Purpose of this document

In April 2008 each company made its initial cost base submission, containing cost estimates for a range of standard projects and breakdowns of projected AMP5 expenditure. This report explains how we analysed these submissions and presents our initial findings. We will also give each company feedback to help them improve their final business plan submissions in April 2009.

We will take account of these findings, among other evidence, in setting the draft baseline level of capital expenditure for the new capital expenditure incentive scheme in December 2008. We will explain to each company the adjustments we have made in our baseline expenditure assumptions.

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Contents

1. Overview of the cost base method

We use the cost base to assess relative efficiency in the procurement and implementation ('delivery') of capital projects, by comparing company estimates of capital works unit costs for a representative range of standardised capital projects ('standard costs').

The usefulness of these estimates for comparison purposes depends on having clear specifications of the standard projects for companies to follow and identifying where companies have not complied with these. Over successive price reviews, we have improved both these aspects.

For each standard cost we look at the distribution, identify a fixed cost for comparison and see how far proportionally above or below this each company's cost is. Chapter 2 describes how our method for selecting this fixed cost has evolved over successive price reviews.

For each sub-service, we take the average of these proportions, weighted as far as possible by projected activity in the next asset management plan (AMP), using forecast proportions of expenditure in investment areas (such as mains laying in grassland and pumping stations). For water mains and sewers, we use the asset inventory to estimate how activity is spread across size bands. For non-infrastructure, the link between existing assets and future work is less clear (for example, because of changing treatment standards and processes), so we take a simple average of the proportional distances above or below the fixed costs in each investment area (for example, water treatment works).

We use these average proportions for each sub-service to adjust the company's estimate of capital expenditure (capex).

We also take into account continuing efficiency (the future efficiency improvements expected from an average company).

2. The evolving role of the cost base

The cost base is a well-established comparative efficiency tool. We first used it in the 1994 price review and have developed it for subsequent reviews.

In the 1994 review, we used the lower quartile of the standard cost distribution as a yardstick for comparison.

In 1999, we felt that using a benchmark (lowest credible cost) would more closely mirror a competitive market, and we kept this approach for the 2004 review.

The benchmark cost needed to comply closely with the standard cost specification, be a robust estimate and companies representing at least 3% of the sector by turnover had to be at or below the benchmark. We generally chose a single benchmark company for a type of activity, such as water mains or sewer laying, even if it was not the most efficient for every standard cost. We assumed companies with higher costs would catch up a proportion of the distance to the benchmark cost.

We have now introduced the capex incentive scheme, which gives companies a new incentive to submit accurate plans, while retaining the incentive to improve efficiency and reduce costs.

In this scheme, we will compare each company's forecast expenditure with our assessment of a 'baseline' level of expenditure. To derive this, we will challenge the scale of activity or schemes included in the company's business plan. We will use the cost base to assess the company's delivery efficiency, and adjust expenditure to an achievable level of efficiency for a middle-ranking company. As noted in chapter 6, we will also make further appropriate adjustments if we consider that a company's cost base submission and its business plan have not been prepared on a consistent basis.

At both the 1999 and 2004 reviews we used econometrics as an alternative means of challenging forecast capital maintenance expenditure. We will not do this for the 2009 review.

Until now, we have asked each company to submit claims for any special factors beyond management control that increase cost. To the extent that we accepted these claims, we reduced the company's standard costs and hence the efficiency challenge.

The most common special factor claim was for regional construction prices. We accept this in principle and we have developed our own approach to estimating this,

described in chapter 4. In the context of a one-way (downward) efficiency adjustment to expenditure, it was appropriate to make one-way (downward) adjustments for regional prices. Now that we are making two-way efficiency adjustments, we have decided to make systematic, two-way regional price adjustments to standard costs for all companies. Therefore, we no longer require claims for regional prices. In 2007 the UKWIR report ‘Review of the approach to efficiency assessment in the regulation of the UK water industry’ (07/RG/04/2) recommended that we model ‘systemic’ factors in this way. Regional prices are especially suitable for such modelling because there are well-established regional price indices.

3. Review of the 2004 process

In December 2004, we commissioned an independent steering group, chaired by John Baker, to examine how we had carried out the 2004 price review and to consider recommendations for improvements to the process. The group recommended that we review our cost base methodology. A more general recommendation was for us to consider whether similar price limits could have been produced with reduced data requirements.

We visited several companies to understand their costing systems and to gather their views. We formed a cost base working group with representatives from companies and the company reporters to consider the issues affecting the cost base and what improvements could be made.

In RD17/06, 'PR09 business plan information requirements: cost base', we described these issues, and in PR09/01 we reported how we were taking them forward.

