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QaResearch

Willingness to Pay for Water Services at PR24

Prepared for South Staffs and Cambridge Water

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Executive Summary

NERA Economic Consulting (NERA) and Qa Research (Qa) were commissioned by South Staffs and Cambridge Water (SSCW) to design, implement and analyse a stated preference (SP) survey to estimate customers' willingness to pay (WTP) for improvements in the service provided by SSCW. SSCW intends to use the findings from this study to inform development of its business plan ahead of the next price control period, PR24.

We examined WTP for improvements in water service for three different categories of SSCW customer: household (HH) customers, non-household (NHH) customers, and future bill paying (FBP) customers. FBP customers must be aged 18-29 and not currently responsible for paying the water bill.

We surveyed customers in both SSCW service regions, i.e. South Staffordshire (SST) and Cambridge (CAM). Where appropriate, the survey was modified to reflect the region in question.

Design of Stated Preference Survey

Our stated preference survey asked customers to choose their preferred combination of bill adjustments and service levels for twelve distinct attributes for the PR24 price control period 2025-2030. The twelve attributes over which we elicited customers' preferences are shown in Table 1. For NHH customers, we did not elicit preferences for attribute A (customer service), because customer service is provided to NHH customers by water retailers rather than SSCW. Therefore NHH customers were asked about eleven attributes in total.

Table 1: We Examined Customer WTP for Twelve Service Attributes

Attribute	
A	Customer service
B	Risk of temporary "do not drink" notice
C	Installing "smart" water meters
D	Hard water supply
E	Lead pipes
F	Water lost to leakage from pipes
G	Issues with tap water colour, taste, or smell
H	Chance of property flooding from a burst pipe
I	Low water pressure
J	Supporting nature and wildlife
K	Unplanned short interruptions to water supply
L	Risk of temporary use ban, including hosepipes

Source: WTP survey for SSCW

For each attribute, customers could select one of up to five service level options, each of which had a pre-defined impact on their bill.[1] They could choose to maintain the status quo

[1] For most attributes, customers could select five options, but for some attributes this was limited to three or four options. This is explained further in Section 2.1.

service level; they could select a small or a large deterioration in service that would reduce their bill relative to the status quo option by either a small or a large amount; or they could select either a small or large improvement in service that would increase their bill relative to the status quo option by either a small or large amount. The service levels differed by region. The bill impacts that each customer saw was tailored to the customer in question based on information they provided about their current bill.

After customers made their choices for each attribute individually, we presented them with a summary screen of all their choices and the total bill impact of those choices. Customers then had an opportunity to revise their choices for individual attributes. This allowed the customer to ensure that their final chosen package of service levels for all twelve attributes did not exceed their total willingness to pay for water services or to adjust their choices following consideration of all attributes.

Qa ran a pilot survey between 22 September and 3 October 2022 from which we collected data from 260 household customers. We ran the main stage survey over a period of four weeks between 21 October and 17 November 2022 and collected data from 1,709 household customers, 247 non-household customers, and 91 future bill payers. Surveying was predominantly online via the SSCW customer database and commercial access panels, but also included face to face interviewing with vulnerable customers. In the final analysis, we use data from the main stage survey only.

Incorporating Guidance on Best Practice

We have adopted an innovative approach in this stated preference study that addresses a range of concerns raised by the Consumer Council for Water (CCW) and others following a review of stated preference studies conducted at PR19.

Following PR19, CCW commissioned a study from Blue Marble on water companies' customer engagement research, which identified a number of concerns about water companies' use of traditional WTP studies. Traditional WTP studies first present customers with information about a number of attributes, then ask customers to make a series of choices between pre-defined packages comprising service levels for a number of different attributes and a fixed bill amount. The CCW/Blue Marble study highlighted that such studies are often not easy for customers to complete. It found that customers struggle to retain all the information about attributes presented at the beginning of the survey and find the pre-defined packages and the requirement to make multiple choices between pairs confusing.

Our innovative approach addresses various concerns raised by the Blue Marble report. We ask customers to make decisions about only one attribute at a time and provide information about that attribute at the point where the customer is asked to make the decision, so customers are not required to retain information. We allow customers to construct their preferred package by combining choices on individual attributes, rather than requiring them to choose between pre-defined packages. Each customer is only asked to construct one preferred package.

In addition to taking steps to respond to the CCW/Blue Marble concerns about traditional WTP studies, we have also adhered to the standards for high-quality research and customer engagement set out by Ofwat in advance of PR24.

Approach to Willingness-to-Pay Estimation

To estimate customer WTP for service improvements based on the survey data we collected, we rely on an econometric model that estimates customers' willingness to pay for changes in the service level for each attribute.[2] For example, for attribute H (chance of property flooding from a burst pipe), the econometric model tests whether and by how much customers are willing to pay for a unit reduction in the number of flooding incidents.

The specific econometric model we estimate assumes that customers' per-unit WTP for changes in the service level is consistent across all possible levels of service.[3] This means we derive a single value for customers' WTP for each attribute (e.g. for attribute H, we get a single value for WTP for a unit reduction in the number of flooding incidents). We adopt this model because the Copperleaf valuation framework that SSCW will use as part of its business planning process requires customer WTP to be expressed as a single value per attribute.

We estimate this econometric model separately for each of HH, FBP, and NHH customers. For HH and NHH customers we estimate the model separately for each of the two regions (SST and CAM) and also estimate a combined model that uses responses collected in both regions together. For FBP we are only able to estimate the combined model due to the relatively small sample size.

We estimate a number of variants of this model to test the robustness of our findings.

- First, we estimate the model for different customer sub-groups. For HH customers, we examine preferences for sub-groups defined by gender, socio-economic group, metering status, indicators of vulnerability, and whether respondents hold "protest" attitudes. The small size of the NHH and FBP samples limits the extent to which we can estimate sub-group models. For NHH customers, we are only able to estimate the model for the sub-group excluding respondents that hold "protest" attitudes,[4] and for FBP customers the sample is too small to allow for any sub-group analysis.
- Second, we estimate a model that allows us to adjust for the over- and under-representation of certain demographic and billing characteristics in our HH sample, relative to the SSCW customer base. In particular, we adjust for the slight over-representation of women and metered customers in our HH sample.
- Third, we estimate a series of models that analyse customers' preferences regarding each attribute individually, rather than considering the overall package of customer choices. This model was estimated following a request from the peer reviewer. It allows us to understand customer preferences over each attribute in isolation, taking as given the trade-offs customers make between attributes.

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2 Specifically, we estimate a conditional logit model. The outcome variable is an indicator for whether the customer chose a specific combination, or package, of service levels across all attributes. The explanatory variables are the service levels of each attribute (one explanatory variable per attribute) and the total bill impact of the package.

3 That is, we estimate a conditional logit model that is linear in the service level for each attribute.

4 We ask two questions in the survey to elicit whether customers hold an "protest ideological" attitude (i.e. they do not accept that service improvements must be paid for through bill increases) or a "protest mistrust" attitude (i.e. they do not trust that SSCW will deliver on commitments to improve service).

- Fourth, we estimate models that look at preferences for overall improvement or deterioration, rather than discriminating between "small" and "large" improvements and deteriorations.

Willingness-to-Pay Results

Across *all* of the models we estimate and across different categories of customer (HH, NHH, and FBP), we find robust evidence of willingness to pay for improvement in attribute J (supporting nature and wildlife). We observe willingness to pay for improvement in three further attributes across *most* of the models we estimate. These are attributes B (risk of a temporary 'do not drink' notice), F (water lost to leakage from pipes), and H (chance of property flooding from a burst pipe). We find that some sub-groups of HH customers are not willing to pay for improvement in attributes F and H, in particular financially vulnerable customers or customers in the C2DE socioeconomic group. For attribute B, we do not find positive willingness to pay among HH customers in the alternative specification where we look only at preferences for overall improvement and deterioration. NHH and FBP customers are willing to pay for improvement in all four attributes.

The four attributes identified above relate to improvement in service in areas where adverse outcomes may substantially inconvenience customers, leakage, and environmental protection. The finding that customers are WTP for improvement in such attributes is consistent with the results of other WTP studies we have conducted at PR24. That is, we typically find that customers are willing to pay for improvement in environmental attributes or attributes that relate to particularly adverse and inconvenient outcomes, but are less likely to be willing to pay for improvement in other attributes.

There are a number of other attributes for which we observe positive WTP in some customer sub-groups and models, but not in all sub-groups and models. These are as follows:

- HH customers in the CAM region are willing to pay for improvement in attributes A (customer service), D (hard water supply), and G (issues with tap water colour, taste, or smell). With regard to attribute D (hard water supply), we understand from SSCW that customers in CAM typically face harder water and are less satisfied with this aspect of their water supply than customers in SST, which may explain the regional difference in WTP for this attribute. Another factor contributing to the regional difference in WTP may be that CAM customers are likely to have higher disposable income and so be willing to accept larger bill increases. This hypothesis is supported by our finding that financially vulnerable customers and customers in the C2DE socioeconomic group in the CAM region are not willing to pay for improvement in these attributes.

- We also observe positive willingness to pay for attributes D and G in the SST region if we exclude customers who exhibit "protest" attitudes from the analysis.

- Certain HH customers in the CAM region are also willing to pay for improvement to attributes E (lead pipes), K (unplanned short interruptions to water supply), and L (risk of a temporary use ban). Customers in the ABC1 socio-economic group in CAM are willing to pay for improvement to attributes E and K. We see positive WTP for improvement in CAM for attributes E and K if we exclude customers who exhibit "protest" attitudes from the analysis, and for attributes K and L if we exclude customers who either are on a social tariff or potentially eligible for a social tariff. For attribute E, we also find positive

willingness to pay in CAM in the alternative specification where we look at preferences for overall improvement and deterioration. For attribute K, we find positive willingness to pay in the models for HH \customers that look at the attributes in isolation.

- If we restrict the analysis of HH customers to those who report problems with a hard water supply, then we identify positive willingness to pay for attribute D (hard water) in both regions. In each region we also identify positive willingness to pay for other attributes related to water quality in this model: attribute G (issues with tap water colour, taste, or smell) in SST and attributes E, K, and L in CAM.
- If we exclude NHH customers who exhibit "protest" attitudes from the analysis, we find positive willingness to pay for improvement in attributes G (issues with tap water colour, taste, or smell) and L (risk of non-essential use ban) in the SST region.

We do not observe positive willingness to pay for attributes C (installing 'smart' water meters) or I (low water pressure) in any of the models that we estimate. For smart meters, it is likely that the negative result is because many customers do not in fact want smart meters. For attribute I, customers may not see low pressure as a significant inconvenience.

We present the per-unit WTP results from our main models for HH and NHH customers in Table 2. These estimates should be interpreted as follows: for attribute B, HH customers in SST are willing to pay, on average, an additional £0.74 on their annual bill to reduce the number of properties receiving a 'do not drink' notice by one; while NHH customers in SST are willing to pay, on average, an increase of 0.013 per cent of their annual bill for the same improvement in service.

For some attributes, our model generates negative values for the estimated WTP. Negative WTP values can arise mechanically from estimation when many customers have selected deteriorations in service. In such situations, it is common in the literature to constrain the analysis to eliminate negative WTP, for example by setting the negative WTP values to zero.[5] We recommend that SSCW should set any negative per-unit WTP values to zero when using these results in its Copperleaf valuation framework.

[5] See, for example, Metcalfe, Paul J. et al. (2012), "An assessment of the nonmarket benefits of the Water Framework Directive for households in England and Wales", *Water Resources Research 48(3)*; Haab, Timothy C. and McConnell, Kenneth E. (1997) "Referendum models and negative willingness to pay: alternative solutions", *Journal of Environmental Economics and Management 32* pp. 251-270

Table 2: Main Model WTP per Unit Change from SQ

			HH WTP (£)		NHH WTP (% of bill)	
	Attribute	**Unit**	**SST**	**CAM**	**SST**	**CAM**
A	Customer service	reduction in the percentage of costumers that wait more than 10 minutes	-0.07	0.00	N/A	N/A
B	Risk of temporary “do not drink” notice	reduction in number of properties that received "do not drink" notice	0.74	0.97	0.013	0.015
C	Installing “smart” water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.21	-0.30	-0.004	-0.008
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	0.00	0.03	-0.0002	-0.001
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-0.86	-0.13	-0.017	-0.017
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.61	1.40	0.001	0.010
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.17	0.11	-0.001	-0.014
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.16	1.03	0.002	0.005
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.27	-0.12	-0.003	-0.001
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.03	0.28	0.0002	0.003
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.19	-0.01	-0.002	-0.002
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-5.99	-0.30	-0.089	-0.024

Note: NHH customers were not asked about attribute A (customer service).
Source: NERA analysis of SSCW WTP survey

Conclusions

The results of our WTP analysis suggest that, on average, customers across both SST and CAM are willing to pay for improvement in attributes that relate to protecting the environment, reducing the risk of service failures that would have particularly unpleasant consequences (such as property flooding), and reducing leakage.

It would therefore be consistent with customers' preferences for SSCW to include in its PR24 business plan additional investments to achieve the proposed higher service levels for these attributes, provided that customer WTP is above the cost per customer of the investment.

To perform a cost-benefit analysis of proposed investments using the Copperleaf planning software, we recommend that SSCW relies in the first instance on the estimates derived from our main model for HH and NHH customers in each region, presented in Table 2 above. For the attributes where the estimated per-unit WTP is negative, we recommend using a per-unit WTP of zero in the cost-benefit analysis. We also recommend that SSCW tests the sensitivity of its cost-benefit analysis to alternative per-unit WTP estimates from other models estimated in this report (in particular the models estimated for single attributes in isolation and the models estimated looking at preferences for overall improvements and deteriorations).

We recommend that SSCW should use the results for FBP customers for insight only. The WTP results for FBP customers should not be used in the cost-benefit analysis, because we do not have a sufficiently large sample to generate estimates for SST and CAM separately or to correct for the over-representation of women in the sample.

The finding that certain sub-groups of HH customers are less willing to pay for improvements represents a challenge for SSCW in developing its business plan. SSCW provides services that are "public goods" from which all customers benefit, so it cannot provide improvements for some customers but not for others. One potential solution to this challenge would be to adjust the tariff structure so that the burden of paying for improvements does not fall on those customer groups that are less willing to pay for improvements, although developing such adjustments to the tariff structure would require further research and engagement with customers and with Ofwat.

Further targeted qualitative research may also be useful to understand exactly how customers would like SSCW to implement any additional investment supported by its cost-benefit analysis, since the descriptions of improvements in this survey were necessarily high-level.

1. Introduction

NERA Economic Consulting (NERA) and Qa Research (Qa) were commissioned by South Staffs and Cambridge Water (SSCW) to design, implement and analyse a stated preference (SP) survey to estimate customers' willingness to pay (WTP) for improvements in the service provided by SSCW. This study covered both of the regions in which SSCW operates, i.e. South Staffordshire (SST) and Cambridge (CAM). It included domestic (household, or HH) and non-domestic (non-household, or NHH) customers. It also included a sample of future bill payers (FBP), i.e. individuals aged between 18 and 29 who currently have no responsibility for paying the water bill.

This study comes at a relatively early stage in SSCW's PR24 business planning process. At this stage, SSCW has substantial flexibility in the design of its business plan. Therefore, SSCW is seeking input from customers in order to design a business plan where the attribute-by-attribute service levels, as well as the impact of the business plan on customer bills, are consistent with overall customer preferences.

Since water services are a public good and the final service levels and bill impact (in percentage terms) will be the same across all customers, it is important that SSCW consider not only the average customer preference but how that preference may differ across customer sub-groups. In this report, we test the consistency of our findings across different sub-groups.

The project consisted of four main parts:

1. Set up and design of the study, defining service attributes, testing customer comprehension of attribute descriptions and then refining them, designing and building the survey, and selecting the SP technique;
2. Survey testing through cognitive testing, pilot fieldwork, and analysis and peer review of pilot results;
3. Fieldwork, consisting of online and face-to-face surveys;
4. Quantitative analysis of the fieldwork data to derive WTP estimates and conduct sensitivity and robustness checks.

This report is set out as follows:

- Section 2 explains the set-up and design of the stated preference study. This section includes a description of adjustments we made to the main survey following cognitive testing and analysis of results from the pilot study. It also includes a discussion of how this WTP research incorporates guidance on best practice from Ofwat and CCW and how we have responded to suggestions from a peer review following the pilot stage.
- Section 0 describes the data collected as a result of our main-stage fieldwork.
- Section 4 sets out the findings of our research. The main findings are the WTP estimates, and we include here a description of the statistical approach used to derive those estimates.
- Section 5 concludes.

2. Study Design

The objective of a stated preference survey is to obtain information on customers' preferences, where these preferences cannot be observed through market transactions. This constraint applies to many of the service attributes that SSCW can influence through its business planning process, as they are inevitably public goods (i.e. the quality or reliability of service provided by a network utility) or relate to environmental or social objectives.

A stated preference study involves giving a sample of individuals the opportunity to state their preferences about a set of hypothetical economic trade-offs. It is then possible to draw conclusions about average or typical preferences based on the responses from that sample.

In the study at hand, we give a sample of the SSCW customer base an opportunity to state their preferences about trade-offs between attributes of the service provided by SSCW and the price they would pay to receive those services. While these choices are hypothetical (as explained below), they are closely related to the real choices SSCW faces, and the prices shown to customers are centred around the costs SSCW expects to incur to provide them. We use the data collected from this survey to draw conclusions about the preferences of the typical SSCW customer regarding these trade-offs, which SSCW can in turn use to plan investment in its service offerings in a way that responds to customer preferences.

We worked closely with SSCW to design the stated preference study such that we could draw conclusions from the data that would provide meaningful input to SSCW's business planning process. In this section, we set out the key design features of the study and explain how our design choices ensure that our conclusions are robust and meaningful.

- Section 2.1 lists the twelve service attributes about which we elicit customer preferences. It also explains how we ensure that the survey provides customers with appropriate information to understand each attribute and make an informed decision about the trade-offs presented to them.
- Section 2.2 explains how we used customer co-development workshops to ensure that the attributes we study are presented in a way that is understandable to customers.
- Section 2.3 sets out the structure of the questionnaire that customers received.
- Section 2.4 describes the format of the stated preference questions that we pose to customers. It explains how we ensure that the costs that customers face are credible and relevant to them. It also explains how we have responded to customer feedback on previous stated preference surveys to reduce the complexity of the questionnaire while giving customers more flexibility in expressing preferences.
- Section 2.5 provides information on additional data we collected as part of the survey, which we use to contextualise our findings and examine whether our conclusions are robust across different SSCW customer sub-groups.
- Section 2.6 explains how we used cognitive testing and a pilot study to test that the survey design was accessible to customers and elicited plausible customer preferences.
- Section 2.7 describes how we adhered to Ofwat guidance on best practice in customer engagement throughout the study and how we incorporated advice and suggestions from a post-pilot peer review in developing the approach to analysis.

2.1. Service Attributes Selected for Evaluation

We examine customer willingness to pay (WTP) for twelve different service attributes in this study. Each service attribute captures an area of South Staffs and Cambridge Water (SSCW) activity where additional investment could lead to improvement, or less investment could lead to a deterioration in service. Table 2.1 lists all twelve attributes.

Table 2.1: We Examined Customer WTP for Twelve Service Attributes

	Attribute
A	Customer service
B	Risk of temporary "do not drink" notice
C	Installing "smart" water meters
D	Hard water supply
E	Lead pipes
F	Water lost to leakage from pipes
G	Issues with tap water colour, taste, or smell
H	Chance of property flooding from a burst pipe
I	Low water pressure
J	Supporting nature and wildlife
K	Unplanned short interruptions to water supply
L	Risk of temporary use ban, including hosepipes

Source: WTP survey for SSCW

The process to select attributes for inclusion was as follows:

- SSCW provided an initial "long-list" of twenty attributes for consideration. It identified twelve attributes as high priority, four as medium priority, and four as low priority.
- Qa advised that the survey should include no more than twelve attributes, to limit the cognitive burden imposed on customers.
- NERA and Qa advised that for one of the twelve high priority attributes (carbon emissions), it may not be necessary for SSCW to use the WTP survey to derive a customer valuation since data on the social value of reducing carbon emissions is readily available from government sources. NERA and Qa also advised that another of the high priority attributes (incidence of severe drought restrictions) may not be well-suited to a stated preference study as the probability of severe drought restrictions is very low and customers may struggle to draw meaningful distinctions between low probabilities.
- SSCW went through a second round of internal prioritisation and decided to adjust three of its high priority attributes. It changed three attributes from high priority to medium priority: carbon emissions, distance of rivers with healthy flows with water quality levels able to support biodiversity, and the incidence of household properties experiencing a severe drought restriction in a given year. It changed three attributes from medium priority to high priority: area of land proactively managed to improve biodiversity outcomes, customer service, and chance of property flooding from a burst pipe. This yielded the final list of twelve high-priority attributes set out in the table above.

Having selected the twelve attributes of interest, we worked with SSCW to develop the associated material for each attribute that we shared with customers to ensure that they would make informed decisions in the stated preference study. The associated material comprised:

- **The issue:** a description of the attribute.
- **Current situation:** a description of the current service level for that attribute.
- **What could change:** a summary of how additional investment would impact the service level for that attribute.

We presented the selected attributes and associated material to household and non-household customers at a series of co-development workshops. The purpose of these workshops was to assess whether the attributes and associated material made sense to customers.

Customers typically preferred attribute descriptions that:

- Kept text to a minimum so that customers did not have too much to read – anything seen as 'too wordy' limited comprehension levels;
- Avoided using percentages to describe a very low probability of something happening;
- Used ratios to explain the chance of something happening;
- Added the whole number to support a ratio – for example the total number of properties that could be impacted.

Based on these insights as well as some attribute-specific phrasing suggestions, we further refined the material to ensure that it was understandable to customers while still providing useful material for business planning purposes. Further information is available in the Qa report on attribute development, attached here as Appendix D.1. The final material is presented in Table 2.2.

In parallel to the co-development workshops we worked with SSCW to define up to five service levels for each attribute that SSCW could achieve by varying investment in that attribute. The five possible service levels were: small and large deteriorations in service, maintaining the status quo, and small and large improvements in service.

For some attributes, we agreed with SSCW that it did not make sense to offer all five service levels. This was the case for attributes where:

- No deterioration in service is possible, either because SSCW does not currently undertake any activity in this service area (hard water), because it is not possible to reverse activity in this service area (installing "smart" water meters), or because SSCW has regulatory obligations that prevent it from offering a lower level of service (lead pipes).
- There is no scope for a large improvement due to physical constraints (risk of temporary use ban).

We worked with Copperleaf, who are providing technical support to SSCW in developing their business plan, to ensure that the units for the service levels were compatible with the valuation framework that SSCW will use to develop its business plan.

We tested the revised attributes and associated material further in cognitive interviews and made further adjustments to ensure that the material was understandable for customers. The final material for each attribute is set out in Table 2.3 and Table 2.4. For some attributes, the

service levels are different between the South Staffs (SST) and Cambridge (CAM) regions. The attributes with region-specific service levels are highlighted blue in the tables.

For NHH customers, attribute A is excluded, and the service levels for attribute L are different than for HH customers as shown in Table 2.3 and Table 2.4.

Table 2.2: We Provide Customers with a Description of Each Attribute, the Current Service Level, and the Potential Impact of Additional Investment

Attribute	Issue	Current Situation	What could change
A Customer Service	To provide excellent levels of service when customers get in touch with queries – by phone, email, online, letter, or face-to-face. In 2021/22 (TEXT SUB: South Staffs Water / Cambridge Water) customer satisfaction was rated 3rd out of all 17 water & sewerage companies in England and Wales.	Last year, 1-in-3 customers contacting (TEXT SUB: South Staffs Water / Cambridge Water) had to wait longer than 10 minutes for their call to be answered.	Greater investment would mean (TEXT SUB: South Staffs Water / Cambridge Water) can improve response times and quality of customer service, through additional staff, training and use of the latest technology.
B Risk of a temporary "do not drink" notice	Occasionally, water companies have to send customers a notice saying not to drink the tap water because of an issue with the water quality. Usually this would last about 2-3 days, and (TEXT SUB: South Staffs Water / Cambridge Water) would provide safe drinking water near your property at temporary water stations and would deliver bottled water directly to vulnerable households.	In a typical year, 2 properties are issued a 'do not drink' notice in the (TEXT SUB: South Staffs Water / Cambridge Water) area.	More investment in pipe cleaning and upgrading water treatment processes to use the latest technology would all help to reduce the chance of a 'do not drink' notice happening.
C Installing 'smart' water meters	(TEXT SUB: South Staffs Water / Cambridge Water) needs to carefully manage demand for water to ensure there is enough for the future. 'Smart' water meters automatically send regular readings. Having more information helps the water company and customers to understand where and when water is being used, or lost to leaks.	(TEXT SUB FOR SSW: 24% / (TEXT SUB FOR CAM: 66%) of properties have a meter that could operate in smart meter mode, although currently they do not operate as a smart meter as the technology to take the readings is not in place yet. (TEXT SUB FOR SSW: South Staffs Water currently takes manual readings once a year.) (TEXT SUB FOR CAM: Cambridge Water currently takes manual readings twice a year.)	Investing in installing more smart water meters and converting existing meters into smart meters. The smart meters would help flag issues to reduce water wasted from undetected leaks and would give customers regular updates on their water consumption to help them find ways to use less water.

Attribute	Issue	Current Situation	What could change
D Hard water supply	(TEXT SUB: South Staffs Water / Cambridge Water) has a hard water supply. Hard water is not harmful to human health, but it can lead to limescale damage on taps, showerheads and appliances (e.g. washing machines).	Hard water can be softened to reduce damage caused by limescale, but this can alter the taste of the water. (TEXT SUB: South Staffs Water / Cambridge Water) does not currently invest in water softening.	(TEXT SUB: South Staffs Water / Cambridge Water) could either 1) contribute to the cost of installing water softening devices in some customers' homes; or 2) soften the water supply through a large investment in building, running and maintaining a new treatment works.
E Lead pipes	Some properties in your area are served by a lead supply pipe. Most of these pipes are owned by the customer and not your water company. (TEXT SUB: South Staffs Water / Cambridge Water) treats the water supply to ensure lead levels in the water are safe, but there are some circumstances where it can become unsafe (e.g. if lead pipes are badly damaged). Over time, lead exposure can be damaging to health.	Currently, 2-in-8 properties in your area are served by a lead supply pipe. (TEXT SUB FOR SSW: South Staffs Water currently replaces 900 lead supply pipes a year, with no charge to the customer whose property it is.) (TEXT SUB FOR CAM: Cambridge Water currently replaces 100 lead supply pipes a year, with no charge to the customer whose property it is.)	(TEXT SUB: South Staffs Water / Cambridge Water) could employ additional teams to remove more lead pipes each year. This would reduce the chance of lead affecting customers' water supply and someone's health being damaged due to lead exposure.
F Water lost to leakage from pipes	Every day, treated water is lost to leakage from the (TEXT SUB: South Staffs Water / Cambridge Water) pipe network as pipes age or are damaged. The majority of the water lost to leaks is from the water company's pipes (70%) and the rest is from customer pipes. The company aims to fix the largest and most disruptive leaks first.	(TEXT SUB IF SSW: 20% of the treated water that enters the South Staffs Water network is lost to leakage every day – this is the same as the national average of 20%. That's the same as 26 Olympic sized swimming pools.) (TEXT SUB IF CAM: 15% of the treated water that enters the Cambridge Water network is lost to leakage every day – which is less than the national average of 20%. That's the same as 5 Olympic sized swimming pools.)	Increased investment would mean a larger team fixing pipes, using innovative technologies that detect leaks before they happen, for example by fitting sensors throughout the pipe network, and using pipe materials that are less prone to leaking. This would mean less water would be lost to leakage.

Attribute	Issue	Current Situation	What could change
G Issues with tap water colour, taste, or smell	Every year, some (TEXT SUB: South Staffs Water / Cambridge Water) customers suddenly experience a temporary issue with the look, taste or smell of their tap water. The water is still safe to drink. The most common issues are the water turning a light brown colour or a chlorine smell, typically lasting up to 24 hours.	(TEXT SUB IF SSW: Around 23,000 properties report issues with drinking water per year in the South Staffs Water area, that's 1-in-26 properties.) (TEXT SUB IF CAM: Around 3,000 properties report issues with drinking water per year in the Cambridge Water area, that's 1-in-47 properties.)	More investment in modernising water treatment processes, expanding the pipe renewal and cleaning programme and installing modern technology would help reduce the number of properties that experience these issues.
H Chance of property flooding from a burst pipe	Sometimes the main water supply pipe owned by the water company can burst and flood the ground floor of a customer's home or business. When this happens, (TEXT SUB: South Staffs Water / Cambridge Water) covers the cost of the repair through its insurance to get the property put back as it was.	(TEXT SUB IF SSW: Currently, 51 properties per year in the South Staffs Water) (TEXT SUB IF CAM: Currently, 12 properties per year in the Cambridge Water) area experience flooding due to a burst pipe.	More investment would enable (TEXT SUB: South Staffs Water / Cambridge Water) to employ more teams to replace pipes quicker and invest in new technology (e.g. sensors) to identify pipes that should be replaced before they burst. This would reduce the number of properties that experience flooding.
I Low water pressure	Every year some properties experience temporary periods of low water pressure, normally lasting less than 6 hours. These periods of low pressure are usually caused by problems with the pipe network.	2-in-26 properties served by (TEXT SUB: South Staffs Water / Cambridge Water) experience a short period of low water pressure every year.	Increased investment by (TEXT SUB: South Staffs Water / Cambridge Water) to replace and lay new pipes and update other equipment in the network quicker would reduce the risk of problems that cause short periods of low water pressure.

Attribute	Issue	Current Situation	What could change
J Supporting nature and wildlife	(TEXT SUB: South Staffs Water / Cambridge Water) has a legal duty to protect and enhance nature and wildlife and ensure there is no permanent damage to the areas where it operates. The company aims to ensure rivers, (TEXT SUB IF CAM: chalk) streams, reservoirs and underground water stores are healthy.	(TEXT SUB IF SSW: South Staffs Water currently protects and enhances 1,280 acres of land in its supply area. This is equivalent to approximately 720 football pitches.) (TEXT SUB IF CAM: South Staffs Water currently protects and enhances 60 acres of land in its supply area. This is equivalent to approximately 40 football pitches.)	(TEXT SUB: South Staffs Water / Cambridge Water) would increase investment in programmes focused on nature and wildlife. This includes partnering with more landowners and farmers to reduce pollution and protect and enhance more areas of land and water. For example, by creating wetlands or meadows for native wildlife.
K Unplanned short interruptions to water supply	Every year some customers will experience a short interruption to their property's water supply, where it suddenly stops working without warning for 3-6 hours. During this type of interruption, (TEXT SUB: South Staffs Water / Cambridge Water) would deliver bottled water directly to the homes of vulnerable people.	Last year, 1-in-130 properties in the (TEXT SUB: South Staffs Water / Cambridge Water) area experienced a short interruption to their water supply.	More investment would enable (TEXT SUB: South Staffs Water / Cambridge Water) to employ more teams to replace older and damaged pipes quicker and increase the pump and water treatment works maintenance programme.
L Risk of temporary (NHH: non-essential) use ban, including hosepipes	To protect essential water supplies during extended periods of dry weather, (TEXT SUB: South Staffs Water / Cambridge Water) may send you a notice saying you must not use a hosepipe or sprinkler, or use water for other non-essential uses. The length of temporary (NHH: non-essential) use bans can vary, but are usually issued for five months, between May and September.	(TEXT SUB IF SSW HH: South Staffs Water currently plans for the potential need to bring in a temporary use ban once every 40 years. The last temporary use ban in this region was in 1976.) (TEXT SUB IF SSW NHH: South Staffs Water currently plans for the potential need to bring in a non-essential use ban once every 80 years.) (TEXT SUB IF CAM HH: Cambridge Water currently plans for the potential need to bring in a temporary use ban once every 20 years. The last temporary use ban in this region was in 1991-92.) (TEXT SUB IF CAM NHH: Cambridge Water currently plans for the potential need to bring in a non-essential use ban once every 50 years.)	(TEXT SUB: South Staffs Water / Cambridge Water) could invest more to make the water supply more resilient to a changing climate and population growth. For example, by further reducing leakage, extending an existing reservoir, (TEXT SUB IF CAM: investing in a new reservoir) or installing more underground pipes that better transfer water around the region to where demand is highest.

Source: WTP survey

Table 2.3: Service Levels for Each Attribute in SST

Attribute		Larger Reduction (-2)	Small Reduction (-1)	Current Level (0)	Small Improvement (+1)	Larger Improvement (+2)
A	Customer Service	2 in 3 customers (60%) wait more than 10 minutes	1 in 2 customers (50%) waits more than 10 minutes	1 in 3 customers (30%) waits more than 10 minutes	1 in 6 customers (20%) waits more than 10 minutes	1 in 20 customers (5%) waits more than 10 minutes
B	Risk of a temporary "do not drink" notice	8 properties per year receive "do not drink" notice	4 properties per year receive "do not drink" notice	2 properties per year receive "do not drink" notice	1 property per year receives "do not drink" notice	N/A
C	Installing 'smart' water meters	N/A	N/A	24% of properties have an operational 'smart' meter by 2030	38% of properties have an operational 'smart' meter by 2030	50% of properties have an operational 'smart' meter by 2030
D	Hard water supply	N/A	N/A	South Staffs Water does not invest in water softening	South Staffs Water contributes to the cost of installing water softening devices in 5,000 properties	South Staffs Water softens the water supply for 171,200 properties through a large investment in a new treatment works
E	Lead pipes	N/A	N/A	2 in 8 properties will still have a lead supply pipe by 2030	2 in 9 properties will still have a lead supply pipe by 2030	2 in 10 properties will still have a lead supply pipe by 2030
F	Water lost to leakage from pipes	24% of treated water lost to leakage	22% of treated water lost to leakage	20% of treated water lost to leakage	18% of treated water lost to leakage	16% of treated water lost to leakage
G	Issues with tap water colour, taste, or smell	1-in-23 properties per year experience issues with tap water	1-in-25 properties per year experience issues with tap water	1-in-26 properties per year experience issues with tap water	1-in-29 properties per year experience issues with tap water	1-in-32 properties per year experience issues with tap water

Attribute		Larger Reduction (-2)	Small Reduction (-1)	Current Level (0)	Small Improvement (+1)	Larger Improvement (+2)
H	Chance of property flooding from a burst pipe	55 flooding incidents per year	53 flooding incidents per year	51 flooding incidents per year	46 flooding incidents per year	40 flooding incidents per year
I	Low water pressure	2-in-24 properties experiences low pressure per year	2-in-25 properties experiences low pressure per year	2-in-26 properties experiences low pressure per year	2-in-29 properties experiences low pressure per year	2-in-33 properties experiences low pressure per year
J	Supporting nature and wildlife	740 acres (420 football pitches) protected and enhanced	980 acres (550 football pitches) protected and enhanced	1280 acres (720 football pitches) protected and enhanced	2030 acres (1150 football pitches) protected and enhanced	2450 acres (1390 football pitches) protected and enhanced
K	Unplanned short interruptions to water supply	1 in 115 properties experience a short interruption per year	1 in 120 properties experience a short interruption per year	1 in 130 properties experience a short interruption per year	1 in 140 properties experience a short interruption per year	1 in 160 properties experience a short interruption per year
L	Risk of temporary (NHH: non-essential) use ban, including hosepipes	Temporary use ban occurs once in 30 years (NHH: Non-essential use ban occurs once in 60 years)	Temporary use ban occurs once in 35 years (NHH: Non-essential use ban occurs once in 70 years)	Temporary use ban occurs once in 40 years (NHH: Non-essential use ban occurs once in 80 years)	Temporary use ban occurs once in 45 years (NHH: Non-essential use ban occurs once in 90 years)	N/A

Source: WTP survey

Table 2.4: Service Levels for Each Attribute in CAM

Attribute		Larger Reduction (-2)	Small Reduction (-1)	Current Level (0)	Small Improvement (+1)	Larger Improvement (+2)
A	Customer Service	2 in 3 customers (60%) wait more than 10 minutes	1 in 2 customers (50%) waits more than 10 minutes	1 in 3 customers (30%) waits more than 10 minutes	1 in 6 customers (20%) waits more than 10 minutes	1 in 20 customers (5%) waits more than 10 minutes
B	Risk of a temporary "do not drink" notice	8 properties per year receive "do not drink" notice	4 properties per year receive "do not drink" notice	2 properties per year receive "do not drink" notice	1 property per year receives "do not drink" notice	N/A
C	Installing ‘smart’ water meters	N/A	N/A	66% of properties have an operational 'smart' meter by 2030	68% of properties have an operational 'smart' meter by 2030	70% of properties have an operational 'smart' meter by 2030
D	Hard water supply	N/A	N/A	Cambridge Water does not invest in water softening	Cambridge Water contributes to the cost of installing water softening devices in 2,600 properties	Cambridge Water softens the water supply for 51,000 properties through a large investment in a new treatment works
E	Lead pipes	N/A	N/A	2 in 8 properties will still have a lead supply pipe by 2030	2 in 9 properties will still have a lead supply pipe by 2030	2 in 10 properties will still have a lead supply pipe by 2030
F	Water lost to leakage from pipes	19% of treated water lost to leakage	17% of treated water lost to leakage	15% of treated water lost to leakage	13% of treated water lost to leakage	11% of treated water lost to leakage
G	Issues with tap water colour, taste, or smell	1-in-42 properties per year experience issues with tap water	1-in-44 properties per year experience issues with tap water	1-in-47 properties per year experience issues with tap water	1-in-52 properties per year experience issues with tap water	1-in-58 properties per year experience issues with tap water

Attribute		Larger Reduction (-2)	Small Reduction (-1)	Current Level (0)	Small Improvement (+1)	Larger Improvement (+2)
H	Chance of property flooding from a burst pipe	14 flooding incidents per year	13 flooding incidents per year	12 flooding incidents per year	11 flooding incidents per year	10 flooding incidents per year
I	Low water pressure	2-in-24 properties experiences low pressure per year	2-in-25 properties experiences low pressure per year	2-in-26 properties experiences low pressure per year	2-in-29 properties experiences low pressure per year	2-in-33 properties experiences low pressure per year
J	Supporting nature and wildlife	0 acres (0 football pitches) protected and enhanced	10 acres (10 football pitches) protected and enhanced	60 acres (40 football pitches) protected and enhanced	200 acres (110 football pitches) protected and enhanced	270 acres (150 football pitches) protected and enhanced
K	Unplanned short interruptions to water supply	1 in 115 properties experience a short interruption per year	1 in 120 properties experience a short interruption per year	1 in 130 properties experience a short interruption per year	1 in 140 properties experience a short interruption per year	1 in 160 properties experience a short interruption per year
L	Risk of temporary (NHH: non-essential) use ban, including hosepipes	Temporary use ban occurs once in 10 years (NHH: Non-essential use ban occurs once in 30 years)	Temporary use ban occurs once in 15 years (NHH: Non-essential use ban occurs once in 40 years)	Temporary use ban occurs once in 20 years (NHH: Non-essential use ban occurs once in 50 years)	Temporary use ban occurs once in 25 years (NHH: Non-essential use ban occurs once in 60 years)	N/A

Source: WTP survey

2.2. Initial Research to Identify Customer Views on Selected Attributes

We conducted qualitative research on the initial set of attributes and associated information with SSCW customers. This research had two objectives:

1. To test customer comprehension of the attribute descriptions and associated service levels and to recommend refinements that would improve customer understanding. We examined both the wording of the descriptions and the framing of any numerical information (for example, whether customers found it easier to understand percentages or ratios); and
2. To understand whether customers had stronger opinions with regard to some attributes than others and if so to understand the factors determining the strength of customer opinion.

