

## ANNEX C

### **Severn Tidal Power Feasibility Study Working Paper: Compensatory Measures – Application of Compensation Ratios under Article 6 (4).**

#### **A technical contribution to the work of the study by the HRA Expert Group.**

## **1. INTRODUCTION**

1.1 Compensation is a requirement introduced through Article 6 (4) of the Habitats Directive. The concept of compensation ratios is contained within EC guidance (e.g. EC, 2007). The extent of impact from a proposed development is determined through Appropriate Assessment as part of the Habitats Regulations Assessment. To maintain overall coherence of the Natura 2000 network as required by the Habitats Directive a multiplier termed the compensation ratio is applied to the outstanding impact to determine the amount of compensation required. Commission guidance states that there is wide acknowledgement that ratios should generally be substantially more than 1:1. Guidance states that ratios of 1:1 or below should only be considered where the measures will be 100% effective within a short period of time.

Three main elements of uncertainty need to be addressed in the process towards delivery of compensatory measures. For the purposes of this paper only Point 2 is to be applied to determination of the compensation ratio.

**(1) Uncertainty within the Feasibility Study** – Uncertainty within the Feasibility Study and inherent within the mitigation measures are considered and applied within the strategic appropriate assessment. This uncertainty should not therefore be included within the compensation ratio. Similarly uncertainty about the practical delivery of compensation measures should be reflected in contingency or optimism bias not in compensation ratio. In other words the compensation ratio addresses the risk to ecological equivalence.

**(2) Lack of Equivalence / Maintenance of Coherence** – Many factors are involved in determining the degree of ecological equivalence and coherence. These factors are discussed in detail within this paper; in general terms, the less equivalence demonstrated by a measure the higher the compensation ratio will need to be – additional compensation is required to compensate for the lack of equivalence.

**(3) Delivery Risk** – The risk that approved compensatory measures will not achieve their ecological objectives is to be contained within an agreed level of optimism bias and other contingency measures, it is therefore separate from consideration of compensation ratios.

1.2 The consideration of compensation for effects on Ramsar site features is outside the scope of this paper. Existing Government policy states that Ramsar sites should receive the same level of protection as listed Ramsar sites. The consideration of compensation and compensation ratios for Ramsar sites would need to be made in the context of relevant guidance.

## **2. PURPOSE**

2.1 To inform the STP feasibility study, by developing ideas on compensation ratios (multipliers) that might be applied to those compensatory measures that would be needed for the adoption of a plan to develop an STP project. The paper is limited to the consideration of compensatory measures that might be needed under the Habitats Directive to protect the coherence of Natura 2000. At this strategic level this paper will only consider the three features that will incur the greatest impact, namely: (1) intertidal features encompassing “mudflats and sandflats not covered by seawater at low tide” and “Atlantic salt meadow”, (2) SPA and Ramsar bird features and assemblages and (3) estuarine and migratory fish.

An adverse effect on any designated feature is significant; the remaining Natura 2000 features and sub-features will be addressed in a forthcoming report.

This paper considers possible compensation ratios in the context of a strategic study on whether and on what terms Government could support the development of a Severn Tidal Power scheme. It considers ratios that might apply to a strategic compensation proposal if a plan to develop an STP were to be adopted. The measures would need to be related to the strategic Appropriate Assessment which would identify the adverse effect on the integrity of Natura 2000 sites. Compensation ratios for a project would need to be determined in the context of an EIA and Appropriate Assessment of a scheme. This has the potential to be different from the findings of the strategic study. The EIA will inevitably provide more detailed conclusions than the SEA strategic study, for this reason the compensation ratios attributed following an EIA may differ from those adopted under an SEA.

### **3. STATUS OF PAPER**

- 3.1 This is a contribution to the work of the compensatory measures work plan through the HRA and Compensatory Measures Expert Group (a sub-group of the environment workstream); the contents of this paper should not be taken as organisational policy. A draft was circulated for comment by the HRA and Compensatory Measures Expert Group. This version takes account of comments received from members of that group.

