BioAtlantis

Nature Working Naturally™

Foreshore License Application:
Sustainable hand-harvesting of *Ascophyllum nodosum* at Clew Bay
(cSAC Site Code 1482)

Natura Impact Statement to inform Appropriate Assessment

17th January 2014

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EXECUTIVE SUMMARY

BioAtlantis Ltd. is a biotechnology company which provides solutions to problems caused by stresses in plants, animals and humans. The company works with several of the leading universities in Ireland and across the world, isolating key functional molecules from natural resources and validating their functionality and effectiveness for use in solving problems facing modern agriculture and healthcare. As part of continued expansion, security of supply of raw material, the common brown seaweed *Ascophyllum nodosum,* is essential to future development.

A previous study entitled 'Mapping and assessment of the seaweed resources (*Ascophyllum nodosum*, *Laminaria* spp.) off the west coast of Ireland' (Hession *et al*., 1998) indicates that the Clew Bay region has the potential to sustainably yield 16,600 tonnes of *A. nodosum* seaweed per annum. BioAtlantis propose to incorporate known rates of *A. nodosum* recovery within Clew Bay into a broader system of harvesting, based primarily with sustainability in mind. Central to this approach will be a harvesting methodology which is minimally invasive and ensures rapid recovery and re-growth of *A. nodosum* post-harvest. By applying hand-harvesting techniques known to be environmentally friendly and incorporating their use within a sustainable best practise approach, BioAtlantis aims to develop a sustainable mode of seaweed harvesting in Clew Bay.

The preparation of this Natura Impact Statement (NIS) is to inform the Appropriate Assessment process as required under the Habitats Directive (92/43/EEC) in instances where a plan or project may give rise to significant effects upon a Natura 2000 site. This NIS report is set out in two parts, the first of which is a Screening Assessment which aims to inform the Appropriate Assessment process in determining whether the proposed project, alone or in combination with other plans and projects, is likely to have significant effects on the Natura 2000 sites within the study area. The Screening Assessment identifies designated sites within the potential impact zone of the proposed project, following the guidance published in the manual *'Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities'* published by (DoEHLG, 2009). The Screening Assessment considers the potential for adverse effects upon the conservation objectives and qualifying interests (including habitats and species) within the affected designated Natura 2000 sites. If the effects are deemed to be significant, potentially significant, or uncertain, or where the Screening process becomes overly complicated, then the preparation of the NIS to inform the Appropriate Assessment process is required under the requirements of Article 6(3) of the EU Habitats Directive (92/43/EEC).

The EU *'Habitats Directive'* was transposed into Irish law by the '*European Community (Natural Habitats) Regulations 1997*' (S.I. No. 94/1997). The most recent transposition of this legislation in Ireland is the '*European Communities (Birds and Natural Habitats) Regulations 2011*' (S.I. No. 477 of 2011). The Birds Directive (2009/147/EC) which is now included in these previous Regulations seeks to protect birds of special importance by the designation of Special Protection Areas (SPAs) whereas the Habitats Directive does the same for habitats and other species groups within Special Areas of Conservation (SACs), which are designated or proposed as candidate Special Areas of Conservation (cSACs). Both SAC and SPA sites are identified as Natura 2000 sites and collectively form the Natura 2000 network within the EU. Specific guidance for the preparation of Natura Impact Statement reporting and the evaluation of effects on Natura 2000 sites has been utilised in the current report, including:

- DoEHLG (2009) Appropriate Assessment of Plans and Projects in Ireland, Guidance for Planning Authorities;

- NPWS (2012). Marine Natura Impact Statements in Irish Special Areas of Conservation: A Working Document. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht;
- EC (2002). Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC. European Commission;
- English Nature (2001) Habitats Regulations Guidance Note (No.4): Alone or in combination.

In addition to existing baseline studies and impact assessment reporting set out in the previously prepared assessments for the Foreshore Licence Application, the current NIS has been informed by detailed coastal and marine baseline studies, completed on behalf of the National Parks and Wildlife Service (NPWS) and utilised in developing the conservation objectives of the Clew Bay Complex cSAC.

From the evaluation of the Screening assessment the Clew Bay Complex cSAC is identified as the only site potentially affected by the proposal and which is subject to further assessment in the NIS. The qualifying interests of the cSAC are:

- Mudflats and sandflats not covered by seawater at low tide [1140]
- Coastal lagoons [1150]
- Large shallow inlets and bays [1160]
- Annual vegetation of drift lines [1210]
- Perennial vegetation of stony banks [1220]
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
- Embryonic shifting dunes [2110]
- Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]
- Otter (*Lutra lutra*) [1355]
- Common seal (*Phoca vitulina*) [1365]
- *Vertigo geyeri* [1013]

The key qualifying interests of the Clew Bay Complex cSAC identified as being potentially affected by the proposal and assessed in the NIS reporting include Annex I listed habitats (Large shallow inlets and bays) and Annex II listed mammals (Common seals and Otter). Specific mitigation measures have been set out in detailed 'Codes of Practice', developed by BioAtlantis and included in the Licence Application (BioAtlantis, 2014), in order to avoid significant direct, indirect and cumulative effects on these qualifying interests.

The conclusions of the NIS have been reached taking account of the impact predictions, with cognisance of mitigation measures prescribed with reference to the size and scale of the proposal and the character of the current study area. The NIS therefore concludes that there is sufficient evidence to determine that the proposed sustainable hand-harvesting of *Ascophyllum nodosum* within the Clew Bay Complex cSAC will not have an adverse effect on the integrity of the Natura 2000 site identified above, alone or in combination with other projects or proposals, in respect of the requirements of Article 6(3) of the EC Habitats Directive (1992), transposed in Ireland as the EC (Birds and Natural Habitats) Regulations (2011).

TABLE OF CONTENTS

1 INTRODUCTION

ECOFACT Environmental Consultants Ltd. have been commissioned by BioAtlantis Ltd. to prepare a Natura Impact Statement (NIS) to inform the Appropriate Assessment process for the proposed hand-harvesting of the seaweed *Ascophyllum nodosum* in a sustainable manner from Clew Bay, Co. Mayo. The proposed licensing area within Clew Bay is presented in Figure 1.

BioAtlantis Ltd. is a biotechnology company which provides solutions to problems caused by stresses in plants, animals and humans. The company works with several of the leading universities in Ireland and across the world, isolating key functional molecules from natural resources and validating their functionality and effectiveness for use in solving problems facing modern agriculture and healthcare. As part of continued expansion, security of supply of raw material, *A. nodosum,* is essential to future development.

The study completed by Hession C. *et al*. (1998) indicates that the Clew Bay region has the potential to sustainably yield 16,600 tonnes of *A. nodosum* seaweed per annum. BioAtlantis propose to incorporate known rates of *A. nodosum* recovery within Clew Bay into a broader system of harvesting, based primarily with sustainability in mind. Central to this approach will be a harvesting methodology which is minimally invasive and ensures rapid recovery and re-growth of *A. nodosum* post-harvest. By applying hand-harvesting techniques known to be environmentally friendly and incorporating their use within a sustainable best practise approach, BioAtlantis aims to develop a sustainable mode of seaweed harvesting in Clew Bay. The proposed licensing area within Clew Bay is presented in Figure 1.

The preparation of this NIS is to inform the Appropriate Assessment process as required under the Habitats Directive (92/43/EEC) in instances where a plan or project may give rise to significant effects upon a Natura 2000 site. Natura 2000 sites are of European Importance and have been designated in accordance with the requirements of the EC Habitats Directive (1992) and EC Birds Directive (2009/147/EC); transposed into Irish legislation as the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011). The Habitats Directive, in combination with the Birds Directive (2009), establishes a network of internationally important sites designated for their ecological status; identified as Special Areas of Conservation (SACs) designated under the Habitats Directive for the protection of flora, fauna and habitats and as Special Protection Areas (SPAs) designated under the Birds Directive to protect rare, vulnerable and migratory birds. These sites together form a Europe-wide 'Natura 2000' network of designated sites, referred to in this report as Natura 2000 sites.

This NIS provides a focused and detailed impact assessment of the implications of the proposed hand harvesting of *A. nodosum* from Clew Bay, alone and in combination with other plans and projects, on the integrity of the Natura 2000 site network in view of the conservation objectives of these sites. This assessment takes account of the best scientific evidence and methods available. It is the obligation of the appropriate Competent Authority to make a determination for the Appropriate Assessment on the basis of information provided, taking account of the findings of the NIS. The assessment follows the requirements of the Habitats Directive 92/43/EEC, Article 6(3) and the guidance published by the National Parks and Wildlife Service (DoEHLG, 2009) '*Appropriate Assessment of Plans and Projects in Ireland, Guidance for Planning Authorities*'. Mitigation measures are set out in detail to avoid / reduce any potential impacts.

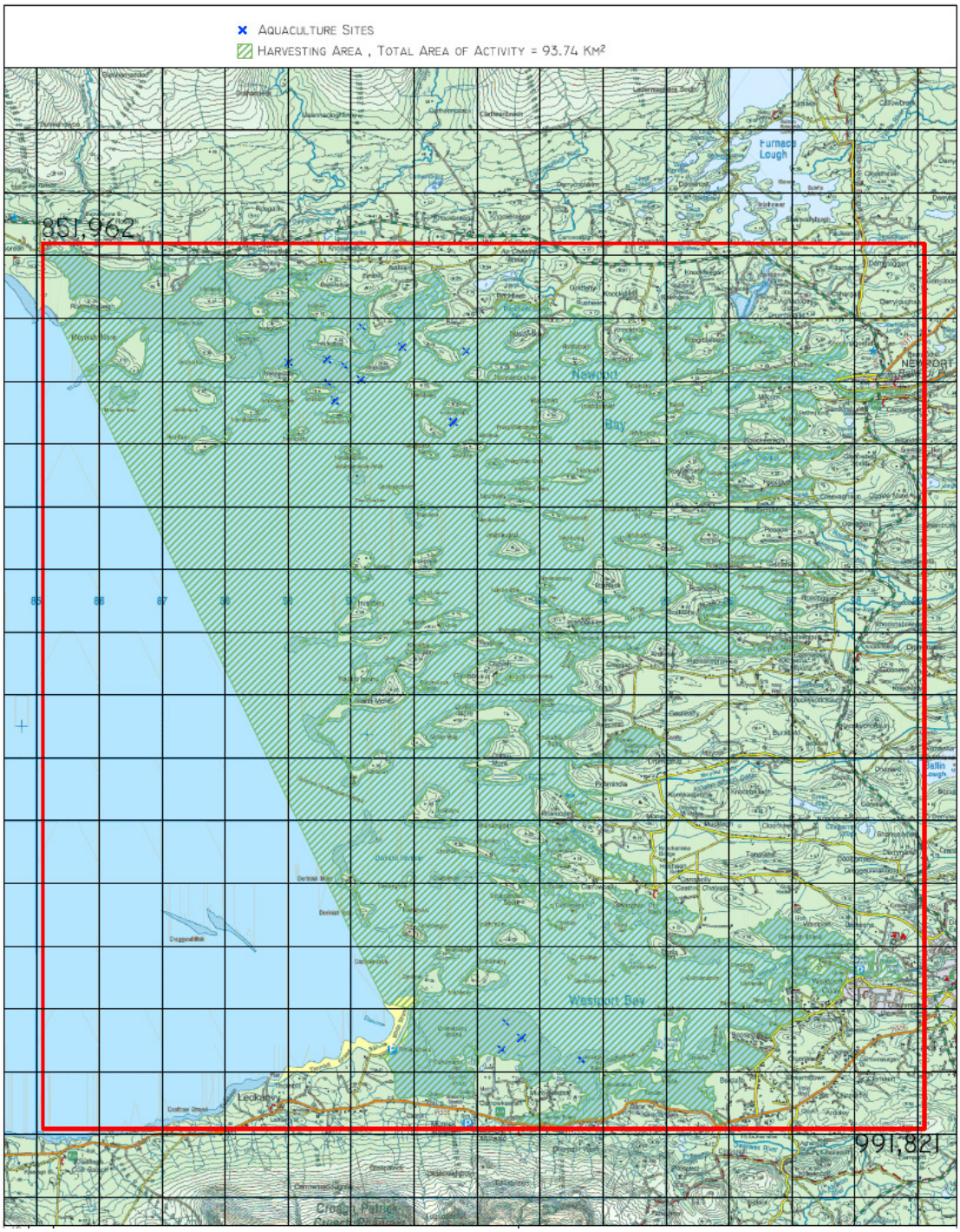

Figure 1 Map showing the proposed harvesting area within the licence application, Clew Bay, Co. Mayo.

1.1 Legislative context

The current assessment takes account of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora - '*The Habitats Directive'* which was transposed into Irish law by the '*European Community (Natural Habitats) Regulations 1997*' (S.I. No. 94/1997). The most recent transposition of this legislation in Ireland is the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). The Birds Directive (2009/147/EC) which is now included in the former Regulations seeks to protect birds of special importance by the designation of Special Protection Areas (SPAs) whereas

the Habitats Directive does the same for habitats and other species groups within Special Areas of Conservation (SACs), which are designated or proposed as candidate Special Areas of Conservation (cSACs). It is the responsibility of each member state to designate SPAs and SACs, both of which will form part of Natura 2000, a network of protected areas throughout the European Community. Article 6, paragraphs 3 and 4 of the EC 'Habitats' Directive (1992) state that:

6(3) '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.'

6(4) 'If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and / or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.'

In addition, the European Court of Justice in Case C-127/02 (the "Waddenzee Ruling") has made a relevant ruling in relation to Appropriate Assessment and this is reflected in the current assessment:

'Any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects" and that the plan or project may only be authorised "where no reasonable scientific doubt remains as to the absence of such effects.'

1.2 Appropriate Assessment guidance documents

- DoEHLG (2009) Appropriate Assessment of Plans and Projects in Ireland, Guidance for Planning Authorities;
- NPWS (2012a) Marine Natura Impact Statements in Irish Special Areas of Conservation: A Working Document. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht;
- European Commission (2001) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC. European Commission;
- English Nature (2001) Habitats Regulations Guidance Note (No.4): Alone or in combination.

