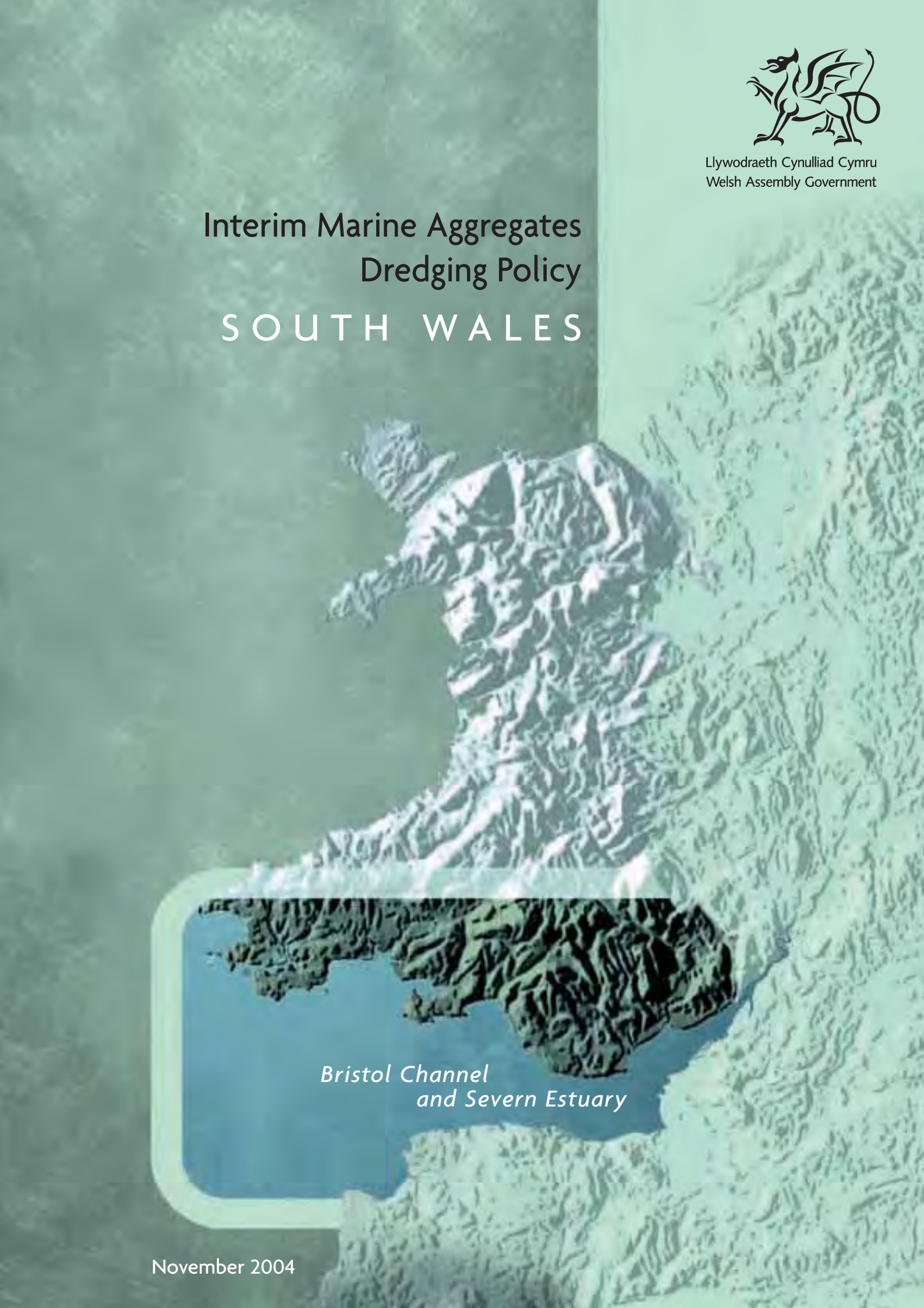
Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Interim Marine Aggregates Dredging Policy

SOUTH WALES



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Interim Marine Aggregates Dredging Policy is being published in English only, and not bilingually. This decision has been taken in accordance with the Assembly Government's Welsh Language Scheme because of its lower priority rating compared with other translation work.

Ni fydd y Polisi Dros Dro ar Garthu Agregau Morol yn cael ei gyhoeddi yn y Gymraeg nac ychwaith yn ddwyieithog. Penderfynwyd hyn yn unol â Chynllun Iaith Gymraeg Llywodraeth y Cynulliad oherwydd statws isel y ddogfen o ran blaenoriaeth o'i chymharu â gwaith cyfieithu arall.

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Erratum

Dated 4.11.2004 - please note that OBC 11 shown originally as Category 3 in Annex 2 page 41 has been correctly shown as Category 2.

LIST OF INTERIM STRATEGIC POLICIES AND INTERIM POLICIES

1. INTRODUCTION

1.1. Background

1.1.1 Currently, applications to dredge from seabed owned by the Crown Estate are assessed under the Government View Procedure. This procedure, whereby the Crown Estate will not issue a dredging license unless the Government expresses a favourable view on the environmental implications of the proposed dredging operation, was introduced in 1968. In 1989 the GV procedure was amended to advise that Environmental Impact Assessment (EIA) be undertaken for all applications for a GV. In 1998, more formal measures were introduced in The Interim Government View Procedure (Government View: New Arrangements for the Licensing of Minerals Dredging)[1]. However, the procedure remains a purely informal process with no statutory backing.

1.1.2 The Environmental Impact Assessment and Habitats (Extraction of Minerals by Marine Dredging) Regulations (the Regulations) will in due course supersede the GV procedures. The Regulations will transpose the European Community requirements for EIA[2], integrate the Habitats Directive which covers territorial waters and address other relevant legislation. The Assembly will produce guidance that explains how the Regulations apply to Wales.

1.1.3 Environmental Statements have been submitted with every GV application since 1989 owing to the co-operation and goodwill of the dredging industry. Nonetheless, it is appropriate to formalise the strategy and policy of the Welsh Assembly Government without awaiting the introduction of the Regulations. This will provide a context for dredging applications and enable consistent, clear and open decision-making.

1.2. Interim Marine Aggregates Dredging Policy

1.2.1 Marine Aggregates Dredging Policy, (IMADP) is therefore an interim document that forms a part of the integrated strategy for the supply of fine aggregates to South Wales.[3] The provision of dredged aggregates to South Wales is considered in the context of Minerals Technical Advice Note (Wales) 1: Aggregates; ensuring that supply is managed in a sustainable way and maximising the use of secondary and recycled

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[1] DETR 1998

[2] Also note;
Town and Country Planning (Environmental Impact Assessment) England and Wales Regulations 1999 (SI 1999/293)
Harbour Works (Assessment of Environmental Effects) (No 2) Regulations 1989 (SI 1989/424)
Harbour Works (Environmental Impact Assessment) Regulations 1999 (SI 1999/3445)

[3] Minerals Planning Policy (Wales)
Minerals Technical Advice Note MTAN (Wales) 1: Aggregates - 2004.

1.2.2 IMADP forms the basis for decisions with the objective being to guide aggregates dredging towards preferred areas. The dredging industry and consultees including Countryside Council for Wales, the Environment Agency, Department for Environment Food and Rural Affairs (DEFRA), Centre for the Environment Fisheries and Aquaculture Science (CEFAS), and Cadw, will be guided by these policies when considering dredging for aggregates from seabed in the ownership of Crown Estate. Other owners of the seabed, local-planning authorities, harbour authorities and coastal groups are advised on the context within which dredging applications will need to be considered. IMADP has been developed in consultation with these organisations and environmental groups, and takes account of consultation responses on the draft IMADP. The policies provide the marine aggregates industry with greater certainty, assisting with medium to long-term planning and investment decisions, while protecting environmental quality and biodiversity.

1.2.3 The relative environmental impacts of supplying fine aggregates from all potential sources in South Wales are considered in the Aggregates TAN. While the planning system in Wales must ensure that supply is capable of meeting demand as it arises, the means of meeting that demand must be through a number of sources of supply, and not simply from primary extraction. The pattern of supply of sand for construction purposes in South East Wales is unique in the UK because of its current and historic dependence on marine dredged resources. The fine aggregate dredged from the Severn Estuary and Bristol Channel is of high quality with virtually no outsize wastage and significant manufacturing and production benefits. The Comparative Impact Assessment of Land and Marine sand and Gravel (Symonds, 2001) considered that it is unlikely in the foreseeable future that the marine-dredged sand could be substantially replaced from other sources without raising the cost and reducing the quality of construction. “This would have definite adverse economic consequences for the region and would not be justified on sustainability grounds.”

1.3. IMADP OBJECTIVE

1.3.1 IMADP seeks to ensure sustainable, objective and transparent decision-making to meet society’s needs for aggregates dredged from the Bristol Channel, Severn Estuary and River Severn. IMADP plans for dredged aggregate supplies to meet society’s needs by making provision to:

- *Identify areas where dredging for marine aggregates is likely to be acceptable;*
- *Protect the marine and coastal environment – landscape, habitats, ecology and heritage;*
- *Control the impacts of marine dredging to acceptable levels;*
- *Encourage efficient and appropriate use of dredged aggregates;*
- *Safeguard resources from sterilisation; and*

- *Protect the interests of other users of the area.*

1.3.2` The effectiveness of IMADP will be evaluated by monitoring progress against these provisions; possible indicators and quantified targets are identified within this document. The Assembly will review IMADP at five yearly intervals, and will consider the need for earlier review following significant change in the understanding of the natural processes or the impacts of dredging within the IMADP area.

2. MARINE AGGREGATES DREDGING STRATEGY

2.1 Sustainable Development

See also: Annex1.1

2.1.1 The Government of Wales Act 1998 places a duty upon the Assembly to promote sustainable development in the exercise of its functions. The objectives of the Assembly's Sustainable Development Scheme are:

- *Social progress which recognises the needs of everyone;*
- *Effective protection of the environment;*
- *Prudent use of natural resources; and*
- *The maintenance of high and stable levels of growth and employment.*

2.1.2 In steering industry towards areas where dredging for aggregates is likely to be most sustainable and away from potentially vulnerable areas, IMADP is seeking to meet these objectives. Minimising the use of aggregates together with the use of alternative and secondary materials and the reuse and recycling of aggregates are fundamental, but dredged sand will continue to help meet the needs of society for construction aggregates. It is acknowledged that the potential for substitution of alternatives for marine sand is limited at present.

SP 1 While other alternative sources of supply of suitable fine aggregates will continue to be investigated, the use of marine dredged sand and gravel will continue for the foreseeable future but only where this remains consistent with the principles of sustainable development.

2.2 Dredging Strategy

2.2.1 The Bristol Channel and Severn Estuary represent an area under pressure from a variety of competing human interests and natural changes that increasingly impinge on the marine and coastal environment. The Assembly has adopted an eco-system based approach to reconcile conservation goals with the full range of demands that we place on the marine environment. The Comparative Impact Assessment of Land and Marine Sand and Gravel (Symonds, 2001) considered a range of Policy scenarios on the provision of fine aggregate to South East Wales with reference to dredged sand. The study indicated that the clearest increase in sustainability would be achieved by a gradual shift of dredging operations from inshore areas to other areas further offshore and/or further west. Map 2 shows the licenses and the general areas of the sand resource. The study noted a strong economic case for avoiding precipitate

change, with a transition period and clear timetable encouraging more efficient and less disruptive market changes.

The strategy set out in IMADP provides for a measured change of dredging operations, so that within 10 years the majority of dredged aggregates will be provided from these off shore and outer channel areas, providing this meets sustainability criteria. Whilst it is recognised that in the medium term there are benefits to retaining the local and varied material supplies from the Severn Estuary and Inner Bristol Channel, in the long term only a minor proportion of sand should be provided from these potentially vulnerable areas. Where positive GVs *are* given for new or extended Licences in these areas, they will be for smaller amounts and shorter periods than their off shore replacements.

SP 2 Aggregates dredging will progressively, over the next ten years, become focused in areas off-shore and to the West of the Bristol Channel where this remains consistent with the principles of sustainable development.

2.3 Area-specific Strategy for Sediment Environments

2.3.1 To guide development within this overall strategy, IMADP uses evidence-based spatial policy determined by discrete sediment environments. The BCMA Study divided the Bristol Channel and Severn Estuary into 49 sediment environments that exhibit similar "sediment regimes". (Map 3). They represent amalgams of data and information, collected from various sources, and are areas that exhibit similarities across the sedimentary regime. The data-sets underlying the Sediment Environments were updated in 2003. The policy categories and assessment of sensitivity drew upon a wide range of factors, including coastal sensitivity, nature conservation and fisheries. They are accepted by the Assembly Government as a rigorous and robust way to determine dredging policy in the marine environment.

2.3.2 The information on which the SEs are based include:

- Geological controls – an identification of significant geological features that influence the local morphology and sediment regime (e.g. headlands);
- Form – a description of the profile of the local seabed morphology;
- Sedimentology – a summary of the main sediment types distributed through each sediment environment;
- Bedform – an interpretation of macro-bedform features (eg sandbanks, sandwaves and sand ribbons) in relation to sediment dynamics;
- Conceptual sediment transport model – a synergy of the present understanding to describe the behaviour of sediments in each SE and in respect to the coastal process mechanisms involved;

- Sediment volumes – an assessment of sediment volumes and resource potential; and
- Data quality – a statement on the quality/reliability of the present level of understanding and the degree of consistency.

To these were added data and comments received from a wide range of consultees on environmental, social and economic criteria.

2.3.3. Each sediment environment is assigned to a policy category (Map 4), although it is emphasised that within many sediment environments there is likely to be subtle variation in sensitivity. **There will always be a need for site-specific assessment.**

Categories of Sediment Environment

Category 1 – The Assembly will look favourably on dredging for aggregates in sediment environments where impact is considered likely to be minimal. Dredging Permissions will include Dredging Conditions to prevent or mitigate environmental impacts to acceptable levels. Permission will usually be linked to suitable thresholds, with indicators to be measured by annual or more frequent monitoring.

Category 2 – The Assembly will adopt a precautionary approach. In new areas, research and baseline measurement to establish the sensitivity of the environment to aggregates dredging will be required. Dredging Permissions will include Dredging Conditions to prevent or mitigate environmental impacts to acceptable levels. Permission will be linked to thresholds, with indicators to be measured by annual or more frequent monitoring.

Category 3 – The Assembly is very unlikely to look favourably on dredging for marine aggregates because in the light of significant identifiable constraints the impact is considered to be unacceptable.

The Assembly Government policy with reference to applications within English waters which may impact on Wales is:

Category 4 - The Assembly will look favourably when responding to consultations on dredging for aggregates in sediment environments where impact is considered likely to be minimal. The Assembly will recommend Dredging Conditions to prevent or mitigate environmental impacts in Welsh waters to acceptable levels and may advise thresholds, with indicators to be measured by annual or more frequent monitoring.

Category 5 - The Assembly will adopt a precautionary approach to consultations. In new areas, research and baseline measurement to establish the sensitivity of the environment to aggregates dredging will be required. The Assembly will recommend Dredging Conditions to prevent or mitigate environmental impacts in Welsh waters to acceptable levels and will advise thresholds, with indicators to be measured by annual or more frequent monitoring.

Category 6 – The Assembly is very unlikely to look favourably on consultations on dredging for marine aggregates where in the light of significant identifiable constraints the impact is considered to be unacceptable.

2.3.4 The Sediment Environments, the categories to which they have been attributed and the evidence to support this are set out in Annex 2.

2.4 Aggregates provision in South Wales

See also Annex 1.5 DREDGED AGGREGATES STATISTICS

2.4.1 It is important to the economic well being of Wales that the construction industry has an adequate supply of minerals. Dredged aggregates provide an important raw material for the construction industry in South Wales and to a lesser extent South West England. Table 1 shows the production of aggregates in South Wales. This shows that from 1996 onwards, dredging has been providing over 85% of sand and gravel for South Wales. Production of sand and gravel fell from 2.8mt in 1995 to 1.9mt in 1996, declining since then to 1.3mt in 2001. Aggregate production as a whole in South Wales declined from 19.4mt in 1995 to 12.2mt in 2001.

2.5 Current Dredged Aggregates Reserves and Production

See also Annex 1. 2 USES OF MARINE SAND AND SUBSTITUTION
Annex 1. 3 MARINE AGGREGATES RESOURCES
Annex 1. 4 REGIONAL RESOURCE APPRAISAL
Annex 1. 5 DREDGED AGGREGATES STATISTICS Tables 1,2,3 & 4

2.5.1 High quality medium and fine sand dominates the dredged aggregates market. The sand landed at wharves in South Wales is valued at approximately £9 million per annum. A significant number of jobs - industry estimates have put this at 1,700 - link directly or indirectly to aggregates dredging in South Wales (British Marine Aggregates Producers Association, unpublished data).

2.5.2 There are currently ten Crown Estate licensed areas for aggregates dredging in the IMADP area. (Table 2) Crown Estate

aggregates dredged from the area remained at about 2 million tonnes a year between1992 and 1997, with a steady reduction in landings to 1.5 million tonnes until 2002, increasing slightly in 2003 (Crown Estate Licences, Table 4). A further 150,000 tonnes is dredged from Bedwyn Sands - Bedwyn / Dunn Sands and part of North Middle Ground are owned by the Swangrove Estate. Approximately two thirds of the aggregates dredged from the Severn Estuary and Bristol Channel are landed in South Wales, currently in the region of 1.2mtpa.

2.6 Anticipated need for dredged aggregates

2.6.1 In considering the likely need for dredged aggregates, IMADP takes into account the findings of Aggregates TAN that need for aggregates in Wales is not likely to change significantly over the next five years. The necessity for change in the pattern of supply is an objective in the determination of future proposals. To begin the process of change in the pattern of supply of aggregates, any increase in total demand for aggregates should be met wherever possible from secondary sources or recycled materials. Wales does not at present reflect the reduction in intensity-of-use that has been identified in England and improvement in this area will limit the need for aggregates. Nonetheless, any significant increase in major infrastructure and construction in South Wales or South West England would in the short term increase the need for dredged aggregates.

2.6.2 Crown Estate figures suggest extraction rates typically average about 60% of permitted tonneages. This capacity allows flexibility both to meet changes in market demand and for emergencies such as replacing storm damaged beaches at short notice. Although some two million tonnes of dredged material were used for beach recharge in England in 2003, such schemes are very unusual in South Wales. Such contracts may be for a relatively large volume of dredged material required within a short period of time, and as they are difficult to anticipate they add uncertainty to the likely levels of future production. In considering the need for dredged aggregates, the provision for coastal management will be addressed separately. To accommodate the varied specifications for the materials supplied to the construction market and the possibility that a Licence might need to cease production because of unacceptable impacts there remains a requirement for some additional capacity.

2.6.3 The investment in infrastructure for developments in the Outer Bristol Channel may be on a scale that cannot be supported by annual production limits that meet current needs. The Assembly intention is to move development offshore and to the west, and recognises that there are logistical constraints that hamper this move. However, the Assembly does not see the need for a significant increase in production capacity and is confident that the longer term security of off-shore dredging licences is an appropriate balance for the increased investment that may be needed.

SP 3 Considering only the "construction" market, maintaining a licensed capacity within Welsh waters of up to 2 million tonnes per annum will be a factor in Government View decisions. Strong justification on environmental, social and economic grounds will be required to demonstrate any need to exceed this capacity.

2.6.4 Licensed capacity at present is some 2.7 million tonnes, although production capacity is closer to 1.5 million tonnes. The Assembly wishes, by agreeing suitable programmes with the dredging industry and other interested parties, to maintain the licences for dredging at a minimum commensurate with meeting society's needs. A realistic appraisal of the available reserve is necessary to guide strategic planning and industry's investments. An example of this is Holm Sands, for which the permitted tonneage is 1.15mtpa, but where the limited sand resource means that 100,000 to 200,000tpa are taken. At present, to allow evaluation of the provision of essential materials, the current output of Holm Sands is assumed to be 150,000 tonnes per year and of West Middle Ground as 50,000 tonnes per year, and these are figures used to assess the permitted reserves. Within five years it is anticipated that the actual licensed figures will be used. **The Assembly will seek the co-operation of the industry to identify the production capacity of existing Licences and to address significant discrepancies by formal amendment.**

2.6.5 Without new positive Government Views, production will reduce significantly over the next few years. Because of the need to investigate and evaluate fully each dredging proposal in social, environmental and economic terms before determining the GV, a long lead in time is inevitable, but industry needs some certainty to plan production and future investment decisions. The period for which the reserves are maintained is a function of the individual licence periods and will therefore increase as dredging moves into the sediment environments identified as favourable. However, it is unlikely that a ten-year reserve will be achieved in the short term.

SP 4 The Assembly will seek to maintain licensed dredging reserves at between five and fifteen years supply, subject to suitable applications coming forward.

2.6.6 The Aggregates TAN requests RAWP secretaries to assess major proposals to anticipate demand and consider the need to review supply. The Regional Aggregates Working Parties collect production figures on an annual basis. These figures will be used to monitor aggregates production generally, while the Crown Estates and additional dredging figures will be used to monitor dredged aggregates production.

2.7 Environmental capacity and environmental capital

2.7.1 The Assembly is keen to apply the concept of environmental capacity, the concern that processes satisfy certain conditions of ecosystem stability and resilience, to minerals planning in Wales. Environmental capacity can be described as the physical, ecological and social capacity of a place to support human activity of a particular nature[4]. The concept includes impacts related to reduction of natural habitat, and impacts on amenities such as scenic value or beaches. Estimation of environmental capacity together with the capacity of the system for recovery allows assessments of cumulative or combined impacts and of acceptable levels of environmental change compatible with the sustainability objectives of IMADP. The Sediment Environments provide the initial mechanism, taking into account parameters such as bank volumes, sediment transport, coastal sensitivity, wave change, the sensitivities of species and habitats and the impacts of sea level rise. The present understanding of the environmental capacity of the area is far from complete, which may result in over or under-protection. The approach is necessarily iterative starting with simple, conservative methods and will be refined as additional information becomes available through the strands of Environmental Impact Assessment (EIA), Regional Environmental Impact Assessment (REIA) and Appropriate Assessment (AA) and through research. The concept of "favourable condition" used by JNCC (see Marine Monitoring Handbook)[5] in monitoring European designated sites provides a valuable approach. For a natural habitat, *favourable conservation status* occurs when:

- its natural range and area it covers within that range are stable or increasing; and
- the specific structure and functions, which are necessary for its long-term maintenance, exist and are likely to continue to exist for the foreseeable future; and
- the conservation status of its typical species is favourable.

2.72 Environmental capital concerns the resource. Dredging in the Bristol Channel entails the extraction and use of effectively finite stocks; IMADP seeks to ensure that the resource is managed to identify and preserve critical stocks. Using the precautionary approach, environmental capacity and environmental capital will be regularly reviewed to ensure that extraction will not exceed environmental limits within the Bristol Channel and Severn Estuary Sediment Environments. The Bristol Channel Marine Aggregates Study summarised resources of the fine sand element of the sediment budget in the Severn Estuary and Inner Bristol Channel to be 877 million cubic metres. Extraction of 1% of this volume of fine sand is an initial threshold when considering the environmental capacity and the ability of the system to recover.

[4] Arup, 2003 EMAADS final report

[5] Marine Monitoring Handbook www.jncc.gov.uk

2.7.3 The Severn Estuary and Inner Bristol Channel areas are considered to be effectively isolated from the exchanges of medium grained sediment that characterise the outer channel, with only relatively fine grained sediment being delivered by the river systems. The Sediment Environments in these two areas are classified as either very unlikely to be favourable or precautionary (Category 2 or 3) and it is probable that constraints will increase as users compete within this limited space. Climate change will increase sensitivities. Several applications for GV have been received within these relatively small areas which have international, national and local designations and serve a large number of interests. Whilst each ES must assess the cumulative and in combination effects of existing and proposed applications (including maintenance and navigational dredging) and other activities in the area of influence, a co-operative approach by the applicants will allow one all-inclusive interpretation of sediment movement and coastal effects to be developed.

2.7.4 Changes in wave and current energy will result from the removal of sediment from the system, with climate change causing sea level rise and likely increase in storminess. The Gwent Levels Foreshore Management Plan[6] provides a valuable holistic analysis of foreshore evolution, scheme and monitoring options. The wider assessment will need to consider, over time, the cumulative and in-combination effects in the Severn Estuary and Inner Bristol Channel as a whole and the relevant individual sediment environments:

- *On designated sites;*
- *On waves and currents;*
- *Within and between sediment environments and on sediment transport;*
- *On the coastline;*
- *On coastal flood risk;*
- *On habitats, ecology and biodiversity;*
- *On archaeology and cultural heritage;*
- *On commercial fisheries;*
- *On other users of the sea.*

A sensitivity analysis, by means of modelling, will be indispensable to establish guiding principles. A range of scenarios will allow theoretical consideration of the potential impacts of reduced bank levels, rising sea level and increased storminess on the shoreline and sediment regime.

2.7.5 The Assembly is sympathetic to the view that operators and applicants should not be required to produce regional research in support of their proposals. However, unless adequate information is available to allow the interactions of the proposals to be adequately

[6] Gwent Levels Foreshore Management Plan, Environment Agency Wales. Phase III Final Report January 2004

understood, a sequential approach will have to be taken to GV applications. A joint regional review will benefit the applicants by drawing together already available monitoring and research, which will contribute to Appropriate Assessment where required and focus any future monitoring requirements.

2.7.6 Nash Bank and Helwick Bank, in the Central and Outer Bristol Channel respectively, currently account for two thirds of production. Under existing permissions, Nash Bank production reduces until the Licence ends in 2010 and the Helwick Bank Licence lapses in 2005. Paragraph 2.6.3 describes how existing licences in the Severn Estuary and Inner Bristol Channel will be considered. The industry is, therefore, encouraged to make provision for applications within favourable Sediment Environments in the Central and Outer Bristol Channel, to come forward within five years.

SP 5 Subject to sustainability criteria, not more than 1 million tonnes of annual dredged aggregates reserves will be in Welsh waters in the Severn Estuary and Inner Bristol Channel. By 2015, with the move off-shore and to the West it is expected that less than 800,000 mtpa of reserves will be in these areas.

SP 6 Applications for a GV will need to address cumulative and in-combination effects to permit appraisal of the environmental capacity at the scales of the Severn Estuary and Inner, Central and Outer Bristol Channel areas.

2.8 Transport of dredged aggregates

2.8.1 Marine aggregates are landed at eight ports and seventeen wharves in South Wales and three ports and five wharves in South West England. Avonmouth, Cardiff and Newport handle over 65% of the total tonneage landed. The remaining ports handle relatively small amounts but their contribution to the local economy is of some significance. (Annex 1.3 Table 4)

2.8.2 Reducing road freight is a key sustainability objective. The section on Transport in Mineral Planning Policy Wales sets out the general issues. [7] The Assembly wishes to substitute road transport of aggregates with transport by rail or waterway where feasible. Road transport of aggregate is expensive due to the bulk of the product and can add significantly to the final cost to the consumer. Dredged aggregates will continue to be landed close to the market where possible. Mineral Planning Policy Wales requires the safeguarding of docks and railheads where dredged aggregates can be landed, stocked and moved on.

[7] Minerals Planning Policy Wales December 2000, Technical Advice Note (Wales) 18 Transport 1998.

2.8.3 A potential consequence of the long-term move offshore is a reduction in the number of docks accessible to the dredgers and a consequent increase in land-based distribution. The Assembly will work with the industry, Local Authorities and others to assess the potential impacts and to identify and, where possible to facilitate, solutions. In the interim a proportion of dredging will need to continue from several sites in the Severn Estuary and Inner Bristol Channel. This confers benefits in terms of local supply to smaller wharves and to the growth areas of Cardiff and Newport, but needs careful consideration in terms of environmental capacity.

2.8.4 Subject to other material considerations, including cumulative and in-combination effects, it is considered that several separate areas of extraction may have less impact and more rapid recovery than one or two more intensely dredged areas. This will also provide the opportunity to obtain a full range of product; the heterogeneous nature of the marine aggregate resources in the Bristol Channel and Severn Estuary means that replacing production from one source with another is not a straightforward task.

2.9 Period of Licences

2.9.1 The period of time for which a positive GV is given is site specific, but the criteria used to classify the Sediment Environments provide guidance. It is probable that an application in a Category 1 Sediment Environment will be considered for a fifteen year GV, within a Category 2 Sediment Environment a View of between three and seven years is more likely.

SP 7 A favourable GV within a Precautionary Sediment Environment would normally support a licence for between three and seven years, in a Favourable Sediment Environment for up to fifteen years.

2.10 Efficient use of dredged aggregates

2.10.1 The fine aggregates resource in the study area is for practical purposes finite and high quality. To ensure the appropriate end-use for such material, the estimate of need for annual production of high-grade sand has been linked to construction requirements. Whilst high quality dredged aggregates are only exceptionally used as construction fill, the potential for further use should be avoided. Future GVs will seek to ensure that, where possible, the different categories of aggregate resource are identified and sources suitable for fill distinguished within the Licence. The Environmental Statement will necessarily cover alternatives and applications for marine extraction for fill will take account of the availability of practical substitute materials which can be provided at less environmental cost.

2.10.2 The Aggregates Levy is gradually encouraging the use of suitable secondary and waste materials for lower grade uses. The Assembly will use the figures from the 2005 AM survey to assess whether there are increased pressures to use marine aggregates for fill and lower grade uses. The breakdown for dredged aggregates use in 2001 was 50% concrete, 25% soft sand, 20% sharp sand and 5% fill. None of the marine sand landed in SE Wales is currently exported.[8]

SP 8 The proposed end-use of high quality dredged aggregates together with the consideration of substitutes and alternative materials will be taken into account in considering need when determining the Government View.

2.11 Coastal Use of Marine Aggregates

2.11.1 Where beach levels are falling or there is erosion of important coastal habitats, landforms or coastal defenses, proposals for the use of dredged resources to replace depleted materials will be assessed using the criteria in IMADP - EIA, CIS and, if necessary, Appropriate Assessment will be required. Where appropriate grades of dredged aggregates have been identified, for a specific market for beach recharge, an application for short-term extraction limited to the specific project will be considered as additional to the need identified for construction. To ensure efficient use, the aggregates used for beach recharge should meet appropriate environmental, aesthetic and engineering criteria on a case-by-case basis. The Assembly will work with the Harbour Authorities and others to explore the potential uses of maintenance and capital dredging.

SP 9 Subject to a positive sustainability assessment, schemes identified and Conditioned for specific beach recharge needs will not be counted within the total for construction reserves.

[8] SWRAWP Annual Report 2001.

2.12 Future Development of the Marine Aggregates Industry

2.12.1 Off the South and East coast of England, the trend is for larger dredgers to operate further offshore. There are more constraints to moving offshore in the Bristol Channel, where there will be greater exposure to severe weather and wave action. The large tidal range constrains port facilities and wharf depths, limiting ships to cargo capacities between 600 and 2,400 tonnes and with a shallow draft. These ships rely on a fast turnaround in a limited tidal window to load and land two cargoes of aggregate per 24-hour period. A significant increase in travel time between aggregate resources and landing ports will preclude this.