To achieve these objectives, Qa adopted an approach involving co-development workshops (CDWs) and depth interviews.

2.2.1. Co-development workshop sample structure and methodology

Co-development in the context of this study means to work in tandem with customers to improve the language of the attributes so that as many customers as possible could read and understand them easily when taking part in the survey.

Qa conducted five CDWs. Three of the workshops were with household customers and two were with non-household customers covering both the SST and CAM regions. All CDWs were conducted on Zoom.

- The three HH CDWs included a broad range of customer profiles. Each session focused on customers at a different lifestage, i.e. pre-family, family, and post-family. A mix of socio-economic groups were covered across all three workshops.
- The two NHH CDWs included a mix of business size, sector, and whether they were water dependent or not. One CDW was conducted with NHH customers in the SST region and the other was conducted with customers in the CAM region.

Qa also conducted 12 in-depth interviews with HH customers in vulnerable circumstances. This included customers who had physical or mental health issues, who were on very low incomes, who were elderly (age 75+), and/or who were digitally excluded. Four interviews were conducted on Zoom and eight via the phone (if digitally excluded).

A full breakdown of the sample split and approach are detailed in Qa's separate qualitative report, which is attached as Appendix D.1.

2.2.2. Approach to the qualitative workshops and depth interviews

Qa presented customers with two different versions of each attribute: a version '1' provided by SSCW and NERA and an alternative version '2' created by Qa for use in the co-development workshop. For each attribute, versions 1 and 2 were designed to communicate the same information but using different words and numeric examples.

Participants were asked to review each version to explore whether the words made sense and whether the material was effective at explaining the attribute. After exploring reactions to and comprehension of both versions, Qa showed customers both versions side by side. Customers then co-developed a revised version which either took the best bits from version 1 or 2 or developed these into something new.

Qa analysed the customer feedback, both verbal and non-verbal, and prepared a qualitative report which highlighted those words, phrases, and numeric expressions which participants struggled to comprehend, caused confusion, or participants deemed useful in helping them understand the descriptions. The qualitative report included a revised suggested version of each attribute to use in the quantitative survey, based on the versions co-developed by customers. This report is attached as Appendix D.1.

The ultimate goal of this co-development process was to make each of the final attribute descriptions as customer friendly and clearly understandable as possible.

Following discussion between Qa, NERA, and SSCW, we made a number of alterations to the revised set of descriptions to ensure that the survey results would still provide sufficient information to guide SSCW planning decisions. These descriptions were then taken forward for use in the first iteration of the survey. We describe the format of the survey in Sections 2.3 to 2.5, and then describe our iterative testing of the survey in Section 2.6.

2.3. Structure of Survey Questionnaire

The questionnaire includes three parts: an initial screening section, the stated preference exercise, and a set of closing questions on the customer's experience of the stated preference exercise and demographic characteristics.

The initial screening section ensures that we only record responses from billpayers within the SSCW area and that we do not record responses from certain categories of respondent (e.g. SSCW employees). It also provides us with contextual information to tailor the stated preference exercise, including current bill levels.

- The stated preference exercise is the core of the survey. It collects data on customers' choices for each of the twelve attributes introduced in Section 2.1.
- The closing questions allow us to collect information, such as demographic characteristics, that we use to assess whether our sample is representative of the SSCW customer base and whether the results of the stated preference exercise differ across customer sub-groups.
- Most customers completed the survey online. We interviewed a small sample of digitally disengaged or vulnerable HH customers face-to-face using an interviewer administered Computer Assisted Personal Interview (CAPI) survey. This is the Vulnerable Customer Survey (VCS), which we describe further in Section 3.1.1.1.

2.4. Format of Stated Preference Exercise

2.4.1. Overview of the stated preference exercise

In the stated preference exercise, we ask respondents to choose between different service levels for each of the twelve attributes over the period 2025-2030, where the choice of service level affects the customer's water bill.

To obtain reliable valuations, it is important that customers believe that they may actually have to make payments in line with their stated preferences. Otherwise, respondents may not reveal their true valuations (known as "hypothetical bias"). Therefore, we present the costs (savings) associated with an improvement (deterioration) in service as a change to the respondent's own water bill and inform customers that SSCW expects to make decisions based on the results of this survey that may affect their bills.[6]

In order to collect the information needed to present costs as a change to the respondent's own water bill, we ask customers to state what their current total water bill is. If they do not know their bill, we ask them to select from one of a number of bands. Since SSCW only provides clean water services and not wastewater services, we provide customers with an estimate of their current bill for clean water services by multiplying their reported bill by a pre-set percentage (37 per cent for CAM and 46 per cent for SST).

For economic valuation of service changes, we require that respondents state values that they would actually be willing to pay, taking into account their income and other costs. Therefore, we also remind customers that their bills may go up due to inflation, and that other household bills may go up or down, affecting the total amount of money they have to spend.

The survey then moves onto the choice exercises.

First, we ask respondents to consider each attribute in isolation. In the surveys conducted online, respondents see a single attribute per screen as shown as in Figure 2.1.

For each attribute, we show respondents the name of the attribute alongside the associated material for the attribute as described in Section 2.1. We then present respondents with the different service levels for the attribute. Option 1 shows a large deterioration in service, Option 2 shows a small deterioration in service, Option 3 is to maintain the current service level (status quo), Option 4 shows a small improvement in service, and Option 5 shows a large improvement in service. For each option, the customer sees a customer-specific bill impact; we explain the calculation of these bill impacts in Section 2.4.3.

We ask customers to select one of the available options for each attribute. Once they make their selection for that attribute, they progress to the next attribute. We randomise the order

[6] As with any stated preference study, there remains some risk of hypothetical bias, i.e. that customers' preferences over options within the choice exercise may not perfectly reflect their preferences in reality because they are based on hypothetical choices (even though customers are informed that their choices may influence their bills).

in which attributes were displayed to different respondents, to ensure that our results are not biased by order effects.[7]

Figure 2.1: Example Screen for a Single Attribute

Customer Service

The issue: To provide excellent levels of service when customers get in touch with queries - by phone, email, online, letter, or face-to-face. Cambridge Water customer satisfaction is rated 3rd out of all 17 water & sewerage companies in England and Wales.

Current situation: Last year, 1-in-3 customers contacting Cambridge Water had to wait longer than 10 minutes for their call to be answered.

What could change in 2025-2030: Greater investment would mean Cambridge Water can improve response times and quality of customer service, through additional staff, training and use of the latest technology.

	Option 1	Option 2	Option 3	Option 4	Option 5
Proportion of customers who have to wait more than 10 minutes for their call to be answered	**2 in 3 customers (60%) wait more than 10 minutes**	**1 in 2 customers (50%) waits more than 10 minutes**	**1 in 3 customers (30%) waits more than 10 minutes**	**1 in 6 customers (17%) waits more than 10 minutes**	**1 in 20 customers (5%) waits more than 10 minutes**
Impact on Water Bill Per Year	Reduce by £2.70	Reduce by £1.30	Reduce by £0.60	Increase by £0.10	Increase by £2.80
Your Choice TICK ONE ONLY	◯ Option 1	◯ Option 2	◯ Option 3	◯ Option 4	◯ Option 5

Source: WTP survey

Once customers have made their selection for each attribute, they see a screen summarising their choices for all twelve attributes and the total impact of their choices on their bill for 2025-2030.

Customers are informed that they can revise their choices for any of the attributes by clicking on the attribute in question. This takes them back to the attribute screen as shown in Figure 2.1. After they select an option at that screen, they are returned to the summary screen and see an updated summary of their choices and the total bill impact.

Customers can revise their choices an unlimited number of times, giving them the flexibility to construct the package of service levels that best reflects their preference, given the costs of each service level. Once customers are happy with the package they have constructed, they proceed to the closing questions of the survey.

This final step of allowing customers to alter the attribute-by-attribute choices they made is important; customers' initial choices may result in them breaching budget constraints, so this step allows them to reduce the improvements they selected in any attribute, to reduce the overall costs. Conversely, if customers reach the end of the attribute-specific choices and decide they want to select more or different improvements, they can do so. Customers may also adjust their priorities as they see the full range of service changes on offer in the survey instrument.

[7] There may still be order effects within-attribute because the options are presented in order, with the large deterioration to the left and the large improvement to the right. There is a trade-off here between eliminating order effects and ensuring customers can easily understand the task, and we prioritise customer understanding in this case.

Figure 2.2: Respondents See a Summary of their Choices and Have the Option to Revise their Choices

Here's a summary of your choices.

Your choices mean that your annual clean water bill would **increase** from **£126.50** per year to **£132.60**

If you'd like to change anything, just select it on the right-hand side and you can do that on the next screen.

If it all looks good, press 'I'm happy with my choices' at the bottom.

Aspect of service	Your choice		Impact on bill per year	Tick to change
Supporting nature and wildlife	Amount of land protected and enhanced to support nature and wildlife	2030 acres (equivalent to 1150 football pitches) protected and enhanced	**Increase by £1.60 per year**	☐
Risk of temporary use ban, including hosepipes	Frequency of temporary water use bans	Temporary use ban occurs once every 45 years	**Increase by £0.40 per year**	☐
Unplanned short interruptions to water supply	Proportion of properties experiencing a short supply interruption (3-6 hours) per year	1 in 140 properties experience a short interruption per year	**Decrease by £0.50 per year**	☐
Risk of a temporary 'do not drink' notice	Number of properties per year that receive a 'do not drink' notice	2 properties per year receive 'do not drink' notice	**Increase by £0.40 per year**	☐
Installing 'smart' water meters	Number of properties with a 'smart' meter	24% of properties have an operational 'smart' meter by 2030	**Decrease by £0.60 per year**	☐
Hard water supply	Investment undertaken to soften the water supply	South Staffs Water softens the water supply for 171,200 properties through a large investment in a new treatment works	**Increase by £2.00 per year**	☐
Customer Service	Proportion of customers who have to wait more than 10 minutes for their call to be answered	1 in 2 customers (50%) waits more than 10 minutes	**Decrease by £0.20 per year**	☐
Issues with tap water colour, taste, or smell	Proportion of properties per year experiencing issues with tap water colour, taste, or smell	1-in-29 properties per year experience issues with tap water	**Decrease by £0.60 per year**	☐
Chance of property flooding from a burst pipe	Number of properties affected by flooding from a burst pipe per year	40 properties per year flooded due to a burst pipe	**Increase by £1.10 per year**	☐
Lead pipes	Proportion of properties with a lead supply pipe by 2030	2 in 9 properties will still have a lead supply pipe by 2030	**Increase by £2.00 per year**	☐
Low water pressure	Proportion of properties that experience temporary low pressure per year	2-in-24 properties experiences low pressure per year	**Decrease by £0.50 per year**	☐
Water lost to leakage from pipes	Proportion of treated water lost to leakage	18% of treated water lost to leakage	**Increase by £1.00 per year**	☐

☐ I am happy with my choices

Next

Source: WTP survey

2.4.2. Innovation relative to previous stated preference survey formats

The stated preference question format described above is a new format, developed by NERA in response to customer feedback on previous water industry stated preference surveys and CCW/Ofwat commentary on the stated preference surveys used at PR19. The new format

reduces the complexity of the questionnaire by only showing one attribute per screen, while giving customers more flexibility by allowing them to construct their preferred package of service levels across attributes.

In previous stated preference studies, customers were presented with detailed information about all attributes at the beginning of the survey. Then, each question presented customers with pre-defined packages of service levels for multiple attributes and asked them to choose which package they preferred. This exercise was repeated multiple times, with each customer seeing several different pairs of packages.

Sometimes, these package exercises were combined with "max diff" choices, which ask customers to select their favoured and least-favoured service improvement (or the service failures that would have the most/least effect on them). These max-diff questions were used to value individual attributes within the package.

These package exercises were commonly used at PR19 and previous price reviews. They have been used to estimate customer WTP for service levels in a range of sectors. However, customer feedback highlighted a number of limitations of these exercises:

- Some customers found it difficult to retain all of the information about the different attributes that was presented at the beginning of the survey, and therefore struggled to fully understand the trade-offs in the package exercises.
- Some customers disliked being forced to choose between two pre-defined packages and would have preferred to be able to combine features from both packages.

Our approach in this study addresses both limitations of the package exercises:

- Customers see all of the associated information about the attribute at the same time as they make choices about the attribute, so that they can make an informed decision and are not required to remember large quantities of material.
- Customers have the flexibility to build their own preferred package, given the costs of different service levels.

The stated preference question format that we adopt materially increases the total number of package options available to customers, which creates additional challenges for data management and WTP analysis. We address these challenges by adopting an analytical approach that combines modern data management tools with classic econometric techniques. We describe this analytical approach in Section 4.1.4.

2.4.3. Calculation of customer-specific bill impacts

In this section, we explain how we use information provided by customers in the screening section of the questionnaire to set the costs that the customer sees for different service levels in the choice exercise. By using information from the screening section to tailor these values to the customer, we ensure that the stated preference exercise is realistic and meaningful for the customer, so that they are more likely to report their true preferences.

In the screening portion of the questionnaire, we ask customers to state the level of their current water bill. We allow respondents to report their bill in a number of different formats based on different billing options (i.e. per week, per month, biannually, and per year), which the survey software then converts into an annual bill. For customers that do not know the

level of their current water bill, we ask customers to select which of a number of bands most accurately reflects their total monthly or annual water bill. The bands we showed to HH customers are presented in Table 2.5 while the bands we showed to NHH customers are presented in Table 2.6.

Table 2.5: We Ask HH Customers Who Do Not Know Their Bill to Select from a Range

Monthly	Annual	Midpoint for bill calc
Less than £13 per month	Less than £150 per year	£100
£13 - £16 per month	£151 - £200 per year	£175
£17 - £20 per month	£201 - £250 per year	£225
£21 - £24 per month	£251 - £300 per year	£275
£25 - £28 per month	£301 - £350 per year	£325
£29 - £32 per month	£351 - £400 per year	£375
£33 - £37 per month	£401 - £450 per year	£425
£38 - £41 per month	£451 - £500 per year	£475
£42 - £45 per month	£501 - £550 per year	£525
£46 - £50 per month	£551 - £600 per year	£575
£50 - £54 per month	£601 - £650 per year	£625
£55 - £59 per month	£651 - £700 per year	£675
£60 - £64 per month	£701 - £750 per year	£725
£65 - £69 per month	£751 - £800 per year	£775
£70 - £75 per month	£801 - £900 per year	£850
£76 - £83 per month	£901 - £1,000 per year	£950
£84+ per month	£1,001+ per year	£1,050
Don't know		Unmetered: £164 (SS) / £170 (CW) Metered: £155 (SS) / £141 (CW)
Prefer not to say		Unmetered: £164 (SS) / £170 (CW) Metered: £155 (SS) / £141 (CW)

Source: SSCW

Table 2.6: We Ask NHH Customers Who Do Not Know Their Bill to Select from a Range

Monthly	Annual	Midpoint for bill calc
Less than £13 per month	Less than £150 per year	£100
£13 - £16 per month	£151 - £200 per year	£175
£17 - £23 per month	£201 - £300 per year	£250
£24 - £40 per month	£301 - £500 per year	£400
£41 - £64 per month	£501 - £750 per year	£625
£65 - £83 per month	£751 - £1,000 per year	£875
£84 - £166 per month	£1,001 - £2,000 per year	£1,500
£167 - £333 per month	£2,001 - £4,000 per year	£3,000
£334 - £500 per month	£4,001 - £6,000 per year	£5,000
£501 - £833 per month	£6,001 - £10,000 per year	£8,000
£834 - £1,666 per month	£10,001 - £20,000 per year	£15,000
£1,667 - £4,166 per month	£20,001 - £50,000 per year	£35,000
£4,167 - £8,333 per month	£50,001 - £100,000 per year	£75,000
£8,334 - £20,833 per month	£100,001 - £250,000 per year	£175,000
£20,834 - £41,666 per month	£250,001 - £500,000 per year	£375,000
£41,667 - £83,333	£500,001 - £1m per year	£750,000
£83,334 or more per month	more than £1m per year	£1,500,000
Don't know	*	*

*Note: * if NHH customers answer "don't know" at this stage, we ask them to estimate their typical annual clean water usage in m^3 or in household consumption equivalent and provide a bill estimate based on this.*
Source: SSCW

We use the estimate of the customer's water bill for 2025-2030 to calculate the customer-specific bill impacts of changes in service levels for each attribute as follows.

1. First, we collect data from SSCW on the estimated impact of each of the service level change on the average annual customer bill. These values are shown in Table 2.7. We also collect the average annual customer bill in each region; these values are £161 and £148 per year for SST and CAM respectively.

Table 2.7: Impact of Service Level Changes on the Average Customer's Bill

Attribute		£ Impact (-2)	£ Impact (-1)	£ Impact (0)	£ Impact (+1)	£ Impact (+2)
A	Customer Service	-0.35	-0.10	0.00	0.60	1.25
B	Risk of a temporary "do not drink" notice	-2.66	-1.33	0.00	0.33	N/A
C	Installing 'smart' water meters	N/A	N/A	0.00	2.50	5.00
D	Hard water supply	N/A	N/A	0.00	0.40	1.81
E	Lead pipes	N/A	N/A	0.00	0.60	1.20
F	Water lost to leakage from pipes	-0.50	-0.25	0.00	0.50	1.00
G	Issues with tap water colour, taste, or smell	-1.00	-0.05	0.00	0.10	2.00
H	Chance of property flooding from a burst pipe	-0.40	-0.20	0.00	0.40	0.80
I	Low water pressure	-0.40	-0.20	0.00	0.40	0.80
J	Supporting nature and wildlife	-0.20	-0.10	0.00	0.50	1.00
K	Unplanned short interruptions to water supply	-0.40	-0.20	0.00	0.40	0.80
L	Risk of temporary (NHH: non-essential) use ban, including hosepipes	-1.66 (NHH: -3.31)	-0.83 (NHH: -1.66)	0.00 (NHH: 0.00)	0.83 (NHH: 1.66)	N/A (NHH: N/A)

Source: SSCW

2. Second, for each customer we draw a random integer value for each attribute between *minus* £1 and £2. We "shift" the bill impacts in Table 2.7 by that amount. We do this for two reasons:

   A. It allows us to ensure that our results are robust to the concern that customers' preferences may be sensitive to budget constraints. The customer's bill may go up or down due to other factors not covered in this survey (e.g. labour costs). We need to be confident our analysis reflects what customers' preferences would be even if other parts of the bill were to increase (or decrease). To do this, we need to introduce a random total bill increase/decrease. The specific range for the random bill increase of *minus* £1 to £2 generates a total change to the bill that is typically between a 5 per cent reduction and a 7 per cent increase, which reflects our understanding of the likely range of exogenously-driven variation based on previous work with utility companies.

   B. It reduces the risk of customers defaulting to the status quo by making the status quo less obvious (i.e. it does not have a £0 bill impact) and therefore requiring customers to engage with the survey more thoughtfully.

3. Based on the bill impact *levels* for the average customer calculated by combining the data from step 1 with the bill shift from step 2, we calculate the average *percentage change* to the current bill associated with the change in service level.

4. For each customer, for each attribute and each of the service levels we generate a random draw from the uniform distribution on the range (0, 1). This randomisation will be used to ensure that different customers see different prices associated with changes in service,

which is important for enabling us to apply the statistical methods used to estimate customers' WTP for changes in service.

5. We combine the percentage bill increases from step 3 with the random numbers from step 4 to get customer-specific bill impacts for each service level and attribute as follows:
   A. We set the "status quo" bill impact to the percentage bill impact for the status quo from step 3 × the random draw from step 4 × the customer's existing bill.
   B. We set the "small improvement" ("small deterioration") to be a random increase (decrease), distributed around the expected proportional increase (decrease) from step 3, but "stretched" such that increases (decreases) of greater magnitude are possible. We achieve this by scaling the random draw by 2.5 × the customer's existing bill × the relevant percentage change from step 3 and adding it to the bill impact for the status quo from step 5A.
   C. We set the "large improvement" ("large deterioration") to be a random increase (decrease), distributed around the likely proportional increase (decrease) provided by SSCW in step 3 but stretched such that increases (decreases) of greater magnitude were possible. We achieve this by scaling the random draw by 2.5 × the customer's existing bill × the relevant percentage change from step 3 and adding it to the bill impact for the small improvement calculated in step 5B.

The scaling factor 2.5 is judgement based. Since we are multiplying by a random draw between 0 and 1 to get a distribution of possible cost values and this reduces the values by half (0.5) in expectation, we need to scale up again by at least a factor of 2. Scaling by a factor of 2 would give us a distribution centred on the original cost value.

Scaling by 2.5, rather than 2, ensures that we examine WTP at values for the cost (saving) of a change to the service level beyond the estimate provided by SSCW. This is useful in the event that the true cost (saving) of a change to the service level exceeds the estimate provided by SSC. It also allows us to capture information on individual customers' having relatively high willingness to pay for improvement in particular attributes.

2.5. Survey Closing Questions

In the final section of the survey, we ask a number of closing questions on demographics and the customer's experience of the stated preference exercise. The answers to these questions allow us to contextualise our findings and examine whether our conclusions are consistent across different sub-groups of the SSCW customer base.

We include a set of questions to assess whether respondents found the survey easy or difficult to complete. This is useful to assess the reliability of our conclusions; if most customers found the survey easy to complete, we can have more confidence in our conclusions than we might otherwise do.

In order to assess customers' motivations for their choices in the stated preference exercise, we include questions on the factors that the respondent considered when making their choices.

We also include additional questions to elicit customers' attitudes towards SSCW and towards paying for water services in general. In particular, we are interested in understanding whether customers hold "protest attitudes". Protest attitudes include objection to being asked to pay for certain attributes, objection to the idea that attributes can be valued in monetary

terms, and mistrust of the company. There is evidence from the literature on stated preference studies that protest attitudes may affect estimates of WTP.[8] Therefore, it is useful to be able to assess whether our WTP estimates vary depending on whether or not customers exhibit protest attitudes.

2.6. Testing of Survey Instrument

2.6.1. Cognitive interviews

We conducted a series of cognitive interviews with both general and vulnerable household customers as well as non-household customers, to further test the quantitative surveys. This stage aimed to:

1. Determine if customers struggled to comprehend any questions or instructions;
2. Investigate improvements to overcome these difficulties, making the survey easier to understand and complete;
3. Revisit comprehension of final attribute descriptions and associated service levels and to recommend refinements that would improve customer understanding; and
4. Highlight areas where the existing survey worked successfully.

To achieve these objectives, Qa adopted the methodology described in the following sections.

2.6.1.1. Cognitive interview sample structure and methodology

Qa conducted five interviews with general household customers on Zoom. Two of the interviewees lived in the SST region and three in the CAM region. Those recruited for interview also reflected a range of customer profiles including a mix of metered vs. unmetered, gender, ethnicity, social grade, and life stage.

Three further cognitive interviews were conducted with household customers in vulnerable circumstances. This included customers who had physical or mental health issues, who were on very low incomes, who were elderly (age 75+), and/or who were digitally excluded. These interviews were all completed face-to-face at the South Staffs Community Hub in Wednesbury.

The five non-household interviews were undertaken on Zoom with senior decision makers from businesses in the SSCW operating area. Three of the interviewees were based in the SST region and two in the CAM region. These included a mix of businesses in terms of size, sector and whether they were water dependent or not.

The general household and non-household interviews were conducted via Zoom. Respondents were given the online survey link at the start of the interview and asked to complete the survey whilst being observed by a moderator from Qa Research. Participants were asked to point out any words or phrases which didn't make sense or were confusing, along with anything else they felt needed to be changed or improved. The moderators also

[8] See for example Meyerhoff and Liebe (2009), *Status quo effect in choice experiments: empirical evidence on attitudes and choice task complexity, Land Economics 85*, pp. 515-528

prompted discussion if verbal or non-verbal cues suggested that the interviewee was having difficulties.

The interviews with vulnerable customers were conducted face to face at the South Staffs Hub. A Qa moderator instructed interviewees to point out any problems when answering the questions, whilst also looking out for cues that they were experiencing difficulties.

A full breakdown of the sample structure and approach is provided in a separate cognitive interview report, included here as Appendix D.2.

2.6.1.2. Outcomes of the cognitive interviews

As a result of the 13 cognitive interviews, Qa recommended a number of amendments to the questionnaires. Key recommendations included:

- Reducing the length of the survey to aid readability and reduce the burden on customers;
- Delaying introduction of the fact that the water bill is split between clean water and wastewater until after customers had entered a total water bill amount, as introducing the split earlier was causing confusion, particularly among vulnerable HH customers;
- Showing key information in bold, on a new screen, or in on-screen showcards to avoid important information being missed;
- Amending the wording for attributes D (hard water supply) and E (lead pipes) to further aid understanding; and
- Revising the wording for a question aiming to gain insight into the reasons for customers' choices.

All recommended changes, along with actual amendments made following discussion between Qa, NERA, and SSCW, are detailed in the cognitive interview report, included here as Appendix D.2.

2.6.2. Survey pilot

We conducted a pilot to determine how the survey would work in practice when accessed by customers. This provided an opportunity to test the survey among HH customers under 'real world' conditions.

SSCW drew a random sample from its database of HH customers for whom an email address was available and issued email invitations to those customers. The email invitation contained an explanation of the purpose of the survey and details of data protection and adherence to the MRS Code of Conduct. In total, SSCW issued 13,937 invitations to participate in the pilot survey (7,963 in South Staffs and 5,974 in Cambridge). In total 260 surveys were completed by recipients of the email invitation; 131 in South Staffs and 129 in Cambridge. This gave a final overall response rate of 1.9 per cent, in line with expectations.

We used the results of the pilot to:

- Assess whether the average length of time taken to complete the survey was reasonable, in that the survey did not impose an undue burden on respondents.
- Confirm that customers were not finding the survey difficult to understand or complete;

- Conduct preliminary analysis on customers' choices, including a preliminary WTP analysis, to ensure that the survey was not producing implausible results that might suggest problems with the survey design.

To the first of these objectives, we found that the average time taken to complete the pilot was 28 minutes, above the target time of c. 20 minutes. We therefore agreed to take a number of steps to reduce the length of the survey, including:

- Removing a screening question on size of household;
- Reducing the number of times that customers are asked to state a reason for their choice following their initial choice of service level for a given attribute. For the pilot we asked this after every second question, but for the main stage we reduced it to after every fourth question. Since the attribute order is random, this means we still get responses to the motivation question for every attribute;
- Removing questions related to frequency of contact with SSW or CW, "segmentation statements" that SSCW uses to assess customers' general attitude to change and sense of environmental responsibility, and questions on water usage; and
- Removing a question on concern about ability to pay household bills now (given we already had a question on concern about future ability to pay).

To the second and third objectives, we found that most customers understood the twelve attributes and were able to work out the differences between the service levels, indicating that the survey was understandable. We also found that the data collected allowed us to produce a preliminary set of WTP results that were consistent with the attribute-by-attribute choice data. We therefore did not recommend any further changes to the choice exercise.

We did make changes to the question on customer motivations for their choices. In the pilot, the pre-set responses for this question were multi-clause sentences. We revised the pre-set responses to be shorter and easier for customers to understand, as shown in Table 2.8.

Table 2.8: Following the Pilot we Revised the Options for the Motivations Question

Old pre-set responses	New pre-set responses
You want to see improvement, even if this meant paying more on your bill	Improvement – you wanted the issue to improve
You want the response (i.e. the current level of service provided) to stay the same as it is now	Consistency – you wanted to keep things as they currently are
You want lower bills, even if this meant having a worse level of service than you currently receive	Price – you looked for the cheapest option (the one with the lowest impact on your bill)

Source: WTP survey

Following the peer review of the pilot, we did not make any changes to the survey (due to time constraints) but we did introduce an additional, alternative econometric specification to estimate WTP. The peer review and our response to it are discussed further in Section 2.7.3, and the additional econometric specification is discussed in Section 4.2.4.3.

SSCW also revised the service levels and costs for two attributes based on updated internal information between the pilot and the main stage. For attribute C (installing 'smart' water meters), SSCW updated both the service levels and the cost data to align with the draft

WRMP24 plan. For attribute L (risk of a temporary use ban, including hosepipes), SSCW provided new cost data based on updated internal calculations.

2.7. Incorporating Guidance on Best Practice

Throughout the project, we have worked to incorporate guidance on best practice from both Ofwat and the CCW. We have also accounted for feedback from the post-pilot peer review in our analysis.

We explain how we have accounted for Ofwat's standards for customer engagement in Section 2.7.1 and describe how we incorporated guidance on best practice from the CCW in Section 2.7.2. We summarise the comments made in the peer review of the pilot documents, and how we have responded to them, in Section 2.7.3.

2.7.1. Addressing Ofwat's customer engagement policy

In advance of PR24, Ofwat has defined a set of standards for high-quality research, customer challenge, and assurance of customer engagement during price reviews.[9] Ofwat states that water company research and engagement should provide evidence of a meaningful, significant understanding of customers' and wider stakeholders' preferences. In particular, water company research should be:

- **Useful and contextualised**: The objectives of the research and the potential implications of the findings (i.e. how they will be used) should be clear from the final output.[10]
  - We clearly state the objective of the research at the beginning of this report (Section 1); that is, to *"estimate customers' willingness to pay (WTP) for improvements in the service provided by SSCW"*. Later in the report (Section 0), we explain that the results of this study will be used to *"draw conclusions about the preferences of the typical SSCW customer regarding these trade-offs [between service attributes and costs], which SSCW can in turn use to plan investment in its service offerings in a way that responds to customer preferences"*. We set out our conclusions and final recommendations in Section 5.
- **Neutrally designed**: The research should be designed to be neutral and free from bias. Sources of bias should be considered at every stage of the research. If some bias in unavoidable, this should be noted and explained in the research findings.[11]
  - At every stage of the research process, we took steps to mitigate sources of bias.
    - ***Survey development:*** We used qualitative engagement to assess the accessibility of the survey design to customers (see Section 2.6). We made changes to the survey based on customer feedback to mitigate the potential for bias arising from customer differences in understanding of attribute or service level descriptions.
    - ***Survey design:*** We randomise the order in which attributes are displayed to different respondents to limit bias from order effects.

[9] Ofwat (February 2022), PR24 and beyond: Customer engagement policy – a position paper, p. 4

[10] Ofwat (February 2022), PR24 and beyond: Customer engagement policy – a position paper, p. 6

[11] Ofwat (February 2022), PR24 and beyond: Customer engagement policy – a position paper, p. 6

  - ***Survey design:*** We anchor customers' expectations about future bill increases, thus preventing any systematic bias in valuations caused by customers' preconceptions about future bill levels, by introducing random variation to the cost of the status quo option for all attributes.
  - ***Fieldwork:*** We conducted additional vulnerable customer recruitment (see Section 3.1) to ensure that we collected enough data from groups that were under-represented in our main sample to enable estimation of group-specific differences in preferences among HH customers.
- Where we were unable to mitigate sources of bias, we note and explain the potential impact of that bias on our results in Section 4.

- **Fit for purpose**: Both the sample and the methodology should be appropriate for the research setting. Ofwat welcomes innovation as long as *"it is likely to lead to meaningful and trusted insight and learning"*.[12] Further, respondents should be able to understand the questions they are asked.
  - We adopt an innovative format for the survey (i.e. our stated preference exercise that allows respondents to build their own preferred package) because it addresses concerns raised by respondents about previous survey formats (see Section 2.4.2).
  - Moreover, asking about one attribute at a time allows us to display a brief description of the attribute next to the question, helping respondents understand what they are being asked.
  - For estimation of WTP from the survey data, we use an approach that is standard in both academic and industry literature, i.e. using conditional logit models to estimate utility functions.
- **Inclusive**: The sample should be representative of the full spectrum of the company's customers. Results should consider and report differences in preferences by socio-demographics and consumer types.[13]
  - As mentioned above, we designed the sampling approach to provide a robust and representative sample of all SSCW customers. In particular, we augmented our online survey with a face-to-face survey to ensure we collected responses from vulnerable or digitally disengaged customers.
  - We provide summary statistics on the representativeness of the household, future bill payer, and non-household samples in Sections 3.2, 3.3, and 3.4, respectively.
  - We estimate and report the impact of socio-demographic characteristics and customer type (e.g. billing characteristics) on WTP.
- **Continual**: Companies should carry out research on a continual basis, enabling both day-to-day and longer-term research.[14]
  - This research will feed into the next phase of SSCW's research to inform its business plan development.

[12] Ofwat (February 2022), PR24 and beyond: Customer engagement policy – a position paper, p. 6

[13] Ofwat (February 2022), PR24 and beyond: Customer engagement policy – a position paper, p. 6

[14] Ofwat (February 2022), PR24 and beyond: Customer engagement policy – a position paper, p. 7

- **Independently assured**: Research should be reviewed by entities that are independent of water companies and have the relevant skills and know-how to evaluate the research findings.[15]
  - SSCW commissioned Dr. Silvia Ferrini to provide an independent peer review of the research methodology and findings. Dr. Ferrini provided an initial peer review following the pilot stage in which she suggested a number of actions that we could take to test the robustness of the methodology. While it was not possible to implement all of her suggestions due to the limited time available between the pilot and the main stage, we have implemented a number of the suggestions that related to post-survey econometric analysis. We discuss this further in Section 2.7.3.
  - SSCW asked Dr. Ferrini to provide a follow-on peer review of the main stage. This is available on SSCW's website.[16]
- **Shared in full with others**: Research findings should be made available in full, as early as possible, and include detailed discussions around the methodology employed (including, e.g., questionnaires and discussion guides).[17] Publishing research will allow methodologies to be improved on, build a common knowledge base about customers' views, and allow similar research to be compared.
- **Ethical**: Research should adhere to "the ethical standards of a widely recognised research body".[18]
  - Qa Research adhered to the Market Research Society (MRS) Code of Conduct in administering the survey.

2.7.2. Addressing the CCW critique of the PR19 approach

Following PR19, the CCW commissioned Blue Marble to conduct a study on water companies' customer engagement research. The study examines how customers feel about the research processes in which they are asked to participate and, in particular, whether customers feel that the research processes enable them to make meaningful contributions.

CCW and Blue Marble identify five themes on which customer engagement research could improve to ensure that customers feel that their contribution is meaningful.

[15] Ofwat (February 2022), PR24 and beyond: Customer engagement policy – a position paper, p. 7

[16] Link: https://www.south-staffs-water.co.uk/media/4339/peer_review_of_final_nera_wtp_report-1.pdf (last accessed 29 September 2023)

[17] Ofwat (February 2022), PR24 and beyond: Customer engagement policy – a position paper, p. 7

[18] Ofwat (February 2022), PR24 and beyond: Customer engagement policy – a position paper, p. 7

Figure 2.3: CCW/Blue Marble Identify Five Themes that Customers Require for Meaningful Research

Criteria		Threshold questions
	**Ease**	• Am I able to answer the questions that I am being asked? • Is what I'm being asked to do straightforward and reasonable?
	**Relevance**	• Is the topic relevant / of interest to me? • Do I actually have a view on what I am being asked?
	**Listening**	• Do I feel like the organisation that has commissioned the research is paying attention to what I say?
	**Making a difference**	• Do I think anything will happen as a result of taking part? • Will taking part benefit others / the wider community?
	**Financial incentive**	• Do I receive a financial incentive for taking part? Or the prospect of a prize?