Specific changes to the cost base methodology include the following.

- Removing the option to make a revised submission with draft business plans, and requiring each company to explain changes made between first and final submissions. This should reduce the large changes in standard costs seen between submissions at the 2004 review and help us understand the changes that are made.
- Introducing the cost breakdown structure spreadsheets, in place of the checklists used at the 2004 review, so that each company can show how their costs are built up from the direct cost of items, indirect costs and corporate overheads.
- A revised approach to confidence grades. We have replaced the engineering judgement grades (EJG) for reliability (letters A to D) and accuracy (numbers 1 to 4) with confidence grades – numbers 1 (low) to 5 (high) for scope, cost, risk and compliance with standard cost definition. Appendix 1 reproduces the guidance that defines confidence grades.
- Reviewing the standard projects to be included, to make them more representative of current capital works, and reducing their number from 124 to 80 (48 for the water service and 32 for sewerage) to reduce the workload and data burden. Appendix 2 summarises the specifications for each standard cost.
- The 2% rule: reducing the workload and data burden by not requiring companies to submit standard costs for investment areas where projected expenditure is less than 2% of the total, therefore having little effect on the

weighted average. The quality of standard costs for these areas is also likely to be poorer if companies have little experience or plan little activity.

- Improving the guidance.

In PR09/01, we consulted on draft reporting requirements. We also commissioned a technical review of the draft. We used consultation responses and this review to finalise the reporting requirements, which we published on 30 November 2007. We held a workshop on these in December 2007 for companies and reporters, and issued clarifications in response to points made at the workshop and in written queries.

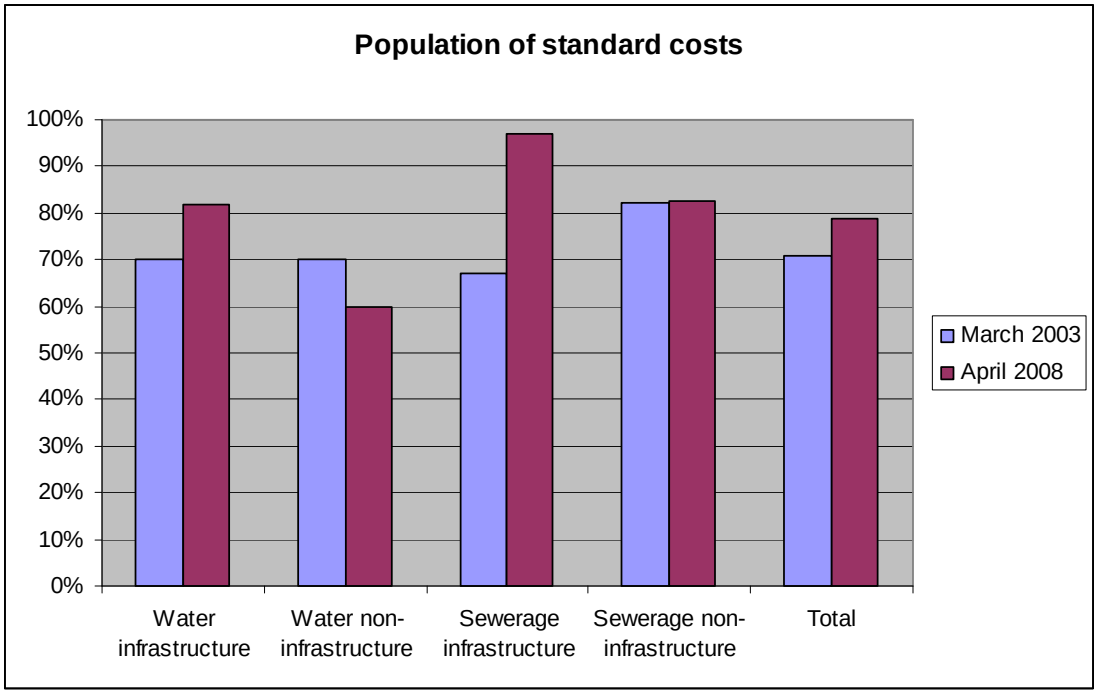
4. April 2008 submissions

Expenditure projections

All companies provided forecast proportions of expenditure during AMP5, although some commented that they had not yet completed their business plans and that these were therefore provisional. A few companies submitted standard costs where forecast expenditure was slightly below 2% of the total, in case their draft business plan showed a figure above 2%.

Population of standard costs

The 21 companies completed 1,048 (79%) of the possible 1,328 standard costs. At the same stage of the 2004 review, 22 companies completed 1,482 (71%) of the possible 2,092 standard costs. The histogram below shows the changes for each sub-service and overall.



