

# SEVERN TRENT WATER DRAFT WATER RESOURCES MANAGEMENT PLAN 2014 - ENVIRONMENTAL AND SOCIAL EFFECTS VALUATION METHODOLOGY

## 1 INTRODUCTION

This paper describes the approach for the valuation of environmental and social effects of all schemes (supply and demand management - metering) on the constrained scheme list for Severn Trent Water's draft Water Resources Management Plan (WRMP) 2014.

As recommended by the Environment Agency's (EA) Water Resources Planning Guideline (WRPG) (EA, 2012), the methodology adopted for the valuation of environmental and social effects uses the EA's Benefits Assessment Guidance (BAG) documentation. This includes the original BAG (EA, 2003), plus the updated User Guide (Eftec, 2012a) and Worked Example (Eftec, 2012b) published in 2012, which link the original BAG with more recent guidance on the use of value transfer in project appraisal. Of the original BAG, Part 2 (Rivers and Groundwater), Part 3 (Reservoirs, Lakes and Broads) and Part 5 (Works Related Impacts) are relevant to the assessment of the draft WRMP schemes. Section 2 of this paper describes the general principles which apply to valuation with reference to the BAG and the supplementary documentation. Section 3 explains the application of the approach in scheme and effect specific terms.

This draft methodology is subject to peer review to ensure it is appropriately robust, and may be revised between draft and final versions of the WRMP. This review will include sensitivity testing around assumptions and transfer values used, and will consider potential instances of double counting which have arisen on account of overlaps between transfer values. Sensitivity testing will focus on the schemes and associated impacts which make up the Preferred Programmes of the WRMP.

## 2 SUMMARY OF PRINCIPLES OF THE BENEFITS ASSESSMENT GUIDANCE

### 2.1 Qualitative and Quantitative Effects Assessment

In accordance with the BAG, environmental and social effects of each scheme are qualitatively assessed in the first instance. This qualitative assessment is undertaken for the SEA and recorded in assessment tables to be included in the Environmental Report which accompanies the draft WRMP. The assessment undertaken for the SEA is based on a set of objectives which have been determined through the SEA scoping process and subsequent consultation, and which were initially derived by the SEA Directive topics<sup>1</sup>. This process is fully documented in the SEA documentation (Scoping Report and Environmental Report).

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<sup>1</sup> Annex I(f) of Directive 2001/42/EC (the SEA Directive) indicates the following topics as a starting point for consideration of effects: biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage, landscape and the interrelationship between these factors.

The BAG User Guide identifies in Section 3 a set of impact categories which determine the effects which can be valued. It states that those most likely to be relevant to the construction and operation of water resource planning schemes include amenity, biodiversity, global warming potential, landscape, noise and recreation. These do not correspond exactly with the topics prescribed by the SEA Directive (Table 2.1). However, the SEA outputs indicate which effects are significant and should be considered for valuation. Once effects have been qualitatively assessed, significant effects are quantified according to the approach described by the BAG User Guide. Parameters considered include the affected population and the scale of effect (e.g. length of pipeline). Data for each scheme have been derived to facilitate quantification. This data is recorded in the individual scheme proformas. In all instances, the current and future baseline condition is the ‘without scheme’ scenario (i.e. a ‘do nothing’ case).

**Table 2.1 BAG and SEA Impact Categories**

<b><i>BAG impact categories</i></b>	<b><i>SEA Directive impact categories</i></b>
<ul style="list-style-type: none"> <li>• Conservation value / biodiversity</li> <li>• Heritage, archaeology, landscape</li> <li>• Informal recreation</li> <li>• Amenity</li> <li>• Boating / watersports</li> <li>• Canoeing</li> <li>• Swimming / bathing</li> <li>• Coarse / sea angling</li> <li>• Game angling (trout and salmon)</li> <li>• Commercial fisheries</li> <li>• Shellfisheries</li> <li>• Impacts on abstractors</li> <li>• Land take</li> <li>• Odour</li> <li>• Noise</li> <li>• Global warming potential</li> </ul>	<ul style="list-style-type: none"> <li>• Biodiversity</li> <li>• Human health</li> <li>• Fauna &amp; flora</li> <li>• Soil, water, air</li> <li>• Climate</li> <li>• Material assets (e.g. housing)</li> <li>• Cultural and archaeological heritage</li> <li>• Landscape</li> </ul>

Using transfer values, most of which are suggested by the BAG User Guide and Worked Example, quantified effects are valued (explained in the section below - Value Transfer). Certain effects cannot be valued because appropriate values for transfer are not available. This will be considered during the programme appraisal stage of WRMP development when significant effects as identified by the SEA are taken into account in refining the Least Cost programme. In order to avoid double counting of effects that have been valued, only those effects which have not been valued will be taken into account at this stage. This process is described in the Environmental Report and the dWRMP. It is therefore important firstly to explain what aspects of environmental and social effects are valued, and secondly to note that effects will still be taken into account in the WRMP development process despite their not being valued.

