05 Update	PR04 SBP[2]	2004/05 Update
[Ml/d]	[Ml/d]	[p/m^3]	[p/m^3]	[p/m^3]	[p/m^3]
792	-	-	-	Start = 654Ml/d	Start = 635Ml/d
780	12	-	-		
768	12	excised	-	138Ml/d net reduction from mains renewal.	144Ml/d net reduction from mains renewal.
756	12	excised	excised		
744	12	excised	excised		
732	12	excised	excised	Inc. effect of pressure mgt	Inc. effect of pressure mgt
720	12	excised	excised		
708	12	excised	excised		
696	12	excised	excised		
684	12	excised	excised		
672	12	excised	excised		
660	12	excised	excised	-	
648	12	excised	excised	excised	
636	12	excised	excised	excised	-
624	12	excised	excised	excised	excised
612	12		excised	excised	excised
600	12			excised	excised
588	12			excised	excised
576	12			excised	excised
564	12			excised	excised
552	12			excised	excised
540	12			excised	excised
528	12			excised	excised
516	12			excised	excised
504	12			excised	excised
492	12			excised	excised
480	12				excised
468	12				excised
456	12				

(1)AIC of first step of leakage reduction on current policy excluded due to edge effects of year end data
(2)Inflated to 2004/05 prices
(3)The cost curves start lower down due to the estimated effect of mains renewal. This is the 1202km in the SBP and the 967km for this update (See Table 2)

Figure 1. AIC for Active Leakage Control



Mains Renewal Costs/Benefits (Economic Programme)

Figure 2 presents a full comparison of the AICs for each DMA between the SBP and the updated analysis and Table 2a provides a detailed breakdown of the estimated economic length (i.e. those DMAs less than *(excised*)).

Overall the data support the original SBP analysis. The 'economic' length is largely unchanged showing the current programme it is an appropriate level during AMP4. The updated analysis show the length is made from more DMAs. This is, however, solely due to rezoning which has produced more, but smaller, DMAs in London. There is some evidence to suggest that the potential leakage savings may be greater. This is mainly due to improved DMA leakage data which shows a greater variation in leakage (and burst rate) than the original analysis enabling better benefits to potentially be achieved. There will however always be inherent uncertainty in these estimates, and at this stage it is too early to draw a firm conclusion, but it does suggest that the programme is moving in a positive direction.

Capex cost for renewal activity suggests some improvement has been made. A direct comparison of the average unit rates with the SBP needs to be considered carefully:

- Firstly, the location of renewal is slightly different from the SBP in this analysis. This is a dynamic function of the any changes in the capex cost for renewal of a DMA, the leakage costs and the leakage level itself and hence not implicitly due to productivity improvements. Whilst the headline data show a slight change in the distribution, it does not suggest that the areas in original analysis have changed significantly.
- Secondly, in order to show the limit of renewal, the estimated capex costs for this update assumed the highest productivity rates achieved to date. This is a relatively extreme position and must be judged as such. Under average productivity rates the mean cost is *(excised).*

Taking into account practical issues of access, DMA proximity, specific contractor availability (including impact of the Olympics) these will limit how close the actual programme may be the true 'economic' one and the ability with which the highest productivities can be achieved in every single DMA. Hence the average productivity rate figure is likely to be closer to the actual long term unit cost. Whilst drawing definitive conclusions on cost cannot be made on the limited new information available at this stage, indications are that it is moving in a positive direction. However, on average, it has yet to reach the rate funded in the Final Determination.

The change in capex cost has not resulted in an extension of the 'economic' length. This fall is offset by the current lower ALC costs that mean the long term current cost saving from renewal is now lower than in the previous assessment.