Source: CCW and Blue Marble[19]

- **Ease:** CCW and Blue Marble are concerned that traditional WTP studies are not easy for customers to complete. They are particularly concerned about the cognitive burden of remembering all the attribute descriptions (traditionally provided at the beginning of the survey) and that asking customers to make multiple choices between paired bundles is confusing.[20]
  - The innovative format of our WTP study, described in Section 2.4.2, addresses both points of concern to CCW. Customers do not have to remember attribute descriptions, because we ask customers about one attribute at a time and so can show the description alongside the choice exercise. There is no risk of confusion from being asked to make multiple choices between paired bundles, as each customer is asked to build their preferred bundle only once.
- **Relevance:** Customers only want to be consulted on a subset of the decisions made by water utilities. The CCW/Blue Marble study finds that customers do want to be consulted on near-future investment scenarios (5-15 years) and prefer consultations that are framed in terms of the impact on the customer's own bill and services.[21] Customers also feel that *"it is more valid to ask for consumers' views on specific business planning topics once they are briefed and feel able to give a considered answer"*.[22]
  - Our WTP exercise falls within the set of topics that CCW and Blue Marble identify as relevant to customers, because it focuses on how near-future investment might impact customers' own bills and service experiences. To ensure that customers are able to give considered answers, we provide contextual information about each attribute; we

[19] CCW and Blue Marble Research (April 2020), Engaging water customers for better consumer and business outcomes, p. 4

[20] CCW and Blue Marble Research (April 2020), Engaging water customers for better consumer and business outcomes, p. 37

[21] CCW and Blue Marble Research (April 2020), Engaging water customers for better consumer and business outcomes, p. 21

[22] CCW and Blue Marble Research (April 2020), Engaging water customers for better consumer and business outcomes, p. 8

tailored this contextual information to customer needs through focus group interviews and cognitive testing.

- **Listening:** Customers view research as more meaningful when it is clear that someone is actually listening. CCW and Blue Marble suggest that this can be achieved in quantitative research through a well-introduced survey and expressions of gratitude.[23]
- **Making a difference:** CCW and Blue Marble find that customers are more likely to feel that their contribution is meaningful if they believe that their participation in research will have a real impact.
  - Qa and SSCW worked in collaboration to design an introduction to the survey that succinctly explains its purpose and why customers' views were important, to address the suggestions from CCW and Blue Marble that customers want to see that someone is listening to their opinions and that their opinions will make a difference.
- **Financial incentive:** Offering a financial incentive makes it more likely that customers will make time to participate in the survey.
  - Participants in all pre-survey qualitative workshops and interviews were offered compensation, varying from £50 - £100 dependent on the length and type of involvement. This is typical in qualitative research of this type.
  - To encourage participation in the quantitative willingness to pay survey, a Prize Draw was offered as an incentive for taking part. A total prize fund of £1,000 was offered, which was administered by Qa Research in line with MRS guidelines. Respondents from the survey with households (email invites issued by SSCW only) and the survey of non-household customers (issued by retailers) were eligible for the draw, and the fund was split equally between South Staffs customers (five prizes of £100 each) and Cambridge customers (five prizes of £100 each).
  - All respondents who completed the survey via an access panel were incentivised by their panel provider.

In addition to the five themes outlined above, CCW and Blue Marble identify a number of other factors that should be taken into consideration as part of customer engagement research.

- CCW and Blue Marble highlight the importance of adopting *"an iterative process to questionnaire development"* and ensuring that feedback from cognitive testing and pilots is incorporated in the survey design.[24] We provide further details on how we adapted our survey based on feedback from focus groups and the pilot study in Section 2.6.
- CCW and Blue Marble find that a number of customers are happy to leave decisions about water services to experts working within the water company and regulator.[25]

[23] CCW and Blue Marble Research (April 2020), Engaging water customers for better consumer and business outcomes, p. 19

[24] CCW and Blue Marble Research (April 2020), Engaging water customers for better consumer and business outcomes, p. 24

[25] This "leave it to the experts" type is one of four customer types that CCW and Blue Marble identify. Most customers were either of this type or of a second "I want to be involved, but I'm struggling" type, who want to give feedback but struggle with cognitively demanding research formats. The other two minority types were "I don't care" and "Give me

2.7.3. Response to peer review

Following the pilot study and before the main stage survey, SSCW commissioned a peer review of the methodology from Dr. Silvia Ferrini. Dr. Ferrini provided comments on the proposed approach, including suggestions for improvement. We summarise those comments below and explain how we have responded to them.

Realism of Choice Exercise: Dr. Ferrini expressed concern that a setting where the customer can *"adjust levels and final price as desired"* for each attribute *"does not resemble how SS or CAM will deliver these packages of services"* and therefore *"presents unrealistic choices"*. Dr. Ferrini pointed out that in reality *"customers would get the bundle of services preferred by the majority of people"*.[26]

- Part of the concern here may reflect a misunderstanding about how the choice exercise works. Customers do not have full flexibility to adjust final price. The customer can only adjust the final price by altering their choice of service levels – each service level for each attribute has a predefined (and randomly generated) price.
- The choice exercise is therefore reflective of the business planning problem that SSCW faces, and on which it is seeking customers' input. For each attribute, SSCW could either invest more to improve service, or reduce its investment which would reduce customer bills at the cost of a lower level of service. SSCW does face some regulatory and technical constraints, but we have incorporated some of these into our choice exercise (e.g. there is no option for a deterioration in service for attribute C, relating to the roll-out of smart meters), and SSCW can incorporate others into its subsequent modelling that optimises levels of service in Copperleaf.
- Nonetheless, many aspects of water companies' services are public goods, and therefore the final service level will be common across all customers. The purpose of this choice exercise is to allow individual customers to express their preferences and then on the basis of that data calculate the average customer valuation. This is the same as the purpose of other stated preference WTP exercises conducted at PR19 and previous price reviews.[27] Dr. Ferrini is correct that a business plan based on average preferences calculated in this way may still not be acceptable to a majority of customers. Water companies have often conducted acceptability testing of the final proposed business plan at a later stage of the price control process for exactly this reason, and SSCW may wish to consider doing so at PR24.
- We have added further information on the context to Section 1 of our report to address the second and third bullet points above.

Price Mechanism: Dr. Ferrini noted that several of the design aspects of our price mechanism involve pre-set parameters and asked whether we had tested, or could test at the

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everything you've got" (very disengaged and very engaged, respectively). See CCW and Blue Marble Research (April 2020), Engaging water customers for better consumer and business outcomes, p. 5

[26] Ferrini, S. (15 October 2022), Review of 'Estimating Willingness to Pay at PR24: Methodology Statement Prepared for South Staffs and Cambridge Water' Pilot Documents, p. 2 para. 3

[27] See for example Accent and PJM Economics (January 2018), Wessex Water PR19 Willingness to Pay Research: Final Report.

main stage, the sensitivity of our analysis to those choices. Dr. Ferrini also asked why we adopted this price mechanism rather than using a vector of price levels, as is conventional in bounded contingent valuation exercises or indeed discrete choice experiments.

- The particular features that Dr. Ferrini has asked about are the choice to draw the status quo bill shift from the range *minus* £1 to £2; the use of a uniform distribution for the random draw between 0 and 1; and the judgement-based scaling factor of 2.5 (see Section 2.4.3 for further explanation of how each of these parameters affects the prices that customers see). We understand from Dr. Ferrini that the potential sensitivity of our findings to the judgement-based scaling factor of 2.5 is of particular concern since the same value is applied to all respondents.
- We agree with Dr. Ferrini that it would be of interest to test and understand the sensitivity of our results to the choice of these parameters. Unfortunately, due to time constraints, it was not possible to include this sensitivity testing in the main stage analysis.
- We anticipate that our findings may be sensitive to these parameters, in particular (as Dr. Ferrini suggests) to the scaling factor of 2.5. This factor determines the maximum prices customers see. If we limited the scaling factor to 2,[28] then customers would typically see, and choose between, lower prices. This might lead our WTP estimates to be different in two ways: first, we might see lower WTP for individual attributes, and second, we might see positive WTP for more attributes as lower prices would allow customers to select improvements in more attributes for the same total bill increase.
- However, it is an unavoidable feature of WTP studies that results are likely to be sensitive to the set of prices shown to customers. Studies that use a conventional vector of price levels are also affected by this problem.
  - For example, our current approach means that customers see prices within the range of 0 to 250 per cent of the actual cost to SSCW of providing that service level, where the average price (in expectation) is 125 per cent of the actual cost. If we used a scaling factor of 2, the range would be 0 to 200 per cent and the average (in expectation) would be at 100 per cent of actual cost.
  - We could have used a simpler price vector approach whereby each service level would have three possible prices equal to 0 per cent, 125 per cent, and 250 per cent of the cost reported by SSCW; such a study would likely yield higher WTP values than one in which we used a vector of three possible prices equal to 0 per cent, 100 per cent, and 200 per cent of the cost reported by SSCW.
- Ultimately, the challenge facing an applied researcher is not to design a price mechanism such that customer preferences are insensitive to the mechanism, but rather to ensure that the mechanism tests customer preferences for a realistic set of possible prices so that the resulting estimates of customer WTP are relevant to real-world applications. The parameters specified in our price mechanism are based on our experience from previous work with utility companies (in particular, for the 2.5 scaling factor, of the potential for initial cost estimates to be below the true cost). We are therefore confident that the set of possible prices generated by our mechanism are realistic.

[28] This is the minimum plausible scaling factor as it would ensure that (in expectation) the average price customers see is equal to the actual cost that the company reports for providing that service level, as explained in Section 2.4.3.

Econometric Analysis: Dr. Ferrini asked that we consider alternative econometric modelling strategies to examine whether the results of our main modelling approach could be reproduced using other methods, as this would mitigate some concerns about the credibility of the assumptions underpinning our main modelling approach.

- We understand that Dr. Ferrini's primary concern relates to our modelling of the choice of one among c. 34 million packages. Dr. Ferrini is concerned that the idea that respondents considered and rejected all non-selected options is not credible, and that we do not sample enough non-selected options to generate robust results.
- Dr. Ferrini asked us to consider modelling single attribute choices individually, which we have done. The idea here is to model the per-attribute trade-off between service level and cost. This approach has the advantages that there are only four non-selected options per attribute, so it is credible that the respondent considered all of these; and there is no need to randomly sample non-selected options to render the estimation feasible (we can include all non-selected options). The disadvantage to this modelling approach is that does not account for trade-offs that customers make between attributes. We discuss the results of this modelling exercise in Section 4.2.4.3.
- Dr. Ferrini also asked us to consider modelling the choice as *"a censored model where the bill payment is a function of the twelve attributes".*[29] We have examined some examples of the use of censored models in WTP analysis and concluded that this modelling approach is not suitable for our choice exercise. This modelling approach is typically adopted for contingent valuation exercises where all respondents are asked to place a value on the same good, and the censored model is used to understand how that value changes depending on characteristics of the respondent.[30] In our choice experiment, the total bill payment associated with the chosen package directly depends on the service levels of each attribute through the cost of those service levels (i.e. the supply side) in addition to the respondents' willingness to pay for the service level. The censored model would estimate a single coefficient per attribute for the relationship between the service level for a given attribute and the total bill payment. This coefficient would combine both the demand-side WTP and the supply-side relationship between cost and service level; therefore, the coefficient cannot be used as an estimate of WTP alone.

Comments on Drafting: Dr. Ferrini expressed concern about a lack of clarity and statistical and economic rigour in the drafting of the methodological section.

- Our previous drafting of this section sought to simplify some of the more technical detail for the general reader, and was prepared at an earlier, interim stage of this study.
- We have revised the main text of the methodology section (Section 4.1) to ensure that the simplified description more closely reflects the underlying statistical and economic theory. We have also added a number of technical footnotes to the section to provide more precise and detailed information for readers with a more technical background.

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[29] Ferrini, S. (25 October 2022), Follow up on the Review of 'Estimating Willingness to Pay at PR24: Methodology Statement Prepared for South Staffs and Cambridge Water' Pilot Documents, p. 1

[30] See for example Gumirakiza, J. D., & Choate, T. (2018). The Willingness to Pay for Local, Domestic, and Imported Bundled Fresh Produce by Online Shoppers. *Journal of Agricultural Science*, 10(12), 15-23. and Carlsson, F., & Martinsson, P. (2007). Willingness to pay among Swedish households to avoid power outages: a random parameter Tobit model approach. *The Energy Journal*, 28(1).

3. Survey Implementation

In this section, we explain the implementation of the survey, describe the data collected through the survey, and consider whether there is evidence that the data collected through the survey can be used to generate reliable estimates of SSCW customers' WTP.

- Section 3.1 provides an overview of the fieldwork methods adopted to collect the data.
- Sections 3.2 to 3.4 summarise the data collected from each of the HH, FBP, and NHH surveys respectively. In each case we consider whether the customer characteristics in the sample are reflective of the SSCW customer base; the extent to which customers express concern about the uncertain financial future; and evidence on customer understanding of and meaningful engagement with the survey.
- Section 3.5 concludes, explaining how the information in the preceding sections gives us confidence that the results of our WTP analysis are reflective of SSCW customers' preferences.

3.1. Fieldwork and Sampling Approach

3.1.1. Household survey

For HH customers, we designed the sampling approach to provide a robust and representative sample of all SSCW customers while at the same time balancing the practicalities of implementing a complex survey within the available budget and timeframe.

We collected all responses through an online survey, programmed and hosted by Qa Research. SSCW drew a random sample from its database of HH customers for whom an email address was available and issued email invitations to those customers.

The email invitation contained an explanation of the purpose of the survey and details of data protection and adherence to the MRS Code of Conduct. To provide further reassurance and encouragement to respondents, the email invitation also included a link to an accompanying letter from SSCW which provided further explanation about the survey and how the findings would be used. It also included contact details for both SSCW and Qa Research, should the customer wish to find out more about the survey.

We issued 50,032 invitations to participate in the main stage household survey (36,501 in South Staffs and 13,531 in Cambridge). We set this number with a view to achieving a target sample size of c. 1,250 responses in total based on an expected response rate of c.2 per cent.

SSCW issued email invitations on Friday 21 October and the survey closed on 15 November 2022. In total 1,257 surveys were completed by recipients of the email invitation: 833 in South Staffs and 424 in Cambridge. This gave a final overall response rate of 2.5 per cent, in line with expectations.

This was further complemented by additional completions gathered via an access panel which were targeted, as far as possible, towards younger HH bill payers and helped to make the final HH sample representative by age.

3.1.1.1. Vulnerable customer survey

The purpose of the vulnerable customer survey was to supplement the main survey with a sample of HH customers who were digitally disengaged and/or experiencing health or financial vulnerabilities. Specifically, respondents had to fall into at least one of the following vulnerable groups;

- **Digitally Disengaged:** those who reported that they 'Never' or 'Rarely (few times in the year)' use the internet;
- **Financial Vulnerability:** those on a very low income (up to £365 per week or 'Under £19,000' per year);
- **Elderly Alone Vulnerability:** those aged 75 and over and living alone;
- **Health Vulnerability:** those who reported someone in their household has a long term disability and/or health condition.

All respondents were free-found and interviewed face-to-face on-street, with interviewing shifts carried out in a range of locations throughout the South Staffs Water and Cambridge Water operating areas by Qa research staff.

3.1.2. Future bill payers survey

The FBP survey was primarily carried out online via a commercial access panel provider. The survey design was similar to that of the HH survey. Qa hosted the survey and provided a survey link to the panel provider, which was responsible for sampling panelists. A small number of respondents were free-found by local market research recruiters and completed the survey online, via a link they were issued with.

Respondents were eligible to complete the survey if they met the criteria for inclusion in the FBP sample (i.e. those defined as aged 18-29 who were currently living in, or mainly lived in in the last year, a property in either the SST or CAM region, with no responsibility for paying their household's water bill). Aside from meeting this definition, no quotas were set on recruitment.

The final sample consists of responses from 91 FBP customers, 54 of whom are in the South Staffs Water region and 37 of whom are in the Cambridge Water region.

3.1.3. Non-household survey

The NHH survey was carried out online, predominantly through a commercial access panel provider. Qa designed the survey in conjunction with NERA and SSCW and programmed it into an online survey using Askia. Qa hosted the survey and provided a survey link to two panel providers who were responsible for sampling panelists.

To supplement the panel responses, the online survey was also shared with SSCW retailers to distribute to their customers. A small number of respondents were free-found by local market research recruiters; these respondents completed the survey online, via a link they were issued with.

Any respondent was eligible to complete the survey provided their organisation had premises in either the South Staffs Water or Cambridge Water operating area and the respondent personally had some responsibility for paying their organisation's water bill.

We achieved a total sample of 247 survey completions, with the majority of these collected from the panel provider (200 completions).

3.2. Summary of Data Collected from Household Customers

We have 1,709 completed surveys from HH customers. Among these, 1,257 are from responses to the email invitations issued to the sample from the SSCW customer database, 367 are from the access panel, and 87 are from the face-to-face survey for vulnerable customers. All respondents were 18 or over, lived in the SSCW operating area, and had some degree of responsibility for paying their water bills.

We omit 19 completed surveys from our analysis because they report an implausibly high annual water bill (i.e., exceeding £1,000 per year). Therefore, we perform the main stage analysis on a sample of 1,690 responses. Of these, 1,148 are from the SST area and 542 are from the CAM area.

Section 3.2.1 describes the HH customers' characteristics and the representativeness of the sample. Section 3.2.2 considers the extent to which these customers are uncertain about their future financial security and how this may affect the WTP valuations. Finally, Section 3.2.3 reports on the respondents' experience with the survey.

3.2.1. Household bill payers' characteristics

The sample is broadly representative of SSCW's customer base of HH bill payers in terms of demographic characteristics such as gender, socio-economic group (SEG)[31], and ACORN[32], as shown in Table 3.1. Women and the socio-economic segment ABC1 are slightly over-represented.

The sample is also broadly representative in terms of billing characteristics. Table 3.2 shows that metered HH are slightly over-represented, but the sample is reasonably representative in terms of whether customers are on a social tariff or on the priority services register (PSR).

We analyse how WTP differs by demographic and billing characteristics and estimate a model that corrects for the over-representation of women, the socioeconomic group ABC1 and metered customers in Section 4.2.4.

[31] The socio-economic group, or social grade, is an occupational classification system for the UK population. Households are classified into grades A, B, C1, C2, D, or E based on the occupation of the main income earner. See Ipsos (2009), Social Grade: A Classification Tool. Link: https://www.ipsos.com/sites/default/files/publication/6800-03/MediaCT_thoughtpiece_Social_Grade_July09_V3_WEB.pdf

[32] ACORN ("A Classification Of Residential Neighborhoods") is a geodemographic segmentation of the UK population. Each postcode is classified as belonging to one of six categories: Level 1 (affluent achievers), level 2 (rising prosperity), level 3 (comfortable communities), level 4 (financially stretched), level 5 (urban adversity), or level 6 (not private households). See CACI, The Acorn User Guide. Link: https://acorn.caci.co.uk/downloads/Acorn-User-guide.pdf

Table 3.1: Demographic Characteristics of Household Customers

	SST HH Customers		CAM HH Customers	
	All HH Bill Payers	**Achieved Sample**	**All HH Bill Payers**	**Achieved Sample**
Gender	**%**	**%**	**%**	**%**
Female	46%	57%	42%	50%
Male	54%	43%	58%	50%
Age	**%**	**%**	**%**	**%**
18-24	1%	6%	2%	2%
25-34	13%	12%	15%	15%
35-44	19%	22%	22%	18%
45-64	37%	27%	35%	35%
65-74	14%	17%	13%	18%
75+/75-80	15%	16%	14%	13%
SEG	**%**	**%**	**%**	**%**
AB	17%	31%	35%	47%
C1	29%	25%	30%	27%
C2	22%	14%	18%	10%
DE	32%	29%	17%	17%
ACORN	**%**	**%**	**%**	**%**
1	21%	22%	40%	48%
2	3%	2%	15%	12%
3	29%	26%	23%	19%
4	25%	22%	15%	16%
5	21%	28%	6%	5%
6	<1%	-	<1%	-
No data	1%	-	1%	-

Source: Qa analysis

Table 3.2: Billing Characteristics of Household Customers

	SST HH Customers		CAM HH Customers	
	All HH Bill Payers	**Achieved Sample**	**All HH Bill Payers**	**Achieved Sample**
Meterage	**%**	**%**	**%**	**%**
Metered	43%	66%	76%	86%
Unmetered	57%	34%	24%	14%
Tariff type	**%**	**%**	**%**	**%**
On Social Tariff	8%	11%	3%	6%
Not on Social Tariff	92%	89%	97%	94%
PSR	**%**	**%**	**%**	**%**
Registered	9%	7%	6%	4%
Not registered	91%	93%	94%	96%

Source: Qa analysis

We also defined, in conjunction with SSCW, different categories of vulnerable customer. We identify indicators of three forms of vulnerability for customers in our sample: financial vulnerability, social vulnerability, and transient vulnerability. We also define the category "vulnerable", which combines indicators for either financial or social vulnerability. A customer is deemed vulnerable if they meet the criteria for at least one "primary" indicator or at least two "secondary" indicators; see Appendix A.1.2 for details. Table 3.3 presents the number and percentage of customers in each vulnerability category in our sample per region.

In Section 4.2.4, we analyse how WTP differs for financially vulnerable, socially vulnerable, and "vulnerable" customers. We did not examine WTP for transiently vulnerable customers because we can only capture some forms of transient vulnerability.[33] In particular, we do not capture temporary homelessness, joblessness, illness, or injury. Therefore, WTP estimates for our sample of transiently vulnerable customers are unlikely to be representative for all types of transiently vulnerable customers.

Table 3.3: Count of Vulnerable Household Customers in Sample

	SST HH Customers		CAM HH Customers	
	count	**%**	**count**	**%**
Financially vulnerable	284	25%	76	14%
Socially vulnerable	386	34%	154	28%
Vulnerable (financially or socially)	499	44%	183	34%
Transiently vulnerable	189	16%	88	16%

Source: NERA analysis of WTP survey data.

[33] We agreed with SSCW to consider as transiently vulnerable those respondents that, according to their response to survey question D8, have experienced "bereavement of a close family member", "divorce", or "moving house" in the last 12 months. We also include those who report that English is not their first language and that they speak English "not well" or "not at all" in response to questions D7 and D7a.

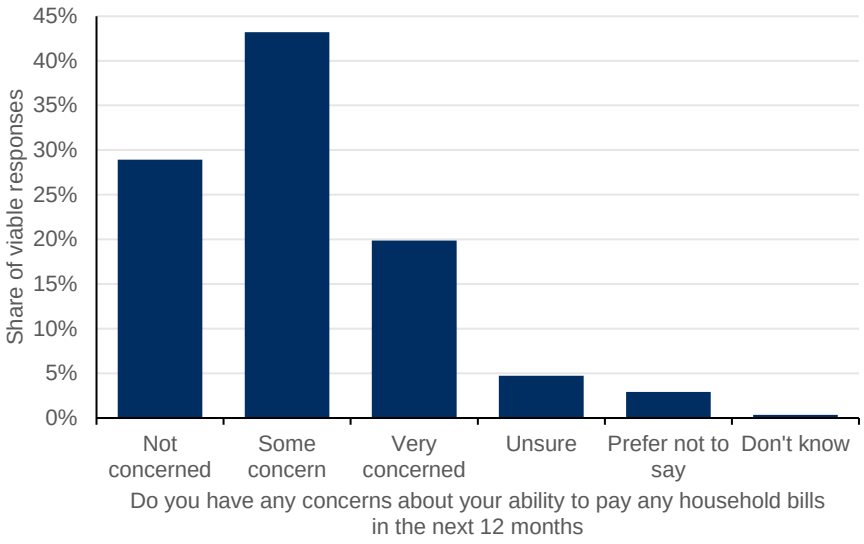
3.2.2. Financial uncertainty

Currently, most household respondents are able to pay their water bills. Just under ten per cent of household respondents struggle with paying their water bills. In both areas, more than 90 per cent of HH customers answered that they always pay their water bills on time.[34]

However, there is evidence that most HH customers are pessimistic about their future financial situation. In the SST area, 63 per cent of respondents are concerned about their ability to pay bills in the next 12 months (see Figure 3.1). In the CAM area, this figure is slightly lower at 54 per cent (see Figure 3.2). This concern about their future financial situation may reduce respondents' willingness to select costly improvements in service (i.e. reduce their willingness to pay for improvement).

In Section 4.2.4.1 we report the results of a sensitivity test where we restrict the analysis to customers that we identify to be financially vulnerable and assess whether the WTP among those customers differs from the WTP of the household sample as a whole. If customers report that they are 'very concerned' about their ability to pay bills in the next 12 months, we use this as a secondary indicator of financial vulnerability (see Appendix A.1.2 for details on the use of primary and secondary indicators to determine financial vulnerability).

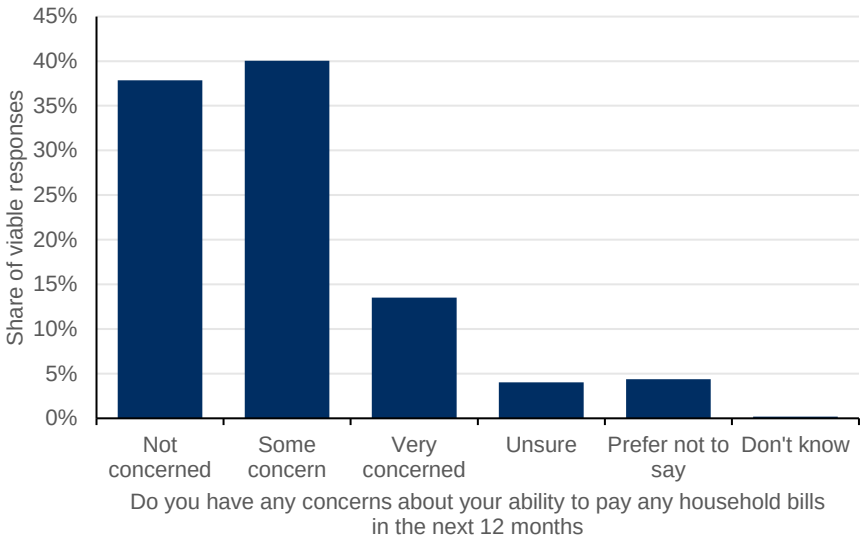
Figure 3.1: 63 per cent of SST HH Customers are Concerned about the Affordability of their Bills



Source: NERA analysis of WTP survey data.

[34] Split by region, 91 per cent pay their water bill on time in SST and 93 per cent pay their water bill on time in CAM. These results include those that answered, "I always pay my water bill on time, but sometimes struggle, or am late, paying other bills". This group is 10 per cent of respondents for SST and 6 per cent for CAM area.

Figure 3.2: 54 per cent of CAM HH Customers are Concerned about the Affordability of their Bills



Source: NERA analysis of WTP survey data

3.2.3. Experience of completing survey

The survey includes questions that allows us to evaluate whether respondents found the survey easy to complete, examine how respondents are making decisions, and understand the extent to which respondents change their decisions on individual attributes when considering their service package as a whole.

3.2.3.1. Ease of understanding topics and options

We asked respondents to indicate how well they understood the 12 topics and how easy they found it to work out the differences between options.

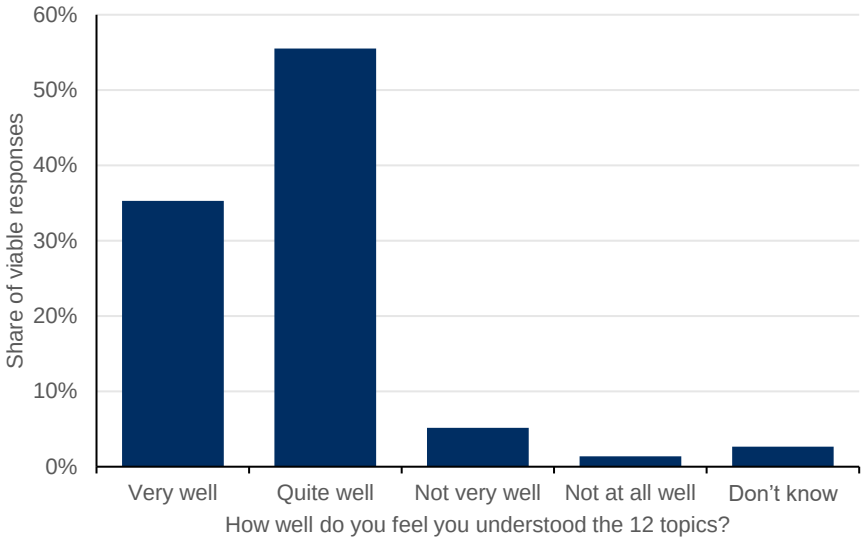
Almost all respondents understood the 12 attributes "very well" or "quite well", which suggests the descriptions of the attributes were clear. In particular, 93 per cent of SST respondents understood the attributes well, and in CAM this number is 95 per cent (see Figure 3.3 and Figure 3.4, respectively).

Respondents had slightly more difficulty working out the differences between options. In response to the question “how easy or difficult did you find it to work out the differences between the options”, on a scale of 1 to 5, with “1” being "very difficult" and “5” being "very easy", 70 per cent of SST respondents and 69 per cent of CAM respondents answered either 4 or 5. This result is typical in surveys of this kind, and we consider that the options were reasonably understandable for customers.

Based on the responses to these questions, we conclude that HH customers typically understood the topics they were being asked to make decisions on and the options available to them. We are therefore confident that their choices reflect their preferences over the options presented in the choice exercise and are not distorted by problems of comprehension.

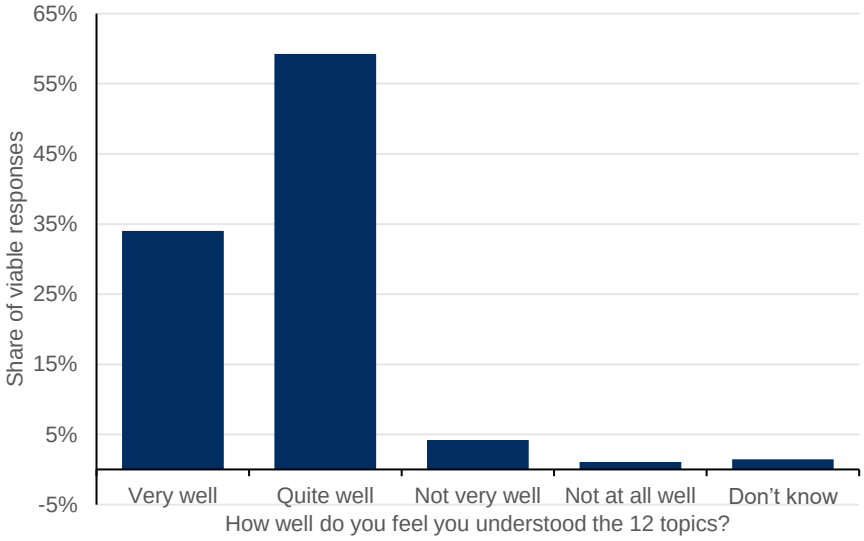
As a sensitivity check, we estimate WTP for the sample excluding those HH customers who found it "difficult" or "very difficult" to work out the differences between the options and those who understood the 12 topics "not very well" or "not at all well". We summarise the findings in Section 4.2.4 and report the full results in Appendix A.1.2.

Figure 3.3: 93 per cent of SST HH Customers Understood the Attributes Well



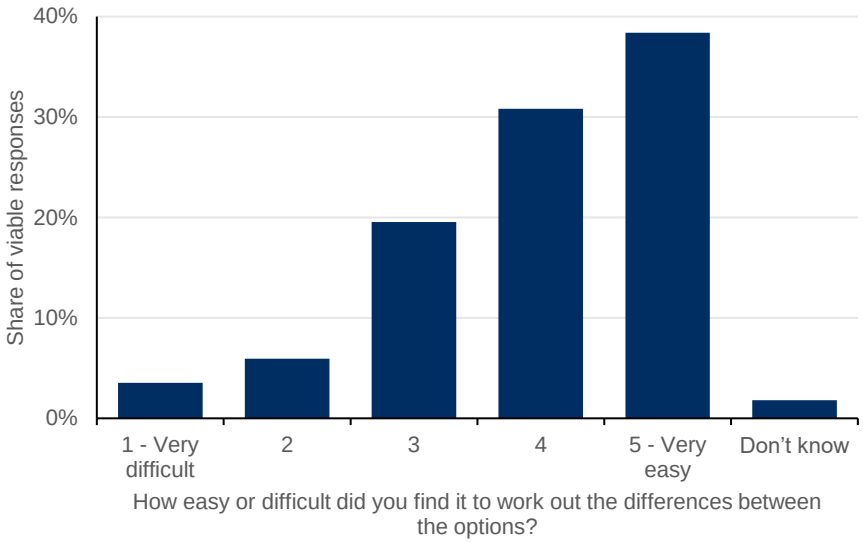
Source: NERA analysis of WTP survey data.

Figure 3.4: 95 per cent of CAM HH Customers Understood the Attributes Well



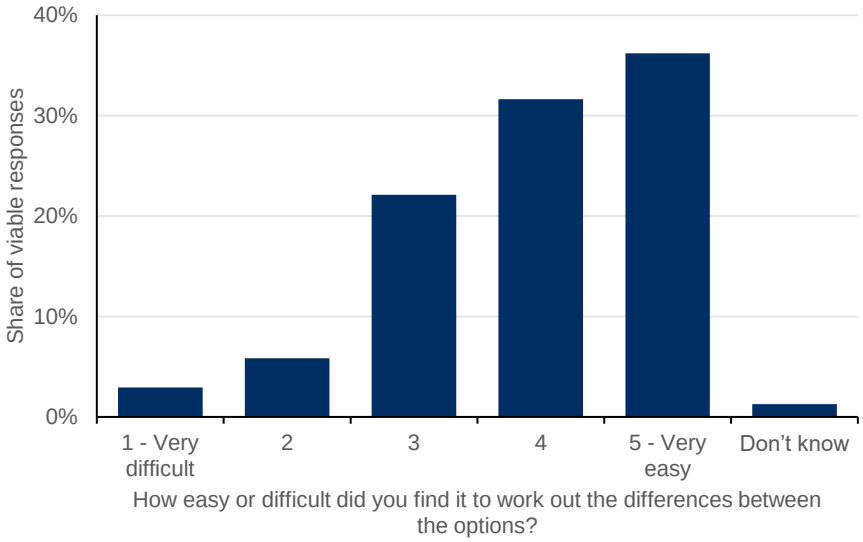
Source: NERA analysis of WTP survey data.

Figure 3.5: 70 per cent of SST HH Respondents Found it Easy to Understand the Options



Source: NERA analysis of WTP survey data.

Figure 3.6: 69 per cent of CAM HH Respondents Found it Easy to Understand the Options



Source: NERA analysis of WTP survey data.

3.2.3.2. Protest attitudes

In the survey, we asked respondents two questions to elicit whether they held "protest" attitudes towards paying for water services, as there is evidence from academic literature that

protest attitudes can influence responses in WTP studies.[35] We examined two protest attitudes, as set out below:

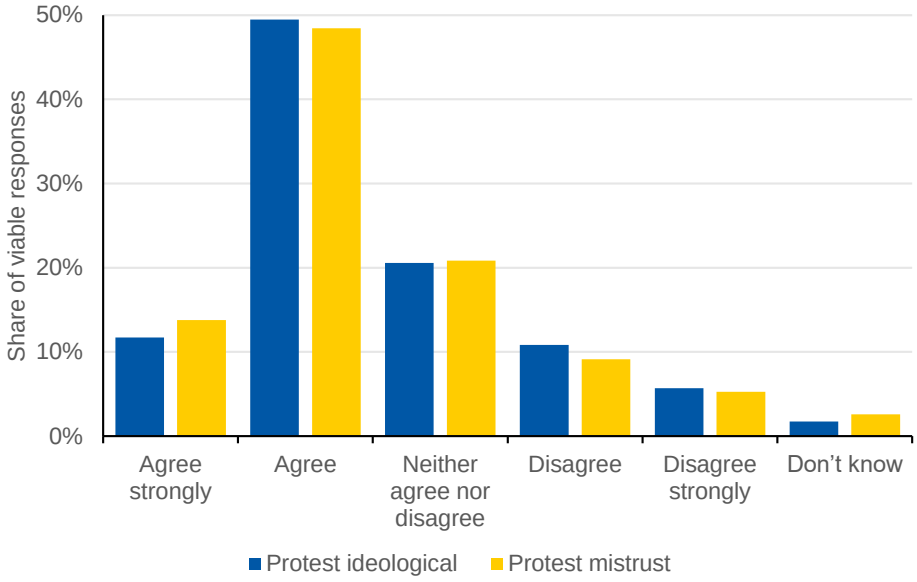
- **Protest ideological:** we consider that a respondent has an ideological protest attitude when they "disagree" or "disagree strongly" with the statement *"If (South Staffs Water/Cambridge Water) invests more to provide a better response to these 12 topics then bills will need to increase"*. We consider that respondents who disagree with this statement have some form of objection to the idea that they must pay for improvement in water services. We find that 17 per cent of SST and 17 per cent of CAM respondents exhibit an ideological protest attitude.
- **Protest mistrust:** we consider that a respondent has a protest mistrust attitude when "disagree" or "disagree strongly" with the statement *"If your water bill increases in order to fund service improvements, then you would trust (South Staffs Water/Cambridge Water) to invest more and deliver the service improvements"*. We find that 14 per cent of SST respondents and 15 per cent of CAM respondents have a protest mistrust attitude.

Among HH respondents, 21 per cent of SST customers and 22 per cent of CAM customers present at least one of these types of protest attitudes.

During the WTP analysis, we examined how the results changed when excluding the respondents with protest attitudes (see Appendix A.1.2).