### **4. DEFINITIONS**

- 4.1 The strategic Appropriate Assessment will highlight the features that will be adversely affected by each option and identify the extent to which the conservation objectives for each feature will be affected following application of mitigation measures. The result for each feature will represent the predicted damage to the features, which equates directly to the “compensation *need*”. The current evaluation of the measures to prevent and reduce effect provides a list of feasible measures, many of which will require further study to ascertain their effectiveness and feasibility. It is therefore likely that “compensation need” will be defined as a range or will be subject to uncertainty. It is to be expected that the outstanding impact which informs the need for compensation would be determined as part of the Appropriate Assessment of a project.
- 4.2 The “Article 6(4) compensation *requirement*” is the amount and type of compensation that Government might require from an STP option in order to ensure that the legal requirements of the Directive are met and that the coherence of Natura 2000 is protected. This is different to the outstanding impact as it should, for example, take account of any multipliers needed to ensure that the compensation achieves the level of ecological functionality required to protect coherence.

### **5. LEGISLATION AND GUIDANCE**

- 5.1 Article 6 (4) paragraph 1 of the Habitats Directive states that compensatory measures must ensure the coherence of Natura 2000. The EC (2007) guidance recognises that compensation measures are unlikely to fully reproduce the characteristics and functionality of the original site; consequently, compensating for the direct impact only would not maintain coherence of the network, the application of a “compensation ratio” is therefore recommended.

- 5.2 Article 6.4 guidance (EC, 2007); 1.5.4. *Extent of compensation:*  
“The extent required for the compensatory measures to be effective has a direct relationship to the quantitative and qualitative aspects inherent to the elements of integrity (i.e. including structure and functionality and their role in the overall coherence of the Natura 2000 network) likely to be impaired and to the estimated effectiveness of the measures.

*Consequently, compensation ratios are best set on a case-by-case basis and must be initially determined in the light of the information managed during Article 6(3) assessment and ensuring the minimum requirements to meet ecological functionality. The ratios may then be redefined according to the results observed when monitoring the effectiveness, and the final decision on the proportion of compensation must be justified.*

*There is wide acknowledgement that ratios should be generally well above 1:1. Thus, compensation ratios of 1:1 or below should only be considered when it is demonstrated that with such an extent, the measures will be 100% effective in reinstating structure and functionality within a short period of time (e.g. without compromising the preservation of the habitats or the populations of key species likely to be affected by the plan or project)”.*

- 5.3 The EC (2007) guidance recommends that compensation ratios are applied individually to each plan / project dependent upon the outcome of the Article 6 (3) assessment; compensation ratios will be applied individually to each compensation measure within that plan / project. No guidance exists addressing the process of determining the compensation ratio. It is therefore the purpose of this paper to review information relevant to compensation ratios for designated features adversely affected by development of a Severn Tidal Power Scheme. Consideration of compensation ratios for the purposes of a strategic study in isolation from an Appropriate Assessment will necessarily have to be regarded as provisional and subject to change in light of the outcome of the Article 6 (3) assessment.

## 6. CASE STUDIES

For estuarine developments affecting intertidal habitat in the UK, managed realignment has been the most commonly required compensation measure. The Environment Agency applies a compensation ratio approaching 1 : 1 when considering the future requirement for compensation to offset the coastal squeeze effect of coastal flood risk management as for example in the planned Steart realignment in the Severn Estuary. This is justified because the measures are planned to be in place and ecologically functioning well in advance of flood risk management actions being felt. For other developments ratios have ranged from 1 : 1 for schemes located adjacent to the impact site to ratios of 4 : 1, for example, by Harwich Harbour Authority where the highest ratio was required to compensate for accelerated intertidal erosion over the five years taken provide the compensation. Both of these schemes represent small realignments; no schemes have been undertaken on a scale comparable with STP requirements.

Compensation ratios adopted for other habitat types have been as high as 14.5 : 1 in the case of the French TGV high speed rail link (Entec, 2009). The Article 6(4) Opinions (Kramer, 2009) does not go so far as detailing the compensation ratios used but highlights the site specific nature required in attributing compensation ratios; the article alludes to ratios used between 1 : 1 and 100: 1 in some instances.

Table 1 – Summary of Managed Realignment Case Studies determined under Article 6 (4) of the Habitats Directive.