Figure 2 Comparison of AIC data for Mains Renewal
(includes both full and targeted replacement)

(Excised)

Table 2 a Summary data for Mains Renewal (Economic Programme)

Component	Unit	PR04 SBP total	PR04 AMP4 total	AMP4 - 2004/05 Update
Total Length <excised	[km]	1202	1012	967
- full replacement	[km]	766	645*	693
- partial replacement	[km]	436	367*	274
No. DMAs	[nr]	108	91*	119
Zonal split (by length)				
- Zone 1	[%]	46%	46%*	35%
- Zone 2	[%]	32%	32%*	48%
- Zone 3	[%]	20%	20%*	7%
- Zone 4	[%]	2%	2%*	10%
Total Leakage Saving**	[Ml/d]	143	120	150
- unit leakage saving	[Ml/d/km]	0.119	0.119	0.155
Burst rate saving	[av bursts/km]	1.60	1.60*	1.49
Mean Unit Cost	£/m	excised	excised	~excised

*As per the total programme or on a pro rata basis **Excluding capital maintenance overlap

Table 2 b Summary data for Mains Renewal (Risk Programme)

Component	Unit	PR04 SBP	AMP4 – 2004/05

		total	Update
Total Length <excisedp/m^3	[km]	450	248
Leakage Saving	[Ml/d]	42	23
AIC to reach 450km	[p/m3]	excised	excised
Leakage Saving for 450km	[Ml/d]	excised	excised

Importantly, the updated data has resulted in a much sharper change in the AIC of renewal than the previous assessment (see Figure 2). This suggests rigorous assessment of individual DMAs will be needed during AMP4 to ensure the highest benefits are achieved.

Furthermore, the data suggest important potential implications for the ELL:

- Firstly, the scope for capex efficiencies would be expected to be greatest during the early part of the programme. Any further reductions are likely to be small. All other factors remaining constant, this suggests that significantly accelerating the programme length in place of other options in the short term is unlikely to be justified on cost grounds alone and other factors such as the reliability of sustained leakage reductions from traditional find and fix activity, and need to close the supply-demand gap in London would need to take precedence for this investment.

- Secondly, the sharper rise in the AIC of the DMAs suggest that they show faster diminishing returns. This suggests that an AMP5 programme in excess of AMP4 may not be least cost, but, with the marginal cost of leakage in 2009/10 higher than the original estimate this effect may be offset. It is important to decouple this long term effect from the short term estimate of the economic length for renewal over AMP4 which is based on current active leakage control costs alone and further work is required to understand this dynamic.

- Finally, the DMAs can quickly become cost effective should they deteriorate. Future assessments of the length of mains renewal and the subsequent impact on the ELL therefore need to take into account not only cost, but also risk and uncertainty. In addition further integration of the benefits of mains renewal (e.g. DG3/DG2) to the total service cost of capital maintenance and supply-demand is required to ensure the total net benefit of renewal is accounted for.

Overall therefore, the results support the original analysis, and whilst firm conclusions on changes to the programme cannot be made, it appears to have moved in a positive direction – costs moving towards the average Final Determination funding and predicted leakage savings are healthy.

Mains Renewal Costs/Benefits (Risk Programme)

In addition to the 'economic' level of mains renewal, the PR04 SBP also included 450km (excisedMl/d) to improve the certainty of leakage target delivery to allow for the natural variation in underlying components (such as recurrence rates). Table 2b details a comparison of the results from the SBP and the updated analysis.

Overall this suggests that the long term cost of the 450km risk programme in the SBP may have been underestimated. Again however, the differences are small and there is no evidence to suggest that the original analysis has changed significantly from this updated analysis.

For completeness the SBP leakage uncertainty analysis has been repeated and the results are presented in Section 4.2.

Mains Renewal Environmental/Social Costs

The results of the updated field study are presented in Table 3 and show the actual social cost of traffic disruption is significantly less than the original desk top study value for mains renewal activity. This confirms expectations that the original desk top study was over estimating the impact primarily due to the assumptions on road capacity and delay from width restrictions and confirms it was correct to exclude this data in assessing the SBP results.

Table 3 Environmental and Social Costs of Mains Renewal and ALC

Component	PR04 SBP	2004/05 Update*
Mains Renewal - Env & social cost	excised	excised

*WS Atkins, 2005.