As is the case for the SEA, only residual effects are assessed and valued, i.e. those remaining

after mitigation. In this respect ‘mitigation’ refers to the common measures implemented throughout construction and/or operation to minimise the adverse effects of a proposed scheme (i.e. odour/noise reduction, best practice during construction works, acoustic enclosures to minimise operational noise/vibration, compensatory habitat etc.). The costs of mitigation are therefore considered to be included in the overall capital and operating costs (capex and opex) of the scheme and as such are not valued as environmental and social costs.

## **2.2 Value Transfer**

The updated BAG User Guide and Worked Example provide guidance on the selection of appropriate transfer values for valuation of quantified environmental and social effects. In all cases, costs are updated to 2012 prices using the Retail Price Index (RPI) (Office for National Statistics, 2012). The selection, applicability and derivation of each transfer value is described in Section 3 on a category-specific basis. The selection of each transfer value is based on a literature search of potential studies suitable to the effects being monetised; the studies reported in Section 3 are those deemed most applicable to these effects. Scheme-specific information (e.g. operating regime, affected waterbodies/resources etc.) are contained in individual scheme proformas. Temporary costs are assessed over the relevant period during construction. Operational costs are the annual recurring costs over the scheme lifetime, which as per the WRPG is taken as 80 years, and includes effects associated with scheme maintenance as a component of operation. The exceptions to this are the demand management schemes, which have variable operational durations. A discount rate of 4.5%, as set out in the WRPG, is applicable to the annual recurring effects of each water resource scheme to provide a net present value (NPV).

The original BAG uses valuation studies which would now be considered to be significantly dated for current use. Although the updated BAG Use Guide and Worked Example suggest some new valuation study references, a number of the valuation studies used in the original BAG are retained for the purposes of this assessment. The criteria for assessing the relevance of valuation evidence follows Defra value transfer guidelines as summarised in Box 3.3 of the BAG User Guide. The application of each transfer value is discussed under each BAG impact category in Section 3.

When valuing environmental and social effects using value transfer, there is a risk a value may overlap with another value in terms of the qualitative effects it considers, i.e. there is a risk of double counting of effects. Where decisions have been taken to not value certain effects to avoid double-counting (as described in Section 4.5 of Part One of the original BAG) these are referred to within the specific methodologies described in Section 3.

## **2.3 Sensitivity**

The BAG User Guide summarises the general approach to sensitivity testing for environmental and social costs. The guidance proposes that one or more important parameters (which include key assumptions) are varied to establish the multiple effects on the resulting cost. The guidance concludes that testing of the individual parameters of

schemes (rather than on a programme level) is sufficient for the appraisal of water resource schemes. However, a test of sensitivity of overall scheme costs to environmental and social costs is also recommended to help form a conclusion as to the level of accuracy appropriate to estimation of environmental and social costs.

During the quantification stage one or multiple selected parameters are varied to derive a lower, middle and upper bound cost to allow sensitivity screening. The middle value for each valued effect is the value reported as the environmental and social cost, representing the best-estimate. Valued temporary construction costs and benefits and operational recurring costs and benefits are then aggregated to produce net temporary and recurring costs for each scheme. Sensitivity testing of significant effects involves investigating the range between upper and lower bound estimates of costs and identification of the main variable affecting the resulting cost.

The sensitivity of overall scheme average incremental social costs (AISC) to environmental and social costs will be tested. This will provide context to programme selection in relation to the sensitivity to individual components of environmental and social costs. The significant findings of the sensitivity analysis as applied to the Preferred Programme of the dWRMP are summarised in Appendix 1 of this methodology.

### **3 SUMMARY OF METHODOLOGY AS APPLIED**

#### **3.1 Relevant BAG Impact Categories**

Table 3.1 lists the BAG impact categories that have been assessed for schemes on the constrained list, and provides information on the transfer values and references used, qualitative assessment and sensitivity. All transfer values listed in the table have been updated to 2012 prices using the Retail Price Index (RPI). Of the full list of BAG impact categories in Table 2.1, heritage, archaeology, landscape / boating / watersports, canoeing, swimming / bathing, coarse / sea angling, game angling (trout and salmon), commercial fisheries, shellfisheries, impacts on abstractors, odour and noise are not included in Table 3.1, as no relevant significant qualitative effects were assessed for the WRMP schemes.