<b>Scheme</b>	<b>Initial Breach</b>	<b>Area Created (Ha)</b>	<b>Compensation Ratio</b>	<b>Habitat Created</b>
Alkborough / Paull Holme Strays, Humber.	2003	440	3 : 1 Direct loss <sup>1</sup> 1 : 1 Coastal Squeeze	Mudflat / Saltmarsh Freshwater Reedbed Wet Grassland
Cardiff Bay – Newport Wetlands.	2000	439	2.6 : 1 <sup>2</sup>	Reedbed, Saline Lagoon, Wet Grassland
Morecombe Bay Coastal Defence Works, Hesketh Out Marsh, Ribble Estuary.	2009	180	3 : 1 <sup>3</sup>	Mudflat Saltmarsh Saline Lagoon Transitional & Floodbank
Bathside Bay Container Terminal; Little Oakley.	TBC	138	2 : 1	Mixed Coastal Habitats
Wallasea, Humber.	2006	115	2 : 1	Mudflat Saltmarsh Saline Lagoon Transitional
London Gateway Port Development, Thames Estuary.	TBC	74	1 : 1 <sup>4</sup>	Mudflat Saltmarsh
Welwick, Humber.	2006	54	2 : 1	Mudflat Saltmarsh Saline Lagoon Grassland
Channel Deepening, Harwich Harbour Authority.	2001	4	4 : 1 <sup>5</sup>	Mudflat Saltmarsh

<sup>1</sup> Direct loss refers to the footprint of the coastal defence works.

<sup>2</sup> 2.6 : 1 ratio relates to the non-equivalence in habitat provision; freshwater wetland habitat compensating for lost mudflat.

<sup>3</sup> The compensation site is 40km from the impact site (52km by sea); consequently, a 3 : 1 ratio was applied.

<sup>4</sup> 1 : 1 ratio but main SPA impact assumes all SPA features will be lost. However, this is not the case, and any that remains is additional to 1 : 1.

<sup>5</sup> 4 : 1 applies to the direct impact; hydrology and geomorphology modelling indicated additional loss based on a five year period to deliver the project, once incorporated the ratio equates to 1 : 1.

## 7. INTERTIDAL FEATURES

### 7.1 Factors for Consideration

7.1.1 **Efficacy of Measure** - A large proportion of compensation for coastal projects in the UK is conducted through managed realignment. This technique is becoming an established method and is generally accepted to deliver required compensation objectives. Table 1 presents a general trend that recent schemes utilise a lower ratio, highlighting the development of this technique over the past decade; however, it must be acknowledged that the ratio applied to each site depends upon site specific factors. The reported successes suggest that future realignment schemes might adopt lower ratios whilst delivering compensation objectives.

Current managed realignment schemes have been conducted on a much smaller scale than that proposed for an STP scheme. The level of ecological functionality that might be delivered by large schemes and whether this is likely to be different to existing schemes must also be considered when deriving a ratio. The STP large scale re-alignment study suggests that large alignments will achieve similar levels of functionality as smaller sites.

7.1.2 **Scale of Delivery** – Any of the STP options could result in an unprecedented requirement for managed realignment. An argument exists that larger tracts of land will recreate a stable and ecologically functioning environment more successfully than many smaller schemes. “Edge-effects” will be far more prominent and detrimental to smaller schemes which will be more vulnerable to disturbance or chance events. In contrast, the impact of edge-effects on larger sites will be proportionately less, with more potential to deliver conservation objectives; for this reason lower compensation ratios might be justified for larger sites.

Additionally, larger sites may be more self-sustaining because the scale enables a mixture of habitats to be maintained over longer timescales. For example, within a large area there may be greater potential for a mixture of mudflat and saltmarsh to be maintained, whereas in smaller realignments the trend is for mudflat to progress to saltmarsh over time; the latter circumstance is usually a consequence of small realignment sites being located relatively high in the tidal frame.

Managed realignment schemes presented in Table 1 are frequently delivered at a 2 : 1 ratio for sites smaller than 150 Ha; schemes presented larger than 150 Ha have been delivered at a 3 : 1 ratio; again, it must be acknowledged that the ratio applied to each site depends upon site specific factors.