4.2 ELL Results

Figure 3 presents the results of the least cost modelling and the associated ELL. The updated data show the short (to 2009/10) and long term (post 2009/10) leakage levels are largely unchanged. Any differences are small and within the tolerance of the SBP analysis and uncertainty range.

Table 1 showed the long term cost marginal cost of leakage control was higher than in the SBP yet the results suggest this does not manifest itself in an increase in the long term ELL and this would appear inconsistent with a 'least cost' analysis. Whilst the headline figure is however, unchanged, the timing of the reductions is significantly different.

In the SBP, the leakage reduction to meet the long term ELL was programmed over the 2013-16 period. In contrast in this update the leakage reduction is focussed over 2021-22. The later period reflects the higher cost of leakage control and that cheaper alternatives are available in the medium term. Furthermore, these reductions are implemented immediately before the Upper Thames Reservoir, and are thus only deemed economic by virtue of the saving incurred through 1-2 years delay in this scheme.

Risk Programme

For consistency, the leakage uncertainty risk methodology developed for the SBP was applied to the updated data. The results from this show that with the updated 'economic' level of mains renewal and risk programme, the certainty of achieving the 2009/10 leakage target remains similar to that reported in the SBP at nearly 50% - see Appendix 4. This confirms the level of replacement in the SBP was of the correct order of magnitude, although the long term cost to Thames Water of the actual '450km programme' may be slightly higher than the original estimate (since 450km takes the AIC to excised p/m^3).

4.3 Sensitivity Analysis

The sensitivity of the ELL was tested against a programme of ALC only and changes in Base Level. The results are presented in Figure 3. The results show:

- Without mains renewal the ELL is c70-100Ml/d higher
- A +/-10% variation in the base level does not affect the short term leakage target. In the long term, the change in base level flexes the leakage target by -36Ml/d/+12Ml/d respectively.

Importantly, in total cost terms the analysis showed the cost of the supply-demand programme including mains renewal programme is c8% lower than that based on Active Leakage Control alone and confirms the renewal programme was the true least cost strategy.

As per the SBP, the results show mains renewal is a key component in reducing leakage in the short to medium term. Given the importance of mains renewal, outside of the ELL

modelling, the sensitivity of the calculation of the economic length of mains renewal was tested against changes in the capex cost for replacement and changes in leakage control cost. The results are presented in Table 4 and show:

- The updated programme length is less sensitive to changes in capex than in the SBP analysis
- The updated programme length is more sensitive to changes in leakage control costs

The change in sensitivity in these areas is, however, relatively small.

Table 4 Sensitivity Test – 'Economic' Length of Mains Renewal
(*Full replacement Only)

