Consultation Response in respect of the Draft River Basin Management Plan for the South East River Basin District with reference to the Sussex Ouse and Adur Catchment

1.1 Introduction

This consultation response is submitted jointly on behalf of a number of organisations with a direct interest in the Sussex Ouse and Adur WFD catchment. The responding organisation are the Sussex Ouse Conservation Society (S.O.C.S), the River Adur Conservation Society (R.A.C.S.), the Ouse Angling Preservation Society Ltd., the Sussex Piscatorial Society, the Haywards Heath and District Angling Society Ltd., the Copthorne and District Angling Society and the Henfield and District Angling Society. The submission expands upon, at a local level, the national level response provided by the Association of River's Trusts (ART). It is structured so as to address a number of key questions which were posed by the EA and addressed by ART in its response. In addition to answering these specific questions, in relation to a range of general issues relevant to the Ouse and Adur catchments, comments are provided with respect to each of the individual water bodies within the Ouse and Adur catchment as defined in the South East River Basin District (SERBD) Draft Plan.

1.2 The respondents

S.O.C.S. (www.sussex-ouse.org.uk) is a conservation body with charitable status established c1995 and is a member of the Association of Rivers Trusts (ART). A memorandum of understanding (MoU) has recently been agreed between S.O.C.S. and the EA, building, at a local catchment level, on the national level partnership agreement between the EA and ART signed in 2006. The S.O.C.S./EA MoU specifically references the potential for the two organisations to work in partnership to achieve WFD objectives. **R.A.C.S**. (www.sussex-adur.org.uk) was established in 2006 and will formally become a member of ART with effect from 1st July 2009. It is anticipated that a MoU similar to that agreed with S.O.C.S. can be drawn up between the EA and R.A.C.S. with respect to the Adur catchment. **The Ouse Angling Preservation Society Ltd**, (O.A.P.S.; www.ouseaps.co.uk) was established in 1875 and controls angling, via ownership or leasing of fishing rights, on the river Ouse from just north of Lewes to Goldbridge in part via a reciprocal water sharing agreement with **the Copthorne and District Angling Society** (www.copthorneangling.co.uk) . In addition to the main stem of the river, fishing is controlled by these two societies on stretches of two tributaries, the Bevern and Longford Streams. The Copthorne Society also controls angling on, within the Ouse catchment, Piltdown Pond. The remit of O.A.P.S. as an angling preservation society is wider than that of a conventional angling society and, as far back as 1884 (when it funded the first fish passes on the Ouse) it has engaged in conservation related activities and, since S.O.C.S. was established has collaborated with it (e.g. via overlapping committee membership and with respect to a research project involving the reading of sea trout scales). **The Sussex Piscatorial Society** (www.sussexpiscatorialsociety.co.uk) was established in 1891 and controls angling on a stretches of both the Ouse and Adur. **The Haywards Heath and District Angling Society** (www.hhdas.com) controls angling on much of the main stem of the Ouse from Goldbridge upstream to Lindfield. **The Henfield and District Angling Society** (www.henfieldas.co.uk) controls angling on stretches of the main stem of the Adur upstream of Stretham bridge, its Eastern and Western arms, and two tributaries, the Chess and Honeybridge Streams. In addition to these organisations, a number of individual riparian owners have indicated that they also to be endorse to this submission. At the time of submission, we are still awaiting a formal response from them; we will provide a full list of those who wish to endorse it at the earliest opportunity.

1.3 Endorsement of, and cross-referencing to, ART national level submission

A consultation response in respect of the Draft River Basin Management Plans (dated March 09) has been submitted by the Association of Rivers Trusts (ART) to Mr Geoff Bateman, the EA's Head of River Basin Management. The ART's national level response is endorsed by the signatories to this submission which elaborates, with respect to the Ouse and Adur, on specific issues raised in the ART's response. It is noted that both S.O.C.S. and R.A.C.S. are participants, as is the EA, in the Water EU Interreg IVA Cross Border project bid referred to on pg 15 of the ART's consultation response. S.O.C.S. and R.A.C.S. are additionally listed in Annex B of the ART's submission, being the only two ART member organisations referred to within the SERBD.

2.1 Response to specific questions posed via the consultation process

The consultation process sets out 9 specific questions (highlighted in blue in this document), responses to which comprise the bulk of the ART's submission. While endorsing the ART's response (which should be read in conjunction with this submission), responses to the same questions are provided below offering a perspective specific to the Ouse and Adur catchments. Although a number of direct quotes from the ART submission particularly pertinent to the Ouse/ Adur are incorporated into the following text, this submission is intended to provide a far greater level of detail, down to that of individual water bodies, than is provided by ART's general submission. Following a discussion of a specific issue, key points are summarised in this typeface.

1. Do you agree with our assessment of the problems in our water bodies?

While we agree that, at a basic level, many of the broad issue/impact categories are identified we are concerned as to a paucity of detail at the level of individual water bodies and, at this level, of the omission of a number of key issues including the apparently limited attention devoted to hydromorphological issues.

We set out below observations on what we consider to be the most significant issues relating to the Ouse and Adur catchments:

2.1(i) Hydromorphological Issues:

a) Modifications of the rivers due to navigation works

The entire transitional (tidal) sections of the Ouse and Adur (including the transitional reaches of the Western and Eastern Arms) are impacted by their modification for navigation purposes, which involved the straightening of the channel and by-passing of meanders (this being more apparent on the Ouse, where "oxbows", particularly in the Barcombe to Lewes reach, are meanders artificially isolated c 1790 by navigation works. Although less obvious on the ground now, there is also evidence of former meanders bordering the tidal Adur). The initial hydromorphological impact of the navigation works has, on both rivers, subsequently been compounded by flood defence/land drainage works. Navigation on the tidal Ouse by powered craft currently extends upstream as far as Lewes. On the Adur, boat traffic is now primarily restricted to the very lowest section, although some commercial barge traffic made use of the river further upstream as late as the 20th C.

With respect to the non-tidal reaches, modification for navigation relates primarily to the Ouse, although the Western Arm of the Adur is also impacted. The main stem of the non-tidal Ouse (that upstream Barcombe, although historically the tidal limit was at Lewes) was fundamentally modified by works (lock and weir construction, channel straightening, widening and deepening, and the creation of artificial cuts) to render it navigable to commercial barge traffic; the works were undertaken between around 1790 and 1814 and all or parts of the non-tidal river were navigable c 1790–1870. Although the navigation was abandoned c1870 and the locks and weirs gradually fell into disrepair, the hydromorphology of the river remains fundamentally modified as a result of navigation works. Although not, for WFD purposes classed as Heavily Modified upstream of the Uck confluence (a categorisation we agree with, as the purpose of the modification, i.e. navigation by commercial barge traffic, is redundant) the river's hydromorphology remains modified to an extent significant to compromise, and potentially exclude, Good Status being achieved. We consider that achieving good ecological status may only be realised by restoring the river to a condition at least approaching its state prior to the navigation works being undertaken. There is very significant potential for river restoration programmes entailing the reinstatement of meanders isolated by navigation cuts and the removal or modification of structures which were initially installed as part of the navigation works. We accept that it is however debatable whether river restoration of this scale is a pre-requisite for achieving good ecological status and that improving the habitat quality afforded by the current main (navigation) channel may, at least at some locations, represent a more cost-effective and practical alternative to restoration of the original meanders. The Ouse is atypical within the UK in being a river still modified by (entirely redundant) navigation works and a strategic decision is required as to how good ecological status should relate to a restoration of the pre-navigation era environment. Three major river restorations programmes are known to have been (at least tentatively, and with some associated documentation) proposed for the main stem of the Ouse, with at least one other scheme being mooted. Each of the schemes would entail the reinstatement of former main river sections which were isolated c1790 by the navigation works, with an additional objective of restoring river channel-flood plain connectivity.

These schemes are discussed separately under the discussion of the individual river stretches; however, there are common issues, which are potentially relevant to any restoration scheme on the Ouse or Adur, which should be considered:

1 Transference of flow from the current to its historic channel may result in the river being realigned by distances of several hundred metres. This may potentially mean the main channel being transferred from the property of one landowner to another, and/or of the significant reduction in the capital value of fishing

rights on the current channel and creation of new rights on the restored channel. Such complexities may not be present where both current and original restored channels fall within the same estate, but in other circumstances may arise.

2 To date, potential major river restoration schemes have emerged on an ad-hoc basis, rather than as a result of a co-ordinated plan to address the potential for restoring the river to all or its original channel. It is considered that in respect of WFD, a more strategic view should be taken, relating to the entire section of the river modified by navigation works. This should include an assessment (including of costs) of the relative merits of restoring the river to its original channel or enhancing the current channel.

The non-tidal reaches of the Adur were never modified for navigation to the same extent as the Ouse; however navigation did extend into the Western Arm as far upstream as the Knepp estate (with the channel downstream of Knepp being less sinuous than upstream, presumably reflecting the impact of navigation works). Only one structure (at Lock Farm) believed to be linked to these navigation works now exists. Any restoration of the river to its original channel within the Knepp estate will essentially be to restore it to its original, pre-navigation works, course. Navigation on the Eastern Arm was essentially restricted to the tidal stretch as far upstream as Shermanbury.

The final plan should acknowledge the extent to which the Ouse and Adur have been modified by navigation works. Where these are now redundant, GES should relate to hydromorphological conditions which would be expected to have prevailed during the pre-navigation era.

b) Structures/obstructions

The hydromorphology of the Ouse and Adur catchments is fundamentally influenced by numerous structures within the channel of both the main stems and their tributaries (down to 4th order tributaries). While those on the main rivers and major tributaries, and the often adverse environmental impacts of them, are relatively well documented (although, we consider, not sufficiently addressed in the Draft Plan), the locations of structures, some of them unofficial, on the smaller tributaries is not adequately known, with recent survey work locating previously undocumented structures which appear to be having significant adverse impacts including preventing sea trout migration. In total, probably only about 50% of potential sea trout spawning habitat within the Ouse catchment is currently accessible, access to the remainder being total prevented by impassable structures. On the Adur, the corresponding figure may be somewhat less, but is still significant.

With respect to the Ouse, the majority of significant structures on the main stem are a legacy of the navigation works c1800 when a series of weirs and locks were constructed. In some instances (e.g. at Fletching and Barcombe Mills) the original structures were for milling purposes and pre-date the navigation works. At some locations, the existing structures are not original, but replace structures which comprised an element of the navigation works or were of an earlier origin. Others are of much more recent origin, including gauging weirs under the ownership of the EA. The Ouse is, in a national context, unusual in that, within the past few decades, obstructions sufficient to seriously hinder or prevent salmonid migration have been constructed. These include Goldbridge gauging weir (c1980s) which although comprising a severe obstruction to sea trout migration, and probably impassable to all other species except elvers, was constructed without a functional fish pass. Another example is the Buxted Park structure on the Uck (c1980s), which is entirely impassable to sea trout and has cut off a significant proportion of the best sea trout spawning habitat in the Ouse catchment There are a number of other structures which also have either no (e.g. Dean's Mill) or inadequate (e.g. Sutton Hall weir) fish passage. Interference with the passage of migratory species is only one impact associated with structures; in additional to the fundamental modification of the rivers' hydromorphology, including the loss of the natural pool-riffle regime, impacts include that very extensive growths of submerged and floating macrophytes, including duckweed, can develop in impounded stretches upstream; on the Glynde Reach (a tributary of Ouse) this has been associated with adverse impacts on water quality and associated fish kills.

A summary of the types of structure present within the Ouse and Adur catchments is as follows:

Automatic sluices. Manually operated sluices were replaced with automatically operated ones at a number of locations within the Ouse from the mid 1960s onwards. The continuing use of such sluices significantly conflicts with WFD objectives, their mode of operation leading to a particularly un-natural hydromorphological regime, especially where bottom opening sluices are employed (as is the case at Barcombe Mills). Adverse impacts include the wash-out of coarse fish fry when such sluices suddenly open and the relatively poor rate of recovery of the coarse fish population in the lower Ouse upstream of the sluice following a major pesticide pollution incident in 2001 may in part be a consequence of this. In addressing these structures in a WFD context, their impacts should be acknowledged and we suggest the following hierarchical approach: Preferably, the structures should be removed. In instances where it can be proven that structures serve a valid function, consideration should be given to replacing automatic bottom opening gates with alternative structures which have less significant adverse impacts associated with them. As an interim measure, sluice opening protocols should be reviewed as there are instances where sluices appear to open prematurely or unnecessarily.

Tidal sluice valves (flaps) are present at a number of locations where tributaries enter the tidal reaches on the Ouse and Adur. Specific locations include, in the Ouse catchment, the confluences with the Northend Stream and Lewes Winterbourne and on the Adur catchment where a by pass channel of the Woodsmill Stream and the original (now bypassed) course of the Cowfold enters the main river. These structures, date primarily from the 1960s and 70s, in at least some cases they appear to perform no valid flood defence or other function. They are prone to malfunctioning (e.g. history of failure of the Northend valve) and significantly interfere with in-stream connectivity between the tributary and the main stem of the river into which it flows. Although they are generally small streams, they are ecologically significant (including as sea trout spawning habitat). To realise WFD objectives, unless an over-riding reason for retaining specific structures exists, tidal sluice valves should be removed.

Structures (particularly penstocks) with removable boards. These are of relatively minor significance on the Ouse catchment, where the most significant is considered to be that adjacent to Uckfield Railway Station. They are a more significant issue on the Adur. Many structures on small streams remain undocumented, including one recently located on the Chess Stream. In situations where boards are, on a seasonal basis, removed and reinstated, a particularly unnatural hydromorphological regime will be present. We are not persuaded that, at any location within the Ouse and Adur catchments, that the retention and operation of structures with removable boards is compatible with WFD. Specific consideration should be given in the plan to their location, impacts, and measures to remove them if appropriate.

With respect to the cumulative impact of all structures we note that the ART's observation that a *"great number of waterbodies are affected by human activity, past and present, including many not categorised as 'heavily modified' in the draft plans"* is particularly pertinent with respect to the Ouse and Adur, and that impoundment by structures, the majority of which are now redundant, is a fundamental constraint to achieving the hydromorphological component of GES.

c) Prioritising of obstructions to fish passage

The ART's assertion that greater emphasis should be placed on fish passage improvements and hydromorphological connectivity between water bodies in catchments is highly relevant to the Ouse and Adur where passage is impeded on both the main stems and tributaries by numerous structures, which as well as comprising obstructions, adversely affect hydromorphology. The EA has published a map/list of the "Top 25" obstructions to fish passage within the SERBD. Of these, none are located within the Adur catchment but there are 5 in the Ouse Catchment (3 at Barcombe Mills, Pools Bay and Deans Mill). We accept that, taking the SERBD as a whole, prioritising the "top" obstructions will entail some degree of subjectivity and do not feel it is appropriate to offer any comment with respect to the entire River Basin District. However we concur that, relative to other rivers within the SERBD, the Ouse is particularly severely impacted and it having designated on it more priority structures than any other river within the SERBD is a realistic assessment. With respect to the Adur, while we agree that the issue of obstruction to fish passage (at least with respect to the main stems of the rivers) is a less significant issue than it is with respect to the Ouse, it is questionable whether no Adur catchment structures should have been included; we consider that at least the double obstruction at Wineham should have been included within this list. It is certainly a more significant obstruction than certain of the listed Ouse obstructions, e.g. Pools Bay.

With respect to the listed Ouse structures, we would not entirely concur with the EA's assessment. We agree that Dean's Mill, which represents the normal limit of sea trout migration during all except winters with exceptionally high flows, is a priority structure, as is the Barcombe Mills New Weir Channel. The Barcombe Mills Sluice gates (assuming that these are the automatic sluice gates which intermittently, under high flow conditions, discharge water into the main Barcombe Mills Pool) are also agreed to be a priority structure. However, the "Barcombe Mills Garden Gate" structure (which we assume to be that within the grounds of Barcombe House, and visible from the old Toll Road), is, because although the Alaskan steep type pass incorporated into the structure, is not entirely satisfactorily configured (its entrance being too far downstream of the weir it passes), it is, at least with respect to sea trout migration, a far less significant obstruction to fish passage than other structures not included on the EA's list. Similarly, the Pools Bay structure is readily passable at least to sea trout. While historically attention with respect to fish passage has concentrated primarily on salmonids, it is appropriate for WFD purposes that consideration should be given to a wider range of species, including those which are not migratory per se, but which nevertheless make more local movements e.g. to reach suitable spawning habitat. With respect to the Ouse specific consideration should be given to the presence of migratory lamprey and shad. In addressing fish passage at obstructions, full consideration should be given not just to the provision of new or improved fish passes, but removal of the obstruction. With respect to overall WFD objectives, removal of structures is likely to be the preferred option as, in addition to addressing fish passage, this will address wider hydromorphological impacts.