7.1.3 **Tranches** – It is unlikely that large realignment targets could be met within a single site and that they would need to be provided across several sites and/or in tranches. The practicalities of developing a large programme mean that it is likely that individual projects would proceed along different timescales. The anticipated timescale for construction of an STP option might enable an initial tranche to be developed at an early stage in the project and a succession of subsequent tranches to be created. This might be feasible within an adaptive framework in which the performance of earlier tranches could be used to adjust subsequent tranches; this would depend on a monitoring programme linked to clear criteria and performance targets. In principle, it is possible the later tranches could still be developed in time to compensate for the impacts of the desired option. In the event that significant tracts of compensation are required delivery may occur at the time of impact or later. A rolling programme such as this may be the only practical way of delivering very large realignment targets. Considering the recent success of managed realignment

schemes it may be feasible to suggest employing an initial compensation ratio to the first tranche(s) with the option of subsequent tranche(s) being created at a compensation ratio commensurate with the success of the previous.

- 7.1.4 **Proximity** – The STP options affect the potential for managed realignment adjacent to the Severn Estuary. EC (2007) guidance advises that compensatory measures should be prioritised as follows: 1) within the Natura 2000 site, 2) outside the Natura 2000 site concerned but within a common topographical or landscape unit and 3) outside the Natura 2000 site and in a different topographical or landscape unit but within the biogeographic region. Measures undertaken in proximity could therefore be applied at lower ratios. A higher compensation ratio has been applied for compensation at distance, for example a 3 : 1 ratio was applied to compensate the Morecombe Bay coastal defence works at Hesketh Out Marsh in the Ribble Estuary. The compensation site was 40km from the impact site, or 52km by sea. Hence compensation ratios might vary according to the relative proportions of habitat close to or at distance from the Severn. However, these measures relate to relatively small areas of compensation.

Consideration of large-scale managed realignment restricts the availability of sites. This may preclude delivering a scheme in close proximity to the impacted site.

An alternative perspective might be that very large compensation schemes might be viewed within a wider geographical context of their overall effect on the coherence of the Natura 2000 network not just their contribution to network coherence within the Severn area.

- 7.1.5 **Timing** – EC (2007) guidance advises that compensation measures should be in place and effective at the time of any impact occurring upon the designated site; although the guidance also says that under certain circumstances where this cannot be achieved overcompensation would be required for interim losses. Measures that require engineering techniques are unlikely to provide representative natural conditions upon completion. Newly created sites initially require the deposited sediments to equilibrate sediment size distributions and physicochemistry before an assemblage of benthic invertebrates can establish; this latter process may take several years before they attain equivalent ecological functionality.

Many managed realignment schemes are conducted alongside or after the impacting development; consequently, these schemes require higher compensation ratios to accommodate the fact that full levels of ecological functionality are not in place at the time of impact on the development. The long construction period associated with an STP scheme may permit creation of functional compensatory habitat prior to habitat in the Severn Estuary being impacted. For example, for some features such as the total area of intertidal habitat, the main loss would be on closure and completion of a development not on commencement of construction. This could justify a lower compensation ratio and / or be linked to an adaptive approach. Within such an approach priorities for early delivery would need to be identified. A key issue for an STP development will be achieving high levels of ecological functionality for SPA bird populations early in the process. Hence the timing of habitat for birds may be more critical than the timing of habitat creation to compensate for saltmarsh loss for example.

- 7.1.6 **Resource Equivalence** – Many authorised compensation measures have provided alternative habitats that permit maintenance of the conservation objectives of the impacted site. Freshwater wetland habitat compensating for loss of intertidal habitat still provides feeding and resting areas for a number of impacted bird features.

Construction of the Cardiff Bay barrage resulted in the loss of intertidal mudflat; compensation was provided through creation of reedbeds, saline lagoons and wet grassland at a compensation ratio of 2.6 : 1. The site has successfully achieved the agreed compensation objectives (two nationally important species) but not all impacted species benefited. For this reason a higher compensation ratio is required to offset the fact that the created habitat is not fully ecologically equivalent. The compensatory measures for the Cardiff Bay barrage were approved in 1994 recently after the release of the Habitats Directive; as such no EC guidance was available on the provision of compensatory measures. It cannot be guaranteed that such measures be permissible under current EC guidance.