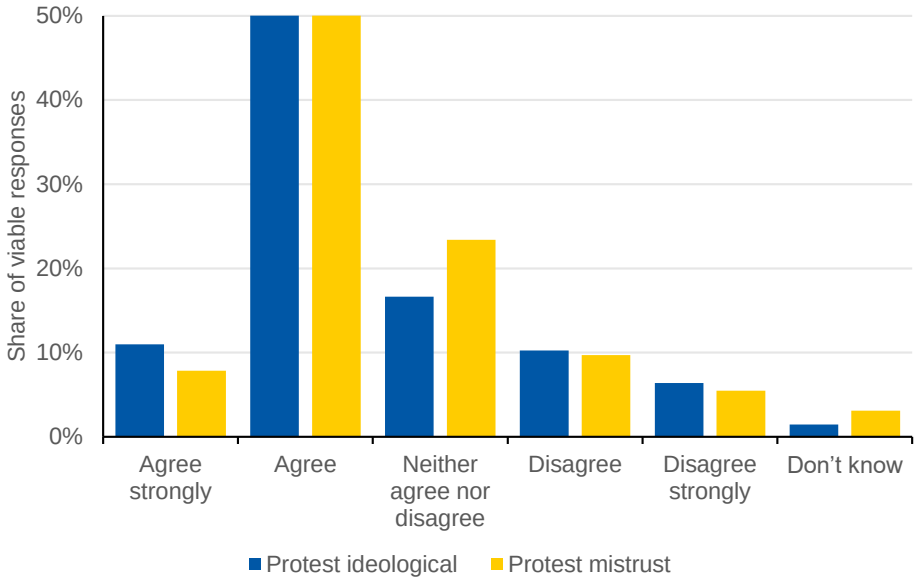
[35] The exemplar study of protest attitudes and status quo preferences was investigating WTP for forest diversification in Germany. It asked respondents to indicate the extent to which they agreed with four different statements on a five-point scale. The statements were as follows (1) I already pay enough for other things (2) Lower Saxony should cut public spending for other things instead of expecting a voluntary contribution from me (3) It is my right to have a high level of biodiversity in forests and not something I should have to pay extra for (4) I refuse to assess nature in monetary terms. See Meyerhoff and Liebe (2009), *Status quo effect in choice experiments: empirical evidence on attitudes and choice task complexity, Land Economics 85*, pp. 515-528.

Figure 3.7: 21 per cent of STT HH Respondents Exhibit Protest Attitudes



Source: NERA analysis of WTP survey data.

Figure 3.8: 22 per cent of CAM HH Respondents Exhibit Protest Attitudes



Source: NERA analysis of WTP survey data.

3.2.3.3. Respondents changing decisions

After respondents had answered all survey questions, they had the option to review the total impact of their combined decisions on their bill and make changes, as explained in Section 2.4. Among SST respondents, 19 per cent opted to change at least one choice. Among CAM respondents, 14 per cent opted to change at least one choice. These results suggest that respondents are mostly happy with their initial choices and are unlikely to change them. However, a significant minority reconsidered their choices at this stage, suggesting that in

addition to having attribute-by-attribute preferences they also had preferences over the total water bill and may have been willing to make trade-offs between attributes.

We analysed the characteristics of respondents who changed at least one choice and found that they do not differ substantially from the characteristics of the whole sample. We observe slight differences in terms of age and financial security:

- Young people make up a higher proportion of the sample that changes at least one choice than the full sample. In SST, respondents aged 18-29 make up 21 per cent of respondents that change their choices but just 10 per cent of the full sample. In CAM, respondents aged 18-29 make up 16 per cent of respondents that change their choices but just 10 per cent of the full sample. Young people may be less familiar with the topics they were asked about, so they learn more in the course of the survey and are therefore more likely to change their choices after reviewing all the options and the impact on their bill.

- People who are very concerned about their ability to pay household bills in the future are more likely to change at least one choice. In SST, respondents who say they are "very concerned" are 25 per cent of those who changed at least one choice but 20 per cent of the whole sample. In CAM, customers who are "very concerned" are 27 per cent of those who changed at least one choice but only 14 per cent of the whole sample.[36] This may be because people who struggle to pay their bills are more sensitive to the impact of their combined decisions on their bill.

- In SST, respondents from socio-economic group C2DE have a higher propensity to change their choices. Individuals in group C2DE make up 53 per cent of respondents that change their choices in SST, but only 43 per cent of the whole sample.[37] This may be because respondents in socio-economic group C2DE are more budget-constrained and so are more sensitive to the impact of their decisions on their bill. We also observe that respondents in socio-economic group C2DE in CAM have a higher propensity to change their choices, although to a lesser extent than in SST.[38]

3.3. Summary of Data Collected from Future Bill Payer Customers

We collected 91 surveys from FBP via an online panel. Of these, 54 are from the SST area, and 37 are from the CAM area. We omit two responses from our analysis because they report an implausibly high annual water bill (i.e., exceeding £ 1,000 per year). Therefore, we perform the main stage analysis on a sample of 89 responses for FBP.

Section 3.3.1 describes the characteristics of the FBP sample. Sections 3.3.2 and 3.3.3 consider the extent to which these customers are uncertain about their financial security and the respondents' experience with the survey, respectively.

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[36] Those who are "not concerned" about their ability to pay household bills are less likely to change options. In SST they make up 21 per cent of the sample who changed at least one option, and 29 per cent of the whole sample. In CAM, they are 34 per cent of those who changed at least one option, and 38 per cent of the whole sample.

[37] Respondents in socio-economic group ABC1 are less likely to change options: they are 47 per cent of respondents that change options, but 57 per cent of the whole SST sample.

[38] In CAM, individuals in socio-economic group C2DE are 29 per cent of those who change at least one option, and 26 per cent of the total sample. Individuals in socio-economic group ABC1 make up 71 per cent of respondents changing options, and 74 per cent of the full sample.

3.3.1. Future bill payers' characteristics

We find that women are over-represented in the FBP sample, as shown in Table 3.5. We do not collect information in the survey on the socioeconomic group or ACORN classification of FBP customers and so we cannot assess whether the sample is representative with respect to these demographic characteristics.[39]

Due to the small total FBP sample size, we are not able to estimate sub-group models that would allow us to examine how FBP willingness-to-pay for water service differs between different demographic groups (e.g. by age or gender). However, we expect that the differences between demographic groups among FBP customers are similar to the differences between demographic groups among HH customers. We examine how HH customer willingness-to-pay for water service differ between demographic groups in Section 4.2.4.1.

Table 3.4: Demographic Characteristics of Future Bill Payers

	SST HH Customers		CAM HH Customers	
	All HH Bill Payers	**Achieved FBP Sample**	**All HH Bill Payers**	**Achieved FBP Sample**
Gender	**%**	**%**	**%**	**%**
Female	46%	75%	42%	68%
Male	54%	25%	58%	32%
Age	**%**	**%**	**%**	**%**
18-24	-	74%	-	68%
25-29	-	26%	-	32%

Source: Qa analysis

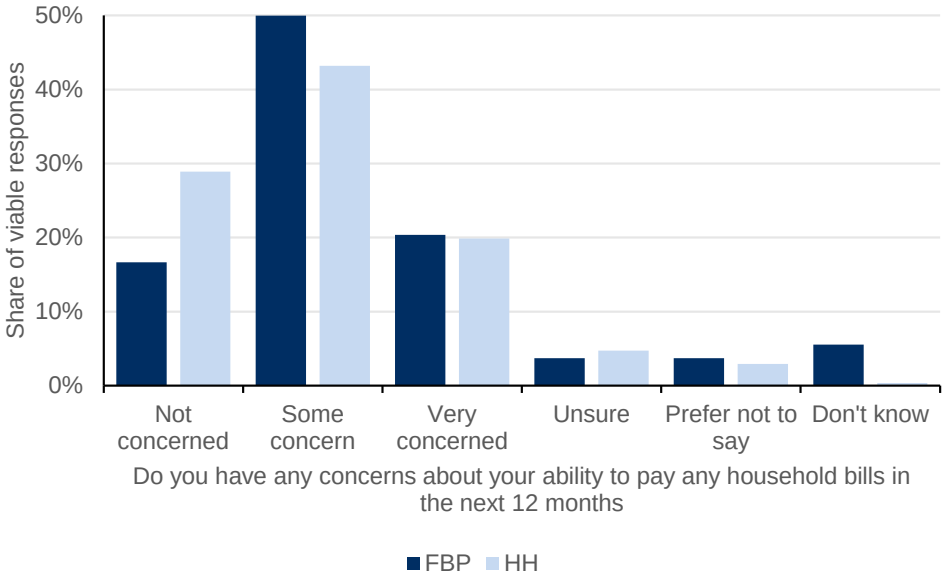
3.3.2. Financial uncertainty

As discussed in Section 3.2.2, financial uncertainty may affect customers' WTP. When asked if they have any concerns about their ability to pay any household bills in the next 12 months, 70 per cent of SST FBP customers answered that they are "very concerned" or have "some concern" (see Figure 3.9). In the CAM area, this number is lower at 57 per cent (see Figure 3.10).

Due to the small FBP sample size, we are not able to examine how financial uncertainty and vulnerability affect FBP willingness-to-pay for water service. However, we expect that the impact of financial vulnerability on FBP customer WTP is similar to the impact of financial vulnerability on HH customer WTP. We examine how HH customer willingness-to-pay is affected by financial vulnerability in Section 4.2.4.1.

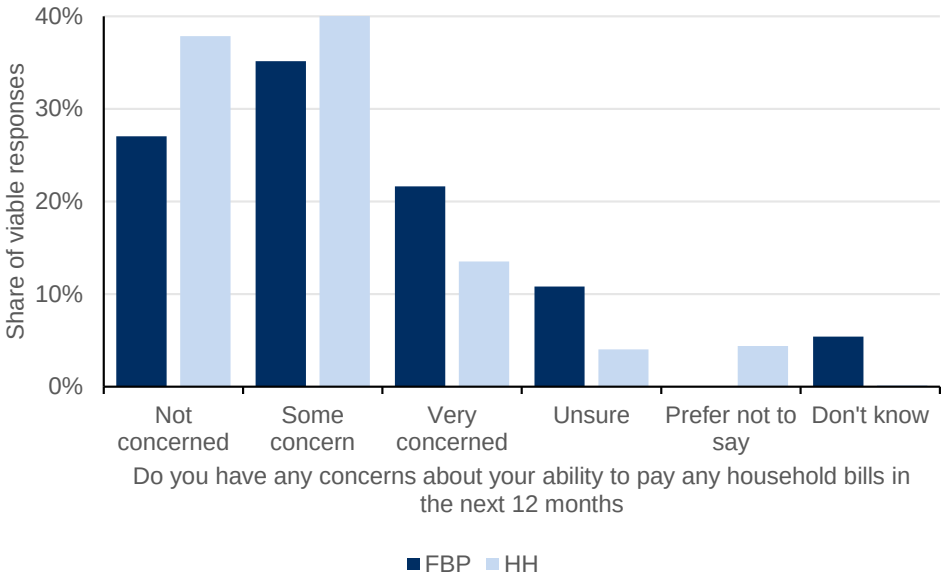
[39] See Section 3.2.1 for an explanation of the socioeconomic group and ACORN classifications that we record for household customers.

Figure 3.9: 70 per cent of SST FBP are Concerned About Their Ability to Pay Bills



Source: NERA analysis of WTP survey data.

Figure 3.10: 57 per cent of CAM FBP are Concerned About Their Ability to Pay Bills



Source: NERA analysis of WTP survey data.

3.3.3. Experience of completing survey

3.3.3.1. Ease of understanding topics and options

In both the SST and CAM areas, more than 80 per cent of respondents understood the 12 attributes "quite well" or "very well" (see Figure 3.11 and Figure 3.12).[40]

However, FBP found it somewhat challenging to work out the differences between options. In response to the question "how easy or difficult did you find it to work out the differences between the options", on a scale of 1 to 5, with "1" being "very difficult" and "5" being "very easy", 60 per cent answered 4 or 5 in the SST area and 53 per cent answered 4 or 5 in the CAM area. Only 8 per cent of SST respondents, and no CAM respondents, found it "very difficult" (see Figure 3.13 and Figure 3.14).

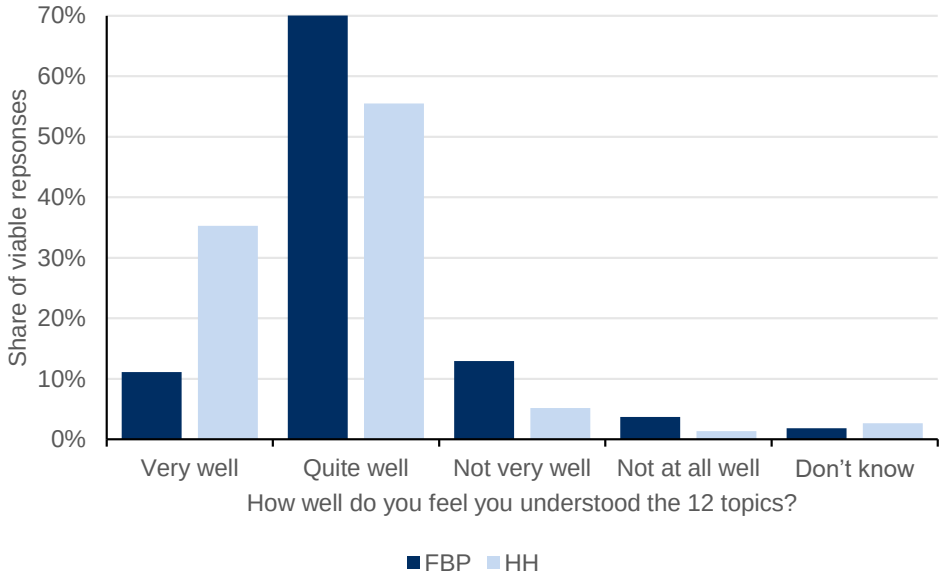
Therefore, FBP customers had a lower level of understanding of the survey than HH customers. As shown in Section 3.2.3, more than 90 per cent of HH customers understood the 12 topics "quite well" or "very well", while around 70 per cent answered either 4 or 5 when asked about how easy it was to work out the differences between options ("5" being "very easy").

This lower level of understanding among FBP customers may be because the entire setting is more novel to FBP customers, who are not currently responsible for their water bill and so may have a more limited background understanding of what is covered by their water bill.

Although understanding is lower among FBP customers than HH customers, most FBP customers do appear to understand the decisions they were asked to make. We are therefore confident that the responses in the survey are reflective of FBP preferences in the context of this choice exercise.

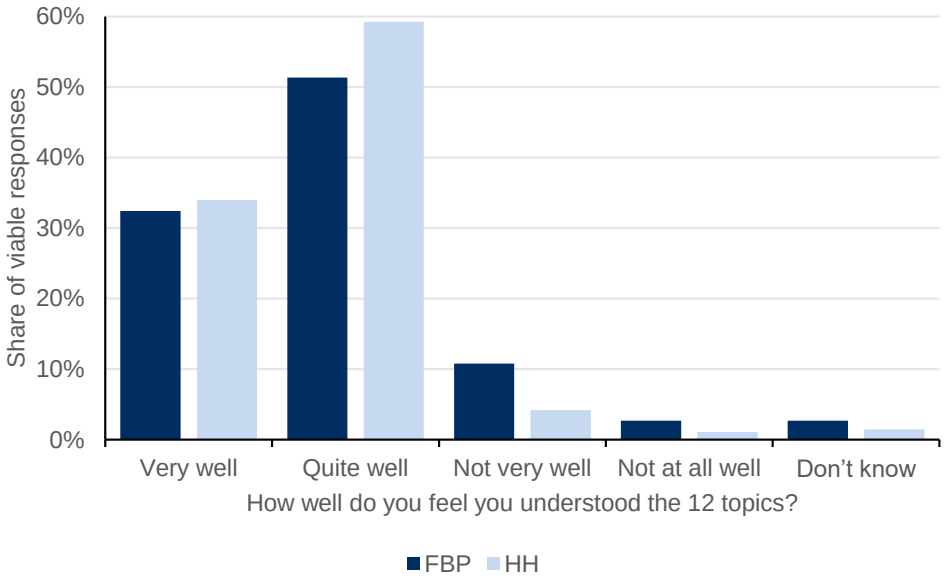
[40] Specifically, 83 per cent in SST and 86 per cent in CAM understood the 12 attributes "quite well" or "very well".

Figure 3.11: 83 per cent of SST FBP Understood the Attributes Well



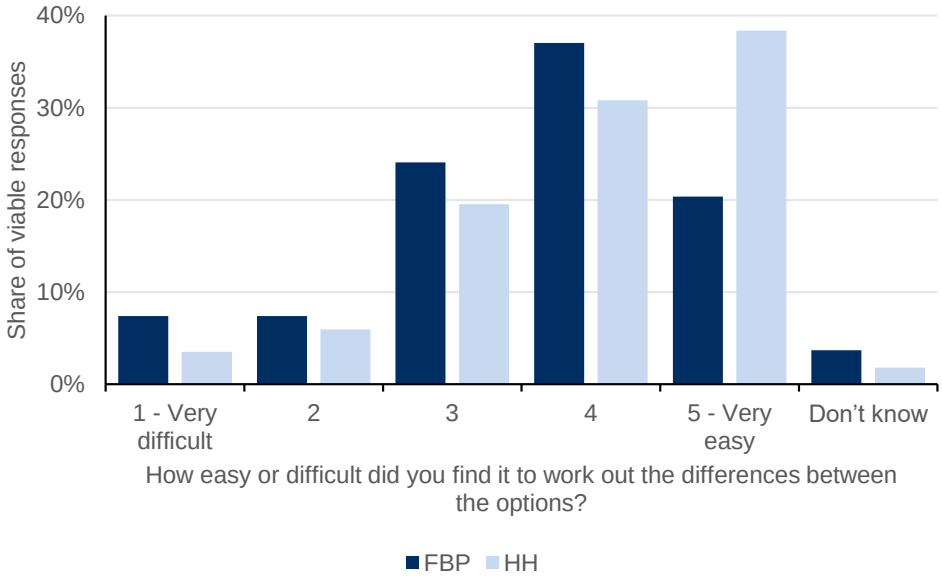
Source: NERA analysis of WTP survey data.

Figure 3.12: 86 per cent of CAM FBP Understood the Attributes Well



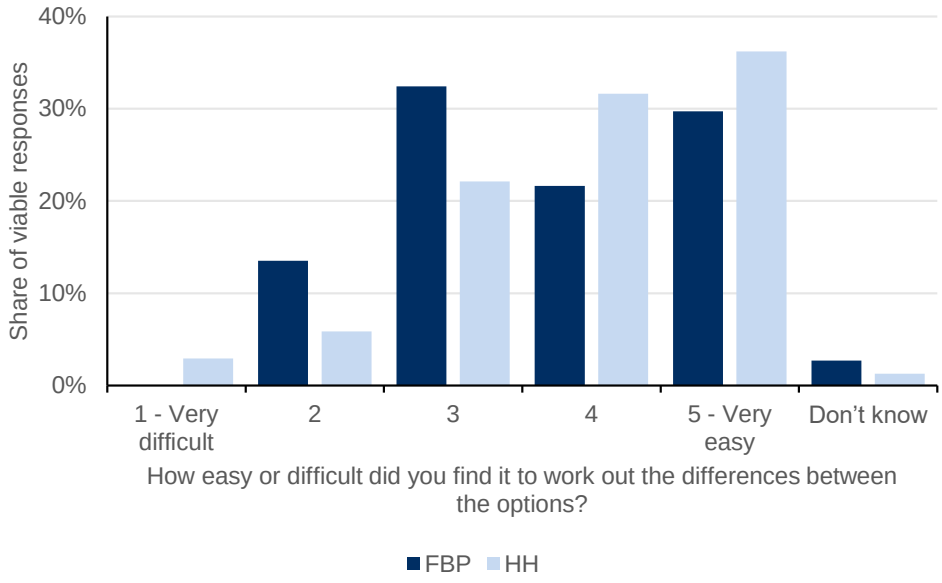
Source: NERA analysis of WTP survey data.

Figure 3.13: 60 per cent of SST FBP Found it Easy to Understand the Options



Source: NERA analysis of WTP survey data.

Figure 3.14: 53 per cent of CAM FBP Found it Easy to Understand the Options



Source: NERA analysis of WTP survey data.

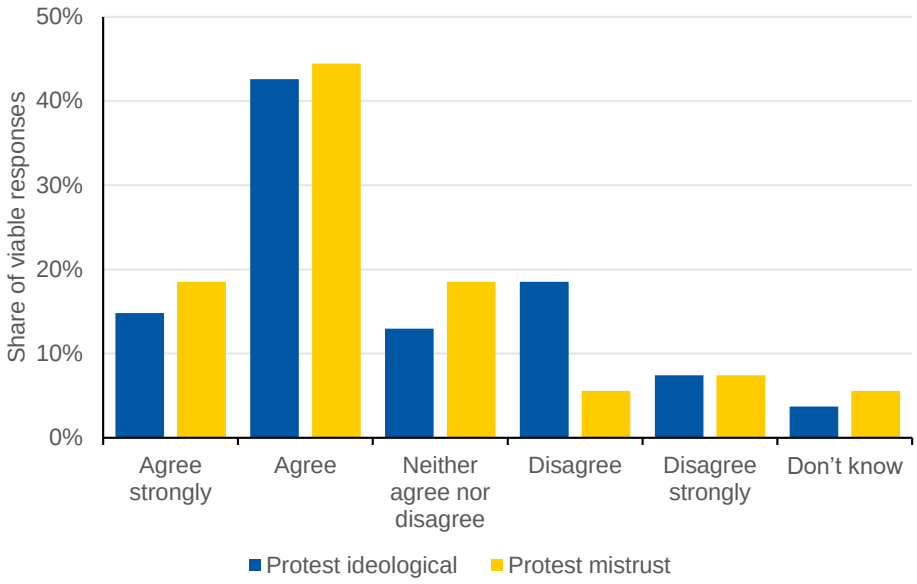
3.3.3.2. Protest attitudes

Among FBP customers, 28 per cent of SST and 27 per cent of CAM respondents exhibit at least one of the protest attitudes defined in Section 3.2.3.[41]

Among FBP customers, the ideological protest attitude is more common than the mistrust protest attitude. This differs from the result for HH customers, among whom both attitudes appear with similar frequency (see Section 3.2.3). In SST, 26 per cent of FBP respondents exhibit a protest ideological attitude, and 13 per cent exhibit a protest mistrust attitude (see Figure 3.15). In CAM, 22 per cent of FBP respondents exhibit a protest ideological attitude, and 16 per cent exhibit protest a mistrust attitude (see Figure 3.16).

During the WTP analysis, we ran a sensitivity to examine whether the FBP results changed when excluding the respondents with protest attitudes, similar to our approach for HH customers. Due to the small FBP sample size (65 observations, once respondents with protest attitudes are excluded), we do not have sufficient information to draw firm conclusions about specific WTP values from this analysis. However, it is reassuring that the set of attributes for which we find positive WTP among FBP customers is unchanged when we exclude respondents with protest attitudes.

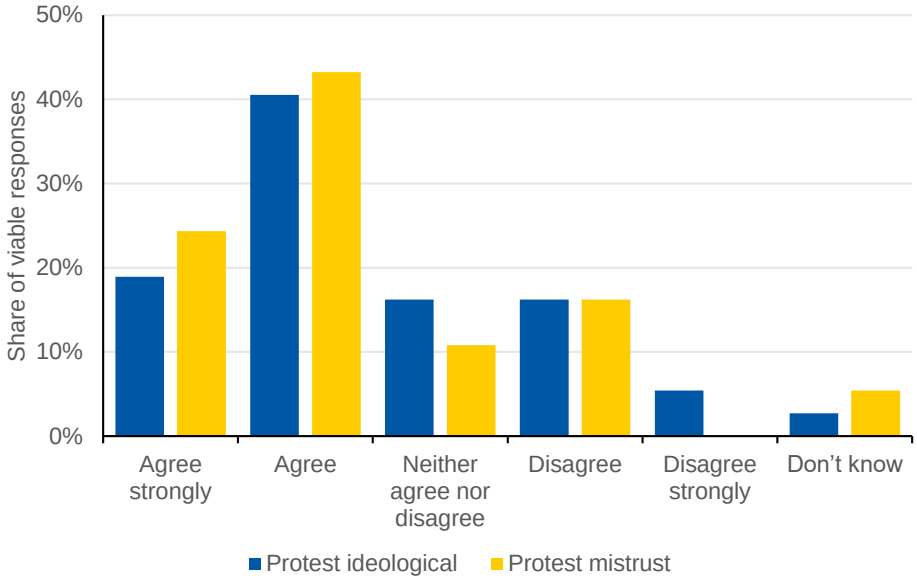
Figure 3.15: 28 per cent of SST FBP Exhibit Protest Attitudes



Source: NERA analysis of WTP survey data.

[41] We consider that a respondent has an ideological protest attitude when they "disagree" or "disagree strongly" with the statement "If (South Staffs Water/Cambridge Water) invests more to provide a better response to these 12 topics then bills will need to increase". We consider that a respondent has a mistrust protest attitude when "disagree" or "disagree strongly" with the statement "If your water bill increases in order to fund service improvements, then you would trust (South Staffs Water/Cambridge Water) to invest more and deliver the service improvements".

Figure 3.16: 27 per cent of CAM FBP Exhibit Protest Attitudes



Source: NERA analysis of WTP survey data.

3.3.3.3. Respondents changing decisions

After FBP respondents had answered all survey questions, they had the option to review the total impact of their combined decisions on their bill and make changes, as explained in Section 2.4. We find that 31 per cent of SST FBP respondents and 22 per cent of CAM FBP respondents opted to change at least one choice. This number is higher than for HH customers, where 19 and 14 per cent, respectively, changed at least one option (see Section 3.2.3).

We analysed the characteristics of FBP that changed at least one choice and found that respondents that found it "very difficult" to work out the differences between options make up a higher proportion of the sample that changes at least one choice than the full sample. Respondents that found it "very difficult" make up 12 per cent of FBP that change at least one choice but just 4 per cent of the whole sample.[42]

FBP customers may be more likely to change their choices than HH customers because the entire setting is more novel to FBP customers, so they have a more limited background understanding of what is covered by the water bill. These customers may therefore have gained more new information in the course of the survey than household customers, and that new information may have led them to revise their choices for some of the earlier attributes.

The novelty of the setting may also explain why, among FBP customers, those who change their choices are also more likely to be those who found it difficult to work out the differences between options. FBP customers for whom the setting is more novel may be

[42] Due to the small size of the sample (17 responses for STT and 8 for CAM), we are not able to identify other trends nor analyse each region separately.

more likely to report difficulty in understanding the differences, as well as more likely to learn new information during the exercise that leads them to change their choices.

3.4. Summary of Data Collected from Non-Household Customers

We have 247 completed surveys from NHH customers. Of these, 200 come from an online panel, 41 come from retailers, and 4 were free-found by local market research recruiters as described in Section 3.1.3 (these are referred to as "Push to web" responses).

Among the NHH respondents, 165 are from the SST area, and 82 are from the CAM area.

Section 3.4.1 describes the NHH customers' characteristics. Section 3.4.2 considers the extent to which these customers are uncertain about their financial security and how this may affect the WTP valuations. Section 3.4.3 describes the respondents' experience with the survey.

3.4.1. Non-household customers' characteristics

Table 3.5 compares the characteristics of the NHH customers in our sample to the characteristics of all enterprises operating in the SSC and CAM regions.

Micro-enterprises are underrepresented in the sample in both areas. All other sizes are overrepresented, particularly large firms. Also, some Standard Industrial Classification (SIC) codes are overrepresented, such as Construction in the SST area; and others are underrepresented, such as Professional, scientific and technical activities in the CAM area.

However, the characteristics of all enterprises in the region may not be reflective of the characteristics of the SSCW non-household customer base. In particular, many micro-enterprises may not have a premises, and so would not appear in the SSCW customer base. Consequently, we do not see the underrepresentation of micro-enterprises (relative to the set of all firms operating in the region) as a cause for concern.

Due to the small sample size of NHH customers in each region, we are not able to estimate the model using sub-samples for NHH. We are therefore not able to examine how NHH willingness-to-pay for water service differs based on NHH customer characteristics.

Table 3.5: Characteristics of Non-Household Customers

	SST		CAM	
	% All Enterprises	**% Final Sample**	**% All Enterprises**	**% Final Sample**
Total Employees				
Micro (0 to 9)	88%	27%	88%	36%
Small (10 to 49)	10%	22%	10%	29%
Medium-sized (50 to 249)	2%	15%	2%	9%
Large (250+)	0%	36%	1%	26%
Standard Industrial Classification (SIC) code				
Agriculture, forestry and fishing	2%	1%	4%	5%
Mining and quarrying	0%	-	0%	-
Manufacturing	9%	8%	6%	14%
Electricity, gas, steam and air conditioning supply	0%	3%	0%	3%
Water supply; sewerage, waste management and remediation activities	1%	-	0%	-
Construction	15%	21%	11%	5%
Wholesale and retail trade; repair of motor vehicles and motorcycles	19%	19%	11%	7%
Transportation and storage	10%	4%	2%	3%
Accommodation and food service activities	7%	3%	5%	1%
Information and communication	4%	2%	12%	12%
Financial and insurance activities	1%	3%	2%	4%
Real estate activities	3%	1%	4%	3%
Professional, scientific and technical activities	11%	4%	22%	10%
Administrative and support service activities	8%	3%	8%	1%
Public administration and defence; compulsory social security	0%	1%	1%	-
Education	1%	7%	3%	8%
Human health and social work activities	4%	10%	4%	8%
Arts, entertainment and recreation	1%	3%	2%	8%
Other service activities	4%	5%	3%	7%
Activities of households as employers	0%	-	0%	-
Activities of extraterritorial organisations and bodies	0%	-	0%	-

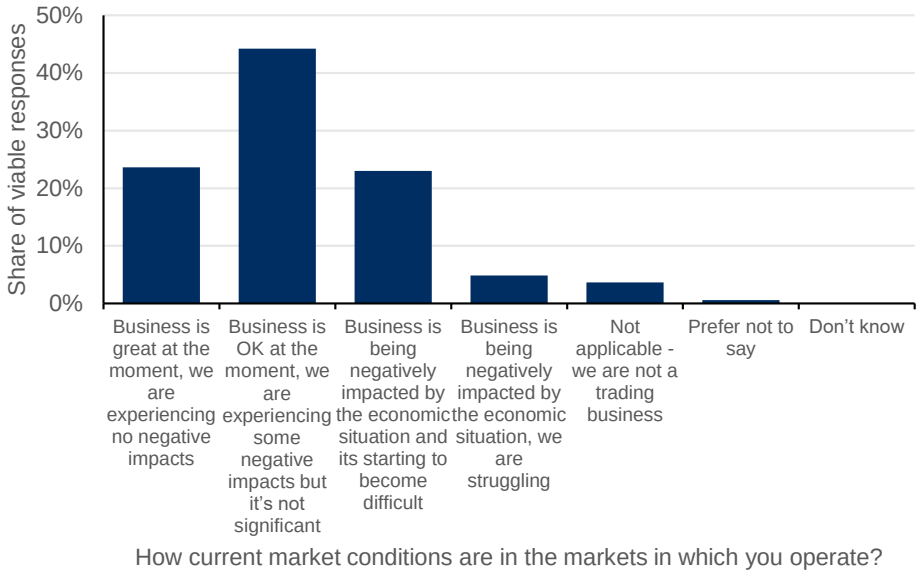
Source: Qa
Note: SSW Operating area is based on the LA areas of Cannock Chase, Dudley, East Staffordshire, Lichfield, Sandwell and Walsall. CAM Operating area is based on the LA areas of Cambridge and South Cambridgeshire.

3.4.2. Financial uncertainty

Across both regions, the majority of NHH respondents are currently experiencing at least some negative impacts due to current market conditions. A significant minority of NHH respondents (over 20 per cent in both regions) report that the situation is "starting to become difficult" or that the business is "already struggling", as shown in Figure 3.17 and Figure 3.18 for SST and CAM respectively. This may reduce NHH customer WTP for improvement in services. However, in both regions more respondents have positive expectations about future developments than have negative expectations about future developments, as shown in Figure 3.19 and Figure 3.20 for SST and CAM respectively. This may mitigate any negative impact of current financial uncertainty on WTP for service in 2025-2030.

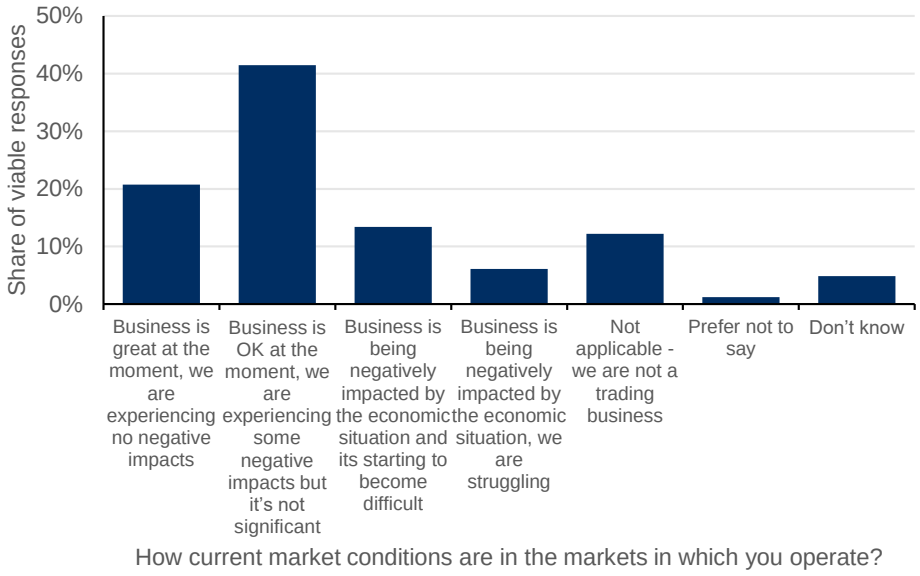
Due to the small size of the sample of NHH customers in each region, we are not able to estimate the model using sub-samples for NHH. We are therefore not able to examine how NHH willingness-to-pay for water service differs by experience of the current economic situation or by expectations about the future economic situation.

Figure 3.17: 28 per cent of SST NHH Customers are Significantly Negatively Affected by the Economic Situation



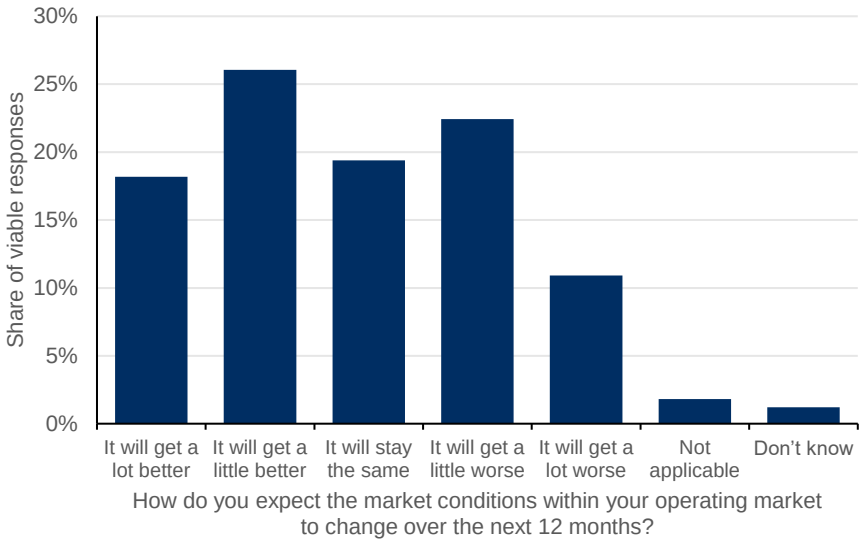
Source: NERA analysis of WTP survey data.

Figure 3.18: 20 per cent of CAM NHH Customers are Significantly Negatively Affected by the Economic Situation



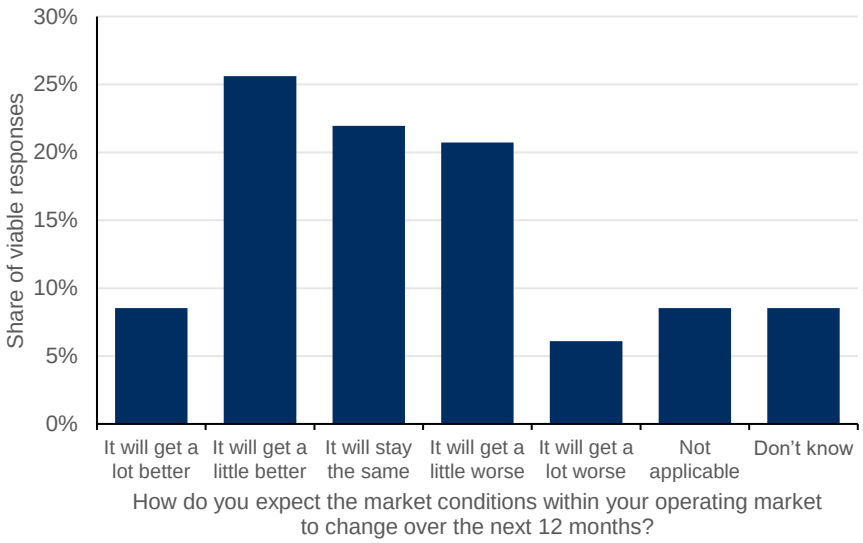
Source: NERA analysis of WTP survey data.

Figure 3.19: 34 per cent of SST NHH Respondents Expect that the Market Conditions Would Get Worse



Source: NERA analysis of WTP survey data.

Figure 3.20: 32 per cent of CAM NHH Respondents Expect that the Market Conditions Would Get Worse



Source: NERA analysis of WTP survey data.

3.4.3. Experience of completing survey

3.4.3.1. Ease of understanding topics and options

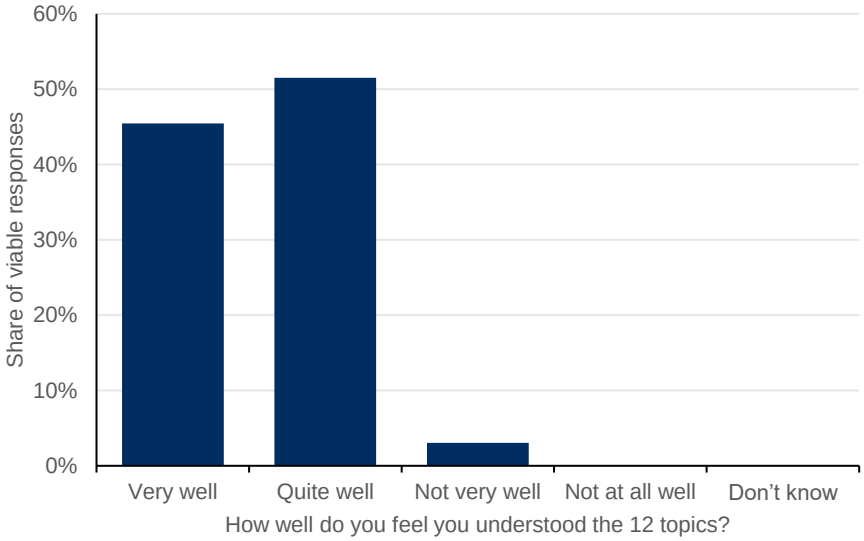
Most NHH customers found the survey easy to understand. From the sample, 97 per cent of SST customers and 95 per cent of CAM customers understood the 12 topics "very well" or "quite well" (see Figure 3.21 and Figure 3.22).