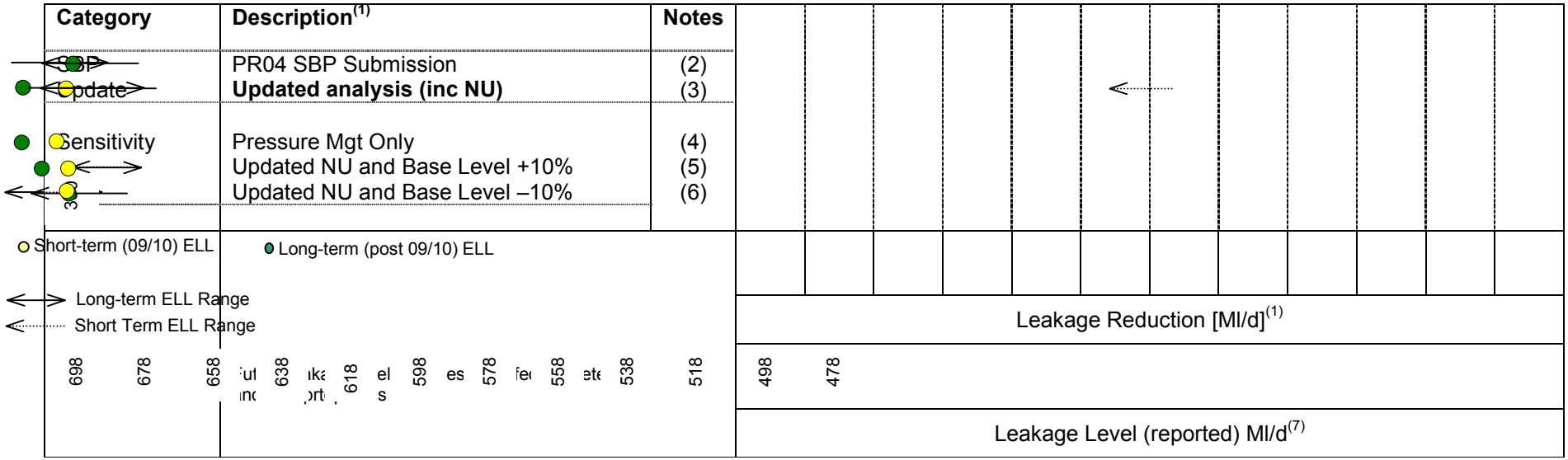
a) CAPEX Sensitivity *

	+5% CAPEX	Base Position	-5% CAPEX	-10% CAPEX	-15% CAPEX
SBP					
Length [km]	661	766	899	1066	1270
Leakage [Ml/d]	95	104	116	129	143
Length % change	-14%	-	+17%	+39%	+66%
Leakage % change	-9%	-	+12%	+25%	+38%
Updated Data					
Length [km]	586	693	831	862	1055
Leakage [Ml/d]	108	121	132	138	151
Length % change	-15%	-	+20%	+24%	+52%
Leakage % change	-11%	-	+9%	+14%	+25%

b) Leakage Cost Sensitivity *

	+20% ALC	Base Position	-20% ALC
SBP			
Length [km]	1056	766	598
Leakage [Ml/d]	126	104	91
Length % change	+38%	-	-22%
Leakage % change	+21%	-	-12%
Updated Data			
Length [km]	840	693	479
Leakage [Ml/d]	134	121	102
Length % change	+21%	-	-31%
Leakage % change	+11%	121	-15%

Figure 3 **Summary Results for London – Economic Leakage Reduction and Range**



Notes
(1) Reduction are relative to the 2002/03 SBP leakage level of 808Ml/d
(2) SBP ELL Modelling: Short term Reduction = 210Ml/d (72Ml/d ALC + 138Ml/d NU). Long term reduction 272Ml/d (+60Ml/d ALC)
(3) Updated Modelling (inc 967km Network Upgrade): Short Term Reduction = 228Ml/d (72Ml/d ALC + 144Ml/d + 12Ml/d for 02-05 progress): Long term 276Ml/d (+48Ml/d ALC)
(4) Pressure Mgt and District Metering only: Short Term reduction = 156Ml/d (144Ml/d ALC + 12 for 02-05 progress): Long Term Reduction: 168Ml/d (+12Ml/d ALC)
(5) Includes updated 967km of NU plus +10% on base level: Short Term Reduction = 228Ml/d (72Ml/d ALC, 144Ml/d NU +12Ml/d for 02-05 progress); Long term 240Ml/d (+12Ml/d ALC)
(6) Includes updated 967km of NU plus -10% on base level: Short Term Reduction = 228Ml/d (72Ml/d ALC, 144Ml/d NU +12Ml/d for 02-05 progress); Long term 288Ml/d (+60Ml/d ALC)
Excluding new property growth and metering impact (equal to net extra c10Ml/d in long term)

5.0 Summary

This report details an update to the Economic Level of Leakage calculation taking into account updated data on the cost of Active Leakage Control Activity and the cost/benefits of mains renewal.

The results show the short and long term ELL is unchanged and confirm the current AMP4 targets. The results also confirm that a mains renewal strategy forms part of the least cost strategy for managing supply and demand in London. Analysis of the underlying components of the updated data shows:

- The marginal cost of leakage control appears to have increased in the long term. This is primarily due to changes in the expected cost of leakage detection activity and the improved data on the fixed/variable cost of detection.
- The AMP4 'economic' length of mains renewal is unchanged, but the updated data show the 'cost-benefit' curve (as measured by the AIC) increases more steeply than in the previous calculations. This suggests diminishing returns sets in earlier than the SBP analysis indicated.