**Table 3.1 Impact Categories Valued for the draft WRMP**

Valued impact category	Transfer value (£, 2012 prices; or annualised value) and units	Reference	Applicability (relevance/similarity BAG update Box3.3)	Environmental impact requirements (describing each of the units and where the info set comes from)	Sensitivity bounds on environmental effect quantification	Sensitivity bounds on transfer value	Notes
<b>Informal recreation (construction impacts)</b>							
Disruption to recreational activities during works	£0.12/person visit/year	Willis & Garrod (1990)	The transfer value used for the valuation of recreation during the construction phase is based on the willingness to pay to undertake different informal recreation activities. This value is based on the disruption to walkers from construction activities as a cost per person per year.	<p><b>Duration of Works</b> - This is a temporary, one-off duration. For schemes with multiple components (static works or pipeline construction) the total duration of effects of all components is combined to derive an overall duration.</p> <p><b>Population Density</b> This figure is the estimated resident population density (per local authority) mid-year in 2010, taken from the Office for National Statistics.</p> <p>For schemes with construction components in more than one local authority, a weighted average impacted population density is calculated based on the relative duration of works within each local authority.</p> <p><b>Site Type</b> – For the purposes of assessment according to the BAG, a site can either be a 'local', 'honeypot' or 'nationally important' site. This allows an annual visit rate to be approximated based on</p>	Duration of works (months) (+/- 10%)	Not listed in study, +/-10% used	<p>The BAG User Guide recommends that the approach outlined in the original guidance should be used to ensure consistency of application when valuing the impact on recreation. Given the range of water resource management plan schemes, schemes may result in recreation benefits and/or disbenefits.</p> <p>For all schemes with a construction phase (the majority of supply-side schemes), a recreation disbenefit was valued. To account for the effects on recreation from static construction works compared with pipeline construction, the two were initially considered as separate elements and then combined to give an overall recreation impact. Splitting these two elements accounts for the differences in works durations, affected populations</p>

Valued impact category	Transfer value (£, 2012 prices; or annualised value) and units	Reference	Applicability (relevance/similarity BAG update Box3.3)	Environmental impact requirements (describing each of the units and where the info set comes from)	Sensitivity bounds on environmental effect quantification	Sensitivity bounds on transfer value	Notes
				typical visitor rates to similar sites as detailed in Section 2.3.4 of Part 2 of the original BAG. For this assessment any scheme with static construction works within a National Park or an Area of Outstanding Natural Beauty is considered to be within a nationally important area for recreation. For schemes with rolling impacts (e.g. pipelines), these components are only considered to affect locally important areas given the short term, rolling nature of construction impacts.			and site importance (affecting visitor rate – see below) associated with the effects of construction.  No benefits were identified for recreation during the construction phase of any scheme.
<b>Amenity<sup>‡</sup></b>							
Amenity value associated with watercourses	£/household/year  (value depends on discrete water level change, 5cm, 45cm, 1m)§	Eftec & CSERGE (1998)	The transfer value used for the valuation of fluvial impacts focusses on the amenity and recreation benefits relating to the effects of abstraction upon river water quality, vegetation, fish and water levels. The transfer value is based on the willingness to pay per household per year to avoid a physical decrease in water level§ <sup>‡</sup>	<b>Impacted reach</b> – The approximate length (km) of river impacted during scheme operation.  <b>Population Density</b> - This figure is the estimated resident population density (per local authority) mid-year in 2010, taken from the Office for National Statistics.  <b>Affected Households</b> – The impacted population is calculated using the population density (assuming 2.3 persons per	Impacted river reach (km) (+/- 10%)	Not listed in study, +/-10% used	For schemes with a significant hydrological impact, the change in water level of a watercourse from scheme operation has been valued.