In addition, 75 per cent of SST customers and 61 per cent of CAM customers found it “easy” or “very easy” to understand the differences between options (see Figure 3.23 and Figure 3.24).

These relatively high levels of understanding give us confidence that the responses obtained represent the preferences of NHH customers.

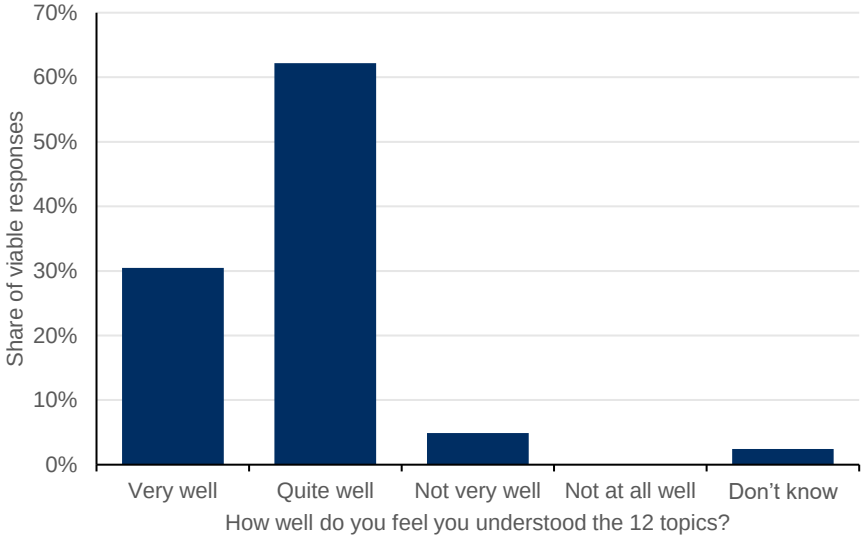
As a sensitivity check, we estimate WTP for the sample excluding those NHH respondents who found it “difficult” or “very difficult” to work out the differences between the options and those who understood the attributes “not very well” or “not at all well”. We summarise the findings in Section 4.4.4 and present the results in Appendix A.3.

Figure 3.21: 97 per cent of SST NHH Customers Understood the Attributes Well



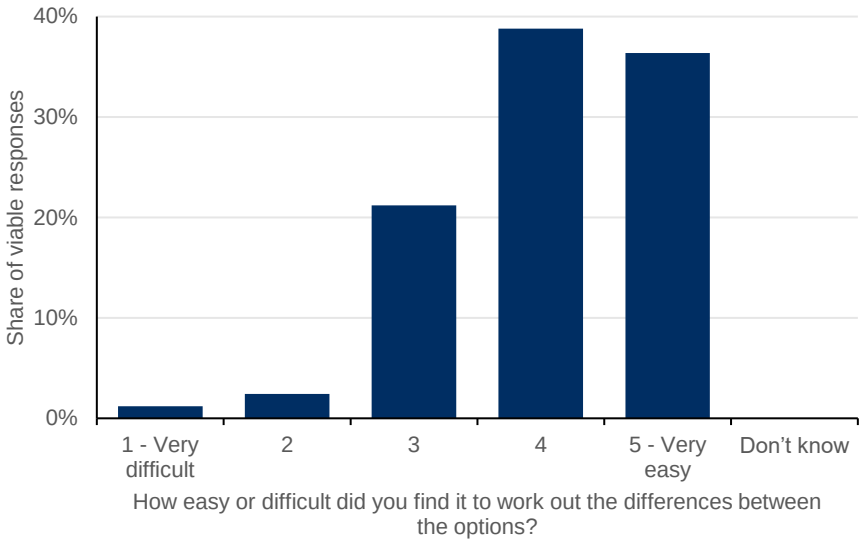
Source: NERA analysis of WTP survey data.

Figure 3.22: 95 per cent of CAM NHH Customers Understood the Attributes Well



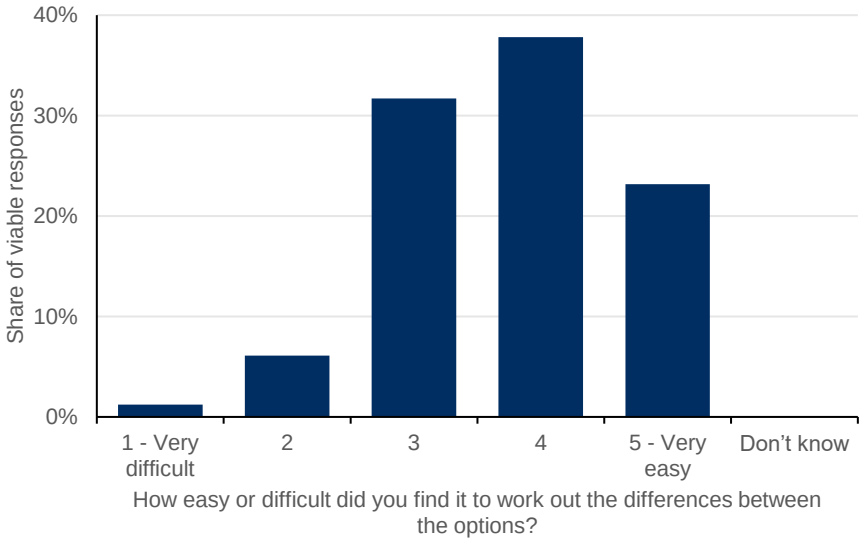
Source: NERA analysis of WTP survey data.

Figure 3.23: 75 per cent of SST NHH Customers Found it Easy to Work Out the Differences Between Options



Source: NERA analysis of WTP survey data.

Figure 3.24: 61 per cent of CAM NHH Customers Found it Easy to Work Out the Differences Between Options



Source: NERA analysis of WTP survey data.

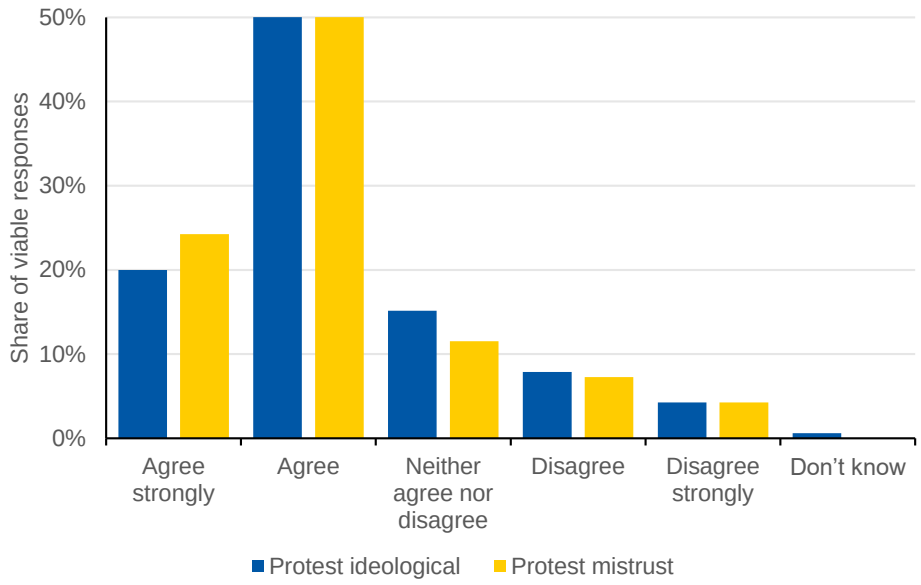
3.4.3.2. Protest attitudes

Among NHH, 18 per cent of SST customers and 17 per cent of CAM customers exhibit at least one of the protest attitudes defined in Section 3.2.3.[43]

We find that 12 per cent of SST customers and 4 per cent of CAM customers exhibit a protest ideological attitude. We find that 12 per cent of SST customers and 15 per cent of CAM customers present a protest mistrust attitude (see Figure 3.25 and Figure 3.26).

During the WTP analysis, we examined how the results changed when excluding the respondents with protest attitudes (See Appendix A.3).

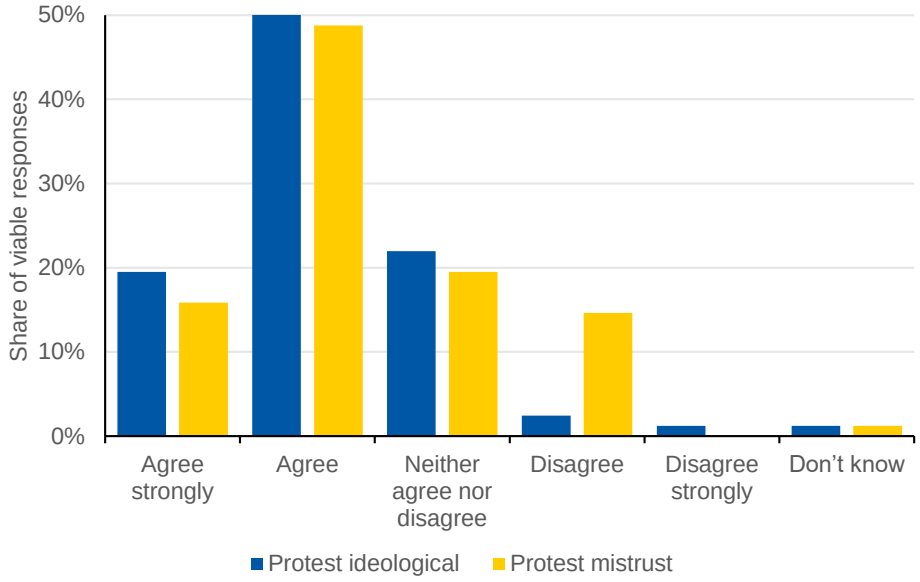
Figure 3.25: 18 per cent of SST NHH Customers Exhibit Protest Attitudes



Source: NERA analysis of WTP survey data.

[43] We consider that a respondent has an ideological protest attitude when they "disagree" or "disagree strongly" with the statement "If (SST/CAM) invests more to provide a better response to these 12 topics then bills will need to increase". We consider that a respondent has a mistrust protest attitude when "disagree" or "disagree strongly" with the statement "If your water bill increases in order to fund service improvements, then you would trust (SST/CAM) to invest more and deliver the service improvements".

Figure 3.26: 17 per cent of CAM NHH Customers Exhibit Protest Attitudes



Source: NERA analysis of WTP survey data.

3.4.3.3. Respondents changing decisions

Among NHH, 36 per cent of SST respondents and 27 per cent of CAM respondents changed at least one choice after reviewing the total impact of their combined decisions on their bill.

This number is larger than for HH customers (19 per cent of SST HH and 14 per cent of CAM HH changed their choices, as discussed in Section 3.2.3.3), suggesting that NHH customers are more sensitive to their total water bill than HH customers.

When we analysed the characteristics of NHH respondents that changed at least one choice, we found that they do not differ substantially from the characteristics of the whole sample. We observe slight differences in terms of size and how they are affected by the current economic situation:[44]

- Larger businesses are more likely to change at least one choice. Medium and large businesses (50+) make up 57 per cent of respondents that change at least one choice, but 46 per cent of the whole sample.[45]
- Businesses that are not negatively impacted by the current economic situation and those that expect market conditions to improve are more likely to change at least one choice after reviewing the total impact of their combined decisions on their bill. In particular, respondents who said that *"business is great at the moment, we are experiencing no negative impacts"* represent 32 per cent of those who changed at least one choice, but only 23 per cent of the whole sample. Respondents who expect that market conditions

[44] Due to the small sample size (60 responses for STT and 22 for CAM), we are not able to analyse each region separately.

[45] Micro and small businesses (less than 50 employees) are less likely to change options; they make up 43 per cent of respondents that change options, but 54 per cent of the whole sample.

"will get a lot better" make up 27 per cent of respondents that change their choices, but only 15 per cent of the whole sample.

It may be that larger businesses and businesses less impacted by the economic conditions were less budget constrained and so they may have been more open to considering service improvements, leading them either to select additional improvements at the end of the survey, or to initially select improvements and later change their selection to remove those improvements. However, as the NHH sample size is small, it is not possible to draw conclusions with confidence.

3.5. Conclusions on Survey Performance

Overall, the survey appears to have been effective in collecting information about customers' preferences that SSCW can rely on in its business planning.

First, we have obtained a sample size in line with targets that is reasonably representative of the SSCW customer base.

- The main stage response rate amongst HH customers was slightly above our expectation at 2.5 per cent. This was further complemented by additional completions gathered via an access panel which were targeted, as far as possible, towards younger HH bill payers and helped to make the final HH sample representative by age. Additionally, the face-to-face vulnerable survey helped to ensure that harder-to-reach customers were included in the final sample. Our final sample of c.1,700 survey completions is a robust number for the WTP analysis we conduct.
- Consequently, the profile of the final achieved HH sample was very close to the profile of HH bill payers both based on demographics and other key account information (i.e. meterage, registration on the PSR, and receipt of the social tariff). The only discrepancies are that metered customers and women are slightly over-represented in the final sample.
- As anticipated, the NHH sample proved challenging to gather given that a direct link between water companies and NHH customers no longer exists. The multi-method approach enabled us to achieve a final sample of c.250 completions, which is acceptable for this sample group.

Second, the evidence on customers' experience of completing the survey suggests that customers were able to understand and engage with the survey, so that the collected data is likely to fairly reflect their actual preferences over options within the choice exercise. In particular, across all three customer groups (HH, FBP, and NHH):

- Most customers understood both the attributes and the options presented to them. Customers typically have more difficulty understanding the options than the attributes, but across all three customer groups fewer than one-fifth of respondents had difficulty understanding the attributes.[46]
- Less than one-third of the sample for each of HH, FBP, and NHH report protest attitudes (less than one-quarter looking at just HH and NHH). This indicates that the majority of

[46] That is, in response to the question "how easy or difficult did you find it to work out the differences between the options", on a scale of 1 to 5, with "1" being "very difficult" and "5" being "very easy", fewer than one-fifth of respondents recorded a 1 or 2.

these respondents accept the premise of the survey, i.e. that for service levels to increase bills must increase, and vice versa. This gives us confidence that these customers have expressed genuine preferences relating to these trade-offs. We also examine the sensitivity of our results for the HH and NHH samples to excluding respondents with protest attitudes from the sample, as reported in Section 4.2.4 and 4.4.4, respectively.

4. Willingness-to-Pay Analysis

This section sets out the details and results of our WTP analysis. Section 4.1 describes the methodological approach, while Sections 4.2 to 4.4 present the results for each of the HH, FBP, and NHH customer groups.

4.1. Methodological Approach

The data collected from the stated preference exercise allows us to estimate the extent to which customers would be willing to pay a specified amount for the specific package of service levels across attributes that they selected.

From a business planning perspective, SSCW needs to know how much a representative average customer would be willing to pay for a change to the level of service for each attribute individually. The need for information about the representative average customer reflects the fact that SSCW cannot typically target service changes to subsets of its customer base, and that the service changes it does implement affect the bills paid by the generality of its customer base. We estimate this willingness to pay (WTP) for a representative average customer using the conceptual framework of utility functions estimated using an econometric tool called the "conditional logit" model.

4.1.1. Utility functions

A utility function is a conceptual framework used in economics to think about customers' general wellbeing. We assume that each customer's utility, or well-being, depends on the quality of water services they receive and on the bill for water services, among other things. We also assume that customers' utility improves as the quality of the service received from the water company improves and falls as the bill increases.[47] We can use this trade-off inherent in the utility function to derive a value for WTP.

Consider a simple example with one service attribute, where we represent the utility of a single customer i as an equation:

$$U_{il} = aQ_l - bB_l + e_{il}$$

Here U_{il} is the utility person i derives from service level l; Q_l is the quality of service at service level l; B_l is the bill associated with service level l; and e_{il} captures the factors that affect utility other than Q_l and B_l but are not known to the researcher.[48] The terms a, b, and c are referred to as the "parameters" of the utility function.

[47] As researchers, we do not observe customers' utility, nor do we observe their utility functions. The assumptions we make here are more precisely described as assumptions about the *representative utility* of the customer, which is a mathematical function specified by us as the researchers to relate observable factors (i.e. the water services received and the water bill) to the customer's underlying and unobservable utility. See Train, K. (2009), *Discrete Choice Methods with Simulation*, Chapter 2: Properties of Discrete Choice Models.

[48] More precisely, e_{il} captures the factors that affect customers' utility but that either (a) are excluded by our assumed mathematical function for representative utility, e.g. customer-specific sensitivities to water service levels or (b) are unobserved by the researcher. This term e_{il} is therefore defined by the assumptions imposed by the researcher, rather than a fundamental feature of customers' true (unobservable) utility.

We can use this utility function to derive WTP for a change in service as follows. Consider that, all else equal, a customer should be willing to change their bill for the sake of a change in service up to the point that the customer's utility is the same with or without the change: that is, the change in utility associated with the change in service and bill is zero. We can write this in terms of the utility function, using Δ to represent changes, as follows:[49]

$$\Delta U_l = a\Delta Q_l - b\Delta B_l$$

$$0 = a\Delta Q_l - b\Delta B_l$$

The WTP is simply the extent to which a customer is willing to change their bill for a given change in service, i.e., the ΔB such that the change in utility from the change in service and bill is zero. Therefore, we derive the WTP by solving the above equation for ΔB:

$$\text{WTP} = \Delta B = \frac{a}{b}\Delta Q$$

4.1.2. Conditional logit model

We do not have data on customers' utility, and so we cannot directly apply the calculations above to estimate WTP. We do have data on customers' choices made in response to our survey questions. By understanding how choices relate to utility, we can use the data we do have to estimate WTP.

Customers will choose one combination of service levels and bill payments, l, over another combination, m, if the utility they derive from l is higher than the utility they derive from m. That is, customer i will choose combination l over m if:

$$U_l > U_m$$

$$aQ_l - bB_l + e_{il} > aQ_m - bB_m + e_{im}$$

$$a(Q_l - Q_m) - b(B_l - B_m) + e_{il} - e_{im} > 0$$

If we make certain assumptions about e_{il} and e_{im}, and we have data on what customers choose when presented with l and m as options, then we can estimate what the values of a and b must be so that the equation above holds true when we observe customers choose l over m. Once we have estimates of the utility function parameters a and b, then we can derive estimates of WTP.

The conditional logit model refers to the standard set of assumptions that economists make about e_{il} and e_{im}. Applying this conditional logit model allows us to derive estimates for a and b and thus derive estimates of WTP.

[49] We omit the term e_{il} here because we are considering the trade-off under the assumption that all else is equal, i.e. that e_{il} is unchanged (so $\Delta e_{il} = 0$).

4.1.3. Model development

The example described in Sections 4.1.1 and 4.1.2 is highly simplified. There is only one service attribute, and customers have only two options to choose between. We do not include other factors, such as demographic characteristics, that might influence utility.[50]

In practice, the conceptual framework of the utility function and the econometric technique of the conditional logit model can handle far more complexity than this simple example. The utility function can be extended to include multiple service attributes and account for the influence of other factors. The conditional logit model can be used to derive estimates for this more complex utility function, given data on choices over a range of options.

4.1.4. Derivation of WTP estimates from conditional logit model estimates

The main model that we estimate assumes that customers have the same WTP for improvements in service across the full range of possible service levels for each attribute. Specifically, we assume that the utility that customer i obtains from a specific combination of service levels and associated bill impacts l can be expressed as:

$$U_{il} = a_1 Q_{1,l} + a_2 Q_{2,l} + \cdots + a_{12} Q_{12,l} + b B_{il}$$

In this model, we have:

- Twelve observable factors of the form $Q_{j,l}$. Each of these captures the service level of attribute j that appears in the specific combination of service levels and associated bill impacts l. The service levels are defined in terms of unit improvements relative to the status quo service level (see Appendix C for further details);
- Twelve parameters of the form a_j, which capture the marginal utility derived from a unit improvement in service level of attribute j;[51]
- The observable factor B_{il} which is the total change in the customer's bill, relative to their current bill, implied by combination l;
- The parameter b, which captures the marginal utility of having a lower bill.

We describe how we estimate the parameters of this model using the collected survey data in Section 4.1.5. Once we have estimated the parameters, we calculate the incremental WTP for service level l of attribute j as $\frac{a_j}{b} \times \Delta Q_{jl}$, using our estimated values of a_j and b and letting ΔQ_{jl} be the change in service of attribute j between the status quo service level and level l. This is line with the expression for WTP derived in Section 4.1.1.

In some cases, the above approach may yield negative WTP for incremental improvements in service for some attributes. This happens if the statistical analysis shows that respondents are more likely, on average, to choose packages with lower service levels for those attributes than

[50] To be precise, we do not include these factors in the *representative utility* function, which is the mathematical function that we as researchers have adopted to represent the observable component of customers' utility.

[51] For attributes where service levels are numerically defined, the incremental improvement is a unit improvement. For example, the service levels of attribute B are defined in terms of test failures; therefore a_B captures the marginal utility the average customer gets from one fewer test failure.

packages with higher service levels, even when the total cost of the package is controlled for; so a_j is negative. However, there is a subtle difference between this pattern of choice behaviour and a true negative WTP for incremental improvements.

A true negative WTP for incremental improvements would imply that respondents want to be compensated for incremental improvements in service. This is fundamentally implausible and also not a preference that any individual survey respondent has actually expressed; it was impossible for respondents to express such a preference because the survey was constructed so that the improved service level always increased the customer's bill. Therefore, when the model produces a negative WTP for incremental improvements we instead assume a zero WTP for incremental improvements.

4.1.5. Sample used for estimation

If we were to approach our analysis using standard WTP techniques, we would face significant computer processing challenges. The standard WTP technique is to build a single dataset containing a row for each possible option that each respondent could have chosen.

The standard technique works well when using stated preference exercises that ask respondents to choose between two pre-defined packages, as described in Section 2.4.2. Each respondent has only two options per round, and so the number of rows in the dataset is equal to the 2 × the number of rounds × the number of respondents. With say twelve rounds and a sample size in the thousands, this would generate a dataset on the order of a few hundred thousand rows, which modern statistical software can easily handle.

The standard technique runs into problems when using our new stated preference exercise, that allows respondents to build their own preferred package. In this setting, each respondent faces 33,750,000 possible options.[52] Therefore, if we were to build a dataset to use in our WTP analysis of all possible options for each respondent, we would have a dataset of several billion rows. This is too large for standard statistical software to process efficiently.

We avoid these problems by using a reduced dataset that contains, for each respondent, the option that the respondent did select as well as a random selection of the options that the respondent did not select. This approach was initially proposed by econometricians in the 1970s in the context of studying the choice of housing, where the set of possible options is near limitless.[53] As long as we include a sufficient number of the non-selected options, and do this in a random way, this approach produces results that closely approximate the results that we would obtain using the standard complete dataset.

For HH customers, we report the results of models estimated using c. 50,000 non-selected options per respondent, equivalent to 0.15 per cent of the possible combinations. This number strikes a good balance between model accuracy and feasibility (larger samples mean the model takes longer to estimate, given the large number of respondents).[54] For FBP, we

[52] There are three attributes with three possible choices, one attribute with four possible choices, and eight attributes with five possible choices, leading to a total of $3^3 \times 4^2 \times 5^7 = 33{,}750{,}000$ possible combinations of choices.

[53] McFadden, D. (1977), Modelling the Choice of Residential Location, Cowles Foundation Discussion Paper No. 477

[54] We looked at the difference between estimated WTP using this 0.15 per cent sample (50,000 non-selected options) and a 1 per cent sample (337,500 non-selected options). The difference between the estimated WTP using 50,000 and 337,500 non-selected options is always less than 0.8 per cent of the estimated value of WTP for SST, and less than 0.3

report the results estimated using c. 337,500 non-selected options per respondent, equivalent to 1 per cent of the total combinations of options. For NHH, we report the results of models estimated using c. 135,000 non-selected options per respondent, equivalent to 2 per cent of the total options.[55]

To produce this reduced dataset, we use the following approach:

1. For each respondent, we start with a dataset containing the single option that the respondent actually selected.
2. We then extend the respondent-specific dataset by randomly generating a fixed number of draws from the set of possible options (50,000 draws).[56] We drop any duplicates so that for each respondent, any given option appears in the dataset only once.
3. We combine the respondent-specific datasets into a single dataset for our WTP analysis.

Due to the randomisation, the number of duplicate draws differs across respondents and so the final number of rows differs across respondents. This does not create a problem for our analysis: it is not necessary to have an equal number of observations for each respondent as long as the ex ante probability of any single non-selected option appearing in the final dataset is equal across non-selected options and across respondents.

When using random sampling techniques, it is standard practice to account for the possibility that results could be sensitive to the particular random sample of non-selected options used (referred to as testing sensitivity to the random seed). We account for this by estimating each model using four different random seeds and assessing whether the choice of seed affects the result. We find that it does not: the per-unit WTP is consistent across all four seeds. Rather than choosing the results from any one seed, the results we report take the average estimated WTP across all four seeds.

4.2. Results for Household Customers

In this section, we examine household customers' WTP for service changes. We examine WTP estimates from a linear model, to evaluate whether customers are willing to pay for incremental improvements in service for the different attributes.

4.2.1. Descriptive statistics on household customers choices

In this section, we analyse the final choices made by customers for each attribute. This analysis is based on the full sample of 1,709 household responses, of which 1,162 are from

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per cent of the estimated value of WTP for the attributes that are significant at the 5 per cent level of significance in CAM. While it was not possible to estimate a model with a larger percentage of non-selected options for this study, for studies with fewer attributes we have estimated models with a larger percentage of non-selected options and found that the results are consistent between a 1 per cent sample and larger samples.

[55] For NHH, we do not use the attribute A (customer service). Therefore, the total number of possible combinations of choices is: $3^3 \times 4^2 \times 5^6 = 6{,}750{,}000$.

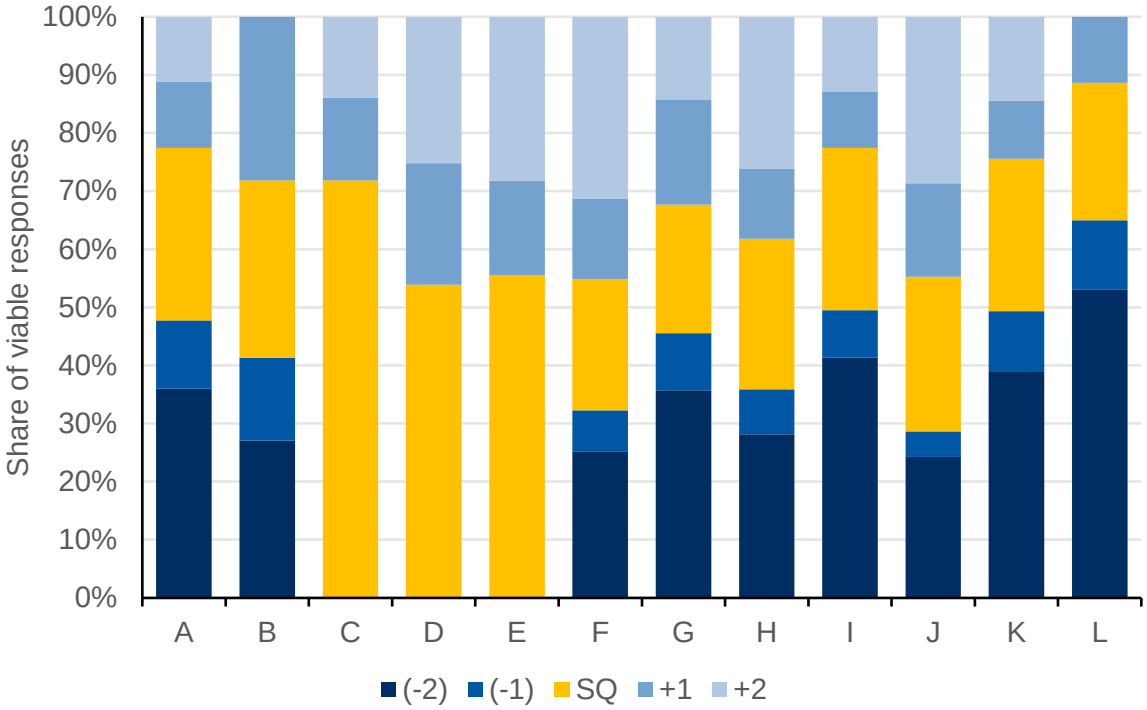
[56] To implement this, we select from a uniform distribution over integers representing the available service levels. For the eight attributes where all five service levels are available, this draw is between 1 and 5 inclusive; for service levels with fewer attributes, it is over the relevant integers. Each integer is then the level chosen for that attribute. This generates one of the 42,187,500 possible combination options, with each combination option equally probable.

SST and 547 are from CAM. We examine customers' final choices for question 3, i.e. after they have seen the summary screen of their initial decisions in question 2 (and the total impact of those choices on their bill) and had the opportunity to revise their choices. Figure 4.1 and Figure 4.2 show these choices for SST and CAM household customers, respectively.

- In SST, we see from Figure 4.1 that there is no attribute for which the two improvement options (i.e. options +1 and +2, shown in light blue) are preferred by a majority of customers; that is, the combination of the two does not cross the 50 per cent threshold. This suggests that appetite for improvement in service is limited in SST. However, there is only one attribute for which the majority of customers select a deterioration in service (attribute L, risk of a temporary use ban). Therefore, although appetite for improvement is limited, customers may have a positive per-unit valuation for the attribute in that they want to avoid deteriorations and maintain the status quo service level.
- In CAM, there is slightly more appetite for improvement in service than we observe in SST. Comparing Figure 4.2 against Figure 4.1, we observe that for each attribute, customers are slightly more likely to choose improvements and slightly less likely to choose deteriorations. In particular, over 50 per cent of customers chose one of the two improvement options (i.e. options +1 and +2, shown in light blue in the figures) for three attributes: E (lead pipes), F (water lost to leakage from pipes) and J (supporting nature and wildlife). As in SST, we find that a majority of customers choose deteriorations in attribute L (risk of a temporary use ban).

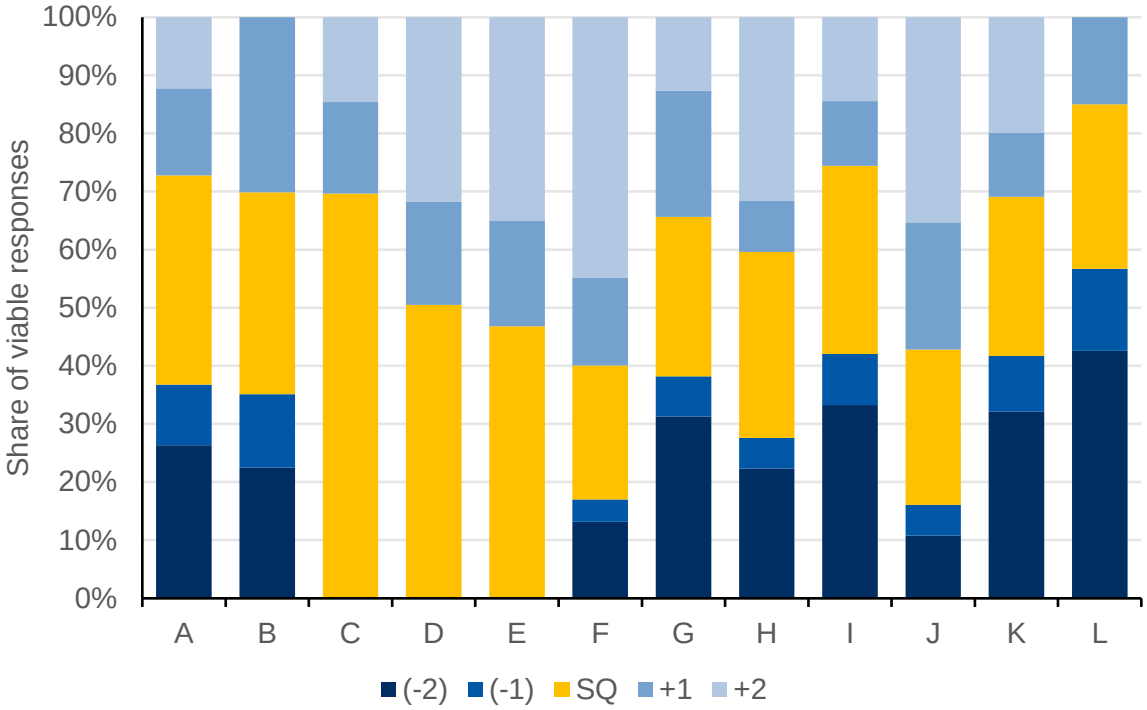
It is particularly interesting that customers appear to be willing to accept a heightened risk of temporary use bans (TUBs) following a summer in which such bans were imposed in some regions of the UK. Customers may not have seen the recent TUBs as particularly inconvenient and may therefore be willing to accept TUBs with greater frequency. There is also some evidence from the free text responses that customers view TUBs positively. Customers suggest that TUBs should be used as a tool to manage water resources and to convey to customers the need for behaviour adaptation in drought situations (see Section 4.2.2 for examples).

Figure 4.1: The Attributes for Which SST Customers were Least Likely to Choose Deteriorations are Attributes F, H, and J



Source: NERA analysis of SSCW WTP survey

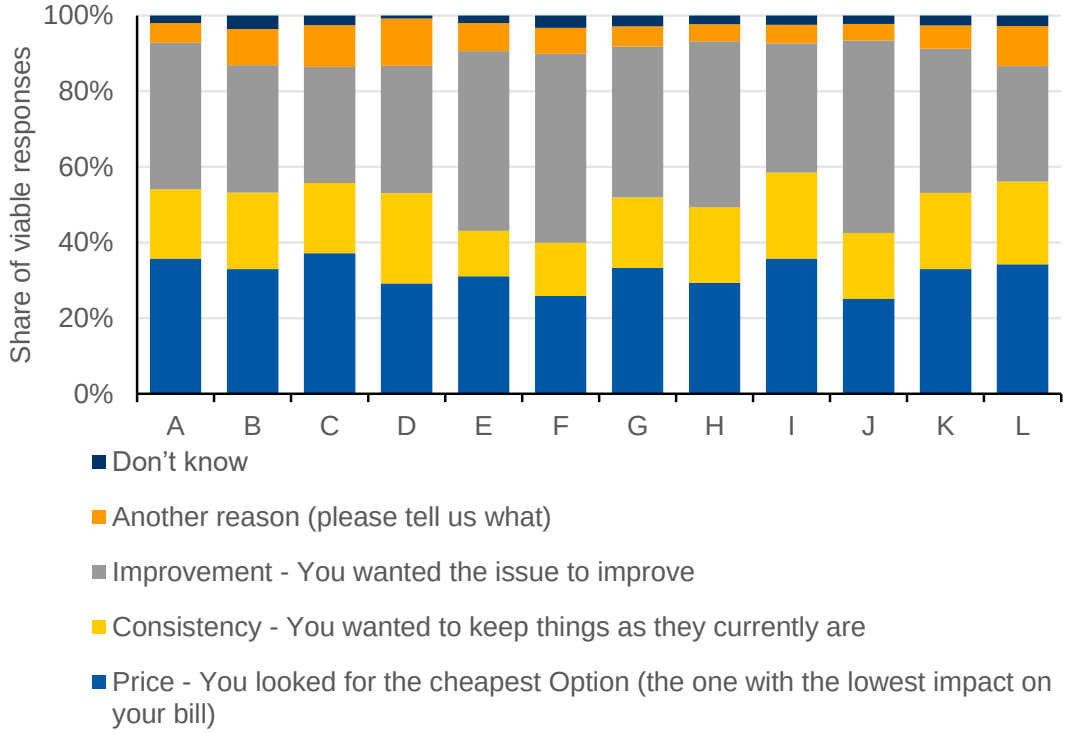
Figure 4.2: A Majority of CAM Customers Chose Improvements for Three Attributes



Source: NERA analysis of SSCW WTP survey

We also asked customers about the motivations for the choices they made. The question on motivation for each attribute directly followed the choice exercise for that attribute.[57] Figure 4.3 and Figure 4.4 show customer responses to the question on motivation for SST and CAM, respectively. In both regions, customer motivations broadly align with observed patterns of choice. Customers most frequently selected "improvement" as a motivation for those attributes where they were least likely to select deteriorations (i.e. attributes F and J). Comparing across regions, customers in SST more frequently said they were motivated by lower prices while customers in CAM more frequently said they were motivated either by consistency or "another reason".