Overall the results support the original analysis and suggest the renewal programme is moving in a positive direction. Whilst it is too early to draw definitive conclusions, there are, however, important short and longer-term potential pointers for the ELL and mains renewal:

- Firstly, mains renewal appears pivotal to controlling leakage and minimising the long term cost of balancing supply and demand – especially in the 2010-2020 period.
- Secondly, using average productivity rates the unit cost of renewal is currently still higher than the Final Determination funding, and only if the highest productivity rates can be consistently achieved can this figure fall below £excised/m.
- Thirdly, the updated longer term marginal costs of leakage control appear higher than the SBP. This has implications over AMP4 but also means further analysis of the economics of mains renewal over the medium term (2010-2020) needs to be undertaken in more detail than it has been to date.

Finally, the sensitivity of the calculation to reasonable assumptions in data and the range of the answer also suggests that a pragmatic and balanced view on the appropriate level of renewal is needed. This will need to reflect practical issues (such as the optimum balance between partial and full DMA renewal), uncertainty (such as the difficulty untangling customer side leakage/wastage from actual legitimate use), as well as risk (such as changes in deterioration, or sudden shocks) and economics.

The longer term view of the correct level of renewal will also need to assess in more detail the net benefits of the activity to minimising total service cost (i.e. capital maintenance and supply-demand) which in turn will affect the long term ELL. This will need to be addressed for PR09.

References

Thames Water (2004), Strategic Business Plan, Section C4

WS Atkins (2005), Thames Water Traffic Disruption Cost Study Phase 2 Final Report

Appendix 1 Data Used

Component	SBP Data (Dec 03/Jan 04)	August 05 Update (only changes shown)
Demand Forecast	Dry Year Annual Average Demand	
WAFU	2002/03 base position with forecast AMP3 scheme delivery. Also included sustainability reductions in the ELL analysis (although these were removed from the final SBP/WRP submission following further EA Guidance)	
Target Headroom	2002/03 Forecast	
Leakage Costs	2002/03 actuals	Updated. See Appendix 2
Mains Renewal	Dec 03 estimate of costs and benefits	Updated. See Appendix 3
Mains Renewal (Env & Social costs)	2003 desk study estimate	Updated. Based on 2004 field study.
Metering	2003 Optant and targeted metering forecasts	
Resource Schemes	2003 estimates of yield, capex and opex	Capex inflated to 2004/05 price base
Resource Schemes (Env + Social costs)	2003 estimates	Inflated to 2004/05 price base
Variable cost of water	2002/03 estimate	Inflated to 2004/05 price base

Appendix 2 Detail of Updates Made to ALC Data

The APLE (Application of Practical Leakage Economics) model has been updated to reflect current detection and repair costs and build in the current view of savings from planned Engineering Projects. This Appendix details the data used for this update. The base year has been rolled on to 04-05 from the 02-03 SBP model, and the following key inputs have been updated:

- Leakage Repairs
- Detection Activity
- Leakage Control Costs
- Base Year Leakage Levels
- AMP4 Pressure Management and Zonal Reconfiguration programmes
- AMP4 Mains Renewal programme

Data Used in APLE for the July 05 ELL Calculation
v5.06 APLE model used - base year 04-05