Valued impact category	Transfer value (£, 2012 prices; or annualised value) and units	Reference	Applicability (relevance/similarity BAG update Box3.3)	Environmental impact requirements (describing each of the units and where the info set comes from)	Sensitivity bounds on environmental effect quantification	Sensitivity bounds on transfer value	Notes
				household) within 1km (lower), 5km (central) and 10km (upper) radius of the affected length of impacted river reach  <b>Water Level Change</b> – A discrete change in water level (minor, moderate or major) is used to derive the relevant transfer value.			
<b>Global warming potential</b>							
Whole life carbon cost (associated with scheme construction and operational - energy use, transport and materials)	£/tonne CO <sub>2</sub> e using appropriate emissions factors according to the traded price/non-traded price of carbon ratio of components	DECC, 2009, and DECC/HM Treasury 2011	Transfer value derived using current guidance for valuing greenhouse gas emissions.	Methodology as applied by Severn Trent Water	Methodology as applied by Severn Trent Water	Traded and non-traded values provided by DECC have upper and lower bound as well as central values	All carbon emissions and valuations were undertaken by Severn Trent Water.
<b>Air quality<sup>†</sup></b>							
Human health impacts from transport emissions (direct) and grid electricity (indirect): NO <sub>x</sub> and PM <sub>10</sub>	£/tonne (source and pollutant-specific)	ICGB / Defra (2011)	Appropriate transfer value derived following Defra Damage Cost Approach, as detailed in the BAG User Guide.	<b>Duration of Works</b> - For the construction phase this is a temporary, one-off cost. For operation an annually recurring value is calculated.  <b>Total HGV movements</b> – As detailed in Section 3.2.  <b>Operational energy usage</b> in megawatt hours per year (MWh/year).  <b>Unit Emission Factor (UEF)</b> – For the construction phase, the	Transport: vehicle movements per year (+/- 10%)  Grid: Energy consumed per year (MWh/year) (+/- 10%)	Values provided by ICGB/Defra 2011 have upper and lower bound as well as central values	As is illustrated in the BAG worked example, air quality impacts were calculated for Nitrous Oxides (NO <sub>x</sub> ) and particulate matter (PM <sub>10</sub> ).For the construction phase the impact from direct emissions from HGV movements only are quantified. For the operational stage, indirect emissions from energy consumption (per annum) are

Valued impact category	Transfer value (£, 2012 prices; or annualised value) and units	Reference	Applicability (relevance/similarity BAG update Box3.3)	Environmental impact requirements (describing each of the units and where the info set comes from)	Sensitivity bounds on environmental effect quantification	Sensitivity bounds on transfer value	Notes
				<p>value is based on Road Vehicle Emission Factors (Department for Transport, 2009). For the operational phase the value (tonnes/MWh) is based on the emission of pollutants by UK energy industries.</p> <p><b>Transfer value</b> – The transfer values used are based on the IGCB/Defra Damage Cost Approach. For NOx a central estimate is used for both direct and indirect emissions. For particulate matter, a separate value is used for the cost of transport emissions and for indirect emissions from use of the national grid.</p>			quantified.
<b>Works related impacts±</b>							
Marginal cost of traffic delays associated with congestion	£/km  (value depends on proportion of road type impacted)±	Sansom et al. (2001)	The transfer value selected for the valuation of congestion is based on the marginal cost of congestion associated with HGV and LGV movements±	<p><b>Total HGV movements</b> – HGV movements are calculated, as detailed in Section 3.2.</p> <p><b>Road type impacted</b> – In order to derive a transfer value the type of road impacted (e.g. motorway, rural trunk, urban, etc.) is required. For schemes with multiple types of roads impacted, a weighted average road type is impacted to approximate a</p>	Vehicle movements per year (+/- 10%)	Not listed in study, +/-10% used	As detailed in the original BAG, schemes involving construction activities lasting months or years may cause traffic relating impacts, in particular the time delays associated with congestion. Therefore the impact of congestion associated with HGV movements during the construction phase was valued. The impact of HGV



Valued impact category	Transfer value (£, 2012 prices; or annualised value) and units	Reference	Applicability (relevance/similarity BAG update Box3.3)	Environmental impact requirements (describing each of the units and where the info set comes from)	Sensitivity bounds on environmental effect quantification	Sensitivity bounds on transfer value	Notes
				transfer value.			<p>movements during operation was also valued using the same method. Additionally, the impact of congestion associated with LGV movements for those schemes with increased visitor numbers during the operational phase (reservoir and canal schemes) was included.</p> <p>The study used is not detailed in the original or BAG User Guide. However it contains an update to the original guidance and has therefore been used in the valuation of works related impacts on congestion.</p>

† Air quality and works related impacts are not explicitly referred to as impact categories in the guidance, although BAG recommends the assessment of both.