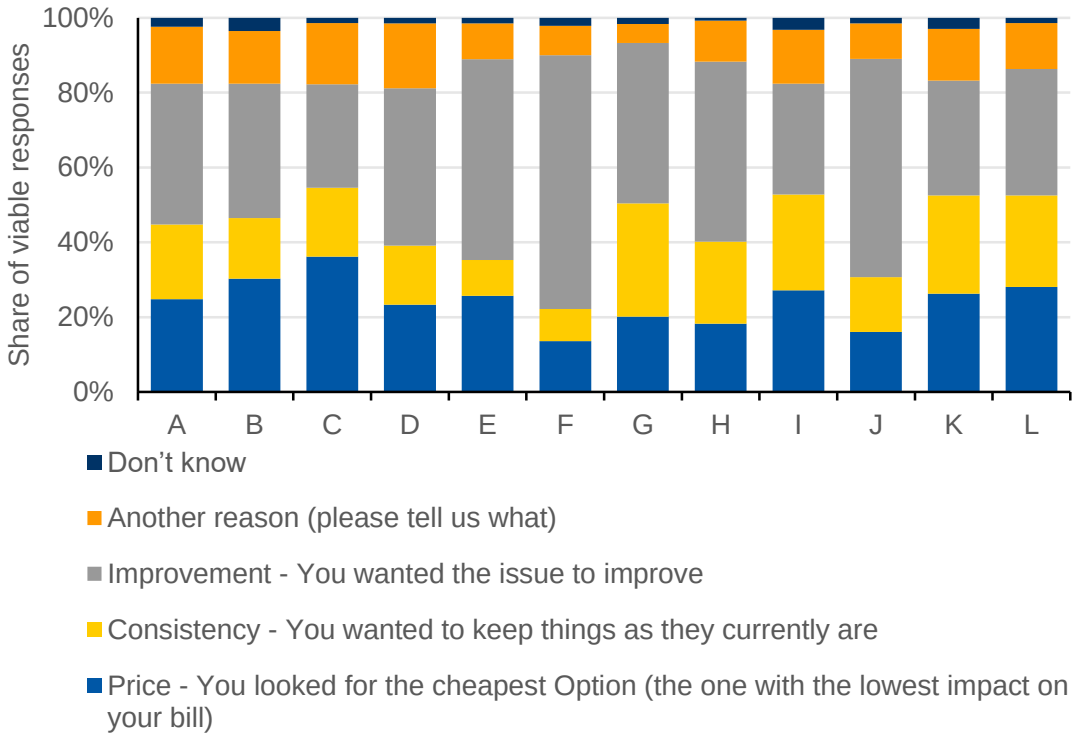
Figure 4.3: Many SST Customers' Choices were Motivated by Price



Source: NERA analysis of SSCW WTP survey

[57] To reduce the overall length of the survey, we only asked about motivations after every fourth attribute. Since attributes are displayed in a random order for each customer, we have answers to the motivation question for each attribute from one-quarter of the sample.

Figure 4.4: Many CAM Customers' Choices were Motivated by Improvement



Source: NERA analysis of SSCW WTP survey

4.2.2. Summary of WTP results

We find that household customers in both SST and CAM are willing to pay for improvements in service for four of the twelve attributes examined. The four attributes for which customers are willing to pay for improvement in service relate to adverse outcomes that may substantially inconvenience household customers, leakage, or environmental protection. These four attributes are:

- Attribute B (risk of a temporary "do not drink" notice),
- Attribute F (water lost to leakage from pipes),
- Attribute H (chance of property flooding from a burst pipe), and
- Attribute J (supporting nature and wildlife).

Attributes B and H relate to adverse outcomes that could be a source of substantial inconvenience (inability to use tap water for 2-3 days, or damage to the ground floor of a property). Attribute F relates to leakage. Attribute J relates to environmental protection.

For each of the attributes above, the finding of positive WTP is significant at the 5 per cent significance level.

Comparing customers between SST and CAM, we find that customers in the CAM region typically have higher WTP than customers in the SST region. In the CAM region, we also identify positive willingness to pay for improvement in three additional attributes:

- Attribute A (customer service)

- Attribute D (hard water supply)
- Attribute G (issues with tap water colour, taste, or smell)

Among these three attributes, the only WTP estimate that is significant at the 5 per cent significance level is attribute D.[58] We understand from SSCW that the CAM region has harder water than the SST region and that in previous research SSCW has found lower satisfaction scores for this attribute in the CAM region than the SST region; this may explain why CAM customers are more willing to pay for improvement in water hardness than SST customers. The finding of positive WTP for additional attributes in CAM is consistent with the fact that customers in the CAM region typically have higher incomes, so those customers may also have more disposable income that they are willing to spend on their water bills.

Across both regions, customers are not willing to pay for improvement in service in the remaining five attributes. One possible explanation for the lack of WTP for two of the attributes is that they relate to adverse outcomes that are not sources of material inconvenience to customers. These are:

- Attribute I (low water pressure), which is described as lasting up to 6 hours;
- Attribute K (unplanned short interruptions to water supply), which are described as lasting 3-6 hours.

Customers are also not willing to pay for improvement for three further attributes. These are as follows:

- Attribute C (installing 'smart' water meters). Customers may not be willing to pay for improvement in this attribute if they do not view smart metering as a benefit (e.g. due to concerns around monitoring and privacy, or because they would prefer not to have a meter at all).
- Attribute E (lead pipes).
  - This result is somewhat counterintuitive in the CAM region, given that we observe in Figure 4.2 that a slight majority of customers (53 per cent) selected improvements for this attribute. We do identify positive WTP for attribute E in the CAM region in a number of our modelling sensitivities, including the model excluding respondents with protest attitudes and a model which looks at improvement overall rather than distinguishing between (+1) and (+2) improvements. We recommend that SSCW consider the results of these sensitivities in its valuation analysis.
  - More generally in the SST region and overall, the lack of positive WTP may arise if customers are not willing to pay through their water bill for something that they see as the responsibility of the customer rather than the water company (they were told *"most of these pipes are owned by the customer and not your water company"*). This hypothesis is supported by some of the free text responses, for example one respondent said that *"if most lead pipe is on the customers' property then the house owner should pay"*. Some respondents also expressed views consistent with an "ideological protest" motivation (see Section 3.2.3.2 for an explanation of how we

[58] The p-values for attributes A and G are 0.97 and 0.37, respectively.

define this), saying that the company should be responsible for the safety of the water and *"individuals shouldn't be paying for drinking water to be safe"*.

- Attribute L (risk of a temporary use ban, including hosepipes).
  - As discussed in Section 4.2.1, customers may feel that recent TUBs were not particularly inconvenient and may therefore be willing to accept TUBs with greater frequency. Customers' answers to the free text questions support this hypothesis. Most respondents answering these questions suggest that a TUB every 20-30-40 years is *"perfectly acceptable"*.
  - Customers' answers also suggest that they view bans as a good way to manage the water supply. Respondents said that TUBs *"help reduce the amount of water used"*, that *"(...) if the reservoirs are emptying then (...) a ban should be imposed"*, and that people should *"understand they need to adapt if in _temporary_ drought".*
  - There is also evidence that some customers did not select improvements in this attribute because they prioritised other attributes. For example, one customer writes *"having no water for a short period of time is not as important as reducing waste due to water leaks".*

Overall, these findings on household customer preferences are consistent with results obtained from other stated preference willingness to pay surveys we have conducted at PR24. That is, we typically find that customers are willing to pay for improvement in environmental attributes or attributes that relate to particularly adverse and inconvenient outcomes, but less willing to pay for improvement in other attributes.

4.2.3. Estimated values of WTP for main model

We report the specific willingness-to-pay values underpinning the results described above in Table 4.1 to Table 4.5. For example, Table 4.1 reports the modelled household customer WTP to move from the status quo service level to a specific alternative, for each of SST and CAM, for attributes A to C. The results should be read as follows:

- For attribute B, for SST customers we report a value of 0.74 for the service level "1 property per year receives 'do not drink' notice". The interpretation is that the average SST customer would be willing to pay an extra £0.74 to reduce the number of properties receiving a 'do not drink' notice from two to one. The reported value of *minus* 4.43 for the service level "8 properties per year receive 'do not drink' notice" can be interpreted as showing that the average SST customer would need to be compensated by a £4.43 reduction in their bill if the number of properties receiving a 'do not drink' notice increased from two to eight.
- For attribute C, for CAM customers we report a value of *minus* 2.42 for the service level "74% of properties have an operational 'smart' meter by 2030". This is a negative willingness to pay value. This means that customers are not WTP for improvements in service.

Table 4.2 to Table 4.4 present similar results for the remaining nine attributes. The interpretation of the individual values follows the pattern described above.

Each of the values reported in Table 4.1 to Table 4.4 is derived by combining a *per-unit* WTP value with the difference, in relevant service units, between the status quo service level and

the alternative service level in question. We also report the underlying per-unit WTP value in Table 4.5. We report a per-unit WTP for each attribute and for each region, as well as a combined WTP for the two regions. For example:

- For attribute B, for SST customers we report a per-unit WTP of 0.74. This means that customers are WTP an additional £0.74 on their water bill for a one-unit incremental improvement in service. In the case of attribute B, this is per unit reduction in the number of properties that receive a 'do not drink' notice (relative to the status quo service level). We can see how this corresponds to the values reported in Table 4.1. The small improvement (+1 service level) involves a reduction from two properties to one properties, i.e. a one-unit improvement, and so the WTP is £0.74. The large deterioration (-2 service level) involves an increase from two properties to eight properties, i.e. a six-unit deterioration, and so the WTP is *minus* £4.43 (approximately equal to 0.74 x 6 = 4.43, with the slight discrepancy due to rounding).
- For attribute D, for CAM customers we report a per-unit WTP of 0.03. This means that CAM customers are WTP an additional £0.03 on their water bill for a one-unit incremental improvement in service. In the case of attribute D, this is per thousand properties that benefit from investment. Moving from the status quo to the large improvement (+2 service level) would mean that 51,000 additional properties benefit from investment, i.e. a 51-unit improvement, so the WTP for the large improvement reported in Table 4.2 is £1.50 (approximately equal to 0.03 x 51 = 1.50).

The values for the two regions combined are based on a single model that uses the raw data for both regions to estimate a single WTP value. There is a caveat to the results based on this model, which arises because the service levels offered differ across the two regions for some attributes. Since we estimate the model in terms of change relative to the status quo, the validity of the combined model relies on an assumption that customers only care about *change* relative to the status quo, rather than the actual level of service. For this reason, as well as the fact that customers in the two regions may have different preferences, we recommend that wherever possible SSCW uses the separate results for the two service regions to select the levels of service provided to those service regions separately.

Table 4.1: Household Customer Main Model WTP to Switch from SQ (Attributes A-C)

		South Staffs (SST)		Cambridge (CAM)	
Attribute		**Service Level**	**WTP to switch from SQ (£)**	**Service Level**	**WTP to switch from SQ (£)**
A	Customer Service	2 in 3 customers (60%) wait more than 10 minutes	2.17	2 in 3 customers (60%) wait more than 10 minutes	-0.01
		1 in 2 customers (50%) waits more than 10 minutes	1.45	1 in 2 customers (50%) waits more than 10 minutes	-0.01
		1 in 3 customers (30%) waits more than 10 minutes		1 in 3 customers (30%) waits more than 10 minutes	
		1 in 6 customers (20%) waits more than 10 minutes	-0.72	1 in 6 customers (20%) waits more than 10 minutes	0.00
		1 in 20 customers (5%) waits more than 10 minutes	-1.81	1 in 20 customers (5%) waits more than 10 minutes	0.01
B	Risk of a temporary "do not drink" notice	8 properties per year receive "do not drink" notice	-4.43	8 properties per year receive "do not drink" notice	-5.79
		4 properties per year receive "do not drink" notice	-1.48	4 properties per year receive "do not drink" notice	-1.93
		2 properties per year receive "do not drink" notice		2 properties per year receive "do not drink" notice	
		1 property per year receives "do not drink" notice	0.74	1 property per year receives "do not drink" notice	0.97
		N/A		N/A	
C	Installing 'smart' water meters	N/A		N/A	
		N/A		N/A	
		24% of properties have an operational 'smart' meter by 2030		66% of properties have an operational 'smart' meter by 2030	
		42% of properties have an operational 'smart' meter by 2030	-3.78	74% of properties have an operational 'smart' meter by 2030	-2.42
		60% of properties have an operational 'smart' meter by 2030	-7.55	82% of properties have an operational 'smart' meter by 2030	-4.84

Source: NERA analysis of SSCW WTP survey

Table 4.2: Household Customer Main Model WTP to Switch from SQ (Attributes D-F)

	South Staffs (SST)		Cambridge (CAM)	
Attribute	**Service Level**	**WTP to switch from SQ (£)**	**Service Level**	**WTP to switch from SQ (£)**
D Hard water supply	N/A		N/A	
	N/A		N/A	
	South Staffs Water does not invest in water softening		Cambridge Water does not invest in water softening	
	South Staffs Water contributes to the cost of installing water softening devices in 5,000 properties	-0.02	Cambridge Water contributes to the cost of installing water softening devices in 2,600 properties	0.08
	South Staffs Water softens the water supply for 171,200 properties through a large investment in a new treatment works	-0.77	Cambridge Water softens the water supply for 51,000 properties through a large investment in a new treatment works	1.50
E Lead pipes	N/A		N/A	
	N/A		N/A	
	2 in 8 properties will still have a lead supply pipe by 2030		2 in 8 properties will still have a lead supply pipe by 2030	
	2 in 9 properties will still have a lead supply pipe by 2030	-2.38	2 in 9 properties will still have a lead supply pipe by 2030	-0.37
	2 in 10 properties will still have a lead supply pipe by 2030	-4.29	2 in 10 properties will still have a lead supply pipe by 2030	-0.66
F Water lost to leakage from pipes	24% of treated water lost to leakage	-2.42	19% of treated water lost to leakage	-5.59
	22% of treated water lost to leakage	-1.21	17% of treated water lost to leakage	-2.80
	20% of treated water lost to leakage		15% of treated water lost to leakage	
	18% of treated water lost to leakage	1.21	13% of treated water lost to leakage	2.80
	16% of treated water lost to leakage	2.42	11% of treated water lost to leakage	5.59

Source: NERA analysis of SSCW WTP survey

Table 4.3: Household Customer Main Model WTP to Switch from SQ (Attributes G-I)

	South Staffs (SST)		Cambridge (CAM)	
Attribute	**Service Level**	**WTP to switch from SQ (£)**	**Service Level**	**WTP to switch from SQ (£)**
G Issues with tap water colour, taste, or smell	1-in-23 properties per year experience issues with tap water	0.87	1-in-42 properties per year experience issues with tap water	-0.27
	1-in-25 properties per year experience issues with tap water	0.27	1-in-44 properties per year experience issues with tap water	-0.15
	1-in-26 properties per year experience issues with tap water		1-in-47 properties per year experience issues with tap water	
	1-in-29 properties per year experience issues with tap water	-0.69	1-in-52 properties per year experience issues with tap water	0.22
	1-in-32 properties per year experience issues with tap water	-1.25	1-in-58 properties per year experience issues with tap water	0.42
H Chance of property flooding from a burst pipe	55 properties per year flooded due to a burst pipe	-0.64	14 properties per year flooded due to a burst pipe	-2.05
	53 properties per year flooded due to a burst pipe	-0.32	13 properties per year flooded due to a burst pipe	-1.03
	51 properties per year flooded due to a burst pipe		12 properties per year flooded due to a burst pipe	
	46 properties per year flooded due to a burst pipe	0.80	11 properties per year flooded due to a burst pipe	1.03
	40 properties per year flooded due to a burst pipe	1.77	10 properties per year flooded due to a burst pipe	2.05
I Low water pressure	2-in-24 properties experiences low pressure per year	1.74	2-in-24 properties experiences low pressure per year	0.74
	2-in-25 properties experiences low pressure per year	0.83	2-in-25 properties experiences low pressure per year	0.36
	2-in-26 properties experiences low pressure per year		2-in-26 properties experiences low pressure per year	
	2-in-29 properties experiences low pressure per year	-2.16	2-in-29 properties experiences low pressure per year	-0.92
	2-in-33 properties experiences low pressure per year	-4.42	2-in-33 properties experiences low pressure per year	-1.89

Source: NERA analysis of SSCW WTP survey

Table 4.4: Household Customer Main Model WTP to Switch from SQ (Attributes J-L)

	South Staffs (SST)		Cambridge (CAM)	
Attribute	**Service Level**	**WTP to switch from SQ (£)**	**Service Level**	**WTP to switch from SQ (£)**
J Supporting nature and wildlife	740 acres (equivalent to 420 football pitches) protected and enhanced	-1.38	0 acres (equivalent to 0 football pitches) protected and enhanced	-1.66
	980 acres (equivalent to 550 football pitches) protected and enhanced	-0.77	10 acres (equivalent to 6 football pitches) protected and enhanced	-1.38
	1280 acres (equivalent to 720 football pitches) protected and enhanced		60 acres (equivalent to 33 football pitches) protected and enhanced	
	2030 acres (equivalent to 1150 football pitches) protected and enhanced	1.92	200 acres (equivalent to 110 football pitches) protected and enhanced	3.88
	2450 acres (equivalent to 1390 football pitches) protected and enhanced	3.00	270 acres (equivalent to 150 football pitches) protected and enhanced	5.81
K Unplanned short interruptions to water supply	1 in 115 properties per year	1.89	1 in 115 properties per year	0.10
	1 in 120 properties per year	1.20	1 in 120 properties per year	0.06
	1 in 130 properties per year		1 in 130 properties per year	
	1 in 140 properties per year	-1.03	1 in 140 properties per year	-0.05
	1 in 160 properties per year	-2.71	1 in 160 properties per year	-0.14
L Risk of temporary use ban, including hosepipes	Temporary use ban occurs once every 30 years	4.99	Temporary use ban occurs once every 10 years	1.50
	Temporary use ban occurs once every 35 years	2.14	Temporary use ban occurs once every 15 years	0.50
	Temporary use ban occurs once every 40 years		Temporary use ban occurs once every 20 years	
	Temporary use ban occurs once every 45 years	-1.66	Temporary use ban occurs once every 25 years	-0.30
	N/A		N/A	

Source: NERA analysis of SSCW WTP survey

Table 4.5: Household Customer Main Model WTP per Unit Change from SQ

			WTP per unit change from SQ (£)		
Attribute		**Unit**	**SST**	**CAM**	**Combined**
A	Customer service	reduction in the percentage of costumers that wait more than 10 minutes	-0.07	0.00	-0.04
B	Risk of temporary “do not drink” notice	reduction in number of properties that received "do not drink" notice	0.74	0.97	0.80
C	Installing “smart” water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.21	-0.30	-0.17
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-0.004	0.03	-0.001
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-0.86	-0.13	-0.51
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.61	1.40	0.82
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.17	0.11	-0.09
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.16	1.03	0.18
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.27	-0.12	-0.19
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.03	0.28	0.03
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.19	-0.01	-0.10
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-5.99	-0.30	-0.59

Source: NERA analysis of SSCW WTP survey

4.2.4. Robustness to alternative specifications

In addition to the main linear models for household customers, the methodology of which is described in Section 4.1.3 and the results of which are described above in Section 4.2.2 and 4.2.3, we estimated a number of alternative specifications using the household customer data. These included versions of the main modelling approach where we account for different demographic and billing characteristics and alternative modelling approaches as suggested by the peer reviewer (see Section 2.7.3).

Overall, the qualitative results from each of these alternative specifications are broadly similar to the results of the main specification. Customers across the board exhibit more willingness to pay for environmental attributes, leakage, and attributes related to particularly adverse outcomes. There are some differences in results, which we discuss further below.

In this section, we provide a high-level summary of the results of our alternative specifications. The estimated WTP values from the alternative specifications are presented in Appendix A.1.

4.2.4.1. Main model estimated on customer sub-groups

We estimated the same linear model that we estimated on the full household dataset on sub-groups of the household data, split according to demographic and billing characteristics. We also estimated the linear model excluding respondents that exhibit protest attitudes, according to the definitions discussed in Section 3.2.3. These exercises allowed us to examine how willingness-to-pay differed across different groups.

At a high level, we find that customers in the C2DE socio-economic group, customers without a water meter, and customers defined as vulnerable have lower WTP and in some cases are WTP for improvement in fewer attributes.[59] We also find that some customer sub-groups are WTP for additional attributes, in particular, customers in the ABC1 socio-economic group and customers who do not exhibit protest attitudes.

The results of this exercise are as follows, for each characteristic:

- **Gender:** for each of SST and CAM, we estimated a model including only women and a model including only men. There is no systematic difference between men and women in their WTP for improvement. For some attributes we observe that men have higher WTP than women (e.g. for attribute F, water lost to leakage from pipes) while for others we observe that women have higher WTP than men (e.g. for attribute H, chance of property flooding from a burst pipe). However, both genders are WTP for improvement in the same set of attributes that we identified from the main household model, except that women in CAM are not WTP for attributes A and G.
- **Socio-economic group:** for each of SST and CAM, we estimated a model including only individuals in the ABC1 socio-economic group and a model including only individuals in the C2DE socio-economic group. As expected, we observe that individuals in the ABC1 group have systematically higher WTP than individuals in the C2DE group. Broadly speaking, individuals in both categories are WTP for the attributes that we identified household customers were WTP for in Section 4.2.2. However, there are some differences:
  - C2DE customers in the SST region are not WTP for attribute H (chance of property flooding from a burst pipe), and their WTP for attribute F (water lost to leakage from pipes), although positive, is not statistically significant at the 5 per cent level. Therefore, the two attributes for which we can say with confidence that they have positive WTP are attribute B (risk of temporary 'do not drink' notice) and attribute J (supporting nature and wildlife).

[59] We provide details on our approach to defining vulnerability, developed in conjunction with SSCW, in Appendix A.1.2.

  - C2DE customers in the CAM region are not WTP for attributes A (customer service), D (hard water supply), or G (issues with tap water colour, taste, or smell). Their WTP for attribute H (chance of property flooding from a burst pipe), although positive, is not statistically significant at the 5 per cent level. Therefore, the three attributes for which we can say with confidence that these customers have positive WTP are attributes B, F, and J.
  - ABC1 customers in the SST region exhibit positive WTP for all four attributes identified in Section 4.2.2. They also have positive WTP for attribute G (issues with tap water colour, taste, and smell), although it is not statistically significant at the 5 or 10 per cent level.
  - ABC1 customers in the CAM region exhibit positive WTP for all seven attributes identified in Section 4.2.2. They also have positive but not statistically significant WTP for two further attributes: attribute E (lead pipes), and attribute K (unplanned short interruptions to water supply).

- **Metering:** for each of SST and CAM, we estimated a model including only individuals with a metered water supply and a model including only individuals without a metered water supply. Individuals with a meter typically have higher WTP than unmetered customers, with one exception: unmetered customers in CAM have higher WTP than metered customers for improvements in attribute D (hard water supply). We find that customers with and without meters are WTP for improvement in the same sets of attributes identified for the full household sample in Section 4.2.2, except that unmetered customers in CAM are not willing to pay for improvement in attribute A (customer service), although this finding is not significant at the 5 or 10 per cent significance level.
- **Vulnerability:** we agreed a set of criteria to identify individuals that were either financially or socially vulnerable with SSCW, which is described in detail in Appendix A.1.2. For both SST and CAM, we estimated three different models: a model including only those identified as financially vulnerable, a model including only those identified as socially vulnerable, and a model including those identified as either financially or socially vulnerable.
  - Looking at the model estimated on the financially vulnerable, we observe lower WTP than we did for the full household sample. Similar to the results of the C2DE modelling exercise, we observe that in both regions financially vulnerable customers no longer exhibit positive WTP for attribute H (chance of property flooding from a burst pipe). In SST they are not WTP for attribute F (water lost to leakage from pipes). In CAM they are not WTP for attributes A (customer service), D (hard water supply), and G (issues with tap water colour, taste, and smell).
  - Looking at the model estimated on the socially vulnerable, the results stand in contrast to the findings for the financially vulnerable. Socially vulnerable customers in both regions have higher WTP than household customers overall for attributes H (chance of property flooding from a burst pipe), and J (supporting nature and wildlife). For the remaining attributes, socially vulnerable customers have lower WTP than household customers overall in both regions. In CAM, they are not WTP for attributes A (customer service) and G (issues with tap water colour, taste, and smell).
- **Excluding customers who lack understanding:** for each of SST and CAM, and for both regions combined, we estimated a model excluding respondents who reported that they

had difficulty understanding either the options or the topics. Specifically, we excluded those who found it "difficult" or "very difficult" to work out the differences between the options, and those who understood the 12 topics "not very well" or "not at all well" (see Section 3.2.3 for further information). When we restrict the HH sample in this way, the per-unit valuations increase (or become less negative) for all attributes. We also see positive WTP for more attributes, as follows:

  - In CAM, the WTP estimate for attribute K (unplanned short interruptions to water supply) is positive but not significant at the five per cent significance level.[60]
  - When combining both regions, the WTP estimate for attribute D (hard water supply) is positive but not significant at the five per cent significance level.[61]

- **Excluding potential social tariff customers:** for each of SST and CAM, and for both regions combined, we estimated a model excluding customers who are currently on a social tariff as well as a group of customers who could potentially be eligible for a social tariff if SSCW were to amend the eligibility criteria. We agreed with SSCW to define customers potentially eligible for a social tariff as those with a yearly income under £23,000. As expected, when we restrict the HH sample in this way, the WTP estimates for all attributes increase.[62] We also see positive WTP for a larger number of attributes, as follows:
  - In the CAM area, WTP for attributes K (unplanned short interruptions to water supply) and L (risk of temporary use ban) is positive, but this result is not significant at the five per cent significance level.[63]
  - When combining both regions, WTP for attributes D (hard water supply) and G (issues with tap water) is positive but this result is not significant at the five per cent significance level.[64]
- **Restricted to those with hard water:** for each of SST and CAM, and for both regions combined, we estimated a model excluding those respondents who reported problems due to having a hard water supply.[65] As expected, for this sample we find that there is positive WTP for attribute D (hard water supply) in both regions and in the combined model which is significant at the 5 per cent level. We also observe positive WTP for attributes related to water supply quality for which we did not identify positive WTP in the sample as a whole. Since our hard water measure is self-reported, it may be that customers who perceive more problems with their water supply are more willing to pay for improvement in their water supply.

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60 The p-value is 0.58.

61 The p-value is 0.77.

62 WTP for attribute J in the CAM area does not increase, but the difference is marginal (per-unit WTP changes from £0.28 to £0.27).

63 The p-values are 0.15 and 0.56, respectively.

64 The p-values are 0.44 and 0.65, respectively.

65 We restricted the sample to people who answered "yes" to a question asking whether they have experienced "a problem relating to limescale in the water – such as a failure of an appliance, or stained taps" in the last 2 to 3 years.

  - In SST, WTP for attribute G (issues with tap water) is positive, although this is only significant at the ten per cent level and not the five per cent level.[66]
  - In CAM, WTP for attribute E (lead pipes) is positive and significant at the 5 per cent level. There is also positive WTP for attributes K (unplanned short interruptions to water supply) and L (risk of temporary use ban), but it is not significant.[67]
  - When combining both regions, WTP for attribute G (issues with tap water) is positive and significant at the 5 per cent level. WTP for attributes E (lead pipes) and K (unplanned short interruptions to water supply) is positive but not significant at the five per cent significance level.[68]

- **Excluding customers who exhibit protest attitudes:** for each of SST and CAM, and for both regions combined, we estimated a model excluding respondents with ideological or mistrust attitudes. That is, we exclude all respondents who "disagree" or "disagree strongly" with the statements used to elicit protest attitudes, set out in Section 3.2.3.2. As expected, the WTP per-unit valuations increase (or become less negative) for all attributes. We also see positive WTP for a larger number of attributes, as follows:
  - In the SST region, the estimates of WTP for attributes D (hard water supply) and G (issues with tap water colour, taste, or smell) are now positive, but not significant.[69]
  - In the CAM region, the positive WTP for attributes A (customer service) and G (issues with tap water colour, taste, or smell) is now significant at the 5 per cent significance level. In addition, attributes E (lead pipes) and K (unplanned short interruptions to water supply) now have positive WTP, but this result is not significant at the five per cent significance level.[70]
  - When combining both regions, we observe a similar result to that found in the SST region: attributes D (hard water supply) and G (issues with tap water colour, taste, or smell) now have positive WTP, but this result is not significant at the five per cent significance level.[71]

4.2.4.2. Model with controls to match population customer profile

Each of the results discussed in Section 4.2.4.1 involves estimating the same linear model described in Section 4.1.3, but on a subset of the household data. We have also estimated a model that uses the full household dataset but includes the billing and demographic characteristics listed above as controls.[72] This model is based on a utility model of the following form:

$$U_{il} = a_1 Q_{1,l} + \cdots + a_{12} Q_{12,l} + bB_{il} + c_1 K_i Q_{1,l} + \cdots + c_{12} K_i Q_{12,l} + dK_i B_{il}$$

[66] The p-value is 0.07.

[67] The p-values are 0.35 and 0.45, respectively.

[68] The p-values are 0.31 and 0.76, respectively.

[69] The p-values are 0.80 and 0.99, respectively.

[70] The p-values are 0.28 and 0.07, respectively.

[71] The p-values are 0.18 and 0.20, respectively.

[72] In economic terms, we include all controls as interactions with each of the attributes and with the bill.

In this model, we have the same factors and parameters as set out in the model in Section 4.1.3 but also:

- The observable factor K_i which captures the value of a control variable, such as gender, for the individual i;[73]
- Twelve parameters of the form c_j, which capture the adjustment to the marginal utility derived from a unit improvement in service level of attribute j that results from the observable factor K_i; and
- The parameter d, which captures the adjustment to the marginal utility of having a lower bill that results from the observable factor K_i.

We use this model to estimate the WTP of the average SST or CAM customer, accounting for the fact that the sample collected is not exactly representative of the customer base as explained in Section 3.2.1. Once we have estimated the model, we insert the population values of the demographic and billing characteristics for each of the control variables. We then calculate the incremental WTP for service level l of attribute j as $\frac{a_j+c_jK_i}{b+dK_i} \times \Delta Q_{jl}$, using our estimated values of all parameters and letting ΔQ_{jl} be the change in service of attribute j between the status quo service level and level l.

The estimated WTP values from this model are similar to those estimated from the unadjusted main model. This is not particularly surprising: although there were some discrepancies in demographic and billing characteristics between the population of SSCW customers and the sample collected, these differences were not substantial. The only difference is that this model does not generate positive WTP for attribute A (customer service) in CAM; this may be because this model corrects for the slight under-representation of C2DE and unmetered customers, who (as reported above) are not WTP for attribute A.

4.2.4.3. Modelling the single attribute choices individually

As explained in Section 2.7.3, the peer reviewer (Dr. Silvia Ferrini) asked us to consider an alternative approach to WTP estimation of modelling single attribute choices individually. These models assume that individuals consider each attribute independently of all other attributes, and the utility derived from an individual attribute j can be represented as follows:

$$U_{j,il} = a_j Q_{j,l} + b_j B_{j,il}$$

In this model, we have

- The observable factor $Q_{j,l}$ which captures the service level l of attribute j;
- The parameter a_j, which capture the marginal utility derived from a unit improvement in service level of attribute j;

[73] For simplicity we have described this model as though there were only one control variable. In practice we include multiple control variables in the regression model. Specifically we control for: gender (binary variable equal to 1 if male and 0 otherwise), socio-economic group (binary variable equal to 1 if C2DE and 0 otherwise), age (continuous variable), metering (binary variable equal to 1 if metered and 0 otherwise), whether the customer was on the priority services register (binary variable equal to 1 if on the register and 0 otherwise), and whether the customer was on a social tariff (binary variable equal to 1 if on a social tariff and 0 otherwise).

- The observable factor $B_{j,il}$ which is the total change in the customer's bill, relative to their current bill, implied by choosing service level l for attribute j;
- The parameter b_j, which captures the marginal utility of having a lower expenditure on attribute j.

We estimate these parameters using a conditional logit. For each attribute, we record up to five options per individual, and we record which option the individual selected. We estimate the logit using the selection variable for that attribute as the outcome variable and the service level and cost impact for the attribute as the explanatory variables. We calculate the incremental WTP for service level l of attribute j as $\frac{a_j}{b_j} \times \Delta Q_{jl}$, using our estimated values of a_j and b_j and letting ΔQ_{jl} be the change in service of attribute j between the status quo service level and level l.

The estimated WTP values for this model are similar to the estimated WTP values from the main model for some attributes, and different for others. We observe similar results for eight of the twelve attributes, in the sense that (a) the sign of the estimated WTP is similar and (b) the magnitude of the estimated WTP is similar – although the values are not identical.[74] The eight attributes are attributes C, D, E, F, G, H, I, and J.

The attributes for which we observe different results are as follows:

- Attribute A (customer service). For this attribute, the WTP estimated from the main model is negative in SST and in the combined model, while the WTP estimated from the single attribute specification is positive in both models.
- Attribute B (risk of a temporary 'do not drink' notice). For this attribute, the single attribute model fails to produce sensible estimates. The p-values of the WTP estimates are close to 1 and the WTP estimates are an order of magnitude larger than the WTP estimates from the main model.
- Attribute K (unplanned short interruptions to water supply). For this attribute, the WTP estimated from the main model is negative in each region, while the WTP estimated from the single attribute model is positive. However, the estimates from the single attribute model are not significant at any reasonable significance level (all p-values are larger than 0.3).
- Attribute L (risk of a temporary use ban, including hosepipes). For this attribute, for the region-specific models the single attribute specification fails to produce sensible estimates. The p-value of the WTP estimates is close to 1 and the WTP estimates are an order of magnitude larger than the WTP estimates from the main model.

For attributes B and L, where the single-attribute model yields implausible results, a closer inspection of the model reveals that the coefficient b_j is very small and statistically

[74] There is no consistent pattern in the differences in values between the per-attribute model and the main model. For some attributes (e.g. attribute F, water leakage lost from pipes) the per-attribute model yields higher WTP values. For others (e.g. attribute H, chance of property flooding from a burst pipe) the per-attribute model yields lower WTP.

insignificant. This means that the cost of the service level of the attribute has very little ability to explain customer choices, over and above the service level itself.[75]

For attributes A and K, one possible explanation for the fact that we find positive WTP in the single attribute model but negative WTP in the main model is that the single attribute model does not account for trade-offs between attributes.

- In the single attribute model, a positive a_j coefficient means that customers prefer the option with a higher level of service of that attribute holding fixed the cost of providing that service. In other words, this means that customers have a preference for higher levels of service in that attribute, when that attribute is considered in isolation.
- In the main model, a positive a_j coefficient means that customers prefer the option with a higher level of service of that attribute, holding fixed the cost of all water services. If this coefficient is negative, it means that among all packages with a similar total cost, customers typically prefer one with lower levels of service for that attribute. This may happen if customers choose lower levels of service for that attribute so they can choose higher levels of service for other attributes (i.e. they make trade-offs between attributes).

Ultimately, the two models capture slightly different things. The main model captures customers' preferences accounting for patterns of choice across attributes. For example, the main model captures the fact that customers may trade off service levels between attributes. The single attribute model captures customers' preferences for each attribute in isolation. It is therefore not surprising that there are some differences between the two, but it is reassuring that they are broadly consistent for the majority of attributes.

4.2.4.4. Modelling preferences for overall improvements or deteriorations

We also considered an alternative specification in which we look at preferences for overall improvement or deterioration, rather than discriminating between "small" and "large" improvements and deteriorations.

We tested this specification to assess the implications of the requirement to estimate a single incremental WTP value across the full range of deteriorations and improvements, in order to produce outputs that are compatible with the Copperleaf valuation framework. Given this requirement, the estimated value from the main model and the per-attribute models therefore depends not only on customers' preferences for improvements relative to deteriorations, but also preferences across options within the range of improvements and deteriorations. This sensitivity allows us to assess the extent to which the results might be driven by the latter, rather than the former (where the former is arguably of greater interest to the analysis).

We implement this specification by assuming that any customer who chose a large improvement or deterioration for a given attribute would, in the absence of those more extreme options, have chosen the small improvement or deterioration.[76] For each customer

[75] The coefficient on the service level is positive and significant for attribute B in CAM and the combined model, positive and not significant for attribute B in SST, and negative and significant for attribute L in CAM.

[76] While this is a pragmatic assumption, it is not a trivial one. Customers who chose the second option may have thought that the second improvement option offered good value for money and the first improvement option did not, and it may therefore not be true that they prefer the first improvement option to the status quo.

that chose a large improvement, we re-assign them to a small improvement (and the associated bill impact); and for each customer that chose a large deterioration, we re-assign them to a small deterioration (and the associated bill impact). We therefore have a modified dataset such that for each attribute we record choices between three options: a deterioration, the status quo, and an improvement.[77]

We then estimate both the main model and the per-attribute model on this modified dataset.

- Looking at the main model, the results from this specification are broadly consistent with the results from the main specification. We observe positive WTP for the same set of attributes in both the SST model and the model that combines data from both regions, although the per-unit WTP value is slightly higher. For CAM, we observe positive WTP for all the same attributes except that we no longer have positive WTP for attribute G; however, recall that the positive WTP for attribute G was not significant.
- Looking at the per-attribute models, the results are more affected by the change of specification. In general, the per-attribute models more closely reflect the per-attribute choices seen in Figure 4.1 and Figure 4.2 than the main model does. This is because the per-attribute model reflects patterns of choice on each attribute in isolation, whereas the main model reflects patterns of choice across combinations of attributes and therefore is affected by customers making trade-offs between attributes.
  - In SST, we continue to observe positive WTP for attributes F, H, and J, although the per-unit WTP value is somewhat higher. We no longer observe positive WTP for attributes A, B, and K, suggesting that the positive valuation observed for these attributes was driven by preferences between service levels in either improvements or deteriorations. This result is consistent with the observation from Figure 4.1 that SST customers choose deteriorations more frequently than either improvements or the status quo for all three of these attributes.
  - In CAM, we continue to observe positive WTP for attributes F, H, and J, and as for SST the per-unit WTP value is somewhat higher. We also still observe positive WTP for attributes A and G, although this result is no longer significant. We now observe positive WTP for attribute E but we no longer observe positive WTP for attribute D, consistent with the choice patterns observed in Figure 4.2.
  - In the combined model, we continue to observe positive WTP for attributes F and H. Although we do not observe positive WTP for attribute J, closer investigation reveals that this is driven by a positive coefficient on the cost variable. This suggests that customers have a strong preference for improvement in attribute J. We no longer observe positive WTP for attributes A, D, and K (consistent with the results reported for CAM and SST above). We do now observe positive WTP for attribute E, in line with the result for CAM, and for attribute G (although the WTP for G is not significant).