We would suggest an alternative list, of the most significant obstructions to fish passage in the Ouse catchment comprising:

Barcombe Mills: Composite site; review of all structures required, including automatic sluices (Mill Pool and House Stream) and fixed structures (Barcombe Mills Pool New weir channel, House Stream, Navigation Cut and Andrews Stream)
Sutton Hall Weir
Goldbridge Weir
Fletching Weir
Pools Bay
Deans Mill
River Uck; Uckfield Railway structure
River Uck; Hempstead Mill sluice
River Uck Buxted Park weir
Glynde Reach; Beddingham Sluice
Shortbridge & Batts Bridge Stream obstructions
The series of structures (4 weirs and a culvert) on the lower Plumpton Mill Stream are also considered priority obstructions, but as work is underway to address these, they are not included. Additional obstructions upstream of these do however require consideration.

With respect to the Adur, the following obstructions are considered to be the most significant:

Adur Eastern Arm; Sakeham
Adur Eastern Arm; Wineham penstock/road culvert
Adur Western Arm; gauging weir upstream of A24 road bridge
Herrings Stream; series of structures
Cowfold Stream; structures at confluence with Adur Eastern Arm
Woodsmill Stream sub-catchment; series of obstructions on main stream and tributaries

It is noted however that the above lists are by no means comprehensive and that additional structures not included are also significant (in some cases total) obstructions to fish passage. For WFD purposes, there should be an evaluation of all structures which potentially obstruct fish passage. However, resources must be targeted effectively and we would wish to work with the EA to draw up a revised list of priority obstructions to be included within the final plan.

d) Candidate Waterbodies for restoration to help achieve Good Ecological Status or Potential

The EA has published a map/list of 37 candidate waterbodies (within the SERBD) for restoration to help achieve Good Ecological Status or Potential. Of these 37 waterbodies, one falls within the Adur catchment and 5 within the Ouse. We assume that restoration of natural hydromorphological characteristics will be a fundamental element of specific restoration projects. As is the case with the Agency's top 25 obstructions to fish passage, it is recognised that there will inevitably be some degree of subjectivity, at a River Basin level, in prioritising candidate bodies for restoration, and we do not feel it appropriate to comment on prioritisation within the SERBD as a whole. Also, it is not clear, for the identified water bodies, what restoration would entail e.g. would it involve reinstatement to an original channel; breaching of flood banks to enhance flood plain connectivity; habitat enhancement relating to the existing channel (e.g. removing structures, re-instating gravel) etc. However, we make the following observations with respect to the Adur-Ouse catchment.

We endorse an approach which recognises that river restoration schemes will be needed to achieve GES. However in respect of the Adur, the only candidate water body identified is the West Branch of the river (which may presumably incorporate proposals in respect of the Knepp Estate). Compared to most other river catchments within the SERBD, this appears an unusually low level of identification of waters which would benefit from physical habitat restoration and, while the initiatives to improve riverine (and other) habitat within the Knepp estate are endorsed, we are not persuaded that this represents the only significant opportunity within the Adur catchment to help achieve GES via river restoration programmes. The Cowfold and Chess Streams in particular have significant potential for restoration. Additionally, addressing the multiple structures within the Woods Mill Stream and Herring Stream sub-catchment may necessitate a wider river-restoration based approach.

With respect to the Ouse, all identified candidate waterbodies are apparently tributaries. We thus note the apparent exclusion of the entire main stem of the non-tidal river, which is considered anomalous because of the very significant potential for restoration of much of it. This apparent omission to identify any stretch of the main stem of the river as candidate water for restoration also appears inconsistent with there being to date at least three significant proposals for substantive river restoration schemes involving reinstatement of meanders which were isolated by the navigation works of c1790 which fundamentally modified the river. The final plan should make more explicit reference to the potential for the restoration of the main stem of the Ouse and should adopt a strategic approach to this, in addition to noting individual schemes which have been proposed.

With respect to the identification for restoration of the Ouse tributaries (apparently the Shell Brook, Scrase Stream, Cockhaise Brook, Pellingford Stream, Lewes Winterbourne, Lewes Brooks sub-catchment, and the Framfield, Ridgewood, Little Horsted and Clayhill Streams) it is agreed that there is the potential for significant hydromorphological enhancement work to be undertaken with respect to all of these. However there are other tributaries within the catchment (e.g. Bevern and Longford Streams) which also have potential for restoration work to be undertaken on them; the final plan should give wider consideration to the potential for restoring tributaries within the catchment and justification as to why particular tributaries have been selected.

In relation to restoration schemes for tributaries, a number of issues needed to be addressed. As is the case with respect to the main stems of the rivers, many of the tributary channels have been realigned, although normally for milling and/or land drainage purposes and generally not, unlike much of the main stems, for navigation. Where the tributaries have discrete flood plains, in many cases stream have, at various times from the medieval period to WW1, been realigned to the edge of the flood plain. The realigned channels are often straight, sometimes over-widened and over-deepened, with little habitat diversity. The course of the original, meandering channel can often still be traced.

In the context of restoring tributaries in many instances there may be the opportunity, as a component of restoration schemes, for realignment to their original channel, with the benefits of, as well as enhancing in-stream habitats, restoring stream-flood plain connectivity and recreating wetland areas.

It is noted that the University of Sussex is undertaking a study (www.sussex.ac.uk/cce/1-4-15-20.html) with respect to grassland and woodland habitats within the upper Ouse flood plain, where recent theoretical work suggests that flood alleviation measures could be linked to biodiversity objectives. The outcomes of this study may potentially be of use to the EA in establishing and implementing GES measures.

A significant issue relating to the Ouse and Adur catchments is that there is a paucity of gravel bed substrate within the main stems and tributary systems of both rivers. In their natural state, extensive gravel deposits would have been present, much of which has been removed in the course of modification to river and stream channels (including dredging and channel re-alignment). The transformation of many reaches from an eroding to a depositing regime due to the construction of impounding structures also restricts the distribution of gravels to limited areas of fast flowing water immediately below structures. There is a general correlation between the degree of physical modification to individual waterbodies and the extent to which they retain a gravel substrate. For example, the two canalised stretches of the Northend stream, respectively upstream of its confluence with the main Ouse and the A275 road bridge, are almost entirely devoid of gravel, which adjoining, less modified reaches still retain significant deposits. This strongly suggests that the scarcity of gravel in such locations is a product of the stream channels having been engineered for land drainage purposes, including channel straightening and deepening.

The nature of the natural substrate varies throughout the catchments, with e.g. sandstone-derived gravels in sections of streams rising or flowing over certain Wealden strata in the more upstream sub-catchments, whilst tributaries rising in proximity to the South Downs have a characteristic flint gravel bed, comprising flint derived from the Chalk. A gravel benthic substrate is of significance for a number of reason; for example it comprises habitat for many macroinvertebrate taxa, provides a spawning medium for various fish including lamprey and salmonids (especially sea trout) and provides a substrate for the growth of *Ranunculus* spp. (water crowfoot). The presence of, in stretches where the gradient is naturally steep enough for there to be an eroding bed, a gravel substrate is a component of the natural hydromorphology of the Ouse and Adur catchments. There is evidence from field observations that where gravel has been removed from streams where they flow over clay geology, this promotes rapid channel deepening as the exposed underlying clay is quickly eroded. It thus seems that, in addition to providing a valuable habitat in its own right, a gravel bed comprises a protective veneer which limits erosional processes. The loss of gravel substrate also has implications for habitat restoration including the placement of large woody debris. A generally perceived benefit of the introduction of large woody debris is that it promotes scour, including the scouring of, and removal of sediment from, gravel bed substrate. In the absence of such a substrate, this benefit will not be realised.

The courses of the Ouse and Adur are ancient; their catchments were not subject to Pleistocene glaciation, which fundamentally modified the catchments of rivers under the glacial ice. The evolution of stream channels and accumulation of bed substrates in the Ouse/Adur has therefore been a process which has potentially taken place over geological time scales. Although not actually glaciated, the catchments were subject to a periglacial climate during the last Ice Age, with extensive ice sheets present on the higher land of the South Downs and Weald. The erosional context in the late Pleistocene was therefore entirely different to that which now prevails and the fact that chalk derived flint comprises the natural bed substrate of streams many km downstream of the point at which they flow off the chalk, and in some streams which at no point flow over chalk geology, may at least be in part attributable to the fluvial erosional/depositional (e.g. resulting from outwash as the ice sheets on the South Downs melted) environment which prevailed during the periglacial climatic period. It is probable that, due to these processes, even streams which flowed entirely over geological formations (e.g. Wealden clays) which were not themselves a direct source of gravel substrate, nevertheless had significant gravel bed deposits. Under the current climatic regime, natural erosional processes cannot be relied on to replenish gravel removed from watercourses by channel modification and if it is to be reinstated, augmentation via the introduction of gravel, of a type appropriate for particular waterbodies, will be required.

The plan should recognise the extent of depletion of gravel substrate from the main stems and tributaries of both rivers; that this represents a departure from natural hydromorphology and GES, and that restoration of Good Hydromorphological and Ecological Status will be dependent on re-instatement of gravels on a catchment wide basis. This may be achieved by direct augmentation with gravel and restoration of natural hydromorphology to re-establish a natural pool-riffle regime, giving a more natural balance between eroding and depositing benthic environments.

In addition to the depletion of gravel substrate an addition hydromorphological perturbation relates to a scarcity of coarse and large woody debris within the river systems. There has been conflicting management of woody debris within the catchments, with both augmentation and removal (including by predecessors of the EA, following the 1987 storm) having taken place. While the benefits of introducing woody debris to stream channels where there is an unnaturally low amount of it present are now generally accepted, the unique hydromorphological context the of Ouse and Adur (and adjacent Wealden) catchments, reflecting the combination of Chalk and Wealden geology, means that some caution should be exercised in extrapolating the results of studies relating to catchments with a significantly different natural hydromorphology. There are therefore grounds for, in recognition of their unusual geomorphological context, developing specific protocols relating to the Ouse, Adur and other Wealden catchments in relation to the introduction and management of woody debris so as to maximise the benefits (and minimise any adverse effects) of its reinstatement.

e) The significance of headwater streams and the relationship between WFD and the Freshwater Fish Directive

We remain concerned about limitations in the extent of designation under the Freshwater Fish Directive (FFD) within the Ouse and Adur catchments and look to the implementation of WFD to remedy this deficiency, as FFD is subsumed by the implementation of WDF. To restate our two primary concerns with respect to current FFD designations; firstly the extent of specific salmonid designation was inadequate, with sizeable tributaries supporting significant salmonid populations being designated as cyprinid instead of salmonid (e.g. Bevern in the Ouse catchment). The second concern is a generic one in that the hydromorphological characteristics of the two catchments precluded many tributaries receiving any designation. The Ouse and Adur catchments have a complex drainage network reflecting their geology and topography, with numerous very small tributary streams, the majority of which were excluded from designation under the Freshwater Fish Directive as their flow fell below the value specified (by DEFRA) as that required to make them eligible for designation. Nevertheless many of these small headwater streams are biologically very important, including as sea trout spawning/juvenile habitat. There has been (nationally) debate as to whether WFD will provide adequate protection for sea trout stocks and this debate is possibly nowhere more relevant than with respect to the Ouse and Adur, where tiny and at first sight insignificant watercourses may actually comprise very significant sea trout spawning habitat. The Ouse/Adur headwater network includes hundreds of km of small streams, many of which do not appear to have ever been professionally surveyed, although casual walk-over surveys have established a range of hydromorphological (including unofficial structures) and other impacts (such as STW discharges). We are encouraged that the list of designated individual water bodies within the Ouse and Adur catchments does include many additional sub-catchments which were omitted from any designation under the FFD. However, we note that, even within these sub-catchments there are often many 3rd and 4th order tributaries in addition to the tributary which comprises the designated water body. The entire sub-catchment systems will need to be addressed with respect to hydromorphology (and other elements of GES). We also note that some significant individual sub-catchments (particularly the Pells Brook on the Ouse system) remain undesignated as individual water bodies within the Draft Plan.

f) Identification of hydromorphology reference sections

While the hydromorphology of the majority of the main stems and tributary systems of the two rivers are significant altered, there are nevertheless (usually short) sections which do retain relatively natural hydromorphological characteristics (e.g. with respect to channel morphology; flood plain connectivity; bed substrate etc). The identification of such reference sections, and their hydromorphological characteristics, will assist in both identified and re-establishing hydromorphological elements of GES.

2.1 (ii) Hydrogeology of the Chalk

A characteristic of both Ouse and Adur catchments is that each has a series of minor Chalk groundwater fed tributaries rising on the north (scarpe) slope of the South Downs. The CAMS process for the Ouse and Adur acknowledged uncertainty with respect to the hydrogeology of the Brighton Chalk Block. A simple “Black Box” approach to modelling the hydrogeology of the Chalk is likely to lead to imperfect assumptions as to the extent of, and interconnectivity between, the groundwater catchments of these tributaries, for example the Chalk is not a homogeneous formation and perched water tables may exist within it. It is acknowledged that certain Adur headwater streams may be impacted by groundwater abstraction in their immediate proximity (one of these, the Poynings Stream is the subject of a PR09 project to alleviate low flow). The potential for other Chalk streams, notably the Lewes Winterbourne, to be impacted by groundwater abstraction is also recognised. There is however consistent and we consider reliable, anecdotal evidence that the flow of other Chalk fed streams, for example the upper Bevern, which do not rise in the immediate vicinity of boreholes, and outside of their presumed localised cones of groundwater depression, has also significantly declined over an approximately 30 year period. It has generally been assumed that abstractions on the south face of the South Downs intercept seaward flowing groundwater and do not have any impact on the streams rising on the north face, however, however given the consistency of anecdotal reports, and uncertainty about the hydrogeology of the Brighton Block we consider that there should for WFD purposes, be a review of the potential impacts of Chalk groundwater abstraction with respect to the Ouse – Adur Chalk streams and springs.

2.1 (iii) Abstraction/flow modification/water resources

Hydromorphology is in part a function of hydrology, which in turn is impacted by abstraction, augmentation and effluent discharge. The uncertainty relating to the hydrogeology of the Brighton Block, and the impact of abstraction from it on Chalk groundwater fed sub-catchments is referred to previously.

The Ouse is in effect a regulated river and its hydrology (and consequently hydromorphology) is not natural in the reach downstream of its confluence with the Shell Brook, which was dammed to create Ardingly reservoir. Water is, depending on river flow and water demand, released from Ardingly and subsequently abstracted further downstream at Barcombe. The flow of the Ouse is thus frequently augmented above its natural level between the Shell Brook and Barcombe, but may be reduced significantly below its natural level downstream of the Barcombe abstraction, although the flow is subject to a MRF (minimum residual flow) consent. Significant mortality of adult sea trout has on occasion occurred downstream of the Barcombe abstraction and, while this may have multifactorial causes, low flow could be contributory. Similarly, augmented summer flows (of cooler water released from Ardingly) may be affecting the biota of the river between Ardingly and Barcombe.

The implications of the modification to the hydrology (and hence hydromorphology) of the main stem of the Ouse due to the operation of Ardingly and Barcombe Reservoirs should be specifically recognised and assessed with respect to GES criteria. Potential impacts downstream of the abstraction, including on fish migration (of all migratory species present) due to the modified hydrology should be explicitly addressed and MRF criteria reviewed and revised if appropriate. In order to make a full assessment, it may be necessary to generate naturalised flow data for the Ouse.

We note the proposals for the “Clay Hill” reservoir and the need for these, as (and if) they are advanced, to be thoroughly tested against GES criteria specifically developed in relation to the hydromorphology (including hydrology) of the Ouse.

While the impact of STW effluent is dealt with in this submission primarily in relation to water quality, the physical volume of effluent discharged also has hydrological/hydromorphological impacts. Certain main stem effluents (e.g. Scaynes Hill on the Ouse) comprise a significant proportion of flow at the point of discharge and in the summer during periods of low flow, the flow of the main stems where they reach the transitional limit may be dominated by treated effluent. In some instances there are significant STW discharges into minor Chalk stream tributaries (e.g. the Poynings and Bevern Streams in the Adur and Ouse catchments respectively) with, at times, effluent comprising in excess of 90% of the flow of these streams at the point of discharge. We note that consent has previously been sought (by Newater PLC) to discharge highly treated sewage effluent, derived from Southern Water’s Newhaven STW and currently discharged to sea, into the Ouse upstream of Barcombe and, after a short run of river, re-abstract it for potable supply. While that proposal has not progressed, it is recognised that similar proposals may emerge and that these will raise complex issues in respect of WFD requirements. Relevant issues have previously been raised in the context of a previous submission to the EA in the context of Newater’s consent application.

2.2 Water quality issues

This section of the submission addresses a limited range of key water quality issues. No attempt is made to discuss the large suite of chemical parameters employed as measures of GES.