1.3 Consultation

During preparation of this document consultation was undertaken, both directly and indirectly (via publically available information / websites) with relevant statutory bodies and stakeholders. Additional consultation undertaken by BioAtlantis Ltd. informed the assessment including early stage discussions and scoping with the Department of the Environment, Community and Local Government. Direct consultation of relevance to the current NIS was also undertaken with Inland Fisheries Ireland (IFI) and with the National Parks and Wildlife Service (NPWS).

A consultation meeting with the regional staff of the National Parks and Wildlife Service was held on the 13th of November 2013, in order to inform the Appropriate Assessment and to highlight ecological constraints and sensitivities at a local level. This meeting was also attended by a representative Marine Ecologist from the Science and Biodiversity section of the NPWS. Key constraints and sensitivities with regard to the Clew Bay Complex cSAC and wider ecological issues, outside the remit of the Appropriate Assessment process were identified, with requirements for the avoidance of significant adverse effects clearly specified at this meeting.

1.4 Statement of authority

The current report was prepared by the following senior ecologists who have a combined experience of over 30 years working on ecological impact assessments. They are considered to be suitably qualified for preparing the current Natura Impact Statement.

- Dr. William O'Connor, PhD, MSc, BSc, CEnv, CBiol, FSB, MIEEM, MIFM
- Daireann McDonnell MSc, BSc, MSB, MIEEM

Dr. William O' Connor is a senior ecologist with over 20 professional experience. He is a graduate of the University of Wales, Cardiff where he was awarded an MSc degree in Applied Hydrobiology, and the National University of Ireland, Galway where he received a PhD degree in Zoology for research on the Shannon Estuary. He is a Fellow of the Society of Biology, a Chartered Environmentalist, a Chartered Biologist and a full member of both the Chartered Institute of Ecology and Environmental Management and the Institute of Fisheries Management. Dr. O'Connor is the Managing Director and Principal Ecologist of ECOFACT Environmental Consultants Ltd. and has prepared Natura Impact Statements and Environmental Impact Statements for numerous major commercial and infrastructural developments affecting marine, estuarine and coastal habitats. He has also worked as a scientific advisor for a number of state bodies, including the NPWS, BIM, OPW, EPA, ESB and numerous local authorities.

Daireann McDonnell is a senior ecologist who has been working in the environmental consultancy industry for over ten years. He is a graduate of the University of Limerick where he was awarded an MSc (Research) in Environmental Science. Daireann also holds a BSc (Hons) in Environmental Management from University College Dublin. He is a full member of both the Chartered Institute of Ecology and Environmental Management and the Society of Biology. He has previously acted as Principal Ecologist for the Irish operation of large multinational engineering firm, and has been the Senior Ecologist at ECOFACT since 2008. Daireann has completed a large number of Natura Impact Statements for marine projects including offshore wind farms, coastal road projects, wastewater discharges and aquaculture projects.

2 METHODOLOGY

2.1 Desk study

A desktop study was undertaken to identify the extent and scope of the potentially affected designated Natura 2000 sites within the current study area in relation to the proposed hand-harvesting of *A. nodosum* within Clew Bay. The desktop study identified the designated Natura 2000 sites within the zone of influence of the project and identified this as the study area for consideration in the current NIS. Following the DoEHLG (2009) guidance publication a distance of 15km is presented as a suitable radius for sites potentially affected, in the absence of pathways identified where Natura 2000 sites outside of this radius could potentially be affected. The desk study undertaken for the current NIS included a review of the baseline survey data undertaken to inform the Conservation Objectives for Clew Bay, including marine and intertidal surveys commissioned by the NPWS:

- Aqua-Fact (1999) A survey of selected littoral and sublittoral sites in Clew Bay, Co. Mayo. Duchas, The Heritage Service, Dublin.
- Falvey, *et al*. (1997) Survey of intertidal sediment biotopes in estuaries in Ireland. Unpublished report to the National Parks and Wildlife Service.
- McCorry (2007) Saltmarsh Monitoring Project 2006: Summary Report. Research Branch, National Parks and Wildlife Service, Dublin.
- McCorry & Ryle (2009) Saltmarsh Monitoring Project 2007-2008: Volume 4. Research Branch, National Parks and Wildlife Service, Dublin.
- MERC Consultants (2006) Surveys of sensitive subtidal benthic communities in Slyne Head Peninsula SAC, Clew Bay Complex SAC and Galway Bay Complex SAC. Project Report on behalf of the National Parks and Wildlife Service.
- NPWS (2011a) Conservation Objectives: Clew Bay Complex SAC 001482. Version 1.0 (July 2011). National Parks and Wildlife Service, Dublin.
- NPWS (2011b) Clew Bay SAC (site code 1482) Conservation objectives supporting document - coastal habitats. Version 1. National Parks and Wildlife Service, Dublin.
- NPWS (2011c) Clew Bay Complex SAC (site code 1482) Conservation objectives supporting document- marine habitats and species. Version 1. National Parks and Wildlife Service, Dublin.
- Ryle, *et al.* (2009) Coastal Monitoring Project 2004-2006. National Parks and Wildlife Service, Dublin.

Additional reporting prepared by BioAtlantis was also reviewed with regard to field survey observations within the study area and the assessments undertaken with regard to sustainable harvest management, potential impacts and interactions, as set out in the Foreshore Licence Application (BioAtlantis, 2014).

2.2 Site survey to inform the NIS

A site walkover survey and visual assessment was undertaken to inform the NIS with regard to the qualifying interests and conservation features of the Natura 2000 sites within the study area of the proposed project. The findings of this broad-scale survey are included in the current assessment. The study area, comprising the islands and shoreline of Clew Bay, were visited by boat during November 2013 and an overview assessment was carried out to

establish the presence and sensitivity of Annex I habitats and suitable habitat availability for Annex II species, with regard to the Natura 2000 designations within the study area.

2.3 Appropriate Assessment Methodology

The preparation of this NIS to inform the Appropriate Assessment process follows the guidance published by the National Parks and Wildlife Service (DoEHLG, 2009) '*Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities'*. According to these guidelines, the Appropriate Assessment process is a four staged approach, as described below:

- *Stage One: Screening / Test of Significance* - The process which identifies the likely impacts upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant;
- *Stage Two: Natura Impact Statement* - The consideration of the impact of the project or plan on the integrity of the Natura 2000 site, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts;
- *Stage Three: Assessment of Alternative Solutions* - The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site; and
- *Stage Four: Assessment Where Adverse Impacts Remain* - An assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest (IROPI), it is deemed that the project or plan should proceed.

The safeguards set out in Article 6(3) and (4) of the Habitats Directive are triggered not by certainty but by the possibility of significant effects. Thus, in line with the precautionary principle, it is unacceptable to fail to undertake an appropriate assessment on the basis that it is not certain that there are significant effects.

2.3.1 Screening to Inform Appropriate Assessment

Following the guidelines set out by DoEHLG (2009), Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3); i.e. whether a plan or project can be excluded from Appropriate Assessment requirements because it is directly connected with or necessary to the management of the site; and the potential effects of a project or plan, either alone or in combination with other projects or plans, on a Natura 2000 site in view of its conservation objectives, and considering whether these effects will be significant. According to the DoEHLG (2009) guidance, screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3) of the EU Habitats Directive, that is: whether a plan or project is directly connected to or necessary for the management of the site; and whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site or sites in view of its conservation objectives.

The BioAtlantis proposal for the hand-harvesting of *A. nodosum* within Clew Bay does not comply with the first screening test (i.e. the proposed works are not directly connected to or

necessary for the management of any Natura 2000 site). The Screening assessment therefore aims to inform the Appropriate Assessment process in determining whether the proposed project, alone or in combination with other plans and projects, is likely to have significant effects on the Natura 2000 sites within the study area. If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the Appropriate Assessment process must proceed to the preparation of a Natura Impact Statement (NIS). The required elements of a Screening Report included in the current report are as follows:

- Description of plan or project - Identification of relevant Natura 2000 sites and compilation of information on their qualifying interests and conservation objectives. Include the potential for a plan or project, whether it is within or outside a Natura 2000 site, to have direct, indirect or cumulative effects. Desk study information for the conservation interests is available from the NPWS.
- Assessment of likely effects – direct, indirect and cumulative – undertaken on the basis of available information as a desk study or field survey or primary research as necessary. A precautionary approach is fundamental and, in cases of uncertainty, it should be assumed the effects could be significant. As a guide, any element of a plan or project that has the potential to affect the conservation objectives of a Natura 2000 site, including its structure and function, should be considered significant.

2.3.2 Natura Impact Assessment

A Natura Impact Statement (NIS) considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the integrity of a Natura 2000 site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. The current report is set out in the format of a NIS and comprises a scientific examination of the plan / project and the relevant Natura 2000 sites; to identify and characterise any possible implications for the site in view of the site's conservation objectives, structure and function, taking account of in combination effects. The requirements for Appropriate Assessment derive directly from Article 6(3) of the EU Habitats Directive (1992).

Direct and indirect impacts in isolation or in combination with other plans and projects on the identified Natura 2000 sites in view of the sites' conservation objectives have been examined. Case law of the European Court of Justice (ECJ) has established that Appropriate Assessment must be based on best scientific knowledge in the field. These are the qualifying interests i.e. Annex I habitats, Annex I bird species (EU Birds Directive, incorporated into the EU Habitats Directive) and Annex II species hosted by a site and for which that site has been selected. The conservation objectives for Natura sites (SACs and SPAs) are determined under Article 4 of the Habitats Directive and are intended to ensure that the relevant qualifying interests i.e. Annex I habitats, Annex I bird species and Annex II species present within the designated sites are maintained in a favourable condition. The current assessment of the proposal for hand-harvesting of *A. nodosum* at sustainable levels within Clew Bay provides a description of the project and the receiving environment. The conservation objectives of Natura 2000 sites potentially affected by the proposal are listed and potential impacts outlined with respect to the integrity of the Natura 2000 site. Mitigation measures have been proposed for the protection of the conservation interests and the avoidance of impacts to Natura 2000 sites occurring within the study area.

3 SCREENING FOR APPROPRIATE ASSESSMENT

3.1 Description of the proposed project

3.1.1 Overview of the proposal

BioAtlantis Ltd. has a current requirement for c. 3,500 wet tonnes of *A. nodosum.* Based on the projected growth of the business, this is expected to rise to c.12,500 wet tonnes over the next 5 years. It is therefore necessary for BioAtlantis to secure a source of raw material (*A. nodosum*) of sufficiently high quality to allow for the further processing, necessary for BioAtlantis to continue to produce high quality, value-added products for sale on the global market. Clew Bay has in excess of 90 islands and 100Km of coastline that contain harvestable quantities of *A. nodosum*. Through use of data obtained from the field studies undertaken by BioAtlantis (2013) and published literature (Hession *et al*., 1998), and using maps and aerial photographs of the region, the current maximum yield *A. nodosum* from the Clew Bay was calculated to be of the order 65,060 tonnes. This equates to an annual sustainable harvest of 12,484 tonnes, based on harvesting a maximum of 20% of the available seaweed. Given the ecological sensitivities identified within the Clew Bay works area, harvesting must be carried out in a manner which does not negatively affect the biological environs. Utilising sustainable hand-harvesting technique and extraction (Kelly L. *et al*., 2001; Guiry & Morrison, 2013) and incorporating their use within a best practise approach, BioAtlantis has developed a sustainable model of seaweed harvesting in Clew Bay. Approximately 500-900 dry weight tonnes *A. nodosum*/annum were harvested in Clew Bay between 2005 and 2011 (Guiry & Morrison, 2013). Subject to obtaining a licence to harvest in Clew Bay, BioAtlantis will contract up to 16 full-time hand harvesters from the region, to service both the production requirements and the additional sales requirements (see Table 1).

Table 1 Projected economic outlook for *A. nodosum* harvesting by BioAtlantis in the Clew Bay area.

Year	BioAtlantis Total Requirement		No. full-time hand harvesters	Income to Clew Bay area (at €40/wet tonne)
	Dry tonnes	Wet tonnes[+]		
2014[++]	200	1000[*]	3	€40,000
2015	1000	5000[*]	6	€200,000
2016	2497	12484	16	€499,360
2017	2497	12484	16	€499,360
2018	2497	12484	16	€499,360
2019	2497	12484	16	€499,360

* Over the first years of harvesting in Clew Bay, the total harvest available may need to be reduced to allow time for areas that have been over-harvested in the past to fully recover.
+ A conversion factor of 5 is used for the conversion from wet to dry tonnes. This is based on the average solids content of the less chopping, washing and drying losses.
++ The available harvest for 2014 may be reduced depending on the date of issue of the foreshore license.

BioAtlantis will recruit harvesters with previous experience or whose families have farms or fishing interests in the area and will work with the harvesters to apply sustainable methods of harvesting, collection and conservation of the resource. Hand-harvested *A. nodosum* will be transported to production facilities in Kanturk, Co. Cork for further processing.

3.1.2 Operational phase of the proposal

The BioAtlantis proposal for sustainable hand-harvesting of *A. nodosum* from Clew Bay will include an area extending from Rosmurrevagh point on the north of Clew Bay to Leckanvy Pier in the south, including the islands within the Bay. Through use of data obtained from the field studies and evaluations by BioAtlantis Ltd. (BioAtlantis, 2013) and Hession *et al*. (1998) and maps and aerial photographs of the region, it is calculated that the current maximum yield of *A. nodosum* from Clew Bay to be of the order of 65,060 tonnes. This equates to an annual sustainable harvest of 12,484 tonnes, based on harvesting a maximum of 20% of the available seaweed. BioAtlantis Ltd. will employ a Resource Manager or Project Manager to operate on site, with relevant environmental qualifications and experience in the fishing / marine resources industry. This individual will be responsible for managing activities within the harvesting area and in ensuring sustainability of these activities. They will report directly to the company CEO, and work as part of the resource management team.

3.1.2.1 Overview of the proposed operational phase

In carrying out the operational stage of the proposal, BioAtlantis has developed a management plan set out in the 'Codes of Practice for *A. nodosum* harvest activities in Clew Bay cSAC', included as Appendix 1 of the current NIS. This includes the development of a database, to take account of the study area of Clew Bay including over 90 islands and 100Km of coastline that contain harvestable quantities of *A. nodosum*. This database will be used to:

(a) Determine and manage sites which require a fallowing period to allow for adequate recovery from recent activities;
(b) Determine and manage rotation requirements (i.e. extrapolation and calculation of the duration or fallowing period required prior to a particular areas being fit for re-harvest);
(c) Prevent harvest activities that would lead to a decline in yield;
(d) Record the details of each harvest, how much, by whom and when.