The 2% rule (see chapter 3) has reduced the number of investment areas for which we require companies to submit costs. Nevertheless, the proportion of standard costs completed increased overall.

For infrastructure, the removal of less popular techniques has resulted in significant increases in completion rates, although water mains rehabilitation remains a difficult

area with only six companies completing costs for relining. Across both services, completion rates for pumping stations remain high. (Pumping stations are non-infrastructure, but higher activity levels and repeatable work give them some of the characteristics of infrastructure.)

We introduced new standard costs for non-infrastructure maintenance work to make the cost base more representative of the mix of work companies do. Completion rates for these were high.

For water non-infrastructure there were low completion rates (20 to 50%) for most water only companies. In particular, this affects treatment works, where many water only companies have few projects. Many of these companies explained that they had not undertaken these types of work historically and did not plan to do so in AMP5. In general, companies struck a reasonable balance between number of costs submitted, their quality and their significance to the efficiency calculations. This means that our efficiency findings are well supported.

For sewerage non-infrastructure, the completion rate for sewer structures has fallen from 93% to 70%, although the standard projects have not changed. This was because of the 2% rule and because some companies did not submit costs for projects they did not expect to include in their business plans.

Ensuring comparability between companies

In order to make comparisons between companies we need to make sure that they all comply with the standard cost specifications and the guidance. For non-infrastructure, we allow alternative process solutions as long as we are satisfied that this is the company's standard practice and it will deliver the required output. This extends the concept of efficiency to include an element of innovation.

We employed consultants Jacobs to advise us on the cost base submissions. The main part of this was to review the standard costs for compliance with specifications and guidance, and look at consistency across companies.

The cost breakdown structures have given more numerical information than previously. This has revealed those companies able to provide a detailed breakdown of costs based on their own data.

It has also highlighted some inconsistencies in handling indirect costs and overheads. Some smaller companies have allocated corporate overheads to opex. We have accepted this because apparent decreases in relative opex efficiency will offset the apparent increases in relative capex efficiency.

In general, most companies provided robust submissions and commendable detail. A few appear determined to submit the lowest standard cost possible and have attempted to do this by ignoring elements of the standard definitions. We will not tolerate this and we have asked them to resubmit these standard costs. Occasionally, a company has submitted a standard cost that appears implausibly low but compliant in terms of the scope of work. We have asked these companies to re-examine their costs and if necessary to supply a revised standard cost.

We expected companies to make a full submission, but in a few cases they have been unable to complete all their standard costs in time. Some companies have told us they expect to have better data in time for final business plan submissions.

We issued 283 queries under three main themes:

1. Omission, duplication or addition of elements within the scope of work.
2. The basis of the costs and their realism.
3. The internal consistency of approach and comparability between companies of indirect costs and overheads.

The responses provided additional information to establish compliance. We amended 109 standard costs (about 10% of those submitted), in most cases where companies revised their costs and we accepted them. We excluded 32 standard costs, generally because of non-compliance with the definitions, low confidence grades and costs lacking credibility. We also excluded all of one company's water non-infrastructure costs because, even after a large number of queries, we still had serious concerns about compliance and the credibility of the costs.

The histograms show the distribution of each standard cost following these amendments and exclusions, and the regional price adjustments described below. Even after intensive review and making many amendments, the range of costs from lowest to highest remains large and we are working to understand the reasons for this. There are also some query responses still outstanding. Therefore we may make further amendments before calculating efficiencies for setting baseline expenditure.

In some cases companies have interpreted reporting requirements differently. Enough companies appear to have misinterpreted the definitions for household meters to warrant a complete revision of the definition for the final business plan. We expect to adjust some other definitions slightly to clarify issues raised by companies. We will issue this revised guidance in January 2009.

Confidence grades

Appendix 1 defines the scoring system for confidence grades.

In general, confidence grades were reasonably high, with only a few less than 3. Larger companies generally had higher confidence grades, mostly 4 or 5. The confidence grades for non-infrastructure were weaker than for infrastructure, particularly for smaller companies.

Grades were often lower in the area of risk. Five smaller companies were graded 1 for risk, that is they had not developed their risk approach. We have considered the impact on the accuracy of standard costs and concluded that in most cases the effect is unlikely to be large.

Reporters were generally content will companies' confidence grades, but proposed a few adjustments.

Independence of company submissions

Companies said they had prepared their submissions independently of each other and reporters confirmed this.