2.2(i) STW effluent and septic drainage discharges. A number of major STW effluent discharges are identified in the draft plan. However, smaller STWs located on tributaries (in some cases close to their sources), are an equal cause of concern and their location, known or potential impacts and proposed remedial measures should be more explicitly addressed in the individual waterbody information sheets. We are concerned that the impacts and their significance, of many of these discharges are not yet adequately recognised and, when upgrades are planned, that adequate contingency measures (e.g. storm water storage tanks of adequate volume) are not invariably provided. Small streams are particularly vulnerable to CSO discharges (e.g. following summer thunderstorms) as these may operate prior to the natural flow of the streams responding to rain and the discharge may thus be into a low flow environment.

Persistently high phosphate levels are recorded at some sites downstream of some of these headwater STW's (an example being the Ditchling STW which discharges into the Chalk stream headwaters of the Bevern Stream), although the recorded elevated phosphate levels have not unambiguously been attributed to treated effluent discharges.

In addition to consented discharges, failure of the sewerage infrastructure may lead to significant discharges remote from STW's. Recent examples are where a blockage, understood to be of fat from a commercial premises, resulted into a discharge of raw sewage via a manhole into the Northend Stream and another instance where a crude sewage discharge, again via a manhole, into the Bevern Stream was sufficient to result in the stream bed being overgrown by sewage fungus over a distance of several hundred metres. In the Adur catchment a significant incident occurred in August 2005 when there was a sewage discharge, via a faulty valve, from the Malthouse Lane pumping station into the Pook Bourne Stream, a tributary of the Herrings Stream. There was a subsequent algal bloom in the main stem of the Adur and significant mortality of sea trout. A causative link between these events was not however proven, although the water company was successfully prosecuted for the initial pollution.

With respect to the potential impacts of domestic and other premises not connected by the mains sewerage system, but served by septic drainage, while our evidence is primarily anecdotal (including visual evidence of gross organic pollution) we believe that the contribution of septic drainage discharges from premises may be significant in relation to small tributary streams.

The realisation and maintenance of GES is potentially compromised, throughout much of both catchments, by STW/CSO discharges and also (unpredictably) by sporadic failures of the sewerage infrastructure. The plan should make more explicit reference (including at the individual waterbody level) to the impacts of named individual STWs and CSOs and potential remedial measures. The vulnerability of small headwater streams (including Chalk stream sections) should be explicitly recognised, again including at the individual waterbody level. The potential impacts of septic drainage systems should be adequately recognised.

With respect to the individual waterbodies within the Ouse and Adur catchment, phosphate is the chemical parameter which most commonly leads to failure of Good Status. However, the individual waterbody information sheets do not include any information as to the source of excessive phosphate levels affecting a particular waterbody. It is therefore unclear whether measured high phosphate levels are wholly or partially attributable to STW discharges, septic drainage, or are of agricultural or other origin. It is therefore unclear whether, in respect of a particular waterbody, what specific measures (which may include tertiary treatment of STW effluents) are necessary to achieve Good Status.

In addition to crude chemical parameters relating to sewage discharges**,** with environmental quality standards having been established for a wide range of organic micro-pollutants, there is potential for the achievement of GES within the Ouse and Adur to be compromised by the presence, in concentrations exceeding specified standards, of a wide range of substances. Relevant studies include a recent (2007) EA report on contaminants (including organochlorine pesticides and derivatives) in eels in Sussex which, while demonstrating a reduction in concentrations of substances of concern relative to a similar study a decade previously, demonstrates the persistence of specific organic-micropollutants. Natural removal processes may be expected to result in a continuing decline in concentrations, however there should be, for WFD purposes, a formal assessment of whether predicted concentrations may lead to any breach of GES criteria.

In recent years there has been increasing concern that many organic micro-pollutants can act as endocrine disruptors; some substances have been demonstrated, via specific testing protocols, to exhibit this property, however, with to date a small proportion of potential endocrine disruptors having actually been tested there remains a very significant gap in the basic science. We note that, in relation to the Ouse, organs from sea trout caught by anglers have been analysed for specific endocrine disruptors in context of a recent Sussex University project. It is further noted that the University of Brighton (Environment and Public Health Research Institute) study in respect of water-borne pathogens (attributable to sewage and livestock farming) is ongoing. The findings of these academic studies could usefully be referred to in the context of WFD implementation with respect to the Ouse and Adur catchments.

2.2(ii) Acid deposition. While it is understood that there are no studies relating specifically to the Ouse or Adur catchments, and acid deposition (rain) is not considered to currently comprise a significant issue, the geological context of certain Ashdown Forest headwater streams makes them potentially vulnerable to acid deposition. It is understood that a study on the Old Lodge Stream, in the Medway catchment, immediately north of the Ouse/Medway watershed, has demonstrated, via chemical and fisheries monitoring, recent improvements in both water quality and trout populations as acid deposition has decreased due to increased control of emissions. The results of this study can probably be (retrospectively) extrapolated to Ouse and Adur tributaries rising on the Ashdown Forest. This is of significance in reconstructing what good ecological status comprises with respect to these tributaries; for example, certain fishery survey data demonstrate low trout populations in streams rising on the Ashdown Forest in the 1970s & 80s. In the light of the Old Lodge Stream study, such results can be reinterpreted as evidence of trout populations being, at that time, depressed due to the impacts of acid rain on stream water quality, and representing a situation when, in spite of the relatively physically unmodified nature of the tributaries, they were failing to achieve good ecological status. In determining what fish populations can be considered indicative of GES for Ashdown Forest tributaries, caution should therefore be exercised in extrapolating from historic fishery data, as fish populations in the 1970's & 80's in particular may have at that time been depressed by acid deposition and cannot be assumed to be representative of GES.

2.2(iii) Road/urban run-off.. In addition to sub-catchments with a predominantly urban setting (including the Scrase Stream and the Lewes Winterbourne, which of all the Chalk streams identified in the EA publication, "The State of England's Chalk Rivers" probably has the most urbanised catchment) many essentially rural tributaries receive significant road run-off. These include the headwaters of many of the minor Chalk Streams rising on the north slope of the South Downs which are intersected by the B2116 and other roads, and, being small watercourses are particularly susceptible to adverse impacts from road run off. A particularly notable example is a Chalk stream headwater of the Chess Stream which, for approaching 1km of its course, flows adjacent to and receives run-off from the A23. The apparent loss of *Ranunculus* from some of these streams (and others within the Ouse and Adur catchments) during the 1960s and 70s may have been at least in part attributable to herbicides applied to road verges being washed, via road run off, into the streams.

The lack of specific measures to control (at the individual waterbody level) the potential effects of road run-off is noted; we believe that this should be addressed in the final plan. In addition to run off (via road drains) from the carriageways, there may also be significant run-off from ditches in road verges, and the maintenance of such ditches may exacerbate this. This issue should also specifically be addressed.

2.2(iv) Agricultural impacts on water quality. Whilst historically the main impact of agriculture within the Ouse and Adur catchments has been through modification to hydromorphology, which has been considered previously, the main ongoing impact is on water quality, particularly diffuse pollution including **sediment input.** This is primarily a function of land management practices and affects both catchments although possibly more in the Ouse, where there may be both a greater incidence of agricultural practices which exacerbate impacts on watercourses (e.g. inadequate buffer strips) and the increasing planting of crops, including maize, which are recognised as having specific associated problems There is, at various locations throughout the catchments, where intensive agriculture is practiced, evidence of significant sediment ingress into streams, apparent at many locations by the gross siltation of gravels. In some locations this appears sufficient to significantly impede or prevent successful salmonid reproduction. In addition, diffuse agricultural pollution may contribute to the high (sufficient to preclude good Status) phosphate levels measured in many individual waterbodies.

Diffuse agricultural pollution compromises Good Status being achieved at many locations throughout the catchments. Siltation is a significant issue; the plan should recognise, including at the individual waterbody level, its specific impacts (including on sea trout reproductive success). In at least some waterbodies phosphate concentrations sufficient to preclude Good Status are presumably at least partly attributable to agricultural sources. As noted previously, in respect of STW discharges, where individual waterbodies fail to achieve good status due to high phosphate concentrations, the relevant information sheets should, wherever possible, specify the causes/source(s) of excessive phosphate input. Numerous agri-environmental schemes may assist in reducing diffuse agricultural pollution; however the range of schemes (and of organisations offering advice) may be confusing. WFD could be used as a vehicle for co-ordinating their delivery. In addition to measures to reduce future inputs, remedial measures, particularly the cleansing of gravels (via water-jetting) are appropriate in specific locations.

2.3 Priority communities and species

Observations are provided below with respect to a particular species and communities which should be given specific attention in the context of realising GES within the Ouse and Adur catchment.

2.3(i) *Ranunculus/Callitriche* community. In both rivers this presumably formerly comprised the dominant submerged macrophyte community of much of the main stems and many tributaries. It is now very restricted in distribution, due to the hydromorphological modifications, particularly by structures which restrict the distribution of shallow, riffle dominated, areas where the *Ranunculus/Callitriche* can become established. In the two catchments, the best remaining representation of the community occurs in a single short (about 1km) stretch of the original (by-passed by the navigation works, but retaining flow) main channel of the river downstream of Bacon Wish weir (upstream of Sheffield Bridge). With respect to the tributaries, in both river systems the *Ranunculus/Callitriche* community is also essentially absent (except where *Ranunculus* has been re-established via a SOCS planting programme). The loss of *Ranunculus* from many tributaries appears to have been relatively recent, with extensive growths of the plant present in some locations (e.g. the Uck in the Uckfield area), until the 1960s or 70s. *Ranunculus* also appears to have disappeared from some of the Chalk aquifer fed headwaters over the same period. The disappearance of *Ranunculus* at this time coincides with a peak in the use of the herbicides Atrazine and Simazine (of which Local Authorities and British Rail were the largest, in terms of volume, users) and herbicide use may have been contributory, although other factors, particularly land drainage may also have been involved. The *Ranunculus/Callitriche* community should be regarded as an element of GES and its re-establishment should be a specific objective, at a catchment and individual waterbody level. In the main stems of the river the realisation of this will be predicated on restoring hydromorphology to re-establish the natural riffle-pool regime. With respect to those tributaries where more natural hydromorphological conditions still prevail, re-establishment via a planting scheme, possibly with gravel augmentation to provide a substrate for the growth of *Ranunculus* may be sufficient. A planting scheme undertaken by S.O.C.S. to re-establish the *Ranunculus/Callitriche* community in a tributary (the Bevern Stream, from which it was probably eliminated by a combination of dredging and herbicide pollution) has already successfully demonstrating that re-establishment is viable.

2.3 (ii) Migratory fish Species. The issue of fish passage as constrained by structures has previously (section 1.2(i)) been addressed. The plan, at both catchment and individual waterbody level, could be made more explicit with respect to the actual (or, with improved access, potential) distribution of particular migratory fish species. Notes are provided below on the occurrence of these and of those which while not strictly migratory, nevertheless make local movements, the passage of which may be impeded by structures, in the Ouse and Adur:

a) Migratory lampreys. All three UK lamprey species, including the migratory river and sea lamprey, are recorded from the Ouse**.** The river supports a significant (but probably still declining) population of sea lamprey, and possibly still has a smaller population of river lamprey. All records of sea and river lamprey (with the exception of a single dead sea lamprey in Barcombe Reservoir, presumably transported there by a predator) relate to for the tidal stretches, below the Barcombe Mills obstructions, which appear to completely terminate their upstream migration. The majority of records relate to the Andrews Stream (the channel at Barcombe which comprises the original channel of the Ouse, but which now only carries a small proportion of the total flow of the river). Assuming that the Barcombe obstructions are impassable (surveys specifically for spawning lamprey over 5 consecutive years by the author of this submission have not located any individuals, or evidence of spawning, upstream of them), they thus restrict spawning habitat to a very small area of suitable spawning gravels – possibly less than 10 square metres downstream of the Barcombe structures.

Before modification of the river by the navigation works, both species were likely to have been abundant, and to have penetrated well upstream; sea lamprey typically spawn many km upstream of the tidal limit in medium and large rivers. The current restriction (due to obstructions) of the sea lamprey population in the Ouse to the tidal river is atypical. Since modification of the river by the navigation works, ***sea lamprey*** appear to have fared better than ***river lamprey***, with the latter not observed for some years. The sea lamprey population has remained, perhaps surprisingly, strong until recent decades. During the 1950s and 60s sea lamprey were so abundant (and perceived as a pest species, due to their parasitizing and hence injuring or killing sea trout) that they were removed, with gaffs, including by the predecessors of the EA. Numbers sharply declined in the late 1960's, probably predominantly due to a very significant loss of the available spawning gravels due to dredging of the main river and Andrews stream. This may have resulted in a 90% + loss of suitable spawning gravels. Modifications to Hamsey weir at a slightly later date, which altered the characteristics of the river above it, and rendered it more subject to tidal influence due to an alteration of the weir crest height, may also have adversely affected larval (ammocoete) habitat. The location of larval habitat at the present time is not known, although recent electric fishing surveys have established an almost total absence of ammocoetes immediately downstream of the confirmed spawning beds, indicating that ammocoete habitat must be located further downstream, somewhere within the tidal stretch. Numbers have progressively declined since the late 1960s and the average annual run may now comprise only a few tens of adults. In the 1950s and 60s hundreds of sea lampreys were observed on occasion. ***River lamprey*** numbers, while the species was not as abundant in the 1950s and 60s as sea lamprey, have declined equally or more sharply, with no confirmed records at all of the species since 2004. Both species may have been adversely affected, possibly to a very significant degree, by the pesticide pollution incident of 2001 and it is not inconceivable that the pesticide pollution incident may have caused the near (or even total) extinction of river lamprey within the catchment. The continuing decline of migratory lampreys in the Ouse contrasts with a number of other catchments, where there is evidence of increasing populations, generally attributed to improving water quality. In a WFD context, migratory lampreys could be considered an important element of the natural biota of the Ouse and the restoration of their populations an important measure. An obvious (simple and low cost) measure would be to reinstate suitable spawning grounds (in the shape of beds of suitably graded gravels) in the upper tidal reaches, including the Andrews stream, to compensate for those destroyed by dredging in the 1960's, which may have precipitated the effective collapse of the population. The modification of the Barcombe fish passes to facilitate passage via lampreys also warrants consideration.

The lamprey populations of the **Adur** are not adequately documented, only the non-migratory brook lamprey is known to occur (in a number of tributaries, including in the Cowfold Stream), however small populations of the two migratory species may also conceivably be present. The final plan should reference, at catchment and individual waterbody level, the significance of the Ouse for migratory lamprey populations, and the possibility of their occurrence in the Adur. The issue of the Barcombe structures being apparently impassable to migratory lampreys, and the potential for enhancing lamprey spawning habitat should both be documented.

b) Twaite and Allis Shad. Shad occur in the tidal Ouse; although the two species are not always readily distinguishable by casual examination, there are indications that both are present. Fish confirmed to be twaite shad have been examined by the author of this report and occasional shad in excess of 1.5kg have been clearly observed in the Barcombe Mill area, which from their size can be presumed to be allis shad. The majority of records, principally catches by anglers, relate to the lower (particularly Piddinghoe to Newhaven) tidal stretch, although observations of shoals of 4–15 individuals around the tidal limit in the Barcombe Mills area have been made on fairly regular occasions. Although such sightings (which appear to have declined over the past 5 years) have often coincided with the May/June spawning season, there is no conclusive evidence as to whether the fish recorded comprise part of breeding populations, or are individuals derived from breeding populations in continental Europe (e.g. France) which are only utilizing the tidal Ouse for feeding. It is understood (through an approach by the EA to O.A.P.S.) that the EA is (or has been) seeking to obtain data, potentially including surveys for spawning activity, with respect to shad in the Ouse. With probably two exceptions all recent (from c2002) shad records are from the tidal river, suggesting that the Barcombe obstructions are an almost complete barrier to upstream migration. The denil type fish passes situated on the most likely migratory routes at Barcombe (the Andrews and House Streams) are potentially inherently unsuitable for shad as the passage chambers employ turbulent rather than laminar flow. Evidence from other locations suggests that shad cannot effectively utilise fish passes which employ baffles to create turbulent flow. If shad are (or may, with enhanced passage, be expected to become) established as a breeding rather than transient non-breeding population, modifying the existing fish passes (assuming the structures are to be retained to protect the Barcombe Reservoir abstraction intake, or other purposes) would be desirable so as to restore, for the shad, in-stream connectivity.