Overall, we conclude that the finding of positive WTP for attributes F, H, and J is robust to whether we look at preferences across the full range of options or preferences between

[77] For attributes C, D, and E there is no deterioration option and so in this modelling exercise there are only two options: the status quo and an improvement option.

improvement and deterioration at a high level. The findings of positive WTP for attributes A, B, D, E, G, and K are sensitive to this choice.

We provide the valuations from this exercise in Appendix A.1.4. We recommend that SSCW use the results described in this section as a sensitivity check in its valuation exercise. However, it is important to note that the results in this section can only be used to value improvements and deteriorations up to the level of the small improvement and deterioration (i.e. they are not applicable to the large improvement and deterioration options).

4.3. Results for Future Bill Payers

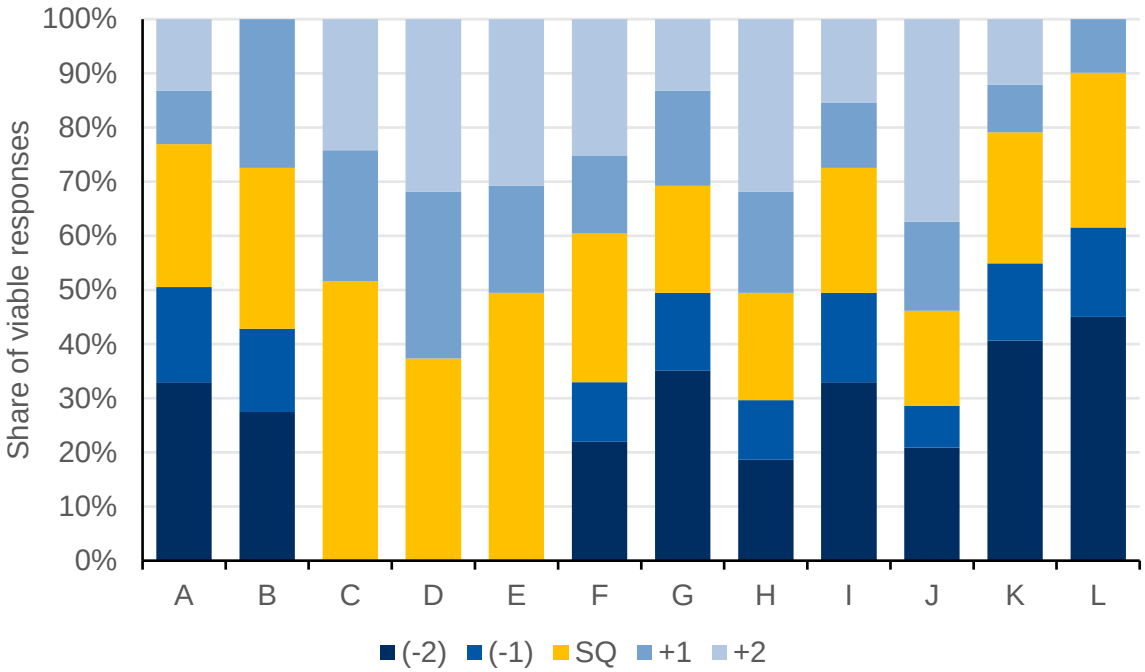
In this section, we examine FBP customers' WTP for service changes. As for HH costumers, we examine WTP estimates from a linear model, to evaluate whether there is willingness to pay for incremental improvements in service for the different attributes.

4.3.1. Descriptive statistics on future bill payers' choices

In this section, we examine the choices made by customers for each attribute. Figure 4.5 shows the final choices for FBP, after have seen the summary screen of their initial decisions and the total impact of those choices on their bill. This analysis is based on the full FBP sample of 91 responses, of which 54 are from SST and 37 are from CAM.

Due to the small FBP sample size, we examine the results for both regions together. We find that there is appetite for improvement in some, but not all, attributes. We also find that FBP customers are more likely to deviate from the status quo than HH customers. Among FBP customers, there is a majority preference for either improvement or deterioration for seven attributes, whereas among HH customers we only saw this for four attributes. A majority of FBP customers select improvements in service for four attributes: D (hard water supply), E (lead pipes), H (chance of property flooding from a burst pipe), and J (supporting nature and wildlife). A majority select deteriorations in service for three attributes: A (customer service), K (unplanned short interruptions to the water supply), and L (risk of a temporary use ban, including hosepipes).

Figure 4.5: FBP Choose Improvement for Four Attributes and Deterioration for Three

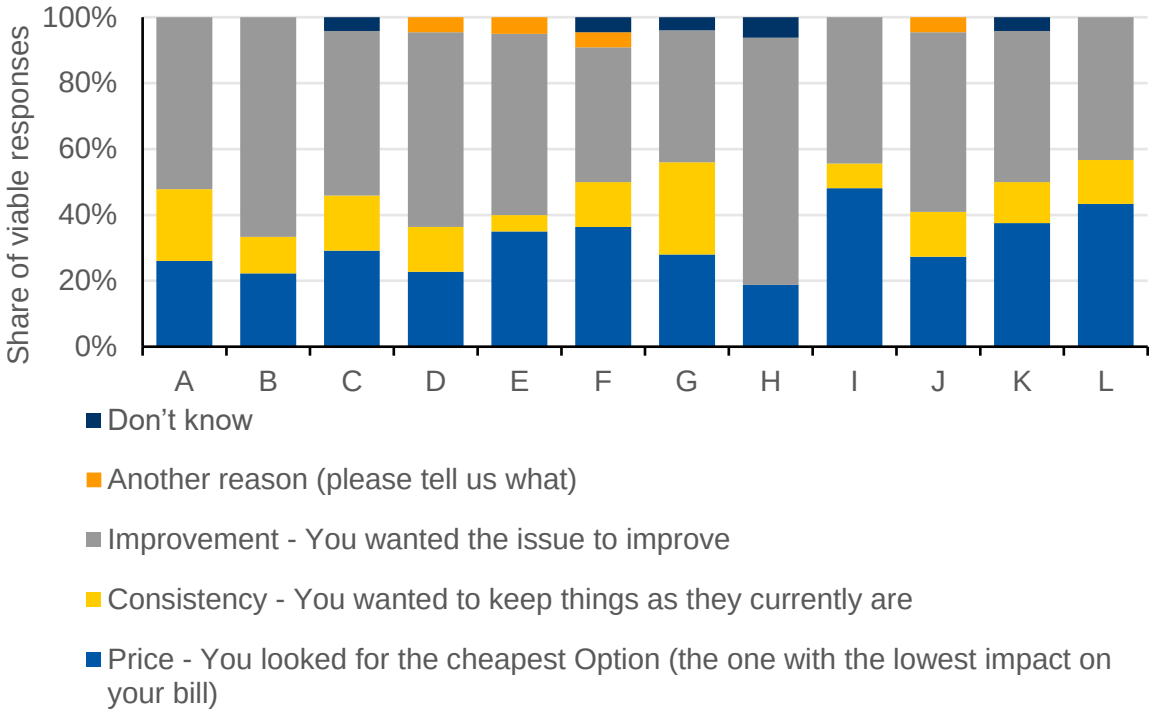


Source: NERA analysis of WTP survey data.

We also asked FBP about their motivations for the choices they made.[78] Figure 4.6 shows that a majority of FBP customers report that they want to see improvements for all four of the attributes where we saw a majority of FBP customers choose improvements in the choice exercise (i.e. attributes D, E, H, and J). Somewhat surprisingly, we also find that a majority of FBP customers report that they want to see improvements in attribute A (customer service), for which a majority selected the deterioration options in the choice exercise; and for attribute B (risk of a temporary "do not drink" notice). This could be due to the specific sample that were asked the motivation question. Alternatively, customers may want to see improvement in these attributes but either not be willing to pay the cost as set out in the choice exercise, or they may hold the view that they should not be asked to pay for improvements in these attributes (e.g. if they think this improvement should be funded by the government or by water companies).

[78] To reduce the overall length of the survey, following the pilot we decided to only ask respondents this question on motivations after every fourth choice. Since the attributes are displayed in a random order, we see responses on motivation for each attribute; however, for each attribute we see responses from just one-quarter of the sample.

Figure 4.6: Most FBP Want to See Improvements for Six Attributes



Source: NERA analysis of WTP survey data.

4.3.2. Summary of WTP results

Due to the limited number of FBP observations, we are not able to estimate a WTP model for the two regions separately. Instead, we estimate a single model combining both regions. We observe positive customer valuations for incremental changes in service for four attributes:

- B (risk of a temporary "do not drink" notice)
- F (water lost to leakage from pipes)
- H (chance of property flooding from a burst pipe)
- J (supporting nature and wildlife)

However, none of the results is significant at the conventional 5 per cent significance level. The lack of significance may be because of the small sample size.

The finding of a positive customer valuation for attributes H and J is consistent with the findings from the analysis of customer choices in Section 4.3.1, that a majority of customers chose improvements in attributes H and J.

The finding of positive customer valuation for attributes B and F reflects the fact that we are estimating a single valuation number that combines both preferences to see improvements and preferences to avoid deteriorations. After attributes H and J, attributes B and F are the two attributes for which deteriorations are least frequently selected. Therefore the positive customer valuation for these attributes is the best estimate for a single number that can capture preferences across the full range of possible improvements and deteriorations.

Given the small sample size and consequent inability to estimate models for the two regions separately or correct for the over-representation of women in the sample (as described in Section 3.3.1), SSCW should not use the FBP results directly in its valuation exercise. Instead, it should use the FBP results for insight only, and rely on the HH and NHH results for valuation and business planning.

4.3.3. Estimated values of WTP for main model

There are two main differences in how we estimate the model for the FBP sample as compared to the HH sample:

- Due to the limited sample size for FBP customers (i.e. 89 surveys), we are able to use a larger number of non-selected options. We use a c. 1 per cent randomly selected subset of the non-selected options (c. 337,500 non selected options per respondent).
- Again, due to the limited sample size, it was not possible to estimate the model for each region separately and so we have estimated a single model for the two regions together.

Table 4.6 presents the customer valuation results per unit change from SQ for both areas combined. The numbers in this table should be interpreted in the same way as the numbers in Table 4.5 for HH customers, presented in Section 4.2.3.

Table 4.6: FBP Main Model WTP per Unit Change from SQ

Attribute		Unit	WTP per unit change from SQ (£)
A	Customer Service	reduction in the percentage of costumers that wait more than 10 minutes	-0.36
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	1.01
C	Installing 'smart' water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.25
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-0.01
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-2.43
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.83
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-1.51
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.88
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.82
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.10
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-1.15
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-3.66

Source: NERA analysis of SSCW WTP survey

4.4. Results for Non-Household Customers

In this section, we examine NHH customers' WTP for service changes. We adopt the same approach that we used for HH and FBP costumers, that is, we examine WTP estimates from a linear model to evaluate whether customers are willing to pay for incremental improvements in service for the different attributes.

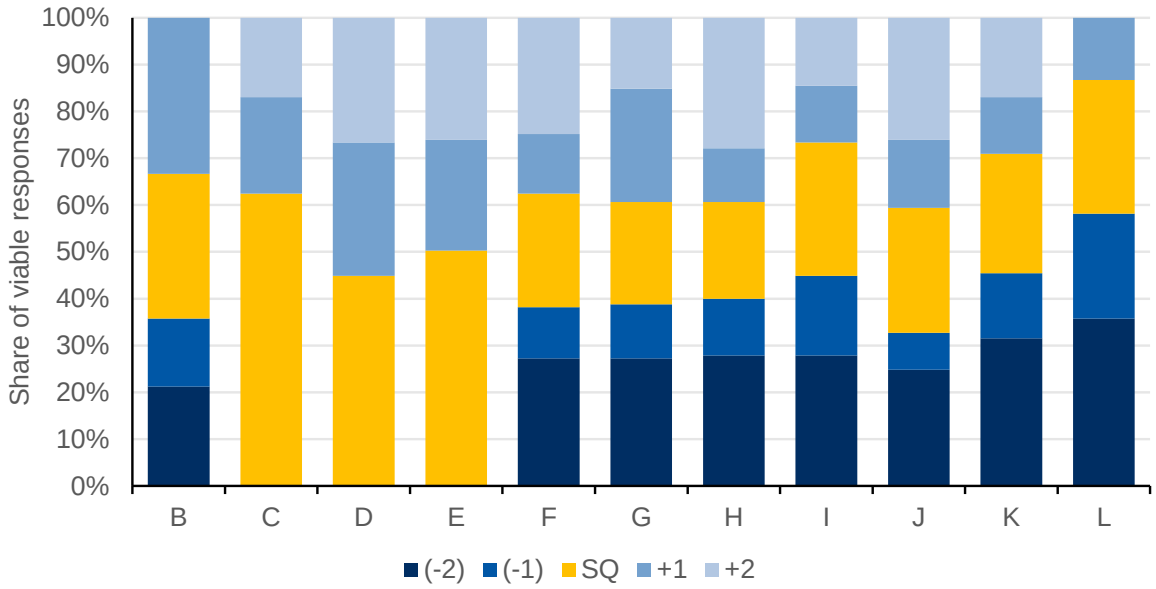
4.4.1. Descriptive statistics on non-household customers' choices

We examine the choices made by NHH customers for each attribute, after they have seen the summary screen of their initial decisions (and the total impact of those choices on their bill) and had the opportunity to revise their choices. Figure 4.7 and Figure 4.8 present the choices

made by NHH customers from SST and CAM, respectively.[79] This analysis based on 247 responses of which 165 are from the SST area and 82 are from the CAM area.

- In SST, the results are similar to those for HH customers: there is limited willingness to select improvements but also limited willingness to accept deteriorations. We observe from Figure 4.7 that there are only two attributes for which more than 50 per cent of respondents chose the improvement options (+1 or +2). These are attributes D (hard water supply) and E (lead pipes). On the other hand, there is only one attribute for which more than 50 per cent chose the deterioration options (-2 or -1): attribute L (risk of non-essential use ban).
- In CAM, we again find that there is limited willingness to select improvements but also limited willingness to accept deteriorations. We observe from Figure 4.8 that there is no attribute for which the two improvement options are preferred by a majority of NHH customers. For attribute J (supporting nature and wildlife), half of the respondents chose either improvement option. On the other hand, most respondents chose the deterioration options for attributes G (issues with tap water colour, taste, or smell) and L (risk of non-essential use ban).

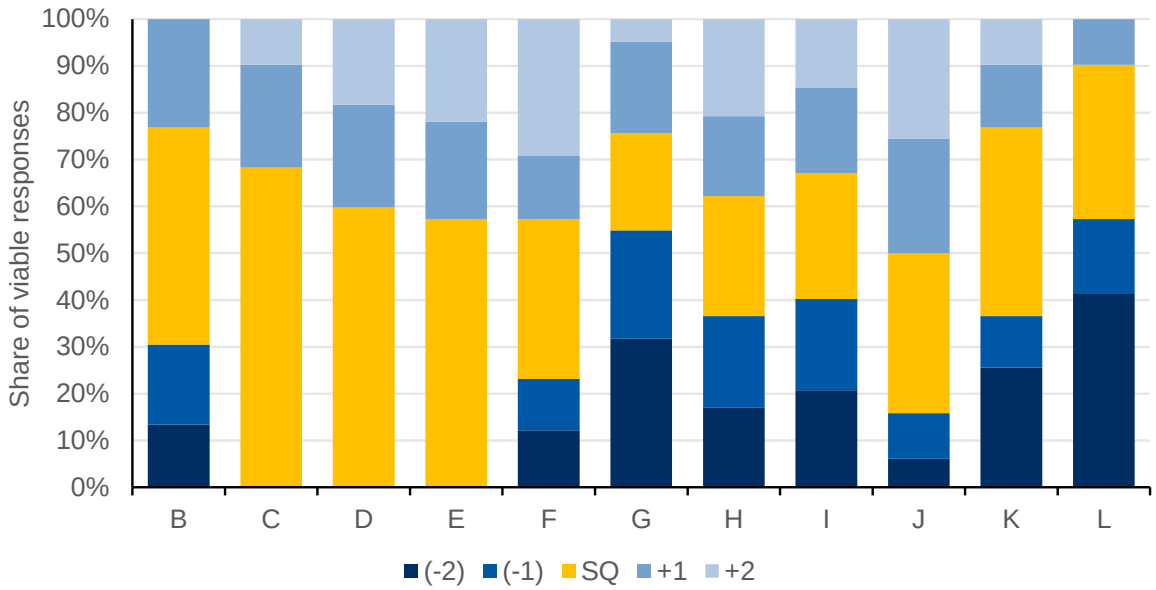
Figure 4.7: The Improvement Options Are Not the Most Preferred by NHH SST Customers



Source: NERA analysis of WTP survey data.

[79] These figures exclude attribute A because NHH customers were not asked about this attribute, since they receive customer service from their water retailer rather than SSCW.

Figure 4.8: The Improvement Options Are Not the Most Preferred by NHH CAM Customers for Any of the Attributes



Source: NERA analysis of WTP survey data.

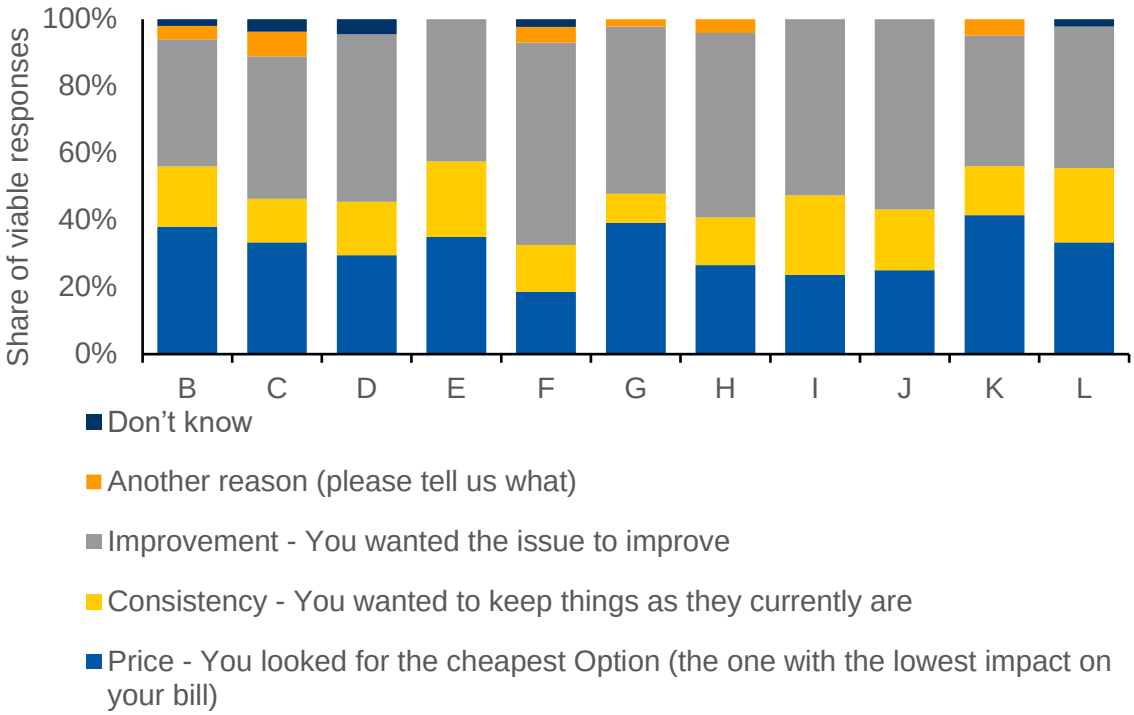
We also asked NHH customers about the motivations for their choices. Since we have a limited number of responses to the motivation question for each attribute in each region,[80] we combine the results from both regions for analysis in Figure 4.9. We find that the most common answers to this question are that the customer "wanted the issue to improve" or "looked for the cheapest option".

There is some discrepancy between the reported preferences of NHH customers and their decisions in the choice exercise, as reported in Figure 4.7 and Figure 4.8. We do observe that a majority of customers want to see improvements for attributes D and J, which is consistent with the choices expressed in SST and CAM respectively. We do not find that a majority of customers want to see improvements in attribute E, even though a majority of SST customers selected an improvement option; this could be due to the specific sample that were asked the motivation question for attribute E.

A majority of NHH customers report that they want to see improvements in three further attributes, for which we did not see a majority select improvement options in the choice exercise: F, H, and I. Again, this could be due to the specific sample that were asked the motivation question. Alternatively, NHH customers may want to see improvement but either not be willing to pay the cost as set out in the choice exercise or hold the view that they should not be asked to pay for improvements in these attributes.

[80] To reduce the overall length of the survey, following the pilot we decided to only ask respondents this question on motivations after every fourth choice. Since the attributes are displayed in a random order, we see responses on motivation for each attribute; however, for each attribute we see responses from just one-quarter of the sample. We have between 20 and 37 answers per attribute for SST; and between 11 and 18 answers per attribute for CAM.

Figure 4.9: Most NHH Customers want to See Improvements in Four Attributes



Source: NERA analysis of WTP survey data.

4.4.2. Summary of WTP results

For NHH customers, we identify positive WTP for four attributes when running the model for each region separately and with both regions together. These attributes are the same as for HH customers and FBP:

- B (risk of a temporary "do not drink" notice)
- F (water lost to leakage from pipes)
- H (chance of property flooding from a burst pipe)
- J (supporting nature and wildlife)

However, when running the regions separately, none of our WTP estimates is significant at the 5 per cent significance level. This may be due to the limited sample size in each region. In the model with both regions combined, the WTP for attributes B and F become significant at the 5 per cent level.

4.4.3. Estimated values of WTP for main model

There are two main differences in how we estimate the model for the NHH sample as compared to the HH sample:

- Due to the limited sample size for non-household customers (i.e. 247 surveys) and the fact that we have 11 attributes for NHH instead of 12,[81] we are able to use a larger number of non-selected options. We use a c. 2 per cent randomly selected sample of the non-selected options (c. 135,000 non selected options per respondent).
- Instead of using the level of the costs associated with respondents' choices, we now explain utility as a function of the cost of respondents' choices relative to their bill size (i.e. in percentage terms). Specifically, we use the percentage increase in cost relative to the reported bill amount, rather than the pound value of the change in costs. This alternative specification is required because non-household bill sizes (and thus costs associated with changes in service levels for a given attributes) vary much more across customers than household bill sizes.[82]

We report the willingness-to-pay results for NHH in Table 4.7 to Table 4.10. Because of the second point above, the interpretation of the WTP estimates changes slightly. Looking at column "WTP to switch from SQ (%)" for attribute B (risk of a temporary “do not drink” notice) in CAM, for instance, the interpretation of the figures shown in the table is as follows:

- The estimate of 0.02 per cent for the small improvement (1 property per year receives "do not drink" notice) means that customers would be willing to pay, on average, the equivalent of 0.02 per cent of their current bill for a reduction from two properties to one property receiving the “do not drink” notice.
- The estimate of -0.03 per cent for the small deterioration (4 properties per year receive "do not drink" notice) means that, on average, customers would need to be compensated with the equivalent of 0.03 per cent of their current bill for an increase from two to four properties receiving the “do not drink” notice.

Each of the values reported in Table 4.7 to Table 4.10 is derived by combining a *per-unit* WTP value with the difference, in relevant service units, between the status quo service level and the alternative service level in question. We also report the underlying per-unit WTP value in Table 4.11. For example for attribute B, for SST customers we report a per-unit WTP of 0.013. This means that customers are WTP an additional amount equal to 0.013 per cent of their current water bill for a one-unit incremental improvement in service.

[81] We exclude attribute A (customer service) in the survey made for NHH customers.

[82] In the sample used for HH analysis, the annual bill amount varies between £22 to £1,000. On the other hand, for NHH, the annual bill amount varies between £22 and £1,500,000.

Table 4.7: Non-household Customer Main Model WTP to Switch from SQ (Attributes B-C)

		South Staffs (SST)		Cambridge (CAM)	
Attribute		**Service Level**	**WTP to switch from SQ (%)**	**Service Level**	**WTP to switch from SQ (%)**
B	Risk of a temporary "do not drink" notice	8 properties per year receive "do not drink" notice	-0.08	8 properties per year receive "do not drink" notice	-0.09
		4 properties per year receive "do not drink" notice	-0.03	4 properties per year receive "do not drink" notice	-0.03
		2 properties per year receive "do not drink" notice		2 properties per year receive "do not drink" notice	
		1 property per year receives "do not drink" notice	0.01	1 property per year receives "do not drink" notice	0.02
		N/A		N/A	
C	Installing 'smart' water meters	N/A		N/A	
		N/A		N/A	
		24% of properties have an operational 'smart' meter by 2030		66% of properties have an operational 'smart' meter by 2030	
		42% of properties have an operational 'smart' meter by 2030	-0.07	74% of properties have an operational 'smart' meter by 2030	-0.07
		60% of properties have an operational 'smart' meter by 2030	-0.14	82% of properties have an operational 'smart' meter by 2030	-0.13

Source: NERA analysis of SSCW WTP survey

Table 4.8: Non-household Customer Main Model WTP to Switch from SQ (Attributes D-F)

	South Staffs (SST)		Cambridge (CAM)	
Attribute	**Service Level**	**WTP to switch from SQ (%)**	**Service Level**	**WTP to switch from SQ (%)**
D Hard water supply	N/A		N/A	
	N/A		N/A	
	South Staffs Water does not invest in water softening		Cambridge Water does not invest in water softening	
	South Staffs Water contributes to the cost of installing water softening devices in 5,000 properties	-0.001	Cambridge Water contributes to the cost of installing water softening devices in 2,600 properties	-0.003
	South Staffs Water softens the water supply for 171,200 properties through a large investment in a new treatment works	-0.03	Cambridge Water softens the water supply for 51,000 properties through a large investment in a new treatment works	-0.06
E Lead pipes	N/A		N/A	
	N/A		N/A	
	2 in 8 properties will still have a lead supply pipe by 2030		2 in 8 properties will still have a lead supply pipe by 2030	
	2 in 9 properties will still have a lead supply pipe by 2030	-0.05	2 in 9 properties will still have a lead supply pipe by 2030	-0.05
	2 in 10 properties will still have a lead supply pipe by 2030	-0.08	2 in 10 properties will still have a lead supply pipe by 2030	-0.09
F Water lost to leakage from pipes	24% of treated water lost to leakage	-0.002	19% of treated water lost to leakage	-0.04
	22% of treated water lost to leakage	-0.001	17% of treated water lost to leakage	-0.02
	20% of treated water lost to leakage		15% of treated water lost to leakage	
	18% of treated water lost to leakage	0.001	13% of treated water lost to leakage	0.02
	16% of treated water lost to leakage	0.002	11% of treated water lost to leakage	0.04

Source: NERA analysis of SSCW WTP survey

Table 4.9: Non-household Customer Main Model WTP to Switch from SQ (Attributes G-I)

	South Staffs (SST)		Cambridge (CAM)	
Attribute	**Service Level**	**WTP to switch from SQ (%)**	**Service Level**	**WTP to switch from SQ (%)**
G Issues with tap water colour, taste, or smell	1-in-23 properties per year experience issues with tap water	0.006	1-in-42 properties per year experience issues with tap water	0.03
	1-in-25 properties per year experience issues with tap water	0.002	1-in-44 properties per year experience issues with tap water	0.02
	1-in-26 properties per year experience issues with tap water		1-in-47 properties per year experience issues with tap water	
	1-in-29 properties per year experience issues with tap water	-0.005	1-in-52 properties per year experience issues with tap water	-0.03
	1-in-32 properties per year experience issues with tap water	-0.009	1-in-58 properties per year experience issues with tap water	-0.06
H Chance of property flooding from a burst pipe	55 properties per year flooded due to a burst pipe	-0.01	14 properties per year flooded due to a burst pipe	-0.01
	53 properties per year flooded due to a burst pipe	-0.004	13 properties per year flooded due to a burst pipe	-0.005
	51 properties per year flooded due to a burst pipe		12 properties per year flooded due to a burst pipe	
	46 properties per year flooded due to a burst pipe	0.01	11 properties per year flooded due to a burst pipe	0.005
	40 properties per year flooded due to a burst pipe	0.02	10 properties per year flooded due to a burst pipe	0.01
I Low water pressure	2-in-24 properties experiences low pressure per year	0.02	2-in-24 properties experiences low pressure per year	0.01
	2-in-25 properties experiences low pressure per year	0.01	2-in-25 properties experiences low pressure per year	0.003
	2-in-26 properties experiences low pressure per year		2-in-26 properties experiences low pressure per year	
	2-in-29 properties experiences low pressure per year	-0.03	2-in-29 properties experiences low pressure per year	-0.01
	2-in-33 properties experiences low pressure per year	-0.06	2-in-33 properties experiences low pressure per year	-0.02

Source: NERA analysis of SSCW WTP survey

Table 4.10: Non-household Customer Main Model WTP to Switch from SQ (Attributes J-L)

	South Staffs (SST)		Cambridge (CAM)	
Attribute	**Service Level**	**WTP to switch from SQ (%)**	**Service Level**	**WTP to switch from SQ (%)**
J Supporting nature and wildlife	740 acres (equivalent to 420 football pitches) protected and enhanced	-0.01	0 acres (equivalent to 0 football pitches) protected and enhanced	-0.02
	980 acres (equivalent to 550 football pitches) protected and enhanced	-0.005	10 acres (equivalent to 6 football pitches) protected and enhanced	-0.01
	1280 acres (equivalent to 720 football pitches) protected and enhanced		60 acres (equivalent to 33 football pitches) protected and enhanced	
	2030 acres (equivalent to 1150 football pitches) protected and enhanced	0.01	200 acres (equivalent to 110 football pitches) protected and enhanced	0.04
	2450 acres (equivalent to 1390 football pitches) protected and enhanced	0.02	270 acres (equivalent to 150 football pitches) protected and enhanced	0.05
K Unplanned short interruptions to water supply	1 in 115 properties per year	0.02	1 in 115 properties per year	0.02
	1 in 120 properties per year	0.02	1 in 120 properties per year	0.01
	1 in 130 properties per year		1 in 130 properties per year	
	1 in 140 properties per year	-0.01	1 in 140 properties per year	-0.01
	1 in 160 properties per year	-0.03	1 in 160 properties per year	-0.03
L Risk of non-essential use ban, including hosepipes	Non-essential use ban occurs once in 60 years	0.04	Non-essential use ban occurs once in 30 years	0.03
	Non-essential use ban occurs once in 70 years	0.02	Non-essential use ban occurs once in 40 years	0.01
	Non-essential use ban occurs once in 80 years		Non-essential use ban occurs once in 50 years	
	Non-essential use ban occurs once in 90 years	-0.01	Non-essential use ban occurs once in 60 years	-0.01
	N/A		N/A	

Source: NERA analysis of SSCW WTP survey

Table 4.11: Non-household Customer Main Model WTP per Unit Change from SQ

			WTP per unit change from SQ (%)		
Attribute		**Unit**	**SST**	**CAM**	**Combined**
B	Risk of temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	0.013	0.015	0.010
C	Installing "smart" water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.004	-0.008	-0.002
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-0.0002	-0.0012	-0.0001
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-0.017	-0.017	-0.009
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.001	0.010	0.003
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.001	-0.014	-0.001
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.002	0.005	0.001
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.003	-0.001	-0.001
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.0002	0.0026	0.0001
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.002	-0.002	-0.001
L	Risk of non-essential use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-0.089	-0.024	-0.010

Source: NERA analysis of SSCW WTP survey

4.4.4. Robustness to alternative specifications

In addition to the main model described above, we have estimated two alternative specifications of the NHH models. The first excludes respondents who exhibit protest attitudes and the second excludes customers who report difficulty understanding the topics or options in the survey. In this section, we summarise the results of these models. The estimated WTP values from these alternative specifications are presented in Appendix A.3.

- **Excluding customers who exhibit protest attitudes:** for each of SST and CAM, and for both regions combined, we estimated a model excluding respondents with ideological or mistrust attitudes according to the definitions discussed in Section 3.2.3.2. As expected,

the per-unit WTP increases (or becomes less negative) for all attributes. We also see positive WTP for more attributes in the SST model and the combined model, as follows:

  - In the SST region, WTP for attributes G (issues with tap water colour, taste, or smell) and L (risk of non-essential use ban, including hosepipes) is positive, but not significant.[83]
  - In the combined model, we find a similar result to that for the SST model i.e. the WTP for improvements in attributes G (issues with tap water colour, taste, or smell) and L (risk of non-essential use ban, including hosepipes) is positive. However, WTP is not significant for either of these attributes at the five per cent significance level.[84]

- **Excluding customers who lack understanding:** for each of SST and CAM, and for both regions combined, we estimated a model excluding respondents who reported that they had difficulty understanding either the options or the topics. Specifically, we excluded those who found it "difficult" or "very difficult" to work out the differences between the options, and those who understood the attributes "not very well" or "not at all well" (see Section 3.4.3 for further information). The estimated WTP from this sub-sample is similar to that from the full sample of NHH customers.

Due to the small sample size for the CAM region after excluding respondents that exhibit protest attitudes (68 observations) and after excluding those with lack of understanding (73 observations), we do not have sufficient information to draw firm conclusions about specific WTP values from this analysis. However, it is reassuring that the set of attributes for which we find positive WTP among CAM NHH customers is unchanged when we exclude respondents with protest attitudes or respondents who had difficulty understanding aspects of the survey.

[83] The p-values are 0.30 and 0.70, respectively.

[84] The p-values are 0.73, and 0.51, respectively.

5. Conclusion

5.1. Conclusions on Performance of the Survey

In this stated preference study, we have adopted an innovative approach that addresses concerns raised by Ofwat and CCW at PR19 about the reliability of estimates of customer WTP from traditional stated preference studies.

Specifically:

- By asking respondents about one attribute at a time and describing the attribute at the same time that the customer is asked to make a decision, we reduce the cognitive burden on the customer. Most respondents to this survey reported that they did not find it very difficult to understand either the attributes or the options presented for each attribute.
- Because we give respondents the opportunity to construct their preferred package rather than asking them to choose between pre-defined packages, our approach actively engages with customers on the choices SSCW faces in developing its business plan, so the context for the questions accurately reflects the intended use of our results.

Further, we have confidence that the sample is reasonably representative of the SSCW customer base and consequently that SSCW can view the results of the study as informative about the average preferences of its customers. Our HH customer sample is broadly in line with demographic and billing characteristics of the SSCW customer base; and when we estimate an adjusted model that accounts for the under-representation of men and unmetered customers in our sample, we get very similar WTP results to those from the unadjusted model. For FBP and NHH customers the sample size is too small to perform this sort of adjustment; however, the collected data includes a reasonable cross-section of the SSCW customer base on relevant demographic and billing characteristics (for FBP) or firm size and industry (for NHH).

5.2. Summary of Willingness to Pay Estimates

We identify a number of key themes from our analysis of the results of the WTP models that we estimated.

Across most of the models we estimate and across different categories of customer, we find evidence of willingness to pay for improvement in four attributes: attribute B (risk of a temporary ‘do not drink’ notice), attribute F (water lost to leakage from pipes) attribute H (chance of property flooding from a burst pipe), and attribute J (supporting nature and wildlife).

The four attributes identified above relate to improvement in service relate to adverse outcomes that may substantially inconvenience customers, leakage, or environmental protection. The finding that customers are WTP for improvement in attributes like this is consistent with the results of other WTP studies we have conducted at PR24. That is, we typically find that customers are willing to pay for improvement in environmental attributes or attributes that relate to particularly adverse and inconvenient outcomes, but less willing to pay for improvement in other attributes.

There are some differences in preferences across household customers:

- Customers that meet our criteria to be identified as financially vulnerable and customers in the C2DE socioeconomic group typically have lower WTP than other customers. In some models, these customers are not willing to pay for improvement in attributes F and H (i.e. some region-specific models).
- Eight household customer sub-groups have positive willingness to pay for one or more attributes beyond the four identified above. These are male customers, customers in the ABC1 socioeconomic group, metered customers, customers in the CAM region, customers who do not exhibit protest attitudes, customers who do not report difficulty understanding the options or attributes, customers who report that they have experienced problems due to a hard water supply, and customers who are neither on a social tariff nor potentially eligible for a social tariff.

The difference in preferences across customer groups suggests that, if SSCW were to improve service for all customers with the costs recovered from all customers, some would be made better off (i.e. would see enhanced "utility") while others would be made worse off (lower utility) as they are not willing to pay for improvements. This finding represents a challenge when selecting the improvements SSCW should offer as part of its business plan when providing "public goods" from which all customers benefit, especially if all customers are constrained by the tariff structure to pay the same contributions to the costs. This could potentially be addressed through adjusting tariff structures so that the burden of paying the costs for improvements does not fall on financially vulnerable customers, though separate research and engagement would be required to develop the tariff mechanisms needed to achieve this.

Appendix A. Further WTP Results

In this appendix, we provide a complete set of WTP estimates for the models reported in Section 4.2 to 4.4. In particular, we report the p-values associated with the per-unit WTP estimates, on which our comments around statistical significance are based; and we report the results for additional models other than the main model.

A.1. Further WTP Results for Household Customers

Here, we report the results of the models described in Section 4.2.

- Appendix A.1.1 reports the results of an alternative specification requested by the peer reviewer, as well as the p-values associated with our main models.
- Appendix A.1.2 reports the results of the models estimated on sub-groups of the household sample, which are summarised in Section 4.2.4.1.
- Appendix A.1.3 reports the results of the exercise to generate WTP values reflective of the population demographic and billing characteristics, rather than the sample demographic and billing characteristics. This exercise involves estimating a model with demographic and billing controls, and then deriving WTP values from that model calculated at the population values of those controls, as described in Section 4.2.4.2.

A.1.1. Alternative specification: single attribute models

Here, we report the full results of the main model as well as the results of the estimation of the single attribute models described in Section 4.2.4.3. We report the per-unit WTP estimates and p-values for each attribute as follows:

- Table A.1 reports the results for SST, CAM, and the two regions combined for attributes A-F; and
- Table A.2 reports the results for SST, CAM, and the two regions combined for attributes G-J.