2.12.2 Moving offshore will change the economics, operational and technological characteristics of the industry. It will be a matter for the industry to complete studies on a case-by-case basis to establish whether this will be economically feasible. Shifting aggregate production will require modification of the existing dredging fleet to work in deeper water, which may not be feasible for depths greater than 40 metres. The industry will need to invest in new and larger deep-water dredgers. Significant harbour development will be required to accommodate larger ships, with extended wharf storage areas for the aggregates landed. The development of this infrastructure will be significant in terms of planning, integration with other facilities and cost. The Assembly will seek the views of the industry and others on the opportunities, costs and time scales for such development. Such development will not be practicable for all landing wharves in South Wales and supplies would be concentrated at those with sustainable deep-water access.

2.12.3 If that capital investment takes place, fewer but significantly larger cargoes would be landed, at fewer locations, requiring increased storage of aggregates at wharves. An increase in dredging capacity could result, but market demand is predicted to remain relatively stable. The individual companies would have significant “down-time” or would need to move elsewhere once the annual licensed tonneges were landed.

2.13 Regional Information

2.13.1 Any move to a new area for dredging means that there is necessarily less complete information about possible impacts. Less is known about the marine ecology in the offshore waters, and this is of particular concern for the fishing industry. To improve the data and understanding of the potential dredging areas further offshore, a study of the Outer Bristol Channel is being conducted by British Geological Survey and the National Museum and Galleries of Wales. This will

integrate geological and biological information gathered through geophysical and benthic surveys. The interpretation of bedform, sediment and faunal distributions will further inform the relevant Sediment Environments in IMADP and contribute to the screening and scoping opinions for dredging proposals. Research on the potential impacts of dredging on marine life is advancing and the conclusions will be integrated into the process of determining any GV.

2.13.2 Whilst the results of such research will provide a clear indication of the main issues, it is important that the ES can be assessed in the context of the wider environment and the significance of any potential impacts fully considered. In any new sediment environment, therefore, the the screening opinion is likely to require the ES to be supported by a regional evaluation that will allow sufficient understanding of the extent of similar habitats, ecosystems and biotopes to allow the significance of impacts to be determined. The degree of detail required will be seperately determined for each application, but will not go beyond that required to support decision making.

2.13.3 An evaluation of the potential adverse effects will be based on these data when considering the measures necessary to protect the environment. The evaluation will take account of the reliability of the assessment and the remaining uncertainties. Permission will only be granted where the impacts of dredging can be controlled or mitigated to acceptable levels.

SP 10 Applications for aggregates dredging in a sediment environment where there has been no GV to date will need to be supported by background information on that and, if appropriate, adjoining sediment environments, at a level that supports the precautionary approach in reaching a GV.

2.14 Safeguarding Aggregates Resources

2.14.1 Safeguarding does not necessarily indicate future extraction but is a long-term approach that protects resources from temporary or permanent development. Development at sea has the potential to sterilise or contaminate aggregates resources by:

- *The placing of structures on the seabed;*
- *Exclusion zones around seabed pipelines and cables;*
- *Interference to the processes of sediment transport;*
- *Licensed maintenance and capital dredging disposal sites;*
- *MOD ranges; and*
- *Port and Harbour navigation channels.*

2.14.2 The pressures for offshore development are increasing. Major proposals for offshore windfarms, tidal barrages, tidal-driven generating stations, oil and gas development and infrastructure projects such as

airport developments may arise. The resources and constraints identified for each Sediment Environment can usefully be applied to activities other than aggregates dredging.

2.14.3 To minimise the sterilisation of potential aggregates resources from development of the seabed and sea surface, the Assembly will require to be consulted on proposed non-dredging development in the Bristol Channel and Severn Estuary. The loss of resource will be considered against the need for the development and the suitability of alternative locations identified in the ES for the development. Developers will be encouraged to make best use of seabed that is already sterilised or has little potential as an aggregates resource.

2.14.4 Licensing and consenting authorities are advised to ensure that structures on or under the seabed are removed and the seabed reinstated to limit the sterilisation of the aggregates resource to the operational life of the development. The area of seabed that is sterilised can be minimised by, for example, using existing routes for cables and pipelines.

SP 11 The Assembly will consider the protection of the aggregates resource in responding to consultations on seabed development and may advise that the application should be refused or that steps should be taken to avoid the sterilisation of the mineral resource.

2.15 Capital and Maintenance Dredging Spoil

2.15.1 Deposits in the sea whether for construction or disposal, including the disposal of capital and maintenance dredge spoil, are regulated by a system of licences under the Food and Environment Protection Act (FEPA) 1985. This legislation protects the marine environment and prevents interference with other uses of the sea. Responsibility for statutory controls within Welsh waters is devolved to the Welsh Assembly Government. However, the administration of such applications, and recommendations to the Assembly Government for the issue of licences is undertaken by the Marine Consents and Environment Unit (MCEU) of the Department for Environment, Food and Rural Affairs (DEFRA). MCEU is a joint-departmental unit that was set up in April 2001 to administer the marine works consents for which each Department has responsibility under FEPA, the Coast Protection Act 1949, Telecommunications Act 1984 and certain other local legislation.

2.15.2 There are 12 Assembly licensed disposal sites in the study area, with a tonneage of almost 9.3 million tonnes per annum. The extraction and disposal of maintenance dredge spoil in the Bristol Channel and Severn Estuary has implications for aggregates dredging policy because of the scale of the operation - although the material is probably not removed from the system, significant

quantities are redistributed. The disposal sites have traditionally been located in areas of high natural dispersion where the tidal currents largely disperse the predominant silt and fine sand fractions. The disposal of capital and maintenance dredging arisings can potentially lead to the sterilisation and contamination of aggregates resources.

2.15.3 Co-operation and consultation between the aggregates dredging industry, the capital and maintenance dredging operators, DEFRA, Environment Agency, CCW, Local Authorities and Harbour Authorities will continue to minimise the impacts of capital and maintenance dredging. IMADP will assist The Marine Consents and Environment Unit when determining FEPA Licence applications.

SP 12 The Assembly will take into account the likelihood that new disposal sites or the continued use of existing ones for the disposal of dredged material licensed under Part II of the Food & Environment Protection Act could contaminate or sterilise marine aggregate resource of proven or likely commercial significance.

3. PROCEDURAL REQUIREMENTS

3.1 The Government View and other regulators

3.1.1 The non-statutory Interim Government View Procedure (Government View: New Arrangements for the Licensing of Minerals Dredging)[9] applies to seabed owned by the Crown Estate. Under the current agreements, IMADP applies to applications under the Government View. These non-statutory procedures set out the stages to be followed in obtaining a GV to support an application to dredge seabed owned by the Crown Estate and below the Mean Low Water Mark (MLWM)[10].

3.1.2 The GV does not apply to other seabed owners who are, however, expected to take proper account of IMADP when considering proposals to dredge aggregates. (The Assembly will need to be assured that such proposals comply with the European Directives.) Nor does the GV apply to the dredging of material for the maintenance of navigation channels, ports and harbours or capital dredging during their construction.[11] Where dredging within Harbour Authority Areas is for commercial aggregates, both the Harbour Authority procedures and the GV will need to run in parallel. The Assembly will consider the elements of the proposal that relate to the extraction of commercial aggregates. The Memorandum of Understanding between the Assembly and the Gloucester Harbour Trustees is an example of good practice.

3.1.3 For marine dredging proposals that may influence English Waters, consideration will be given to the guidance issued by ODPM. *MMG1: Guidance on the Extraction by Dredging of Sand, Gravel and*

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9 DETR 1998

10 All areas below the mean low water mark in Wales's territorial waters in the Bristol Channel and Severn Estuary as defined in the Assembly (Transfer of Function) Order 1999, with the exception of the City of Bristol Area and a small part of Pembrokeshire in Milford Haven; the Territorial Sea Act 1987.

All areas below the mean low water mark in Wales's territorial waters in the Bristol Channel seaward of the limit of internal waters;

All other areas in Wales (as defined by the National Assembly of Wales (Transfer of Functions) Order 1999 that are outside the jurisdiction of Local Authorities, including offshore intertidal banks that are not contiguous with the foreshore mean low water mark.

11 These activities are controlled under separate legislation and their disposal within the Bristol Channel and Severn Estuary is licensed by DEFRA on behalf of the Welsh Assembly Government under the Food and Environmental Protection Act (1985).

Coast Protection Act 1949

Section 34 of the Coast Protection Act (as amended by Section 36 of the Merchant Shipping Act 1988) the consent of the Secretary of State for Transport is required for the following operations: the construction, alteration or improvement of any works on, under or over any part of the seashore lying below the level of mean high water springs; The deposit of any object or materials below the level of mean high water springs; The removal of any object or materials from the seashore below the level of mean high water springs (e.g. dredging).

Other Minerals from the English Seabed (August 2002). The Assembly and ODPM will work closely when considering applications to dredge for marine aggregates in the Bristol Channel and Severn Estuary. For a marine dredging proposal that straddles the boundary between England and Wales, a GV will be required from both the ODPM and the Assembly. The Assembly will be notified of all proposals to dredge in the Bristol Channel and Severn Estuary outside Welsh Waters and in replying to such consultations will be guided by IMADP.

3.2 Limits of Territorial and Internal Waters

3.2.1 The legal framework governing aggregates dredging in the IMADP area involves ownership and minerals rights, and the regulation of those rights in the public interest. Map 2 shows the limit of Welsh territorial waters and the boundary between England and Wales drawn equidistant from the opposite coasts in the Bristol Channel and Severn Estuary.[12] The baseline defining the boundary between territorial waters and internal waters is a straight line from Worms Head to Morte Point. Territorial waters extend from the baselines (often the mean low water mark) to the 12-nautical mile limit. As defined by the Admiralty, the River Severn and Severn Estuary are bounded effectively at the Second Severn Crossing; the Severn Estuary and the Bristol Channel at a line between Lavernock and Brean.

3.3 Ownership of the Seabed and Foreshore

3.3.1 The ownership of the bed and foreshore in the study area is complex. Land above the mean high water mark is not legally part of the foreshore, and is generally private property. The foreshore between the mean high and low water marks and the bed of tidal estuaries below mean low water mark is largely vested in the Crown Estate. But at least half of the intertidal foreshore of the Bristol Channel has passed out of Crown ownership. This includes the foreshore of the Beaufort and Berkeley estates. The Duke of Beaufort was declared in 1849 to be the owner of the entire foreshore of the Gower Peninsula, although some of that land has now been transferred to, amongst others, Swansea County Council. Elsewhere, there are numerous examples of privately owned foreshore.

3.3.2 The majority of the seabed of the Bristol Channel below the mean low water mark and within territorial waters remains vested in the Crown Estate. However, there are important exceptions, including an area of bed extending about 12 miles east from Avonmouth, the

[12] Government of Wales Act 1998 (Section 151(2)) and in the National Assembly for Wales (Transfer of Functions) Order 1999 (SI 1999/672, art6, Sch 3)). following the practice adopted in the delineation of international boundaries (United Nations Convention on the Law of the Sea, 1982 and Territorial Sea Act, 1987).

southern half of the bed of the Burry Inlet and Loughor Estuary which are part of the Duke of Beaufort's (Swangrove) Estate.

3.4 Land Use Planning Controls over Dredged Aggregate Production

3.4.1 Dredging for aggregates above the MLWM on areas contiguous with the foreshore and some other areas is covered by the Town and Country Planning Act 1990[13]. The Welsh Assembly Government expects planning applications to be determined in accord with IMADP. Local Authorities exercise land use planning control to the mean low water line, but there is no statutory definition of Local Authority areas of jurisdiction in estuaries, bays and internal waters. [14] Where the Local Authority boundary extends below mean low water, planning control extends into these subtidal areas. The Ordnance Survey depicts administrative boundaries across estuaries "where the surface level of a river reaches the surface level of the sea at low water". For example, the Bedwyn Sands dredged aggregates production area and parts of the North Middle Grounds wholly or partly lie above the mean low water mark and are contiguous with the foreshore.

3.5 Environmental Impact Assessment

3.5.1 Environmental Impact Assessment (EIA) is the procedure for ensuring the likely effects of dredging on the environment are addressed. Marine or fluvial dredging is an Annex II project[15] in the Directive. As such, the need for EIA is determined either through a case-by-case examination, or by set criteria, taking into account the characteristics and location of the project. The Assembly wishes to

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[13] Office of the Deputy Prime Minister currently considers that planning control in England is co-extensive with local government areas. Under the Local Government Act 1972, s 72, "every accretion from the sea, whether natural or artificial, and any part of the sea-shore to the low-water mark" is "annexed to and incorporated with" the parish that it adjoins and the district and county in which that parish is situated.

[14]. Extent of Local Authority Jurisdiction in the Marine Environment - Department of the Environment, Transport and the Regions by David Tyldesley and Associates in Association with Browne Jacobson Solicitors. December 2000.

[15] ANNEX II PROJECTS SUBJECT TO ARTICLE 4 (2)

'Article 4

1. Subject to Article 2 (3), projects listed in Annex I shall be made subject to an assessment in accordance with Articles 5 to 10.

2. Subject to Article 2 (3), for projects listed in Annex II, the Member States shall determine through:

(a) a case-by-case examination,

or

(b) thresholds or criteria set by the Member State

whether the project shall be made subject to an assessment in accordance with Articles 5 to 10.

Member States may decide to apply both procedures referred to in (a) and (b).

3. When a case-by-case examination is carried out or thresholds or criteria are set for the purpose of paragraph 2, the relevant selection criteria set out in Annex III shall be taken into account.

4. Member States shall ensure that the determination made by the competent authorities under paragraph 2 is made available to the public.`;

take a managed approach in assessing the potential significant effects of dredging. It will take into account:

- *The potential for cumulative impact;*
- *The use of natural resources;*
- *The environmental sensitivity of nearby areas;*
- *The regenerative capacity of natural resources in the area.*

3.5.2 To ensure that risks are properly identified, assessed and managed, **an EIA will be expected for new applications or for renewal of licences.** Significant variations to existing licences will need to obtain a Screening Opinion as proposals for even small volumes of extraction need to be evaluated against environmental criteria. (Applications for prospecting licences, which may take bulk samples up to 5,000 tonnes, require prior approval from DEFRA.) Screening is a decision on whether or not EIA is required. **The Assembly would be unable to grant a favourable view if it were considered that an EIA had been necessary but had not been undertaken.** To prevent this from occurring, the Assembly will provide a screening opinion upon request. The decision and the reasons for it will be recorded and made available to the public. Guidance on EIA Screening[16], June 2001 provides comprehensive advice.

3.5.3 The Scoping procedures are set out in the Interim Procedures of the Government View (GV). In order to achieve a systematic and objective assessment, the content and extent of the important issues need to be identified and properly considered. The applicant is advised to consult widely and at an early stage. The GV identifies environmental authorities and other interested parties, and the value of public participation in the scoping process should be recognised. The Assembly and consultees can request additional information at a later stage in the EIA process, even if this information were not requested in the Scoping Opinion. Guidance on EIA Scoping, [17]June 2001 provides comprehensive advice.

3.5.4 Annex 3 sets out guidelines on the content of an Environmental Statement for aggregates dredging taken from MMG1: Guidance on the Extraction by Dredging of Sand, Gravel and Other Minerals from the English Seabed (ODPM *August 2002*), references amended for Wales. It is important to appreciate, however, that the approach to an EIA is necessarily site specific and iterative.

[16] Environmental Resources Management, European Commission, June 2001
http://europa.eu.int/comm/environment/eia/eia-guidelines/g-screening-full-text.pdf
[17] Environmental Resources Management, European Commission, June 2001
http://europa.eu.int/comm/environment/eia/eia-guidelines/g-scoping-full-text.pdf

P 1 Environmental Impact Assessment will be expected for new or renewed applications to dredge for aggregates.
P 2 Screening for Environmental Impact Assessment will be expected for variations to Licences to dredge for aggregates.

3.6 Habitats Directive[18]

See Annex 1. 6

3.6.1 Article 6.3 of the Habitats Directive reads:

> '*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public*.'

3.6.2 The Conservation (Natural Habitats, &c.) Regulations 1994[19] apply to territorial waters but do not implement the Directive for permissions such as the GV; paragraphs 48 to 51 do not apply. The current UK policy is that the Habitats and Birds Directives should apply to waters up to 200 nautical miles from the coast. To comply with the Directive, an assessment must be made of any project that is likely to have significant effect on a Special Protection Area (SPA) or a Special Area of Conservation (SAC). The Assembly will also consider proposed SPAs and candidate SACs under the Directive. Before it is submitted to the European Commission, a proposed SAC is not a European site and the procedures of the Habitats Directive do not apply. However, in order to protect the interest features of the site, the fact that the site is being considered for submission will be a factor in GV decisions. Dredging that may harm the site and prejudice its classification will follow the Habitats procedures. Similarly, Ramsar sites listed as wetlands of international importance will need to be

[18] Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora,
EC Direction on the Conservation of Wild Birds (79/409/EEC);
The Conservation (Natural Habitats, &c.) 1994).
This guidance must be read in conjunction with the directives and legislation, and
the advice set out in the document 'Managing Natura 2000 sites: The provisions of Article 6 of the ''Habitats'' Directive 92/43/EEC

[19] The Conservation (Natural Habitats, &c.) Regulations 1994Statutory Instrument 1994 No. 2716

assessed to enable the Assembly to meet its obligations under the Ramsar Convention.

P 3 Applications for aggregates dredging will undergo screening for Significant Effect on a designated, proposed or candidate European site or a Ramsar site. Unless it can be demonstrated that there is not the potential for Significant Effect, Appropriate Assessment will be required.

P 4 Where Appropriate Assessment shows the proposal to have an adverse affect on the integrity of a designated proposed or candidate European site or a Ramsar site the proposal will only receive a favourable GV in the exceptional circumstances of there being no alternative solutions and being considered necessary for imperative reasons of over-riding public interest.

P 5 Extant dredging permissions will undergo screening for Significant Effect on a European or a Ramsar site. Unless it can be demonstrated that there is not the potential for Significant Effect, Appropriate Assessment will be required. Where Appropriate Assessment shows the proposal to have an adverse affect on the integrity of a European site or Ramsar site will only retain a favourable GV in the exceptional circumstances of there being no alternative solutions and being considered necessary for imperative reasons of over-riding public interest.

3.6.3 The following conservation sites in Wales (Map 5) will need to be considered:

- Braunton Burrows cSAC
- Burry Inlet cSAC, SPA and Ramsar;
- Castlemartin Coast SPA;
- Carmarthen Bay and Estuaries cSAC;
- Carmarthen Bay SPA;
- Carmarthen Bay Dunes, cSAC and Ramsar;
- Dunraven Bay cSAC;
- Grassholm SPA
- Kenfig cSAC;
- Limestone Coast of South Wales cSAC;
- Pembrokeshire Marine cSAC;
- Severn Estuary pSAC, SPA and Ramsar;
- Skokholm and Skomer SPA
- Tintagel-Marsland-Clovelly Coast cSAC
- River Usk cSAC.
- River Wye cSAC

3.6.4 Where there is the potential for effect on international sites in England, these will be considered in consultation with ODPM.

3.7 Marine Protected Areas

3.7.1 In 1998, OSPAR (The Convention for the Protection of the Marine Environment of the North-East Atlantic) which covers the North-East Atlantic and to which the UK is a signatory, adopted “The protection and conservation of the ecosystems and biological diversity of the maritime area”. A Marine Protected Area is "any area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment". In association with Joint Nature Conservation Committee (JNCC), guidelines have been developed for a network of marine protected areas to meet these obligations and provision to protect sites under OSPAR may be needed in future.

3.8 EU Water Framework Directive

3.8.1 The Water Framework Directive (WFD) requires inland and coastal waters to reach "good status" by 2015. It will do this by establishing a river basin district structure within which a common approach to protecting and setting demanding environmental objectives for all groundwater and surface waters will be set, including ecological targets for surface waters. The Directive looks at the condition of all the key things living in the water in order to decide if it is good quality or "good status". Morphological pressures are a consideration in assessing risk. The Directive came into force on 22 December 2000 and is implemented by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003.

3.9 Biodiversity

3.9.1 The Convention on Biological Diversity provides a legal framework for biodiversity conservation and is implemented in the UK through the 1994 UK Biodiversity Action Plan. The Convention on Biological Diversity adopted the ecosystem approach as the primary framework for action under the Convention. The Countryside and Rights of Way Act (2000) places a duty on the Assembly to have regard, so far as is consistent with the proper exercise of its functions, to the purpose of conserving biodiversity in accordance with the Convention. Habitat Action Plans (HAPs) and Species Action Plans (SAPs) have been written for various marine habitats and species.[20] The Countryside Council for Wales has the responsibility to advise the Assembly on

[20] Biodiversity: The UK Action Plan Cmd 2428, HMSO 1994

Biodiversity matters, and note should be taken of their Marine Biodiversity Action Plan Atlas.[21]

P 6 Proposals for aggregates dredging which will be likely to cause demonstrable harm to species or their habitats protected by the Wildlife and Countryside Act 1981, European Directives or identified as priorities in the UK Biodiversity Action Plan are unlikely to receive a favourable GV.

3.10 Nationally Designated Sites

3.10.1 Nationally designated sites have statutory protection within the Town and Country Planning System and within all other statutory decision-making processes[22]. A similar level of protection will be required when considering applications for a GV. SSSIs have been designated under the Wildlife and Countryside Act 1981 as amended by section 75 and schedule 9 of the Countryside and Rights of Way Act 2000 to protect areas of important flora, fauna, geological and/or physiographical features. SSSIs provide the basis for designations such as SACs and SPAs however the boundaries of these sites generally extend only as far as the mean low water mark. Marine Nature Reserves (MNRs) have been designated under the Wildlife and Countryside Act 1981 to conserve inter-tidal and shallow-sea ecosystems and coastal features. Lundy Island is an MNR.

P 7 Proposals for aggregates dredging which will be likely to cause demonstrable harm to the features of interest for which a Site of Special Scientific Interest, National Nature Reserve or Marine Nature Reserve was notified are unlikely to receive a favourable GV.

P 8 Proposals for aggregates dredging which will be likely to cause demonstrable harm to the features of interest for which a County Wildlife Site, a Regionally Important Geological/Geomorphological Site or an Area of Special Protection for Birds were notified are unlikely to receive a favourable GV. Where the benefits of the development would outweigh the harmful effects, then the benefits will be carefully considered and weighed against the reasons for which the sites were designated.

3.11 National Parks and Areas of Outstanding Natural Beauty.

The Statutory Landscape Designations are covered by the Countryside Act, 1968, Environment Act 1995, Part III and Welsh Office Circular 13/99, Environment Act 1995, Part III in Wales.

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[21] Atlas of Marine Biodiversity Action Plan Species and Habitats, and Species of Conservation Concern in Wales. 2nd Edition. March 2002. Jon Moore. CCW Contract Science Report No 509

[22] Wildlife and Countryside Act 1981 amended by Pt III of the Countryside and Rights of Way Act 2000.

P 9 Proposals for aggregates dredging which will be likely to cause demonstrable harm to the distinctive character and features of an AONB, National Park or Heritage Coast are unlikely to receive a favourable GV.

3.12 Other legislation

3.12.1 There are further pieces of legislation and complementary conventions that it may be necessary to consider in applications for dredging. These include:

- United Nations Convention on the Law of the Sea.
- The International Convention for the Prevention of Pollution from Ships 1973 (MARPOL) as modified by the Protocol 1978.
- Coastal Protection Act 1949
  Section 34 of the Coastal Protection Act requires consent for the removal of any object or materials from the seashore below the level of the mean low water springs, and allows Coastal Protection Authorities to control dredging within 3 miles of the coast.
- Transport and Works Act 1992
- Water Resources Act 1991
- Water Industry Act 1991
- Sea Fisheries (Wildlife Conservation Act 1992)
- Protection of Wrecks Act 1973
- Ancient Monuments and Archaeological Areas Act 1979
- Protection of Military Remains Act 1986
- International Regulations for Preventing Collisions at Sea 1972 (COLREGS) as amended by Merchant Shipping Regulations 1996

4. IMPACTS OF AGGREGATES DREDGING

4.1 Introduction

4.1.1 The impacts of dredging cannot be considered independently of other changes that are occurring. For example, sea level rise as a consequence of climate change is a factor that needs to be included in assessments.

4.2 Climate change

4.2.1 The UKCIP report 'Climate adaptation: risk, uncertainty and decision-making'[23] helps judge the significance of the climate change risk and will be a factor in the GV, which will be regarded as a "climate influenced decision". Such decisions are not primarily about managing present climate variability but the outcomes may be affected by climate change. For dredging decisions, climate change represents one of a large number of factors of varying importance, and varying degrees of uncertainty. It is important that dredging decisions do not lead to actions that limit the ability of other decision-makers to manage, reduce or otherwise adapt to the consequences of climate change.

4.2.2 Planning Policy Wales considers climate change (13.1.4); requiring authorities to use the Precautionary Principle to plan now on the basis of the latest climate change scenarios from the UK climate impact programme. Flood risk and climate change requires a strategic approach and development proposals should not increase flood risk. Appropriate mitigation may need to consider co-operation on coastal land management - dredging may provide the material for beach recharge and coastal defence and this positive role will be a consideration. (See 4.7) The Technical Advice Note on Flood Risk offers additional guidance.

P 10 Proposals for aggregates dredging will need to consider climate change and the government predictions for rise in sea level and wave climate to demonstrate that they will not increase flood risk unacceptably.

4.3 Environmental Impacts

4.3.1 Dredging of aggregates inevitably affects the marine environment. The extent to which it does so and its significance to human activities and the environment will depend on a number of factors. The physical impacts of dredging may be direct, (removing or disturbing the sediment and modifying the substrate) or indirect (changing patterns of sediment accretion and erosion, propagation of

[23] Environment Agency's Centre for Risk and Forecasting and UKCIP May 2003

wave energy, or levels of suspended sediment). The significance of these impacts depends on the importance and the vulnerability of the environment. The comparative impacts of extraction from different sources of aggregates will need to be fully considered. The Best Practice Guide to Assessing the Impacts of Marine Aggregate Extraction by Posford Haskoning Ltd for ODPM, MIRO and Royal Haskoning offers valuable advice to improve environmental assessment, management and decision making.

4.4 Licence Conditions

4.4.1 Dredging licences will be subject to Conditions required by the GV and by other regulatory bodies. The conditions to be applied will be:

- proportionate to the appropriate level of protection,
- non-discriminatory in their application,
- consistent with similar measures already taken,
- based on an examination of the potential benefits and costs of action or lack of action (including, where appropriate and feasible, an economic cost/benefit analysis),
- subject to review, in the light of new scientific data, and
- capable of assigning responsibility for producing the scientific evidence necessary for a more comprehensive risk assessment.

4.4.2 The Conditions may address the following areas:

4.4.2.1 Details of operations

Maximum total quantity of material to be extracted;
Boundaries of the permitted area;
Maximum annual extraction rate;
Start date of the permission;
Duration of the permission.

4.4.2.2 Controls over dredging activities

Maximum depth of dredging;
Type of dredger allowed;
Zoning arrangements;
On-board screening;
Removal and treatment of any overburden;
Seasonal and tidal restrictions;
Required notice before moving between zones;
Condition of the seabed at the cessation of dredging;
Restoration;
Protection of existing or proposed pipelines, cables, installations, wrecks or other remains of archaeological interest.

4.4.2.3 Monitoring

Requirements for Electronic Monitoring System (EMS) monitoring of dredging activity;
Baseline monitoring of seabed sediment compositions, benthos, bathymetry, ecology, fisheries, location of wrecks or other items of archaeological interests, contaminants;
Repeat surveys at defined time intervals, or following extraction of identified quantities of material;
Coastline monitoring, including beach, cliff and nearshore profiles as appropriate;
Seabed stability;
Post dredge assessments;
Linking of monitoring to thresholds and mitigation.

4.4.2.4 Navigation

Notification to other shipping, fishing or dredging activities;
Reporting of collisions or near misses;
Protection of navigational marks;
Pollution prevention and remediation.

4.4.2.5 Liaison

Notifications and liaison procedures with relevant fishing organisations;
Informing appropriate organisations of discovery of significant archaeological features.

4.4.2.6 Reporting arrangements

List of organisations to receive copies of reports, monitoring information etc.;
Format and content of monitoring reports;
Annual evaluations of monitoring results;
Five-yearly interpretative reports of monitoring data and other environmental information.

4.4.2.7 Review of Dredging Conditions

Requirements for periodic reviews;
Actions to be taken in the case of impacts being identified.

P 11 Dredging Permission will always be subject to appropriate Conditions. These may include:

- **Details of operations;**
- **Controls over dredging activities;**
- **Monitoring;**
- **Thresholds;**
- **Navigation;**
- **Liaison;**
- **Reporting arrangements;**
- **Review of Dredging Conditions.**

4.5 Monitoring, indicators and thresholds

See Annex 1. 1 RISK MANAGEMENT AND THE PRECAUTIONARY PRINCIPLE

4.5.1 The area of IMADP is one of the most intensively studied marine, estuarine and coastal systems in the world. Nevertheless, decisions often need to be taken without full knowledge and understanding of the systems. This is particularly true for the marine environment for which data are not easily obtained and consensus on interpretation is not always achieved. There will be occasions when information is inconclusive, there is no consensus and there is reasonable doubt about the likely significance of impacts. In these circumstances, the Assembly will expect the applicant to implement appropriate research and monitoring to reduce the level of uncertainty in the ES. Where necessary, the Assembly will seek specialist advice from agencies and advisors on the findings of the reports.

4.5.2 The significance of impacts depends both on the vulnerability of the environment and the intensity and method of dredging. Adequate baseline surveys are required to enable subsequent monitoring to determine change against the background of natural variability. Subject to the environmental sensitivity of the area, this may need to run for more than one year. This applies particularly in new areas and the industry is encouraged to collaborate in regional survey to support this approach.

4.5.3 Where a positive GV is given, monitoring will be carefully constructed in order to address those site-specific issues identified in the EIA, the CIS and by consultees. Where necessary monitoring will be related to the reasons for designation of European sites. Targeted monitoring will establish long-term trends, reduce uncertainty and increase the level of understanding of both the natural system and the effects of dredging. Annual monitoring increases the accountability of

the dredging industry and provides a mechanism for audit[24]. Monitoring information will be open to public scrutiny and may be subject to independent audit where appropriate. Quality control and systems for cross checking will be required.

4.5.4 The Crown Estate monitors dredging activity with the Electronic Monitoring System (EMS), which accurately records when and where dredging for marine aggregates takes place. The EMS output is supplied to the Crown Estate who inform the Assembly of any non-compliance with the operational Dredging Conditions. Other monitoring may include, for example, physical survey of the licence area and local coast, survey of species and ecology, and sedimentary processes.

4.5.5 Monitoring will be linked to thresholds with predetermined mitigation proposals. By this means potential problems can be identified at an early stage and appropriate actions taken. Risk management measures should be in place to prevent harmful effects, to mitigate the severity and to ensure recovery should such effects occur. Risk management is particularly useful as prevention, whilst the effort invested in identifying and prioritising risks will improve decision-making. It is necessary to justify that “reasonable measures” will ensure risk reduction; this will help in deciding if the risk is "acceptable".