The occurrence of shad in the Adur is not adequately documented, although there are sporadic, essentially anecdotal, records relating to the lower tidal reaches at Shoreham. Shad are certainly not recorded from the Adur with the same regularity as they are from the Ouse, although this may be a result of fewer anglers fishing the lower tidal Adur for sea trout using small spinners. This angling practice, which is more common on the Ouse, is responsible for capture of most reported shad, may result in the fish being under-reported in the Adur relative to the Ouse, or it may be that fewer are present in the Adur. Only two credible (though anecdotal) record of shad (species unknown, though relating to fish in the 0.4–0.6kg range) have been obtained. One was of an angler reporting catching 6 shad in one year (2005), effectively in the mouth of the river, and another angler catching a single fish (2006) in the same location.

The final plan should recognise, at catchment and individual waterbody level, the confirmed presence of shad in the Ouse, and the possibility of their presence in the Adur. The issue of fish passage should (including specifically in respect of the Barcombe Mills obstructions) recognise the reduced ability of shad, relative to salmonids, to utilise certain fish pass designs.

c) Salmon. Considerable resources have been devoted (with variable success) to re-establish atlantic salmon in rivers (e.g. Thames and Rhine) in which it once occurred but from which it has been eliminated. Unusually, in respect of the Ouse and Adur, there is some ambiguity as to whether, in relatively recent times, salmon were actually present within the two rivers. This arises partly because Sussex sea trout (a species which, if large, can closely resemble salmon) are very large, comparable to salmon in size, and as a consequence there can be uncertainty in interpreting historic records as to the occurrence of “salmon” in the two river systems. However, at least with respect to the Ouse, a recent (2008) thorough examination of evidence from the O.A.P.S. archives confirms that the Ouse did once have a significant salmon population; though this was largely (and, at least upstream of the Uck, possibly entirely) eliminated as a result of the navigation works of c1790 -1810, which in addition to creating a series of obstructions destroyed spawning/juvenile habitat. There are a number of reasons why the navigation works would have eliminated the salmon, but not the sea trout, population. For example, juvenile sea trout are better adapted to the often very low flow conditions that prevail in the tributaries, while juvenile salmon habitat more likely comprised – before modification by weirs and locks – riffle dominated areas of the middle and upper main river. With the abandonment of the Ouse Navigation c1870 (after which the lock gates were generally kept open and fish passes were constructed, c1885) there appears to have been some recovery/re-establishment of the salmon population; this however declined during the 20th century although a relict population may have persisted until at least the mid 1970s. In addition to the occasional fish caught by anglers, netting and electric fishing exercises on O.A.P.S. waters in the Barcombe area to secure brood stock for the then operational sea trout hatchery up to at least 1976, relatively frequently resulted in the capture of salmon, more normally pairs or trios of fish, rather than single individuals. If a small population did persist, various factors may have contributed to its final demise, including the construction of Barcombe Reservoir and the associated MRF downstream of it and the construction of an impassable weir on the Uck (Buxted Park). Information in the OAPS archives suggests that, since the abandonment of the Ouse Navigation, the spawning population was concentrated in, or confined to, one tributary of the Ouse, probably the Uck. Attempts to re-establish a population in the upper main stem of the river (including in the area of Fletching Mill) by restocking with salmon fry in the late 1880’s do not appear to have been successful.

If WFD measures include the removal of weirs and thus reinstatement of the natural riffle dominated regime, there is the possibility that natural recolonisation of the river by salmon may occur (salmon, presumably strays from other rivers with established populations, do occasionally still run the Ouse) and there remains the option of artificial stocking to re-establish a salmon population. There are, however, many issues which would need to be addressed if such a programme were contemplated, not least whether climate change may, within, the space of a few decades, render the river unsuitable for salmon due to elevated water temperature. Nevertheless, it is considered that, as there is evidence that the Ouse has, in recent historic times, supported a salmon population, which could be argued to comprise an element of GES for the river that consideration should be given as to whether restoring it should be a WFD objective.

There is no unequivocal evidence that the Adur processed a salmon population, though it appears unlikely that it did not. It is understood that an unsuccessful attempt to establish a salmon population was made in the early 1900's, by stocking with fry.

As rivers which currently support a sea trout, but no salmon population, no salmon action plan has been prepared for the Ouse or Adur. With the extension of salmon action plans to include rivers with sea trout only populations, this situation must be remedied, albeit with the incorporation of the plans into wider WFD documentation rather than as stand alone plans. In preparing these plans there should be recognition that the Ouse has, relatively recently, supported a salmon population, and that there is a possibility that salmon may also have been present in the Adur.

***d*) se*a trout*.** Sea (and non migratory brown) trout have recently been designated BAP species and sea trout comprise a "flagship" conservation species for the Ouse and Adur. Both rivers have significant sea trout runs, which are, particularly on the Ouse, an important element of the recreational fishery. There are indications that there is a discrete "Sussex" strain of sea trout present in the Ouse, Adur and adjacent Sussex catchments (Cuckmere, Arun & Eastern Rother), possibly extending west to the New Forest streams. It is understood that studies of the genetics of the Sussex sea trout are projected as an element of a wider study of the sea trout stocks of the south of England. There is an intriguing possibility that the Sussex stock could be the same strain as the "Fordwich Trout" of the Kent Stour, which figures in literature back to medieval times and is of cultural/historical significance.

The Ouse and Adur sea trout (and those of adjacent Sussex rivers) have the highest average weight for rod-caught sea trout of any English or Welsh river system and are of distinctive appearance. The Ouse population has been particularly well studied in the context of a collaborative study between O.A.P.S. and S.O.C.S., with scales from fish being caught by anglers on the OAPS fishery being read by Dr Clive Fetter. Sea trout redd surveys and counts are undertaken by S.O.C.S. as an element of its Sea Trout Watch programme and Dr Fetter's reports also summarise the results of these. For the sake of brevity, information from his reports is not reproduced here, but the original documents may be accessed via the S.O.C.S. website, as can general text on the Ouse sea trout population written by the author of this submission, which is also applicable to the Adur catchment.

Sea trout in the Ouse and Adur catchments frequently use, as spawning habitat, extremely small (and sometimes ephemeral) headwater streams, almost to their sources, where they can still be accessed by the fish. With the streams in their original natural state sea trout populations were probably present in every sub-catchment with populations greatly in excess of their current levels.

It is considered that the restoration of sea trout populations, on a catchment-wide basis throughout both the Ouse and Adur should be a specific WFD measure in relation to the two rivers and that the monitoring of such populations could be a measure of the effectiveness of WFD implementation. It is noted that, while the status of the sea trout populations of the two rivers may be an easily quantifiable indicator, the measures taken to enhance them – including restoration of a more natural hydromorphology – will bring benefits for a wide range of other species.

As rivers with a sea trout, but no salmon population, salmon action plans have not been prepared for either the Ouse or Adur. With the requirement for salmon action plans being extended to sea trout only rivers (albeit likely incorporated into wider WFD plans than as stand alone documents) specific plans should now be prepared for the two rivers. These should be informed by the likely occurrence of a discrete "Sussex" strain of sea trout, information obtained by the S.O.C.S./O.A.P.S. scale reading project and by the results of genetic studies when available.

e) Eels. The precipitous decline of the European eel's population is well documented, although the contribution of different factors (including pollution, parasite infections, habitat modification, changes in oceanic currents and natural population fluctuations) is incompletely understood and the factors contributing to the decline are certainly not specific to the Ouse and Adur. Within the two rivers, the eel population has probably declined, in terms of numbers of individuals and biomass by at least 90% over the past 2–3 decades. The Ouse is now designated as one of a number of rivers to be used in a national eel monitoring programme and in the future quantitative data as to the species status should be forthcoming. Prior to the population decline, eels comprised a very significant component of the ecology of the Ouse and Adur and thus arguably of GES in relation to the rivers; historically some electric fishing survey sites e.g. Sharpsbridge on the Ouse had a fish biomass dominated by eels. The species is now virtually or entirely absent in many locations. As many of the factors contributing to the decline of the eel may be extrinsic to the Ouse and Adur, the value of any in- river measures to recover the eel population (e.g. elver passes) is debatable. A factor contributing to the decline in eel populations which has yet to be fully quantified is that there may be, in rivers in eastern England at least, a change in the partition of eel stocks between fresh and salt water. Eels can live equally well in freshwater, a brackish estuarine environment, or fully saline coastal waters. It has been suggested that the decline in stocks in eastern areas may at least in part reflect that a greater proportion of the stock is now utilising coastal rather than fresh waters. With respect to the Ouse, it is interesting to note that electric fishing surveys (undertaken by consultants rather than the EA) of the Andrews stream in 2006 and 2007 actually show a very significant **increase** in eel biomass and numbers, however, the increased stock comprises fish of at least several years of age. This may suggest that, for unknown reasons, a proportion of the local stock has not entered the river as elvers but have delayed migration into freshwater for some years, with growth having occurred in coastal or lower estuary regions. On the Adur, anglers reported a similar increase in eel numbers over the same period year, again with the increased stock comprising eels of at least a few years of age. Nevertheless the overall trend is of continuing decline and the employment of all reasonable measures to recover eel stocks (via eel management plans) is supported. However, while the provision of elver passes in the form of superstructure fixed onto existing weirs and sluices (as has been adopted elsewhere within the SERBD, and has been proposed for at least some locations within the Ouse–Adur catchment), may represent a solution in specific circumstances, these do not facilitate passage by other species or otherwise contribute to enhanced in-river connectivity, or address adverse hydromorphological conditions attributable to the structure which is affecting elver migration. We therefore consider that the provision of elver passes should not be a general measure and only be considered in circumstances (e.g. lake dams) where it can be clearly demonstrated that it is not practical or appropriate to remove the structure itself. Removal of the structure, rather than the addition of an elver pass to it, should, within an overall WFD context, be the preferred option.

f) Non-migratory fish species. Many non migratory species make local movements e.g. to locate suitable spawning habitat. In some instances these movements can readily be observed e.g. of bream into the Andrews Stream at Barcombe Mills, annually during May and June, to spawn. The fragmentation of, in particular the main stem of the Ouse, and the Eastern Arm of the Adur significantly interferes with such local migrations and may be a factor limiting coarse fish populations. Additionally, if non-migratory species are washed over a structure (particularly during spate conditions) they will not usually be able to negotiate it to move upstream again. Adult brook lamprey also make local movements to locate suitable spawning habitat and apparently insignificant obstructions in small tributaries may be significantly impacting populations of the species.

2.3 (iii) Other BAP species

It is recognised that certain emblematic BAP species (e.g. water vole) are not indicator species for WFD purposes, however they may be expected to benefit from general measures to achieve GES. We make no attempt to document the occurrence of all riverine, or riverine associated, BAP species present in the Ouse or Adur catchments in this submission, however as an example offer observations with respect to the depressed river mussel which is recorded from the Ouse catchment, although its historical distribution and abundance are uncertain due to the relative vague nature of old records of “river mussels” and the potential for it to be confused with commoner species. There are (plausible) anecdotal reports that it was once abundant in the lower Bevern Stream, just above its confluence of the Ouse upstream of Barcombe Mills, prior to extensive dredging of the stream from the 1960s onwards. Positive identifications of the species in the Ouse catchment after the major dredging works of the 1960s and 70s are scanty and it appears that there are no confirmed records of it still occurring in the Barcombe area (or elsewhere in the Ouse catchment). While habitat modification was presumably causative in its decline, it may possibly have been finally eliminated by the major organophosphate pesticide pollution incident of 2001, which affected over half of the main stem of the Ouse. Given that the depressed river muscle is apparently indigenous to the Ouse, was present until recently, and may have been eliminated by a pollution incident, we believe that consideration should be given, particularly once hydromorphological have been improved, to its re-introduction, and also to other BAP species now extinct but which are known, or can reasonably be inferred, to have occurred.

2.4 Alien/invasive species

We are in broad agreement with the EA’s River Basin level prioritisation of non-native invasive species (of those identified via the UK WFD TAG) for the SERBD. We also endorse the ART’s observation in its general submission that risk based approaches to invasive species control should be adopted.

2.4(i) Invasive plant species. With respect to species not which are not specifically water dependant, **Himalayan balsam** and **Japanese knotweed** are apparently increasing their range within the two catchments (though possibly more prevalent in the Ouse catchment). While the are precedents within the UK for attempts at catchment-wide elimination schemes (e.g. R. Camel invasives project in Cornwall) the practicality, employing currently available techniques, of eliminating Himalayan balsam or knotweed from either the Ouse or Adur catchment is questionable, although local elimination may be possible at specific sensitive locations e.g. Chalk stream tributary headwaters. With respect to aquatic species per se, **Canadian waterweed** is present in both catchments and particularly abundant in impounded (by structures) stretches of the Ouse. In certain reaches e.g. the Andrews Cut at Barcombe Mills, its growth may be to the extent that the channel is entirely occluded and sporadic observed fish mortality may be attributable to nocturnal deoxygenation due to the respiration of extensive growths of the plant. The only practical means of permanent control of Canadian Waterweed is likely to be habitat restoration programmes to replace impounded reaches by ones with a more natural flow regime, which in addition to the naturalisation of hydromorphological characteristics (principally by removing structures to restore the natural riffle/pool regime) may have the additional benefit of rendering the river a less suitable environment for invasive aquatic plants.

Parrots feather, floating pennywort and **Australian swamp stonecrop** are also recorded in the catchments, and established in stillwaters, including, in the Ouse catchment, in isolated river meanders, created by the navigation works of the late 18th/early 19th centuries which are acting as reservoirs for invasive species (e.g. parrots feather has recently become established within old meanders upstream of Isfield). An issue is that these species are often present in small ponds, well below the threshold size for WFD designation in their own right, but which can act as reservoirs for the invasive species to become repeated re-established elsewhere within the Ouse and Adur catchments. While local elimination of these invasive species may be achievable, the most effective and sustainable means of preventing their colonisation of the main stems and tributary systems of the rivers is, as is the case for Canadian waterweed, likely to be via the naturalisation of hydromorphological characteristics.

2.4(ii) Pumpkinseeds. The Ouse is possibly unique in the UK as the only river in which the pumpkinseed may, downstream of the confluence of the Shortbridge Stream (but probably not upstream of Sharpsbridge, as shown in recent EA mapping) now be established as a breeding population, therefore warranting particular consideration being given to the presence of the species. It is known to reproduce, with large populations present, in certain on-line stream fed stillwaters within the catchment (e.g. on the Batts Bridge Stream).

Pumpkinseeds may be washed out of such stillwaters into the streams exiting them, and ultimately into the main river, where they are regularly encountered as far downstream as Barcombe Mills. Although clearly reproducing in stillwaters within the catchment, the status of the pumpkinseed as a breeding species in the Ouse itself is uncertain. We understand that the view has been expressed that it does not reproduce within the Ouse, but is represented in the river only by escapees. We would however note observations in the Barcombe Mills area from 2006 of both obvious male/female pumpkinseed pairings, and, in the same area, of very small (1–2cm) pumpkinseeds which suggests that reproduction is occurring. Climate change may lead to an increased probability of successful reproduction. We are aware that DEFRA has conducted a study on Pumpkinseeds in the Ouse, although our understanding is that this has concentrated on monitoring and no specific proposals to attempt to eliminate the species appear to have been developed. It is considered unlikely that pumpkinseed populations will become established in the main river to the extent that they will perturb its ecology (mainly due to its flashy nature) and compromise GES being realised. If elimination from the stillwaters within the catchment is excluded as an option, the restoration of a more natural flow regime within the main river may be the most appropriate measure to prevent a substantial pumpkinseed population developing, as the species is most likely to become established in impounded reaches.

2.4 (iii) Common carp. We agree with the general assessment for the SERBD that common carp are not a priority species in respect of either river. While not indigenous to the UK, having been introduced in medieval times, carp are nevertheless an accepted part of the UK fish fauna and have probably been present as a breeding population in the Ouse and Adur for a much longer time period than is the case for most UK rivers. They comprise an important element of the recreational fishery, and do not appear to have significantly affected the overall ecology of the rivers. However, both rivers (but particularly the Ouse) are subject to occasional large influxes of carp washed into them from stillwaters within the catchments and an increasing number of koi and koi/common carp crossbreeds are encountered, which have presumably been stocked illegally, possibly having outgrown garden ponds. Such introductions (along with those of goldfish, grass carp, golden rudd and golden orfe) have an associated risk of disease introduction and appear to be becoming more frequent. We consider that a programme of information/education is the best way to counter this.