‡ Where a scheme is assessed as having a significant hydrological impact, existing literature or expert judgement is used to estimate the length of impacted river reaches and changes in water levels. For those schemes with potential effects on hydrology, the overall disbenefits arising from changes in water level (e.g. upon recreation, water quality, overall amenity value, etc.) are valued using the relevant transfer value based on the willingness to pay avoid a decrease in water level. Hydrogeological effects of groundwater schemes are considered in terms of surface water effects as there are no relevant valuations applicable to groundwater.

§ Willingness-to-pay transfer values to avoid a decrease in water level (from *Eftec & CSERGE, 1998*):

Water Level Change	Depth (cm)	£/household/yr (2012)
Minor	5	4.15
Moderate	45	9.70
Major	100	21.74

± Marginal cost of congestion from HGV and LGV movements (from *Samson et al, 2001*):

Road Type	HGV (pence/km) (2012)	LGV (pence/km) (2012)
Motorway	35.0	16.7
Major urban central peak	234.6	112.1
Major urban central off-peak	128.8	61.5
Major urban non-central peak	66.3	31.7
Major urban non-central off-peak	37.4	17.9
Other urban peak	22.9	10.9
Other urban off-peak	13.4	6.4
Rural trunk and principle	25.2	12.1
Rural other	8.0	3.8

### 3.2 Assumptions

In the absence of scheme-specific information provided in engineering design documents, generic assumptions are made. These include assumptions for the duration of works, construction area requirements, HGV/LGV movements and land take required for a range of water resource schemes as described in Tables 3.2 and 3.3 below. Where scheme-specific assumptions have been made, these are explicitly referred to in the appraisal summary table for each scheme. Assumptions were informed by discussions with Atkins engineering staff (consultants for Severn Trent Water).

**Table 3.2 Scheme Construction Assumptions**

Scope of works	Land take	Construction area	Construction duration
New WTW	1 ha	2 ha	1 year
WTW Upgrade	0.1 ha	0.2 ha	1 year
New Borehole	0.005 ha	0.25 ha	6 months
Borehole Upgrade	n/a	0.1 ha	4 months
New Pipeline	n/a	0.1ha/km (urban), or 0.2ha/km (rural)	1-2 month/km
New Pumping Station	0.1 ha	0.25 ha	6 months
Upgrade pumping station	n/a	0.1 ha	4 months
Outfall structures/intakes	0.25 ha	0.5 ha	4 months
Settlement tanks/lagoons	0.25 ha	0.5 ha	1 year
River Crossings	0.25 ha	0.5 ha	4 months

For many of the larger schemes including reservoirs, fewer assumptions were required due to provision of design information.

**Table 3.3 HGV Trip Assumptions**

Scope of works	HGV movements during Construction*	Operational HGV movements* (per year)
New reservoir	30,000	100
New WTW	60	50
WTW Upgrade	50	20
New/upgraded STW	120	50
New Borehole	4	4
Borehole Upgrade	4	4
New Pumping Station	10	10
Upgrade pumping station	10	10
Outfall structures/intakes	20	0
Culvert	20	10
Canal lock bypasses / river crossings	10	10
Break pressure tanks	10	10
Artificial developments	4	4

Canal restorative works	5 movements/km	0
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\*Each HGV movement is assumed as a 40km round trip

HGV movements associated with the construction of new pipelines are dependent on the proposed pipe diameter and whether a pipe route is within a predominantly rural or urban location. It is assumed that 64 pipes up to 300mm diameter and 5.5m length can be delivered on one HGV. For pipes below 300mm diameter, the amount of pipes that can be delivered on one HGV is scaled accordingly. For pipelines above 300mm it is assumed that approximately 6 HGVs are required for the delivery of 1km pipeline. For pipeline routes in urban areas, it is assumed that 83 HGV movements are required per km of new pipeline for the purposes of removing excavated spoil. An assumption is made that most of the spoil from excavation in rural areas can be deposited beside the trench, hence requiring no additional HGV movements.

Each HGV or LGV movement is assumed as a 40km or 20km round trip respectively. The latter figure applies only to car journeys made during the operational phase of schemes that result in increased visitor numbers (e.g. reservoir / canal restoration schemes).

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## **APPENDIX 1**

# **SENSITIVITY TESTING**

## Environmental and Social Impact Sensitivity Testing

A sequential three-step sensitivity assessment has been undertaken and reported. Sensitivity testing of this type is an onerous exercise if applied to all valued impacts of all schemes. A screening process has been utilised to focus effort on those schemes and their component impacts which are considered to have the potential to change the prioritisation (based on valuation of E&S costs) of schemes in programme selection. Programme selection is considered to be sufficiently insensitive to all other (low value) impacts and schemes.