- 7.1.7 **Ecological Productivity** – The EC (2007) guidance requires provision of habitat of equivalent functionality; the productivity of impacted habitats must, at least, be replicated. Application of a compensation ratio approaching 1 : 1 in respect of areas of low productivity could be justified as the chance of success of reproducing this habitat is high. In practical terms this would require the areas of ‘low ecological productivity’ to be defined.

The extreme nature of the Severn Estuary results in some areas of low productivity; however, areas of high productivity exist to fuel the 90,000 waterfowl. Tillin (2009) describes the intertidal mudflat and sandflat as “characterised by low diversity communities, with a high abundance of small individuals, and sometimes a high biomass”, and subsequently relatively high productivity. A proxy for productivity could be described by resource use; areas of high sediment mobility are often avoided by waterbirds as a resource and hence could be compensated for at a 1: 1 ratio; the outer Welsh Grounds may represent such a strongly dynamic area. This rationale could apply to compensation for loss of those areas of SAC habitat that were very dynamic mobile intertidal sediment.

- 7.1.8 **Habitat Development and a Dynamic Approach to Targets and Ratios** – Within smaller intertidal realignments mudflat inherently develops into saltmarsh; this is because smaller realignment sites are generally found high in the tidal frame. However, some larger realignment sites have been too low within the tidal frame resulting in the creation of sub-tidal habitat; extensive land raising is planned at Wallasea to bring the realignment site within the target part of the tidal frame. Coastal habitats are inherently dynamic and will change over time depending on their size, characteristics and the geophysical and hydrodynamic processes affecting them. In some cases mudflat created in a new area may remain as mudflat only for a prescribed time. Larger realignment sites provide the potential for more of a dynamic equilibrium to be established between a mixture of habitats. They also have the potential for adaptation space to be built into the design enabling a more sustainable approach to future management. In practical terms, the approach to defining habitat targets within a large realignment should be more flexible with more of an emphasis on creating a dynamic self-sustaining series of coastal habitats. This would be in keeping with an approach that is adaptive and responds to climate change.

It would require an approach to compensation ratios that was flexible, perhaps defined in terms of anticipated ranges for each of the components of the mix of habitats. Hence the overall ratio applied to intertidal habitat creation would accept that the ratio for features such as saltmarsh and mudflat would change over time and could be flexible; i.e. determining the need for a proportional range of mudflat of between 60-80% mudflat and 20-40% saltmarsh over a prescribed period. This would recognise the realities of managing coastal ecosystems. The ratios might be linked to specific periods of time: for example, 20 years, 50 years and beyond. In terms of climate change impacts on intertidal habitat, sea level rise is squeezing

saltmarsh habitat which has suffered extensive decline with saltmarsh lost to mudflat or subtidal habitat. Creating a realignment that enabled the proportion of saltmarsh to be maintained or increased over time could be beneficial in terms of the overall coherence of Natura 2000. A decision would be required on the acceptability and mechanics of such an approach.

## **8. SPA BIRD FEATURES AND ASSEMBLAGES**

The effects of habitat creation measures including compensation for SPA bird features and assemblages will be discussed in a separate report by the British Trust for Ornithology. The anticipated report is to be based on feeding guilds such that the relevant proportion of habitats can be assigned to maintain the conservation objectives for SPA bird features and assemblages.

## **9. SAC MIGRATORY AND ESTUARINE FISH**

### **9.1 Factors for Consideration**

Application of compensation ratios with regard to species targeted measures (e.g. species introductions: compensating numbers of individuals rather than areal extent of habitat) is relatively novel with no significant precedents having been set. Various approaches can be taken that involve either compensating equivalent numbers of rivers to those impacted or compensating for the population size lost; realistically both the range of the species concerned and the size of the population will need to be addressed.