2.4 (iv) Signal crayfish. Although currently having a restricted distribution within the two catchments, signal crayfish possibly comprise the invasive species representing the most significant risk to GES being realised and maintained within the Adur and Ouse. Nationally, signal crayfish are of very significant concern for two principle reasons (only one of which is relevant to the Ouse-Adur); first that they can carry the infectious (fungal) agent responsible for the "crayfish plague" which has caused local extinction of the native (white clawed) crayfish in many areas and threatens it with national extinction, and secondly, that once established, signal crayfish populations can achieve densities sufficient to fundamentally perturb the ecology of the colonised watercourse. It is unlikely that native crayfish are indigenous to the Ouse or Adur; there are no confirmed recent reports of them from either river catchment, although there are anecdotal records of them having, several decades ago, being present in a small Chalk aquifer fed stream in the lower Adur catchment and similarly in another Chalk aquifer fed stream (probably the Northend or in the Bevern sub-catchment) in the Ouse catchment. There are no known recent records and both populations, if they were once present, should be considered extinct. Assuming these isolated populations did exist, they probably originated from small scale local (possibly Victorian era) introductions and were eliminated (probably before 1970) by declining water quality or habitat modification. With white clawed crayfish absent from (and likely not indigenous to) the Ouse and Adur the risk posed by signal crayfish is not to populations of the native species but through colonisation to an extent sufficient to perturb riverine ecology, potentially to an extent which will compromise GES being achieved. We consider this to comprise a very significant issue.

Signal crayfish are, at least within flowing water, within the Ouse catchment, possibly presently restricted primarily to a small section of upper Uck sub catchment, and in the Adur catchment are possibly similarly restricted to one sub-catchment, in each case having entered the watercourses from on-line stillwaters. However, as the low population densities which follow initial colonisation may go unnoticed for some time, their distribution may already be more widespread in both rivers and they may also be present, unrecorded, in other ponds or lakes connected to the river systems. It is probably inevitable that signal crayfish will, over a period of several decades, colonise much of both catchments and potentially fundamentally perturb their ecology, dominating the biomass in significant stretches of the rivers. The EA should form, and include in the final plan, an opinion (with appropriate justification) as to whether, if signal crayfish populations become established to this extent, they will preclude Good, or only High Ecological Status being realised.

We also note that **mitten crabs** are likely to establish significant populations within the lower (tidal) reaches of the Ouse and Adur. The species is well established in the Thames estuary and sporadic individuals are now being reported from the Sussex coast and estuaries. We concur with the EA's decision (with respect to the SERBD) that mitten crabs comprise a priority invasive species, at least with respect to the transitional reaches. The EA should form, and include in the final plan, an opinion (with appropriate justification) as to whether, if mitten crab populations become established to this extent, they will preclude Good, or only High Ecological Status (or potential) being realised.

2. Do you agree with our proposed objectives?

We agree with the general objective for all waterbodies to be in GES/GEP by 2027 but we would like to see significantly more ambition, evidenced by more work being scheduled to undertaken during the current 2010–2015 cycle, to reduce the amount needed in the subsequent two cycles to 2027. With respect to those waters which classified as heavily modified, we would like to see more detailed justification for the use of this designation and a re-examination of their extent as some stretches which are designated as heavily modified e.g. the Ouse for some distance downstream of the Uck confluence, are arguably not.

3. For some water bodies we have proposed objectives with deadlines after 2015 or a lower overall target. Do you agree with these changes we have proposed?

We are currently unable to endorse this approach, at either a catchment of individual waterbody level, on the same grounds set out in the ART's response i.e. that "***It is extremely difficult to agree with the proposed extended deadlines and/or lower overall targets in general due to a lack of information on how these decisions have been made…….. We would like to see the full range of measures considered for each waterbody, and how these have been analysed for cost benefit and technical feasibility".*** In the event of this information being provided, we would be pleased to provide a further response.

The ART's response further states (and we again endorse it) that ***"The process is set out in Annex E but when it comes down to specific waterbodies, or even catchments, there is nothing to explain what measures have been appraised and how the measure (or measures) which are deemed 'disproportionately costly' or 'technically infeasible' were selected and then discarded. The same is true of extended timescales, where the reasoning behind a 2021 or 2027 target is not shown. We would welcome clearer communication of the decision making process as it relates to individual waterbodies and measures. We would welcome the inclusion of all proposed measures for each water body with a brief assessment of why they have been rejected/accepted on the waterbody information sheets. For catchment related actions the same could be shown in the catchment measures table. Our aim in suggesting this modification is to allow co deliverers to avoid wasting valuable time and effort (both theirs and the EA's) in suggesting measures that have come up before and been rejected as not suitable".***

The ART goes on to state its concern that ***"measures currently included do not take into account the full work programmes of many Rivers Trusts, and their costs for carry out such work. Generally Rivers Trusts have an excellent record of delivering high quality work extremely cost effectively and it would be to the benefit of the whole WFD delivery programme if the EA took proactive steps to engage with Trust work and aid its delivery"***.

We recognise that S.O.C.S. and R.A.C.S. are amongst the less established ART members (particularly in that they do not employ qualified staff), nevertheless they have active volunteer groups with a track record of undertaking habitat enhancement projects and an increasing capability (via both scientific/technical expertise and having volunteers with e.g. professional experience in the construction industry) to undertake significant projects. With a MoU now in place between the EA and S.O.C.S., and the prospect of another between the EA and R.A.C.S., both organisations would welcome the opportunity to be active partners with the EA in delivering

WFD measures and further endorse the ART's observation that, as technical solutions are constantly developing, the final plan should include clarification of how those measures deemed 'technically infeasible' in 2009 will be reassessed in coming years and the two future planning cycles as technology and remediation/enhancement methods advance. The development of novel techniques, and the ability of River Trusts to apply them in a cost effective manner, provides a mechanism for circumventing constraints (technical and cost) in the plan and it would be unfortunate if there was not an opportunity to apply these due to out of date assessments being used in the RBMP.

4. *This plan sets out the actions required to meet the objectives. To what extent do you agree that the right actions have been identified (actions that are proportionate and feasible)?*

We have followed a process to assess (appraise) these actions. This process is described in detail in annex E. Do you agree with how we have done this?

We endorse all the observations made in the ART's response (which, to ensure brevity, are not restated here), but would particularly emphasise reiterate the ART's reservation that: ***"Hydromorphology is only used to change waterbody status from High to Good. We are concerned that the Ecological Status assessment pathway only incorporates hydromorphology in the capacity to grade waterbodies between High and Good status. We are not clear on why this is the case as we feel there is a strong case for the hydromorphological state of a river to be the defining factor in reaching GES for bad, poor and moderate waterbodies. We believe that where a waterbody is hydromorphologically 'poor' then any changes to upstream land management (for example) may only have limited effect, possibly not enough to bring the waterbody to Good Status. For this reason WFD delivery should be addressing serious hydromorphological issues as a priority to lay the foundation for further ecological and chemical improvements".*** This statement is particularly pertinent to the Ouse and Adur given their history of hydromorphological perturbation, as previously detailed, particularly in section 2.1(i), of this submission. We support the stance that, whatever other improvements are delivered, that Good Status may not be achieved without fundamental hydromorphological issues being addressed and consider that the individual waterbody sheets should provide more explicit information about hydromorphological constraints and potential remediation measures.

5. What comments do you have on these actions? Are there any actions we've missed, or any changes you'd propose?

We share ART's general concern that it is extremely difficult in most cases to identify exactly which action (or measure) will have an impact on which individual water body and that even where waterbody specific actions have been identified they are shown in the draft plans in a table by catchment, leaving readers to try to match actions to waterbodies. The provision of a spreadsheet (which we understand is planned) showing actions/measures by waterbody would go a considerable way towards linking existing measures to waterbodies but at this time it has not been released. In drafting this response, it has been very difficult to establish how general measures will (or may) relate to individual waterbodies. A primary issue relating to the Ouse and Adur catchments is less than good hydromorphological status. It is not yet clear how this is to be addressed at either at the catchment or waterbody level. For example, will, where there is a structure which comprises an obstruction to fish passage, will there be a general, catchment level, objective to entirely remove the structure, rather than just provide a fish pass? – complete removal would bring a range of additional benefits in addition to facilitating fish movement. Taking the same issue with respect to individual waterbodies, the individual waterbody sheets should specify which structures are present, and the approach to be adopted with respect to each of them. Another issue concerns phosphate; elevated phosphate levels compromise the achievement of Good Status in many waterbodies. As previously stated, high phosphate may be attributable to various sources (STW effluents; septic drainage; agricultural inputs) but unless the contributions of various sources within a various waterbody are specified the applicability of specific remediation measures cannot be determined.

6. What comments on Scenario C actions do you have, including any additional information you can supply about specific actions?

We are concerned that while a number of scenario C issues are proposed, a number of obvious and in some cases potentially readily soluble, issues, particularly relating to hydromorphology (especially where it is impacted by structures) are not addressed. Specific information is presented in the section of this submission which addresses specific waterbodies. We would therefore request that, with respect to individual waterbodies, information on proposed measures is made more explicit.

We share the general concern expressed by ART that ***"too many Scenario B measures (and even Scenario C measures) appear to be activities that are already going on or are definitively planned. There appears to be a lack of novel or specific measures in the plans. We feel this is probably as a result of inadequate planning / consultation at the catchment scale and would urge the EA to engage with Rivers Trusts to address this issue".*** As ART member organisations, S.O.C.S. and R.A.C.S. would welcome the opportunity for such engagement.

The ART's national response includes the observation that ***"It is also worth noting that Article 14 of the WFD calls for public participation in delivery of WFD and Rivers Trusts offer a significant and measurable level of public support and involvement. Rivers Trusts in England and Wales enjoy the support of over 5000 regular volunteers, giving on average 2–5 days of support per year, this equates to between 10,000 and 25,000 volunteer days per year, or approximately 30 working years. This is huge resource potentially available for WFD delivery***". At the level of the Ouse and Adur catchments, local ART member organisations (i.e. S.O.C.S. and R.A.C.S.) have approximately 20 active volunteers and, if suitable projects could be agreed with the EA, additional recruitment is almost certainly achievable. There is thus, assuming on average once monthly outings, the potential for up to several hundred person days per year volunteer input to be made available for co-delivered WFD projects.

7. What support can you offer, such as undertaking any actions or providing resources to help deliver more for your environment?

As noted above, S.O.C.S. and R.A.C.S., have approximately 20 active (in the context of undertaking practical river enhancement/restoration activities) volunteers, with the prospect of recruiting more, and hence the ability to devote a significant volunteer labour to WFD projects. Both organisations have well established links with land and riparian owners. To date, a variety of projects have been undertaken by S.O.C.S. including gravel rehabilitation, introduction of large woody debris and reintroduction of *Ranunculus*. R.A.C.S. has undertaken a number of projects, including small scale wetland recreation on the Knepp estate. More information on project work is available on the Societies' websites. The ART's strong support for the creation of a River Restoration Fund and its assistance offered to DEFRA to make the case for additional funds to the Treasury is endorsed. We believe that, for WFD objectives to be realised, and in particular for a far more ambitious programme to be implemented in respect of the 2015 deadline, that the provision of significant additional government funds is a pre-requisite. In the event of such funding being made available to ART member organisations, S.O.C.S. and R.A.C.S would wish to, at the earliest possible stage, work with the EA to identify and co-deliver priority projects within the Ouse and Adur catchments. We note the two organisations' extensive knowledge of the catchments and that they would, in principle, be willing to assist the EA in drafting sections of the Final Plan, at least as far as the Ouse and Adur are concerned. It is understood that in other River Basin Districts, ART member organisations may be contributing in this way.

S.O.C.S. and R.A.C.S., as ART member organisations, are participants in the EU Interreg IVA Cross Border project bid led by the Westcountry Rivers Trust (with ART and EA also being participating organisations) which has an objective of developing a substantive English Channel wide cooperative network which can deliver environmental restoration of wetted land within river catchments in a cost effective way, and in doing so realise WFD aspirations. As ART members, S.O.C.S. and R.A.C.S. can access ART's considerable expertise, including training courses. It is intended that a S.O.C.S. Committee member will be attending a series of ART courses specifically aimed at allowing attendees to offer professional, targeted advice to landowners on reducing diffuse agricultural pollution. ART member organisations have a track record of securing high multipliers on initial funding sources and thus can assist in the cost effective delivery of measures.

S.O.C.S. has developed the outline of a substantive project in respect of the Chalk Stream tributaries within the Ouse catchment; the project outline is currently being expanded to include the Adur catchment. The project outline has previously been provided to the EA and, rather than re-stating its objectives here, we would ask the EA to refer to the draft previously provided which sets out numerous opportunities for implementing WFD measures with respect to Chalk stream headwaters. The full implementation of this project could help deliver a significantly more ambitious programme of measures by 2015.

S.O.C.S. undertakes water quality testing to a professional standard within the Ouse catchment and R.A.C.S. has an intention to implement a similar programme with respect to the Adur. S.O.C.S. also undertakes macroinvertebrate (BMWP) monitoring within the Ouse catchment. The results of the water quality and BMWP sampling programmes are published on the S.O.C.S. website. S.O.C.S. has an aspiration to develop a capability to undertake quantitative fisheries monitoring.

O.A.P.S Ltd, although an angling society offering fishing on the Ouse and tributaries, was originally established with, and has maintained, wider conservation objectives and collaborates with S.O.C.S. (through overlapping committee membership and on specific projects, including a long running sea trout scale reading project). O.A.P.S. also owns the freehold fishing rights in the vicinity of Barcombe Mills, including the most significant sea lamprey spawning habitat in the Ouse catchment, and would welcome the opportunity to work with the EA to and S.O.C.S. to deliver WFD objectives in respect of its own fishery. O.A.P.S. has archives dating back to its inception in 1875 which include detailed records of the Ouse back to that date, which may be of significant value in determining the historical fisheries and wider ecological status of the river. Other angling societies may also have useful information in their archives.

8. Do you agree with our assessment of how climate change will affect the pressures on the water environment?

We endorse the ART's observation that the key elements in climate change adaptation and mitigation are temperature and flow and would like to see greater emphasis placed on measures to gain greater understanding of these in the first planning cycle. However, we recognise that while the reality of climate change is now widely accepted, and predictive models with higher spatial resolution are now being employed, the extent to which specific, defensible, climate change impact predictions can be made at a catchment (or regional) level remains contentious. Nevertheless, assuming that climate change (including changes in temperature and rainfall patterns) will increasingly affect UK catchments, and that, given their southerly location, the Ouse and Adur may be particularly prone to elevated water temperatures, it is assumed that climate change induced ecological changes will be inevitable. There have been recent incidents (e.g. mass mortality of adult sea trout in the tidal Ouse during a period of low flow and high temperature during 2006, the complete drying up of much of the Northend Stream during 2004 and the floods of 2000) which, while they cannot be unambiguously attributed to climate change are indicative of the type of event which may be expect to become more frequent.

In the context of WFD an important issue is whether there will be, as a consequence of climate change, such fundamental changes in ecology that the ability re-establish GES may be compromised or even rendered unachievable. As an example, a key issue is whether water temperatures will increase to the extent that the Ouse and Adur become a marginal or unsuitable environment for sea trout and that a flagship species (and indicator of GES) for the catchments will decline significantly, or may even be eliminated. Invasive species (e.g. pumpkinseeds) which are currently probably unable to colonise the rivers to a significant degree, may be able to establish significant extent if there is an increase in water temperature. We share the ART's concern that the UK's current freshwater temperature monitoring regime is inadequate for detecting climate change impacts on the country's rivers, but is an important tool in ensuring that they reach GES.

We agree with ART's desire to see specific emphasis on 'climate proofing' river systems and providing adaptive measures that will restore habitats capable of providing refuges for biodiversity in the face of changing climate. With respect to the Ouse and Adur catchments, as far as mitigating against increased temperature is concerned, tree planting to afford shade is likely to be the primary measure available, although the restoration of natural hydromorphology should also have a protective function (for example, narrowing of over-widened reaches and removal of structures to reduce the extent of impounded reaches will reduce the retention time of the systems, which may mitigate against increased water temperature as water will have less time to equilibrate with the ambient air temperature) With respect to mitigating against potentially increased peak and low flow extremes, measures to attenuation overland flow (and reduce silt input) and land, including urban areas, management to provide increased infiltration should be considered. We believe that a review of abstraction licences, including MRF stipulations, with specific reference to climate change is appropriate, as a variation of them may prove an effective means of mitigating climate change related changes in both temperature and flow regimes. This is relevant particularly to abstraction from the Chalk block (both catchments) and the operation of Ardingly and Barcombe Reservoirs on the Ouse. The Ouse and Adur (and other Sussex rivers) have unusually long tidal (transitional) reaches relative to total river length and catchment size. As a result of naturally rising sea levels since the end of the ice age, the tidal reaches have extended further inland and, unless blocked by structures, this trend will continue, but now dominated by climate change related sea level rise. This, coupled with an increased probability of storm surge events, may lead to an increasing likelihood of saline intrusion into the upper tidal sections which, although under tidal influence, are freshwater environments. The incidence of saline intrusion events may be further increased by climate change related reductions in the volume of freshwater entering the transitional stretches.