We are aware that, as at the last price review, companies have shared cost base information and attempted their own comparative analysis. We would be very concerned if this undermined the independence of companies' final cost base submission in April 2009. We expect companies to minimise changes to their standard costs between the first and final submissions and our general guidance requires explanations of such changes.

Regional prices

We use the Building Cost Information Service (BCIS) index to assess the regional variation in construction prices away from the England and Wales average. We weight local indices by population to obtain average figures for each company's area and the whole of England and Wales. We then compare each company's index figure to the England and Wales average.

We acknowledge that regional prices affect companies' costs and expenditure, and are to some extent outside management control. But some items, such as mechanical and electrical equipment, and design services, are procured in a national market. Therefore, regional prices affect only part of capital costs. We have

estimated this proportion for different types of activity. We apply this proportion of the regional variation to the relevant standard costs.

Table 1 Proportion of costs affected by regional prices

Water service	
Mains	70%
Communication pipes	74%
Meters	58%
Water treatment works - surface	54%
Water treatment works - ground	74%
Service reservoirs	82%
Water pumping stations	38%
Sewerage service	
Sewers	70%
Sewer structures	82%
Sewage pumping stations	38%
Sewage treatment works	50%
Sludge treatment and disposal	74%

Seven companies in south-east England made claims for high regional prices, some offering detailed evidence, and an eighth company is considering submitting a claim with its final business plan. Their claims, where quantified, exceeded our estimates. Four of these companies proposed a two-way adjustment, so that they further improve their position relative to companies with below-average regional prices. As explained in chapter 2, we have now decided to make such systematic, two-way adjustments for all companies.

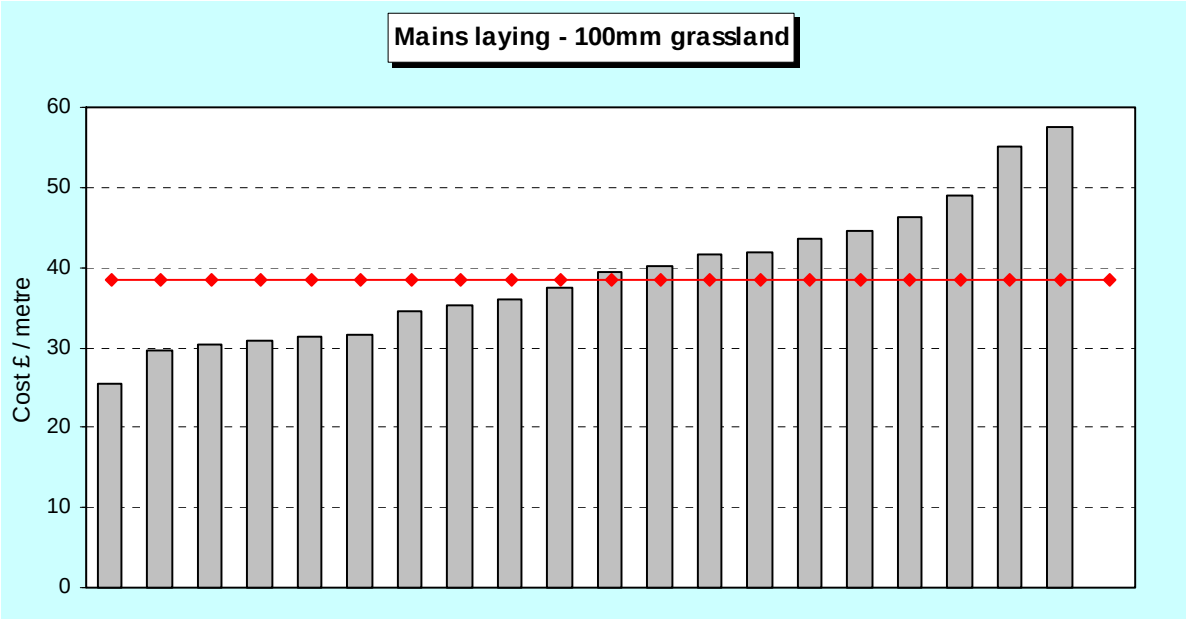
Other company special factors

Several companies claim that a variety of other special factors outside management control increase their costs. Others may submit claims with final business plans.

In line with our approach to opex efficiency, we will not consider claims that would, if accepted, improve assessed efficiency by less than 1%. These small claims are not material to price limits and we consider that other small benefits to the company may offset them. Only one company quantified its claim and we are rejecting it on these grounds.

Baseline selection

The baseline represents a sector-typical cost. We expected that standard costs would be tightly grouped around the middle of the distribution, while at the ends of the distribution values would vary more widely. In other words, we would have an 'S' curve. In general, this expectation has been met, as illustrated below for a straightforward type of work.