4.5.6 The Environmental Statement will include a clear description of the indicators that will be used and the thresholds that describe what is and is not acceptable. It will provide details on the implementation of a management plan to include the proposed monitoring of impacts (cause and effect) and associated risk reduction measures. The ES will set out the mechanism, procedure, funding and responsibility for action should unacceptable impacts arise, including the time scales for implementation and mechanisms for evaluation and follow up.

4.5.7 When monitoring shows cause for concern that the condition of the environment is deteriorating and in the view of the Assembly this is a probable consequence of marine dredging, mitigation to permit the GV to remain favourable may include the introduction of appropriate controls, the reduction or temporary cessation of dredging. Where unanticipated harmful impacts occur, dredging will reduce or cease until appropriate monitoring, management and mitigation plans are in place. Mitigation may include repair and restoration, protection and substitution. Where monitoring or significant additional information demonstrates that there are harmful effects that cannot be mitigated, the Assembly will withdraw the favourable GV and request the Crown Estate to terminate the Licence.

[24] 'Learning To Live Differently' The Sustainable Development Scheme Of The National Assembly For Wales - Made Under Section 121 Of The Government Of Wales Act 1998 – 2000.

P 12 Proposals for aggregates dredging where potential impacts are identified will fully examine programmes of monitoring linked to thresholds and mitigation proposals in the Environmental Statement.

P 13 Aggregates dredging Conditions will incorporate a management plan to cover monitoring and risk management linked to indicators, thresholds, and actions.

4.6 Fisheries

4.6.1 The Bristol Channel and Severn Estuary system is important, supporting commercial marine and migratory fisheries. Sport fishing contributes significantly to the local leisure and tourism economy. The study area is an important spawning and nursery ground for many commercial species such as bass, cod, sole and turbot, and prey species such as sand eel. Shellfish such as crabs and whelks are also taken. Certain areas, however, have low fisheries interest due to the strong tidal currents, turbid waters and relatively barren seabed. It is difficult to map the distribution of fish and fisheries activities because of their mobility, migrations, variable environmental conditions and heterogeneous nature of the seabed. There are significant gaps in information, such as understanding of fish life cycles. The recording of fisheries information is not in a form to provide these data.

4.6.2 The ICES report on the Environmental Status of the European Seas[25] advises that each activity should not be evaluated and treated separately, but rather in conjunction with other activities that may have an effect, so that an overall view of priorities for action can be obtained.

4.6.3 It is essential that the fish and fisheries are understood and carefully considered when assessing aggregates dredging. An understanding of the distribution and abundance of fish and shellfish, their spawning, nursery, feeding and migratory areas, vulnerability and role in the food chain is required. An assessment of fisheries interests for IMADP was made on the best available scientific information, including the Fisheries Intensity Study[26] and consultation responses provided by the South Wales Sea Fisheries Committees when developing policy for each sediment environment.

4.6.4 Dredging conditions will respect Closed Areas applied to fish stock management and seasonal closures to protect spawning and nursery grounds.

[25] Chris Frid (UK); Cornelius Hammer (Germany); Robin Law (UK); Harald Loeng (Norway); Janet F. Pawlak (ICES); Philip C. Reid (UK); Mark Tasker (UK). ICES Environmental Status of the European Seas

[26] BCMA Study (Appendix 9)

P 14 Proposals for aggregates dredging in fish and shellfish breeding, spawning and nursery grounds and feeding grounds will only be permitted where information is sufficient to assess potential impacts adequately and where appropriate to monitor and to manage impacts at acceptable levels.

4.7 Coastal Impacts and Coastal Defence

See Annex 1. 7 COASTAL PROTECTION AND REPLENISHMENT

4.7.1 Coastal defence is a general term used to encompass both coast protection against erosion and sea defence against flooding. Shoreline Management Plans will guide the implementation of coast defence strategies for the Environment Agency and the Local Authorities in the Bristol Channel and Severn Estuary.

4.7.2 Maintaining adequate coastal defence is important because many of the major urban, industrial and tourism centres in South Wales are located close to the coastline. Over 60% of Wales's population live within the coastal zone and development is particularly concentrated along the Bristol Channel and Severn Estuary coast of South Wales. Large areas are at risk from coastal flooding or erosion and are protected by significant lengths of man-made coastal defence. The level or height of the foreshore in front of the defences is critical to maintaining the integrity of the structure and the standard of protection it provides.

4.7.3 There are potential interactions between the dredging of aggregates, natural changes and coastal defence. Issues of particular concern include:

- Short term fluctuations in beach levels;
- Perceived longer term trends of lowering of foreshore levels, of falling beach levels and erosion of sand;
- Reduction of the sediment supply to local coastal areas;
- Erosion of valued environmental resources.
- Erosion of saltmarsh and mudflats

4.7.4 A series of Shoreline Management Plans (SMPs) were prepared for the Bristol Channel and Severn Estuary following joint MAFF and Welsh Office Guidance (Shoreline Management Plans – A Guide for Coast Defence Authorities, 1995). The SMPs provide a strategic overview of the issues associated with coast defence including coast defence strategies and research and monitoring priorities. A second round of plans is being completed; for example the Gwent Foreshore Management Plan is now available[27]. River Basin Management Plans in

[27] Gwent Levels Foreshore Management Plan Environment Agency Wales South East Area Phase III Final Report January 2004

line with the Water Framework Regulations will be developed in due course.

P 15 Proposals for aggregates dredging will only be permitted where the objectives of coastal defence strategies and evolving River Basin Management Plans have been fully considered in the ES and Conditions for monitoring and mitigation will ensure impacts are managed at acceptable levels.

4.8 Leisure, Tourism and the Amenity of the Shoreline

4.8.1 Much of the coast of South Wales is of outstanding beauty and quality. It is afforded a high degree of protection with a wide range of landscape, historic, geological and nature conservation designations. The attractive, varied and high quality beaches and coastal habitats provide numerous recreation opportunities and the area is an important tourist destination. The sandy beaches, secluded coves and cliff top walks are highly valued by the local community and visitors from a wide area, and help provide a "sense of place". The rich diversity of coastal landscapes undoubtedly contributes significantly to the quality of life and cultural richness of South Wales. Tourism can bring with it social and economic benefits and the value of the coast for visitors and local people will be a factor in considering applications for aggregates dredging.

4.8.2 The Comparative Impact Assessment [28] research considers the question of whether and how dredging sand from offshore sandbanks affects the beaches of South East Wales. "Many millions of tonnes of material have been removed, predominantly from sand banks relatively close to the shore. … Residents and interest groups have become increasingly concerned that changes which they have observed along the shoreline … might be linked in some way to this dredging activity." The report looked at the historic data, which demonstrated erosion in some areas and accretion in others from before dredging began. As part of the continuing evolution of the estuary coastline, long-term erosion has occurred for example near Caldicot and between Cardiff and Newport. Somerset beaches also show erosion in recent centuries[29]. The report did not find specific trends in either the scale or pattern of changes that can be attributed to dredging activities. The fears and concerns held by members of the public are a consideration in the GV process, however, and lack of scientific certainty will not be a reason for postponing measures and decisions that are likely to be cost-effective.

4.8.3 The sandbanks within the Bristol Channel and Severn Estuary differ in their characteristics, and the way in which each sandbank

[28] The Comparative Impact Assessment of Land and Marine Sand and Gravel in South East Wales, Symonds, WAG2002
[29] The evolution and fine sediment regime of the Severn Estuary and Bristol Channel, R Kirby. Biological Journal of the Linnean Society (1994)

evolves may affect wider sediment movement and the processes that act on the coastline. The banks in the Estuary such as Middle and Welsh Grounds are highly dynamic, showing alternating periods of fragmentation and coalescence. Nash and Helwick are examples of banner banks, formed during the sea level rise following the last glaciation and maintained by the flow patterns produced by the headland. A circulatory movement of sand over and around the banks helps to maintain stability. The equilibrium of Nash and Helwick differs because of the dissimilarity in the sand supply, and in the storm induced waves. Monitoring of Nash Bank shows reduction in levels and volumes at the western end and a developing kink that suggest it will in time develop into two en-echelon ridges. As wave dissipation by the bank may have an important role in protecting the coast, a precautionary approach has been followed in requiring detailed monitoring linked to the reduction and eventual cessation of dredging. In contrast, Helwick Bank appears to be more stable, buffered by sediment supplied from the large volumes of sand in Carmarthen Bay.

4.8.4 The sediment links between the banks and the coast have been considered in Coastal Impact Studies and in wider research, for example for the Bristol Channel Marine Aggregates Study. The exchange of sediment between beaches and the area immediately offshore is well understood, but links outside this system are weaker and intermittent – it is the significance of *these* exchanges with the beaches that is of concern to many. Coasts are continually evolving and changing, whether in response to a storm or seasonal changes or an adaptation to sea level rise associated with climate change. Other human influences, such as sea-defences or dune stabilisation may play a major role in coastal changes. Consensus over cause and effect will only come from better scientific understanding of the trends and processes. Reports and photographs sent in by local people to show the different aspects of South Wales beaches in different years and seasons add an important dimension to our understanding of the fluctuations and longer term changes of the coastline. The policies and action to address coastal change in IMADP take into account the current level of understanding and will be reviewed in the light of evolving knowledge and new information.

4.8.5 The EIA and CIS for each application will be required to identify the potential risks, so far as they may be reasonably foreseeable. The decision on the GV will be based on evaluation of the risks and as a part of that evaluation will consider the comments received in relation to the application. In the event that a favourable GV is determined, Conditions will be put in place to provide an enforceable framework with a view to measuring and preventing or mitigating these risks to acceptable levels.

P 16 Proposals for aggregates dredging will only be permitted where protecting the amenity of the coastline has been fully considered in the ES and Conditions for monitoring and mitigation will ensure impacts are managed at acceptable levels.

4.9 Benthic habitats and fauna

4.9.1 Dredging Conditions will be used to protect habitats, communities and species from degradation. An improved knowledge of the ecosystem will improve our ability to do this. Biological classification can be associated with physical environmental data, such as sediment type, water depth, salinity, wave exposure, current speed and sediment mobility. Benthic information can be costly and difficult to obtain, may be limited in extent and of variable quality. But the benthos is important for its fisheries yield, its role in the food chain for seabirds and cetaceans as well as its intrinsic environmental value. Seabed habitat mapping can be of great use in providing a detailed description of the type and variability of seabed habitats.

4.9.2 Impacts arise both directly from the physical removal of sediment and organisms and indirectly by the deposition of rejected fine material. Turbidity close to the dredge head is increased during dredging, although this is less of a problem with the clean sands and high currents of many of the areas. Recovery of dredged areas is initially by opportunist species, with the success of later slow growing species dependent on characteristics such as sediment proportions and mobility. The interdependence and the interaction of species and the rates of invertebrate recovery and recolonisation are not fully understood. Recovery rates will vary between habitats; for example highly mobile coarse sediments are likely to recover more quickly than stable and sheltered, mixed sediments.

4.9.3 Guidelines for the Conduct of Benthic Studies at Aggregate Dredging Sites[30] promotes a comprehensive and consistent approach to the assessment of the sea-bed environment for Environmental Impact Assessment and monitoring requirements. The guidelines cover the whole process from the rationale and planning of a survey, surveying and sampling techniques, quality assurance and reporting. The Marine Monitoring Handbook[31] addresses the principles behind, and the procedures for, monitoring the habitats and species within marine SACs

[30] Guidelines for the Conduct of Benthic Studies at Aggregate Dredging Sites
Publication: June 2002 CEFAS (Centre for Environment, Fisheries and Aquaculture Science)

[31] Marine Monitoring Handbook March 2001 Edited by Jon Davies (senior editor), John Baxter, Martin Bradley, David Connor, Janet Khan, Eleanor Murray, William Sanderson, Caroline Turnbull and Malcolm Vincent
JNCC UK Marie SACs Project

in UK waters to assess their condition. This offers valuable guidance for Environmental Statements and monitoring procedures.

4.9.4 The intensity of dredging will be assessed by relating the volume of aggregate dredged to the area from which it is taken, based on Crown Estate monitoring. The frequency and length of campaigns will be taken into account. This will be linked to the monitoring results over the life of the permission, to ensure that the recovery of the system is not compromised. If unanticipated harmful effects to the substrate and benthos are identified, intensity of dredging is one of the variables that can be altered in mitigation. For example, if the footprint of the dredging does not diminish as predicted, a reduction or temporary cessation of dredging in that part of the licence area may be appropriate. The habitat may be protected by the selection of small closed areas, or by seasonal restrictions. Zoning within each license area may be appropriate. Assessment of cumulative effects will determine the acceptable intensity of dredging.

4.9.5 The physical nature of the sea bed after dredging will need to be considered with reference to sediment transport, the sediment particle size range, the remaining depth of aggregate, sediment mobility and the resultant bathymetry. Where appropriate, Conditions will determine the form in which the sea floor should be left. The feasibility of restoration at different sites will be considered.

P 17 Conditions for aggregates dredging will require the monitoring of short and long-term impacts of extraction on the benthos, including the stability of post dredging sediments. The intensity of dredging will be monitored to keep impacts to an acceptable level and to promote recovery of the seabed.

4.10 Archaeology and the Marine Historic Environment

4.10.1 The marine historic environment forms an irreplaceable component to our understanding of the history of Wales. Submerged prehistoric land surfaces and shorelines dating to early prehistoric periods before the formation of the modern coastline may survive offshore. Stone and flint artefacts derived from such early sites are encountered relocated within marine aggregate deposits. Dating from later prehistoric and historic periods, wrecks and their associated artifacts provide vital information about maritime transport, warfare and trading.

4.10.2 The marine historic environment is vulnerable to damage or destruction from offshore development or dredging. Dredging for aggregates has the potential to damage and remove remains. The

disposal of dredging wastes can smother them, the removal of sediments can lead to erosion and their degradation, and changes to sediment transport can bury or expose them. It is therefore important that accurate geophysical and other survey is undertaken to a standard appropriate for the detection of archaeological sites.

4.10.3 BMAPA and English Heritage have produced a guidance mechanism by which archaeological remains underwater will be fully included in the assessment of dredging activities. Marine Aggregate Dredging and the Historic Environment was prepared by Wessex Archaeology on their behalf in 2003[32].

4.10.4 The archaeological sites detected by prior survey and consultation should be assessed for importance in the environmental statement and appropriate mitigation proposed. The value and vulnerability of nationally important sites, which may be statutorily protected, is such that they should be preserved in situ and their immediate environs protected from degradation or destabilising activity. Accurate survey and expert assessment of the condition and significance of the archaeological features is essential for making a properly informed decision on the GV.

4.10.5 Coastal archaeology was audited as part of the BCMA Study[33]; known coastal archaeological sites and many of the charted wrecks are included in the GIS. Nonetheless, our understanding of the full extent of the surviving coastal and marine historic environment is embryonic and there are undoubtedly significant archaeological resources awaiting discovery. There is considerable scope for identifying new sites and for enhancing our knowledge of the extent of the marine archaeological resources.

4.10.6 Where, after properly designed archaeological survey, there is reason to believe that archaeological sites or artefacts exist, an appropriate evaluation will be required as part of the EIA to assess the significance, character and extent of any remains and to propose appropriate mitigation. Where the preservation of archaeological remains in-situ is not justified, dredging permission may be granted subject to satisfactory provision being made for the excavation of sites, retrieval of artefacts, recording and publication of results.

[32] Welsh Office Circular 60/96 Planning and the Historic Environment: Archaeology; Welsh Office Circular 1/98 Planning and the Historic Environment: Directions from the Secretary of State for Wales

[33] Bristol Channel Marine Aggregates resources and constraints research project. August 2000 GIS updated September 2003

P 18 Proposals for aggregates dredging that are likely to cause demonstrable harm to nationally important archaeological remains are unlikely to receive a favourable GV. Nationally designated archaeological sites will be excluded from dredging areas. Environmental Statements will be expected to show that appropriate survey has been undertaken, the results subjected to expert archaeological assessment and appropriate mitigation proposed.

5. RESEARCH, INFORMATION MANAGEMENT AND DISSEMINATION

5.1.1 Basic research is a precondition of sound policies and it is important that research should continue to advance the understanding of the marine environment. Organisations are encouraged to consult the Assembly on proposed research in the area. Engaging stakeholders is essential to achieve the best solution jointly based on participation and sound knowledge.

5.2 Coastal research

5.2.1 Although the BCMA Study has helped improve understanding, there is still lack of consensus over coastal change and its causes. Dredging is a highly visible operation and much attention has focused on the potential detrimental impacts. Links between dredging and fluctuations in sand levels on important beaches have been assumed when there is very little scientific evidence to support that view. For example, severe storms can cause rapid and dramatic changes to coastal habitats and landforms. The effect of an event can be visible for many years. It is often tempting to identify a “cause” of change without supporting scientific information.

5.2.2 The Bristol Channel and Severn Estuary is a dynamic system with the highest tidal range in Europe. The physical processes largely determine and sustain the biology, geomorphology and coastal landscapes. The shape of the coastline and the transport of sediment are determined by factors that operate at different geographical and temporal scales. It is not easy to distinguish the impacts of natural events from those of dredging; there are inherent limitations in determining cause and effect. Dredging removes sand from the system – whether this is significant depends on a range of factors such as the volume of the resource. The early records of dredging were not sufficiently precise to allow accurate assessment of effects, but now research and monitoring provide a baseline against which the significance of any changes can be assessed.

5.2.3 Environmental Statements provide the specific information for evaluating the potential impacts of dredging on the coast. Coastal monitoring is usually required as a dredging Condition, particularly where dredging is close to the coast or sediment exchange is identified. Monitoring beach levels and erosion of landforms can help establish the cause of change – whether aggregates dredging, evolution of the coastline or coastal defences themselves. Research, by Coastal Defence Authorities and academic institutions, further improves the understanding.

5.2.4 IMADP requires applicants to consider the potential interaction between climate change and dredging. It is important that this is considered within a wider context and research to examine the likely impacts of sea-level rise in combination with existing and proposed aggregate extraction activities will be required.

5.2.5 Research to improve the ability to understand the "natural" processes that act on the coastline and to enable the anthropogenic impacts to be decoupled from these processes will be an ongoing element of the risk management approach.

5.3 Fisheries research

5.3.1 Concern about the lack of information on fish, including migratory fish, and fisheries will be addressed in three ways:

- A review of the current understanding of the potential impacts of dredging on fish populations;
- A broad study of fish breeding and spawning, feeding, dependencies and migration in these offshore areas will be related to the sediment environments concerned; and
- Specific data will be provided by EIA and, where relevant, REIA and Appropriate Assessment.

5.3.2 Until there is confidence that the understanding of fish ecology with respect to a new aggregates resource is sufficient to enable the management of the potential impacts of dredging on fish populations to acceptable levels, dredging in new sediment environments will require a precautionary approach with the use of indicators to trigger immediate mitigation.

5.4 Benthic habitats research

5.4.1 Research on benthic habitats is key to assessing the impacts of aggregate extraction, with a need for better mapping and improved baseline data. The Outer Bristol Channel study, due for completion in late 2005, will make a significant contribution to baseline information. Recovery rates of benthic habitats have generally been studied in different environments – the Bristol Channel is exceptional in many ways and recovery on the mobile sandbanks that characterise the sand resource has not been well documented to date. This is also true of the potential impacts of dredging resulting in the increased smothering of the biota. Because it is a dynamic environment and the sediments are generally sorted to a narrow range of grain size, it has been assumed that impacts are low. These conditions do not pertain everywhere, however, and it will be of value to adapt the model that

has been developed by CEFAS to predict the extent of smothering from a given plume.

5.5 Marine mammals research

5.5.1 Under the EU Habitats Directive member states are required to establish a system of strict protection for all cetaceans. The extent to which seismic disturbance affects cetaceans is not well known for all species due to the limited research carried out to date. JNCC considers that seismic surveys at sea do not necessarily constitute a threat to marine mammals, if care is taken to avoid situations which could potentially harm the animals. Noise pollution and habitat degradation are particularly relevant and research on the avoidance of dredging activities by marine mammals is important to the assessment of cumulative effects in an area which falls within a migratory pathway.

5.6 Information Management

5.6.1 The BCMA study collated the best available data on marine aggregates and much of the information is held in a Geographical Information System (GIS). The database requires active management to keep it up to date. The data were updated in Summer 2003. As part of a commitment to disseminate monitoring information on sediment transport and the impacts of dredging for aggregates, a comprehensive, quality controlled and fully documented data set will be held in a GIS, eventually to be made publicly available. At that time, organisations with statutory, operational, research and monitoring responsibilities will be asked to contribute, and all stakeholders will be encouraged to participate. The GIS will have a data management plan that will describe the work and responsibilities concerning the design of monitoring schemes, and report on the collection and gathering of data and quality control. Independent appraisal of the internal consistency of the data sets will be linked to the management plan, with the option of independent audit should anomalies be apparent. The BCMA database and GIS are of relevance and add value to other marine and coastal data collection activities. Initiatives that make this information more widely available and increase the understanding of the Bristol Channel and Severn Estuary will be welcomed. Potential developers may wish to commission research, provide access to commercial data or contribute to information collection and database management. As soon as is practicable, planning and decision making for the dredging of aggregates will be supported by a comprehensive and accessible database and Geographical Information System.

5.7 Co-ordination and Communication

5.7.1 The procedures for discussing aggregates dredging issues are being strengthened and better structured. This will improve confidence and transparency in decision making. The formation of a subgroup of the South Wales Regional Aggregates Working Party with specific reference to aggregates dredging matters in the Bristol Channel, Severn Estuary and River Severn will be considered.

5.8 Information Dissemination

5.8.1 There is clear need to communicate the realities of coastal change, including coastal evolution, long-term trends, short-term changes associated with unpredictable events and the effects of dredging for marine aggregates. The Assembly will consider the best means to communicate these issues more widely.

Glossary

Bathymetry	the measurement of water depths.
Bedforms	features on a seabed such as ripples and sand waves formed by sediment movement.
Benthos	the sea floor, its flora and fauna
Candidate Special Area of Conservation (cSAC)	a site that has been forwarded to the European Commission by the Assembly and/or ODPM.
Coastal Impact Study	an element of the Environmental Statement prepared following the guidelines for the assessment of marine aggregate dredging (CIRIA 1998).
Competent Authority	any statutory public body or public office exercising legislative powers
Cumulative effects	effects that result from incremental changes caused by the plan together with other past, present or reasonably foreseeable actions (based on European Commission, 1999). The combined effect of individual impacts of the plan (e.g. noise, visual) on a particular receptor.
Development Consent	the decision of the Competent Authority or Authorities which entitles the Developer to proceed with the Project.
Draw down	the transport of coastal sediment offshore by storms or in reaction to changed hydrodynamic circumstances.
Dredging Conditions	they are imposed by the Environment Minister on Dredging Permissions issued, and are legally binding on the holder of a Dredging Permission
Dredging Licence	a commercial agreement between an operator (usually a dredging company) and the owner of the seabed (usually the Crown Estate) governing the terms under which the owner of

	the seabed allows dredging to take place.
Dredging Permission	is personal to the owner of the seabed and is issued by the Secretary of State in England or the Environment Minister in Wales. Once issued, a Dredging Permission allows a proposed marine dredging operation to be carried out in accordance with the terms of the permission and the Dredging Conditions imposed on it.
Environmental Impact Assessment:	a tool for integrating environmental considerations into decision-making by ensuring that significant environmental effects of the decision are taken into account.
Environmental Statement	the Environmental Information provided by the Developer to the Competent Authority containing the Environmental Information required.
European Marine Sites	where a Special Protection Area (SPA) such as the Severn Estuary, or Special Area of Conservation (SAC) incorporate subtidal and/or intertidal areas, they are referred to as European Marine Sites (EMS).
Foreshore	is the inter-tidal area between highest and lowest tide levels.
Indicator	a measure of variables over time, often used to measure achievement of objectives or targets.
Input indicator / Outcome indicator	indicator that focuses on actions to be undertaken to achieve an outcome / indicator that focuses on the outcome sought.
Indirect (or secondary) effects	effects which are not a direct result of the project, often produced away from or as a result of a complex pathway.
Littoral drift	the movement of beach material in the littoral zone by waves and currents.
Mean High / Low Water Springs	the average height of the high/low waters of spring tides (at the bi-monthly new and full Moons).

(MH/LWS)	
Natura 2000 Sites	Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) together form the Natura 2000 sites.
Palaeo-valley	a valley system excavated earlier in the Earth's history by processes no longer active and often infilled with sediment.
Possible Special Area of Conservation	a site that has been submitted by the Joint Nature Conservation Committee to the Assembly and/or ODPM, not as yet forwarded to the EU.
Ramsar sites	wetlands of international importance designated under the Ramsar Convention.
Sand Wave	a large undulating bedform (>1.5m high and >30m wavelength) formed by a dynamic equilibrium between a sandy seabed and tidal currents. Asymmetric profiles can indicate sand transport direction (steeper slope being down-transport).
Scoping	the process of identifying the content and extent of the Environmental Information to be submitted to the Competent Authority under the EIA procedure.
Screening	the process by which a decision is taken on whether or not EIA is required for a particular Project.
Special Areas of Conservation	a European network of important high-quality conservation sites conserving the habitat types and species identified in the Directive.
Special Protection Areas	protected sites classified for rare and vulnerable birds and for regularly occurring migratory species in accordance with the Birds Directive.
Veneer	a thin layer of sediment overlying old deposits.

ANNEX 1. 1 SUSTAINABLE DEVELOPMENT

The principles that underpin this sustainable development approach, as set out in Planning Policy Wales, include:

Putting people at the centre of decision making

Engaging stakeholders is essential to achieve sustainable goals. IMADP seeks commitment from stakeholders in what will be a continuing process of establishing facts and achieving the best solutions. IMADP sets out a structured decision-making process to assist in balancing society's need for aggregates with the need to reduce risk to the environment; a balance that will help to minimise the impact of dredging and one that has regard also to cumulative impacts. The decision-making process is designed to be transparent and to involve, as early as possible and to an extent that is reasonably possible, all interested parties.

Making decisions openly

Where and when dredging is likely to be acceptable is clearly set out. The procedures for establishing whether an application meets these criteria require extensive consultation and recognition of the responses. The Environmental Statement, Coastal Impact Study, Appropriate Assessment, monitoring information from permissions and reasons for decisions are publicly available, and information dissemination is an aim of IMADP.

Respecting environmental limits

Dredging for aggregates will be managed to control impacts to acceptable levels, protecting the environmental capital and respecting the environmental capacity of the area. Extraction will be controlled to a level which monitoring shows does not have a significant effect on the natural processes of water movement and sediment transport in the monitored areas.

Applying the precautionary principle

The Assembly will continue to adopt a precautionary approach. IMADP helps to find the balance between supplying the South Wales need for aggregates with the requirement to reduce the risk of adverse effects to the coastal and marine environment. It provides a structured decision-making process with detailed scientific and other objective information, so that proportionate, transparent and consistent decisions can be made. The approach is one of risk assessment, risk management and risk communication, the essence of the precautionary principle.

The basis of risk management is to identify and consider risks as either acceptable, or unacceptable. The particular approach and factors considered will depend on the site, but will take into account both professional scientific judgement and public

perception of risk. It is acknowledged that perception will influence the level of risk considered acceptable and this may not be the same as the level of risk assumed by those undertaking the study. The Assembly regards risk communication and the involvement of the community as an integral part of the risk management process. The precautionary principle is applied where there are reasonable grounds for concern that an activity could cause harm but where there is uncertainty about the probability of the risk and the degree of harm. In 2000, the European Commission set out a number of steps to follow. If a preliminary scientific evaluation shows reasonable grounds for concern that an activity might lead to damaging effects, the Precautionary Principle is triggered. Decision-makers can adopt provisional measures, proportionate to the level of risk and to the desired level of protection, pending the availability of more reliable scientific data. Action is then taken to obtain further information enabling a more objective assessment of the risk.

Using scientific knowledge to aid decision making

The Bristol Channel Marine Aggregates Study[34] (the BCMA Study), completed in August 2000, provides many of the scientific data and information on which IMADP is based. The study area is complex. Gaps in the data remain, particularly with respect to ecology, and it is not always possible to identify the degree of scientific certainty. Nor is there always consensus over the interpretation of available data. These issues will continue to be addressed by a programme of research, including updating of the BCMA database, and by regional and site-specific information provided by applicants.

The proximity principle

The delivery of dredged aggregates to the South Wales markets requires its transfer through ports and wharves and onward movement. IMADP, together with Minerals Planning Policy Wales and Minerals Technical Advice Notes, seek to safeguard and utilise the water and rail network to minimise travel distance and road transport.

Taking account of the full range of costs and benefits

The costs and benefits of aggregates dredging have been considered in the development of IMADP, drawing on The Comparative Impact Assessment of Land and Marine Sand and Gravel in South East Wales[35]. Costs and benefits are addressed in the Environmental Impact Assessment process, and IMADP promotes their consideration in contractual decisions in the selection of aggregates for public projects.

[34] Posford Duvivier Environment and ABP Research and Consultancy

[35] The Comparative Impact Assessment of Land and Marine Sand and Gravel in South East Wales, Symonds, WAG2002

ANNEX 1. 2 USES OF MARINE SAND AND SUBSTITUTION

The rounded grains of marine sand are an important characteristic. As they help improve the "workability" of plaster, mortar and concrete, less water and therefore less energy is required compared to the sharp, angular nature of quarried sand. This is a more energy efficient product than most alternatives. Less cement is required in the final product (cement manufacture requires stringent environmental management to overcome problems of waste and emissions and cement is also the most expensive constituent).

A wide range of customers uses the aggregates. Approximately half the dredged sand is used in pre-cast or ready mixed concrete. Medium building sand is used in mortar, plaster, rendering and general building. Fine sand has been used in asphalt and specialised road-surface treatments, though volumes have decreased. Dredged materials are also used as fill in construction works, for example in the construction of the Cardiff Bay barrage, for beach recharge and for coastal protection.

The substitution of crushed rock for land and marine-won sand and gravel is greater in South Wales than other areas of Wales and England. Pennant Sandstone is crushed to form a high quality aggregate. Typically 35% to 45% is in the form of "fines" which can be treated and then substitute for some sand in concrete or bulk fill. A similar amount (300,000 tonnes a year) of limestone dust/fines is blended with dredged sand and used in concrete as a 50:50 mix, with a further 1.6 million tonnes providing the coarse fraction of the concrete.[36] Crushed rock accounts for 79% of aggregates in South Wales, compared with just over 60% in England and Wales in 1997.

[36] Comparative Impact Assessment of Land and Marine Sand and Gravel in South East Wales, Symonds, 2002. Welsh Assembly Government.

ANNEX 1. 3 MARINE AGGREGATES RESOURCES

The present day Bristol Channel was formed by the gradual transgression of the sea over a former river valley system about 7,000 years ago. Aggregates in the Bristol Channel and Severn Estuary are dredged from sandbanks, sand waves, sand ribbons and general areas of thicker sediment. These features are classified as relict and modern sedimentary bodies.