9. Do you have any other comments on this draft plan that you haven't already told us?

We are in agreement with ART's stance that Liaison Panels should be reshaped into Delivery Panels to implement measures and would appreciate clarification as to if this approach is to be adopted and whether such panels will be constituted on a River Basin or Catchment level. Representatives of the organisations which are signatories to this submission could provide valuable input to an Ouse-Adur delivery panel if a catchment based approach is adopted.

We would also endorse The ART's stance that *"**There should be more monitoring and data collection relating to quantitative invertebrate assessment and fisheries, but that this should not draw funds from sources designed to implement".***

We agree that in certain instances, while additional monitoring and data collection are desirable, this should not draw funds away from other sources intended to support on the ground WFD implementation measures. While additional invertebrate and fisheries monitoring may clarify some outstanding issues, in many cases there are already adequate data for defensible decisions to be made, and actions (e.g. removal of structures) implemented, at the present time. It will be important to monitor the effectiveness of WFD measures (e.g. specific river restoration projects) and existing statutory monitoring programmes may not, due to their limited temporal and spatial extent, be adequate for this purpose. Any additional monitoring programmes should be designed so as to elucidate as much information as practicable on the effectiveness of WFD measures; ART member organisations are increasingly developing a capability to undertake monitoring (including quantitative fisheries monitoring) and there is the potential for such a capability to be developed locally.

Additional comments in relation to individual waterbody information sheets.

The remainder of this submission comprises additional comments with respect to the individual waterbodies defined within the Ouse – Adur catchment (as defined in the catchment map on pg 18, and the individual waterbody sheets comprising pg 32–127 of the Draft Plan). The small scale of the catchment map has, in some instances made it difficult to establish which individual waterbodies specific features of interest (e.g. structures) fall within and in other cases where a waterbody includes both a section of the main stem and a tributary, it is not clear which (or both) of these is the designated waterbody. In some cases, it is also unclear whether a specified waterbody comprises a section of the transitional reach, or a tributary flowing into it. It would be helpful if each individual waterbody had a separate, larger scale, accompanying map, identifying within it not only the waterbody itself, but also features (e.g. structures, STWs; abstractions; locations where restoration schemes are proposed etc) of specific relevance.

The Adur Catchment

16000 Transitional Adur

We are not certain, from the catchment map and waterbody information sheet, as to whether this waterbody comprises the entire tidal stretch of the Adur, the lower section of it, or a stream/creek flowing into the tidal river. If this is clarified, we will provide refined additional comments, however for the purpose of this submission we are assuming that it refers to the entire tidal (transitional) stretch, which extends into the Eastern and Western Arms. If this is the case, then a major issue, throughout much of the transitional stretch, is the potential for increased river – flood plain connectivity. We presume that the potential for this will be specifically addressed in the final plan. Concern has been expressed that, in recent years, high plant nutrient concentrations may have led to an increased growth of both macropyhtes and algae, both in the upper transitional reach and on inter- tidal mudflats in the lowest section of the estuary. An issue with respect to both the Adur and Ouse is where the upper limit for the transitional reach should be set, and whether this should be at the most upstream point under tidal influence, or the downstream limit of the freshwater reach. This issue is further discussed in respect of the Ouse transitional stretch. The upper tidal (but freshwater) section of the Adur, including the tidal Eastern and Western Arms, is significantly over widened and deepened and as a result its channel has limited habitat diversity. There is considerable potential for enhancing this

06510 Ladywell Stream

We presume that waterbody 06510 comprises the Ladywell Stream, though the resolution of the map is insufficient to confirm this. Assuming that this is the case, we have little current knowledge of this stream, other than it has historically supported a population of small "trout", most likely juvenile sea trout. We suggest that it would be appropriate to establish whether this population is still present and, if it no longer exists, suggestive of a decline in ecological status to below GES, then the reason(s) for this should be established and remedial measures identified.

13150 & 13180 "No water"
Although the catchment map identifies these areas as not containing water, two minor Chalk spring fed streams may be located within their boundaries. However, we have no specific information with respect to these other than that, like the Ladywell Stream, they may historically have supported populations of juvenile trout, most likely sea trout.

13030 "Blakes Farm Stream"
We have insufficient information with respect to this minor tributary to make any substantive comment.

13220 Uncertain
It is not possible from the catchment map to establish whether this candidate heavily modified (for flood protection) waterbody comprises a stretch of the tidal Adur or a minor tributary. If this can be clarified, we will provide additional comments. On the assumption that it comprises the main river, the principle issue is hydromorphological modification (initially for navigation and more recently for flood defence/land drainage) and the potential for increased river – flood plain connectivity.

12200 Adur Western Arm, tidal limit to Blakes Gill confluence
This stretch was modified by navigation works, accounting for the loss of channel sinuosity compared to upstream reaches and tributaries. This fundamental hydromorphological modification, which may in part account for fish populations currently being at bad status. should be identified in the plan. It includes the only remaining structure (at Lock Farm), which, while it may not be the original one, was constructed in respect of the W Arm navigation. We do not have sufficient knowledge of this structure to make detailed observations, other than that its impact and remedial measures should be specifically addressed in the plan.

12170 Adur Western Arm or Blakes Gill?
There is confusion within the plan as to which watercourse this refers to. The waterbody information sheet refers to the waterbody as being Blakes Gill (however, waterbody 12280 is also identified as Blakes Gill on its information sheet). The catchment map however appears to show waterbody 12170 as comprising the W Arm of the Adur from the Blakes Gill confluence upstream to around the Lancing brook confluence. The final plan should clarify this, however if waterbody 12170 does comprise a section of the Western Arm of the Adur, then this includes part of the Knepp estate, which is developing its own proposals for a major river restoration programme. If this is the relevant stretch, it includes a gauging weir (immediately upstream of the A24), which although passable to sea trout will impede or prevent passage by other species. This main river stretch is significantly straightened (presumably as a result of navigation works; the upstream terminus of the Adur W Arm navigation being at Knepp), with the original course of the river being still evident as, now isolated, meanders). There is, as identified by the Knepp estate, significant potential for restoration of this stretch of river to its pre-navigation course.

12190 Adur (Western Arm) tributary, rising at West Chiltington
This (apparently unnamed) stream retains little natural channel sinuosity and in places there is obvious evidence of its channel having been realigned or straightened. It thus, as a result of agricultural/land drainage activity, has significantly modified hydromorphology. Very little gravel substrate remains, although observations of juvenile trout (possibly juvenile sea trout, although it is understood that a weir impounding a hammer pond may impede or prevent access by them to most of this sub-catchment) indicate that some suitable spawning habitat may exist. The streams hydromorphological status could be significantly improved via a programme of small scale restoration works.

12160 Adur Western Arm tributary (Lancing Brook)
This stream, sometimes referred to as the Lancing Brook, with the exception of one short stretch, has been significantly straightened throughout its entire length and, from a hydromorphological perspective, comprises one of the more highly modified Adur sub-catchments. In addition to its modified channel configuration, very little gravel remains, presumably as a result of physical modification including dredging. It does, however, support a juvenile trout (probably sea trout) population. Its modified hydromorphology affords significant opportunities for restoration.

12290 Upper Adur Western Arm
Apart from the most downstream approximately 2km of this reach, where the channel has clearly been straightened, and there is the potential for significant hydromorphological restoration, much of this stretch of the

W Adur retains a moderately natural hydromorphology, with significant channel sinuosity remaining. However, even in this more natural stretch there is evidence of relatively recent land drainage related impacts, with an associated loss of benthic substrate.

12270 W Adur tributary (Kneppmill Pond Stream)
The lower reaches of this stream are impounded by Kneppmill Pond; downstream of this there may be no flow during hot summers, in the short stretch between the pond and the confluence with the W. Adur, possibly associated with evaporative losses from the pond.

12900 E Adur, tidal limit (Shermanbury) to Herring Stream confluence
Although, unlike the lower section of the Western Arm, the lower Eastern Arm was not modified by navigation works upstream of the tidal limit, its hydromorphology is still impacted, by historic channel management and extant structures, which should be specifically, addressed in the plan. The first of these is at Sakeham, where a structure with moveable boards is installed. It is understood that the number of boards installed may have been increased in recent years, raising both the height of the structure and the degree of impoundment (and departure from natural hydromorphology) which it causes. Although a significant obstruction it can be passed by sea trout during spate conditions, however it may be impassable by other species. The double obstruction at Wineham (comprising penstock and road culvert which carries the flow of a channel which by-passes the penstock) is arguably the most significant structure on either the E or W Arms of the Adur and comparable in significance to certain structures in the Ouse catchment included in the list of the top 25 obstructions to fish passage in the SERBD. The penstock comprises an extremely difficult structure for sea trout to negotiate and will be impassable to other species. It is however operated with boards kept in place at all times, to provide a sufficient head of water to feed flow into the by-pass channel, and enable fish to use this alternative route (via the road culvert) to migrate upstream. There is a drop from the culvert to the pool below it and this may render it impassable to fish other than salmonids. It is understood that there are proposals to increase the level of water in the pool, however this can only be regarded as a partial, short term, solution. It would appear appropriate to consider whether there are any grounds for retention of the Sakeham and Wineham structures, with a presumption for their removal if none can be demonstrated, given their significant impact on hydromorphology and fish passage.

12180 E Adur, Herring Stream confluence to Bolney Sewer confluence
The lower section of this reach is understood to be impounded by the penstock upstream of Wineham Bridge (which falls within the downstream designated waterbody, no.12900). If this is confirmed, then addressing hydromorphological issues associated with the Wineham structure, will potentially also improve the hydromorphological status of this reach.

12150 Herring (or Herrings) Stream
The hydromorphology and in-stream connectivity of this sub-catchment are adversely impacted by a series of structures and its upper reaches potentially by groundwater abstraction. Although not specified within the draft plan, The Herring Stream and Woodsmill Stream sub-catchments are arguably those within the Adur catchment most severely impacted (including with respect to hydromorphology and fish passage) by structures. The most downstream structure on the Herring Stream is at Cobbs Mill. Here the stream has historically been divided (for milling purpose) into two channels; one comprising the (probably) original stream channel and the other a higher level leat, which, at the Mill, discharges into the main channel via a narrow concrete sluice. It is a significant obstruction; apparently passable by sea trout probably not by other species. Specific consideration to this structure should be given in the plan, including its impact on hydromorphology and fish passage, and the implications of the partition of the flow between the two channels. The next structure/obstruction, and one of the most significant within the Adur catchment, is located around the mid point of the Herring Stream, approximately 1km downstream of the A273 road bridge. This is an usual structure, essentially comprising a cylindrical sump, which has, with some justification, been described as being like a plughole. Its origin was presumably linked to the operation of Ruckford Mill. It appears to have no current function, adversely impacts on the hydromorphology of the stream and comprises a severe obstacle to fish passage. It is only passable, if at all, by sea trout under extreme spate conditions and appears impassable by other species. The plan should specifically address this structure and its removal to naturalise hydromorphology would seem appropriate. A short distance upstream of it, there is an additional significant obstruction, a stepped brick weir, immediately upstream of the A 273. This structure is probably passable by sea trout under high flow conditions. If fish passage could be facilitated at this, and the previous, structure, a significant proportion of the catchment, including Chalk stream headwaters, would be potentially available to sea trout. These Chalk stream headwaters may, however, potentially be impacted by groundwater abstraction (from the Clayton borehole). An additional issue relevant to the Herring Stream is that its upper reaches may, intermittently, be impacted by urban run-off where it runs (for a distance of approximately 1km) through Hassocks. In view of the multiple pressures

affecting the Herring Stream, it is suggested that it is prioritised as a sub-catchment where an integrated river restoration approach may usefully be applied.

12240 Copyhold Stream
These upper sections of this stream in particular have been subject to significant hydromorphological modification; the middle and lower section is less modified.

12250 Bolney Sewer
We have relatively little information with respect to this stream, other than that sea trout are recorded from it. Sections of both the Bolney Sewer and its tributaries have been subject to channel re-alignment and straightening, including the stretch immediately upstream of its confluence with the main (E Arm) stem of the Adur. A number of on-line lakes reduce in stream connectivity within this sub-catchment.

12060 Woodsmill Stream
This sub-catchment is significantly impacted by a series of obstructions, historical channel realignment to the flood plain edge, including for milling, and by groundwater abstraction adjacent to one of its headwater streams. The most downstream km of the stream is divided into two channels and it discharges into the tidal Adur via a sluice and two tidal flaps. The primary channel discharges via the sluice (which has a winding mechanism). Access by sea trout (and other species) from the main river into the stream is dependant on the (manual) opening of the sluice; in some years it has not been opened until complaints were made. The rationale for retaining the sluice is not known, although it may, by maintaining a head of water within the channel, create a wet fence. The next major obstruction is the Truleigh sluice; a significant obstruction, but with work to provide an easement projected to take place on it during 2009. The Truleigh structure was initially used to control the flow of water into the leat supplying water to operate Woods Mill (now the headquarters of the Sussex Wildlife Trust). In addition to the historical partition of flow into the leat (which is now dry other than in spate conditions) there is significant realignment of the stream both upstream and downstream of the sluice. It is understood that various proposals for restoration schemes in the Truleigh Woods Mill area have been advanced, although the current status of these in unknown. In a WFD context, it would appear appropriate that restoration proposals should be focused on the re-instatement of the original stream channel. Approximately 2km further upstream, on the Fulking/Poynings branch, a structure know as the Perching weir, integrated into a farm track bridge, comprises a further significant obstruction, probably only passable by sea trout under a narrow range of flow conditions. Approximately 1km upstream from this is a comparable significant obstruction (Perching Sands Fulling Mill) at the junction of the Poynings and Edburton Streams. The Poynings Stream is subject to low flow attributed to a borehole adjacent to its source. A PR09 project to alleviate this has been submitted by the water company. During recent dry summers the flow in the upper Poynings stream has largely comprised the effluent discharged from the Poynings STW. At least the upper reaches of the headwater streams within the sub-catchment (the Poynings, Fulking and Edburton Streams) are Chalk streams and could usefully be recognised as such within the plan. The sequence of structures, potential for schemes involving realignment/reinstatement of channel, and projected flow alleviation suggests that an integrated restoration programme for the Woodsmill Stream sub-catchment would, for WFD purposes, be an appropriate strategy.

12110 Chess Stream
While some mid sections of the Chess Stream retain significant channel sinuosity, indicating that there has been relatively little modification to its course, other extensive sections, including the top 5km, have been straightened and thus subject to significant hydromorphological modification. A similar situation prevails with respect to much of the lower section, where significant land drainage work, including in the 1990's has resulted in an over widened channel. The impact of more recent maintenance work is readily apparent, with gravel and freshwater mussels deposited on the stream bank. There are two structures on the lower Chess stream, a gauging weir and another, a structure of unknown origin, incorporated into bridge. While probably not an obstruction to sea trout passage (the Chess stream receiving a run of these fish), they nevertheless conflict with in-stream connectivity and good hydromorphological status. The Chess Stream, particularly in its lower reaches, is one of the more hydromorphologically impacted sub-catchments in the Adur system; this is likely to be a significant factor in it having poor fish populations), and it should be a considered as a candidate waterbody for restoration. The upper section of the sub-catchment includes Chalk stream headwaters, most sections of which have been very significantly straightened. The upper approximately 1km of one of these (upstream of Newtimber Place) runs immediately parallel to, and a short distance from, the A23 and receives significant road run-off from the carriageway, which may be significantly compromising its ecology.

12260 Cowfold Stream
The lower section of the Cowfold Stream, upstream of its confluence with the E. Adur at Shermanbury, has been subject to significant hydromorphological modification. The original course of the stream is now, under normal

flow conditions, dewatered, with its flow having been transferred to a flood relief channel of relatively recent origin. There are a number of structures in this area, on the original channel there is a brick weir immediately upstream of its confluence with the (tidal) E. Arm of the Adur and upstream of the weir is a tidal flap. On the flood relief channel there is a winding (bottom opening) sluice, which appears to have been at least partly decommissioned with the gate left raised. There appears to be the potential for a significant river restoration project in this area, involving removal of the structures and reinstatement of the original course of the stream, which currently only carries water during spate conditions. There are additional minor structures further upstream, many or all of which appear to have no valid current function and consideration should also be given to their removal.

12280 Blakes Gill

We have little specific information with respect to this waterbody, other than to note that the most downstream section (particularly downstream of the A272 road bridge) has been subject to significant hydromorphological modification, with evidence of channel straightening and relatively recent land drainage activity.

12120 Honeybridge Stream

A primary issue with respect to this stream is that there at least two penstocks on its course which, in addition to potentially compromising good hydromorphology being realised, comprise very severe obstructions to fish passage. It is understood that, while, comparatively recently, boards were removed from these structures during the winter (which would have at least facilitated passage by sea trout) the boards are now retained on a year round basis. The EA is urged to address the implications of these structures within its final plan. Concern has also been expressed that the stream may be receiving effluent form a disused landfill operation in the vicinity of Ashington. There is potential for river restoration projects to improve the hydromorphology of this sub-catchment (including minor Chalk stream headwaters); it is noted that the then NRA undertook (c1990) a small scale scheme at Daylands Farm which included gravel reinstatement.