Moreover, this database represents a central, working component of the BioAtlantis best practice guidelines for harvesting *A. nodosum*, requiring:

(a) Development of pre-harvest plans in advance of harvest activities;
(b) A cap of 20% on the level of biomass which can be harvested from a given site;
(c) Limitations of a 300m cutting height of *A. nodosum* stipe / frond.

Table 2 below sets out the islands and shore-line areas identified as being within the proposed harvesting area for the BioAtlantis project, with *A. nodosum* densities and coverage included. There are three main types of activities associated with the operational phase include: management and Implementation; monitoring, recording and reporting; and verification & analysis. All operations/activities are described in detail in the Codes of Practice prepared by BioAtlantis, included in the Licence Application (BioAtlantis, 2014) and presented in Appendix 1 of this NIS. When planning future harvests, some islands will be marked as unavailable for certain times of the year, in order to ensure that known seal breeding, moulting and resting and bird breeding and wintering sites are avoided. The Resource Manager will be responsible for ensuring that these sites are avoided. The list of restricted sites is set out in the Codes of Practice (Appendix 1 of this NIS); this will be updated to reflect ongoing consultation and data available from NPWS into the future; taking account of time of year and the presence of Common seals and breeding and wintering bird populations. The BioAtlantis Resource Manager will be required to verify that each site has fully recovered prior

to re-harvesting. This will be done by visiting each site and performing an assessment of the growth and density of *A. nodosum* on each, and updating the production plan as necessary with the results of this analysis.

Table 2 Harvesting locations and quantity estimates within the Clew Bay study area.

Island No.	Island Name	Harvestable *A. nodosum* Area (m^2)	Density of *A. nodosum* (Kg/ m^2)	Coverage of *A. nodosum* Area	*A. nodosum* on Island (Tonnes)	Max. Annual Harvest 20% (Tonnes)
1	Forillan	2,852	22.9	20%	74	15
1	Illanavrick	7,279	22.9	20%		
1	Unnamed	3,442	22.9	20%		
1	Camel Isd	2,638	22.9	20%		
2	Kid Isd East	3,105	22.9	100%	182	36
2	Gabfadda	4,827	22.9	100%		
3	Roslynagh	23,507	22.9	90%	485	97
4	Illannambraher	59,716	22.9	100%	1369	274
5	Inishdasky	29,352	22.9	100%	673	135
6	Inishquirk	36,614	22.9	40%	336	67
7	Inishtubrid	43,065	22.9	50%	494	99
8	Inishlim	17,159	22.9	30%	118	24
9	Unnamed	2,863	17.2	35%	17	3
10	Beetle Isd North	6,616	17.2	35%	40	8
11	Inishbobunnan	35,559	17.2	50%	306	61
12	Unnamed	15,897	17.2	50%	137	27
13	Inishgowla	26,564	17.2	50%	228	46
14	Beetle Isd South	12,558	17.2	50%	108	22
15	InishKeel	33,712	25.0	20%	169	34
16	Black Rock	7,597	25.0	20%	38	8
17	Moynish More	53,091	25.0	0%	0	0
18	Moynish Beg	12,952	25.0	0%	0	0
19	Inisherkin	35,783	17.2	60%	369	74
20	Inishnacross	27,773	22.9	75%	477	95
21	Inishilra	19,243	22.9	60%	265	53
22	Inishcooa	24,110	17.2	20%	83	17
23	Roeillaun	0	0.0	0%	0	0
24	Inishdeashbeag	Included in 30	22.9	40%	456	91
24	Unnamed	Included in 30				
24	Inishdeashmore	49,713				
25	Inishcorky	20,890	22.9	50%	239	48
26	Inishcarrick	39,067	22.9	75%	672	134
27	Inishcoragh	1,906	22.9	100%	44	9
28	Muckinish	28,436	22.9	95%	619	124
29	Inishdaweel	20,905	22.9	100%	479	96
30	Rabbit Isd	24,964	14.1	60%	212	42
31	Unnamed	3,399	14.1	60%	29	6
32	Inishturlin	34,789	18.8	60%	393	79
34	Freaghillanluggagh	23,554	24.4	95%	546	109
33	Illanascrraw	5,669	22.0	20%	25	5
35	Inishkee	26,431	22.9	100%	606	121
36	Unnamed	24,990	22.9	100%	573	115
37	Freaghillan West	10,027	22.9	100%	230	46
38	Innishcannon	11,684	22.9	80%	214	43
39	Carricklahan	4,728	24.4	60%	69	14
40	Carrickachorra	6,111	24.4	60%	89	18
41	Illanmaw	74,676	24.4	100%	1822	364
42	Freaghillan East	9,433	22.9	100%	216	43
43	Unnamed	5,462	22.0	75%	90	18
44	Rosbarnagh Isd	45,872	18.8	60%	518	104
45	Inishcuill West	67,528	22.0	90%	1338	268
46	Mauherillan	2,588	22.0	100%	57	11
47	Inishfesh	24,323	22.0	100%	536	107

Island	Island Name	Harvestable	Density of *A.*	Coverage of	*A. nodosum*	Max. Annual
48	Inishmolt	16,186	22.0	90%	321	64
49	Inishloy	29,056	22.0	80%	512	102
50	Inishdaff	59,567	18.8	80%	897	179
51	Inishbollog	14,892	22.0	100%	328	66
52	Inishlaughil	31,140	22.0	80%	549	110
52	Inishgowla	43,470	24.4	100%	1061	212
54	Inishoo	21,927	0.0	0%	0	0
55	Unnamed	12,250	0.0	0%	0	0
56	InishTurk	47,088	18.8	90%	798	160
57	Illannaconney	11,147	22.0	100%	245	49
58	Atticlea Isd	6,176	0.0	0%	0	0
59	Inishakillew	63,707	24.4	85%	1321	264
60	Trawbaun	as 61	24.4	80%	5522	1104
60	Carrigeenglass North	28,2865				
61	Inishcottle	31,465	16.1	100%	506	101
62	Moneybeg	18,300	24.4	100%	447	89
63	Freaghillan	33,702	24.4	100%	822	164
64	Derrinish, Dernish West	130,776	24.4	100%	3191	638
65	Calf Island	18,708	24.4	100%	456	91
66	Inishbee	2,358	24.4	39%	23	5
67	Unnamed	6,347	0.0	0%	0	0
68	Rabbit Island, Island More	152,834	24.4	65%	2419	484
69	Quinnsheen Island	29,117	24.4	75%	533	107
70	Clynish	78,055	24.4	100%	1905	381
71	Ilaunnamona	11,664	24.4	100%	285	57
72	Carrigeenglass South	206,481	22.3	55%	2535	507
73	Collan More	160,354	22.3	63%	2258	452
74	Collan Beg	26,051	22.3	50%	291	58
75	Unnamed	14,799	0.0	0%	0	0
76	Inishgort	53,611	22.3	50%	598	120
77	Inishlyre	57,157	17.7	20%	202	40
78	Illanataggart	32,587	22.3	50%	364	73
79	Crovinish	240,565	22.3	50%	2685	537
80	Forilan	30,951	22.3	65%	449	90
81	Unnamed	17,282	22.3	60%	231	46
82	Ininhgowla South + Carrickwee	195,955	22.3	40%	1749	350
83	Inishlaghan	8,065	22.3	60%	108	22
84	Inishimmel	11,501	22.3	80%	205	41
85	Dorinish More & Dornish Beag	47,094	22.3	30%	315	63
86	Inishleauge	21,613	22.3	30%	145	29
87	Inishraher	28,434	22.3	30%	190	38
88	Inish Deugh	9,457	22.3	30%	63	13
89	Bartraw	44,920	22.3	50%	501	100
90	Inisheeney	44,827	22.3	50%	500	100
Coast	Rosturk - Rosmore Point	646,422	9.3	60%	3607	721
Coast	Milcum	64,365	7.0	60%	270	54
Coast	Knockkeeraun - Rossantibble	263,486	2.3	60%	356	71
Coast	Rossow - Rosscahill	573,425	11.2	75%	4817	963
Coast	Moyne Strand - Monkelly Strand	570,231	1.5	60%	513	103
Coast	Westport - Rosseymailey	261,130	11.5	80%	2402	480
Coast	Annagh Island	337,411	3.5	50%	590	118

3.1.2.2 Management and implementation during operations

Management and implementation components include activities relating to:

1. ***Planning and scheduling of harvesting activities*:** In the initial stages, it is necessary to establish details of when each area was last harvested. This will be done by working closely with the existing local harvesters, and through analysis of derived datasets, the dates and quantities of the most recent harvests for each island and coastal zone will be established. This data can then be used to derive when a region will be next available for harvest. The nominal recovery time is generally accepted to be 4 years from a complete harvest; it is proposed that a maximum harvest of 20% of the total available seaweed is permitted to ensure sustainability. Once the re-harvesting date for each island is established, this information will be used to plan the next seasons harvesting. The Resource Manager will be required to verify that each site has fully recovered prior to re-harvesting. This will be done by visiting each site and performing an assessment of the growth and density of *A. nodosum* on each, and updating the production plan as necessary with the results of this analysis.
2. ***Data recording and analysis*:** BioAtlantis will provide a boat to be used for the collection of harvested *A. nodosum*. The boat will be piloted by the Resource Manager. The seaweed collected from each point will be weighed and the details of the harvest recorded at each collection point. The Resource Manager will complete a 'Goods Received Note (GRN)' to record the harvest from each site. The harvester will also sign the GRN to confirm accuracy of the details. After receipt of the harvest by BioAtlantis, these details will be uploaded into the main database. The quality of the supplied *A. nodosum* will be assessed by the quality control team and details of any deviations from the specified requirements recorded on the harvest record. Computerised data will be maintained of all harvest records and non-conformances.
3. ***Access and Navigation at harvest sites*:** BioAtlantis will provide a boat that will be approved by the Marine survey office (MSO) for use on the open waters of Clew Bay. This vessel will be used to collect the harvested *A. nodosum* from the designated sites. The harvesters will be made aware that all harvested *A. nodosum* must be collected by BioAtlantis for weighing and processing, and the seaweed will only be collected from the sites identified on the harvesting schedule. The harvesters shall use their own vessels to navigate to and from the island sites. In the case of coastal sites, the harvesters shall be responsible for access to and from the sites via existing access routes. Harvest will occur at islands and shorelines as described in the harvest management plan. Nets will then be picked up at each location in which harvest took place. The size of the shore area covered by an individual net will be approximately 12 to 16 meters. Tied nets will typically cover an area of approximately $2m^2$. Final pick-up points will be at established piers and harbours, particularly in Westport and Newport. Access to the northern coastal area will be via the roads at Knockmanus road, Roskeen south Road, Carrowsallagh Rd, Keeloges Rd, and via boat. Access to the Milcum harvesting site will be via the Teevmore Road. The coast roads on Knockeeragh and Rosclave provide good access to the harvesting sites in this area. The harvesting site at Rosanrubble can be accessed by boat and from the road to Rosanrubble Point. The Harvesting area between Bleanrosdooaun Strand and Monkelly can be accessed by road to Roslaher, Rostoohy Pier, Moyna Strand, Ardkeen Quay, Roscahil Rd, Rosmindle Rd, Castleaffy, Rosmoney, Rusheen, Carrowcally, Bawn Strand, & Monkelly Strand.
4. ***Hand-harvest methodology*:** Harvesters must undergo training in order to be certified as having the skills required to harvest *A. nodosum* in an environmentally friendly and

sustainable manner. Activities will be carried out in accordance with a clearly defined protocol which will prevent any damage to the environment or underlying growth substrate, whilst also facilitating sufficient re-growth and re-generation of the vegetation post-harvest. The 'Code of Practice for *A. nodosum* harvest activities in Clew Bay cSAC' is set out in the Licence Application (BioAtlantis 2014) and is included in Appendix 1 of the current NIS.

5. ***Communication:*** The number of harvesters involved in harvesting the requirements of BioAtlantis will be below five initially, rising to sixteen over time. Communication of the harvesting plan will be done in advance each month/quarter via email or post. This will include information on sites that are to be harvested and the quantity and dates for each harvest site. Sites will be identified on a map and the anticipated quantities for each site indicated. Communications with the harvesters during harvesting activities will be either via a mobile phone or 2 way radios, as deemed appropriate and will be managed by BioAtlantis and the BioAtlantis Resource Manager.
6. ***Health and safety measures*****:** All harvesters will receive appropriate and certified Health & Safety Training. BioAtlantis will run regular training days for the harvesters. The seaweed collection vessel will be equipped with all necessary safety equipment as required by the Marine Survey Office (MSO).

3.1.2.3 Monitoring of the *A. nodosum* resource

The biomass of *A. nodosum* will be assessed according to standard methods, but through use of larger $1m^2$ quadrants summarized as follows:

- Sites located and photographed as required.
- $1m^2$ quadrants provide more robust measures of biomass over a larger area than otherwise smaller $0.25m^2$ units used by Kelly *et al.*, (2001) and others. Typically, 3 replicates taken per site with a distance of approximately 3 meters between each quadrant, where possible. Caution will be taken to ensure that analysis is limited to *A. nodosum* fronds which are bound by holdfasts within the test quadrant itself. Overlapping fronds which are bound by holdfasts outside the quadrants will be excluded from measurements. Where density is deemed relatively homogenous according to visual estimation scales, lower number of replicates may be used.
- Harvest *A. nodosum* from each quadrant and measure wet weight per unit area.
- Record all details in the database and ensure that site is not subjected to further harvest activities until *A. nodosum* density has recovered.
- Statistical analysis: Different regions of Clew Bay will have different rates of *A. nodosum* growth. Therefore, it will be important to calculate the level of variation of *A. nodosum* in as many regions as possible. The datasets will allow for high density mapping of the distribution of the resource within the complex. This will build upon the study by Hession *et al.*, (1998) and provide a more detailed analysis of the extent of the resource in the area. Analysis will be performed using geospatial tools and/or by means of One-Way ANOVA, linear regression or similar tests using software such as GraphPad PRISM.
- Following the assigned fallowing period, repeat the steps outlined above, and where possible, $1m^2$ quadrants will be assigned in the same location as previously. Harvest *A. nodosum* and record data as described above.