Table A.1: Household Customer WTP per Unit Change from SQ – Main Model vs. Per Attribute Model (Attributes A-F)

			Main Model						Per Attribute					
			SST		CAM		Combined		SST		CAM		Combined	
Attribute		Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
A	Customer Service	reduction in the percentage of costumers that wait more than 10 minutes	-0.07	0.00	0.00	0.97	-0.04	0.00	0.01	0.02	0.02	0.00	0.01	0.00
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	0.74	0.00	0.97	0.00	0.80	0.00	11.41	0.94	-5.82	0.81	-21.16	0.95
C	Installing ‘smart’ water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.21	0.00	-0.30	0.01	-0.17	0.00	-0.28	0.00	-0.30	0.05	-0.18	0.00
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-0.00	0.19	0.03	0.01	-0.00	0.77	0.00	0.03	0.03	0.00	0.00	0.43
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-0.86	0.00	-0.13	0.38	-0.51	0.00	-0.29	0.09	-0.03	0.87	-0.21	0.09
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.61	0.00	1.40	0.00	0.82	0.00	0.95	0.12	1.12	0.00	1.07	0.00

Note: the single attribute model estimates for attribute B are unreliable due to a near-zero positive and insignificant coefficient on cost.
Source: NERA analysis of SSCW WTP survey

Table A.2: Household Customer WTP per Unit Change from SQ – Main Model vs. Per Attribute Model (Attributes G-J)

			Main Model						Per Attribute					
			SST		CAM		Combined		SST		CAM		Combined	
	Attribute	Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.17	0.02	0.11	0.37	-0.09	0.08	-0.16	0.16	0.24	0.00	-0.06	0.37
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.16	0.00	1.03	0.00	0.18	0.00	0.13	0.00	0.65	0.00	0.17	0.00
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.27	0.00	-0.12	0.01	-0.19	0.00	-0.05	0.15	-0.01	0.73	-0.04	0.14
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.03	0.00	0.28	0.00	0.03	0.00	0.02	0.00	0.14	0.00	0.16	0.66
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.19	0.00	-0.01	0.77	-0.10	0.00	0.003	0.84	0.02	0.33	0.01	0.69
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-5.99	0.00	-0.30	0.07	-0.59	0.00	-74.68	0.66	10.47	0.72	-0.27	0.03

Note: the single attribute model estimates for attribute L for CAM are unreliable due to a near-zero positive and insignificant coefficient on cost.
Source: NERA analysis of SSCW WTP survey

A.1.2. Models for customer sub-groups

Here, we report the results of the estimation of the main model on different sub-groups of household customers, as summarised in Section 4.2.4.1. We report the per-unit WTP estimates and p-values for each attribute for each sub-group, as follows:

- Table A.5 reports the results for men, women, and the ABC1 socio-economic group for attributes A-F;
- Table A.6 reports the results for men, women, and the ABC1 socio-economic group for attributes G-J;
- Table A.7 reports the results for the C2DE socio-economic group, metered customers, and unmetered customers for attributes A-F;
- Table A.8 reports the results for the C2DE socio-economic group, metered customers, and unmetered customers for attributes G-J;
- Table A.9 reports the results for customers identified as financially vulnerable, customers identified as socially vulnerable, and customers identified as either financially or socially vulnerable for attributes A-F;
- Table A.10 reports the results for customers identified as financially vulnerable, customers identified as socially vulnerable, and customers identified as either financially or socially vulnerable for attributes G-J;
- Table A.11 reports the results from the model where we exclude customers who report difficulty understanding of the attributes or options, the model where we exclude those who are potential beneficiaries of social tariff, and a model restricted to those with hard water issues for attributes A-F;
- Table A.12 reports the results from the model where we exclude customers who report difficulty understanding of the attributes or options, the model where we exclude those who are potential beneficiaries of social tariff, and a model restricted to those with hard water issues for attributes G-J;
- Table A.13 reports the results for all attributes from a model where we exclude customers that we identify as holding a protest attitude.

The results in Table A.9 and Table A.10 are based on the definitions of financial and social vulnerability agreed between NERA and Qa. We define vulnerability using primary and secondary indicators. A customer is deemed vulnerable if they meet the criteria for at least one of the primary indicators, or if they meet the criteria for at least two of the secondary indicators. For the model where we examine customers that are either financially or socially vulnerable, we also allow that a customer is considered vulnerable if they meet the criteria for at least one of the secondary indicators of financial vulnerability and at least one of the secondary indicators for social vulnerability.

We set out the primary and secondary indicators for financial and social vulnerability, respectively, in Table A.3 and Table A.4. Our sample has 284 and 76 HH customers financially vulnerable in SST and CAM, respectively. We have 386 and 154 socially vulnerable in SST and CAM, respectively. Finally, when we combined both criteria, we identified 499 vulnerable respondents in SST and 183 vulnerable respondents in CAM.

Table A.3: Indicators of Financial Vulnerability

Indicator	Primary	Secondary
Response to Q15: Which of the following best describes how affordable you find your water and sewerage bill and other household bills?	▪ I am rarely, or never, able to pay my water bill on time ▪ I often find it difficult to pay my water bill on time	
Response to Q14: Do you have any concerns about your ability to pay any household bills now, or in the future?		▪ Very concerned
Response to D3: Which one of the following best describes the occupation of the main income earner in your household?		▪ Unemployed or not working due to long-term sickness or being furloughed ▪ Student ▪ Full-time carer of other household member ▪ Retired and state pension only
Response to D8: In the last 12 months, have you or anyone in your household experienced any of the following?		▪ Severe financial hardship ▪ Unemployment (excluding Furlough)
Response to D9: Which of the following income bands does your household fall into?		▪ Per year: Under £19,000 ▪ Per week: Up to £365
Social tariff recipient	Marked as on a social tariff in SSC database	Self-report as being on a social tariff in response to a survey question

Source: NERA and SSCW

Table A.4: Indicators of Social Vulnerability

Indicator	Primary	Secondary
Response to D8: In the last 12 months, have you or anyone in your household experienced any of the following?	▪ Serious illness ▪ Disability (where you are registered disabled) ▪ Mental health condition	Something else which has affected your well-being
Response to S8: Is anyone in your household registered disabled, or have a long term health condition that impacts on their everyday lives - including both physical and mental conditions?	Yes	
Priority service register	Marked as on PSR in SSC database	Self-report as on PSR in response to survey question

Note: S8 only asked in vulnerable (face-to-face) HH survey
Source: NERA and SSCW

Table A.5: Household Customer WTP per Unit Change from SQ – Sub-groups for Gender and SEG (Attributes A-F)

			Men				Women				ABC1			
			SST		CAM		SST		CAM		SST		CAM	
Attribute		Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
A	Customer Service	reduction in the percentage of costumers that wait more than 10 minutes	-0.10	0.04	0.02	0.18	-0.06	0.00	-0.02	0.45	-0.05	0.01	0.02	0.15
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	0.77	0.00	0.86	0.00	0.73	0.00	1.16	0.00	0.84	0.00	1.05	0.00
C	Installing ‘smart’ water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.40	0.03	-0.34	0.02	-0.13	0.00	-0.28	0.09	-0.13	0.00	-0.24	0.03
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	0.00	0.58	0.04	0.01	0.00	0.31	0.03	0.13	0.00	0.58	0.04	0.00
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-1.27	0.02	-0.13	0.52	-0.66	0.00	-0.07	0.76	-0.48	0.01	0.08	0.59
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	1.23	0.00	1.62	0.00	0.36	0.00	1.32	0.00	0.88	0.00	1.60	0.00

Source: NERA analysis of SSCW WTP survey

Table A.6: Household Customer WTP per Unit Change from SQ – Sub-groups for Gender and SEG (Attributes G-J)

			Men				Women				ABC1			
			SST		CAM		SST		CAM		SST		CAM	
	Attribute	Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.28	0.18	0.28	0.06	-0.14	0.04	-0.05	0.82	0.01	0.86	0.28	0.02
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.06	0.53	0.63	0.02	0.19	0.00	1.68	0.00	0.26	0.00	1.33	0.00
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.33	0.02	-0.09	0.12	-0.23	0.00	-0.14	0.05	-0.21	0.00	-0.09	0.05
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.03	0.00	0.24	0.00	0.02	0.00	0.35	0.00	0.03	0.00	0.29	0.00
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.28	0.02	-0.01	0.84	-0.14	0.00	0.00	0.99	-0.10	0.01	0.02	0.50
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-10.1	0.02	-0.11	0.55	-3.89	0.00	-0.53	0.09	-4.48	0.00	-0.13	0.42

Source: NERA analysis of SSCW WTP survey

Table A.7: Household Customer WTP per Unit Change from SQ – Sub-groups for SEG and Metering (Attributes A-F)

			C2DE				Metered – yes				Metered – no			
			SST		CAM		SST		CAM		SST		CAM	
Attribute		Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
A	Customer Service	reduction in the percentage of costumers that wait more than 10 minutes	-0.10	0.01	-0.07	0.18	-0.04	0.01	0.01	0.74	-0.18	0.03	-0.01	0.64
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	0.58	0.00	0.74	0.02	0.77	0.00	1.13	0.00	0.68	0.00	0.65	0.00
C	Installing ‘smart’ water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.31	0.02	-0.61	0.12	-0.11	0.01	-0.37	0.01	-0.72	0.03	-0.31	0.22
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-0.01	0.11	0.00	0.92	0.00	0.94	0.03	0.07	-0.02	0.12	0.06	0.01
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-1.42	0.00	-0.99	0.12	-0.76	0.00	-0.12	0.53	-1.44	0.04	-0.17	0.59
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.09	0.53	0.87	0.01	0.63	0.00	1.73	0.00	0.52	0.02	1.00	0.00

Source: NERA analysis of SSCW WTP survey

Table A.8: Household Customer WTP per Unit Change from SQ – Sub-groups for SEG and Metering (Attributes G-J)

			C2DE				Metered – yes				Metered – no			
			SST		CAM		SST		CAM		SST		CAM	
Attribute		Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.52	0.02	-0.63	0.23	-0.09	0.23	0.18	0.21	-0.62	0.07	-0.01	0.98
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	-0.03	0.71	0.09	0.86	0.19	0.00	1.20	0.00	0.00	0.97	1.14	0.00
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.34	0.01	-0.24	0.13	-0.19	0.00	-0.12	0.04	-0.57	0.02	-0.12	0.23
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.01	0.02	0.27	0.01	0.03	0.00	0.34	0.00	0.02	0.04	0.19	0.00
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.32	0.00	-0.14	0.25	-0.12	0.00	0.00	0.93	-0.41	0.02	-0.01	0.94
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-7.28	0.01	-1.15	0.09	-4.61	0.00	-0.39	0.08	-10.4	0.04	-0.10	0.75

Source: NERA analysis of SSCW WTP survey

Table A.9: Household Customer WTP per Unit Change from SQ – Sub-groups for Vulnerability (Attributes A-F)

			Financially vulnerable				Socially vulnerable				Vulnerable (combined)			
			SST		CAM		SST		CAM		SST		CAM	
	Attribute	Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
A	Customer Service	reduction in the percentage of costumers that wait more than 10 minutes	-0.13	0.03	-0.10	0.21	-0.06	0.02	-0.01	0.72	-0.09	0.00	-0.02	0.46
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	0.53	0.00	0.80	0.13	0.59	0.00	0.89	0.00	0.51	0.00	0.90	0.00
C	Installing ‘smart’ water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.31	0.04	-0.92	0.15	-0.20	0.01	-0.27	0.11	-0.26	0.00	-0.28	0.08
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-0.01	0.15	-0.02	0.76	0.00	0.75	0.05	0.01	-0.01	0.21	0.04	0.01
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-1.37	0.02	-0.92	0.28	-0.79	0.00	-0.25	0.34	-1.05	0.00	-0.21	0.38
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	-0.03	0.87	0.88	0.04	0.43	0.00	1.25	0.00	0.35	0.00	1.14	0.00

Source: NERA analysis of SSCW WTP survey

Table A.10: Household Customer WTP per Unit Change from SQ – Sub-groups for Vulnerability (Attributes G-J)

			Financially vulnerable				Socially vulnerable				Vulnerable (combined)			
			SST		CAM		SST		CAM		SST		CAM	
	Attribute	Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.57	0.04	-1.27	0.17	-0.25	0.05	-0.09	0.69	-0.40	0.01	-0.14	0.51
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	-0.04	0.65	-0.12	0.88	0.20	0.00	1.21	0.00	0.13	0.03	1.02	0.00
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.37	0.02	-0.48	0.12	-0.20	0.01	-0.09	0.19	-0.30	0.00	-0.11	0.10
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.02	0.02	0.21	0.08	0.03	0.00	0.29	0.00	0.02	0.00	0.26	0.00
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.29	0.02	-0.46	0.11	-0.14	0.02	-0.03	0.54	-0.21	0.00	-0.06	0.26
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-6.72	0.03	-2.38	0.09	-4.86	0.00	-0.48	0.11	-6.01	0.00	-0.52	0.07

Source: NERA analysis of SSCW WTP survey

Table A.11: Household Customer WTP per Unit Change from SQ – Sub-groups for No Difficulty Understanding, Non-Eligible for Social Tariff, and Hard Water (Attributes A-F)

			No difficulty understanding				Non-eligible for social tariff				Hard water			
			SST		CAM		SST		CAM		SST		CAM	
	Attribute	Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
A	Customer Service	reduction in the percentage of costumers that wait more than 10 minutes	-0.06	0.00	0.01	0.48	-0.07	0.00	0.01	0.49	-0.05	0.14	0.004	0.86
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	0.78	0.00	1.05	0.00	0.80	0.00	0.98	0.00	0.88	0.00	0.96	0.00
C	Installing ‘smart’ water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.17	0.00	-0.31	0.01	-0.16	0.00	-0.23	0.03	-0.17	0.08	-0.14	0.38
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-.002	0.55	0.04	0.00	0.00	0.56	0.05	0.00	0.03	0.00	0.12	0.00
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-0.64	0.00	-0.06	0.71	-0.69	0.00	0.00	0.99	-0.28	0.35	0.69	0.00
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.66	0.00	1.56	0.00	0.86	0.00	1.54	0.00	1.10	0.00	1.51	0.00

Source: NERA analysis of SSCW WTP survey

Table A.12: Household Customer WTP per Unit Change from SQ – Sub-groups for No Difficulty Understanding, Non-Eligible for Social Tariff, and Hard Water (Attributes G-J)

			No difficulty understanding				Non-eligible for social tariff				Hard water			
			SST		CAM		SST		CAM		SST		CAM	
Attribute		Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.11	0.10	0.20	0.09	-0.06	0.44	0.27	0.02	0.21	0.07	0.48	0.01
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.18	0.00	1.29	0.00	0.20	0.00	1.17	0.00	0.31	0.00	1.73	0.00
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.22	0.00	-0.11	0.02	-0.24	0.00	-0.07	0.09	-0.13	0.13	-0.01	0.78
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.03	0.00	0.31	0.00	0.03	0.00	0.27	0.00	0.04	0.00	0.31	0.00
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.15	0.00	0.02	0.58	-0.17	0.00	0.05	0.15	-0.01	0.91	0.05	0.35
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-4.72	0.00	-0.28	0.11	-5.90	0.00	0.08	0.56	-5.51	0.04	0.16	0.45

Source: NERA analysis of SSCW WTP survey

Table A.13: Household Customer WTP per Unit Change from SQ – Sub-group Excluding Customers Who Exhibit Protest Attitudes

			SST		CAM		Combined	
Attribute		**Unit**	**WTP**	**p**	**WTP**	**p**	**WTP**	**p**
A	Customer Service	reduction in the percentage of costumers that wait more than 10 minutes	-0.03	0.04	0.03	0.02	-0.01	0.35
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	1.09	0.00	1.23	0.00	1.14	0.00
C	Installing ‘smart’ water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.15	0.00	-0.16	0.08	-0.13	0.00
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	0.001	0.80	0.04	0.00	0.00	0.18
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-0.47	0.004	0.15	0.28	-0.23	0.02
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.91	0.00	1.48	0.00	1.11	0.00
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	0.001	0.99	0.37	0.00	0.07	0.20
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.29	0.00	1.40	0.00	0.30	0.00
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.18	0.00	-0.05	0.15	-0.13	0.00
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.04	0.00	0.32	0.00	0.04	0.00
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.10	0.01	0.05	0.07	-0.04	0.07
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-4.77	0.00	-0.26	0.10	-0.64	0.00

Source: NERA analysis of SSCW WTP survey

A.1.3. Model for population values of demographic and billing characteristics

In this appendix, we report the results of the modelling exercise described in Section 4.2.4.2. Table A.14 reports the per-unit WTP for each of the SST and CAM regions for two different models: the main model, as reported in Section 4.2.3; and the results of applying population values of demographic and billing variables to a model with controls for these variables.

Table A.14: Household Customer WTP per Unit Change from SQ – Adjusted Model

			WTP per unit change from SQ (£)			
			SST		CAM	
Attribute		Unit	Main	Adj.	Main	Adj.
A	Customer service	reduction in the percentage of costumers that wait more than 10 minutes	-0.07	-0.08	0.00	-0.01
B	Risk of temporary “do not drink” notice	reduction in number of properties that received "do not drink" notice	0.74	0.64	0.97	0.83
C	Installing “smart” water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.21	-0.31	-0.30	-0.31
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	0.00	-0.01	0.03	0.05
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-0.86	-0.87	-0.13	-0.10
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.61	0.51	1.40	1.35
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.17	-0.28	0.11	0.16
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.16	0.05	1.03	0.94
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.27	-0.29	-0.12	-0.11
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.03	0.02	0.28	0.27
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.19	-0.23	-0.01	-0.02
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-5.99	-5.99	-0.30	-0.23

Note: “Adj.” = results adjusted for population values of demographic and billing controls
Source: NERA analysis of SSCW WTP survey

A.1.4. Alternative specification: overall improvements or deteriorations

Here we report the results of the alternative specification described in Section 4.2.4.4.

Table A.1: Household Customer WTP per Unit Change from SQ – Overall Improvement or Deterioration (Attributes A-F)

			Main Model						Per Attribute					
			SST		CAM		Combined		SST		CAM		Combined	
Attribute		Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
A	Customer Service	reduction in the percentage of costumers that wait more than 10 minutes	-0.07	0.00	0.01	0.54	-0.03	0.00	-0.04	0.02	0.01	0.21	-0.02	0.02
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	1.46	0.00	1.84	0.00	1.50	0.00	-0.80	0.31	-0.30	0.84	-0.74	0.32
C	Installing ‘smart’ water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.33	0.00	-0.66	0.00	-0.30	0.00	-0.23	0.01	-0.42	0.13	-0.20	0.00
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-0.81	0.00	-1.26	0.00	-0.76	0.00	-0.05	0.69	-0.02	0.99	-0.14	0.60
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-1.50	0.00	-0.80	0.01	-1.11	0.00	0.02	0.89	0.44	0.00	0.16	0.03
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.72	0.00	1.83	0.00	0.98	0.00	3.19	0.69	1.85	0.04	2.32	0.20

Note: the single attribute model estimates for attribute B are unreliable due to a near-zero positive and insignificant coefficient on cost.
Source: NERA analysis of SSCW WTP survey

Table A.2: Household Customer WTP per Unit Change from SQ – Overall Improvement or Deterioration (Attributes G-J)

			Main Model						Per Attribute					
			SST		CAM		Combined		SST		CAM		Combined	
	Attribute	Unit	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p	WTP	p
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.29	0.00	-0.11	0.44	-0.23	0.00	0.03	0.00	0.02	0.87	0.02	0.21
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.12	0.01	1.27	0.00	0.16	0.00	0.17	0.00	0.81	0.00	0.26	0.00
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.32	0.00	-0.19	0.01	-0.24	0.00	-0.07	0.16	-0.01	0.72	-0.05	0.13
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.03	0.00	0.30	0.00	0.03	0.00	0.02	0.00	0.17	0.00	-0.16	0.65
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.22	0.00	-0.04	0.36	-0.14	0.00	-0.20	0.16	-0.90	0.87	-0.28	0.23
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-4.51	0.00	-0.12	0.64	-0.41	0.06	-36.49	0.22	-4.62	0.30	-0.68	0.00

Note: the single attribute model estimates for attribute L for CAM are unreliable due to a near-zero positive and insignificant coefficient on cost.
Source: NERA analysis of SSCW WTP survey

A.2. Further WTP Results for Future Bill Payers

Here, we report the results of the model described in Section 4.3.3, as well as the p-values associated.

Table A.3: FBP Main Model WTP per Unit Change from SQ

			WTP per unit change from SQ (£)	
Attribute		**Unit**	**Combined**	**p**
A	Customer Service	reduction in the percentage of costumers that wait more than 10 minutes	-0.36	0.36
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	1.01	0.33
C	Installing 'smart' water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.25	0.63
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-0.01	0.84
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-2.43	0.42
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.83	0.45
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-1.51	0.41
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.88	0.32
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.82	0.37
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.10	0.30
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-1.15	0.33
L	Risk of temporary use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-3.66	0.38

Source: NERA analysis of SSCW WTP survey

A.3. Further WTP Results for Non-household Customers

In Table A.4, we report the results of the main model for NHH customers described in Section 4.4.3, as well as the associated p-values. In Table A.5, we report the results when running the same model excluding NHH respondents who exhibit protest attitudes.

Table A.4: Non-household Customer Main Model WTP per Unit Change from SQ

			SST		CAM		Combined	
Attribute		**Unit**	**WTP (%)**	**p**	**WTP (%)**	**p**	**WTP (%)**	**p**
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	0.013	0.15	0.015	0.14	0.010	0.00
C	Installing ‘smart’ water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.004	0.39	-0.008	0.38	-0.002	0.05
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-0.0002	0.50	-0.0012	0.33	-0.0001	0.32
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-0.017	0.34	-0.017	0.28	-0.009	0.01
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.001	0.88	0.010	0.20	0.003	0.05
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.001	0.73	-0.014	0.35	-0.001	0.48
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.002	0.38	0.005	0.47	0.001	0.16
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.003	0.36	-0.001	0.59	-0.001	0.07
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.0002	0.37	0.0026	0.22	0.0001	0.08
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.002	0.38	-0.002	0.41	-0.001	0.08
L	Risk of non-essential use ban, including hosepipes	reduction in the percentage chance of non-essential use ban in a given year	-0.089	0.53	-0.024	0.54	-0.010	0.44

Source: NERA analysis of SSCW WTP survey

Table A.5: Non-household Customer WTP per Unit Change from SQ – Sub-group Excluding Customers Who Exhibit Protest Attitudes

			SST		Combined	
Attribute		**Unit**	**WTP (%)**	**p**	**WTP (%)**	**p**
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	0.014	0.04	0.013	0.00
C	Installing ‘smart’ water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.002	0.32	-0.001	0.10
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-0.00002	0.83	-0.00003	0.67
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-0.006	0.30	-0.006	0.04
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.004	0.13	0.005	0.01
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	0.0015	0.30	0.0004	0.73
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.002	0.12	0.002	0.05
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.001	0.32	-0.001	0.22
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.0002	0.18	0.0002	0.06
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.001	0.41	-0.001	0.21
L	Risk of non-essential use ban, including hosepipes	reduction in the percentage chance of non-essential use ban in a given year	0.015	0.70	0.008	0.51

Source: NERA analysis of SSCW WTP survey

Table A.6: Non-household Customer WTP per Unit Change from SQ – Sub-group Excluding Customers With Difficulty Understanding

			SST		Combined	
Attribute		**Unit**	**WTP (%)**	**p**	**WTP (%)**	**p**
B	Risk of a temporary "do not drink" notice	reduction in number of properties that received "do not drink" notice	0.013	0.16	0.010	0.00
C	Installing ‘smart’ water meters	increase in the percentage of properties having an operational "smart" meter by 2030	-0.004	0.40	-0.002	0.06
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	-0.00019	0.50	0.0001	0.33
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	-0.016	0.36	-0.008	0.01
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	0.0001	0.97	0.003	0.08
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-0.0017	0.68	-0.001	0.50
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	0.002	0.46	0.001	0.21
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-0.003	0.38	-0.001	0.12
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	0.0002	0.35	0.0001	0.07
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-0.003	0.39	-0.001	0.09
L	Risk of non-essential use ban, including hosepipes	reduction in the percentage chance of non-essential use ban in a given year	-0.101	0.52	-0.009	0.52

Source: NERA analysis of SSCW WTP survey

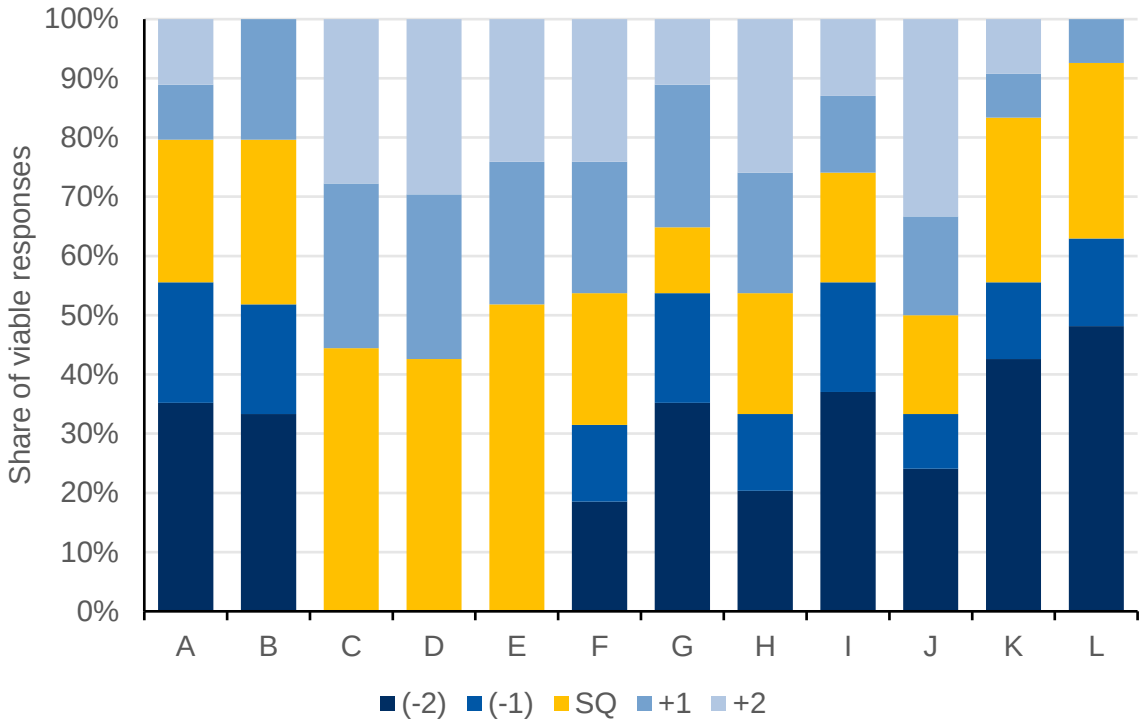
Appendix B. Further Descriptive Statistics

B.1. Future Bill Payer Choices by Region

In this appendix, we provide a summary of the choices made by FBP on a regional basis. Although we were not able to perform a WTP analysis on a regional basis due to the limited sample size, the differences between the regions in the raw data may provide useful context for the WTP results from our combined model. In particular, we observe that FBPs in the SST region are typically less likely to choose improvements, although attribute C (installing 'smart' water meters is an exception to this. This may be due to the lower existing rollout of smart meters in the SST region.

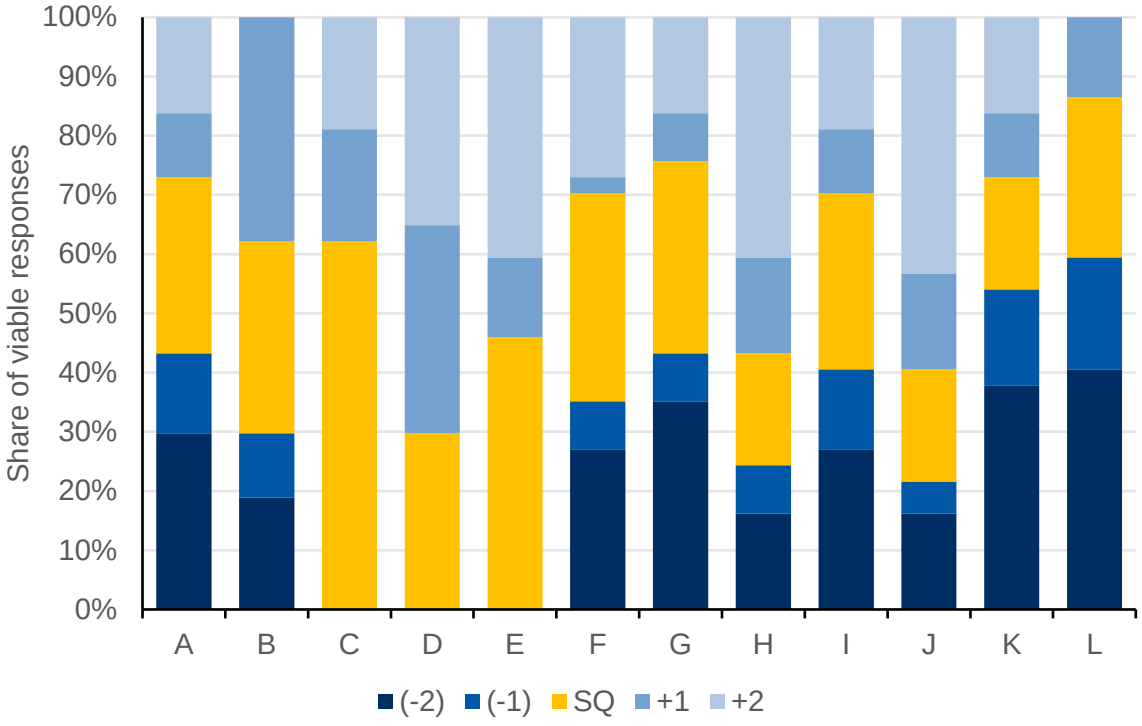
- In SST, we observe from Figure B.1 that FBP customers are willing to pay for improvement in a small number of attributes only. The sum of the improvement options (+1 and +2) is higher than the 50 per cent threshold for two attributes: C (installing "smart" water meters) and D (hard water supply). For attribute J (supporting nature and wildlife), we see that half of FBP respondents chose one of the two improvement options. On the other hand, we see that the majority chose the deterioration options, (-2) or (-1), for six attributes: A (customer service), B (risk of temporary "do not drink" notice), G (issues with tap water colour, taste, or smell), I (low water pressure), K (unplanned short interruptions to water supply), and L (risk of temporary use ban). For the remaining three attributes, slightly less than the majority of customers chose improvements.
- In CAM, there is slightly more appetite for improvement, albeit for slightly different attributes. We observe from Figure B.2 that most respondents chose the improvement options for four attributes: D (hard water supply) and J (supporting nature and wildlife), as found in SST, but also E (lead pipes) and H (chance of property flooding from a burst pipe). Less than 40 per cent of CAM FBPs chose improvement in attribute C (installing 'smart' water meters), indicating that there is less appetite for improvement in this attribute in CAM than there is in SST. There was a majority preference for deterioration for only two attributes: K (unplanned short interruptions to water supply) and L (risk of temporary use ban).

Figure B.1: SST FBP Prefer Improvement for Three Attributes and Deterioration for Six



Source: NERA analysis of WTP survey data.

Figure B.2: CAM FBP Prefer Improvement for Four Attributes and Deterioration for Two



Source: NERA analysis of WTP survey data.

Appendix C. Specification of Service Levels in Regression Model

In order to estimate the conditional logit models described in Section 4.1.4, we convert the service levels for each attribute set out in Table 2.3 into numeric values suitable for estimation. We adopt the following process:

1. We set the status quo as the reference service level, so the numeric value for the status quo service level is always equal to zero.

2. We define the units of the numeric values so that improvements are always positive and deteriorations are always negative. For example, for attribute A (customer service) we define the units of the numeric value to be the *reduction* in the percentage of customers that wait more than ten minutes for their call to be answered, relative to the status quo, as shown in Table C.1 below.

Table C.1: Conversion of Attribute Service Levels to Numeric Values for Estimation

	Larger Reduction (-2)	**Small Reduction (-1)**	**Current Level (0)**	**Small Improvement (+1)**	**Larger Improvement (+2)**
Service Levels Shown to Customers	2 in 3 customers (60%) wait more than 10 minutes	1 in 2 customers (50%) waits more than 10 minutes	1 in 3 customers (30%) waits more than 10 minutes	1 in 6 customers (20%) waits more than 10 minutes	1 in 20 customers (5%) waits more than 10 minutes
Conversion to Numeric Values Used in Estimation	=30-60	=30-50	=30-30	=30-20	=30-5
Numeric Values Used in Estimation	-30	-20	0	10	25

Source: NERA analysis

3. The service levels shown to customers for different attributes can involve units on very different scales. For example, attribute B (risk of a temporary 'do not drink' notice) refers to service level changes affecting fewer than ten properties, while attribute D (hard water supply) refers to service level changes affecting thousands of properties. The algorithm that estimates the logit model performs better when variables are on similar scales, and so we convert all the attributes to be in units on the order of 1 or 10. The final numeric values of each attribute used in estimation are shown in Table C.2 for SST and Table C.3 for CAM. Those attributes for which service levels differ across the two regions are shaded blue.

When we calculate the final WTP for each of the service levels, we convert back from the numeric units used in estimation (shown in Table C.2 and Table C.3) to the units used to display the service levels to customers.

Table C.2: Numeric Values for Estimation for All Attributes (SST)

			Service levels for Estimation				
Attribute		**units**	**-2**	**-1**	**SQ**	**+1**	**+2**
A	Customer service	reduction in the percentage of costumers that wait more than 10 minutes	-30.00	-20.00	0.00	10.00	25.00
B	Risk of temporary “do not drink” notice	reduction in number of properties that received "do not drink" notice	-6.00	-2.00	0.00	1.00	N/A
C	Installing “smart” water meters	increase in the percentage of properties having an operational "smart" meter by 2030	N/A	N/A	0.00	18.00	36.00
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	N/A	N/A	0.00	5.00	171.2
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	N/A	N/A	0.00	2.78	5.00
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	-4.00	-2.00	0.00	2.00	4.00
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-5.02	-1.54	0.00	3.98	7.21
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	-4.00	-2.00	0.00	5.00	11.00
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-6.41	-3.08	0.00	7.96	16.32
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	-54.00	-30.00	0.00	75.00	117.0
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-10.03	-6.41	0.00	5.49	14.42
L	Risk of temporary (NHH: non-essential) use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-0.83 (NHH: -0.42)	-0.36 (NHH: -0.18)	0.00 (NHH: 0.00)	0.28 (NHH: 0.14)	N/A (NHH: N/A)

Source: NERA analysis

Table C.3: Numeric Values for Estimation for All Attributes (CAM)

Attribute		units	Service levels for Estimation -2	-1	SQ	+1	+2
A	Customer service	reduction in the percentage of costumers that wait more than 10 minutes	-30.00	-20.00	0.00	10.00	25.00
B	Risk of temporary “do not drink” notice	reduction in number of properties that received "do not drink" notice	-6.00	-2.00	0.00	1.00	N/A
C	Installing “smart” water meters	increase in the percentage of properties having an operational "smart" meter by 2030	N/A	N/A	0.00	8.00	16.00
D	Hard water supply	increase in the number of properties that benefit from investment (thousands)	N/A	N/A	0.00	2.60	51.00
E	Lead pipes	reduction in the percentage of properties that have a lead supply pipe by 2030	N/A	N/A	0.00	2.78	5.00
F	Water lost to leakage from pipes	reduction in the percentage of water that is lost to leakage	-4.00	-2.00	0.00	2.00	4.00
G	Issues with tap water colour, taste, or smell	reduction in the percentage of properties experiencing issues with tap water per year (tenth of a percentage)	-2.53	-1.45	0.00	2.05	4.04
H	Chance of property flooding from a burst pipe	reduction in the flooding incidents per year	-2.00	-1.00	0.00	1.00	2.00
I	Low water pressure	reduction in the percentage of properties experiencing low pressure per year (tenth of a percentage)	-6.41	-3.08	0.00	7.96	16.32
J	Supporting nature and wildlife	increase in the number of acres protected and enhanced (tens)	-6.00	-5.00	0.00	14.00	21.00
K	Unplanned short interruptions to water supply	reduction in the percentage of properties experiencing a short interruption per year (hundreth of a percentage)	-10.03	-6.41	0.00	5.49	14.42
L	Risk of temporary (NHH: non-essential) use ban, including hosepipes	reduction in the percentage chance of temporary use ban in a given year	-5.00 (NHH: -1.33)	-1.67 (NHH: -0.50)	0.00 (NHH: 0.00)	1.00 (NHH: 0.14)	N/A (NHH: N/A)

Source: NERA analysis

Appendix D. List of Attachments: Findings from Qualitative Research, Cognitive Interviews, and Pilot Survey

D.1. Qa Report on Pre-Survey Qualitative Research

See attachment.

D.2. Qa Report on Cognitive Interviews

See attachment.

D.3. NERA Report on Pilot Survey

See attachment.

D.4. Peer Reviewer Report on Pilot Survey

See attachment.

D.5. NERA Response to Peer Reviewer Report

See attachment.

D.6. Peer Reviewer Report on Follow-Up Conversation

See attachment.

Appendix E. List of Attachments: Survey Invitation and Instruments

E.1. Email Invitation to Participate in Survey

See attachment.

E.2. Letter from SSCW to Accompany Survey Invitation

See attachment.

E.3. Survey of Household and Future Bill Payer Customers

See attachment.

E.4. Survey of Non-Household Customers

See attachment.

Appendix F. Final Peer Review Report

Available from SSCW's website: https://www.south-staffs-water.co.uk/media/4339/peer_review_of_final_nera_wtp_report-1.pdf (last accessed 29 September 2023).

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