Costs	• base year detection and active repair costs	04-05 Active Repair, Detection and Detection Related costs have been provided by Stephanie Dinsdale for North London, South London and Provinces.
	• base year visible repair costs	04-05 Visible Repair costs have been provided by Stephanie Dinsdale for North London, South London & Provinces. A 'Central Provision' figure was apportioned across each region according to its regional total.
	• base year CSL repair costs	04-05 CSL Repair costs have been provided by Stephanie Dinsdale for North London, South London & Provinces.
Repairs	• monthly Active & Visible repairs data from JMS	As for the SBP, monthly Active & Visible leakage repairs reports were run and taken from on JMS.
	• monthly CSL repairs data from JMS	In October 04 a new CSL policy was introduced involving new CSL job codes. The reports run on JMS have been modified in line with this to ensure that all appropriate CSL repair jobs (with both old and new codes) have been included.
	• CSL active/visible repairs ratio	The new CSL codes allow the proportion of detected and customer driven CSL repairs to be monitored. The ratio of active/visible CSL repairs observed since the introduction of the policy has been applied to the total CSL jobs each month for entry into the model.
	• processing the JMS repairs data	As for the SBP, each repair returned is assigned to Catchments by WPA number and Resource Zone by Postcode. The London and Provinces totals are sums of the Catchment data, as the WPA numbers are considered to be slightly more accurate than the Postcodes entered into JMS. Very rare duplicate jobs (e.g. resulting from e.g. a CSL job code with a Visible Leakage finance code) are assessed and assigned to the appropriate category with the duplicate removed.
Detection Hours	• detection hours data for 04-05 by activity from LEDA & TESLA - system handover 18-10-04	LEDA Detection Hours reports were run for each Resource Zone on 'Standard Leakage Control' for each calendar month for the period 01-04-04 to 18-10-04. Detection Hours reports were also run for North London, South London & Provinces on 'Non DMA related work'. These hours were added to the Resource Zone 'SLC' hours according to the proportions of 'SLC' hours worked in against each activity group for each Region. TESLA 'Detection Hours by Area' reports were run from 19-10-04 to 31-03-05. 'Leakage Control' project code hours are returned by Flow Monitoring Zone and were summed to give ANMA and Regional totals. Hours against the 'Leakage Specialist' project code are returned by ANMA and were added to the 'Leakage Control' hours.
	• excluded activities	Certain categories were excluded from the detections hours figures as entered into APLE. These are the same categories that it has been agreed should be excluded from the hours reported in the Quarterly Leakage Progress Reports.
	• TESLA 'Office' activity hours Jan-Mar 05	Initially, 'General' hours could be entered into TESLA, this resulted in a backlog of timesheets covering activities not assigned to one DMA (e.g. office work, seepage). These hours have been added to the detection hours data for APLE. This issue was addressed with 'General' areas being set-up in TESLA and therefore all such data has been entered into the system from April.
	• categories for APLE	New categories have been set-up in APLE which group both LEDA and TESLA activity codes appropriately and comparably.
	• fixed & variable activities	The fixed/variable activity hours proportions from LEDA were applied to the 'Other' category; TESLA activitites can now all be identified as fixed or variable. The ratio is now 30:70 compared with 43:57 for the SBP.
Leakage	• operational leakage, including Trunk Mains leakage	The latest view of Monthly Resource Zone leakage figures for 2004-05 were provided by Roger Robinson and include Trunk Mains leakage.
	• underlying March 05 leakage level	Due to the late winter event experienced in March 05 the monthly figure from this data was unusually high for that time of year. As APLE works by building cost curves from the year end position, using this figure in APLE would have artificially altered the cost curves misrepresenting the current situation. To account for this, the underlying leakage level for March was derived by interpolating between the weekly average leakage levels from 15th Feb 05 to 26th Apr 05. The monthly figures were then adjusted slightly to give the same annual average as from the original monthly figures. This resulted in a March 05 figure of 779.9 rather than 803.7.

Base Level of Leakage	• London base level	As SBP
Steady State Repair Rate	• total steady state repairs	As SBP
	• active steady state repairs	As SBP
Properties	• properties	Base year property counts were brought into line with 04-05 data.
Operating CoW	• operating cost of water	As SBP
New Property Allowances	• new property costs and leakage	As SBP
Policies	• Pressure Management	AMP4 programmed leakage schemes information was provided by the Engineering Water Balance Team.
	• Zonal Reconfiguration	AMP4 programmed leakage schemes information was provided by the Engineering Water Balance Team.
	• District Metering	As SBP, aligned to new base year
	• Mains Upgrade	The total mains length to be replaced together with leakage and repair savings have been taken from the July 05 ELL Mains Replacement AIC Calc re-run. This adopted the same methodology as used for the SBP Economics of Mains Replacement analysis but is based on updated leakage data, CAPEX cost and leakage control costs. Again an allowance has been made for the overlap with mains to be replaced as part of Capital Maintenance.
	• Mains Deterioration	As SBP
	• AMP4 Capital Maintenance	As SBP