Relict bodies were deposited in the recent geological past and under different environmental conditions than those of today. They are typically gravel and sand in Pleistocene[37] buried river valleys, and sandbanks at the outer shelf of the Celtic Sea. They are not features formed by modern transport processes, although superficial movement in, on and around the banks can take place under most conditions. These resources may be of commercial interest but this depends on how thick the deposit is, how well sorted the grain-sizes are and whether there is contamination with peat and clay.

Modern sedimentary bodies are a function of the on-going processes of sediment transport. The outer Bristol Channel is characterised by sandwaves with megaripples superimposed. Sandbanks are found in the relatively shallow waters of the Bristol Channel, tidally generated along the coasts or associated with secondary circulation linked to higher bedrock in mid channel. Helwick, Nash and Scarweather Sands form a series of linear sand bodies, oriented with the dominant tidal streams associated with headlands. The banks are about 10,000 years old, derived from glacial deposits of Pleistocene age, and form considerable sedimentary stores with significant aggregates resources. In the Severn Estuary, the banks merge with intertidal flats or shallow channels. Modern bodies tend to have important sediment exchanges and linkages and can be replenished or eroded by tidal currents, river flows and wave action. Tide is considered the principal sorting mechanism, with waves causing short-term perturbations.

At present the sandbank, sandwave and to a lesser degree sand ribbon relict features are of greatest commercial interest in the Bristol Channel because the resource tends to be discrete and well sorted.

The characteristics of the aggregates resource are critical to its commercial value and end-use. The fine aggregate dredged varies according to a number of critical factors including:

- The mean grain-size and degree of sorting – poorly sorted fine aggregates tend to have little commercial value;
- The size of the deposit, the sediment thickness and geometry of the resource;
- The degree of contamination with materials such as coal, gravel and mud;

[37] The Pleistocene 1.8 million to 11,000 years ago, saw the most recent ice ages and the evolution and expansion of *Homo sapiens*

- The thickness of non-aggregates material overlying the aggregates deposit.

However, economic trends, market demand and extraction technologies change. Aggregate resources that are currently uneconomic to dredge, owing to other sediments overlying the resource or contamination with unsuitable materials such as coal or clay, may become economically viable in the longer term.

ANNEX 1. 4 REGIONAL RESOURCE APPRAISAL

The aggregates dredging industry has provided a regional resource appraisal to assist consideration of future aggregates provision. This describes the known licensed and unlicensed sand aggregate resources of the Bristol Channel from the Severn Estuary to the Outer Bristol Channel. Consideration is also given of the ability of each resource to meet the market requirements for the main end uses of marine sand. These are Building Sand (used for mortar and general building requirements), Concrete Sand F (used for ready mixed and pre-cast concrete) and Concrete Sand M (a coarser sand for laying block paving, ready mixed and concrete block manufacture).

Severn Estuary.

The Bedwyn Sands, Denny Shoal and West Middle Ground are part of the larger Middle and Welsh Ground sandbanks and consist of well sorted fine-medium grained sand currently used as building sand. Market demand for sand from the Middle and Welsh Grounds is currently for mortar manufacture and general building uses. The sand can be used in concrete but requires the addition of larger amounts of crushed rock fines and an increase in cement content.

Inner Bristol Channel

At Holm Sands, extraction of fine-coarse grade sand (building and concreting sands) is decreasing as the sediment becomes increasingly gravelly (gravelly sand and sandy gravel). The resource is most appropriate for unscreened aggregates for beach replenishment and fill. Culver Sands is a sandbank of well-sorted medium grained sands suitable for both building and concreting uses (as Concreting Sand F).

Central Bristol Channel

Nash Bank is a large resource of building sand, and concreting sand (M & F).

Outer Bristol Channel

Helwick Bank is a large resource of well-sorted medium grained sand suitable for building and concreting (as Concreting Sand F). The Outer Bristol channel and Nobel Banks contain extremely large resources of sand, currently under assessment. Prospecting results indicate that all grades of sand required are present.

ANNEX 1. 5 DREDGED AGGREGATES STATISTICS

Table 1 Production of Aggregates in South Wales (million tonnes)

(South Wales Regional Aggregates Working Party Annual Report 2002).

Type		1995	1996	1997	1998	1999	2000	2001
Limestone		9.7	9.3	8.5	9.0	9.1	6.9	6.5
Sandstone		3.8	3.4	3.5	2.5	2.5	2.4	2.6
Igneous		1.4	1.3	1.0	0.8	0.9	0.5	0.8
Total Crushed Rock		14.9	13.9	12.9	12.3	12.5	9.8	10.0
Sand & Gravel	**Land Won**	1.2	0.3	0.3	0.3	0.2	0.2	0.3
	Marine	1.6	1.6	1.5	1.2	1.3	1.1	1.0
Secondary Aggregate		1.7	1.3	1.0	1.1	0.9	N/A	0.9
Total		19.4	17.1	15.7	14.9	14.9	(12.0)	12.2

Table 2 Licensed Aggregates Dredging Sites.

Licence Name	Licence Number	Duration	Expiry	Maximum tonnes/ year	Company
Holm Sands	377, 379, 381	23	31/12/ 2013	1,150,000 (100,000 to 200,000 tonnes per year taken owing to quality constraints)	Hanson Aggregates Marine Ltd British Dredging Ltd. United Marine Dredging
Nash Bank	376, 378, 380		2010	900,000 for 3 years 750,000 for 2 years 600,000 for 2 years	Hanson Aggregates Marine Ltd British Dredging Ltd. United Marine Dredging
West Middle Ground	385	Started 01/01/91	During pleasure	250,000 (40,000 to 60,000 tonnes per year taken)	British Dredging Ltd.

Denny Shoal	391	Started 01/01/91 English waters	During pleasure	150,000	Hanson Aggregates Marine Ltd
Culver Sands	389	Started 01/01/91	During pleasure	16,000	Hanson Aggregates Marine Ltd
Bedwyn, Charston & Dunn Sands	Planning Permission	Current	2013	150,000 (150,000 tonnes per year taken)	Crossavon Ltd (Severn Sands)
Helwick Bank	373	Current	2005	107,000	Llanelli Sand Dredging Ltd

Table 3 Dredging Applications : 2004

Licence Name	Licence Number	Expiry	Policy category	Maximum tonnes/yr	Company
Culver Sands (England)	472	10 years	Precaution	1,000,000	
Bedwyn	Planning Permission	2013	Precaution	250,000	Crossavon Ltd (Severn Sands)
Helwick Bank	373	15 years	Precaution	300,000	Llanelli Sand Dredging Ltd
Nobel Banks	476	15 years	Favourable	300,000	Llanelli Sand Dredging Ltd
North Bristol Deep	470	10 years	Precaution	(325,000 yrs 1&2; 700,000 yrs 3&4; 1,000,000 yrs 5 to 10)	Hanson Aggregates Marine Ltd United Marine Dredging
North Middle Grounds	455, 459	10 years	Precaution	400,000	Crossavon Ltd (Severn Sands)
Western Bristol Channel	486	15 years	Favourable	1.8 million (up to 3 million)per yr	RMA

Table 4
Port landing statistics for marine dredged aggregates from the Bristol Channel and Severn Estuary.
Crown Estate Summary of Statistics

	1999	**2000**	**2001**	**2002**	**2003**
South Wales	**tonnes**	**tonnes**	**tonnes**	**tonnes**	**tonnes**
Barry	52,381	32,718	31,200	22,264	20,581
Briton Ferry	200,384	208,066	197,790	160,313	181,755
Burry Port	62,751	87,802	72,080	140,102	67,029
Cardiff	341,132	283,973	288,634	243,463	275,947
Newport	343,157	293,778	248,221	255,714	264,217
Pembroke	33,372	35,566	34,969	30,229	34,206
Swansea	137,757	113,407	129,336	110,267	137,326
Port Talbot	NFA	5,720	12,918	9,321	24,870
Total South Wales	**1,170,934**	**1,061,030**	**1,015,148**	**971,673**	**1,005,931**
South West England	**tonnes**	**tonnes**	**tonnes**	**tonnes**	**tonnes**
Appledore	82,661	91,549	97,980	85,018	77,622
Avonmouth	437,144	410,703	390,422	360,686	371,371
Bridgwater	23,964	32,951	37,880	42,867	52,895
Total South West England	**543,769**	**535,203**	**526,282**	**488,571**	**501,888**
Total	**1,714,703**	**1,596,233**	**1,541,430**	**1,460,244**	**1,507,819**

NOTE: An estimated additional 150,000 tonnes/year are extracted from Bedwyn Sand and landed in Newport/Chepstow.

ANNEX 1. 6 HABITATS DIRECTIVE

The Directive identifies the Competent Authority to include any Minister, government department, public or statutory undertaker, public body of any description or person holding a public office. When following the GV procedures, the Assembly will take on the role of Competent Authority. It will consider the proposed or existing dredging project for Significant Effect on a Natura 2000 or Ramsar site in view of the site's conservation objectives and if necessary will carry out an Appropriate Assessment.

For applications and existing permissions considered likely to have a significant effect, a favourable GV will only be granted if it has been ascertained, following appropriate assessment, that the proposal will not adversely affect the integrity of any Natura 2000 or Ramsar site. Until powers of revocation are included in the Regulations, the Government View will be withdrawn and the Crown Estate will be asked to suspend existing licences which are not shown to be having no adverse effects, unless further conditions can be applied to remove the risk of adverse effects. (Crown Estate licences contain a clause allowing termination on 6 or 12 months notice). Where it has not been ascertained that a new proposal or existing permission will not have an adverse effect, even after considering additional considerations or restrictions, a favourable GV may be granted if there are no alternative solutions and the operations are necessary for imperative reasons of overriding public interest (IROPI). If minded to proceed to consideration of IROPI, the competent authority will need to examine and compare alternative solutions, and therefore applicants will need to provide information to show that they have considered alternatives. Alternative solutions cannot be dismissed solely on grounds of higher cost or reduced revenue for the applicant. The IROPI may be of a social or economic nature, provided that no habitats directive “priority” habitats or species are affected. If “priority” habitats or species are affected the only considerations that may be used to justify a proposal on grounds of IROPI are reasons relating to human health, public safety, primary environmental benefits or other reasons judged by the European Commission to be IROPI.

These provisions apply equally to new applications and existing permissions. If a positive GV is granted for a development which would adversely affect the integrity of an SPA, SAC, cSAC, pSAC or Ramsar, necessary compensatory measures will be required to ensure that the overall coherence of the Community-wide network of SPAs and SACs, known as Natura 2000, is protected.

ANNEX 1. 7 COASTAL PROTECTION AND REPLENISHMENT

A range of coastal landforms has evolved along the South Wales coast in response to the processes of weather, tide and geological change. Many natural formations such as cliffs, nearshore reefs and rocky platforms, offshore sandbanks, beaches and sand dunes fulfil important defence functions. In many areas, the natural defences are supplemented by man-made structures.

The Assembly has responsibility for policy in respect of coastal defence in Wales. Local Authorities and the Environment Agency are the operational authorities, with the former empowered to undertake coast protection and sea defence matters and the latter responsible for sea defence. The Assembly may award grants to operating authorities for coastal defence schemes which meet technical, environmental and economic criteria. Landowners with frontage along the shoreline may also take measures to protect land.

Nature conservation bodies in the UK have become increasingly concerned at the progressive loss of intertidal habitats, due to erosion and reclamation. Applications for beach recharge, and the protection of habitats and species of designated international importance will be subject to appropriate environmental safeguards. The material to be used for beach nourishment varies according to whether it is for coastal defence or habitat protection, and the characteristics of the beach material. Beach recharge using materials from navigational dredging may offer attractive local or opportunistic options, but are unlikely to satisfy the requirements of most major schemes."[38]

Along the Welsh Coast of the Severn Estuary between Cardiff and Chepstow there are many areas where the muddy foreshore that represents a buffer zone to coastal flood defences have eroded. One potential management option to halt the erosion and encourage replenishment of the foreshore is the use of maintenance-dredged spoil. Material selection would almost certainly be on a like for like basis. Therefore, for the areas of fine sediment erosion, it is likely that only the dredged spoil from navigation channels produced by the local port and harbour authorities will be suitable. Maintenance dredged material from Neath Harbour is sandy and has been used in beach replenishment both at Sker Point and Llanelli.

[38] Beach recharge materials - demand and resources. Humphreys, B, Coates, T, Watkiss, M, Harrison, D. CIRIA R154 1996.

ANNEX 2

CATEGORY FOR EACH SEDIMENT ENVIRONMENT

A1. **Introduction**

A1.1.The Bristol Channel and Severn Estuary is subdivided into four areas shown in **Map 1**. Of the 49 Sediment Environments (SE) defined for the Bristol Channel, 27 are in Welsh Waters,16 in English Waters and 6 cross the boundary between England and Wales. Each SE within Wales or crossing the boundary has been attributed to one of three Categories.

Category 1 – The Assembly will look favourably on dredging for aggregates in sediment environments where impact is considered likely to be minimal. Dredging Permissions will include Dredging Conditions to prevent or mitigate environmental impacts to acceptable levels. Permission will usually be linked to suitable thresholds, with indicators to be measured by annual or more frequent monitoring.

Category 2 – The Assembly will adopt a precautionary approach. In new areas, research and baseline measurement to establish the sensitivity of the environment to aggregates dredging will be required. Dredging Permissions will include Dredging Conditions to prevent or mitigate environmental impacts to acceptable levels. Permission will be linked to thresholds, with indicators to be measured by annual or more frequent monitoring.

Category 3 – The Assembly is very unlikely to look favourably on dredging for marine aggregates because in the light of significant identifiable constraints the impact is considered to be unacceptable.

Category 4 - The Assembly will look favourably when responding to consultations on dredging for aggregates in sediment environments where impact is considered likely to be minimal. The Assembly will recommend Dredging Conditions to prevent or mitigate environmental impacts in Welsh waters to acceptable levels and may advise thresholds, with indicators to be measured by annual or more frequent monitoring.

Category 5 - The Assembly will adopt a precautionary approach to consultations. In new areas, research and baseline measurement to establish the sensitivity of the environment to aggregates dredging will be required. The Assembly will recommend Dredging Conditions to prevent or mitigate environmental impacts in Welsh waters to acceptable levels and will advise thresholds, with indicators to be measured by annual or more frequent monitoring.

Category 6 – The Assembly is very unlikely to look favourably on consultations on dredging for marine aggregates where in the light of significant identifiable constraints the impact is considered to be unacceptable.

A1.2 The selection of the category for each SE is made on the bases of published scientific data and information. These include the BCMA study, consultation responses from the TAG and published EIAs. The principal determinants for the ascribed category are given under the heading “reason”. The category for each SE is presented in the following sections:

- **Section A1.3,** Severn Estuary;
- **Section A1.4,** Inner Bristol Channel;
- **Section A1.5,** Central Bristol Channel ;
- **Section A1.6,** Outer Bristol Channel.

A1.3. Severn Estuary

A.1.3.1 The Severn Estuary area contains eight sediment environments, two of which are in Wales, four in England, and two straddle the boundary (see **Maps 4 & 6**). Although the Upper Severn Estuary is wholly in England, comment is provided for this sediment environment (SE 2) because it has fundamental process linkages with the rest of the Severn Estuary and River Severn.

Category Summary

Category	Sediment Environments
Category 1 - The Assembly will look favourably on aggregates dredging	
Category 2 - The Assembly will adopt a precautionary approach.	SE 3, SE 4, SE 7
Category 3 - The Assembly is very unlikely to look favourably on aggregates dredging.	SE 6
Category 4 – The Assembly will adopt a favourable approach in consultations	
Category 5 – The Assembly will adopt a precautionary approach in consultations	SE 2
Category 6 – The Assembly is very unlikely to look favourably in consultations	

SE1 River Severn
SE2 Severn Estuary (Upper)
SE3 Severn Bridges
SE4 Severn Estuary (Lower)
SE5 English Grounds
SE6 Uskmouth
SE7 Cardiff Grounds
SE8 Sand Bay and Weston Bay

Appendix - Table 1

SE2 Upper Severn Estuary	**England**
Category	5
Area	4853 hectares
Class	Flood
Reason	Precautionary approach because of uncertainty about impacts on: European designated sites; Distribution and extent of sandbanks; Sediment transport to adjacent Sediment Environments; Foreshore and saltmarsh habitats vulnerable to erosion.
Regulators	Gloucestershire County Council South Gloucestershire County Council Gloucester Harbour Trustees ODPM
Ownership	Major owners are the Swangrove and Berkeley Estates
Resource	Mobile inter-tidal banks and infilled channels of fine sand
Commercial Interest	No immediate interest. The commercial value of the fine sand resource is not proven, with shallow water depth and sand quality limiting commercial interest (Ref: BMAPA).
Conceptual sediment transport	Net sand transport in an up-estuary direction due to tidal asymmetry. Local large accumulations of fine sand in balance between erosion and accretion. Strong linkages with the rest of the Severn Estuary, particularly SE1 and SE3.
Features	Typical muddy sand and impoverished sandy estuarine invertebrate species, rock exposures rich in fucoids, limpets and barnacles, areas of Atlantic saltmeadow and Spartina (Ref: CCW). Tide stations: White House, Inward Rocks, Wreck
Designations	Severn Estuary pSAC; Severn Estuary SPA and Ramsar. Severn Estuary SSSI
Constraints	
Conservation	pSAC is one of the most environmentally sensitive areas within the study area. (Ref: CCW, EA). High risk of increased rate of saltmarsh erosion, potential impacts on the pSAC features of interest and damage to biodiversity (Ref: CCW, EN). Saltmeadows and grazing marsh support internationally important numbers of wigeon and white-fronted goose (Ref: CCW, EN). Proven erosion of foreshore to Holocene sediment reduces food availability for waterfowl, erosion due to dredging may adversely affect SPA bird interest (Ref: CCW, EN). Medium to high risk of increased flooding, damage to SSSIs and inhibition of natural system response to sea level rise (Ref: CCW, EN).
Navigation	Main navigation channels (Ref: GHT). Risk of change to morphology of sandbanks and channels
Sediment	Medium risk of change in sediment transport to adjacent SEs.

supply	(Ref: CCW, EA, EN).
Coastal protection	Saltmarsh and mudflats are integral to effective sea defences in the area, but the foreshore and saltmarsh habitats are vulnerable to erosion. Flood embankments limit ability of system to adjust to sediment removal by dredging (Ref: CCW, EN). Medium risk of coastal defence upgrade (Ref: CCW, EA, EN). Erosion is occurring on a large scale at Cone Pill/Lydney New Grounds. (Environment Agency Wales)
Fishing	Typical estuarine fisheries including numerous small codling during winter. Migration route for salmon, shad and eels. (Ref: Environment Agency Wales)
Archaeology	Numerous coastal archaeological sites. Charted wrecks (Ref: BCMA Study).
Other	
Likely Additional Conditions	Monitoring of sediment movement and bathymetry of banks and navigation channels. Monitoring of impacts on adjacent SEs and Severn Estuary system. Shoreline monitoring including morphology, sediment characteristics, vegetation and ecology. Assessment of response to sea level rise and geological settling. Limit extraction during a single Dredging Permission to less than1 per cent of total resource available.
Unknowns	Physical coverage poor, consensus good. Long term effect of upstream tidal transport of sediment, sea level rise and geological settling of Severn Basin unclear (Ref: EA, GHT). Limited information on fisheries resources.

Appendix - Table 2

SE3 The Crossings (Severn Bridges)	**Wales and England**
Category	2 & 5
Area	1528 hectares
Class	Flood
Reason	Precautionary approach because of uncertainty about impacts on: European designated sites; Fisheries interests; Sandbank volumes and positions; Sediment transport to adjacent Sediment Environments; Cumulative impacts associated with sea level rise.
Regulators	South Gloucestershire Council Monmouthshire Council Gloucester Harbour Trustees ODPM Welsh Assembly Government
Ownership	Major seabed owner is Swangrove Estate.
Resource	Dun Sands and Charston Sands are thick deposits of fine sand with rock cores. The banks are exposed between mid-tide and low water.
Commercial Interest	No immediate commercial interest to exploit the significant fine sand resources. The Dunn Sands are an active production area licensed to Crossavon Ltd. Swangrove Estate recognises the potential value of fine sand to the estate. Limited by shallow water, sand quality and sea bed ownership (BMAPA)
Conceptual Sediment Transport	Maximum tidal influences with over-deepened channels. Net sand transport in an up-estuary direction due to tidal asymmetry. Local large accumulations of fine sand in balance between erosion and accretion. Mud lines the margins with net mud transport downstream due to ebb residual flows.
Features	Most of foreshore is sandy mud with typical species, smaller areas of Fucoids, barnacles and limpets on hard substrates. Atlantic saltmeadows on both shores (Ref: CCW, EN). Typical estuarine invertebrate communities including impoverished sand communities, Eurydice pulchra, Bathyporeia spp., intertidal muds with Neries diversicolor. Tide station: Beachley
Designations	Severn Estuary pSAC, Severn Estuary SPA and Ramsar Severn Estuary SSSI, River Wye cSAC
Constraints	
Conservation	Chartson Sands is not worked due to proximity of SPA bird interest and intertidal bird feeding areas. pSAC, one of the most environmentally sensitive areas within the study area. (Ref:EA and CCW) Environmental sensitivity increases closer to the foreshore. The erosion of the foreshore to Holocene sediment reduces the value to feeding waterfowl compared to younger productive soft

	sediment areas. Erosion could adversely affect SPA interest by reducing food availability for wigeon, teal, lapwing, shelduck and particularly dunlin (Ref: CCW, EN). High risk of damage to pSAC. Likely to work against local biodiversity (Ref: CCW, EN). Inhibition of the natural system response to sea level rise (Ref: CCW, EN). Medium to high risk of damage to SSSIs and damage during severe storms (Ref: CCW, EN).
Navigation	Within GHT area, including navigation channels to Sharpness (Ref: GHT).
Coastal protection	The current fine sand dredging appears to have no adverse environmental effect (Ref: Severn Tidal Barrage Studies, Hydraulics Research) Saltmarsh and mudflats form an integral component of effective sea defences in the area. Proven history of erosion of saltmarsh (on Welsh side) to some areas results in loss of future standards of sea defence provision (Ref: EA). Changes to the wave climate at the sea defences as a result of morphological change (Ref: EA). High risk of increased flooding, increased requirement for coastal defence upgrade and increased rate of saltmarsh erosion as a consequence of dredging (Ref: CCW, EN). Presence of flood embankments limits the systems response to sediment removal by dredging.
Sediment supply	Very variable sandbank volume and location.
Fisheries	Typical estuarine fisheries interest including flounder nursery and numerous small codling during winter. Migration route for salmon, eels and shad. (Ref: Environment Agency Wales)
Archaeology	Numerous coastal archaeological sites.
Other	MOD ranges, New Passage (Ref: BCMA Study).
Likely Additional Conditions	Monitoring of sandbank morphology and location. Exclusion of Charston from the dredging area Impacts on adjacent SEs and Severn Estuary system. Shoreline monitoring including morphology, sediment characteristics, vegetation and ecology. Assessment of response to sea level rise and geological settling. Dredging unlikely adjacent to foreshore
Unknowns	Effects of dredging on sandbanks in the adjacent SEs uncertain. Soft sediments represent an interlinked resource within the Severn Estuary and transport linkages poorly understood. The effects of sea level rise. Effect on wave action. Limited information on fisheries resources. Moderate coverage of physical data, with a good consensus.

Appendix - Table 3

SE 4 Severn Estuary Lower	**Wales and England**
Category	2 and 5 (with sensitive Welsh intertidal foreshore habitats)
Area	27,828 hectares
Class	Flood
Reason	Precautionary approach because of uncertainty about impacts on: European designated sites; System's response to sea level rise; Mid channel sandbanks, adjacent foreshore; Sediment transport to upstream Sediment Environments. Cumulative effects of dredging;
Regulators	Monmouthshire Council South Gloucestershire County Council City of Bristol Gloucester Harbour Trustees ODPM Welsh Assembly Government
Ownership	Main seabed owners Crown Estate and Swangrove Estate.
Resource	Large deposits of inter-tidal fine sands in Middle Grounds, Welsh Grounds and Bedwyn Sands, with medium sands in the deeper reaches. Denny Shoal grades from medium to fine sand from W to E. Deposits are generally sorted and well-separated from shoreline silts and muds, (Ref: GHT, BMAPA). Fine sediments may have coal associated (Ref:BCMA)
Commercial Interest	Proven commercially exploitable sand resources (Ref: GHT). Active production areas are Bedwyn Sands, Denny Shoal, Middle Ground, Cockburn Shoal. Bristol Deep is a former production area. Aggregate Production Applications for North Middle Ground, North Bristol Deep, Bedwyn Sands. (Ref: CE) Location not ideal for supply to South West Wales and shallow water depth limits extraction (Ref: BMAPA, Llanelli Sand Dredging).
Conceptual Sediment Transport	Transport upstream in flood direction by tidal asymmetry due to the shallow environment, with local medium and fine sand accumulations in offshore sediment sinks. Large volume banks constantly showing morphological change e.g. Middle Ground, Welsh Hook, Usk Patch (Ref: Llanelli Sand Dredging). Sand ribbons W of English Grounds (Ref:BCMA). High dispersion for muds. (RCL)
Features	Atlantic saltmeadows, Spartina stands, Salicornia and other pioneer species and areas of terrestrial shingle. Typical community on hard surfaces and intertidal mud and sand. Key part of Severn Estuary SPA supporting feeding grounds for nationally important waterfowl, e.g. Dunlin, Shelduck (Ref: CCW). Typical estuarine invertebrate communities including

	impoverished sand communities, Eurydice pulchra, Bathyporeia spp., intertidal muds with Neries diversicolor.
Designations	Severn Estuary pSAC, Severn Estuary SPA and Ramsar site, Severn Estuary SSSI (Ref: CCW, EA, EN).
Constraints	
Conservation	High risk of damage to pSAC, direct impact to intertidal or subtidal sandbanks, or reefs, and indirect impact to other features e.g. saltmarsh, migratory fish. Working against biodiversity. (Ref:CCW)
Navigation	Primary deep water navigation route to Newport, secondary navigation routes to MAFF licensed Newport dredge spoil disposal ground at Denny Island(Ref: ABP, CE). Anchorages (Ref: ABP).
Coastal protection	CIS shows little impact on the coast (Ref: BMAPA). Loss of saltmarsh or major changes to the foreshore or wave climate can result in changes to the effectiveness of the sea defences. Risk of changes to the wave climate as a result of morphological change.(Environment Agency Wales) High risk of increased flooding, requirement for coast defence upgrade and increased rate of saltmarsh erosion – proven history on Welsh shore (Ref: CCW, EA, EN). Ability to respond to removal by dredging or sea level rise constrained by flood defence embankments (Ref: CCW, EA, EN). Inhibition of natural system response to sea level rise. Medium to high risk of; damage during severe storms and to SSSIs (Ref: CCW).
Sediment supply	Sediments interlinked within the Severn Estuary system. Welsh Grounds and Middle Ground overly a buried palaeovalley and their southern flanks are unstable (Ref: BCMA)
Fisheries	Typical estuarine fisheries including numerous codling during winter. Migration route for salmon, eels and shad (Ref: Environment Agency Wales)
Archaeology	Coastal archaeological sites sensitive to erosion, charted wrecks.
Other	MOD Rogiet Moor range (Ref: BCMA Study). Newport dump site.
Likely Additional Conditions	Sand extraction must not interrupt sand transport from SE4 to SE3 (Ref: GHT). Monitoring saltmarsh rate of erosion, foreshore levels and composition. Annual estimate of commercially available resource. More stringent Dredging Conditions closer to foreshore.
Unknowns	Cumulative effects of multiple dredging permissions in SE Systems response to sea level rise

Appendix - Table 4

SE 6 Uskmouth	**Wales**
Category	3
Area	5532 hectares
Class	Sink, mud
Reason	Not favourable for dredging because of concern about potential impacts on: European designated sites; Saltmarsh erosion; System's response to sea level rise.
Regulators	Newport Welsh Assembly Government
Ownership	Crown Estate
Resource	Isolated area of sandwaves to N of Newport Deep.
Commercial Interest	Little aggregate resource of commercial interest. Coal was dredged for power stations (Ref: Llanelli Sand Dredging).
Conceptual Sediment Transport	Shallow inter-tidal area cut through by dredged channel into River Usk. Local sink for mud, movement of mud away from River Usk due to ebb dominant transport and fluvial transport. Links to SE4 and SE7.
Features	Atlantic saltmeadows and limited Spartina stands. Sabellaria alveolata reef subtidal at Uskmouth (Ref: CCW). Severn Estuary / Mor Harfen pSAC sandbanks including plains and slopes characterised by impoverished and biologically stressed communities (Ref: CCW). Areas of high concentrations of waterfowl, with internationally important numbers of dunlin, nationally important curlew, teal, mallard, oystercatches and pintail (Ref: CCW). Typical estuarine intertidal invertebrate communities including improverished sand communities (Bathyporeia spp.) intertidal muds (Neries diversicolor), muddy subtidal species (Nephtys hombergii). Coastal archaeological sites
Designations	Adjacent to River Usk cSAC Severn Estuary pSAC Severn Estuary SPA and Ramsar site. Severn Estuary SSSI Gwent Levels SSSI and wetland reserve.
Constraints	
Conservation	High risk of damage to pSAC features including saltmarsh erosion, and likely to work against biodiversity - aggregate extraction would reduce area of designated sandbank features and available habitat for impoverished fauna (Ref: CCW). Composition and height of foreshore critical for bird feeding areas and SPA interest. Any reductions in the area or quality of intertidal banks could significantly adversely affect the waterfowl feeding areas (Ref: CCW).

	Likely impact due to physical damage and interruption of supply of suspended sandy sediments to Sabellaria reefs (Ref: CCW).
Navigation	Limit of Port of Newport, primary deep water and secondary navigation routes to Newport (Ref: ABP).
Coastal protection	The removal of aggregates in conjunction with the constraints imposed by the coastal defences may limit the ability of the system to accommodate sea level rise. Flood defences protect former flood plain (Caldicot Levels) (Ref: BCMA). Saltmarsh and mudflats form an integral component of effective sea defences with proven history of erosion between Cardiff and Newport (Ref: CCW, EA). High risk of increased flooding, requiring coastal defence upgrade. Increased rate of saltmarsh erosion with damage during severe storms
Sediment supply	
Fisheries	Finfish netting and trawling area, with a tendency towards winter effort. Important recreational activity. Important spawning/juvenile areas for sole, overwintering codling (Ref: SWSFC). Trawling area for Cardiff and Swansea vessels.
Archaeology	charted wrecks (Ref: BCMA study).
Other	Area is of interest for offshore energy generation but is particularly sensitive.
Likely Additional Conditions	Better understanding of the linkages and exchanges between SEs. Seasonal and spatial restrictions to protect fisheries interest.
Unknowns	Limit of system response to sea level rise Complex sediment transport mechanisms throughout the estuary and poorly understood links with other SEs (Ref: EA). Moderate Physical coverage, moderate consensus.