We took the middle or median value as typical. (When there is an even number of values, we take the average of the middle two.) We discuss the reasons for using the median in detail in appendix 3. We also looked at each distribution and in every case found that this choice was well supported by several credible costs.

Jacobs provided us with independent estimates based on their own data and experience. These were generally well within the range of company estimates and provide support for selecting the median as a typical, representative value.

5. Changes in standard costs 2004 to 2008

We asked companies to comment on the reasons for certain standard costs changing in real terms (allowing for inflation) between 2004 and 2008. For infrastructure we chose a representative sample of standard costs and for non-infrastructure we chose all those standard costs that were reasonably comparable between 2004 and 2008 (where the specification had not changed too much).

Both general delivery efficiency and particular cost drivers (such as the price of the materials or changes in the technology used) affect the standard costs. A number of companies say they have better cost capture systems in place, making alignment with the standard cost definitions more feasible. In general, this appears to result in lower standard costs as non-standard items are removed.

Water infrastructure

Companies have reduced their mains-laying unit costs by about 10% on average. The lower costs, over 40% lower in a number of cases, appear to be related to the competitive market and better procurement methods rather than lower material or labour costs. A few smaller companies showed very large increases over their previous keen costs, which they ascribed to increased contractor rates and more stringent environmental requirements.

Water non-infrastructure

The picture for non-infrastructure is less clear. The most significant changes are attributable to amendments to the line definitions, with an overall increase of about 15% in real terms. Savings where indicated are mostly attributed to better procurement, new frameworks or more cost-effective solutions.

Sewerage infrastructure

For sewer laying, standard costs reduced by about 5% on average, with some companies showing very large reductions (20 to 30%) for sewer laying in rural and suburban highways. Sewer rehabilitation showed larger average cost reductions of about 10%. As for water infrastructure, the reduction is attributed to better procurement, including longer-term frameworks.

Sewerage non-infrastructure

On average, there were modest increases in costs. Some companies showed very large changes for some costs, suggesting there are issues around the scope of works, and companies sometimes mentioned this in their commentaries. This (and the small number of comparisons for the installation of nitrate removal plant) made it difficult to draw definite conclusions about cost trends.

6. Consistency between cost base and business plans

We have stressed the requirement for each company to prepare cost base submissions and business plans using the same data and methods. We asked each company to comment on how it intends to achieve this consistency. In general, companies have assured us that the two submissions will be consistent. We will need to review the draft business plans before we can complete our assessment of consistency.

If we consider that a company's cost base submission and business plan are not consistent then the cost base on its own is not a safe basis for making efficiency adjustments. We will review the evidence and make an appropriate adjustment when setting baseline expenditure.

7. Next steps

Table 2 Next steps

Ofwat sends individual feedback letters to companies	September 2008
Ofwat issues capex baselines, using cost base to make efficiency adjustments	December 2008
Ofwat issues updated reporting requirements for final business plans, including cost base	December 2008
Companies submit final business plans (including cost base)	April 2009
Ofwat publishes draft determinations for comment	July 2009
Ofwat publishes final determinations	November 2009

Appendix 1: Definitions of confidence grades

Criteria	Score				
	1	2	3	4	5
Scope	Company has no previous experience of this type of activity.	Company has had some experience of delivering similar projects, but not within past eight years.	Company has carried out similar projects but in significantly different size bands.	Company has experience in similar projects, within similar size bands to the definition. Company has standard solution/s for this type of activity, which has been assessed as providing the least WLC solution.	Company has considerable experience in similar projects and similar size bands to the definition. Company has standard solutions for this type of activity and a process for updating them. It has been assessed as providing the least WLC solution.
Cost	Cost data is from non-company sources. Used industry parametric data (eg, TR61).	Significant use of non-company sources, costs from dissimilar projects or costs from projects completed more than eight years ago.	Company has reasonable company specific data. Some source data may be from a non-company source (eg, contractors' estimates with limited or no company-specific input).	Standard cost represents activity where reliable company-specific cost data is available (few data points).	Standard cost represents activity where reliable company specific cost data is available (reasonable number of data points).
Risk	A generic contingency is included – no basis of value.	A generic contingency is included – based on generic risk register.	Risk register produced qualitatively (risks identified and scored). Or Tender to outturn ratio	Risk register produced and quantified risk assessment modelled. Or Tender to outturn ratio applied	Risk register produced and quantified risk assessment modelled. Or Tender to outturn ratio