**9.1.1 Efficacy of Measure** - Several compensatory measures are under consideration, some measures are established whilst others are relatively novel. Stocking for salmon is well established with reliable data to inform success; a compensation ratio for such measures could be applied relatively easily. Novel techniques or established techniques that incorporate a novel species would require investigation but would still incur a degree of uncertainty; it is this element of risk that would justify an increased compensation ratio.

**9.1.2 Species Dependant Ratio** - The success of each compensation measure will vary depending on the target species. Salmon are easily monitored, a wealth of data is available and their behaviour and ecology are well understood; shad, in particular, but inclusive of lamprey are the antithesis in this regard. Where data and understanding for a species is limited, a higher compensation ratio should be considered.

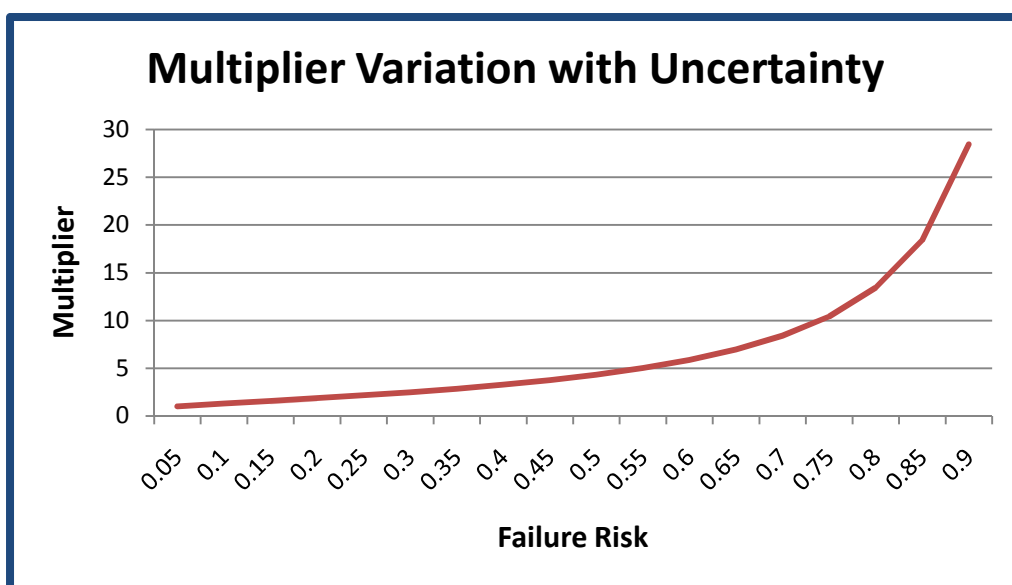
**9.1.3 Ecological Uncertainty** – Measures such as species introduction are not established and raise novel questions in relation to compensation multipliers. The application of uncertainty to compensation multipliers is considered in work commissioned by the Sustainable Development Commission (SDC) which suggested an approach to the use of multipliers for species introductions in their draft paper on equal value (Treweek, 2009). Compensation measures could include introductions of twaite shad (*Alosa fallax*) into rivers outside the Severn Estuary and its tributaries.

The case study presented within the paper reports a 50% chance of failure resulting from unfavourable ecological conditions at the introduction site; accordingly a multiplier of 5 should have been applied (see relationship in Figure 1 below). This multiplier could be applied either to the number of rivers affected or to the predicted numbers of shad that are reported to be lost.



Within STP three<sup>6</sup> shad breeding rivers are likely to incur a significant effect. Following the example above, even at a 50% chance of failure this would require introductions in 5 rivers for each river impacted, or stocking 5 times the number of shad predicted to be lost from each river. Alternatively, five attempts at introductions could be undertaken in at least three suitable rivers, whilst other measures are considered in parallel or sequentially in case of failure. Based on the confidence of the measures to offset the adverse effects of an STP development (O’Keefe *et al.* 2009a) a 50% chance of failure may be too optimistic; the resultant ratio may therefore be considerable but not unachievable. This is novel and other options and approaches to risk management would need to be explored. A key issue will be whether there is sufficient knowledge to determine risk or whether in practice an adaptive approach would need to be applied.

Figure 1: Variation in required multipliers with effectiveness uncertainty of compensatory measures; from: SDC (2009).