Immediately following harvest, *A. nodosum* will be bagged and weighed automatically on the navigation vessel. Details will be recorded on the GRN on arrival at the pier, thus allowing for accurate recording of the locations and quantities of *A. nodosum* harvested per unit area. The

Resource Manager will be responsible for uploading the data from the GRN forms to the harvest database. The maintenance of the database will be the responsibility of the Engineering Manager. Scientific, production and quality personnel will have access to the database as required for the correct implementation of their duties.

Locations and periods of harvest must be planned in a manner which ensures that (a) there is no damage incurred to the environs of this cSAC region, (b) there is sufficient *A. nodosum* biomass available for harvest and (c) sufficient time has passed to allow for recovery. The most accurate means of ensuring that each of these goals are met is through the statistical analysis of datasets as they emerge. In this way, staff at BioAtlantis will make decisions which are informed by knowledge of the rates of *A. nodosum* re-growth and regeneration. Data relating to biomass levels, re-growth and re-generation will be incorporated into the harvest management database for use in planning harvest periods.

In terms of quality control, BioAtlantis, as a GMP+ certified company, must ensure full traceability to end users of the origin and location of the raw material used in the products manufactured. Therefore, the Quality Control system in BioAtlantis will play a key role in the management and monitoring of work relating to the harvest of *A. nodosum* in Clew Bay. In brief, this will involve:

- Quality control checks on harvesting activities in Clew Bay to ensure conformance with quality and other requirements for the cSAC.
- Quality control checks to ensure recording is conducted appropriately (Goods Received Notes (GRN), etc).
- Implementation of corrective actions where necessary. Liaise with BioAtlantis GMP+ Team on non-conformance issues should they arise.
- Utilization of this knowledge in the preparation, scheduling and allocation of resources for harvesting.
- Supervise the implementation and training of all personnel & contractors involved in hand harvesting activities in the Clew Bay area.
- Liaise with environmental research team regarding interpretation of data and on research and development related issues.
- Ensure customers have full traceability from point of harvest to the end product.

The quota for each island is a sustainable harvest of 20% of *A. nodosum.* If the quota is exceeded, the Resource Manager will issue a Non-Conformance Report (NRC) to BioAtlantis management. Harvesters will undergo re-training if required. The Resource Manager will routinely inspect sites post-harvest to ensure compliance of harvesters with sustainable hand harvest methods. An NCR will be filed and re-training provided if deemed necessary. If in the event of continual non-compliance, the contract with any such individual will be terminated. In the event that harvesters employed by BioAtlantis cut excess amounts of *A. nodosum* and/or sell material to other companies, BioAtlantis will investigate and if necessary take disciplinary procedures.

3.2 Description of the receiving environment

Clew Bay is a wide, west-facing bay on the west coast of Co. Mayo. It is open to the westerly swells and winds from the Atlantic with Clare Island giving only a small amount of protection. The drumlin landscape was formed during the last glacial period when sediments were laid down and smoothed over by advancing ice - the sea has subsequently inundated this area,

creating a multitude of islands. These glacial features vary considerably in size from large islands supporting dwellings and pastures to little more than raised features on the sea floor. The numerous islands give rise to shallow straits and lagoons between which flow deep channels. This, together with the erosion of existing and submerged drumlins with their coarse glacial deposits, gives rise to a heterogeneous sediment environment. The presence of coarse material may therefore be an artefact of the glacial deposits rather than simply reflecting the level of energy present.

The geomorphology of the bay has resulted in a complex series of interlocking bays creating a wide variety of marine and terrestrial habitats, including several listed on Annex I of the E.U. Habitats Directive: large shallow bay, lagoon, Atlantic salt meadows, drift lines, perennial vegetation of stony banks, embryonic shifting dunes, Marram dunes, dune slacks and old Oak woodland. Around the edges of the inner part of the bay are shores of mixed boulders, cobbles, gravel with some sand and mud. They have a typical zonation of intertidal communities found on sheltered shores of mixed substratum. The Rosmurrevagh area in the north of Clew Bay displays a high diversity of habitats, from seashore to dunes and coastal grassland, as well as saltmarsh, bog and fen. A further dune system occurs at Bartraw in the south-west of the site. The Clew Bay Complex is identified as being important with regard to the populations of Otter and Common seal within the bay, listed as qualifying interests of the Clew Bay Complex cSAC.

A number of intertidal and marine communities/community complexes have been identified in the bay. The development of a community complex arises when an area possesses similar abiotic features but records a number of biological communities that are not regarded as being sufficiently stable and/or distinct temporally or spatially to become the focus of conservation efforts. In this case, examination of the available data from Clew Bay identified a number of biological communities whose species composition overlapped significantly. Such biological communities are grouped together into what experts consider are sufficiently stable units (i.e. a complex) for the purposes of setting conservation targets with respect to the designated Natura 2000 status of the Clew Bay Complex cSAC as a whole.

3.3 Identification of relevant Natura 2000 sites

3.3.1 Screening of Natura 2000 sites within the study area

The screening assessment to inform the Appropriate Assessment has identified Natura 2000 sites within a 15km radius of the proposed project, following the guidance published by DoEHLG (2009). It has been evaluated that a wider radius was not required in the absence of pathways identified by which sites outside of this radius could potentially be affected. Designated candidate Special Areas of Conservation (cSAC) sites and Special Protection Area (SPA) sites within the study area are presented in Table 3. The conservation interests of these sites and the potential for interactions leading to significant adverse effects arising from the proposed project are identified for each site. The locations of the cSAC and SPA Natura 2000 sites within the study area are presented in Figures 2 and 3.

Table 3 Designated Natura 2000 sites which are located within a 15km radius of the BioAtlantis study area at Clew Bay, Co. Mayo. The qualifying interests and the potential for impacts affecting these individual features are identified.

Natura site	Distance	Qualifying Interests	Potential for impacts identified	Further assessment required
Clew Bay Complex cSAC 001482	0km	*Vertigo geyeri* [1013] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Otter (*Lutra lutra*) [1355] Common seal (*Phoca vitulina*) [1365] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]	There will be no interactions or pathways for impacts arising from the proposal which may affect the terrestrial / upper shore habitats of this designated site. Works are required within habitats that interact with the intertidal zone and within the bay itself. The Otter and Common seal have been recorded from within the project area and cSAC populations are known to be mobile.	No further assessment is required with regard to the terrestrial and upper shore Annex I habitats of this site. The potential for significant impacts affecting Annex I intertidal / marine habitats requires assessment. Further assessment is required to determine the significance of potential impacts affecting the cSAC populations of Common seal and Otter, with regard to disturbance and habitat displacement.
Owenduff/Nephin Complex cSAC (000534)	1.8km northwest	Salmon (*Salmo salar*) [1106] Otter (*Lutra lutra*) [1355] Shining sickle moss (*Drepanocladus vernicosus*) [1393] Marsh saxifrage (*Saxifraga hirculus*) [1528] Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoto-Nanojuncetea* [3130] Natural dystrophic lakes and ponds [3160] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Northern Atlantic wet heaths with *Erica tetralix* [4010] Alpine and Boreal heaths [4060] *Juniperus communis* formations on heaths or	There will be no interactions or pathways for impacts arising from the proposed project which may affect the terrestrial and freshwater Annex I habitats and Annex II flora listed as qualifying interests of this site. The proposed works along the intertidal zone on the northern shore of Clew Bay has the potential to give rise to interactions affecting mobile otter populations from the adjacent Owenduff / Nephin cSAC with respect to the lower reaches of the Owengarve and Carrowsallagh Rivers. However, due to distance and the absence of interactions with the freshwater environment within the cSAC boundary, no significant impacts are identified.	No further assessment is required with regard to the Annex I habitats and Annex II species of this site. There is no potential for significant impacts affecting the conservation interests, with regard to the conservation objectives of this site.

Natura site	Distance	Qualifying Interests	Potential for impacts identified	Further assessment required
		calcareous grasslands [5130] Blanket bog (*active only) [7130] Transition mires and quaking bogs [7140]		
Corraun Plateau cSAC (000485)	1km northwest	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] *Juniperus communis* formations on heaths or calcareous grasslands [5130] Blanket bog (*active only) [7130]	There will be no interactions or pathways for impacts arising from the proposed works which may affect the terrestrial and freshwater habitats listed as qualifying interests of this site.	No further assessment is required with regard to the Annex I habitats listed as qualifying interests of this site.
Newport River cSAC 002144	1.3km east	Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] Salmon (*Salmo salar*) [1106] Northern Atlantic wet heaths with *Erica tetralix* [4010] Blanket bog (*active only) [7130]	Taking account of distance and the character of these qualifying features there will be no interactions or pathways for impacts arising from the proposed works which may affect the habitats or species for which this site is designated.	No further assessment is required with regard to the Annex I habitats and Annex II species listed as qualifying interests of this site.
Brackloon Woods cSAC (000471)	2km south	Old sessile oak woods with *Ilex* and *Blechnum* in British Isles [91A0]	Taking account of distance and the character of the proposal, there will be no interactions or pathways for impacts arising from the works which may affect the Annex I habitat for which this site is designated.	No further assessment is required with regard to the Annex I habitats of this site.
Mweelrea / Sheeffry / Erriff Complex cSAC 001932	5.5km south	*Vertigo geyeri* [1013] *Vertigo angustior* [1014] Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] Salmon (*Salmo salar*) [1106] Coastal lagoons [1150] Annual vegetation of drift lines [1210] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Otter (*Lutra lutra*) [1355] Petalwort (*Petalophyllum ralfsii*) [1395] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Slender naiad (*Najas flexilis*) [1833]	Taking account of distance and the hydrological separation of this designation from the proposed works; there will be no interactions or pathways for impacts arising from the proposal which may affect the Annex I habitats or Annex II species for which this site is designated.	No further assessment required with regard to the Annex I habitats or Annex II species of this site.

Natura site	Distance	Qualifying Interests	Potential for impacts identified	Further assessment required
		Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150] Dunes with *Salix repens ssp.argentea* (*Salix arenariae*) [2170] Machairs [21A0] Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoto-Nanojuncetea* [3130] Natural dystrophic lakes and ponds [3160] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] *Juniperus communis* formations on heaths or calcareous grasslands [5130] Blanket bog (*active only) [7130] Transition mires and quaking bogs [7140] Depressions on peat substrates of the *Rhynchosporion* [7150] Petrifying springs with tufa formation (*Cratoneurion*) [7220] Alkaline fens [7230] Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220]		
Lough Gall Bog cSAC (000522)	6.5km northwest	Blanket bog (*active only) [7130] Depressions on peat substrates of the *Rhynchosporion* [7150]	Taking account of distance and the character of these qualifying features there will be no interactions or pathways for impacts arising from the proposed works	No further assessment is required with regard to the Annex I habitats of this site.

Natura site	Distance	Qualifying Interests	Potential for impacts identified	Further assessment required
			which may affect the habitats for which this site is designated.	
Bellacragher Saltmarsh cSAC (002005)	7km northwest	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Taking account of distance and the hydrological separation between the proposed works and the Annex I habitats listed as qualifying features of this designation, there will be no interactions or pathways for impacts arising which may affect the habitats for which this site is designated.	No further assessment is required with regard to the Annex I habitats of this site.
Oldhead Wood cSAC 000532	7km west	European dry heaths [4030] Old sessile oak woods with *Ilex* and *Blechnum* in British Isles [91A0]	Taking account of distance and the character of these qualifying features there will be no interactions or pathways for impacts arising from the proposed works which may affect the habitats for which this site is designated.	No further assessment is required with regard to the Annex I habitats of this site.
West Connacht Coast cSAC (2998)	8km west	Bottlenose dolphin *Tursiops truncates* [1349]	Taking account of distance and the character of the Annex II species listed as qualifying interests of this designation, i.e. not significantly sensitive to low-level disturbance at the shoreline, there are no pathways for impacts or interactions arising from the proposed works which may affect the species for which this site is designated.	No further assessment is required with regard to the Annex II species listed as a qualifying interest of this site.
River Moy cSAC 002298	10km north	White-clawed crayfish (*Austropotamobius pallipes*) [1092] Sea lamprey (*Petromyzon marinus*) [1095] Brook lamprey (*Lampetra planeri*) [1096] Salmon (Salmo salar) [1106] Otter (*Lutra lutra*) [1355] Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the *Rhynchosporion* [7150] Old sessile oak woods with *Ilex* and *Blechnum* in British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	Taking account of distance and the hydrological separation of this designation from the proposed works; there will be no interactions or pathways for impacts arising from the proposal which may affect the Annex I habitats or Annex II species for which this site is designated.	No further assessment required with regard to the Annex I habitats or Annex II species of this site.
Owenduff/Nephin Complex SPA	1.8km northwest	Merlin (*Falco columbarius*) [A098] Golden Plover (*Pluvialis apricaria*) [A140]	Taking account of distance and the character of these qualifying features, with regard to the proposal, there	No further assessment is required with regard to the

Natura site	Distance	Qualifying Interests	Potential for impacts identified	Further assessment required
004098		Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]	will be no interactions or pathways for impacts arising from the proposed works which may affect the species for which this site is designated.	Annex I bird species listed as special conservation interests of this site.
Clare Island SPA 004136	15km west	Fulmar (*Fulmarus glacialis*) [A009] Shag (*Phalacrocorax aristotelis*) [A018] Common Gull (*Larus canus*) [A182] Kittiwake (*Rissa tridactyla*) [A188] Guillemot (*Uria aalge*) [A199] Razorbill (*Alca torda*) [A200] Chough (*Pyrrhocorax pyrrhocorax*) [A346]	Taking account of distance and the character of these qualifying features, with regard to the proposal, there will be no interactions or pathways for impacts arising from the proposed works which may affect the species for which this site is designated.	No further assessment is required with regard to the Annex I bird species listed as special conservation interests of this site.