### Scheme sensitivity

This has been undertaken only for those schemes in the preferred programme. Schemes subject to sensitivity testing are those for which the unit Present Value (PV) of the Environmental and Social (E&S) costs is more than 10% of the Average Incremental Cost (AIC) (i.e. the Average Incremental Social Cost (AISC) minus the AIC is greater than 10% of the total AIC). Only these schemes are considered to be potentially subject to change of prioritisation (based on valuation of E&S costs) in programme selection. For these schemes the discount rate and the discount period of the total E&S PV have been changed and the combined result expressed as  $\pm\%$  of both the current E&S cost PV and Total PV. Upper and lower bands are identified as in Table A2.1.

**Table A2.1 - Upper and Lower Bound scheme sensitivity**

Factor	Current	Sensitivity	
		Upper	Lower
Discount rate	WRMP 4.5%	Green Book: 3.5% yo-29; 3.0% thereafter	WRMP 4.5%
Discount period	80y	100y	25y

### Impact Sensitivity

All impacts (in schemes subject to sensitivity testing) with an E&S cost PV of £30k (80y, 4.5%) are included. Only these impacts are considered to potentially affect the E&S cost valuation of a scheme sufficient to potentially change the prioritisation (based on valuation of E&S costs) of schemes in programme selection. This PV corresponds with a one-off E&S cost (associated with construction impacts) of £30k or a recurring E&S cost (associated with operational impacts) of approximately £1.5k/y.

For these schemes changes to the assumptions, the transfer value scaler, the transfer value range and alternative transfer values have been investigated separately and collectively (see Table A2.2). A record of the values tested and the provenance has been kept. Scheme descriptions, including a summary of the Impacts monetised for each scheme are contained in the dWRMP. Upper and lower bands are identified below.

For these schemes the combined result has been expressed as  $\pm\%$  of both current E&S cost



PV and total PV. Each valued impact has been reported separately. Those components of the sensitivity testing (of that impact) which have caused the greatest variation (either increase or decrease) have been listed, stating the % change in the E&S cost PV.

**Table A2.2 - Upper and Lower Bound impact sensitivity**

Factor	Current	Sensitivity	
		Upper	Lower
Assumptions on impact (e.g. area, distance travelled, road type, emission rate)	As stated	As available (or suggested by BAG) (or +10%)	As available (or suggested by BAG) (or +10%)
Current study transfer scaler (e.g. population affected, distance from impact)	As stated	As available (or suggested by BAG) (or +10%)	As available (or suggested by BAG) (or +10%)
Current study value range	Mid point	As available (or +10%)	As available (or +10%)
Alternative study	-	As available	As available

### Combined impact and discount rate/period sensitivity

For each scheme subject to Step 2, the sensitivity of the upper and lower band to the discount rate/period has been tested. This requires summation of the total upper and lower band for all impacts assessed in Step 2, together with the valuation of the impacts not subject to Step 2. The discount rate and discount period sensitivity testing described in Step 1 has been used. The combined result has been expressed as ±% of both current E&S cost PV and total PV.

### Summary of Sensitivity Testing

Step 1 of the sensitivity testing of environmental and social impacts did not identify any schemes which are considered to be potentially subject to change of prioritisation (based on the valuation of E&S costs) in programme selection. The PV of the E+S costs as a percentage of the AIC of each option on the preferred programme of the dWRMP are summarised in Table A2.3. No schemes on the preferred programme were subject to steps 2-3 of the sensitivity testing.

**Table A2.3 – Present value environmental and social costs as a percentage of the average incremental costs**

Option	Name	E+S PV as a percentage of AIC (%)
3	Trimpley/Worcs groundwater conjunctive use	4%
11	Belper Meadows borehole re-commissioning	5%
16	DVA to Nottingham pipeline enhancement	<1%
27	Hatton (Warks) conjunctive use	1%
32	Little Eaton conjunctive use	1%
35	Kenilworth borehole	5%
47	Norton artificial recharge (Phase 1)	1%
55	Bellington-Frankley conjunctive use	2%
62	Convert Short Heath borehole to potable supply	6%
64	Stanton/Milton to supply at Melbourne	2%
78	Whitacre artificial storage and recharge (Phase 2)	1%
96	Shropshire groundwater river augmentation	2%
122a	Draycote Reservoir expansion (6%)	2%
129	Bromsgrove groundwater relocation	3%