9.1.4 **Timing** - Compensatory measures for migratory fish will ideally need to be functional prior to any construction works detrimentally affecting each species migration. Noise impacts are known to prohibit migration of migratory species, shad in particular. O’Keefe (2009b) report that only partial reductions can be made in noise impacts upon migratory and estuarine fish and that migration of the resident species occur throughout the year.

## 10. SUMMARY

The EC guidance (EC, 2007) recommendation that compensation ratios are applied on a case-by-case basis combined with the unique characteristics of the Severn Estuary mean that any views on ratios do not have wider application.

The review of compensation ratios applied to schemes show that a range of ratios have been used for intertidal habitat creation. Precedent is a useful guide as it shows what ratios have been considered to be effective in protecting coherence; although, it must be noted that the maintenance of coherence via application of compensation

<sup>6</sup> Assumes only Rivers: Severn, Wye and Usk; effect on River Tywi by all STP options yet to be reported.

ratios has not been tested in law. The range of ratios found might be explained as reflecting site specific factors and a trend towards lower ratios as the technique has become better established. The choice of ratio to apply is a matter of expert judgment informed by evidence on the factors affecting ecological functionality. Factors that might affect a judgement on an appropriate ratio or ratios that might apply to the Severn are reviewed. There are arguments for adjusting ratios upward and downward in the case of very large realignments if they were required for an STP compensation. Larger sites may achieve greater functionality, be more sustainable and be less vulnerable to edge effects. However, they would be more likely to be located at distance from the Severn which would normally be an argument for a higher ratio.

There is less precedent to inform consideration of compensation ratios for species measures (other than SPA birds). The report commissioned by SDC proposes an approach based on risk / probability of success.

The STP study needs to consider what risk factors should inform a compensation ratio to be applied to the strategic feasibility study, a strategic compensation proposal and a compensation proposal for an STP project. Selection of too low a ratio within the strategic study could result in later studies altering cost while an overly precautionary ratio could distort the overall consideration of an STP option. If an STP plan was to be adopted consideration of a compensation ratio would inform a strategic compensation proposal using the results of the shadow Article 6 (3) assessment.

It is very unlikely considering the range of variables to be assessed and the Article 6 (4) guidance that a compensation ratio for any measure will be 1 : 1 unless it were feasible to deliver measures well in advance of the requirement mirroring the approach taken by the Environment Agency in long term Flood Risk Management Strategies. Another way in which compensation ratio might be reduced is through a biodiversity banking approach. This would require a biodiversity bank to be able to offer functional habitat that had already been created and assigned to a developer when it was required. Biodiversity banking is an emerging concept in the UK and some collaboration between NGOs and agencies are tending towards this approach.

Compensation ratios for species measures need to be considered in relation to the risk of the measure. Species introductions might be developed using the approach set out in the SDC commissioned report, where the ratio is set by an assessment of risk. Or a more adaptive approach might be taken with a number of introductions attempted and a requirement for additional measures should they not succeed. A view would need to be taken in the light of further information on the feasibility and risk of such measures.

Taking an adaptive approach to delivery of compensatory measures, in particular, managed realignment, could yield benefits to maintenance of coherence. Prioritising delivery of habitat that is of greater resource value to, for example, designated waterbird features, will benefit delivery of coherence. Equally, utilising monitoring data from initial tranches of compensation to permit revision of applied ratios to subsequent tranches will enable more accurate provision of coherent compensatory measures.

Assignment of a compensation ratio is not the end-point in delivering the required compensation objectives. Monitoring will be essential for all compensatory measures to ensure that the compensation objectives are met. Where monitoring shows that there is a shortfall in the obligations further measures may have to be implemented. At this late stage additional compensation measures should be assigned new

compensation ratios proportionate to the delay in their provision. This is an argument for tending towards a more precautionary ratio in the initial planning.

This report only makes reference to intertidal habitats, waterfowl and migratory and estuarine fish. Consideration will need to be made of the remaining features that will be adversely affected by an STP development. Many of the factors considered above will need to be applied in determining compensation ratios for compensation measures of the remaining SAC, SPA and Ramsar features.

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