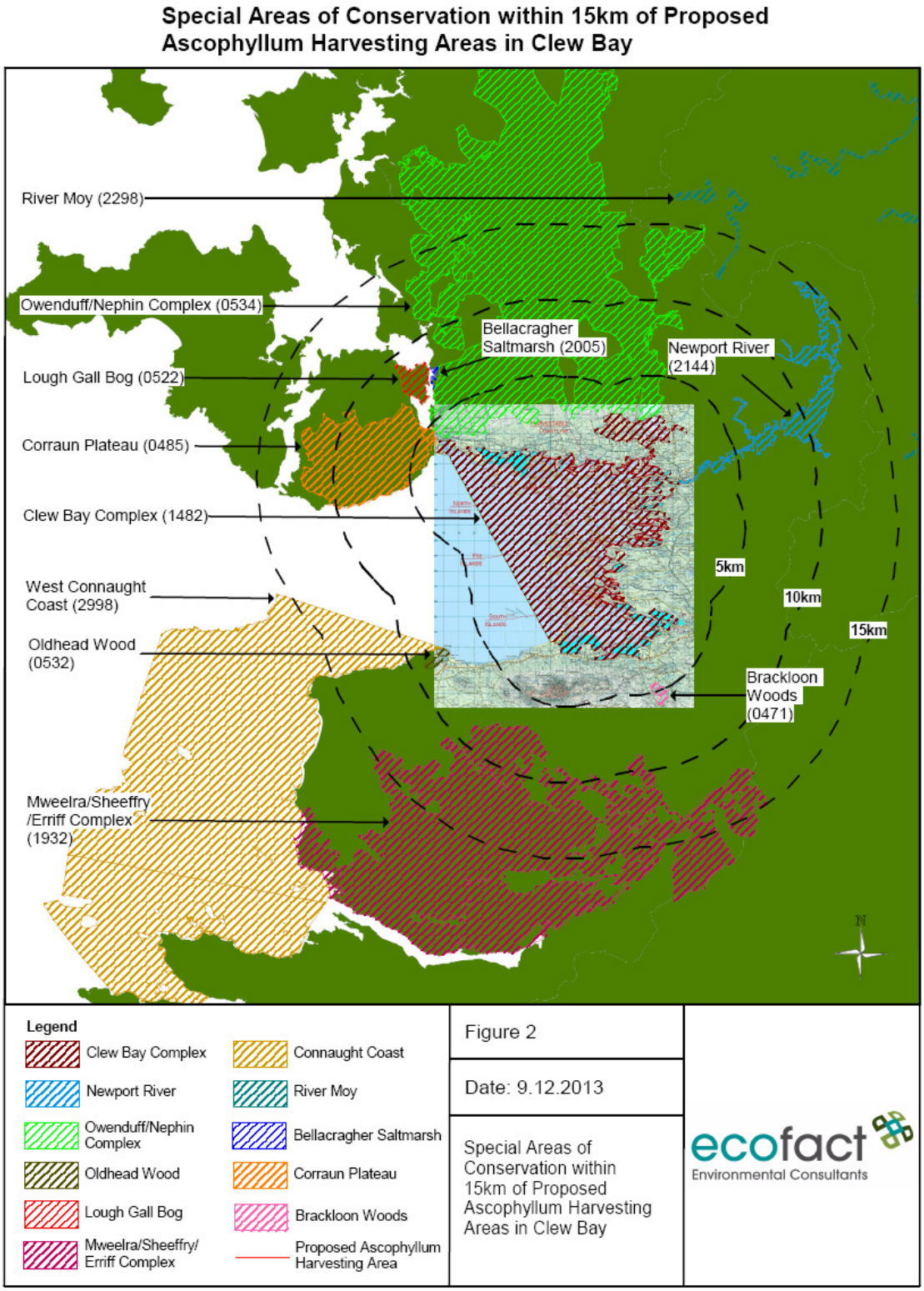

Figure 2 Map showing the locations of designated candidate SAC sites within the study area, relative to the BioAtlantis proposal for hand-harvesting of *A. nodosum* from Clew Bay.

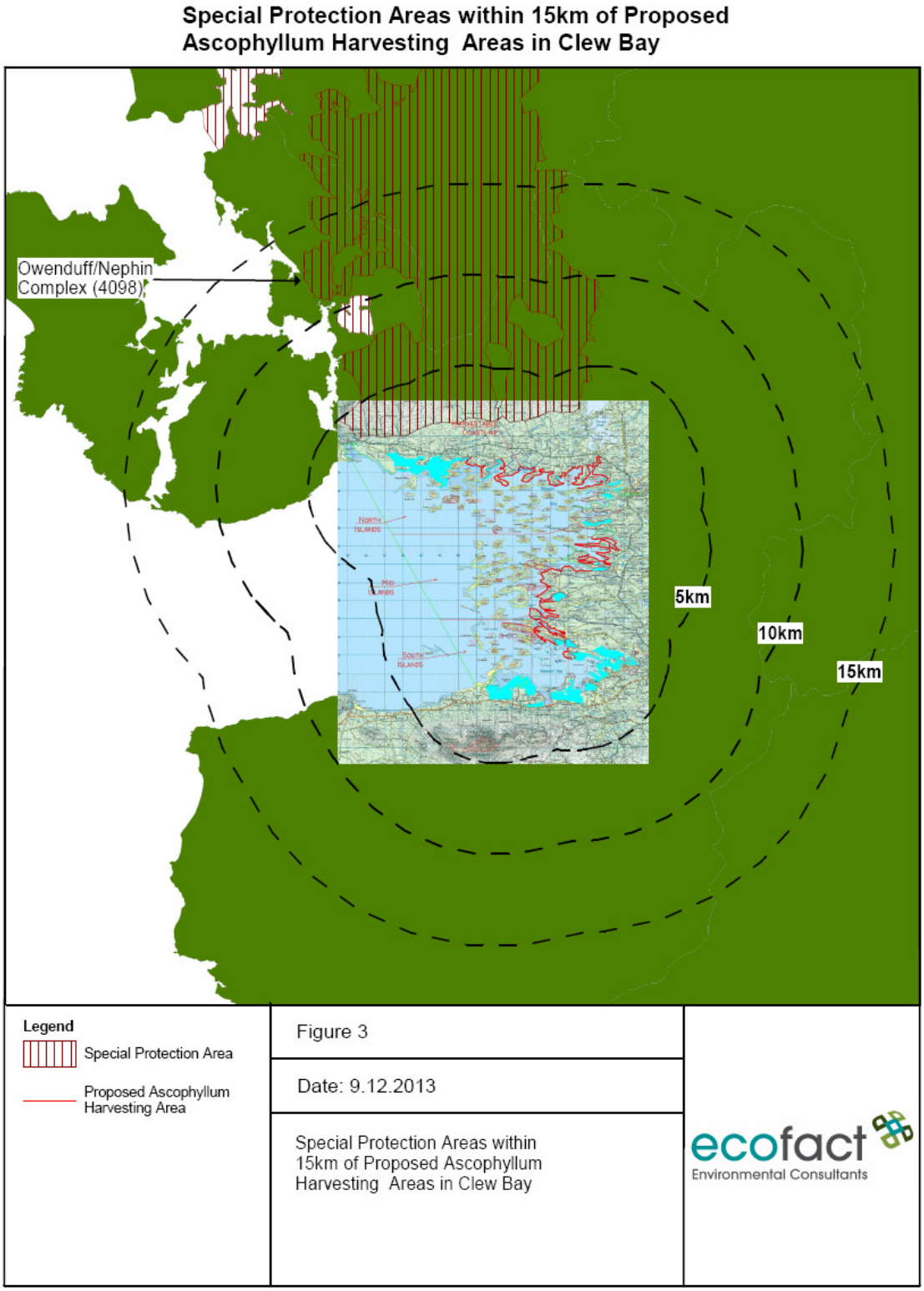

Figure 3 Map showing the locations of designated SPA sites within the study area, relative to the BioAtlantis proposal for hand-harvesting of *A. nodosum* at Clew Bay, Co. Mayo.

3.4 Screening assessment of likely effects

The current Screening assessment takes account of the potential for adverse effects on the qualifying interests and conservation objectives of the Natura 2000 sites potentially affected by the proposed project. Direct, indirect and cumulative impacts arising from the proposal for the sustainable hand-harvesting of *Ascophyllum nodosum* within the intertidal zone of Clew Bay are identified with regard to potential impacts affecting designated Natura 2000 sites as follows:

- disturbance / fragmentation of Annex I habitats;
- disturbance to Annex II species;
- impacts affecting the structure and function of the designated site;
- hydrological changes / water quality impacts.

From the initial screening of Natura 2000 sites within the study area only the Clew Bay Complex cSAC is identified with regard to the potential for significant adverse effects, with regard to the conservation objectives of this site. The site synopsis for the Clew Bay Complex cSAC is presented as Appendix 2 of this NIS. The main potential risks affecting sensitive ecological receptors, i.e. the qualifying interests of this site are primarily due to human disturbance; trampling and removal of *A. nodosum* material potentially affecting the community structure within the Annex I habitats of the intertidal zone and further human disturbance due to increased activity potentially affecting Annex II species: Otter and Common seal.

3.4.1 Assessment of potential direct impacts affecting the Clew Bay Complex cSAC

Ecological impacts are the effects on natural resources and on the components, structures, and functioning of affected ecosystems. Effects may include those resulting from actions which may have both beneficial and detrimental effects. Direct impacts are caused by the action and occur at the same time and place.

3.4.1.1 Potential direct impacts affecting Annex I habitats

The proposal for the sustainable hand-harvesting of *A. nodosum* will require the transport of individual harvesters to the shoreline of Clew Bay and islands by small boat. Harvesters will work within the Bay and islands throughout the year. This work will require access to the shore at low tide from existing access roads and to islands before low tide to allow for harvesting at low tide. There will be no interactions between the proposed works and the following habitats that would give rise to the potential for direct impacts likely to cause significant adverse effects:

- Mudflats and sandflats not covered by seawater at low tide [1140]
- Coastal lagoons [1150]
- Large shallow inlets and bays [1160]
- Annual vegetation of drift lines [1210]
- Perennial vegetation of stony banks [1220]
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
- Embryonic shifting dunes [2110]

- Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]

The entirety of the works are within the Annex I habitat 'Large shallow inlets and bays [1160]'. These works do not require the removal or disturbance to the sensitive littoral reef habitat or to Maerl or *Zostera* communities identified as important community biotopes within the Clew Bay [1160] Annex I habitat type. However, as the proposal requires works within this habitat area, it is considered that the potential for significant effects requires further assessment, with scope for the mitigation and avoidance of potential adverse effects.

3.4.1.2 Potential direct impacts affecting Annex II species

Both the Common seal *Phoca vitulina* and the Otter *Lutra lutra* are listed as Annex II qualifying interests of the Clew Bay Complex cSAC. Both species utilise the shoreline of the bay, in addition to the islands within the study area. A number of these islands have been identified as important haul-out, breeding and moulting sites for Common seal. This gives rise to the potential for disturbance impacts affecting both species which may result in direct impacts affecting the availability of habitat and the range of these species within the cSAC. It is therefore considered that the potential for disturbance impacts, potentially affecting both Common seal and Otter require further examination.

As the proposed harvesting works are limited to the intertidal zone, where *A. nodosum* will be collected, there are no pathways for impacts whereby the proposal would have the potential to give rise to significant direct impacts affecting the Annex II listed whorl snail *Vertigo geyeri*; as the habitats supporting this species above the shoreline will not be affected by the proposal.

3.4.2 Assessment of potential indirect impacts affecting the Clew Bay Complex cSAC

Indirect effects are caused by factor(s) occurring later in time or farther removed in distance, but are considered to be reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

3.4.2.1 Potential indirect impacts affecting Annex I habitats

The proposed works within the Clew Bay Complex will require works within the intertidal zone of the Annex I habitat 'Large shallow inlets and bays [1160]', the removal of a 20% surface cover of *A. nodosum* is considered to have the potential to give rise to an alteration in the intertidal biotope characterised as intertidal reef habitat; identified as an Annex I habitat within the Annex I [1160] habitat of the Clew Bay Complex cSAC as a whole. There are no other Annex I habitats identified that may be indirectly affected by the proposed harvesting activities.

3.4.2.2 Potential indirect impacts affecting Annex II species

Additional indirect impacts may potentially occur due to a reduction in foraging area and displacement of common seal populations within the wider works area leading to the requirement for further assessment within the context of the current NIS. Potential indirect

disturbance arising from both human activity and wider noise impacts affecting both Common seal and Otter within the cSAC are identified. This may include impacts relating to foraging and commuting in the wider context of the study area; in addition to indirect impacts affecting breeding success and energy expenditure resulting from disturbance. The significance of impacts potentially affecting Common seal and Otter populations designated within this cSAC requires further assessment.

3.4.3 Assessment of potential cumulative impacts affecting the Clew Bay Complex cSAC

Cumulative impacts or effects are changes in the environment that result from numerous human-induced, small-scale alterations. Cumulative impacts can be thought of as occurring through two main pathways: first, through persistent additions or losses of the same materials or resource, and second, through the compounding effects as a result of the coming together of two or more effects (Bowers-Marriott, 1997). As part of the Screening for an Appropriate Assessment, in addition to the proposed works, other relevant projects and plans in the region must also be considered at this stage. This step aims to identify at this early stage any possible significant in-combination or cumulative effects / impacts of the proposed project with other such plans and projects on the Natura 2000 sites.

Completed plans or projects, where they contribute to a potential cumulative effect are considered in that they have resulted in an impact upon the qualifying interests of a designated site and the continuing effect must be assessed in order to identify any pattern of continuing loss of integrity (English Nature, 2001). Potential cumulative impacts affecting species listed as conservation interests of designated Natura 2000 sites are identified with regard to the following:

- Disturbance and displacement effects of increased boat traffic;
- Disturbance and potential displacement due to noise and human disturbance at a background level during operation;
- Indirect effects through loss of, or changes to, habitat and prey species availability arising from an alteration to the intertidal biotope / community due to harvesting of *A. nodosum*.

The location of the proposal within the Clew Bay Complex cSAC gives rise to the potential for direct and indirect impacts affecting Common seal and Otter populations listed as qualifying interests of this Natura 2000 site. The potential for disturbance impacts affecting these species are also recognised with regard to existing fishing boat activity, tourism and recreational activity within the Clew Bay area and pre-existing and ongoing seaweed harvesting activities; all of which would have the potential for cumulative and in-combination impacts arising from human disturbance impacts.

3.5 Screening statement with conclusions

According to the guidance published by the DoEHLG (2009), the Screening Assessment to inform the Appropriate Assessment process can identify that a Natura Impact Statement (NIS) is not required in circumstances where a project / proposal is directly related to the management of the designated site. Alternatively the Screening Assessment has the potential to conclude that there is no potential for significant impacts affecting the Natura 2000

network; or that significant effects are certain, likely or uncertain i.e. the project must either proceed to a NIS or be rejected.