12040 Black Sewer

A derelict brick weir upstream of where the Black Sewer stream is intersected by the A238 comprises a severe obstruction to sea trout passage and compromises the hydromorphology of the stream. Its lower reaches, downstream of the A238, have been straightened and dredged and, with considerable potential for the application of small scale river restoration works. This sub-catchment includes the Chalk stream normally referred to as the Tanyard Stream, which flows through Steyning. Although, in terms of flow volume, one of the more significant of the minor Chalk streams within the Adur catchment, it is also one of, if not the most, hydromorphologically modified. Within a few hundred metres of its source, it is impounded to create a series of ponds; downstream of these it enters Steyning where much of its course is via buried culverts. Specific opportunities for restoration of this urban stretch could usefully be addressed.

The Ouse Catchment

04900 Tidal (Transitional) Ouse

It is not clear from the catchment map whether water body 04900 comprises the entire transitional (tidal) reach of the Ouse, but for the purpose of this submission we are assuming that this is the case. If this interpretation is incorrect, we would welcome the opportunity to provide additional comments. Firstly, we note that there are a number of issues in determining how the transitional zone should be defined with respect to the Ouse (and also the Adur); the current tidal limit reflects, in part, hydromorphological modification to the river. The EU Freshwater Fish Directive (FFD) set the freshwater limit at Barcombe Mills, which is arguably incorrect; Barcombe Mills represents the tidal limit but the water at this point is entirely fresh, although (on spring tides) it is backed up by tidal action. The approach adopted in the context of the FFD in respect to the Ouse conflicted with that adopted in respect to a number of rivers in other regions. An additional factor is that the tidal limit has changed significantly in recent times. Prior to the modification of the river for navigation works, it appears that the normal tidal limit was around Lewes. Initially, the estuarine reach would have comprised a tidal channel flanked by extensive mud flats and saltmarsh, which would have accommodated lateral dispersion of water on an incoming tide, this was replaced by a narrow, embanked channel, which may have served to funnel water further upstream; geological subsidence of the S.E. due to the rebound following the final melting of the ice sheet at the end of the last ice age will also have contributed to the tide gradually penetrating further inland, as the land continued to subside relative to the sea. O.S. maps of the 19th to the mid 20th century denotes the tidal limit as being at Hamsey weir and it is clear that over most or all of this period the reach upstream of this was entirely non tidal. More recent (including current) mapping sets the tidal limit at Barcombe Mills, several km further upstream. Two reasons account for this; the continuing gradual increase in sea level rise (climate change having more recently added to the naturally occurring increase in sea level, giving a current annual increase of several mm per year) and modifications to the crest of Hamsey weir undertaken in the 1960s/70s (to improve land drainage and facilitate agricultural intensification). We consider that there are grounds for further considering exactly where the upper limit of the transitional stretch of the Ouse (and Adur) should be demarcated and whether this should relate to the upstream limit of tidal influence or the downstream limit of the entirely freshwater reach, which, in both rivers, is significantly downstream of the tidal limit.

However, assuming the transitional limit extends upstream as far as the Barcombe Mills structures, we make the following specific observations:

1 The entire reach is fundamentally hydromorphologically modified, initially by navigation works (and associated channel straightening and the construction of locks, weirs and navigation cuts) and subsequently by flood defence works. The Ouse in the vicinity of Barcombe Mills has historically been divided into a series of channel, with tidal influence now extending into 4 of them. Of these, the Andrews Stream comprises the original channel of the river; this should be recognised in the context of potential habitat restoration programmes.

2 Meanders isolated by the c1790 navigation works are still apparent in the Lewes to Barcombe stretch and there may be the potential for reconnecting these. Downstream of Lewes, there are additional opportunities for enhancing river-flood plain connectivity.

3 While much of the hydromorphological modification can be attributed to historic navigation works, flood defence and land drainage activities as recently as the 1960s have continued to cause further serious habitat degradation. This includes very significant channel dredging and deepening of the stretch downstream of Barcombe Mills, where the in many places high and steep banks, result primarily from c1960–65 channel modification. O.A.P.S. has in its archives copies of the original plans for these works, which demonstrate the extent of modification undertaken. Prior to the works, much of the now mud-bottomed upper tidal section was characterised by a gravel bed and a fundamentally different macrophyte community to that now present. We consider that there is, without compromising flood protection, a significant opportunity for habitat restoration.

4 The reach is of particular significance for a range of migratory fish species, as previously detailed in section 2.3(ii) of this submission. The fish population, reflecting salinity, is essentially of freshwater (and migratory) species from the tidal limit to around the A27 road bridge; downstream of this estuarine species become dominant and its lowest reaches support a range of essentially estuarine and marine species, including large numbers of juvenile bass.

5 The freshwater flow of the transitional reach is modified by the MRF conditions which apply to the Barcombe Reservoir abstraction licence. There are grounds for, within the context of WFD, reviewing whether the licence conditions are adequate to protect the ecology of the transitional stretch.

6 There may be grounds for reviewing whether it is appropriate that the entire transitional stretch is designated as heavily modified.

While, in most instances, significant negative impacts may be associated with structures, an interesting situation exists in respect of Hamsey weir, the most downstream structure on the Ouse, formerly the tidal limit, but now (for reasons explained above) falling within the upper tidal section of the river. The weir is only topped by medium tides over about 5.8m and even on high spring tides the structure reduces the upstream passage of water by constricting the flow of the incoming tide. This is an un-natural modification to the hydrological regime but nevertheless does have a potentially positive impact in that it reduces the potential for saline intrusion events in the Hamsey to Barcombe reach, which could otherwise potentially result in mass mortality of freshwater coarse fish species in a reach which was, in relatively recent times, not tidal. While, in a “natural” situation, coarse fish could move upstream ahead of incoming saline water, in the case of the Ouse the upstream movement of fish is prevented by the Barcombe obstructions, resulting in the fish effectively being at risk of being trapped downstream of them.

It is not clear from the resolution of the catchment map whether the Barcombe structures are considered to fall within this transitional waterbody, or the upstream freshwater reach (no **12560**). For the purposes of this submission, the latter is assumed.

06500 Minor tributary near Piddinghoe

If we are interpreting the catchment map correctly, this waterbody comprises a minor tributary entering the Ouse near Piddinghoe. We have no information available on this stream, other than OS mapping shows it as a very short (approximately) 600m long watercourse; presumably a minor Chalk stream.

13080 "The Brooks" drainage system

Although a candidate heavily modified waterbody, and artificially maintained as a freshwater environment, the (partly Chalk groundwater fed) drainage system of The Brooks is of designated conservation significance. Due to the complexity of this situation, and the fact that the EA has not yet assessed either the current overall status or proposed status objective, we wish to defer commenting until this information is available.

12450 Lewes Winterbourne

Issues relating to the Lewes Winterbourne have been addressed in the document The S.O.C.S. Sussex Ouse Chalk Streams Project Outline which has previously been provided to the EA; we would refer the EA to that document. We would appreciate clarification as to why the Winterbourne is now classified as a Candidate Heavily Modified waterbody, when mapping at an earlier stage in the consultation process apparently did not show it as such. However, it is recognised that, even on an international basis, the Lewes Winterbourne is one of the most urbanised Chalk streams and as such is subject to a range of pressures. Its discharge to the main Ouse is via a tidal sluice; although the Winterbourne is used by sea trout as spawning habitat, in some years it receives no run of fish due to the degree of closure of the sluice. The operation of this sluice should be reviewed. While naturally, at least in its upper sections, the watercourse comprises a Winterbourne rather than a perennial stream, its flow may be impacted by groundwater abstraction, both for potable supply and on occasion via additional pumping to prevent flooding of the A27. Rapid dryback of the Winterbourne during some years, with an associated mortality of (mostly juvenile) sea trout and a necessity for fish rescues on occasion may be linked to groundwater abstraction. The potential impact of abstraction on the Lewes Winterbourne should be reviewed and solutions to any adverse impacts identified and evaluated**.** There is a history of pollution incidents, although an upgrading of the sewerage and drainage infrastructure has resulted in a reduction of these in recent years. The effectiveness of these remedial measures, and the requirement for additional ones, should be evaluated. Much of the course of the channel through Lewes have been culverted, c1960, following a major flood. Prior to this, the Winterbourne flowed through a relatively natural channel and there may be the potential for recreating this, without increasing flood risk.

12560 Ouse; Barcombe Mills to Uck confluence section.

While recognising that there are a number of complex issues relating to this stretch, we believe that there should be a more explicit description as to why (on flood defence grounds) the entire stretch is deemed to be a candidate heavily modified water body. We consider that there are grounds for not all of the reach being so designated.

The draft plan makes apparent reference to, as a hydromorphological measure, removal of a possibly obsolete structure. There are a number of structures within this stretch, however as the Barcombe ones may need to be retained to protect the Barcombe Reservoir abstraction (although this constraint is not mentioned in the draft plan), we assume that the structure referred may be the Anchor Sluice, built in the 1960s or 70s and replacing a previous wooden structure. It is understood that it is accepted by the EA that the structure not have any current flood defence function. However, the operating regime of winter opening/summer closure of the sluice gates leads to a seasonally variable water level upstream of the structure for several km (as far as the next obstruction, Sutton Hall weir) with a variety of adverse ecological impacts. The summer closure of the sluice also impounds the lower reaches of the Longford Stream and River Uck, upstream of their confluences with the Ouse. It is considered that the variable water level and associated impacts may preclude the stretch from achieving Good Ecological Status or Potential and that, if the sluice comprises a redundant structure, then its removal should be expedited. In calculating the cost effectiveness of this measure, the ongoing maintenance costs of retaining it in its present form, potentially until 2027, should be accounted for.

Three (of 5 listed for the Ouse) of the EA's top 25 obstructions to fish migration within the SERBD are at Barcombe Mills. With the flow of the river being partitioned here into 5 separate channels, all of which are obstructed, an integrated approach to addressing fish passage at Barcombe Mills is required, considering not only the migratory species present and the structures themselves, but the partition of flow between the various channels. It is understood that a study commissioned by the EA into improving fish passage at the Barcombe New Weir channel concluded that there was insufficient water available to operate a pass; however this conclusion may have been reached without considering any options for varying the partition of flow between channels (potentially including termination of flow in one or more). In addition to fixed structures, automatic sluices are also located at Barcombe Mills. In addition to compromising fish migration, the mode of operation of the bottom opening automatic sluice which feeds into Barcombe Mill Pool in particular may be compromising upstream coarse fish populations. On one occasion a shoal of large (up to 3kg) bream, was observed to be displaced into Barcombe Mill Pool from upstream when the sluice operated. Large numbers of juvenile coarse fish, shoals of which accumulate upstream of the sluice during the summer, are regularly displaced during autumn spates and this may be a factor for the apparently poor recovery of coarse fish stocks subsequent to the 2001 pesticide pollution.

The draft plan recognises that achieving GES(P) may be limited by flow quantity and dynamics. We support this concern and are not persuaded that the current abstraction licence conditions, with the MRF specified as a 24 hour average figure, as opposed to an instantaneous flow measurement, is compatible with GES(P) being realised. We are also not persuaded that the MRF value is high enough adequate to allow GES(P) to be achieved. O.A.P.S. archives show that, since Barcombe reservoir was constructed, there has been a significant shift (towards the autumn and winter) of the timing of the sea trout run, which may be a response to the modified flow regime. An additional issue which has arisen in recent years, and reached a peak in the summer of 2006, is that of sea trout mortality in the reach downstream of the Barcombe abstraction, including the tidal section, waterbody **04900,** as far downstream as Hamsey. In 2006 probably about 150 adult sea trout, possibly approaching a third of the total summer run, died in this stretch, culminating in a fish rescue exercise being undertaken by the EA. Although probably multifactorial in origin, if recurrent sea trout mortality were to be attributable at least in part to the flow being too low in the lower (downstream of Barcombe abstraction) section of the Ouse for them to survive, this would raise the question as to whether the current MRF is compatible with good ecological status (or potential). While any severe impacts on the sea trout stock are likely to be readily observed (in the form of dead fish), other ecological impacts may also be attributable to the abstraction regime; for example it could be a factor in the decline in the migratory lamprey population.

There is clearly the potential for a number of habitat enhancement measures to be undertaken within this reach for. One option is the potential for the restoration of flow to the original course of the river. A substantive proposal has been advanced for a restoration of flow to the Iron River in the Isfield area; we are surprised that no reference is made to this. There is also very significant potential for a restoration programme relating to the Andrews Stream (the original course of the Ouse in the Barcombe Mill area) which was subject to particularly severe habitat degradation due to dredging in the 1960's. That almost the entire sea lamprey population of the Ouse appears to make use of this channel may provide a specific focus for restoration work, although measures to benefit the lamprey population will bring much wider benefits.

12950 Clayhill Stream

The Clayhill Stream is significantly modified by land drainage and its hydromorphology is additionally impacted by a structure immediately downstream of where it is crossed by the A26. However, the major potential issue is that the upper section of the sub-catchment comprises the development site of the proposed Clayhill reservoir. We are not making specific comments on that proposal in this submission, but would wish to do so at a future date, if the project is advanced. It is however noted, that were a new reservoir to be commissioned, its construction and operation would raise numerous and complex issues with respect to the implementation of WFD requirements within the Ouse catchment. Waterbody area 12950, in addition to the Clayhill Stream, also includes the Plashett Stream. Although a small stream, impounded by a series of lakes and impacted by agriculture, it nevertheless does receive a run of sea trout each year.

12710 Ouse, Uck confluence to Cockhaise Brook confluence & Searles Stream

The Adur and Ouse catchment map shows waterbody 12710 as a composite one, comprising a long stretch of the main river and a sub-catchment, the Searles Stream. These could usefully be separated as it is not clear to which (or both) of these watercourses the information in the waterbody sheet refers. The main river stretch was modified for navigation during the 1790's and early 1800's; the sequence of oxbows adjacent to the river comprise the rivers original meanders which were isolated by the navigation works. A series of significant structures are present, which further compound the hydromorphological modification to the channel. Sutton Hall weir, adjacent to Isfield Lock was constructed c1792 and comprises a significant obstacle to fish passage and, by impounding the reach upstream, fundamentally affects its hydromorphology. While a fish pass is installed, its performance is unsatisfactory, with a significant jump required for fish to enter the first chamber. The flow of the pass, relative to the main flow, may also be insufficient to attract fish to its entrance; sea trout are often seen unsuccessfully attempting to surmount the main weir structure. Goldbridge Weir is a gauging weir constructed during the 1970's or 80's, replacing a predominantly existing wooden structure. Although it is understood that it is designated as having a fish pass, it is impassable to sea trout under all but extreme spate conditions; the wooden structure which it replaced was easily passable. Although neither Sutton Hall or Goldbridge weirs are included within the top 25 obstructions to fish passage, they are more significant structures than some of the 5 within the Ouse catchment which are included in the "top 25" list. Fletching Mill weir is subject to a proposal (by the EA) to remove it. This approach is endorsed. The Pool's Bay structure, although included in the top 25 list is not as significant an obstruction to fish passage as Sutton Hall or Goldbridge. The weir upstream of The Sloop is also readily passable by sea trout. The Scaynes Hill STW discharges into the upper section of this waterbody, comprising (by volume) the largest effluent discharge to the Ouse. The have been at least initial proposals for two separate substantive river restoration programmes in the Sheffield Bridge area; one downstream of the bridge (on Sheffield Park NT property) and the other (Spring Farm) upstream of Sheffield Bridge. These would involve re-instatement of the river to its original (pre c1790 navigation works) course, by reconnecting isolated meanders. Such schemes could bring significant environmental benefits and assist in realising WFD objectives. However, they do not comprise the only opportunity for restoring the river to its pre-navigation course, and a catchment wide approach to this would be appropriate, as discussed previously in this submission.

12690 Ouse; Cockhaise Brook confluence to Scrase Stream confluence
This short stretch lacks significant meanders, and has reduced habitat diversity, due to it having been significantly in the 1790's by the Upper Ouse Navigation works.

12720 Ouse; Shell Brook confluence to Scrase Stream confluence
This reach of the Ouse was fundamentally modified by the Upper Ouse Navigation works, which account for the loss of channel sinuosity, with meanders (some of which can still be traced on the ground) having been by-passed by the navigation cut. The extent of channel straightening in this reach is greater than for most other sections of the river (giving it both a particularly un-natural hydromorphology, and the potential for significant habitat restoration). Although no reference is made to it within the waterbody information sheet, the stretch includes (Deans Mill/Pimms Lock) one of the most severe obstructions to fish passage within the catchment. Except during extreme spates, this comprises the normal upstream limit of sea trout migration.