Appendix - Table 5

SE 7 Cardiff Grounds	**Wales**
Category	2
Area	7,947 hectares
Class	Flood
Reason	Precautionary approach because of uncertainty about impacts on: European designated sites; Saltmarsh erosion, greater sensitivity nearer the coast; The interlinked sedimentary processes; The system's response to sea level rise; Other users of the seabed.
Regulators	Port of Cardiff City of Cardiff Welsh Assembly Government
Ownership	Crown Estate
Resource	Large accumulations of thick sediment generally medium sands, overlain with gravel sand mixtures. Contaminated with fines, gravel and coal (Ref: BMAPA, Llanelli Sand Dredging). Cardiff Grounds is the major sandbank, with sandwaves to N and W. Sediment thickness generally 5m; 10m over Cardiff Grounds (Ref:BCMA).
Commercial Interest	No immediate commercial interest to exploit the aggregates
Conceptual Sediment Transport	Flood dominant sand transport with up-estuary transport of sand from Flat Holm. Local circulation patterns around Cardiff Grounds indicated by seabed megaripples and sandwave asymmetry. (Ref: BMCA study, Llanelli Sand Dredging). Western limit associated with bedload parting zone.
Features	Nationally important numbers of shelduck and significant numbers of curlew, oystercatcher, dunlin, redshank and pintail (Ref: CCW). Typical sandy mud intertidal species, some areas of barren shingle and Fucus ceranoides on hard substrate. Subtidal hard surfaces with Sabellaria and subtidal sands with Eurydice pulchra (Ref: CCW). Large area of engineered hard coast (Ref: CCW, EA). Numerous coastal archaeological sites (Ref: BCMA study).
Designations	Severn Estuary pSAC Severn Estuary SPA, Severn Estuary SSSI and Ramsar, Taff-Ely SSSI, Lamby Saltmarsh SNCI (Ref: CCW, EA).
Constraints	
Conservation	High risk of working against biodiversity (Ref: CCW). Moderate to high risk of increased rate of saltmarsh erosion, damage to European site, damage to SSSIs and inhibition of natural system response to sea level rise (Ref: CCW).
Navigation	Limit of Port of Cardiff with maintained primary deep-water

	navigation channel. Secondary navigation routes to Newport (Ref: ABP). MAFF licensed dredging disposal site. Anchorages (Ref: ABP).
Coastal protection	Saltmarsh and mudflats form an integral component of effective sea defence structures in the area, loss of which could undermine sea defences. Proven erosion of saltmarsh between Cardiff and Newport (Ref: EA). The removal of aggregate could reduce ability of system to respond as constrained by coast defences. Moderate risk of increased flooding, with requirement to upgrade coast defences. Damage during severe storms (Ref: CCW).
Sediment supply	Likely impacts to other parts of the system (Ref: CCW).
Fishing	Finfish netting and trawling particularly in winter. Important spawning/nursery areas for sole and flounder. Typical estuarine fisheries interest including codling in winter. Recreation activity (Ref: SWSFC). Migration route for salmon, shad and eels. (Ref: Environment Agency Wales, SWSFC) Charter boats. Nursery: lemon sole, plaice, whiting. Spawning: Herring, lemon sole, plaice, sole, sprat.
Archaeology	
Other	Waste dump Cardiff Grounds
Likely Additional Conditions	Consider impact in adjacent SEs. Ensure dredge disposal sites do not affect potential aggregates resources. Sensitivity increases close to Cardiff coast. Consider seasonal restrictions to protect fisheries interest.
Unknowns	Interlinked nature of sedimentary system within the Severn Estuary not fully understood. Marine dredging could cause morphological change and affect wave climate (Ref: CCW, EA). Moderate physical coverage and moderate consensus.

A1.2. Inner Bristol Channel

The Inner Bristol Channel area contains six sediment environments, two of which are in England, two in Wales and two straddle the boundary (see **Maps 4 & 6**). Guidance is not provided for the two sediment environments exclusively in English waters.

Category	**Sediment Environments**
Category 1 - The Assembly will look favourably on dredging.	IBC 6,
Category 2 - The Assembly will adopt a precautionary approach.	IBC 2, IBC3
Category 3 - The Assembly is very unlikely to look favourably on dredging.	IBC 4.
Category 4 – The Assembly will adopt a favourable approach in consultations	IBC 6
Category 5 – The Assembly will adopt a precautionary approach in consultations	IBC2
Category 6 – The Assembly is very unlikely to look favourably in consultations	

IBC1 Bridgwater Bay

IBC2 Culver Sands

IBC3 Holm Sand

IBC4 Vale Coastline

IBC5 Minehead

IBC6 Bristol Channel (Inner)

Appendix - Table 6

SE IBC 2 Culver Sands	**Wales & England**
Category	**2 & 5**
Area	14,205 hectares
Class	Ebb
Reason	Precautionary approach because of uncertainty about impacts on: Nearby European designated sites; Physical processes in Bridgwater Bay; Sediments which may feed pSAC sandbanks and are unlikely to be replenished; Wave climate on the Somerset and Devon coasts.
Regulators	Welsh Assembly Government ODPM
Ownership	Crown Estate
Resource	Culver Sands is an extension of the Bridgwater Bay plateau. Thick medium sand forms the bank, with veneers of gravelly sand to N and S over bedrock and muddy sands to the E.
Commercial Interest	Culver Sands Licence 389 Prospecting Licence Culver Sand Extension (Ref: CE).
Conceptual Sediment Transport	Bedload parting zone with ebb transport and limited cover of sediment over bedrock. Rapid physical change in the form of the bank and channels. Sandbank topography changes significant, particularly during 1970's and 1980's (Ref: Llanelli Sand Dredging). Mobile sediment transport to the west on Culver does not supply the coast (Ref: BMAPA). Sediment source (Ref: RCL) Close relationship between Chilver Sand and Watchet and Minehead. Culver Sand has long been alleged to supply sand to Minehead. (Environment Agency Wales)
Features	Some trawling and sea angling activity (Ref: SWSFC). Sabellaria alveolata reef occurs unusually around Culver Sands, a UK biodiversity target species (Ref: CCW). Sandbanks are a feature of Severn Estuary/ Mor Harfen pSAC including topographical plains and slopes, also characterised by an impoverished and biologically stressed invertebrate community (Ref: CCW).
Designations	Partly within Severn Estuary pSAC Severn Estuary SSSI & Ramsar (Ref: CCW).
Constraints	None identified, assessed in CIS and EIA (Ref: BMAPA).
Conservation	Risk to Sabellaria, a reef building species being damaged by interruption of sand transport (Ref: CCW). Medium risk of damage to SSSI and inhibition of natural system response to sea level rise (Ref: CCW). Medium to high risk of working against biodiversity and damage to European site (Ref: CCW).
Navigation	

Coastal protection	Culver Sands may protect the Somerset and North Devon coast from wave action from NW, N and NE directions (Environment Agency Wales). Erosion sensitive coasts fronting the Somerset levels(Ref: RCL) The undefended dune system is eroding and foreshore levels are falling. (Ref: Port of Bridgwater) Risk of altered wave climate to Barnstaple Bay.
Sediment supply	Area within bedload parting zone, so removal of sand could have impacts for the supply of sand to other SEs (Ref: CCW). On same parting zone as IBC3, similar category. (Environment Agency Wales)
Fisheries	Spurdog
Archaeology	
Other	Cable route, Brean to Oxwich (both Mercury Communications) with 500m safety zone either side of the cables (Ref: CE).
Likely Additional Conditions	Monitor overall area and topographical change of sandbanks. Monitor impacts on wave action on the North Devon coast. Post extraction monitoring
Unknowns	Good coverage from Tidal Barrage studies. Poor consensus.

Appendix - Table 7

SE IBC 3 Holm Sand	**Wales**
Area	8972 hectares
Class	Ebb
Category	2 Cessation of marine dredging within is preferred.
Reason	Precautionary approach because of uncertainty about impacts on: Proposed European site, in particular the Sabellaria alveolata reefs; Lowering of the seabed identified by monitoring, possible effects on hydrodynamic regime.
Regulators	Welsh Assembly Government
Ownership	Crown Estate.
Resource	Generally a veneer of sediment 1 – 5m, but up to 9m coarse sand and gravel on Mackenzie Shoal and One Fathom Bank.
Commercial Interest	Holm Sands has an active production licence (Ref: CE). The licence has no time limit. Conditions include an annual bathymetric survey; no dredging four hours before to two hours after high water. Commercially exploitable resource is limited and contaminated with gravel and coal. Resource estimates need clarifying regarding gravel and coal content and commercial dredging capability (Ref: BMAPA). The quality and quantity of the resource in active production is reducing, with an increase in the gravel fraction, and the Licensees anticipate that it will be uneconomic in the near future. Consider use of gravel and coal fraction for coast protection, beach recharge, habitat restoration.
Conceptual Sediment Transport	Ebb dominant flow shown by bedform shapes and modelling, but contradicted by sediment trends analysis. Proximate to bedload parting zone. BGS data suggests flood dominance north of bank and ebb dominance south, some minor tidally driven replenishment on Mackenzie Shoal (Ref: Llanelli Sand Dredging). No obvious links to other SEs, generally coast parallel transport (Ref: BMAPA).
Features	Sabellaria alveolata reef in the area, a key UK biodiversity target species. (Ref: CCW). Sediment features of the Severn Estuary/ Mor Harfen Psac characterised by an impoverished and biologically stressed invertebrate community (Ref: CCW).
Designations	Severn Estuary pSAC, Severn Estuary SSSI.
Constraints	
Conservation	High risk of damage to European site (Ref: CCW). Risk to Sabellaria, a reef building species damaged directly or by interruption of sand transport (Ref: CCW). Medium to high risk of working against local biodiversity (Ref:

	CCW). Sediment features of Severn Estuary/ Mor Harfen pSAC are unlikely to be replenished, being in the bedload parting zone. (Ref: CCW). Medium risk of damage to SSSIs and inhibition of natural system to respond to sea level rise (Ref: CCW).
Navigation	Limit of the Port of Barry and anchorage at Flatholm (Ref: ABP).
Coastal protection	
Sediment supply	No obvious links to other SEs, generally coast parallel transport (Ref: BMAPA) Area in bedload parting zone, continued extraction will add to the loss of material from this area (Ref: CCW). Key transport route to Severn Estuary pSAC. Some minor tidal replenishment on Mackenzie Shoal. (Ref: LSD.)
Fisheries	Important spawning / juvenile areas for fish including sole. Some recreational activity (Ref: SWSFC). Key finfish netting and trawling area with tendency towards winter effort. Fisheries similarities with SE6 and SE7. Spurdog
Archaeology	Charted wreck (Ref: BCMA study).
Other	
Likely Additional Conditions	Monitoring of area and topography.
Unknowns	Data coverage good. Consensus moderate. Subtidal invertebrate communities on the bank have not been fully characterised. It is not known how significantly the substrate type, bank profile and topography have changed since the GV.

Appendix - Table 8

SE **IBC 4 Vale Coastline**	**Wales**
Area	3021 hectares
Class	Ebb and flood
Category	**3**
Reason	Not favourable for dredging because of concern about potential impacts on: Physically and environmentally sensitive coastline; Transport of sediment along the coast; Significant leisure and tourism use.
Regulators	Local Authority for foreshore to MLW. Welsh Assembly Government.
Ownership	Foreshore - variety of landowners. Crown Estate.
Resource	Predominantly bedrock with a veneer of sediment in some places. Limited medium sand deposits associated with Nash Sands and gravelly sand off Sully Island. Thin deposits around Lavernock Spit contaminated with coal (Ref: Llanelli Sand Dredging).
Commercial Interest	Little marine aggregate of commercial interest.
Conceptual Sediment Transport	Flood dominant during westerly wind and waves, ebb dominant residual transport during calm weather. Important in the transport of sediment into the Severn Estuary along the coast.
Features	Mainly exposed bedrock platforms and cliffs. Localised sand patches important for sand transport for Sabellaria (Ref: CCW). Coastal saline lagoons at Aberthaw power station a key UK biodiversity target habitat. Subtidal sands and gravels also listed in UK BAP including slope and plains (Ref: CCW). Sully Island foreshore important wader roost (Ref: CCW). Numerous coastal archaeological sites (Ref: BCMA study). Significant leisure and tourism use(Ref: SWSFC)
Designations	SSSIs – Penarth coast, Sully Island, Hayes Point to Benrick Rock, Barry Island, Cliff Wood to Golden Stairs, East Aberthaw Coast and Monknash Coast.
Constraints	
Conservation	Concern about loss of sandbank area and habitat by extraction (Ref: CCW). Potential for cliff erosion to affect East Aberthaw Coast, mainly a geological SSSI. Potential to affect wader roosts at Sully Island SSSI (Ref: CCW). Medium to high risk of damage to European site, SSSIs and

	inhibition of natural system to respond to sea level rise (Ref: CCW). Change likely to work against local biodiversity (Ref: CCW).
Navigation	Limit of Port of Barry (Ref: ABP).
Coastal protection	Sensitive coastline and potential coastal erosion and changes to sea defence characteristics as a result of interference with sediment transport (Ref: EA). Medium risk of requirement to upgrade coast defences, damage during severe storms. Ref: CCW)
Sediment supply	Evidence from BCMA study that this area may be sediment transport route to and from the Severn Estuary (Ref: EA).
Fisheries	Smoothhound
Archaeology	
Other	
Likely Additional Conditions	Monitoring of impact of extraction on cliff and island SSSIs. Monitoring of extent of sandbank features.
Unknowns	Moderate coverage from Severn Tidal Barrage studies. Consensus moderate. (BCMA) Complex sediment transport mechanisms throughout the estuary. Linkages within and between SEs are poorly understood. This leads to difficulty in evaluating potential impacts (Ref: EA).

Appendix - Table 9

SE **IBC 6 Bristol Channel Inner**	**Wales and England**
Category	1 and 4
Area	62,570 hectares
Class	Ebb
Reason	A favourable approach, but potential impacts include biodiversity.
Regulators	Welsh Assembly Government ODPM
Ownership	Crown Estate
Resource	Veneer of sediment, sandy gravel in Breaksea Valley. Area of sandwaves to Western limit of sediment environment. (Ref: BMAPA).
Commercial Interest	The commercial viability of marine aggregates in this SE has yet to be investigated by the industry. Economic feasibility of working in deeper water also needs to be established.
Conceptual Sediment Transport	In bedload parting zone with little sediment coverage over bedrock. Erosional environment with net ebb sand transport under all weather conditions contributing to the sand waves to the West. Paleovalleys e.g. Breaksea Valley filled with glacial till.
Features	Sabellaria alveolata present but not known to form reefs (Ref: CCW). Subtidal sands and gravels listed in UK BAP, Breaksea paleo-valleys filled with gravels. (Ref: CCW). Impoverished, reduced and biologically stressed fauna communities. (Ref: CCW).
Designations	
Constraints	
Conservation	Medium to high risk of change likely to work against local biodiversity (Ref: CCW). Medium risk of damage to European site and inhibition of natural system to respond to sea level rise (Ref: CCW).
Navigation	
Coastal protection	
Sediment supply	Generally within an erosional environment in deeper waters.
Fisheries	Some trawling and sea angling (Ref: SWSFC). Smoothound Nursery for plaice, sole and whiting Winter fishery for Minehead charter boats, all year fishery for Watchett boats.
Archaeology	
Other	Existing Cable Routes Brean to Oxwich, and PTAT (both Mercury Communications), 500m safety zone either side of the cables; TYCO TGN North Cable Route soon to be installed (Ref: Crown Estate). MAFF licensed dredge spoil disposal site on western boundary (Ref: ABP). A former sewage sludge disposal site, not used since

	1992 (Ref: CEFAS)
Likely Additional Conditions	Monitoring to identify distribution of Sabellaria.
Unknowns	Coverage poor, consensus good (BCMA)

Central Bristol Channel

The Central Bristol Channel area contains fourteen sediment environments, one of which is in England, twelve in Wales and one straddles the boundary (see **Maps 4 & 5**). Guidance is not provided for the sediment environment exclusively in English waters.

Category	**Sediment Environments**
Category 1 - The Assembly will look favourably on dredging	CBC 13.
Category 2 - The Assembly will adopt a precautionary approach	CBC 4, CBC 12.
Category 3 - The Assembly is very unlikely to look favourably on dredging	CBC 1,CBC 2, CBC 3, CBC 5, CBC 6, CBC 7, CBC 8, CBC 9, CBC 10, CBC 11.
Category 4 – The Assembly will adopt a favourable approach in consultations	
Category 5 – The Assembly will adopt a precautionary approach in consultations	
Category 6 – The Assembly is very unlikely to look favourably in consultations	

CBC1 Nash Sands
CBC2 Porthcawl
CBC3 Margam Burrows
CBC4 Scarweather and Kenfig Patches
CBC5 Swansae Bay (East)
CBC6 Neath Estuary
CBC7 Mumbles
CBC8 Swansea Bay (West)
CBC9 Caswell Bay
CBC10 Oxwich Bay
CBC11 Port-Eynon Bay
CBC12 White Oyster Ledge
CBC13 Bristol Channel (Central)
CBC14 North Devon Coast

Appendix - Table 10

SE **CBC 1 Nash Sands**	**Wales**
Area	7821 hectares
Class	Ebb and flood
Category	**3** – the current licence phases out dredging on Nash Bank by 2010.
Reason	Not favourable for dredging because of concern about potential impacts on: The volume of the Bank, which is reducing and has an unknown threshold of significant change; The important role of the Bank to coastal defence; The sensitive beaches and cliffs of the coastline; Commercial fishery and nursery areas.
Regulators	Welsh Assembly Government
Ownership	Crown Estate
Resource	A headland associated sandbank of medium sand, some 10km by 1km maximum, surrounded by sandy gravels.
Commercial Interest	Active Licensed Production area on Nash Bank is mainly medium sand with gravel and sandy gravel on flanks. Resources beyond the bank are mainly veneers on glacial sediment and bedrock (Ref: BMAPA). Shallow water depth will constrain dredging in other parts of SE. Nash Bank is a finite resource proven to be reducing in volume.
Conceptual Sediment Transport	Sandwave asymmetry indicates net easterly transport on north flank and net westerly on south flank, driven by local self-contained circulation around Nash Bank. Spring tides build bank crest. Crest levels limited by sediment availability and wave action.
Features	The bank fulfils an important coast defence function and is sensitive to storms and wave action. Reduced Spisula community on bank (Ref: CCW). The coastline incorporates the Porthcawl beaches(Ref: EA), Merthwyn Mawn Warren, Coastal footpath, designated historic landscape (Ref: Bridgend CBC).
Designations	Merthyr Mawr Warren SSSI, Kenfig cSAC, Dunraven cSAC (Ref: CCW). Kenfig NNR
Constraints	
Conservation	Concern that extraction could reduce area of subtidal sand and gravel habitat designated under CROW (Ref: CCW). Medium risk of; damage to coastal SSSIs and European site (Ref: CCW).
Navigation	
Coastal protection	EIA indicates an insignificant link between Nash Bank and the coast and few constraints (Ref: BMAPA). Nash Bank is a sea and coastal defence by offering protection from wave exposure. Sea and coastal defences leeward of bank

	dependant on foreshore morphology for effectiveness.(Ref: EA). Medium to high risk of damage during severe storms and risk of inhibition of natural system response to sea level rise (Ref: CCW). Maintenance of bank crest height and bank area necessary for coastal protection constrains the total amount that can be dredged, see assessment in CIS and EIA, (Ref: BMAPA, CCW).
Sediment supply	Long term extraction may affect sand supply to dunes at Merthyr Mawr cSAC (Ref: CCW); monitoring of beach levels has been undertaken over ten years and shows no evidence of a link(Ref: BMAPA)
Fisheries	The bank is an important area for commercial fish species and a nursery area. Fin fish on the bank and bank sides e.g. bass. Feeding and juvenile areas particularly for sandeels on eastern section (Ref: SWSFC). Dredging for oysters. Turbot nursery area.
Archaeology	
Other	
Likely Additional Conditions	Continued monitoring of any coastal impact on beach levels. Continued monitoring of the morphology, area and crest height of bank. Post extraction monitoring.
Unknowns	Significance of sediment transport pathways, although BMAPA consider that sediment transfer on the Bank is largely self-contained. Physical coverage good, consensus generally good. (Ref: BCMA)

Appendix - Table 11

CBC 2 Porthcawl	**Wales**
Area	2185 hectares
Class	Flood
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: European designated sites and adjacent SSSIs; Sediment movement through the SE and along the coast supplying sand to designated dune areas; The coastline, which is sensitive to erosion, saltmarsh erosion, coastal defence.
Regulators	Welsh Assembly Government Local authority areas on foreshore to MLW mark.
Ownership	Crown Estate
Resource	Sandy gravels.
Commercial Interest	Little aggregate of commercial interest
Conceptual Sediment Transport	Net easterly drift of sediment from conceptual model and sediment trends analysis. Beach level fluctuations in response to storms. Engineered coastal defences may influence littoral transport and beach levels (Ref: Llanelli Sand Dredging).
Features	Subtidal sands and gravels, sand dune areas, saltmarsh at Ogmore River, complex area of bedrock platforms, cliffs and sediment shores (Ref: CCW). Sandy tourism beaches e.g. Porthcawl, coastal footpath, and designated historic landscape (Ref: Bridgend CBC, EA). Tide station - Porthcawl
Designations	Kenfig NNR, cSAC, Merthyr Mawr Warren SSSI, Dunraven cSAC, Southerndown Coast SSSI, Monknash Coast SSSI (Ref: Bridgend CBC, CCW, EA). River Ogmore saltmarshes added to Kenfig cSAC as part of moderation process (Ref: CCW).
Constraints	
Conservation	High risk of damage to European site damage to SSSIs, change likely to work against local biodiversity and inhibition of natural system to sea level rise (Ref: CCW). Potential effect of marine dredging on sand supply to designated sand dunes systems which are sensitive to sea level rise (Ref: CCW), although there is no evidence of a linkage (Ref: BMAPA)
Navigation	
Coastal protection	Potential changes to the inshore wave climate as a result of offshore dredging may affect foreshore morphology and undermine sea and coastal defence structures (Ref: EA). Medium to high risk of; increased flooding, requirement of coastal defence upgrade, increased rate of saltmarsh erosion, damage during severe storms (Ref: CCW).
Sediment	

supply	
Fisheries interests	Key fisheries area for trawling and rod and line fishing. Some static gear (nets), potting for whelks, crab and lobster. Dredging for oyster (Ref: SWSFC).
Archaeology	Numerous coastal archaeological sites, some of which are susceptible to changes in erosion and accretion patterns (Ref: BCMA Study).
Other	
Likely Additional Conditions	
Unknowns	Limited subtidal invertebrate community information (Ref: CCW). Poor physical coverage, good consensus.

Appendix - Table 12

SE **CBC 3 Margam Barrows**	**Wales**
Area	1006 hectares
Class	Flood
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: European designated sites and adjacent SSSIs; Sediment movement through the SE and along the coast, supplying sand to designated dune areas; The long coastline, which is sensitive to erosion and flooding; Beach levels; Fisheries interests; Interaction between marine dredging and harbour and navigation channel dredging.
Regulators	Welsh Assembly Government Local authority areas on foreshore to MLW mark.
Ownership	Crown Estate
Resource	Fine sands cover the majority of the region, medium sands and sandy gravels offshore between Sker Point and Hutchwns Point.
Commercial Interest	Land based extraction from the dune system until early 1970 Public Enquiry decision. Marine gravelly sands and medium sands not a proven resource.
Conceptual Sediment Transport	Net littoral southerly (flood) direction towards Sker Point. Sker Point may deflect sediments offshore and aid development around Kenfig, Hugo and Scarweather.
Features	Sandy invertebrate communities, bedrock platforms and wide sediment shores (Ref: CCW). Primarily recreational beach area (Ref: EA).
Designations	Kenfig Pool and Dunes SSSI, part of Kenfig cSAC
Constraints	
Conservation	Kenfig Pool and Dunes SSSI, part of Kenfig cSAC, dunes susceptible to sea level rise. Designated sand dune systems dependent on supply of sand (Ref: CCW). Medium to high risk of; inhibition of natural system response to sea level rise and change likely to work against local biodiversity targets (Ref: CCW). Medium risk of damage to SSSIs.
Navigation	Limit of Port Talbot (Ref: ABP). Any interpretation of change is complicated by maintenance dredging and capital works associated with Port Talbot harbour (Ref: CCW).
Coastal protection	Dredging of foreshore sediments around the bay could lead to coastal erosion and loss of effectiveness of sea defences (Ref: EA) and falling beach levels with clay, peat and silt

	exposures (Ref: Llanelli Sand Dredging). High risk of increased flooding, requirement for coastal defence upgrade, damage during severe storms
Sediment supply	concerns raised about the effects of marine dredging on sediment movement through the SE and along the coast
Fisheries interests	Key demersal fisheries area for trawling and rod and line fishing. Some static gear (nets), potting for whelks, crabs, lobster. Limited brown shrimp beam trawling. Dredging for oyster (Ref: SWSFC).
Archaeology	Numerous coastal archaeological sites, some of which are susceptible to changes in erosion and accretion patterns (Ref: BCMA Study).
Other	
Likely Additional Conditions	
Unknowns	Limited data on understanding impacts of marine dredging of sand supply and invertebrate communities (Ref: CCW). Poor physical coverage, good consensus. (Ref:BCMA)

Appendix - Table 13

SE **CBC 4 Scarweather Sands and Kenfig Patches**	**Wales**
Area	8169 hectares
Class	Ebb and flood
Category	2
Reason	Precautionary approach because of uncertainty about impacts on: European designated sites and adjacent SSSIs; The coastline which is sensitive to erosion and flooding, coastal defence, damage during severe storms and the systems ability to respond to sea level change; Sediment movement between sandbanks and nearby beaches; Fisheries interests; Saltmarsh.
Regulators	Welsh Assembly Government
Ownership	Crown Estate
Resource	Veneers tend to be mixed and thin, overlying older sediment of unknown composition (Ref: Llanelli Sand Dredging). Three local sandbanks with thick deposits of medium and fine sand. Mainly gravelly sand and sandy gravel deposits which reach a maximum of 10m thick on Scarweather sands.
Commercial Interest	Large potential resource but not of proven commercial interest. Locally shallow water depths and resource quality limit commercial interest (Ref: BMAPA). Prospecting in 1970's showed fine sand deposits contaminated with gravel of limited commercial interest.
Conceptual Sediment Transport	Net westerly transport along southern flank of Scarweather Sands and easterly along northern flank as indicated by sandwave asymmetry and residual tidal circulation.
Features	Scarweather sandbank is a key habitat area for Spisula communities (Ref: CCW). Neighbouring beaches used for recreation and tourism (Ref: EA).
Designations	Kenfig Pool and Dunes SSSI, Kenfig cSAC.
Constraints	
Conservation	Concern about overall reduction in sandbank area and habitat availability (Ref: CCW). Medium risk of change likely to work against biodiversity targets (Ref: CCW).
Navigation	
Coastal protection	High risk of increased flooding (Ref: CCW). Medium to high risk of requirement for coastal defence upgrade, damage during severe storms, damage to European site and inhibition of natural response to sea level rise.
Sediment supply	Potential transport links of sand from offshore to beaches and designated dune areas (Ref: BMAPA, CCW).
Fisheries interests	Key area for finfish especially bass on banks and bank sides, feeding and juvenile areas. Limited interest in beam trawling for brown shrimp and for oysters. Due to previous level of disturbance by aggregate dredging fishing of less interest (Ref:

	SWSFC). Turbot nursery area.
Archaeology	
Other	Windfarm Risk of damage to beach morphology and effectiveness of coastal and sea defence and potential loss of amenity value of recreational beaches (Ref: EA). Scarweather Sands anemometer buried 7m under sandbank (Ref: CE).
Likely Additional Conditions	
Unknowns	Poorly understood sediment transport rates and directions along with weak understanding of the exchanges with offshore banks results in uncertainty with respect to impacts of potential extractions of foreshore morphology. Physical coverage and consensus moderate.

Appendix - Table 14

SE CBC 5 Swansea Bay East	**Wales**
Area	3402 hectares
Class	Sink (mud)
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: European designated sites and adjacent SSSIs; Sediment movement between sandbanks and nearby beaches; The coastline which is sensitive to erosion and flooding, coastal defence, damage during severe storms and the systems ability to respond to sea level change; Fisheries interests; Saltmarsh; Biodiversity.
Regulators	Welsh Assembly Government Port Talbot Harbour Neath Harbour
Ownership	Crown Estate
Resource	Occasional deposits of gravel and sandy gravel, generally muddy sand with some recirculation from Swansea Bay dredge spoil disposal ground (Ref: BCMA study).
Commercial Interest	Not a proven resource of commercial interest.
Conceptual Sediment Transport	Westerly storm activity drives sediment into the SE. Fine sand is then transported through CBC3, to the dune systems. Sink for fine sediment.
Features	Neighbouring beaches used for recreation and tourism (Ref: EA).
Designations	Adjacent to Kenfig cSAC and Crymlym Burrows SSSI sand dune system (Ref: CCW).
Constraints	
Conservation	Medium risk of damage to European site (Ref: CCW).
Navigation	Limit of Port Talbot and maintain navigation channel by dredging (Ref: ABP).
Coastal protection	Potential impacts to beach morphology in Swansea Bay, Porthcawl and potentially the Gower peninsula may threaten the effectiveness of coastal defences and amenity value (Ref: EA). Inhibition of natural system to sea level rise (Ref: CCW).
Sediment supply	Erosion of Crymlym Burrows dunes recently replenished with maintenance dredged arising from Port Talbot (Ref: CCW).
Fisheries interests	Key area for finfish such as cod and bass on banks and bank sides, important feeding and juvenile areas. Beam trawling for brown shrimp, limited lobster potting. Due to previous level of disturbance by aggregate dredging fishing of less interest (Ref: SWSFC).
Archaeology	

Other	
Likely Additional Conditions	Seasonal and spatial restrictions to avoid key fisheries juvenile areas.
Unknowns	Poorly understood sediment transport rates and directions along with weak understanding of the exchanges with offshore banks results in uncertainty with respect to impacts of potential extractions of foreshore morphology. Physical coverage and consensus moderate.

Appendix - Table 15

SE CBC 6 Neath Estuary	Wales
Area	880 hectares
Class	Sink (fine sand)
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: Crymlym Burrows Dunes SSSI; The coastline which is sensitive to erosion and flooding, coastal defence, damage during severe storms and the systems ability to respond to sea level change. Commercial fishery interest at mouth of the Estuary; Sediment transport along coast; Saltmarsh.
Regulators	Local authority areas on foreshore to MLW mark. Neath Harbour Port Talbot Harbour
Ownership	Crown Estate.
Resource	W half covered with muddy sand, E of river has fine sand deposits.
Commercial Interest	Fine sand resource, little commercial interest except for fill.
Conceptual Sediment Transport	Drift of fine material into estuary. Fine sand in intertidal area to the east. Storm induced turbidity and influx of fine sediment. Net northerly littoral drift of beach material away from Port Talbot.
Features	Crymlyn Burrows SSSI supports a noteworthy overwintering waterfowl population (Ref: CCW).
Designations	
Constraints	
Conservation	Medium to high risk of; damage during severe storms, change likely to work against local biodiversity and inhibition of natural system to respond to sea level rise (Ref: CCW). Crymlym Bogs cSAC may be affected by erosion and sea level rise in the long term, erosion may affect bird feeding and roosting areas (Ref: CCW).
Navigation	Limit of Port Talbot, dredged navigation channel maintained (Ref: ABP).
Coastal protection	Risk to effectiveness of coastal and sea defence within Swansea Bay and within river estuaries (Ref: EA). High risk of; flooding, requirement for coastal defence upgrade, increased rate of saltmarsh erosion and damage to SSSI (Ref: CCW).
Sediment supply	
Fisheries	Key area for finfish on banks and bank sides, feeding and

interests	juvenile areas. Occasional cockle fishery interest at mouth of Neath estuary. (Ref: SWSFC). Brown shrimp (BCMA)
Archaeology	Numerous coastal archaeological sites, some of which are susceptible to changes in erosion and accretion patterns (Ref: BCMA Study).
Other	
Likely Additional Conditions	Seasonal and spatial restrictions to protect fisheries interest.
Unknowns	Poorly understood sediment transport rates, directions, and the exchanges with offshore banks mean the impacts on foreshore morphology are uncertain. Physical coverage and consensus moderate.