The Screening Statement prepared to inform the current NIS has identified that the proposed sustainable harvesting of *Ascophyllum nodosum* within the intertidal habitats of the Clew Bay Complex cSAC gives rise to the potential for direct, indirect and cumulative impacts which may be significant with regard to the qualifying interests of this Natura 2000 designation. Based on the information provided, the current Screening Assessment has therefore determined that a Natura Impact Statement (NIS) for the proposal is required. The Clew Bay Complex cSAC is identified as the only designated Natura 2000 site potentially affected by the proposal and which will be subject to further assessment in this NIS.

4 NATURA IMPACT ASSESSMENT (NIS)

4.1 Overview of NIS objectives

In line with the requirements of a Natura Impact Statement, this section considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the *integrity* of a Natura 2000 site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. The proposal has been subject to a scientific examination of the proposal and the relevant Natura 2000 sites with regard to any possible implications for the Natura 2000 sites in view of their conservation objectives, structure and function; taking account of in combination effects. From the Screening Assessment in Chapter 3 above it is concluded that the potential exists for adverse effects on the physical environment and biological communities designated within the Natura 2000 network arising from direct, indirect and cumulative impacts of the proposal.

The overall aim of the Habitats Directive (1992) is to maintain or restore the favourable conservation status of habitats and species of Community interest. These habitats and species are afforded protection under the Birds and Natura Habitats Regulations (2011) with Special Areas of Conservation and Special Protection Areas designated to conserve the most vulnerable interests. The qualifying interests of the Clew Bay Complex cSAC within the study area of the BioAtlantis proposal, and the conservation objectives of this site, are assessed with regard to potential direct, indirect and cumulative impacts. It is noted that only the qualifying interests identified as being potentially affected by the proposal (from the Screening Assessment, Chapter 3) are included in this NIS.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network in favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites. The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. Favourable conservation status of a habitat is achieved when its natural range, and area it covers within that range, are stable or increasing; when 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 when the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when the population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; when the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and when there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

4.2 Description of the Clew Bay Complex cSAC Natura 2000 site

A description of the Clew Bay Complex is set out in Section 3.1 and is further described in the NPWS SAC site synopsis included as Appendix 2 of this NIS. The current assessment takes account of the qualifying interests and conservation objectives of this large site, with regard to the interaction of the proposal and the requirements to maintain and restore the qualifying

interests of the site at favourable status. The Annex I habitats and Annex II species listed as qualifying interests of the Natura 2000 site and potentially affected by the proposed project are described in this section. The qualifying interests of the cSAC are:

- Mudflats and sandflats not covered by seawater at low tide [1140]
- Coastal lagoons [1150]
- Large shallow inlets and bays [1160]
- Annual vegetation of drift lines [1210]
- Perennial vegetation of stony banks [1220]
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
- Embryonic shifting dunes [2110]
- Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]
- Otter (*Lutra lutra*) [1355]
- Common seal (*Phoca vitulina*) [1365]
- *Vertigo geyeri* [1013]

4.2.1 Annex I habitats: Large shallow inlets and bays

The 'Large shallow inlets and bays' Annex I habitat encompasses the Annex I habitat Mudflats and sandflats not covered by seawater at low tide (NPWS, 2011c). As well as the communities that occur within that habitat the following benthic communities also occur within large shallow inlets and bays:

- *Zostera* dominated communities
- Maërl dominated communities
- Sandy mud with polychaetes and bivalves community complex
- Fine sand dominated by *Nephtys cirrosa* community
- Shingle
- Reef (intertidal and subtidal)
- Mudflats and sandflats not covered by seawater at low tide
- Intertidal sandy mud with *Tubificoides benedii* and *Pygospio elgans* community complex

4.2.2 Annex II species: Common (or harbour) seal and Otter

A description of the Common seal population and habitat requirements within the Clew Bay Complex cSAC is set out in the NPWS Conservation Objectives for the site (NPWS, 2011c). The Common seal occurs in estuarine, coastal and offshore waters but also utilises a range of intertidal and terrestrial habitats for important life history functions such as breeding, moulting, resting and social activity. When hauling out ashore, common seals tend to prefer comparatively sheltered locations where exposure to wind, wave action and precipitation, for example, are minimised. Common seals occupy both aquatic and terrestrial habitats in Clew Bay Complex SAC, including intertidal shorelines that become exposed during the tidal cycle. The species is present at the site throughout the year during all aspects of its annual life cycle which includes breeding (May-July approx.), moulting (August-September approx.) and non-breeding foraging and resting phases. In acknowledging the limited understanding of aquatic habitat use by the species within the site, it should be noted that all suitable aquatic habitat is considered relevant to the species' range and ecological requirements at the site and is

therefore of potential use by harbour seals.

Common seals are vulnerable to disturbance during periods in which time is spent ashore, or in shallow waters, by individuals or groups of animals. This occurs immediately prior to and during the annual breeding season, which takes place predominantly during the months of May-July. The necessity for individual seals to undergo an annual moult (i.e., hair shedding and replacement), which generally results in seals spending more time ashore during a relatively discrete season, is considered an intensive, energetically-demanding process, which incurs further vulnerability for individuals during this period. Terrestrial or intertidal locations where seals can be found ashore are known as haul-out sites. The Common seal moult season takes place predominantly during the months of August-September.

The NPWS Conservation Objectives for the Clew Bay Complex cSAC do not include a detailed description of the occurrence and range of Otter within the cSAC (NPWS, 2011a; NPWS, 2011b; NPWS 2011c); however, specific conservation objectives for this species are provided and will be addressed in the relevant section of the NIS.

4.3 Assessment of the qualifying interests of the Clew Bay cSAC site potentially affected by the proposal

In this section the qualifying interests, i.e. the Annex I habitats and Annex II species for which the Clew Bay Complex cSAC is designated, are described for further assessment. The qualifying interests of the cSAC, identified within the zone of influence of the Foreshore Licence Application are described with regard to their occurrence, taking account of the potential for significant effects. The potential for significant effects takes account of the proposal, as set out in the BioAtlantis Licence Application (2014). Mitigation measures for the avoidance of significant impacts included in the proposal are deferred to the mitigation section of the current NIS. However, the 'Codes of Practice' and protocols for sustainable, hand-harvesting of *A. nodosum* detailed within the BioAtlantis Licence Application (2014) are considered to comprise the proposal; with regard to determining the potential scale and significance of any impacts.

4.3.1 Potential for direct impacts

4.3.1.1 Potential for direct impacts affecting Annex I habitats

The proposal includes the sustainable harvesting of *A. nodosum* by hand within the inner Clew Bay Complex cSAC, including the shoreline of the bay and the islands. The removal of *A. nodosum* from within the Annex I habitat 'Large shallow inlet and bays' has the potential for the small-scale removal of substrate material (sand, shingle and stone). The reef component of the intertidal / sub-littoral habitat within the 'Shallow inlets and Bays' is identified in the Conservation Objectives of this site as being part of the overall intertidal complex of Clew Bay, rather than as a stand-alone Annex I 'Reef' habitat; 'Reef' is not listed as a qualifying interest of the cSAC. The proposal requires access to the intertidal zone of Clew Bay and will result in small-scale trampling and removal of seaweed (20% of *A. nodosum* cover) occurring throughout the year. The conservation objectives of the Clew Bay Complex cSAC (NPWS, 2011b, 2011c) identified that the permanent habitat area of the Clew Bay area within the cSAC, including all Annex I habitats in the Bay, must be maintained at favourable conservation conditions to ensure stability of the permanent habitat area. This includes the presence of Annex I habitats not listed as individual qualifying interests of the cSAC complex

i.e. reef habitat. The conservation of 'Reef' habitat is identified as an individual objective with regard to the maintenance of 'Reef' communities (NPWS, 2011c).

The proposal does not include any works within the upper shore, or coastal habitats identified as Annex I habitats that may be affected by the harvesting activities. All access to the shoreline will be by existing road and slipways, with islands accessed from the sea by boat. There is therefore, no potential for impacts affecting the conservation status of the coastal and upper shore habitats listed as qualifying interests of the Clew Bay cSAC. Specific control and mitigation measures have been included in the current proposal, integrated into the Harvest Management Plan and the 'Codes of Practice for *A. nodosum* harvest activities in Clew Bay cSAC', to avoid the potential for significant direct impacts affecting the conservation status of the Annex I habitat 'Large shallow inlets and bays', with regard to Clew Bay as a whole. These measures are specified in detail in the proposed mitigations of the NIS.

4.3.1.2 Potential for direct impacts affecting Annex II species

As the proposal requires works within the Clew Bay Complex cSAC, which supports Annex II Common seal and Otter populations listed as qualifying interests of the site, there is the potential for direct impacts to arise with regard to human disturbance. Both the Common seal and the Otter utilise the shorelines and intertidal habitats of Clew Bay and the islands. Common seals require isolate shorelines, primarily on the islands, for important life-cycle stages: breeding, moulting and resting (haul-out). The proposed harvesting activities give rise to the potential for direct human disturbance including increased noise, habitat disturbance and disturbance to foraging. The species is present during all aspects of its annual life cycle including breeding (approx. May-July), moulting (approx. August-September) and phases of non-breeding foraging and rest (approx. October-April). Harbour seals and their pups are vulnerable to disturbances during May-July, the time period just prior to and during the annual breeding season. This is due to the large amount to time spent in shallow waters or ashore. There are many established breeding locations used in Clew Bay, most of which occur in the Northern part of this complex. There are several moult haul-outs in Clew Bay which are important sites for moulting, of which include: Inishdeashmore, Inishdeashbeg and adjacent skerries, Inishnakillew, Inisheeny, Carrickwee, Inishgowla South, Forillan, Finnaun Island, Carrickawart Island, Corillan, Carricknamore, Stony Island and adjacent skerries, the Green Islands and adjacent skerries. There are also several resting haul-out sites in Clew Bay, of which include: Inishdeashbeg and adjacent skerries, Inishtubrid, Inishcuill, Carrickawart Island, Stony Island and adjacent skerries, the Green Islands and adjacent skerries (NPWS, 2011c). These locations are presented in a map of the Clew Bay Complex, Figure 4. Specific Conservation Objectives (NPWS, 2011c) for the Clew Bay cSAC with regard to the Common seal are:

- breeding sites should be maintained in a natural condition;
- moulting sites should be maintained in a natural condition;
- haul-out sites should be maintained in a natural condition;
- human activities should occur at levels that do not adversely affect the harbour seal population at the site.

Specific control and mitigation measures have been included in the current proposal, integrated into the Harvest Management Plan and the 'Codes of Practice for *A. nodosum* harvest activities in Clew Bay cSAC', to avoid the potential for significant direct impacts affecting the conservation status of Common seal with regard to the Conservation Objectives

of the Clew Bay Complex cSAC. These measures are specified in detail in the proposed mitigations of the NIS.

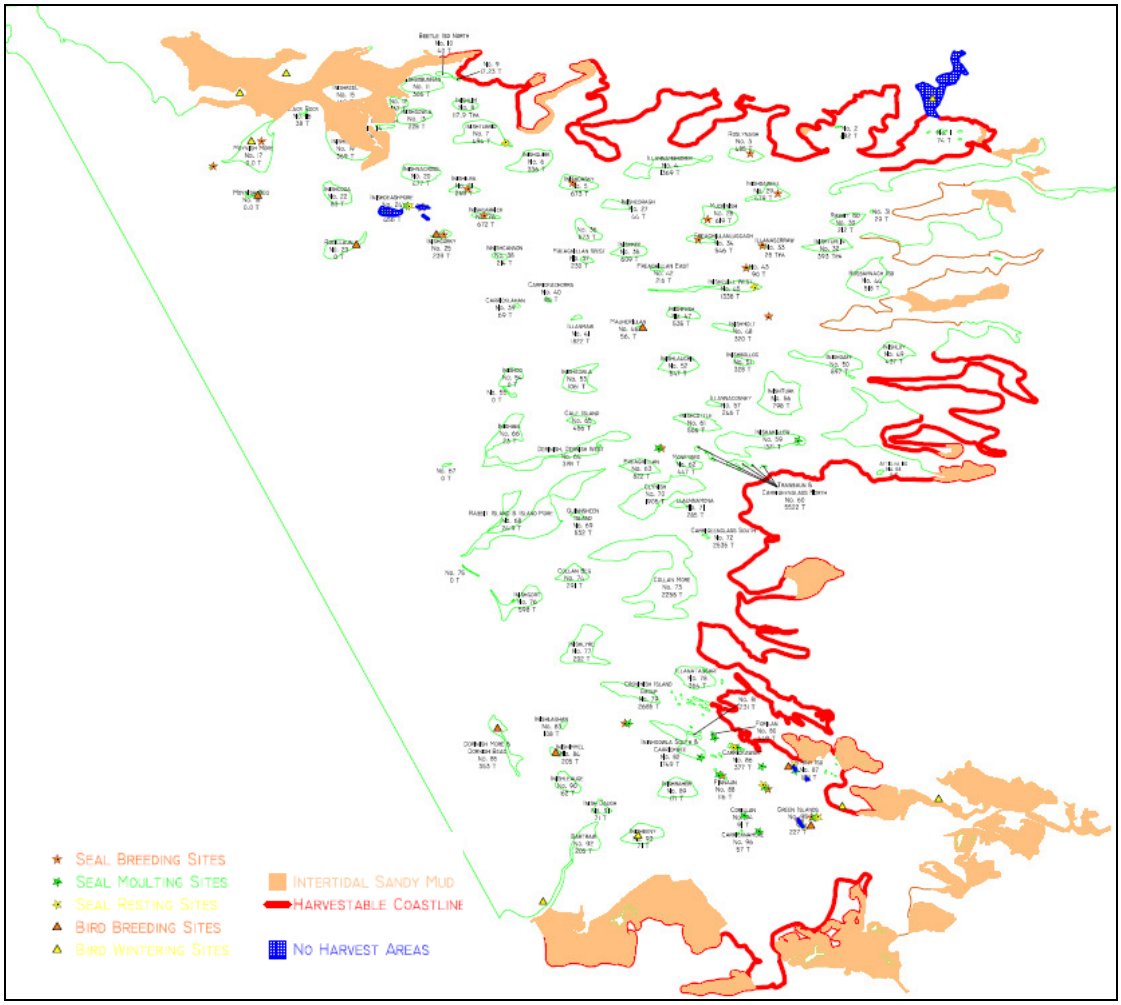

Figure 4 Map showing the important island and shoreline habitats utilised by seals during sensitive life-cycle stages. This information has been utilised to inform the mitigation strategy for the proposal.