			applied or outturn estimated based on a small sample (or old data set) of projects.	or outturn estimated based on a reasonable sample of similar (and recently completed) projects.	applied or outturn estimated based on a significant sample of similar (and recently completed) projects.
Compliance with standard cost definition	Adjustments have not been made as required in the specification. Company is not able to disaggregate costs to allow adjustments or exclusions to be made.	Company is less confident that all adjustments for direct costs have been made as specified in the guidance. Indirect and overhead costs have been derived, but from a small sample of similar projects. Cost data is only available at a site or system level (eg, cost of 30 Ml/d treatment works) making it difficult to derive the adjustments or exclusions.	Company is less confident that all adjustments for direct costs have been made as specified in the guidance. Indirect costs and overheads are based on a small sample of similar projects. Cost data is captured at process unit or system level (eg, rapid gravity filters) with high level breakdown of indirect costs, risk allowances and overheads. Adjustments and exclusions can be made on a representative basis.	Company is reasonably confident that all adjustments for direct costs have been made as specified in the guidance. Indirect costs and overheads are based on a reasonable sample of similar projects. Cost data is captured at sub-process level (eg, backwash pumps). Indirect costs are broken down and risk allowances are based on specific risk log. The required adjustments or exclusions can be made on a representative basis.	All adjustments for direct costs have been made as specified in the guidance and are based on robust historic data. Indirect costs and overheads are based on a significant sample of similar projects. Cost data is fully disaggregated and sufficiently detailed to allow all adjustments and exclusions to be calculated with high confidence.

Appendix 2: Specifications of standards costs

Water infrastructure

Mains laying

General specification for mains laying: New water mains laid in normal site conditions at a depth of cover of 900 mm to the crown of the pipe. No adverse complications. Pipe material is based on companies' own practices. Costs include all fixtures and fittings, ancillary works and reinstatement. Diameters relate to the nominal internal bore of the pipe.	
General specification for mains laying by directional drilling: Soil type is normal and neither rocky, waterlogged nor sandy. Pipe material is based on companies' own practices. Costs include all fixtures and fittings and reception pits are 3 m^2. Diameters relate to the nominal internal bore of the pipe.	
Grassland	Mains laid in urban or rural verges, new development sites or open field normally used for grazing. Excludes the cost of traffic management and fencing.
Rural or suburban highway	Mains laid in secondary or minor roads and housing estates. Type 3 or 4 reinstatement and non-traffic sensitive in accordance with the New Roads and Street Works Act 1991.
Urban highway	Mains laid in cities and town centre trunk roads. Type 2 reinstatement and traffic sensitive in accordance with the New Roads and Street Works Act 1991.

Mains rehabilitation

General specification: Existing water mains rehabilitated using particular techniques at a depth of cover to the main of 900 mm to the crown of the pipe. All fixtures and fittings, ancillary works and reinstatement is included.	
Relining	Encrustation removed and main lined internally by applying a surface-applied internal coating. Typically used for relining cast iron mains.
Pipe insertion	Encrustation removed and a smaller structural pipe inserted into the existing main.

Communication pipes

General specification: New communication pipes installed in a new development site. Lengths of pipes are 3 m for the short side and 7 m for the long side. Renewal of pipes relates to replacement by open cut or moling technique in a suburban location. Both assume a depth of cover of 750 mm to the crown of the pipe.	
New long side	New 7 m length communication pipes, involving a road crossing.
New short side	New 3 m length communication pipes.
Renew long side	Renewal of 7 m length communication pipes, involving a road crossing.
Renew short side	Renewal of 3 m length communication pipes.

Household meters

General specification: Installation of new and renewal of existing meters. Manually read household meters are installed.	
New internal meter	New internal meter, including survey but excluding abortive house visits.
New external meter with boundary box provided	New external meter in an existing boundary box located in path outside the property.
New external meter including boundary box	New external meter including boundary box, unsealed type located in path outside the property.
Renewal of internal meter	Renewal of existing manually read internal meter. Includes survey but excludes abortive house visits.
Renewal of external meter with boundary box provided	Renewal of external meter, boundary box located in path outside the property, suitable to accept new meter.
Renewal of external meter including boundary box	Renewal of external meter, including renewal of boundary box, unsealed type, located in path outside property. Excludes costs for demolition or removal of existing boundary box.