Appendix - Table 16

SE CBC 7 Mumbles	Wales
Area	1035 hectares
Class	Sink (mud)
Category	3
Reason	Not favourable for dredging because of concern about potential about impacts on: The coastline, important for amenity and leisure, which is sensitive to erosion and flooding, coastal defence, damage during severe storms and the systems ability to respond to sea level change; SSSIs.
Regulators	Welsh Assembly Government Local authority areas on foreshore to MLW mark. Swansea Port
Ownership	Crown Estate
Resource	Muddy sands up to 10m thick.
Commercial Interest	No resource of commercial interest.
Conceptual Sediment Transport	Sediment sink for fine sediment with observed net littoral drift in an anti-clockwise direction towards Mumbles Head.
Features	Intertidal waterfowl feeding area with typical sandy and muddy intertidal communities (Ref: CCW).
Designations	Blackpill, Swansea SSSI
Constraints	
Conservation	High risk of damage to SSSI, and damage during severe storms, change likely to work against local biodiversity (Ref: CCW). Dredging may affect bird feeding area by altering foreshore morphology (Ref: CCW).
Navigation	Limit of Swansea Port navigation channel maintained by dredging, anchorage in lee of Mumbles Head (Ref: ABP).
Coastal protection	Medium to high risk of; increased flooding, requirement for coastal defence upgrade and inhibition of natural system to respond to sea level rise (Ref: CCW).
Sediment supply	
Fisheries interests	Key area for static gear for crustaceans on inshore grounds. Fishing for finfish. Shallow grounds on soft sediment are important nursery grounds (Ref: SWSFC).
Archaeology	Numerous coastal archaeological sites, some of which are susceptible to changes in erosion and accretion patterns (Ref: BCMA study).
Other	Neighbouring beaches used for recreation and tourism (Ref: EA).

Likely Additional Conditions	Seasonal and spatial restrictions to protect fisheries interest.
Unknowns	Physical coverage and consensus moderate.

Appendix - Table 17

SE CBC 8 Swansea Bay West	Wales
Area	3408 hectares
Class	Sink (gravels)
Category	3
Reason	Not favourable for dredging because of concern about potential about impacts on: Erosion and flooding, coastal defence, damage during severe storms and the systems ability to respond to sea level change; Sediment transport to adjacent beaches; SSSIs, particularly waterfowl feeding areas.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark. Swansea Port Neath Harbour
Ownership	Crown Estate
Resource	Potential resource of gravelly sand over half the area may be older Quaternary deposits that are poorly sorted and commercially non-viable. Fine and muddy sand elsewhere, thickness 2-10m.
Commercial Interest	
Conceptual Sediment Transport	Transfer of fine material to CBC7. Mainly a sink for coarser gravelly sands located north of the main tidal streams.
Features	Overwintering waterfowl populations in Blackpill, Swansea SSSI, important for feeding and roosting (Ref: CCW).
Designations	Adjacent to Blackpill Swansea SSSI and Crymlyn Burrows SSSI (Ref: CCW).
Constraints	
Conservation	Medium to high risk of damage to SSSI, damage during severe storms and inhibition of natural system to respond to sea level rise (Ref: CCW). Medium risk of inhibition of natural response to sea level rise and loss of waterfowl roosts (Ref: CCW).
Navigation	Limit of Port of Swansea, maintained navigation channel by dredging, MAFF licensed dredge spoil disposal ground (Ref: ABP).
Coastal protection	Medium to high risk of; increased flooding, requirement for coastal defence upgrade, (Ref: CCW)
Sediment supply	Concern that dredging would affect sediment transport to adjacent Blackpill, Swansea and Crymlyn Burrows SSSI including waterfowl feeding areas.
Fisheries interests	Rod and line fishing for bass and trawling for fin fish. Some static gear (nets). Pots for whelks. Dredging for oyster (Ref: SWSFC).
Archaeology	

Other	Potential site for offshore power generation.
Likely Additional Conditions	
Unknowns	Likely affect of dredging on sediment transport and nature conservation interests uncertain (Ref: CCW). Biological communities not fully mapped. Moderate physical coverage and consensus.

Appendix - Table 18

SE **CBC 9 Caswell Bay**	**Wales**
Area	564 hectares
Class	Sink (medium sand)
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: Geologically important SSSIs and limestone cliff cSAC sensitive to erosion; Flooding, coastal defence, damage during severe storms and the systems ability to respond to sea level change; Sediment transport to adjacent amenity and tourism beaches.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark.
Ownership	Crown Estate
Resource	Bays act as sinks for medium sand, waves drive sand into foreshore. Thin veneers of sediment may overly older deposits.
Commercial Interest	Limited potential - medium sand resource of little interest to industry.
Conceptual Sediment Transport	
Features	Limited sandy invertebrate communities in Caswell Bay (Ref: CCW). Key amenity and tourism area (Ref: EA). Small sandy embayments. Tide station - Mumbles
Designations	Caswell Bay SSSI, Bracelet Bay SSSI, Limestone Coast SW Wales cSAC of mainly geological importance including limestone cliffs (Ref: CCW). Pwll-Du Head and Bishopston Valley SSSI Gower AONB
Constraints	
Conservation	High risk of; damage during severe storms, inhibition of natural system to respond to sea level rise and change likely to work against local biodiversity (Ref: CCW).
Navigation	
Coastal protection	Potential impacts to beach morphology in Swansea Bay, Porthcawl and potentially Gower may threaten the effectiveness of coastal and sea defences (Ref: EA). Dredging may cause beach erosion and increased erosion of limestone cliffs and damage to amenity beaches (Ref: CCW, EA). Medium risk of flooding, requirement for coastal defence upgrade and damage to SSSIs (Ref: CCW).
Sediment supply	
Fisheries interests	Static gear for crustaceans on inshore grounds. Key area for bass. Shallow grounds on soft sediment are nursery grounds

	(Ref: SWSFC).
Archaeology	Numerous coastal archaeological sites, some of which are susceptible to changes in erosion and accretion patterns (Ref: BCMA study).
Other	
Additional Conditions	
Unknowns	Poorly understood sediment transport rates and directions along with weak understanding of the exchanges with offshore banks results in uncertainty with respect to impacts of potential extractions of foreshore morphology. Invertebrate communities not characterised (Ref: CCW). Poor physical coverage, moderate consensus.

Appendix - Table 19

SE **CBC 10 Oxwich Bay**	**Wales**
Area	1751 hectares
Class	Sink (fine sand)
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: Geologically important SSSIs and limestone cliff cSAC sensitive to erosion; Flooding, coastal defence, damage during severe storms and the systems ability to respond to sea level change; Carmarthen Bay cSAC Sediment transport to adjacent amenity and tourism beaches.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark.
Ownership	Crown Estate
Resource	Fine sands surround a central zone of muddy sand. Medium sands dominate below 10m isobath.
Commercial Interest	Potential medium sand resource of little commercial interest.
Conceptual Sediment Transport	Sink for fine sands. Muddy sands swept into central portion of bay by local anti-clockwise residual circulation. Medium sands dominate below 10m isobath.
Features	Oxwich Bay is a geological review site, sand dunes and subtidal sandy invertebrate communities (CCW).
Designations	Oxwich Bay NNR and SSSI, Pwll Ddu Head SSSI, Minchin Hole SSSSI. Adjacent to Carmarthen Bay and Estuaries cSAC (Ref: CCW). Gower AONB
Constraints	
Conservation	Geomorphologically sensitive environment. Sand dunes dependent on continued sand supply (Ref: CCW). High risk of; damage during severe storms and damage to SSSI (Ref: CCW). change likely to work against local biodiversity and risk of inhibition to natural system response to sea level rise (Ref: CCW). medium risk of damage to European site (Ref: CCW).
Navigation	
Coastal protection	Risk to dune/ Lagoon system at Oxwich (Ref: EA). Risk to effectiveness of coastal and sea defence (Ref: EA). Medium to high risk of; increased flooding, requirement for coastal defence upgrade,
Sediment supply	
Fisheries	Static gear for crustaceans on inshore grounds, fishing for bass.

interests	Shallow grounds on soft sediment are nursery grounds (Ref: SWSFC). Brown shrimp, crab and lobster.
Archaeology	Numerous coastal archaeological sites, some of which are susceptible to changes in erosion and accretion patterns (Ref: BCMA study).
Other	Existing Cable Routes Brean to Oxwich, Gemini North, and TAT11 (all Mercury Communications) 500m safety zone either side of the cables (Ref: CE). Loss of amenity of beach as a result of direct extraction from beach and adjacent area (Ref: EA).
Likely Additional Conditions	
Unknowns	Poorly understood sediment transport rates and directions along with weak understanding of the exchanges with offshore banks results in uncertainty with respect to impacts of potential extractions of foreshore morphology (Ref: EA). Effects of sand dredging on supply to sand dunes not clear (Ref: CCW). Moderate consensus and coverage on physical information.

Appendix - Table 20

SE CBC 11 Port-Eynon Bay	**Wales**
Area	670 hectares
Class	Ebb and flood
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: Geologically important SSSIs and limestone cliff cSAC sensitive to erosion; Flooding, coastal defence, damage during severe storms and the systems ability to respond to sea level change; Carmarthen Bay cSAC; Sediment transport to adjacent amenity and tourism beaches, which show variable exposures of Holocene peat and clay. Biodiversity.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark.
Ownership	Crown Estate
Resource	Thin veneers of sediment overly older Holocene sediments Mainly intertidal medium sand.
Commercial Interest	Intertidal sand of little commercial interest.
Conceptual Sediment Transport	Sediment trend analysis indicates sand transport pathway around in an anticlockwise direction into main offshore ebb-dominant paths. SE is to the east of OBC 11 from which it receives sediment in the shallow area and recirculates material back into deeper water assisting with a clockwise circulation around Helwick Bank. Beach is fairly mobile responding to both ebb and flood transport and winter storms.
Features	Sand and boulder shore with Holocene deposits including peat exposed and eroding (Ref: CCW). Sabellaria alveolata binds sand together and is a key species listed in the UK BAP (Ref: CCW).
Designations	Limestone Coast of South Wales cSAC, Carmarthen Bay and Estuaries cSAC, Gower Coast Rhossilli to Port Eynon SSSI. Gower AONB
Constraints	
Conservation	Medium to high risk of; damage during severe storms, damage to European site, damage to SSSI, change likely to work against local biodiversity and risk of inhibition to natural system response to sea level rise (Ref: CCW).
Navigation	
Coastal protection	Risk to effectiveness of coastal defence. Potential loss of amenity of beach as a result of extraction from adjacent offshore area (Ref: EA). Medium risk of requirement to upgrade coastal defences (Ref: CCW).
Sediment	

supply	
Fisheries interests	Static gear for crustaceans on inshore grounds. Fishing for bass. Shallow grounds on soft sediment are nursery grounds (Ref: SWSFC). Crab and lobster.
Archaeology	Numerous coastal archaeological sites, some of which are susceptible to changes in erosion and accretion patterns (Ref: BCMA study).
Other	Beach is a key area for tourism and recreation, high landscape value (Ref: CCW, EA). Existing Cable Routes Solas (Cable and Wireless), TAT11 (Mercury Communications), 500m safety zone either side of the cables (Ref: CE).
Likely Additional Conditions	Beach monitoring.
Unknowns	Poorly understood sediment transport rates and directions along with weak understanding of the exchanges with offshore banks results in uncertainty with respect to impacts of potential extractions of foreshore morphology. Difficulty in differentiating between natural and human-induced change (Ref: CCW). Good physical coverage and consensus.

Appendix - Table 21

SE CBC 12 White Oyster Ledge	Wales
Area	14,845 hectares
Class	Ebb and flood
Category	2
Reason	Precautionary approach because of uncertainty about impacts on: Geologically important SSSIs and limestone cliff cSAC sensitive to erosion; Flooding, coastal defence, damage during severe storms and the systems ability to respond to sea level change; Carmarthen Bay cSAC; Sediment transport to adjacent amenity and tourism beaches, which show variable exposures of Holocene peat and clay. Biodiversity and subtidal biology; Sediment transport linkages and exchanges.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark.
Ownership	Crown Estate
Resource	Sandy gravel, gravelly sand and medium sand. Large potential medium sand to sandy gravel resource up to 10m deep on Mixon Shoal.
Commercial Interest	Resource quality not proven (Ref: BMAPA).
Conceptual Sediment Transport	Storm transport of sediment through the SE into the Severn Estuary. During storm events SE provides main route for sediments entering Swansea Bay.
Features	
Designations	Adjacent to Carmarthen Bay and Estuaries cSAC, several coastal SSSIs and Limestone Coast of South Wales cSAC (Ref: CCW).
Constraints	
Conservation	Medium to high risk of damage to European site (Ref: CCW). Medium risk of; damage during severe storms, damage to SSSI, change likely to work against local biodiversity and risk of inhibition to natural system response to sea level rise (Ref: CCW).
Navigation	Primary deep water navigation route to Swansea and Port Talbot, MAFF licensed dredging disposal ground (Ref: ABP).
Coastal protection	Concern about effect of marine dredging adjacent to Oxwich Bay and coast and sea defences (Ref: EA, CCW). Nearshore coastal sensitivity, further offshore fewer constraints (Ref: BMAPA.
Sediment supply	
Fisheries interests	Trawling for finfish and rod and line for finfish. Some static gear (nets). Potting for whelks, crabs and lobsters, dredging for oyster

	(Ref: SWSFC). Brown shrimp.
Archaeology	
Other	Existing Cable Routes Brean to Oxwich, Gemini North, and TAT11 (all Mercury Communications), 500m safety zone either side of the cables (Ref: CE). Solas. Swansea Bay outer dump site.
Likely Additional Conditions	Near to the coast will require strict conditions including monitoring coastal change and impact.
Unknowns	Poorly understood sediment transport rates and directions along with weak understanding of the exchanges with offshore banks results in uncertainty with respect to impacts of potential extractions of foreshore morphology (Ref: EA). Little information to monitor impacts on subtidal biology (Ref: CCW). Moderate physical coverage and moderate consensus.

Appendix - Table 22

SE CBC 13 Bristol Channel Central	**Wales**
Area	61,655 hectares
Class	Ebb
Category	1
Reason	A favourable approach to this large offshore SE, but potential impacts include: Important fisheries hotspots around sandwaves and wrecks. Transport linkages, particularly during storms, between SE and Helwick Bank.
Regulators	Welsh Assembly Government ODPM Local Authority areas on foreshore to MLW mark.
Ownership	Crown Estate
Resource	A thin cover of coarse sediment, sandy gravel, gravel and gravelly sand, generally less than 1m thick.
Commercial Interest	Sandy gravel that in most areas is a thin veneer that is commercially non-viable. Greater commercial potential in sandwave areas. Deep water (30-40mCD) beyond capability of many UK dredgers, wave climate exposure, remote location for some wharves. Quantity and quality of resource is not proven. Economic feasibility of offshore dredging to be assessed (Ref: BMAPA).
Conceptual Sediment Transport	Links to CBC 1, Nash Sands with an extension of north-south flow traverse sandwaves off West Nash and sequence of east-west flow parallel sand ribbons. Intervening seabed between the Bank and this SE predominantly bedrock (Ref: BCMA) Also links to IBC 6 Inner Bristol Channel in a transition from gravel to bedrock towards the coastal process divide. Net ebb sand transport (westerly), no flood reversal during westerly storm events leads to removal of sediment from Inner Bristol Channel.
Features	Limited sediment veneers may be important for sustaining Sabellaria reefs (Ref: CCW).
Designations	
Constraints	
Conservation	Medium to high risk of change likely to work against biodiversity (Ref: CCW). Biological resource not seen as a constraint apart from localised areas of Sabellaria (Ref: CCW). Potential sensitivity of deeper water biological communities (Ref: BMAPA)
Navigation	
Coastal protection	
Sediment supply	
Fisheries interests	Key fishing area of activity trawling, angling and netting. Bigger visiting beam trawlers in outer reaches of OBC10. Inshore

	trawlers (Devon and South Wales) CBC13. Sand waves and wrecks hold valuable species such as bass, turbot and cod (Ref: SWSFC). Nursery ground for lemon sole, plaice, ray, sole, whiting. Spawning ground for lemon sole.
Archaeology	Bristol Channel and Oxwich wrecks
Other	MAFF licensed maintenance dredging disposal sites (Ref: ABP). Existing Cable Routes Brean to Oxwich, PTAT, Gemini North, and TAT11 (all Mercury Communications), 500m safety zone either side of the cables. TYCO TGN North Cable Route (Ref: CE). C+W Swansea – Brean, Solas. 3 Bristol channel dump sites.
Likely Additional Conditions	Care should be taken to minimise extraction around fishing hotspots including wrecks and areas of sandwaves. Pursue a safeguarding policy around identified key fisheries hotspots.
Unknowns	Knowledge of exchange between offshore and coast is likely to be relatively small (Ref: EA). Limited biological information available (Ref: CCW). Moderate physical coverage and good consensus.

Outer Bristol Channel

The Outer Bristol Channel area contains twenty-one sediment environments, nine of which are in England, eleven in Wales and one straddles the boundary (see **Maps 4 & 5**).

Category	Sediment Environments
Category 1 - The Assembly will look favourably on dredging for marine aggregates in sediment environments where few constraints have been identified.	OBC 10.
Category 2 - The Assembly will adopt a precautionary approach to policy until research and monitoring can reduce uncertainty of the actual or potential effects of marine dredging to acceptable levels.	OBC 11, OBC 19, OBC 20 and OBC 21.
Category 3 - The Assembly is very unlikely to look favourably on dredging for marine aggregates due to significance of constraints identified.	OBC 12, OBC 13, OBC 14, OBC 15, OBC 16, OBC 17 and OBC 18.
Category 4 – The Assembly will adopt a favourable approach in consultations	

OBC1	Morte Bay and Croyde Bay
OBC2	Saunton Sands
OBC3	Taw/Torridge Estuary
OBC4	Westward Ho!
OBC5	Barnstaple Bay (Inner)
OBC6	Clovelly
OBC7	Barnstaple Bay (Central)
OBC8	Barnstaple Bay (Outer)
OBC9	Lundy Island
OBC10	Bristol Channel (Outer)
OBC11	Helwick
OBC12	Worms Head
OBC13	Rhossilli Bay
OBC14	Carmarthen Bay (East)
OBC15	Burry Inlet
OBC16	Afon Taf/Tywi
OBC17	Carmarthen Bay (Inner)
OBC18	Saundersfoot Bay
OBC19	Carmarthen Bay (Outer)
OBC20	St Govans Head
OBC21	Turbot Bank

Appendix - Table 23

SE OBC 10 Bristol Channel Outer	**Wales**
Area	135,477 hectares
Class	Ebb
Category	1 or 4
Reason	A favourable approach to this large offshore SE, but potential impacts include: Important fisheries hotspots around sandwaves and wrecks. MOD activity.
Regulators	Welsh Assembly Government ODPM
Ownership	Crown Estate
Resource	Potential gravelly resource up to 15m thick. Medium sand in N to sandy gravel in mid and S areas. A major sandwave field, highest crests 15m. Stanley Bank. Aggregate GV applications for North Outer Bristol Channel NOBEL Banks to dredge 300,000 tonnes a year for 15 years and West Outer Bristol Channel to dredge up to 1.8 million tonnes (possibly 3 million tonnes per year) for 15 years.
Commercial Interest	Water depth in excess of 30 metres and gravel contamination of sandy resources would require on-board screening with potential for sterilisation of resources when returned to the seabed. Exposure to wave action (Ref: BMAPA, Llanelli Sand Dredging).
Conceptual Sediment Transport	Net westerly (ebb dominated) pathway identified by modelling and sandwave topography. No storm reversal of transport. Source of sediment CBC13.
Features	Range of macrofaunal communities including Abra and Modiolis (Ref: BCMA Study). Archaeology.
Designations	
Constraints	
Conservation	Moderate risk of change working against local biodiversity (Ref: CCW). But see unknowns.
Navigation	
Coastal protection	
Sediment supply	Sediment transport offshore to the West (Ref: BMAPA, EA).
Fisheries interests	Key area for finfish by inshore trawling, angling and netting. Whelk fishery Bigger visiting beam trawlers in outer reaches of OBC10. Hotspots e.g. sand waves, wrecks - hold bass, turbot and cod (Ref: SWSFC). Tope. Shark (June – August) Nursery: Lemon sole, plaice, whiting Spawning: Lemon sole, plaice, sole, sprat.
Archaeology	Charted wrecks. (Ref: BCMA Study).

Other	Existing Cable Routes PTAT, Gemini North, and TAT11 (all Mercury Communications) and Cable Route Solas (Cable and Wireless). TYCO Atlantic, TYCO Portugal; 500m safety zone either side of the cables (Ref: CE). Edge of MOD Manobier firing range (Ref: BCMA Study).
Likely Additional Conditions	Temporal and seasonal restrictions to protect fisheries interest especially in identified hotspots.
Unknowns	Environmental status and sensitivity of subtidal fauna not documented (Ref: BMAPA, CCW). Physical coverage moderate, consensus good.

Appendix - Table 24

SE OBC 11 Helwick	**Wales**
Area	10,659 hectares
Class	Ebb and flood
Category	2
Reason	Precautionary approach because of uncertainty about impacts on: Sediment transport linkages and exchanges between bank and adjacent coast, which has significant amenity and leisure interest; Helwick Bank which is the subtidal sandbank feature in the cSAC; Important fishery area especially for commercial species such as bass. Sandeels.
Regulators	Welsh Assembly Government
Ownership	Crown Estate
Resource	Mainly well sorted fine and medium sand on top of bank, shelly and gravelly on flanks (Ref: Llanelli Sand Dredging).
Commercial Interest	Existing Licence on Helwick Bank to take up to 107,000 tonnes per year to October 2005. Application for uplift and extension on Helwick to take 300,000 tonnes a year for 15 years. Area remote from many wharves, wave climate and exposure, sand quality, environmental issues (Ref: BMAPA).
Conceptual Sediment Transport	Sediment trends analysis and modelling suggests a westerly direction of transport along the southern flank. Potential for reversal during westerly storms with a net movement to the east from the bank to Port-Eynon. Off western tip of Helwick Bank a gyre of sand transport develops in accordance with residual flows (Ref: BCMA Study). North Bank some easterly movement towards Port-Eynon evidenced by tracer studies. Bank is prone to large fluctuations during severe winter storms (Ref: Llanelli Sand Dredging).
Features	,Helwick Bank is part of the designated sandbank topographical features of plains and slopes for the cSAC. Infauna reduced and characterised by Spisula community (Ref: CCW). Limited numbers of overwintering common scoter (Ref: CCW)
Designations	Carmarthen Bay and Estuaries cSAC (Ref: CCW)
Constraints	
Conservation	High risk of damage to European site (Ref: CCW). Medium to high risk of; damage during severe storms, damage to SSSIs, change likely to work against local biodiversity and inhibition of natural system response to sea level rise (Ref: CCW).
Navigation	
Coastal	Bank fulfils a coastal defence function (Ref: EA). Medium risk of

protection	coast defence upgrade (Ref: CCW).
Sediment supply	
Fisheries interests	Key area for finfish on banks and bank sides. Feeding and juvenile areas especially bass and sandeels on eastern section (Ref: SWSFC). Whelks
Archaeology	
Other	Recreational beaches along adjacent coastline (Ref: EA).
Likely Additional Conditions	Better definition of rates of sediment transport linkages and exchanges with the beach. Long term beach monitoring. Spatial restrictions to maximise distance of extraction from coast.
Unknowns	Strength of the potential linkages and exchanges between bank and neighbouring foreshores remains uncertain. Potential changes in wave climate may affect beaches with a potential loss of recreational value and possible undermining of coastal defences (Ref: EA). Good physical coverage.

Appendix - Table 25

SE OBC 12 Worms Head	**Wales**
Area	2057 hectares
Class	Flood
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: Carmarthen Bay and Estuaries cSAC; Carmarthen Bay SPA and RAMSAR feeding areas of Common Scoter duck; SSSI; Coastal defence, damage during severe storms and the systems ability to respond to sea level change; Sediment transport between sandwave features and the adjacent Helwick Bank; Biodiversity.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark.
Ownership	Crown Estate Foreshore in private ownership.
Resource	Sandwave fields associated with Helwick up to 5m thick with a resource of medium sand.
Commercial Interest	Sandwave fields may have significant resources of commercial interest.
Conceptual Sediment Transport	Net sand transport is south-east and parallel to coast. Process magnified during westerly storms.
Features	Worms Head is associated with a range of sandbank features (Ref: CCW). Extensive intertidal bedrock platforms, topographical plains and slopes of designated sandbanks listed in UK BAP with Tellina (Fabula) Venus and reduced Spisula communities (Ref: CCW).
Designations	Carmarthen Bay and Estuaries cSAC, Carmarthen Bay SPA (Ref: CCW). Rhosilli Bay is a GCR site
Constraints	
Conservation	High risk of damage to European site (Ref: CCW). Medium to high risk of damage to SSSI, change likely to work against local biodiversity and inhibition of natural system response to sea level rise (Ref: CCW). Sensitivity of common scoter feeding areas, shallow sandy bivalve communities (Ref: CCW).
Navigation	
Coastal protection	Recreational beaches in lee of bank, foreshore provides coast protection (Ref: EA). Medium to high risk of requirement for

	coastal defence upgrade, Medium risk of damage during severe storms.
Sediment supply	
Fisheries interests	Static gear for crustaceans on inshore grounds. Crab and lobster. Fishing for finfish. Drift netting cod and ray (BCMA) Shallow grounds on soft sediment are important nursery areas (Ref: SWSFC). Bass dependent on sandbanks for lifecycle (Ref: CCW, SWSFC).
Archaeology	Numerous coastal archaeological sites (Ref: BCMA Study).
Other	Within MOD Pendine and Pembrey firing ranges (Ref: BCMA Study).
Likely Additional Conditions	Monitoring sediment transport linkages and exchanges with Helwick Bank.
Unknowns	Strength of the potential linkages and exchanges between bank and neighbouring foreshores remains uncertain. Potential changes in wave climate may affect beaches with a potential loss of recreational value and possible undermining of coastal defences (Ref: EA). Good physical coverage and consensus.

Appendix - Table 26

SE OBC 13 Rhosilli Bay	Wales
Area	4467 hectares
Class	Flood
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: Carmarthen Bay and Estuaries cSAC, including subtidal banks and sandwaves; Carmarthen Dunes cSAC; Common scoter feeding areas; Commercial fish species; Rhosilli Bay GCR; Biodiversity; Natural system response to sea level rise; Wave climate.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark.
Ownership	Crown Estate Foreshore in private ownership.
Resource	Fine sands in deeper water.
Commercial Interest	
Conceptual Sediment Transport	Net littoral drift along foreshore is south to north dominated by wave action form the south-west. Local circulation system in Rhosilli Bay. Anti-clockwise gyre in bay then taken up by strong flood tidal race towards Worms Head OBC 12.
Features	Sand dunes and GCR site for Quaternary deposits, extensive areas of bedrock platforms in small bays with specialised invertebrate communities in caves and overhangs. Extensive intertidal sand banks with invertebrate communities including amphipods and polychaetes e.g. Pendine Sands. Subtidal sandbanks part of cSAC designated topographical features with Tellina (Fabula) Venus and reduced Spisula communities (Ref: CCW). Common scoter is a protected duck species that feeds on benthic communities in Rhosilli Bay area (EU Birds Directive and Schedule 1 of WL&C Act (1981)) Numerous coastal archaeological sites (Ref: BCMA Study).
Designations	Carmarthen Bay and Estuaries cSAC, Carmarthen Dunes cSAC, Carmarthen Bay SPA, Rhosilli Downs SSSIs (Ref: CCW).
Constraints	
Conservation	Rhosilli Bay GCR site is sensitive to changes in erosion (Ref: CCW). High risk of damage to European site (Ref: CCW). Medium to high risk of damage during severe storms, damage to SSSIs, change likely to work against local biodiversity and inhibition of natural system response to sea level rise (Ref:

	CCW).
Navigation	
Coastal protection	Some neighbouring beaches also provide protection to coastal defences. Potential losses from change to sediment supply or wave climates. Shallow nature of deposits makes local morphological change more likely (Ref: EA). Medium risk of requirement for coast defence upgrade and potential impacts from extraction in adjacent Helwick sediment environment (Ref: CCW).
Sediment supply	
Fisheries interests	Nursery ground for demersal finfish. Commercial trawling, netting, rod and line, whelk potting. The Shellfish (Specified Sea Area) (Prohibition of Fishing Methods) (Wales) Order 2003 controls hydraulic dredging for bivalves. Sandbanks important in life cycle of fish species such as bass (Ref: CCW, SWSFC) Anchor netting ray, spider crabs, spur dog, whelk. (BCMA)
Archaeology	
Other	Fine and medium sands mainly on recreation beaches (Ref: EA). Pendine Ranges.
Likely Additional Conditions	
Unknowns	Potential link between offshore areas and neighbouring foreshores. Moderate physical coverage, good consensus.