Otters are recognised to rely more closely on the shoreline and were found to occur in good numbers within the Clew Bay area (Bailey and Rochford, 2006). According to the NPWS Conservation Objectives (2011c), otters utilize a wide number of habitats and areas within the cSAC including the freshwater and estuarine reaches of rivers. Lough Furnace and the Burrishoole catchment area are identified as being of significant importance for otter populations, including a 10m buffer zone around the linear shoreline habitats. It is recognised that Otters can typically to forage within 80m of the shoreline; thus their extent is likely to encompass the entire cSAC, including the islands. Commuting zones between island and coastlines are also considered to be extensive; giving rise to the potential for direct impacts arising from human disturbance including noise and disturbance of resting and foraging habitats. The Conservation Objectives of the Clew Bay cSAC (NPWS, 2011c) with regard to Otters are:

- No significant decline in distribution (i.e. & positive survey sites);
- No significant decline in extent of terrestrial habitat;
- No significant decline in extent of marine habitat;

- No significant decline in extent of freshwater (river) habitat;
- No significant decline in extent of freshwater (lake/lagoon) habitat;
- No significant decline in number of Couching sites and Holts (minimize disturbance);
- No significant decline in fish biomass available;
- No significant increase in barriers to connectivity.

Specific control and mitigation measures have been included in the current proposal, integrated into the Licence Application (BioAtlantis, 2014) and the 'Codes of Practice for *A. nodosum* harvest activities in Clew Bay cSAC' (see Appendix 1 of this NIS), to avoid the potential for significant direct impacts affecting the conservation status of Otter with regard to the Conservation Objectives of the Clew Bay Complex cSAC. These measures are specified in detail in the proposed mitigations of the NIS.

4.3.2 Potential indirect impacts

4.3.1.1 Potential for indirect impacts affecting Annex I habitats

Indirect impacts potentially affecting the Clew Bay Complex cSAC, with regard to the Annex I habitat 'Large shallow inlets and bays' and taking cognisance of the complex of Annex I habitats and conservation objectives associated with this overall habitat area, are identified as follows:

- Water quality issues potentially arising from increased machinery and boat usage within the bay;
- Alteration of the shoreline algal community and associated infauna, epifauna and fish community within these biotopes arising from the removal of *A. nodosum*.

It is considered, based on the low intensity of boat usage and the limited equipment (hand-harvesting), that there would be no potential for significant impacts affecting the water quality or overall habitat area of Clew Bay in this regard. Protocols are in place for the management of boats and boat access during the operational phase of the proposal and are included in the mitigation section of the NIS.

The removal of *A. nodosum*, at sustainable levels (proposed 20%), from the intertidal zone has been found to not affect the distribution or density of growth of this species. According to Kelly *et al.* (2001) sustainable hand-harvesting of *A. nodosum* does not affect the epifaunal or fish community within the intertidal habitat and would not lead to an alteration of the species composition within this habitat. There are no indirect impacts identified which would have the potential to significantly affect the sub-tidal and upper shore / coastal habitats listed as qualifying interests of the cSAC.

4.3.1.2 Potential for indirect impacts affecting Annex II species

Indirect impacts arising from the proposed harvesting of *A. nodosum* with regard to Annex II species are limited to the potential alteration of coastal and intertidal habitats supporting both Common seal and Otter. As set out above a study by Kelly et al. (2001) found that hand-harvesting of *A. nodosum* at sustainable levels (20% currently proposed), does not alter the species composition of the intertidal community, nor does it affect the fish species utilising the intertidal habitat. It is these fish species that are indentified as being of particular importance for foraging Otter. There are no indirect impacts identified that would have the potential to

affect the subtidal habitats or benthic and pelagic fish species upon which Common seal populations within Clew Bay rely. Furthermore the proposal does not give rise to any interactions between the freshwater or anadromous salmonid populations identified as being of importance for Otter within the freshwater and estuarine component of the cSAC.

4.3.3 Potential for cumulative or in-combination effects

When assessing cumulative and in-combination impacts it is necessary to consider the effect of other plans and proposals that, together with the current project, would have a cumulative impact on the qualifying interests and conservation objectives of the Clew Bay Complex cSAC. Existing background pressures within Clew Bay are identified with regard to marine activities including aquaculture, fishing, tourism and leisure interests, along with a number of other stakeholders. Of these wide ranging activities, there are two which may be considered as potentially significant in the context of the proposed plan by BioAtlantis Ltd. These include the following:

- Current activities relating to harvest of *A. nodosum* in the Clew Bay Complex cSAC.
- Current fisheries-related activities in proximity to shorelines used by Common seal as haul out, breeding and moulting sites.
- Non-native, invasive species.

4.3.3.1 Existing harvesting of *A. nodosum* within the Clew Bay Complex cSAC

The potential for cumulative and 'in combination' impacts on the Clew Bay Complex was assessed given that hand harvest activities have taken place in the region in recent years. However, harvest has been relatively low with approximately 500-900 dry weight tonnes *A. nodosum*/annum harvested in Clew Bay between 2005 and 2011 (Guiry & Morrison, 2013). Levels have dropped further to less than 400 tonnes per annum between 2009 and 2011; this contrasts strongly with quantities from Kilkieran in Co. Galway which have approached almost 4,000 tonnes per annum since 2008. BioAtlantis aim to harvest approximately 12,500 tonnes of *A. nodosum* per annum in Clew Bay, in a manner which is sustainable and does not exceed 20% of the total yield from any one site. In this context, the potential impact of other small-scale activities is likely to be minimal. The field surveys to inform the current Licence Application identified harvest activities in Clew Bay at levels higher than expected; moreover, cutting methods used were observed to be severe and not in line with best practice. BioAtlantis Ltd. will work with the Department of the Environment and the NPWS to identify unsustainable and unregulated harvesting within Clew Bay; however, it is not within the remit of this proposal to enforce or regulate the protection of the foreshore within the bay. There will therefore, necessarily, be some ongoing harvesting activity that is out of the control of the current proposal. On approval to hand harvest in Clew Bay, BioAtlantis will work to identify all sites which have been harvested recently. These areas will them be designated as requiring a 3-4 year fallowing period, depending on the level and severity of harvest. This approach will ensure that BioAtlantis hand harvest activities will not occur in recently harvested sites, thus preventing any cumulative effects.

In order to ensure that harvest activities are sustainable and not damaging to protected species and habitats, as specified by the NPWS, it is the aim of BioAtlantis to be granted an exclusive license to undertake hand harvest activities in the region. In such an event, BioAtlantis will commit to ensuring that all activities are monitored, controlled and recorded with full traceability. This will include a non-conformance reporting system and strict corrective

actions. Management systems such as these represent the only practical means of guarantying that there are no significant risks either direct, indirect, isolated, interactive, cumulative or short term or long-term on this SAC site.

4.3.3.2 Interactions with aquaculture and fisheries

The proposed harvesting activities are subject to significant management oversight and protocols to limit disturbance to sensitive qualifying interests and ecological receptors within the Clew Bay Complex cSAC. These protocols have been developed taking account of the existing fishing and aquaculture industry within the Clew Bay Complex. Designated Mollusc Production areas in Clew Bay (adapted from The Status of Irish Aquaculture report, Browne *et al*., 2006) are presented in Table 5. Shellfish production activities in the Clew Bay Complex include designated Mollusc Production Areas for Oysters and Mussels at specific bed locations:

- Newport Bay (Oysters, Mussels): Area bounded to the south by 53º 52.6'N and to the West by 09º 37'W and to the east by 09º 35.15'W1;
- Tieranaur Bay (Oysters): Area within a one nautical mile (1,852 M) radius of Roskeen Pt. (53º 53.46'N, 09º 40.10' W);
- Corrie Channel and Rosslaher Beds (Mussels and Oysters): Area bounded to the west by a line from Mulranny Pier to Old Head and to the south east by 09º 35.37'W1.

Table 5 Designated Mollusc Production Areas 2013 (adapted from Sea Fisheries Protection Authority, 2013).

Production area	Species	X coordinates	Y coordinates
Carraholly	Not specified	-9.5933	53.7997
Murrisk	*M. edulis*	-9.6297	53.7917
Corrie Channel	*M. edulis*	-9.577	53.861
Rosslaher	*C. Gigas*	-9.572	53.857
Mynah	*C. gigas*	-9.584	53.848
Inishlaughil	*C. gigas*	-9.631	53.863
Inisquirk	*C. gigas*	-9.6775	53.8856

The potential for cumulative or in-combination effects of the proposed BioAtlantis *A. nodosum* harvesting interacting with shellfish activities is evaluated as being low and not significant given that:

- Corrie Channel, Rosslaher, Mynah, Murrisk and Carraholly production areas do not represent documented haul-out sites for Common seals nor do they lie in close proximity to haul out sites.
- The production site at Inishlaughil does not represent a haul out site, nor does it lie in close proximity to haul out sites. The nearest haul out site to Inishlaughil is over 200 meters away, and is largely shielded from view/disturbance by the presence of Inishfeis and Inishpult.
- There are two breeding sites located in very close proximity to Inishquirk. Harvest activities will not take place at these sites during breeding season between May and July. Between October and April, harvest activities will be undertaken according to the BioAtlantis ‘Code of Practise for Protection of the Harbour seal’ (see Appendix 1 of NIS), thus ensuring that any potential impact on seal behaviour is averted.

4.3.3.3 Non-native, invasive species

The introduction and spread of non-native, invasive species is identified as a potential threat, arising both as an indirect impact from the proposed activities, and in combination with background commercial fishing / shellfish aquaculture and recreational use of the Clew Bay Complex. It is noted that non-native invasive species are not identified as a significant pressure or threat affecting the Annex I habitat 'Large, shallow inlets and bays' or the Annex II species Common seal and Otter, in the most recent NPWS Conservation Status reporting '*The Status of EU Protected Habitats and Species in Ireland*' (NPWS, 2013). Boats to be utilised in the proposed operation will be limited to local fishing boats and there will be no requirement for the transport of boats (and associated bilgewater) or equipment, to or from the Clew Bay Complex. This will effectively avoid the importation of non-native, invasive species into the Bay and will limit the potential for cumulative or in-combination effects.

4.4 Mitigation measures for the proposed project

4.4.1 Mitigation measures for the protection of Annex I habitats

The 'Codes of Practice' for the harvesting of *A. nodosum*, prepared by BioAtlantis (2014) and included in the Licence Application, are also included in Appendix 1 of the current NIS. With regard to the Annex I habitat 'Large, shallow inlets and bays', which includes the Clew Bay Complex cSAC as a whole, the following measures are prescribed for the avoidance of significant impacts on this habitat complex and the communities it supports:

- Control measures are in place to ensure adequate training of harvesters to ensure no removal of permanent habitat area (e.g. sand, shingle, stones, *A. nodosum* holdfast, etc); this will avoid the removal or permanent impact on the shoreline and intertidal reef habitat within the bay complex. All hand-harvesting will sever the *A. nodosum* at 300mm above the holdfast, ensuring that the holdfast and associated substrate are left intact, allowing for regrowth and also avoiding permanent impacts to the intertidal habitat. The Resource Manager will inspect the harvest on collection and during the washing bagging operation on the collection vessel. If excessive sand, shingle or debris is observed in water separator or Mill, the harvester will be re-trained. Production Operators will inspect the incoming harvest via Goods Received Notes (GRN). Boat engines will be regularly maintained to avoid leaks of fuel or oil into the marine environment. Harvesters will be trained to ensure cleaning takes place in a manner which does not lead to wash off into the environment.
- The potential for impacts affecting sublittoral and benthic habitats (including *Zostera* and maerl) are avoided, as these habitats do not overlap with the intertidal zone where the proposed harvesting will take place. In areas where mud/sand flats, intertidal sandy mud or fine sand occur, boats shall only be operated at high tide to reach rocky shores supporting the *A. nodosum* community beyond these areas. The Code of Practice ensures that harvesters do not disrupt these areas.

4.4.2 Mitigation measures for the protection of Annex II species

4.2.2.1 Common seal

The potential for significant disturbance of Common seal populations within the Clew Bay Complex cSAC during the periods of greatest sensitivity for this species (breeding, moulting

and haul-out/resting) has been avoided with the measures included in the 'Codes of Practice', as set out in the Licence Application (BioAtlantis, 2014), see also Appendix 1 of this NIS. Sensitive shorelines and islands of importance for Common seal and which would be subject to disturbance impacts have been identified and are to be avoided during the seasonal requirements of this species. These measures form part of the sustainable harvest management plan for the proposal. Hand harvest of *A. nodosum* will not involve the use of artificial physical barriers which would restrict or affect the species range of harbour seals in Clew Bay. The 'Codes of Practice', with specific regard to Common seal ensure that harvesters:

- Have full knowledge of the sites in Clew Bay known to be relevant the harbour seal.
- Full knowledge of harbour seal sites which are out of bounds at relevant times of the year.
- Understand the steps required to ensure that all contact with seals is prevented from day to day.
- Operate boat according to practises which minimise impact on harbour seal.

The 'Codes of Practice' incorporated into the Licence Application (BioAtlantis, 2014) ensures that no disturbance events occur at Common seal breeding sites (i.e. no harvest between May-July) and includes navigation guidelines to ensure that seals are not disturbed resulting in entry or 'flushing' into the water. The probability of human presence or activities affecting Common seals at known moulting sites of Clew Bay is reduced given that harvesters will not be permitted to harvest at these sites during the moulting period (August-September). Measures to avoid human presence or activities affecting Common seals at known resting sites are set out, where harvesters will not be permitted to harvest at these sites during the obligate resting period (October-April).

4.2.2.2 Otter

Specific mitigation measures have been included for the avoidance of significant impacts affecting Otter, with regard to the habitat requirements of this species and the conservation objectives of the Clew Bay Complex cSAC. Freshwater habitats are excluded from all harvest activities. In addition, the Burrishoole catchment area will be excluded. The mouth of Lough Furncace and the Rosmurrevagh shoreline area will be also excluded from all harvest activity, thus preventing any impact on important otter populations within this area; these measures will further avoid impacts affecting the andadromous life-cycles of trout or salmon which are an important food source for otters within these locations.