Water non-infrastructure

Water treatment works

New medium-size treatment works	Output 30 Ml/d (30,000 m^3 of treated water a day), lowland river source with existing bank-side storage reservoir, no nitrate problem.
Replacement filtration system at medium-size treatment works	Replacement filtration system, output 20 Ml/d, at a lowland river source, no sludge storage or treatment required.
New abstraction borehole and small treatment works	Output 5 Ml/d of treated water, simple disinfection only with no contact tank. Pumping head (static and friction) is 45 m.
Refurbishing plumbosolvency control plant to small borehole treatment works	Refurbishment of plumbosolvency control plant, output 8 Ml/d, simple disinfection only.
Altering medium-size treatment works for cryptosporidium protection	Alterations to fit an approved barrier process at lowland river source treatment works with existing bank-side storage reservoir, output 30 Ml/d, no nitrate problem.
Installing nitrate removal at small borehole treatment works	New nitrate removal plant, output 10 Ml/d, at existing borehole treatment works with simple disinfection only, no contact tank.
Installing cryptosporidium protection at small borehole works	Alterations to fit an approved barrier process to borehole works, output 2.5 Ml/d, simple disinfection only.
Refurbishing rapid gravity filters at medium-size treatment works	Refurbishment of existing rapid gravity filtration plant, output 20 Ml/d. Works cannot be taken off-line.
Replacing disinfection plant	Replacement of existing sodium hypochlorite disinfection plant, output 12 Ml/d. Plant can be taken off-line.

Water storage

New service reservoir	4 Ml (4,000m^3) capacity, two compartments, good ground conditions, including all necessary pipe work and telemetry but no treatment.
Refurbishing small service reservoir	1 Ml (1,000m^3) capacity, two compartments, concrete construction, structurally sound but roof cracking and side walls seeping water, causing coliform failures.

Water pumping stations

Replacement variable speed pumps	Output 6-9 Ml/d, one duty, one standby, pumping head (static and friction) is 45-60 m, shaft driven, situated in a dry well, including all associated control equipment, good access.
New fixed speed pump set	Output 10 Ml/d, pumping head (static and friction) is 75 m, into existing high-lift station, additional cabling and telemetry equipment required, existing switchgear and transformer are adequate, good access.
Replacement motor control centre for an existing large variable speed pumping station	Two new duty or standby compartments with inverters each rated at 45kW, existing transformer and electricity company incomer are adequate, good access.

Sewerage infrastructure

Sewer laying

New sewers laid in normal site conditions at a depth of cover of 2 m to the crown of the pipe. No adverse complications. Pipe material is based on the company's own practice. Costs include a sewer junction and cap at 10 m intervals and 50 m intervals between manholes. Costs are based on open-trench pipe laying, with all other assumptions consistent with the relevant design and construction guidelines in 'Sewers for adoption' (6th edition). Diameters relate to the nominal internal bore of the pipe.	
Grassland	Sewers laid in urban or rural verges, new development sites or open field normally used for grazing. Excludes the cost of traffic management and temporary fencing.
Rural or suburban highway	Sewers laid in secondary or minor roads and housing estates. Type 3 or 4 reinstatement and non-traffic sensitive in accordance with the New Roads and Street Works Act 1991.
Urban highway	Sewers laid in cities and town centre trunk roads. Type 2 reinstatement and traffic sensitive in accordance with the New Roads and Street Works Act 1991.

Sewer rehabilitation – No dig / reline

A flexible lining is inserted into the sewer through existing manholes, under pressure of water and then cured by circulating hot water. Adequate water supply is available on site. Depth of cover to sewer is 2 m. Sewer junction and cap at 10 m intervals. Diameters relate to the nominal internal bore of the pipe.

Sewerage non-infrastructure

Sewer structures

General specification: Well-drained site available in public park adjacent to sewer.	
Medium-size storage tank to a combined sewer overflow	750 m^3 storage capacity, single tank, pumping return to sewer required, sewer 500 mm diameter, all telemetry included.
Large storage tank to a combined sewer overflow	3,000 m^3 storage capacity, single tank, pumping return to sewer required, sewer 500 mm diameter, all telemetry included.
Combined sewer overflow chamber with powered screen	Off-line of existing 600 mm trunk sewer, powered 6 mm self-cleaning screen installed in weir, control panel and instrumentation included, no odour control.

Sewage pumping stations

Replacement pumps and motors for an existing medium-size dry well pumping station	One duty, one standby, total capacity 30 kW, vertical spindle integral units, each pump 150 l/s at 8 m pumping head, new control and telemetry equipment and cabling, existing switchgear and transformer are adequate, good access.
Replacement submersible pumps for an existing small pumping station	One duty, one standby, total capacity 12 kW, installed via guide rails, each pump 45 l/s at 8 m head, new control and telemetry equipment and cabling, existing switchgear and transformer are adequate, good access.
Upsizing of small existing wet well in-line pumping station	Replacement fixed speed submersible pumps (one duty, one standby) via guide rails, total capacity 30 kW, in an existing wet well pumping station, current capacity 12 kW, each pump 150 l/s at 8m head, new control and telemetry equipment and cabling, existing switchgear and transformer are adequate, good access.
Replacement motor control centre for an existing large fixed speed pumping station	Two new duty or stand-by compartments with soft starters each rated at 45kW, existing transformer and electricity company incomer are adequate, good access.