Appendix - Table 27

SE OBC 14 Carmarthen Bay East	**Wales**
Area	19,576 hectares
Class	Sink (fine sand)
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: Carmarthen Bay and Estuaries cSAC, including subtidal banks and sandwaves; Carmarthen Bay SPA and common scoter feeding areas; Carmarthen Dunes cSAC and sand transport to dunes; Commercial fish species and fish life cycles; Rhosilli Bay GCR; Biodiversity; Natural system response to sea level rise; Wave climate. Sensitivity decreases along south western boundary of SE.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark.
Ownership	Crown Estate Foreshore in private ownership.
Resource	Fine sand sink in shallower water. Medium sand resources to S and on southern tip of Pembrey Sands. Changeable steep sided sandbanks.
Commercial Interest	Commercial potential of very fine sand low but medium sand may be available (Ref: Llanelli Sand Dredging). Wave exposure and distance from SE Wales wharves (Ref: BMAPA).
Conceptual Sediment Transport	Fine sand mobilised only during westerly storms. Net easterly transport path and developed via a clockwise circulation through the Bay, especially during spring tides.
Features	Extensive intertidal sand banks with invertebrate communities including amphipods and polychaetes e.g. Pendine Sands. Subtidal sandbanks part of cSAC designated topographical features with Tellina (Fabula) Venus and reduced Spisula communities (Ref: CCW). Common scoter is a protected duck species that feeds on benthic communities in Rhosilli Bay area (EU Birds Directive and Schedule 1 of WL&C Act (1981)). Numerous coastal archaeological sites (Ref: BCMA Study).
Designations	Carmarthen Bay and Estuaries cSAC, Carmarthen Dunes cSAC, Whiteford NNR, Carmarthen Bay SPA, Broughton Bay and Pembrey Coast SSSIs (Ref: CCW). Sand dunes and GCR site for Quaternary deposits.
Constraints	
Conservation	Numerous sensitive shoreline habitats including designated

	sand dunes systems. (Ref: CCW) Concern that marine dredging could reduce total area of subtidal sandbanks and habitat availability including food availability for common scoter (Ref: CCW). High risk of damage to European site and change likely to work against local biodiversity (Ref: CCW). Medium to high risk of damage during severe storms and inhibition of natural system response to sea level rise and risk of damage to SSSIs (Ref: CCW).
Navigation	
Coastal protection	Medium risk of increased flooding, requirement for coast defence upgrade, increased rate of saltmarsh erosion (Ref: CCW).
Sediment supply	Sediment environment adjacent to Burry Inlet and could affect sand transport.
Fisheries interests	Nursery ground for demersal finfish. Commercial trawling, netting, rod and line, whelk potting. (Ref: SWSFC).The Shellfish (Specified Sea Area) (Prohibition of Fishing Methods) (Wales) Order 2003 controls hydraulic dredging for bivalves.
Archaeology	
Other	MOD Firing ranges (Ref: BCMA Study). Pembrey.
Likely Additional Conditions	
Unknowns	Good physical coverage and moderate consensus.

Appendix - Table 28

SE OBC 15 Burry Inlet	**Wales**
Area	4715 hectares
Class	Sink (fine sand)
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: Carmarthen Bay and Estuaries cSAC, including subtidal banks and sandwaves; Carmarthen Bay SPA including Burry Inlet SPA, and common scoter feeding areas; Carmarthen Dunes cSAC and sand transport to dunes; Commercial fish species, fish nursery area and life cycles; Saltmarsh; Rhosilli Bay GCR; Biodiversity; Coastal defence and natural system response to sea level rise; Wave climate; Sensitive estuary an important overwintering site for waterfowl.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark.
Ownership	Crown Estate Foreshore in private ownership.
Resource	Llanrhidian and Cefn Padrig sands contain finer silts and muds.
Commercial Interest	Commercial potential of aggregate low.
Conceptual Sediment Transport	Local sink for fine sands and mud. Westerly waves drive materials into Carmarthen Bay.
Features	Extensive intertidal sandbanks with invertebrate communities backed by saltmarsh, Zostera eelgrass beds a key BAP species. Cockle beds, rare invertebrate Ophelia present e.g. at Llanridian Sands and Northern shore of Burry Inlet. Subtidal sandbanks part of cSAC designated topographical features with Tellina (Fabula) Venus and reduced Spisula communities (Ref: CCW). SPA provides overwintering habitat for 40,000 waterfowl including pintail, shoveler, oystercatcher and knot. Coastal archaeological sites (Ref: BCMA Study).
Designations	Carmarthen Bay and Estuaries cSAC, Carmarthen Dunes cSAC, Carmarthen Bay SPA, Burry Inlet SPA and Ramsar, Burry Inlet and Loughor estuary SSSI Cwm Ivy Marsh Dunes and Tor SSSI (Ref: CCW). Gower AONB, Saltmarshes and estuary designated a GCR site.
Constraints	

Conservation	Key area of sensitive shoreline habitats including designated sand dunes systems. Concern that marine dredging could reduce total area of intertidal banks and affect saltmarsh, highly vulnerable shoreline (Ref: CCW). Risk of damage to European sites. Change likely to work against biodiversity. Inhibition of natural system response to sea level rise. Medium to high risk of damage to SSSIs (Ref: CCW). Burry Inlet is a highly sensitive environment.
Navigation	
Coastal protection	High risk of flooding, requirement for coastal defence upgrade, increased rate of saltmarsh erosion, Medium risk of damage during severe storms (Ref: CCW).
Sediment supply	
Fisheries interests	Key estuarial regulated cockle and mussel fishery and important nursery area (Ref: SWSFC). Nursery: plaice, sole, whiting Whelks, ray, spider crabs, spurdog.
Archaeology	
Other	
Likely Additional Conditions	
Unknowns	Moderate physical coverage, moderate consensus.

Appendix - Table 29

SE OBC 16 Afon Taf / Twyi	**Wales**
Area	1,662 hectares
Class	Sink (fine sand)
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: Carmarthen Bay and Estuaries cSAC, including subtidal banks and sandwaves; Carmarthen Bay SPA including Burry Inlet SPA, and common scoter feeding areas; Carmarthen Dunes cSAC and sand transport to dunes; Commercial fish species, fish nursery area and life cycles; Saltmarsh; Rhosilli Bay GCR; Biodiversity; Coastal defence and natural system response to sea level rise; Wave climate; Sensitive estuaries important sites for birds.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark
Ownership	Crown Estate Foreshore in private ownership.
Resource	Fine sands, silts and muds.
Commercial Interest	Little commercial interest in fine sands in sandbar and sandbank features at estuary mouth.
Conceptual Sediment Transport	Sink for sand. Fluvial transport of muddy material from Taf and Twyi. Fine sands of marine origin.
Features	Extensive intertidal sandbanks with invertebrate communities backed by saltmarsh. Mouths of estuaries comprise complex series of sandbanks and bars. Salmon Point Scar consists of cobbles, gravel, muddy sand and dense mussel beds. Shingle banks within SSSI and Afon Tywi are UK's most important site for Little Ringer Plover. Estuary overwintering habitat for common sandpiper, mute swan and a sand martin breeding site (Ref: CCW). Coastal archaeological sites (Ref: BCMA Study).
Designations	Carmarthen Bay and Estuaries cSAC, Carmarthen Dunes cSAC, Carmarthen Bay SPA, Craig Ddu Wharley Point Cliffs, Laugharne and Pendine Burrows SSSIs (Ref: CCW). Afon Tywi and Aber Taf SSSIs, Saltmarshes and estuary designated a GCR site.
Constraints	
Conservation	Concern that marine dredging could reduce total area of

	intertidal banks and highly vulnerable shoreline (Ref: CCW). High risk of increased rate of saltmarsh erosion, damage to European site and change likely to work against Local biodiversity and inhibition of natural system response to sea level rise and damage to SSSIs (Ref: CCW). Medium to high risk of damage during severe storms (Ref: CCW).
Navigation	
Coastal protection	High risk of flooding, coastal defence upgrade, inhibition of natural system response to sea level rise (Ref: CCW).
Sediment supply	
Fisheries interests	Nursery ground for demersal finfish. Commercial trawling, netting, rod and line, whelk potting. The Shellfish (Specified Sea Area) (Prohibition of Fishing Methods) (Wales) Order 2003 controls hydraulic dredging for bivalves. Regulated cockle fishery (Ref: SWSFC).
Archaeology	
Other	Within MOD Pendine and Pembrey firing ranges (Ref: BCMA Study).
Likely Additional Conditions	
Unknowns	Poor physical coverage, moderate consensus.

Appendix - Table 30

SE OBC 17 Carmarthen Bay Inner	**Wales**
Area	11,968 hectares
Class	Sink (fine sand)
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: Carmarthen Bay and Estuaries cSAC, including subtidal banks and sandwaves; Carmarthen Bay SPA including Burry Inlet SPA, and common scoter feeding areas; Carmarthen Dunes cSAC and sand transport to dunes; Commercial fish species, fish nursery area and life cycles; Biodiversity; Coastal defence and natural system response to sea level rise; Wave climate.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark
Ownership	Crown Estate Foreshore in private ownership.
Resource	Sand up to 5m thick with significant resource of medium sand S of 10m isobar, 8-13m depth.
Commercial Interest	
Conceptual Sediment Transport	Area acts as a sink or fine sands. Clockwise circulation helps sediment enter bay. Mobile sand banks and bars.
Features	Extensive intertidal sandbanks with invertebrate communities backed by saltmarsh. Nationally rare intertidal mollusc present on Walney Island shore (Paludinella sp.). Complex series of sandbanks, sandflats and sandbars. Subtidal sandbanks part of cSAC designated topographical features with Tellina (Fabula) Venus and reduced Spisula communities (Ref: CCW). Important feeding area for common scoter. Numerous coastal archaeological sites (Ref: BCMA Study). Tide station – Tenby.
Designations	Carmarthen Bay and Estuaries cSAC; Carmarthen Dunes cSAC; Carmarthen Bay SPA; Arfordir Pen-Bre SSSI; Saltmarshes and estuary designated a GCR site for coastal morphology.
Constraints	
Conservation	Carmarthen Sand dunes cSAC already showing signs of

	erosion which could be exacerbated by marine dredging (Ref: CCW). Key area of sensitive shoreline habitats including designated sand dunes systems. Concern that marine dredging could reduce total area of subtidal sandbanks and habitat availability including food availability for common scoter (Ref: CCW). High risk of damage to European site and change likely to work against biodiversity. Medium to high risk of increased saltmarsh erosion, damage during severe storms and inhibition of natural system response to sea level rise (Ref: CCW). Medium risk of damage to SSSIs (Ref: CCW).
Navigation	
Coastal protection	High risk of increased flooding, requirement for coast defence upgrade. (Ref: CCW).
Sediment supply	
Fisheries interests	Whelks, Beach netting mixed demersal. Crabs. Charter boat fishery.
Archaeology	
Other	Within MOD Pendine and Pembrey firing ranges (Ref: BCMA Study).
Likely Additional Conditions	
Unknowns	

Appendix - Table 31

SE OBC18 Saundersfoot Bay	**Wales**
Area	6505 hectares
Class	Sink (fine sand)
Category	3
Reason	Not favourable for dredging because of concern about potential impacts on: Carmarthen Bay and Estuaries cSAC subtidal banks, sandwaves and invertebrate communities; Carmarthen Bay SPA and common scoter feeding areas; Sensitive coastline of Carmarthen Dunes cSAC and SSSIs; Commercial fishing and fish life cycles; Biodiversity; Coastal defence, response to sea level rise and sensitivity to storms.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark
Ownership	Crown Estate Foreshore in private ownership.
Resource	Fine sands up to 14m deep towards deeper water, very fine with mud towards the beach. (Ref: BCMA)
Commercial Interest	Areas of sand resource unproven.
Conceptual Sediment Transport	Transport to the south round the bay, cross shore from beach to deeper water and a net easterly drift towards Pendine Sands. Strong tidal residual transport to the south.
Features	Extensive areas of low rocky cliffs, bedrock platforms and rockpools with specialised communities e.g. St Catherine's Islands. Marros Sands has extensive areas of peat and clay exposures with boring bivalve communities (Piddock). Complex series of shallow inlets and bays. Subtidal sand and gravel listed as BAP habitats. Subtidal sandbanks part of cSAC designated topographical features with Tellina (Fabula) Venus and reduced Spisula communities. Important feeding area for overwintering common scoter (Ref: CCW). Numerous coastal archaeological sites (Ref: BCMA Study).
Designations	Carmarthen Bay and Estuaries cSAC; Carmarthen Dunes cSAC; Carmarthen Bay SPA; SSSIs include Amroth to Wiseman's Bridge Cliffs, Lydstep Head to Tenby Burrows, Marros to Pendine Coast, St Margaret's Island, Tenby Cliffs and St Catherine's Island, Watermynch Bay to Saundersfoot Harbour; Saltmarshes and estuary designated a GCR site for coastal morphology.
Constraints	

Conservation	Common scoter relies on shallow subtidal sand communities for feeding areas (Ref: CCW). Medium to high risk of: increased flooding, damage to SSSIs, change likely to work against Local biodiversity, (Ref: CCW).
Navigation	
Coastal protection	High risk of requirement for coast defence upgrade, damage during severe storms, and inhibition of natural system response to sea level rise (Ref: CCW)
Sediment supply	Area adjacent to sensitive shorelines for erosion e.g. Tenby Burrows showing signs of erosion. Sensitivity of sand dunes at Pendine Burrows to interruptions to sand transport. (Ref: CCW)
Fisheries interests	Nursery ground for demersal finfish. Commercial trawling, netting, rod and line, whelk potting. Interest in hydraulic dredging for bivalves. Access via Tenby, Saundersfoot (Ref: SWSFC). Charter boat fishery. Mackrel
Archaeology	
Other	Within MOD Pendine firing ranges (Ref: BCMA Study).
Likely Additional Conditions	
Unknowns	

Appendix - Table 32

SE OBC 19 Carmarthen Bay South	Wales
Area	42,171 hectares
Class	Ebb and flood
Category	2 with increasing sensitivity towards the coast
Reason	Precautionary approach because of uncertainty about impacts on: Carmarthen Bay and Estuaries cSAC and Carmarthen Bay SPA ; High sensitivity of adjacent foreshore, coastline and cliffs; Sediment transport into Carmarthen Bay; The SE is large and diverse - coastal constraints decrease with distance offshore but offshore environment not well known.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark
Ownership	Crown Estate Foreshore in private ownership.
Resource	Medium sand, fine sand and sandy gravel below 30m isobath.
Commercial Interest	Existing Aggregate Prospecting Licence (commencing 01/04/01), North Outer Bristol Channel (Ref: CE). Exposure to wave climate, remote from many wharves, deep water, quality of resource and environmental status unknown (Ref: BMAPA).
Conceptual Sediment Transport	Net westerly trend of sediment transport during tidal conditions, reversing under westerly storm conditions. Sediment brought into the SE from outside the bay via a clockwise circulation. St Govan's Head sediment transport divide.
Features	Area of important limestone cliffs, and outcrops with caves, overhangs, small bays and rock pools. Nationally rare communities near Stackpole Quay (e.g. burrowing anemone Halcampoides sp., carnivorous sea slugs). Internationally important numbers of common scoter overwinter in the area (20,000). A bivalve population that is the scoter's main prey has only recently recovered from oil spill damage (Ref: CCW). Numerous coastal archaeological sites (Ref: BCMA Study).
Designations	Carmarthen Bay and Estuaries cSAC; Carmarthen Bay SPA.
Constraints	
Conservation	Medium to high risk of damage during severe storms, damage to European site and to SSSIs, change likely to work against biodiversity and inhibition of natural system response to sea level rise (Ref: CCW).
Navigation	
Coastal protection	Medium risk of coast defence upgrade and increased flooding (Ref: CCW).
Sediment supply	

Fisheries interests	Crustacean fisheries inshore on hard ground. Demersal trawling, netting and whelk potting on soft ground. Nursery ground for juvenile demersal finfish. (Ref: SWSFC). Charter boat fishery; Anchor netting ray, spider crab, spurdog, lobster. Bass.
Archaeology	
Other	Within MOD Pendine, Manobier, Penally, Castlemartin East and Castlemartin West firing ranges (Ref: BCMA Study).
Likely Additional Conditions	Monitoring effects of dredging on foreshore, limestone cliff erosion and sensitive subtidal communities. Monitoring the effects of transport processes (waves and tidal) into Carmarthen Bay.
Unknowns	Likely effect on sensitive subtidal communities is uncertain.

Appendix - Table 33

SE OBC 20 St Govan's Head	**Wales**
Area	15,070 hectares
Class	Ebb and flood
Category	2 with increasing sensitivity towards coast.
Reason	Precautionary approach because of uncertainty about impacts on: Carmarthen Bay and Estuaries cSAC and Carmarthen Bay SPA ; High sensitivity of adjacent foreshore, coastline and cliffs; Sediment transport into Carmarthen Bay; The SE is large and diverse - coastal constraints decrease with distance offshore but offshore environment not well known. Significant MOD activity.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark
Ownership	Crown Estate Foreshore in private ownership.
Resource	Fine, medium sand and gravelly sands mainly associated with sandbanks.
Commercial Interest	Exposure to wave climate, remote from many wharves, quality of resource and environmental status unknown (BMAPA).
Conceptual Sediment Transport	Main route for sediment input to the system from Celtic Sea during westerly storm events. Material, mainly fine sand, appears to cross the SE with sand becoming trapped in Carmarthen Bay.
Features	Mainly an area of exposed steep cliffs, limestone outcrops, overhangs, caves and small embayments. Open coast rocky platforms with typical rocky shore communities (Ref: CCW). Sandbanks are dynamic and a feature of the cSAC. Important reef areas and reef biotopes (Ref: CCW). Numerous coastal archaeological sites (Ref: BCMA Study). St Govan met buoy.
Designations	Pembrokeshire Marine cSAC; Limestone Coast of South Wales cSAC.
Constraints	Greater sensitivity and conditions in the nearshore environment, possibly less sensitive offshore (Ref: BMAPA).
Conservation	High risk of damage to European site (Ref: CCW). Medium to high risk of damage to SSSIs and change likely to work against biodiversity (Ref: CCW). Long-term duration activities could adversely affect capacity of communities to regenerate, interrupt sediment transport processes. Sufficient habitat area and biological capital will need to be safeguarded (Ref: CCW).
Navigation	
Coastal protection	Medium risk of inhibition of natural system response to sea level rise and damage during severe storms (Ref: CCW).
Sediment supply	Area important for littoral transport of sediment into Carmarthen Bay, sandbanks are dynamic.
Fisheries	Crustacean fisheries on hard ground. Fin Fish on bank systems

interests	and adjoining soft ground. Static and mobile gear methods. Close proximity to Milford fishing port (Ref: SWSFC).
Archaeology	
Other	Within MOD Manobier, Castlemartin East and Castlemartin West firing ranges (Ref: BCMA Study).
Likely Additional Conditions	Potential spatial restrictions to protect sensitive habitats. Monitor sediment transport into system from Celtic Sea. Monitoring effects of dredging on foreshore, limestone cliff erosion.
Unknowns	Little information of the invertebrate communities on the mobile sandbanks (Ref: CCW).

Appendix - Table 34

SE OBC 21 Turbot Bank	**Wales**
Area	6357 hectares
Class	Ebb and flood
Category	2
Reason	Precautionary approach because of uncertainty about impacts on: Pembrokeshire Marine cSAC and adjacent Carmarthen Bay and Estuaries cSAC; Sensitivity of coastline and cliffs; Port-related and MOD activity. Subtidal communities, including Turbot Bank invertebrate and fisheries; Biodiversity.
Regulators	Welsh Assembly Government Local Authority areas on foreshore to MLW mark Milford Haven
Ownership	Crown Estate Foreshore in private ownership.
Resource	Gravelly sand with fine sand on Turbot Bank.
Commercial Interest	Remote from many wharves, resource quality unproven (Ref: BMAPA). Commercial viability of resource on Turbot Bank unproven. Potential resource estimated on bank, but may be hard feature i.e. raised rock of Quaternary feature covered with a thin veneer of sediment (Ref: Llanelli Sand Dredging).
Conceptual Sediment Transport	Net north-westerly (ebb) trend observed during tidal only conditions. Reversing under westerly storm events to become net flood transport. Dispersion and north westerly transport of sediment confirmed by studies of MAFF dredging disposal site (Ref: CCW).
Features	Mainly an area of exposed steep cliffs, limestone outcrops, overhangs, caves and small embayments. Open coast rocky platforms with typical rocky shore communities (Ref: CCW). Sandbanks and gravel topographical features of plains and slopes designated in Turbot Bank area. Numerous coastal archaeological sites (Ref: BCMA Study).
Designations	Pembrokeshire Marine cSAC, Brownslade and Limney Burrows SSSI, Broomhill Burrows SSSI.
Constraints	Increasing sensitivity towards the designated cliffs.
Conservation	High risk of damage to European site (Ref: CCW). Sensitive sand dune systems (Ref: CCW). Pembrokeshire Marine cSAC has important subtidal reef communities and features, which may be sensitive to dredging sediment plumes (Ref: CCW). Medium to high risk of damage to SSSIs, damage during severe storms, change likely to work against biodiversity and inhibition of natural system response to sea level rise (Ref: CCW). Long term duration activities could

	adversely affect capacity of communities to regenerate, need to ensure sufficient habitat area and biological capital remains to allow regeneration (Ref: CCW).
Navigation	Milford Haven primary navigation channel and within Port limit. Milford Haven MAFF licensed maintenance dredge disposal site (Ref: BCMA Study)
Coastal protection	Medium risk of coast defence upgrade (Ref: CCW).
Sediment supply	
Fisheries interests	Crustacean fisheries on hard ground. Crab and lobster. Fin Fish on bank systems and adjoining soft ground. Static and mobile gear methods. Close proximity to Milford fishing port (Ref: SWSFC).
Archaeology	
Other	Within MOD Manobier, Castlemartin East and Castlemartin West firing ranges (Ref: BCMA Study). Important relationship with Milford Haven port and oil terminal and the estuarine system (Ref: BCMA study). Milford Haven dump site.
Likely Additional Conditions	Limits to the area of sandbank taken so as not to disrupt invertebrate community regeneration at end of operations. Spatial and temporal restrictions to protect fisheries interest on banks and sensitive subtidal communities. Baseline and annual monitoring of Turbot Bank invertebrate and fisheries interests.
Unknowns	Poor knowledge of invertebrate sandbank communities e.g. Turbot Bank.

ANNEX 3

Guidance on Environmental Impact Assessment in Relation to Marine Minerals Dredging Applications

From Marine Mineral Guidance 1 : Extraction by dredging from the English seabed

Introduction

A1. The extraction of marine minerals has the potential to impact unacceptably on the coastal environment, commercial fisheries, marine ecosystems, navigational routes, wrecks and other archaeological remains and other uses of the sea. It is therefore important that dredging is only undertaken at locations and in ways that do not have unacceptable impacts.

A2. As indicated, an Environmental Impact Assessment (EIA) is already required for every GV application and it is likely to be a requirement for all applications for new Dredging Permissions. The applicant will therefore need to show that a full EIA has been undertaken by preparing and submitting an Environmental Statement (ES) as part of the application process. This should include such of the information set out in Part I of Schedule 4 of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (which will also apply to the forthcoming statutory system) as is reasonably required to assess the environmental effects of the relevant project and which the applicant can reasonably be required to compile, having regard in particular to current knowledge and methods of assessment. However, it must include at least the information set out in Part II of Schedule 4. The text of Parts I and II are reproduced in Box 2.

A3. Guidance on the procedural steps to be taken when preparing an ES will be explained in separate guidance to be published in due course. The following text provides guidance on issues that should be considered when assessing the environmental effects of the proposed project. It is in four sections:

- Description of the proposed activity and environment
- Assessment of the potential effects of the dredging activity
- Measures to avoid, reduce or remedy significant adverse effects
- Monitoring of environmental effects

Box 2: Schedule 4 To The Town And Country Planning (Environmental Impact Assessment) (England And Wales) Regulations 1999
Information Referred To In The Definition Of Environmental Statement

Part I
1. Description of the project, including in particular -
(a) a description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases;

(b) a description of the main characteristics of the production processes, for instance nature and quantity of the materials used;

(c) an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed project.

2. An outline of the main alternatives studied by the applicant and an indication of the main reasons for his choice, taking into account the environmental effects.

3. A description of the aspects of the environment likely to be significantly affected by the proposed project including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.

4. A description of the likely significant effects of the proposed project on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project, resulting from:

(a) the existence of the project;

(b) the use of natural resources;

(c) the emission of pollutants, the creation of nuisances and the elimination of waste, and a description by the applicant of the forecasting methods used to assess the effects on the environment.

5. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.

6. A non-technical summary of the information provided under paragraphs 1 to 5 of this Part.

7. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information.

Part II

1. A description of the project.

2. A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects.

3. The data required to identify and assess the main effects which the project is likely to have on the environment.

4. An outline of the main alternatives studied by the applicant and an indication of the main reasons for his choice, taking into account the environmental effects.

5. A non-technical summary of the information provided under paragraphs 1 to 4 of this Part

Description Of The Proposed Activity And Environment

Description of the proposed activity

A4. The following issues should be covered:

- the location of the proposed dredging area should be specified by a list of chart co-ordinates together with a map showing its location in relation to the surrounding sea area, other dredging areas and adjacent coastlines.
- the size of the area specified in square kilometres;
- the total volume of material to be extracted together with an indication of the maximum depth to which material will be removed;
- a description of the material to be extracted including the particle size distribution of the material found within the proposed dredging area. This should be presented as the percentage of gravel, sand and finer material, at representative locations within and adjacent to the application area;
- the type of dredgers to be used (e.g. trailing suction hopper dredger), together with details of the vessels' load capacity, overflow arrangements and operating methods. It should be made clear whether on-board screening (i.e. rejection of particular size fractions) is to be used, and the likely nature and quantity of material to be returned to the seabed as a result of screening;
- the proposed annual extraction rate and the predicted lifetime of the deposit;
- estimates of the likely number of shipping movements on an annual, and where appropriate, seasonal basis, and the number of vessels likely to be operating within the area at any one time. The routes likely to be taken by dredgers to and from the application area should also be specified;
- details of proposed operational control procedures to ensure that dredging only takes place in the permitted area and that interference with other uses of the sea is minimised both within and outside the proposed extraction area. Applicants should consider appropriate notification and liaison arrangements with other relevant users of the sea (e.g. fishermen) to ensure harmonious working relationships between the different parties;
- the need to exploit the resources in question through careful, comparative consideration of local, regional and national need for the material in relation to the identified impacts of the proposal and the relative environmental and social costs of provision from other marine and terrestrial sources.

Description of the physical nature of the seabed

A5. The physical aspects that should be considered include:

- a description of the geology and geomorphology of the application area and its surrounds, including the nearby coast, indicating where possible, its recent evolution;
- bathymetry of the seabed in the area proposed for dredging together with a surrounding strip of at least 1km outside;

- assessment of the hydrodynamics of the general area including tidal regime, wave conditions and residual water movements. Notable features on the seabed and indicators of tidal current strength and direction should be identified. Assessment of the mobility of the seabed and sediment transport pathways should be based on direct observations, numerical modelling, or inferred from bedform asymmetry and type;
- the characteristics of seabed sediments in and around the site should be identified using side-scan sonar, shallow seismic and grab sample data. The mineral resource characteristics including particle size and lithology, origin and composition, thickness, and nature of underlying deposits should be identified;
- a baseline assessment should be undertaken of water quality in the area prior to dredging. This should include an assessment of suspended sediment load and, where appropriate, any chemical contamination. An indication of seasonal variability may also be appropriate.

Description of the biological status of the proposed area

A6. A benthic survey of invertebrate fauna and flora should be undertaken by properly qualified and experienced personnel. The sampling strategy, including the number of sampling stations, the method used to collect samples and the method of sorting and recording should be agreed beforehand with NAW, and CCW where conservation interests are concerned. Further guidance on appropriate procedures for undertaking benthic surveys has been produced by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) on behalf of the Secretary of State (DTLR, 2002).

The ES should provide the following:

- a summary of the techniques used, and records of all species identified and their abundance at each sampling station;
- a description of the benthic communities present within and adjacent to the application area. This should include evaluation of the typical assemblages of species, covering diversity, abundance, extent, species richness, representativeness, naturalness, rarity and fragility in and around the proposed dredging area;
- an indication of the sensitivities of particular habitats and species, for example *Sabellaria* reefs, or *Modiolus* beds;
- an assessment of known predator-prey relationships, and measures of abundance of dominant species likely to be influenced by dredging, including temporal and spatial population dynamics of the benthic assemblages.

A7. The ES should also include an assessment of the importance of the general area for fisheries, sea birds, marine mammals and other large mobile species such as sharks. Effort should focus on species that require a specific sediment type or habitat for use, for example, when feeding, or burying or depositing eggs. In view of the variability in the distribution of fisheries, seabirds, marine mammals and other large mobile species, the applicant is encouraged to seek the most recent sources of

information from CCW, Joint Nature Conservation Commitee, WAG and other appropriate experts. The ES should describe:

- the seasonal use of the area for feeding and overwintering by adults;
- any migration routes that may pass through or near the site;
- the location and importance of spawning and breeding grounds; and
- the extent to which the area includes nurseries occupied by juveniles.

Other uses of the sea

A8. There are many legitimate uses of the sea. It is important that dredging does not cause unacceptable disturbance to them. The ES should identify the extent to which the following activities may be affected by dredging.

(a) Commercial fishing activity.

- The ES should include an overall assessment of the nature and level of commercial fishing activity in the vicinity of the application area. This should be obtained by consultation with fishermen and fishermen's organisations at all ports likely to be affected, and analysis of published statistics on fish landings from the vicinity of the proposed dredging site and from the surrounding region.

The ES should provide information on the following:

- the recent and current numbers of vessels operating out of all the ports in the vicinity that are likely to be affected, and whether they are active for part or all of the year. It should indicate the seasonal fishing patterns of these vessels, their normal range and the size of the area they normally visit, together with a description of the fishing methods used and the species landed. In addition to providing valuable background information, this will also identify the most appropriate points for fisheries liaison, and likely sources of direct conflict, for example the need to allow adequate time for removal of fixed gear in advance of any dredging operation;
- the quantity and value of fish and shellfish landings by these fisheries, by port of landing and by season/year. Data should refer to each fleet that occupies the application area for part or all of the year. These data should describe the landings of each species, and any seasonal trends. Since published statistics are normally too general, data should be obtained from fishermen's logbooks, liaison with WAG/ DEFRA Fisheries Officers and local Sea Fisheries Committees. Special fisheries intensity studies should be undertaken by fisheries experts. Statistics should, wherever possible, cover a period before dredging starts to provide a baseline. Natural fluctuations in fish and shellfish populations from year to year mean that, a number of years of pre-dredging data are beneficial;
- an evaluation of the commercial impact of the proposed dredging programme on these fisheries. This can be done by comparing the geographical area of the proposed application with the total size of the area in which each fleet normally fish. The nominal 'resource value' of the application can be estimated from the value of the fishery and the

proportion of the area that is likely to be affected by the application. This method assumes that resources are evenly distributed throughout the area, so care must be taken to include only those areas which fishermen normally visit. More sophisticated methods, which describe the fine scale distribution of fishing vessels can be used. This will give an indication of the relative contribution that the application area makes to the total catch, and therefore gives some indication of the commercial value of the application area for fishing:

(b) other dredging activities in the area;

(c) waste disposal operations (by dumping or pipeline) in the region;

(d) offshore oil and gas activities which might impact on, or limit, dredging;

(e) wrecks and other archaeological remains;

(f) war graves;

(g) shipping and navigational hazards;

(h) location of military exercise areas;

(i) location and magnitude of recreational activities such as yachting, angling and scuba diving;

(j) location of pipelines, cables and other such features;

(k) location of nearby nationally and internationally designated conservation areas (e.g. Marine Nature Reserves, Marine Protection Areas SSSIs, SACs, SPAs and Ramsar sites) and National Parks, Heritage Coast and Areas of Outstanding Natural Beauty.

Assessment of the Potential Effects of the Dredging Activity

A9. When evaluating the potential effects of the proposed dredging programme the ES should identify and quantify the consequences of the proposal on the environment, fisheries and other uses of the sea. Ideally, this should be summarised as an impact hypothesis, drawing on the results of earlier studies. The assessment of some of the potential impacts will require predictive techniques, and it may be necessary to use appropriate mathematical models. Where such models are used there should be sufficient explanation to enable an informed assessment of their suitability for the particular modelling exercise to be undertaken.