Appendix 3 Detail of Updates Made to Mains Renewal Data

Data Used for the July 05 ELL Mains Replacement AIC Calculation

DMA Data		
	• DMA Name	Direct from Netbase - current list as of July 05.
Base DMA Data		
	• original DMA mains length	Direct from Netbase.
	• replaced DMA mains length	Taken from the updated EES model, includes revised percentage rationalisation assumptions by Cost Zone as follows (applied across the diameters): Cost Zone 1 - 20% Abandonment Cost Zone 2 - 17% Cost Zone 3 - 12% Cost Zone 4 - 10%
	• DMA properties	Direct from Netbase.
	• bursts per year	Average of JR01 - JR05 Bursts by DMA from reconciled JMS and Netbase values.
	• asset deterioration rate for mains	As SBP - 0.8% in outer London, 1.2% in met London .
	• leakage before mains replacement (exc trunk mains)	Methodology as for the SBP using mid-April to mid-May 05 leakage values - Netbase daily leakage values from 12-04-05 to 12-05-05 for operable DMAs (data manually inspected, spurious values removed and 'available' DMAs with a high number of 'MISSING' values or significant differences between average, max & min values not used), otherwise based on operable DMAs average if >50% operable, and based on FMZ l/p/h approtioned by properties if <50% operable.
	• SPL before mains replacement	Assumed 75:25 split.
	• detection hours per year	Consistent with APLE methodology - average of 02-03 & 04-05 North London & South London 'Standard Leakage Control' detection hours by DMA from LEDA (to Oct-04) and 'Leakage Control' hours from TESLA (Oct-04 onwards).
	• detection costs per DMA	Consistent with APLE methodology - 04-05 North London & South London detection costs (i.e. 04-05 unit costs) with an average of 02-03 & 04-05 DMA 'Standard Leakage Control' detection hours.
	• detection cost per property	*calculation - above per property*
	• leakage repairs per year	Consistent with APLE methodology - average of 02-03 & 04-05 active & visible repairs apportioned to DMA by average of JR01-JR05 bursts.
	• leakage repair costs per DMA	Consistent with APLE methodology - 04-05 North London & South London repair costs (i.e. 04-05 unit costs), average of 02-03 & 04-05 active & visible repairs apportioned to DMA by average of 01-05 bursts.
	• repair cost per property	*calculation - above per property*
Costs		
	• Capex cost for replacing mains (inc meters)	CAPEX cost estimates taken from the updated EES model which reflects performance to date. Costs based on a number of assumptions applied to DMAs based on their cost zone and contractor - % abandonment per Cost Zone (as above), proportion of Dig and No-Dig Techniques by Contractor area, producivity rates for these techniques for each Cost Zone.
	• Capex cost for fixing SPL	CAPEX cost estimates taken from the updated EES model which reflects performance to date e.g. on amount of routine and non-routine jobs needed.
Benefits		
	• initial leakage saving	As SBP - *calculation - start leakage (exc. CSL) minus leakage assumption of 1.5l/p/h for 22.8 hrs a day after mains replacement*
	• initial leakage saving inc SPL	As SBP - *calculation - assumption that after mains replacement and SPL fixing leakage is down to 2l/prop/h.*
	• initial SPL saving	*calculation - from before and after SPL levels*
	• unit cost of water	Company unit cost of water (power and chemicals).
	• SPL repairs per year (comm pipe repairs)	Comm pipes used as surrogate for SPL repairs, all repairs from JMS comms pipe jobs download matched to DMA using Netbase repairs data.
	• SPL repair unit costs	Regional CSL repair costs from Steph Dinsdale divided by JR05 T1 'no. hh supply pipe repairs' apportioned to region by APLE JMS data.
	• current SPL cost	*calculation - from above data*

Appendix 4 Leakage Uncertainty Modelling Results

Excised