Sewage treatment works

First time rural sewage treatment works	New treatment works serving a population equivalent of 200, treating up to 6 DWF (dry weather flow) = 210 m^3 per day, design capacity = 12 kg of BOD_5/day, no sludge tanks required. Include all necessary pipework, buildings and telemetry, control equipment.
Installing denitrification at an existing large secondary treatment works	Installing nitrate removal at an existing secondary treatment works using percolating filters serving a population equivalent of 40,000, treating up to 3 DWF = 30,000m^3 per day, design capacity = 2,400 kg of BOD_5/day. Include all necessary pipework, buildings and control equipment.
Additional nutrient removal at existing medium-size secondary treatment works	Additional treatment stage at an existing secondary treatment works using percolating filters serving a population equivalent of 4,000, treating up to 3 DWF = 3,000 m^3 per day, design capacity = 240 kg of BOD_5/day. Include all necessary pipework, buildings and control equipment.
Additional ammonia removal at existing small secondary treatment works	Additional treatment stage for ammonia removal at an existing secondary treatment works using percolating filters, serving a population equivalent of 2,000, treating up to 3 DWF = 1,200 m^3 per day, design capacity = 120 kg of BOD_5/day. Include all necessary pipework, buildings and control equipment.
Replacement UV disinfection at existing medium-size treatment works	Replacement UV disinfection plant at an existing treatment works serving a population equivalent of 5,000, treating up to 6 DWF = 9,000m^3 per day. Include all necessary control equipment.
Replacement inlet screens	Replacement fine screens at an existing inlet works, duty and standby channels and one must remain open during construction. Include new local control equipment and interface with site control.

Sludge treatment and disposal

Extension to existing sludge treatment facility	Extending existing anaerobic sludge treatment facility from 2,000 to 5,000 tonnes of dried solids a year. Domestic catchment.

Appendix 3: Reasons for using the median as a representative value

Using the median means that outlying values (that may be less robust estimates) are unlikely to affect the baseline. In contrast, if we had used an average then one extreme value could have affected the baseline unduly.

As noted in chapter 2, a key part of our methodology at the 2004 price review was benchmark selection, as it was important that our efficiency challenge was based on a credible comparator. Rejecting the lowest standard cost for use as the benchmark and moving onto the next lowest reduced the efficiency challenge, and in some cases we rejected several low costs before selecting the benchmark.

In contrast, we do not expect companies to move towards the central baseline we are now using as a representative value.

As a result of the query process, we amended or excluded a significant number of standard costs. Therefore, we considered sensitivity of the median to such changes or exclusions. Changes may bring the next lower or higher cost into consideration for setting the median. Exclusions will bring a new cost into consideration when the initial number of costs was odd, and remove a cost from consideration when the initial number of costs was even; in either case this represents an effective shift of half the difference between successive costs.

We found these potential median shifts were generally small, particularly for the main infrastructure activities of laying water mains and sewers. Potential changes were larger for non-infrastructure, particularly in the sewerage service, where there are fewer comparators.

The following table shows the average change that might result from excluding one cost from each of the sewerage non-infrastructure standard costs if they all moved the baseline in the same direction, and the average proportion of expenditure across the ten companies.

Table 3 Potential baseline shift for sewerage non-infrastructure

	Average change from exclusion of one cost	Average proportion of expenditure
Sewer structures	5.5%	6.9%
Sewage pumping stations	3.5%	6.8%
Sewage treatment works	5.8%	39.3%
Sludge treatment and disposal	9.9%	9.6%

If we excluded one cost from each standard cost across the whole sub-service and they all moved the baseline in the same direction, the baseline would move by 6.1%. However the significant volumes of work sewerage companies carry out and our detailed scrutiny mean that the standard costs used for baseline setting are likely to be robust and the risks of setting an unrepresentative baseline small.

This is a worst case and, for a range of unconnected changes, upward and downward movements may cancel each other out. Similarly a large change for one standard cost is diluted when combined with the others.

Furthermore, it is unclear what alternative method for baseline setting would give a more representative value.

We have therefore decided to use the median in all cases, subject to a review of each distribution to check that this is representative. This approach also has the merit of simplicity and transparency.