Physical effects of dredging

A10. To assess the physical impact of aggregate extraction on the hydrographic and seabed environments, information should be provided on:

- likely production of a sediment plume (from the draghead at the seabed, from hopper overflow, or on-board screening) and its subsequent transportation within the water column or along the seabed. This should be considered together with the background suspended load.
- implications for coastal erosion (through a Coastal Impact Study), in particular whether;

    - the proposed dredging is far enough offshore for there to be no beach drawdown into the deepened area;
    - the proposed dredging will interrupt the natural supply of materials to beaches through tides and currents;
    - the likely effect on bars and banks which provide protection to the coast by absorbing wave energy, and the potential impact on local tidal patterns and currents which could lead to erosion;
    - likely changes to the height of waves passing over dredged areas and the potential effect on the refraction of waves which could lead to significant changes in the wave pattern;

- the likely effects on the seabed of removing material. In particular the nature of the sediment to be left once dredging ceases, and the likely nature and scale of the resulting topography (e.g. ridges and furrows);
- implications for local water circulation resulting from the removal or creation of topographical features on the seabed;
- assessment of the impacts in relation to other active or proposed dredging operations in the area.

A11. Further guidance on assessing the effects of dredging on the coastline is contained in '*Regional seabed sediment studies and assessment of marine aggregate dredging*' produced by CIRIA (1998).

Biological effects of dredging

A12. The principal biological impacts of dredging are direct disturbance, removal of benthic species, and alteration of the nature of the seabed upon which colonisation depends. This can affect the suitability of the seabed as a fish or shellfish food resource or habitat. Dredging should aim to leave the seabed in a similar physical condition to that present before dredging started in order to enhance the possibility of, and rate at which, the seabed recovers physically and biologically to its pre-dredging condition.

A13. The EIA should consider:

- the variability of benthic species and communities over time and space, and provide an indication of the likely rate of recovery following the cessation of dredging;
- the potential impact on the fish and shellfish resources, both within and outside the application area. Particular attention should be given to spawning and nursery areas and overwintering grounds for ovigerous crustaceans (for example, egg bearing lobsters and crabs) and known migration routes; and
- potential impacts on seabirds, marine mammals, and other large mobile species such as sharks.

Effects on other uses of the sea

(a) Potential effects on commercial fisheries

A14. Dredging has two potential effects on commercial fisheries. The first is to modify the marine environment in such a way that it adversely affects fish stocks, for example, by interfering with fish spawning and nursery areas, or migration routes. The second is the direct effect on the activities of fishermen.

A15. Consideration should be given to the noise and the sediment plumes which dredgers may cause, which could result in the temporary movement of fish out of the area, and could therefore put some fisheries out of the reach of smaller vessels.

A16. Dredging may also affect fish stocks indirectly, by disturbing benthic communities which provide the food source for commercial fish. Depending on the size of the area affected, highly mobile fish species may be able to move to other feeding grounds. But this can affect local fishermen. The ability of fishermen to avoid dredging areas will vary depending on the fishery they pursue and the size and complexity of their boats.

A17. WAG should be consulted on the availability of information on such matters as the location of spawning areas, important known feeding/nursery grounds, migration routes and over-wintering grounds for egg-bearing crustaceans.

(b) Other activities

- Careful consideration will need to be given to applications which may interfere with other uses of the sea e.g. shipping lanes, pipelines and cables, wrecks and Ministry of Defence sites; and
- The effect on sports fishermen, leisure craft and divers should also be carefully considered.

Potential effects on marine archaeological sites

A18. The Joint Nautical Archaeology Policy Committee has produced a Code of Practice for Seabed Developers (see endnote 2). This provides recommended

procedures for consultation and cooperation between seabed developers and archaeologists. The British Marine Minerals Aggregate Producers Association and English Heritage have prepared guidance on assessing, evaluating, mitigating and monitoring the effects of dredging on the historic environment.

Cumulative Impacts

A19. The ES will need to demonstrate that a permission is unlikely to result in unacceptable cumulative physical and biological impacts through the combined effects of dredging and of other activities in other nearby areas as well as the proposed dredging area.

A20. An assessment of the cumulative impacts should extend beyond an evaluation of site specific direct and indirect impacts. It should consider the effects of a project in combination with the sum of individual impacts occurring over time (usually both recent changes and changes projected over the proposed period of dredging). Consideration should also be given to the impact of the project over broad geographical scales to encompass the effects on an ecological community, that extends beyond the immediate area of the proposed extraction area.

Measures to Avoid, Reduce or Remedy Significant Adverse Effects

A21. The ES should include consideration of the practical steps that might be taken to mitigate the effects of the proposed mineral extraction. These should be site specific and closely linked to particular potential environmental effects identified during the EIA process. Mitigation measures may include:

- modification of the dredging depth to limit changes to hydrodynamics and sediment transport patterns to acceptable levels;
- agreed dredger navigation routes to minimise interference with shipping, fishing and other uses of the sea;
- zoning of the permitted area to protect sensitive fisheries, optimise access to traditional fisheries, and to reduce the impact on sensitive benthic assemblages;
- exclusion zones to protect rare or stable communities identified as occurring in small areas within a much larger application area. Such exclusion zones also provide a refuge for species that may assist in the eventual recolonisation of the worked-out area. Where such an approach is considered appropriate, it is important that the exclusion zones are large enough to protect the area of critical importance;
- the choice of dredging technique and the timing and phasing of working may also assist in preventing disturbance. For example, it may be appropriate to allow dredging only at particular stages of the tide to ensure that disturbed sediments are transported away from exclusion zones by the tide, or to prohibit screening;
- seasonal restrictions, where appropriate, to minimise impacts on migratory fish stocks or on vulnerable life history stages of fish or the benthos;
- safety buffer zones around war graves, important wrecks or other marine archaeological sites, pipelines and cables.

A22. It will often be necessary to seek expert advice to devise measures to protect species such as seabirds, and marine mammals, where these are at risk. Such advice may be available from CCW and the Joint Nature Conservation Committee.

A23. When considering mitigating measures, a balance has to be struck between the ecological or other importance of the area and the level of protection afforded to it. If an area is identified to contain or, in some other way, to support (e.g. as feeding grounds) important species, this may be sufficient cause to prevent dredging (or other forms of seabed disturbance) altogether.

Monitoring Of Environmental Effects

A24. The ES should include a consideration of an appropriate monitoring programme. Aggregate dredging by its very nature causes disturbance to the marine environment. Conditions attached to permissions are aimed at minimising environmental effects by controlling the operation of dredging activity. However, in many cases it is not possible to predict all the environmental effects at the outset. A programme of monitoring can be used to assess the validity of the predictions made in the EIA as well as establishing whether the dredging conditions are adequately preventing unacceptable effects on the marine and coastal environment, fisheries and other uses of the sea. Monitoring will also be appropriate to determine whether conditions are being properly implemented, and to improve the basis on which future applications can be assessed by improving knowledge of the effects of dredging.

A25. Monitoring should take account of natural variability within the marine environment. This can best be achieved by comparing the physical or biological status of the dredging area with previously defined and monitored sites located away from the influence of dredging activity.

A26. The spatial extent of sampling should include the area permitted for extraction and areas outside which may also be affected. In most cases there should also be monitoring within an area where 'no effect' is expected. This will give a better indication of the extent of any effects.

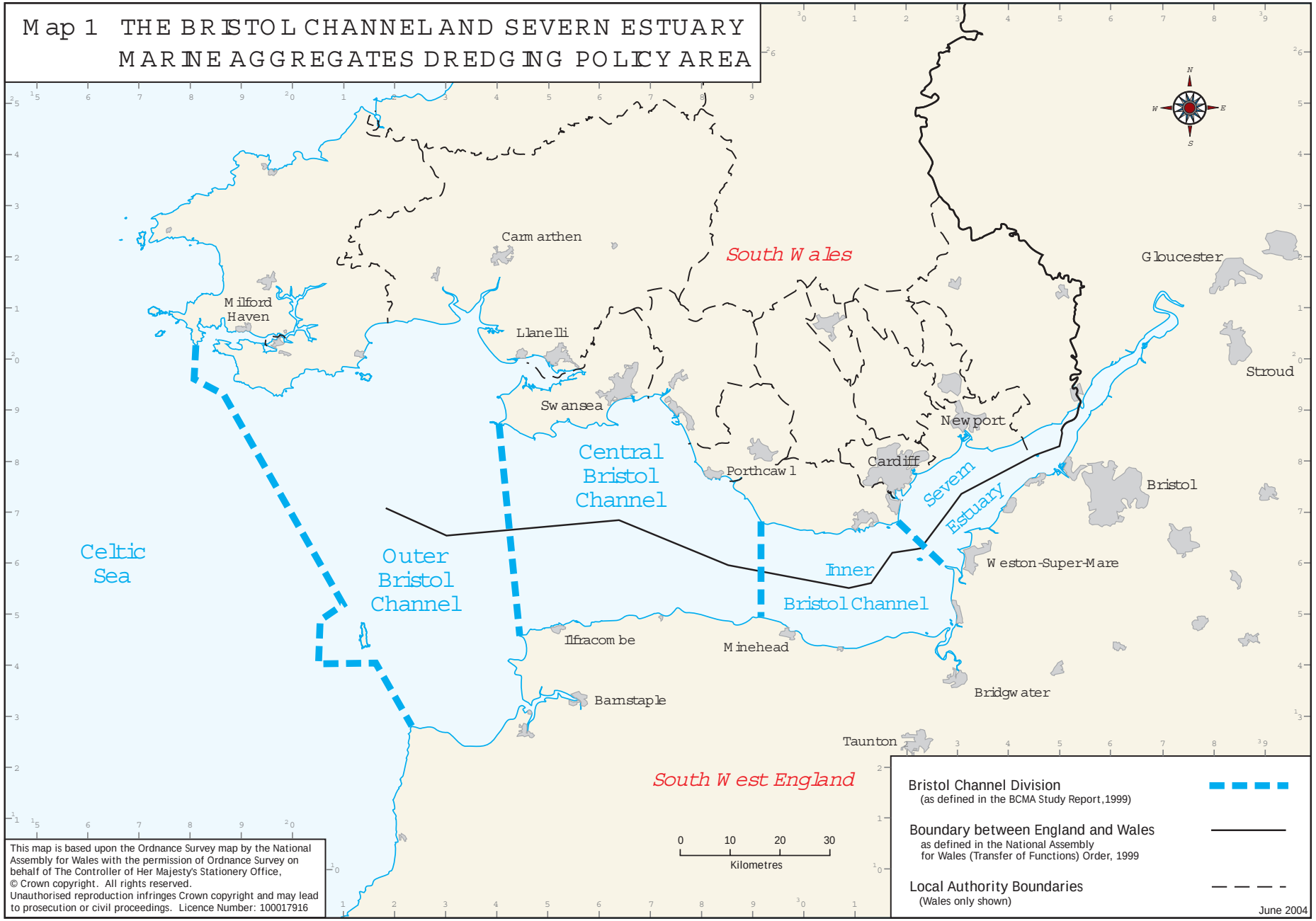
A27. The frequency of monitoring will depend upon the scale of the extraction activities and on the nature of the area of interest, including its sensitivity and the anticipated period of consequential environmental changes.

A28. Reports on monitoring activities should be prepared. These should provide details of the measurements made, results obtained, their interpretation and how the data relate to the monitoring objectives.

A29. Monitoring operations are expensive, as they require considerable resources both at sea and in subsequent sample and data processing. It is important, therefore, to ensure that a monitoring programme is properly designed so that it meets its objectives. The results should be reviewed at regular intervals against the stated objectives and the monitoring exercise should then be continued, reviewed or even terminated.

Endnote
Available from the National Monuments Record Centre, Kemble Drive, Swindon, SN2 2GZ

Map 1 THE BRISTOL CHANNEL AND SEVERN ESTUARY MARINE AGGREGATES DREDGING POLICY AREA



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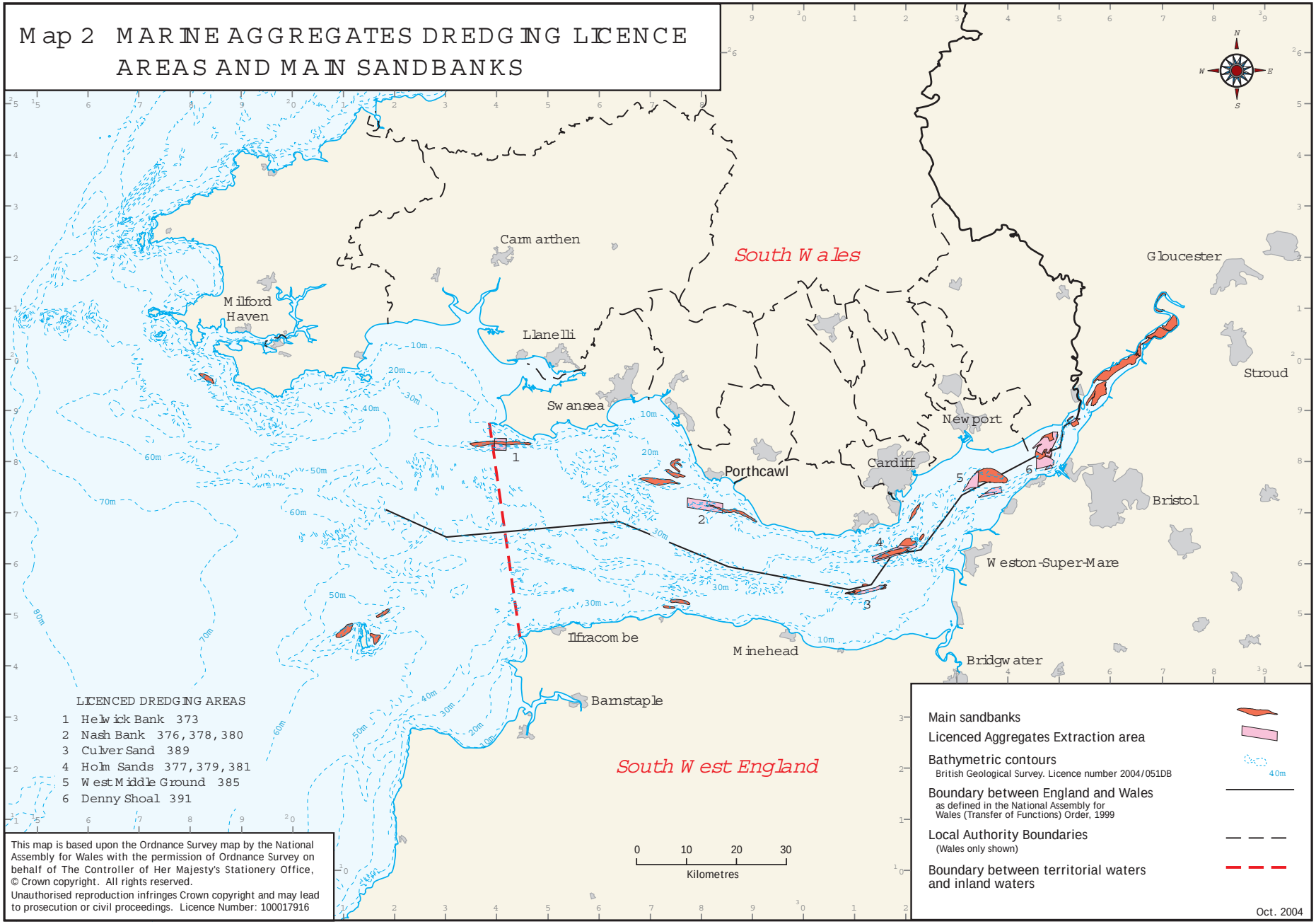
Map 2 MARINE AGGREGATES DREDGING LICENCE AREAS AND MAIN SANDBANKS



LICENCED DREDGING AREAS

1 Helwick Bank 373
2 Nash Bank 376, 378, 380
3 Culver Sand 389
4 Holm Sands 377, 379, 381
5 West Middle Ground 385
6 Denny Shoal 391

Main sandbanks

Licenced Aggregates Extraction area

Bathymetric contours
British Geological Survey. Licence number 2004/051DB
40m

Boundary between England and Wales
as defined in the National Assembly for Wales (Transfer of Functions) Order, 1999

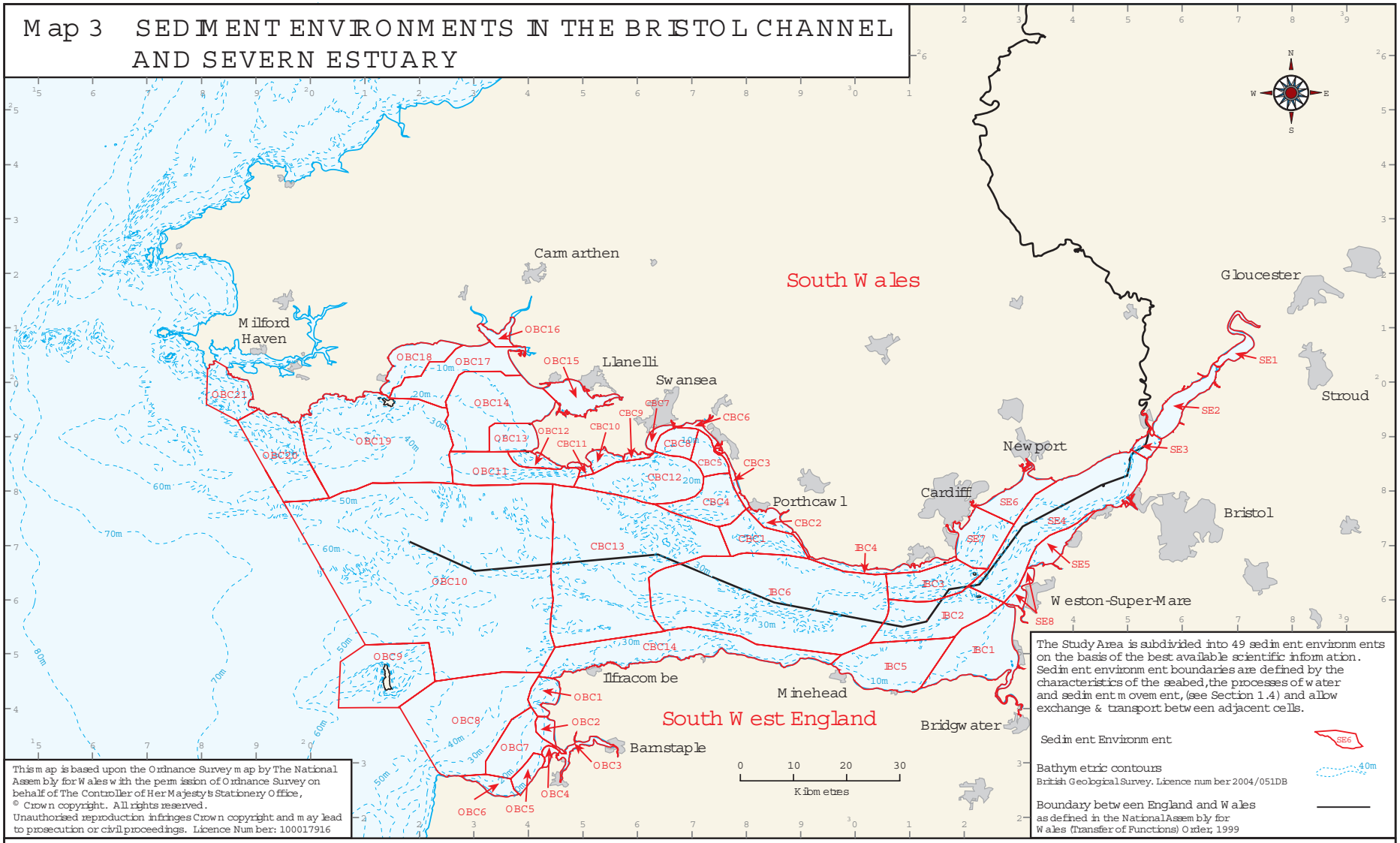
Local Authority Boundaries
(Wales only shown)

Boundary between territorial waters and inland waters

Oct. 2004

13/04-05 Cartographics, Statistical Directorate; National Assembly for Wales

Map 3 SEDIMENT ENVIRONMENTS IN THE BRISTOL CHANNEL AND SEVERN ESTUARY



The Study Area is subdivided into 49 sediment environments on the basis of the best available scientific information. Sediment environment boundaries are defined by the characteristics of the seabed, the processes of water and sediment movement, (see Section 1.4) and allow exchange & transport between adjacent cells.

Sediment Environment — SE6

Bathymetric contours — 40m
British Geological Survey. Licence number 2004/051DB

Boundary between England and Wales
as defined in the National Assembly for Wales (Transfer of Functions) Order, 1999

Sediment Environment Code / Names (Bristol Channel Marine Aggregates Resources and Constraints Research Project, August 2000)

SE1	River Severn	IBC1	Bridgewater Bay	CBC1	Nash Sands	CBC8	Swansea Bay West	OBC1	Morte Bay	OBC9	Lundy Island	OBC17	Carmarthen Bay Inner
SE2	Upper Severn Estuary	IBC2	Culver Sands	CBC2	Porthcawl	CBC9	Caswell Bay	OBC2	Sauton Sands	OBC10	Outer Bristol Channel	OBC18	Saundersfoot Bay
SE3	The Crossings (Severn Bridges)	IBC3	Holm Sands	CBC3	Margam Burrows	CBC10	Oxwich Bay	OBC3	Taw Torridge Estuary	OBC11	Helwick	OBC19	Carmarthen Bay South
SE4	Severn Estuary	IBC4	Vale Coastline	CBC4	Scarweather Sands & Kenfig Patches	CBC11	Port Eynon Bay	OBC4	Westward Ho!	OBC12	Worms Head	OBC20	St Govan's Head
SE5	English Grounds	IBC5	Minehead			CBC12	White Oyster Ledge	OBC5	Barnstaple Bay Inner	OBC13	Rhossili Bay	OBC21	Turbot Bank
SE6	Uskmouth	IBC6	Inner Bristol Channel	CBC5	Swansea Bay East	CBC13	Central Bristol Channel	OBC6	Clovelly	OBC14	Carmarthen Bay East		
SE7	Cardiff Grounds			CBC6	Neath Estuary	CBC14	North Devon Coast	OBC7	Central Barnstaple Bay	OBC15	Bunny Inlet		
SE8	Sand Bay & Weston Bay			CBC7	Mumbles			OBC8	Outer Barnstaple Bay	OBC16	Afon Taf/Tywi		

June 2004

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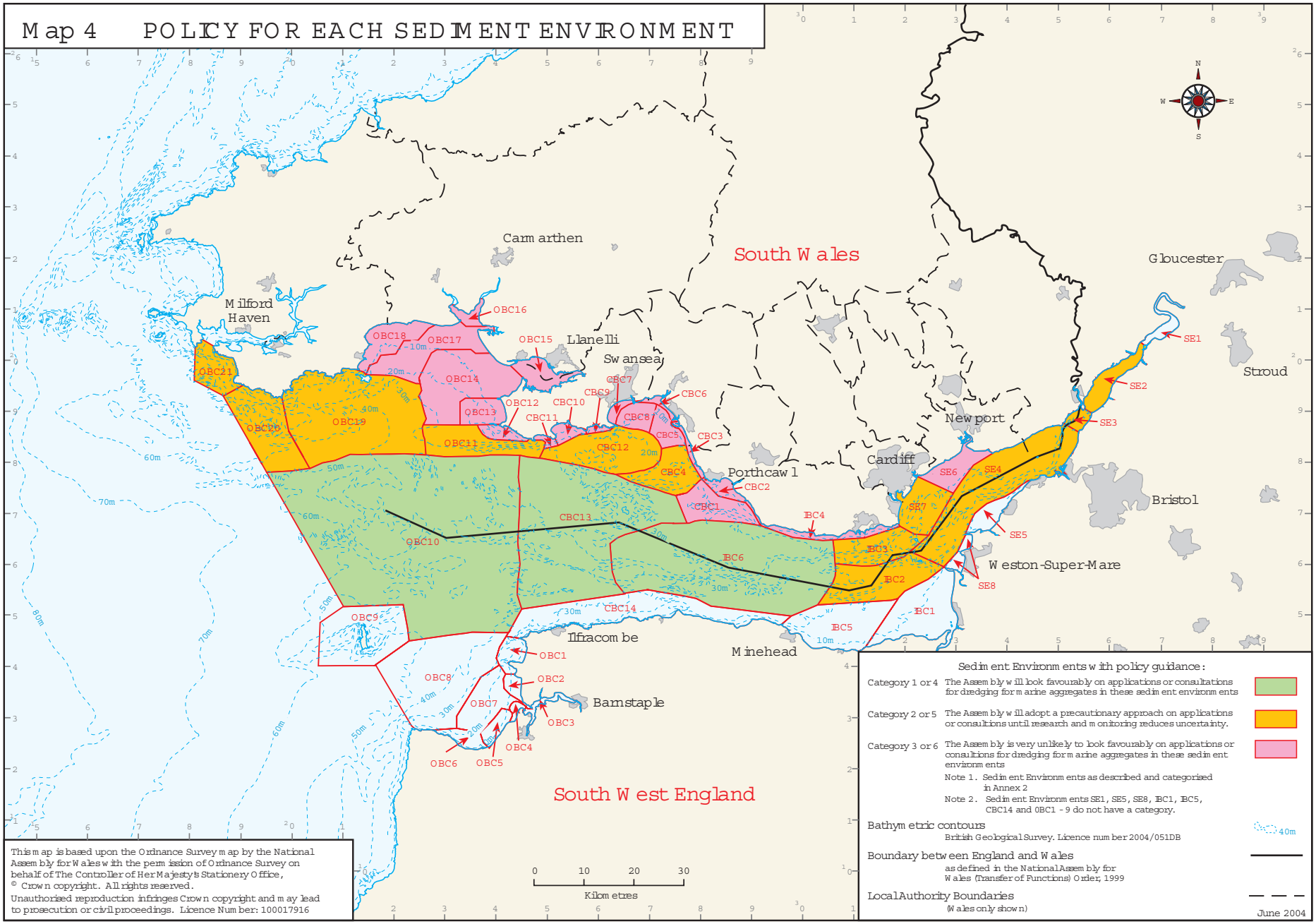
Map 4 POLICY FOR EACH SEDIMENT ENVIRONMENT



Sediment Environments with policy guidance:

Category 1 or 4	The Assembly will look favourably on applications or consultations for dredging for marine aggregates in these sediment environments
Category 2 or 5	The Assembly will adopt a precautionary approach on applications or consultations until research and monitoring reduces uncertainty.
Category 3 or 6	The Assembly is very unlikely to look favourably on applications or consultions for dredging for marine aggregates in these sediment environments

Note 1. Sediment Environments as described and categorised in Annex 2

Note 2. Sediment Environments SE1, SE5, SE8, IBC1, IBC5, CBC14 and OBC1 - 9 do not have a category.

Bathymetric contours — British Geological Survey. Licence number 2004/051DB — 40m

Boundary between England and Wales — as defined in the National Assembly for Wales (Transfer of Functions) Order, 1999

Local Authority Boundaries — (Wales only shown)

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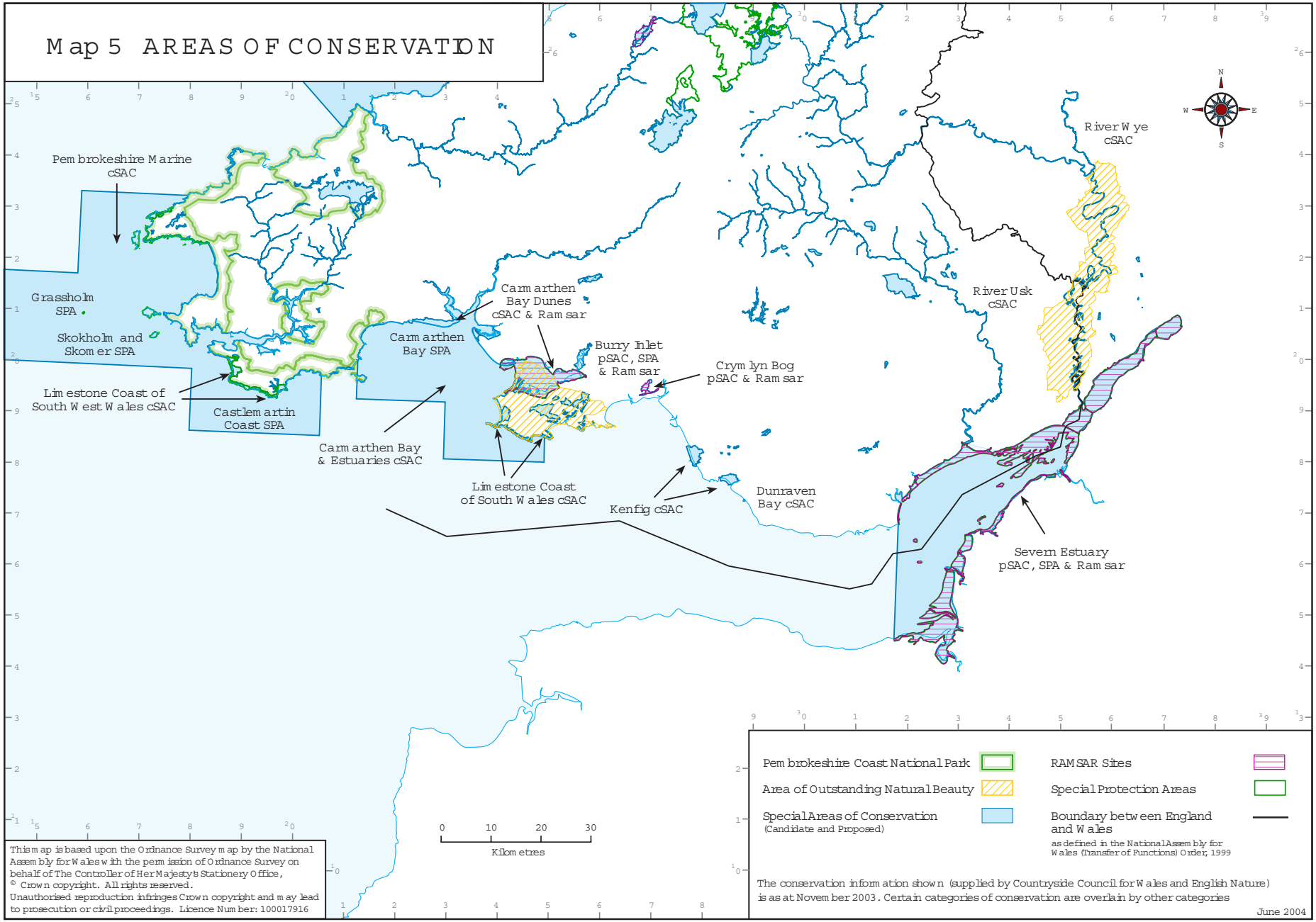
Map 5 AREAS OF CONSERVATION



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The conservation information shown (supplied by Countryside Council for Wales and English Nature) is as at November 2003. Certain categories of conservation are overlain by other categories

June 2004

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