12730 Ouse; source to Shell Brook confluence
Although only the most downstream section of this reach was modified by the Upper Ouse Navigation works, the majority of it shows evidence of (relatively recent) channel modification with significant channel straightening and deepening and loss of benthic substrate. The Ardingly reservoir intake structure (a crump weir) is located within this reach and the presence and impact of both the structure and associated abstraction should be recognised. The most significant tributary feeding the main river within this stretch is the **Great Bentley Stream.** While we are familiar with only sections of this sub-catchment, it has also evidently been impacted by land drainage, with obvious channel straightening and evidence of relatively recent dredging, including removal of benthic gravel deposits. Being a small stream, the logistics of applying habitat restoration techniques would be relatively straightforward. It is understood that an Advisory Visit undertaken by the Wild Trout Trust reached similar conclusions.

12510 Glynde Reach
The Glynde Reach is one of the most modified, and hydromorphologically compromised, sub-catchments with, apart from short, relatively unmodified headwater reaches, very significant channel straightening, deepening and widening, throughout its length. The Beddingham Sluice is a severe obstruction to fish passage and is impassable to sea trout under all except possibly the most extreme spate conditions. It prevents sea trout accessing suitable spawning/nursery areas afforded by Chalk stream tributaries of the Glynde Reach. It significantly impacts on the hydromorphology of the waterbody; extensive mats of duckweed often form upstream of it during the summer months, on occasion apparently having resulted in local de-oxygenation sufficient to cause fish mortality. Explicit reference to the sluice, and proposed measures in respect of it, should be made in the plan, which should also recognise, and propose measures to address, the arguably poor hydromorphological status of the sub-catchment due to channel modification.

12530 Northend Stream
Issues relating to the Northend Stream, which receives most of its water from the Chalk aquifer, have been comprehensively addressed in the document The S.O.C.S. Sussex Ouse Catchment Chalk Streams Project Outline which has previously been supplied to the EA. We would refer the EA to this document. Although an important sea trout spawning stream, lengthy sections of it have been canalised and have a markedly unnatural hydromorphology. There is a scarcity of gravel due to land drainage activities; an application for consent for a project to reinstate gravels to one of the affected stretches has been submitted by SOCS, with the intention of undertaking this work during the autumn of 2009. The potential for small scale river restoration works to naturalise the hydromorphological characteristics of the stream in confirmed by advice provided by the Wild Trout Trust subsequent to an Advisory Visit. The stream discharges into the tidal main Ouse via a tidal flap with a history of malfunctioning; the removal of this structure would appear appropriate in a WFD context.

12570 Bevern Stream Issues relating to the Chalk aquifer fed upper section of the Bevern (and its tributaries, the Roman's Winterbourne, Plumpton Mill Stream (and its tributary, the "Gote Stream") and the Hayleigh Farm Stream) have previously been comprehensively addressed in the document, The S.O.C.S. Sussex Ouse Catchment Chalk Streams Project Outline, which has been previously provided to the EA. We would refer the EA to that document. With respect to the lower (non-Chalk stream) sections, fish passes have been installed by the EA at the two most significant structures (Redbridge and Clappers Weirs) which have facilitated sea trout passage at these previously severe obstructions, although underlying hydromorphological issues attributable to them remain. The passes were designed to only accommodate passage by salmonids. The main stem of the Bevern has been subject to modification due to agricultural activity to a variable extent; some stretches are significantly modified with a loss of gravels and evidence of channel dredging/straightening, while others remain in a more natural condition. S.O.C.S. is currently collaborating with the EA on a project to improve the status (including by addressing fish passage) on one of the tributaries of the Bevern. There remains ongoing concern in relation to the impact (including persistently high phosphate levels) of the Ditchling and Barcombe STW effluents. Although anecdotal, there are consistent reports that the summer flow of the Bevern, throughout its length, has declined very significantly over a period of 30–40 years. In view of the multiple pressures affecting the Bevern sub-catchment, it should be considered as a candidate waterbody for restoration.

12960 Longford Stream
The assignation of current poor status to the Longford Stream appears appropriate, not least because of persistent low oxygen levels, the cause of which does not appear to have been adequately accounted for. This may require detailed investigation to resolve. The lowest section of the stream is impounded during the summer months by the seasonal closure of the Anchor Sluice, which backs up the Longford Stream (and lower Uck) as well as the main river. Further upstream, it is impounded by a series of on-line lakes. There is scope for habitat enhancement to improve the hydromorphology of the stream, particularly its lower reaches.

12590 Little Horsted Stream
This stream is at least moderately impacted by historical (land drainage) and current agricultural practice and there has been a significant loss of gravel from its bed. Although accessible to sea trout, there are few records of them from the stream, likely related to the scarcity of spawning substrate. Its hydromorphological status could be significantly improved by a programme of small scale restoration work.

12580 Lower Uck; Ouse confluence to Little Horsted Stream Confluence
The significant hydromorphological modification to this stretch should be indentified in the plan. The most downstream section of this stretch has been split (to facilitate milling) into two channels, with significant obstructions on each of them in the vicinity of Isfield. The extreme downstream section, immediately upstream of the Ouse confluence, is seasonally (summer months) impounded by the closure of the Anchor sluice, which as well as impounding the main Ouse, also backs up the level in the lower Uck (and another tributary, the Longford Stream), resulting in a particularly unnatural hydromorphological regime. The Isfield structures, although passable by sea trout, are probably impassable by coarse fish. The most upstream section of this stretch (where the Little Horsted Stream enters) has been subject to diversion; the original meandering course of the river can still be traced. Around this area there is another structure (commonly referred to as the Worth Farm weir) which, while passable to sea trout, is probably impassable to most coarse fish and which further compromises the river's hydromorphology in this area.

12640 Uck; Little Horsted Stream confluence to Ridgewood Stream confluence
This is hydromorphologically one of the most natural sections of the lower Uck, probably reflected by its fish population already achieving good status. The lower extremity of this reach is however impounded (for a relatively short distance) by a weir (generally referred to as the Worth Farm weir). Its baffled sill is probably readily passable by salmonids, although not by coarse fish.

12660 Uck; Ridgewood Stream confluence to Framfield Stream confluence
Given that over 50% of this stretch flows through the urban area of Uckfield, and that the town is subject to flooding, we accept that the designation as a Candidate Heavily Modified waterbody is probably appropriate, although possibly not for the most downstream 1km. Nevertheless there remains significant potential for enhancement of this stretch. Until the 1970's it supported extensive growths of *Ranunculus*, and a trial planting has established that it should be possible to re-establish it. An additional observation is that the fish pass under the railway line although apparently adequately configured, at least for salmonid passage, has a number of boards positioned at its upstream end to maintain the water level upstream. These may prevent the pass working effectively.

12700 Uck (Framfield Stream confluence to Tickerage Stream confluence) and Lephams Bridge Stream
The Ouse and Adur catchment map shows this waterbody as comprising both a section of the main Uck and the full length of a tributary, the Lephams Bridge Stream. Although the waterbody information sheet gives an overall current status of poor, as it is not specified whether this applies to the main river, Lephams Bridge Stream, or both, this restricts our ability to comment. However, it is noted that the waterbody includes two

significant structures/obstructions; one on the Lephams Bridge stream (impassable to sea trout) and another, Hempstead Mill sluice on the Uck. Its automated bottom -opening sluice gate is probably not normally passable to sea trout other than during extreme spates conditions (except possibly on brief occasions when the flow is low and the gate is partially drawn). Very few sea trout are observed upstream of the structure and the scarcity of juvenile sea trout in the Tickerage Stream may well be attributable to the Hempstead sluice. The sluice additionally serious compromises the hydromorphology of the reach which it impounds. This reach, in addition to being impounded, for approximately 0.5km upstream of the sluice comprises a linear channel, presumably having been straightened to facilitate operation of the mill. In places, the course of the original meanders is still evident to the east of the present channel.

12990 Upper Uck – Tickerage Stream confluence to source
The assignation of GES to this section is questioned as, while its water quality and hydromorphology are acceptable, it is inaccessible to sea trout due to an impassable structure (Buxted Park weir) at the downstream end of it. If it is accepted that access by, and an established population of, sea trout should be an element of GES, then this section should not currently be at that level. This is particularly the case because, until recently, this stretch did have a sea trout population. Buxted weir is believed to have been constructed during the 1980's and is a complete barrier to migratory fish, preventing access to approximately 15km of spawning/juvenile habitat. It is understood that it replaced a previous structure which, although a significant obstruction, was passable by sea trout under high flows. The weir is by-passed by a ditch (dry except during extreme flows) which comprises a former (but not necessarily the original) channel of the river. It has been suggested that this channel could be modified to provide a fish pass, although removal of the structure would be the preferred option. Buxted weir is one of the key obstructions to fish passage within the Ouse catchment and greater significance than at least some of the 5 obstructions to fish passage which are included within the list of the 25 top obstructions within the SERBD.

12630 Ridgewood Stream This stream is identified (no 21) as one of those identified within the SERBD as a candidate waterbody for restoration to help achieve GES. It is agreed that its hydromorphological status is currently less than good and that it has been impacted by land drainage works, including channel straightening and dredging which has removed the majority of its gravel bed substrate. It appears to be subject to diffuse agricultural pollution and, due to a lengthy section of it running adjacent to the A22, probably also road run-off. The fact that there are few records of sea trout entering it, suggests that it falls short of GES. We would appreciate being informed as to what restoration measures are proposed for this waterbody.

12650 Framfield Stream
Although this stream is currently assigned good status, from a hydromorphological perspective the Framfield Stream, having been impacted by land drainage, including the loss of nearly all gravel, is in no better condition than other streams assigned moderate status. Its current classification is thus difficult to reconcile with its actual hydromorphological condition.

12970 Tickerage Stream
Anecdotal reports suggest a significant decline in the trout population of this stream over a period of several decades. This may be at least partly attributable to the automation of the Hempstead Mill sluice, on the main Uck approximately 1km downstream of the Uck/Tickerage confluence, reducing the opportunity for sea trout to access the Tickerage Stream. The small trout which were previously present may have predominantly been juvenile sea trout. Sea trout are thought to now access the stream intermittently, with reports of spawning fish in 2000 and 2003. A structure at Uptons Mill, Framfield, completely prevents their access to the upper sections of the sub-catchment. In addition to this hydromorphological perturbation, sections of the stream have been straightened and in some areas apparently re-aligned to the edge of the flood plain. Casual macroinvertebrate sampling has, on occasion, demonstrated poor macroinvertebrate assemblages.

12980 Shortbridge Stream
The watercourse marked on the Ouse Adur catchment map actually comprises the lower section of the Shortbridge Stream and the full length of its primary tributary, the **Batts Bridge Stream**. This perpetuates an error in nomenclature which was previously made in respect of the final round of consultation for the Freshwater Fish Directive. With respect to hydromorphology, it is noted that the lowest approximately 3km section of the Shortbridge Stream does not comprise the original channel, the line of which can still be followed parallel to, and to the north of, the current channel. The diversion (and now the main) channel, which probably dates from the 18thC, was constructed for navigation purposes. With respect to structures, a weir a short distance upstream of the confluence with the Ouse comprises a significant obstruction to fish passage. It is understood that it may have been constructed to provide a head of water for a local pumped abstraction, and may have no current function. On the Batts Bridge Stream, a culvert where it is crossed by the A272 comprises

another significant obstacle to fish passage. With respect to the true Shortbridge Stream, fish passage is terminated approximately 200m upstream of its confluence with the Batts Bridge Stream by an impassable lake dam. Silt ingress from adjacent fields may be particularly significant within parts of this sub-catchment.

13000 Sheffield Stream. If it is accepted that hydromorphological connectivity and access by migratory species, including sea trout, is an element of GES, then it is difficult to understand why the Sheffield Stream has been categorised as already achieving GES. The dam of the most downstream dam at Sheffield Park (NT property), a few 100m upstream of the confluence with the Ouse, is a complete barrier to fish migration and isolates the majority of the sub-catchment from the main stem of the Ouse in terms of in-stream connectivity.

12670 Pellingford Stream This sub-catchment is identified (no 20) as one of the candidate waterbodies for restoration to help achieve GES(P). While we do not have detailed knowledge of this stream, it is impounded by a series of lakes which are presumed to impact its hydromorphological status. We would appreciate being provided with more information as to what restoration works are proposed.

12740 Cockhaise Brook This waterbody is identified (no 18) as one of the candidate waterbodies within the SERBD for restoration to help achieve GES. While we do not have detailed knowledge of sections of this sub-catchment, it is understood that a structure at Cockhaise Mill is impassable to fish, and will presumably have a range of additional hydromorphological impacts. If it is the case that the EA's reason for selecting the Cockhaise Brook as a candidate for restoration is (at least in part) to address this structure, we would endorse this. However, we would note that, at least the upper parts of the sub-catchment have retained a relatively natural hydromorphological regime and the potential for restoration (other than addressing the Mill structure) may be significantly less than for other tributaries within the Ouse catchment.

12680 Scrase Stream
Although designated as a candidate heavily modified watercourse (due to urbanisation) we note that where both the Scrase stream and its tributaries flow through Haywards Heath, although there are short culverted sections, much of the course is through green corridors within the town and whether the entire sub-catchment, or just short sections, should be designated as heavily modified is debatable. In spite of its partially urbanised catchment, the Scrase Stream is consistently used as spawning habitat by sea trout, the most upstream tributary within the Ouse catchment utilised on a regular (annual) basis. Observations following rainfall indicate that the stream is subject to significant urban run-off. Dead sea trout kelts are observed more regularly in the Scrase stream than elsewhere within the Ouse catchment; whether this is related to intermittent poor water quality following run-off events is unknown, though it may be a possibility. A range of mitigation measures, including controlling urban run off, opening culverted sections and additional habitat enhancement measures could potentially be employed.

18000 Shell Brook With Ardingly Reservoir impounding the Shell Brook, and its flow downstream of the reservoir being frequently augmented by water released from the reservoir, we agree that, downstream of the reservoir, it comprises, and is appropriately classified as, a highly modified sub-catchment. However, there may be grounds for separately classifying the reach upstream of the reservoir as unmodified. While identified (no 17) as one of the candidate waterbodies within the SERBD for restoration to help achieve GES(P), it is not immediately apparent, given the presence and mode of operation of the reservoir, how restoration techniques could be applied, at least to the stretch downstream of the reservoir, and we would appreciate clarification as to what is proposed.

Unspecified sub-catchments It is noted that a number of sub-catchments which could have been specifically identified have not been recognised for the purposes of WFD. These include two sub-catchments entering the transitional reach of the Ouse; the **Norlington Stream** and the **Pells Brook**.
The Norlington Stream sub-catchment is comparable in size to that of e.g. the Clay Hill, or Ridgewood Streams, which are designated, and it is used as spawning habitat by sea trout. Its designation as a specified waterbody should be considered. The Pells Brook, the entire extent of which is located within the Offham Marshes SSSI, is a Chalk stream which has been modified by navigation works, but with its original course still evident. A number of issues relating to this watercourse, which we believe should be designated as a specific sub-catchment, have previously been detailed in the S.O.C.S. Sussex Ouse Catchment Chalk Streams Project Outline; we refer the EA to that document.

Designated stillwater bodies

44533 Ardingly Reservoir

Our primary concern with this waterbody relates to the way in which water is released from it. Water discharged from Ardingly for abstraction at Barcombe may be significantly colder than that in the Ouse and this could influence the biota of the river. There is the possibility that the reservoir could be operated to produce artificial spates to facilitate fish migration. We suggest, and would support, a comprehensive review of the operation of Ardingly reservoir, including MRF conditions, in relation to how this may impact on the realisation of GES in the Ouse catchment.

Undesignated Stillwater bodies

With the exceptions of oxbows comprising isolated meanders, all lakes and other significant standing water bodies within the Ouse and Adur catchment comprise artificial water bodies; many are "highly modified" sections of streams created by damming them. Their relatively small size has resulted in their not being designated as waterbodies for WFD purposes. However, they have the potential to influence the realisation of WFD within the wider catchments. On-line stillwaters created by damming tributary streams interfere with in-stream connectivity (access to about 50% of potential sea trout habitat within the Ouse catchment is prevented by impassable obstructions, of which the majority are lake dams), raising an issue as to whether fish (including elver) passes/by pass channels should be considered as a WFD measure. Certain stillwaters also comprise reservoirs for alien species, which may, particularly during spate conditions, be released to the wider catchment.

Although they are not designated waterbodies, the final plan should recognise the potential for small stillwaters to compromise the potential for GES to be achieved in the wider catchment via their impact on hydromorphological connectivity, including with respect to fish passage and their potential to act as reservoirs for alien invasive species

Signatories to this consultation response are:

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