Harvest activities will not require construction of barriers which would affect access to sites of habitats. Linear habitats will not be damaged or blocked in anyway therefore ensuring that otter have undisrupted access to the marine zone and existing foraging locations, couching sites and commuting routes between holts and foraging areas. Harvest activities will take place in the *A. nodosum* intertidal zone and will not lead to any destruction of terrestrial habitat. The harvest of *A. nodosum* beds will not exceed 20% per annum, thus ensuring the maintenance of the *A. nodosum* habitat. Otter food supply will not be affected due to harvest activities in Clew Bay, where hand harvest is not associated with reductions in fish numbers within the *A. nodosum* biotope (Kelly *et al.*, 2001). Harvesting activities will take place in the intertidal zone and along existing road and slipway access points and will not affect otter holts.

Overall, BioAtlantis Ltd. will implement an 'Adaptive Management Approach' to ensure continual improvements to the harvesting plan during its implementation and its effectiveness into the future. This will include ongoing liaison with the NPWS regarding shoreline and island locations of importance to Common seal and Otter and will provide for the amendment and alteration of Codes of Practice in order to limit environmental impacts and ensure the sustainable strategy adopted by the company.

4.5 Implications for the conservation objectives of the Natura 2000 sites within the study area

The Conservation Objectives of the Clew Bay Complex cSAC are based on the generic conservation objectives presented for designated Natura 2000 sites; that is '*to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected*'. In the case of the Clew Bay Complex cSAC, specific conservation objectives have been set out for the designated site with regard to qualifying interests of the site (NPWS 2011a; NPWS, 2011b; NPWS, 2011c). From the results of the Screening Assessment and NIS impact assessment, it has been determined that the potential for adverse effects arising from the BioAtlantis proposal is with regard to the Annex I habitat 'Large, shallow inlets and bays' and the Annex II species Common seal and Otter. The conservation objectives of the Clew Bay Complex cSAC with reference to these qualifying interests and their conservation status are discussed in this section.

4.5.1 Large shallow inlets and bays [1160]

Objective: To maintain the favourable conservation condition of Large shallow inlets and bays in Clew Bay Complex SAC.

Target: The permanent habitat area is stable or increasing, subject to natural processes. Maintain natural extent of *Zostera* and maerl dominated communities. Maintain the high quality of both *Zostera*-dominated and maerl-dominated communities. The following sediment communities should be maintained in a natural condition: Intertidal sandy mud with *Tubificoides benedii* and *Pygospio elegans* community complex; Sandy mud with polychaetes and bivalves community complex; and Fine sand dominated by *Nephtys cirrosa* community, Shingle habitat and Reef habitat.

The Conservation Objectives for this habitat overlap significantly with those prescribed for the Annex I habitat 'Mudflats and sandflats not covered by seawater at low tide [1140]' and which are included within the Annex I 'Large, shallow inlet and bay' habitat complex with regard to the Clew Bay Complex cSAC.

At a national level fishing and harvesting aquatic resources are identified as being of high importance with regard to pressures and threats on the Annex I habitat. However, hand collection is evaluated as being of low importance (NPWS, 2013a). The national evaluation of the conservation status of this habitat is:

- Range: Favourable (FV);
- Area: Favourable (FV);
- Specific structures and functions (incl Species): Inadequate (but improving);
- Future prospects: Favourable (FV);

- Overall assessment of Conservation Status: Inadequate (based on Structures and Functions).

4.5.2 Common seal Phoca vitulina

Objective: To maintain the favourable conservation condition of harbour seal (Annex II species) in Clew Bay Complex SAC with regard to the following targets:

- Species range should not be restricted by artificial barriers to site use. Harbour seals occupy aquatic and terrestrial habitats in Clew Bay, including intertidal shorelines. The species is present during all aspects of its annual life cycle including breeding (approx. May-July), moulting (approx. August-September) and phases of non-breeding foraging and rest (approx. Oct-April).
- Breeding sites should be maintained in a natural condition. Harbour seals and their pups are vulnerable to disturbances during May-July, the time period just prior to and during the annual breeding season.
- Moult-out sites should be maintained in a natural condition. There are several haul-outs in Clew Bay which are important sites for moulting: Inishdeashmore, Inishdeashbeg and adjacent skerries, Inishnakillew, Inisheeny, Carrickwee, Inishgowla South, Forillan, Finnaun Island, Carrickawart Island, Corillan, Carricknamore, Stony Island and adjacent skerries, the Green Islands and adjacent skerries.
- Resting haul-out sites should be maintained in a natural condition. There are several resting haul-out sites in Clew Bay: Inishdeashbeg and adjacent skerries, Inishtubrid, Inishcuill, Carrickawart Island, Stony Island and adjacent skerries, the Green Islands and adjacent skerries.
- Human activities should occur at levels that do not adversely affect the harbour seal population at the site.

The main pressures and threats affecting Common seal are identified as Marine and Freshwater Aquaculture; Fishing and harvesting aquatic resources; Illegal taking/ removal of marine fauna; Outdoor sports and leisure activities, recreational activities; Marine water pollution; Noise nuisance, noise pollution; Seismic exploration, explosions; and changes in abiotic conditions. These have all been evaluated as being of low importance, with the exception of seismic exploration/explosions which are evaluated as being of medium importance (NPWS, 2013b). The current conservation status reporting for this species (NPWS, 2013b) states that current population size and distribution information for the species at a national levels is such that pressures may not be impacting with sufficient intensity in Ireland to constitute a threat to the Common seal population. The national evaluation of the conservation status of this species is:

- Range: Favourable (FV);
- Area: Favourable (FV);
- Specific structures and functions (incl. Species): Favourable (FV);
- Future prospects: Favourable (FV);
- Overall assessment of Conservation Status Favourable (FV).

4.5.3 Otter Lutra lutra

Objective: To restore the favourable conservation condition of Otter in Clew Bay Complex SAC with regard to the following targets:

- No significant decline in distribution (i.e. & positive survey sites).
- No significant decline in extent of terrestrial habitat.
- No significant decline in extent of marine habitat.
- No significant decline in extent of freshwater (river) habitat.
- No significant decline in extent of freshwater (lake/lagoon) habitat.
- No significant decline in number of Couching sites and Holts (minimize disturbance)
- No significant decline in fish biomass available.
- No significant increase in barriers to connectivity.

Otters are subject to pressures on land and in water (freshwater and marine). Impacts that reduce the availability or quality of, or cause disturbance to, their terrestrial or aquatic habitats are likely to affect otters. The main threats to otters in Ireland are: habitat destruction (including river drainage and the clearance of bank-side vegetation); pollution, particularly organic pollution resulting in fish kills; and accidental deaths (road traffic and fishing gear). The primary pressures and threats facing this species are identified as roads and motorways, professional passive fishing and water pollution (NPWS, 2013b). The national evaluation of the conservation status of this species is:

- Range: Favourable (FV);
- Area: Favourable (FV);
- Specific structures and functions (incl. Species): Favourable (FV);
- Future prospects: Favourable (FV);
- Overall assessment of Conservation Status Favourable (FV).

Based on the above Conservation Objectives, taking account of the data obtained and available for the assessments used to inform the current NIS and with regard to the sensitivities of the qualifying interests within the cSAC, it is concluded that the proposed project will not cause an adverse effect on the integrity of the Clew Bay cSAC either alone or in-combination with other plans and projects. This evaluation is made with regard to residual impacts, taking account of specific and detailed mitigation measures set out in the 'Codes of Practice' developed by BioAtlantis Ltd. for the Licence Application (BioAtlantis, 2014) and included as Appendix I to the current NIS.

4.6 Conclusions

The potential for impacts on the Clew Bay Complex cSAC Natura 2000 site resulting from the proposed Foreshore Licence application for the sustainable hand-harvesting of *Ascophyllum nodosum* within Clew Bay have been recognised. Appropriate conservation measures are identified for implementation to ensure the habitats and species for which this site has been designated are maintained at a favourable conservation status (compliance with Article 6(1) of the EU Habitats Directive). The proposed operational management plans will also avoid damaging activities that could significantly disturb these species or deteriorate the habitats of the protected species or habitat types (compliance with Article 6(2) of the EU Habitats Directive).

The Clew Bay Complex cSAC, within the works area of the proposed Foreshore Licence Application was assessed with particular regard to potential impacts affecting qualifying interests of the designation, including Annex I habitats (large shallow inlets and bays) and Annex II listed mammal species (Common seal and Otter). It is evaluated that the proposal will not have a significant adverse effect on this Natura 2000 site; with the implementation of

prescribed mitigation measures. A series of specific and comprehensive standard operational protocols have been incorporated into the Foreshore Licence Application (BioAtlantis, 2014) and the associated 'Codes of Practice' in order to ensure the avoidance of significant impacts on these sensitive receptors. There will therefore, be no long-term impact on the integrity of the Clew Bay Complex cSAC site. Taking account of the mitigation measures proposed for the avoidance and reduction of adverse effects on the qualifying interests and conservation objectives of the designated Natura 2000 sites within the study area, it is concluded that the proposal will not result in direct, indirect or cumulative impacts which would have the potential to adversely affect the qualifying interests / special conservation interests of the Natura 2000 site within the study area with regard to the structure and function; range; population densities; or conservation status of the habitats and species for which the Clew Bay Complex cSAC is designated.

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC (2000) defines 'integrity' as the 'coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and / or population of species for which the site is or will be classified'. From the evidence presented in the current assessment, it is concluded, beyond reasonable scientific doubt, that the proposed project, with the implementation of the prescribed mitigation measures, will not give rise to direct, indirect or cumulative impacts that would adversely affect the integrity of any designated Natura 2000 site.

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PLATES

Plate 1 Exposed westerly shore of Inishoo.

Plate 2 Lagoon (priority Annex I habitat) recorded away from the shoreline at Inishgowla.

Plate 3 Inishgowla shoreline, low *A. nodosum* cover

Plate 4 Inishgowla South, view of the south eastern shoreline, with low *A. nodosum* density.

Plate 5 Limited, low-density cutting was recorded at Inishgowla South.

Plate 6 Illauncarrick south shore, with *A. nodosum* and boulder.

Plate 7 Dense *A. nodosum* cover on Inishleague, low-intensity cutting was recorded at this shoreline.

Plate 8 Inishbeg in the south of Clew Bay was found to comprise an extensive band of *A. nodosum* along the easterly shore.

Plate 9 Limited, low-density cutting was recorded on Inishbeg.

Plate 10 Harvested *A. nodosum* on roadside awaiting transportation from the bay, Rosmoney Pier, Clew Bay.

APPENDIX 1 BioAtlantis Code of Practice for *A. nodosum* harvest in Clew Bay cSAC

BioAtlantis

Nature Working Naturally™

License Application for Sustainable hand-harvesting of Ascophyllum nodosum at Clew Bay (SAC Site Code 1482). In accordance with National Parks & Wildlife Service conservation objectives for marine and coastal habitats and species (2011) and the EU Habitats Directive 92/43/EEC.

Codes of Practice for *A. nodosum* harvest activities in Clew Bay SAC.

BioAtlantis Ltd,
Kerry Technology Park,
Tralee,
Co. Kerry

Contents

SECTION 1: Sustainable hand harvest of *A. nodosum*

Introduction and overview

The following rules and best practice guidelines have been developed on the basis of findings from the peer reviewed literature and previous surveys carried out in the Clew Bay Complex. See Section 3.3.5 of the main text document (BioAtlantis Foreshore Licence Application, 2014) for more details. The guidelines described here must be adhered to by all harvesters supplying *A. nodosum* to BioAtlantis Ltd.

The Code of Practice for harvesting *A. nodosum* sustainably.

Certificate to harvest

Harvesters cannot supply *A. nodosum* to BioAtlantis Ltd., unless they have been fully trained in methods which ensure *A. nodosum* recovery and regeneration post-harvest. Training will be provided by BioAtlantis Ltd., prior to harvesters gaining certification for engaging in hand harvest activities in Clew Bay.

Navigation to harvest sites

Harvesters must always follow clearly defined routes according to pre-planned harvest schedules. Schedules will be provided by BioAtlantis in advance of harvest. This will ensure no entry into protected areas of the SAC at times which are inappropriate or damaging to species and habitats in the complex. Should any confusion arise, the Resource Manager should be contacted.

Equipment

Several key items should be in your boat in order to complete your duties, both safely and effectively. Before departing for harvest, ensure that vessel is provided with the following equipment

- An efficient marine outboard engine capable of manoeuvring the vessel safely ahead and astern, and steering the vessel at its maximum speed in the fully loaded condition within the limits of the intended area of operation;
- A suitable pair of oars and rowlocks;
- Adequate seating or thwarts for all persons on board;
- A suitable bailer;
- A suitable anchor with rope of length at least equal to four times the length of the boat;
- A permanently rigged suitable painter which shall not exceed the length of the boat and which may also be used as a tow rope;
- Two approved hand-held distress flares or a portable horn;
- A suitable boat hook;
- A suitable waterproof torch
- Carry an approved lifejacket or approved personal flotation device for each person the vessel is declared to carry and shall be worn at all times when on board
- Communication device(s),
- Navigation maps and Compass,

Harvesting equipment

- Sharp blade cutters.
- Measuring tape
- Binoculars (for assessing presence/absence of harbour seals or mudflats, sandflats or intertidal sandy mud areas in the vicinity of the harvest site).
- Harvest Nets
- Hi visability Bouys

Harvest Records:

The 'Goods Received Note (GRN)' is a vital form and it must be completed to receive payment for a particular harvest. Without a completed GRN, harvested *A. nodosum* may not be accepted. If in doubt, contact the Resource Manager, who will advise on which details which are required for completion of the GRN.

Accident and Incident Reporting:

All accidents, incidents and near misses must be recorded immediately and reported to the Resource Manager. This should be done by completing the Comments/Incidents section of the GRN. Incidents which should be reported include:

- Health and safety accidents or Near Misses:
- Incidents relating to disturbance of seals during navigation.
- Incidents relating to disturbance or damage to any mudflat, sandflat, intertidal sandy mud or fine sand areas during navigation.

En route to the harvest site:

Binoculars must be used to check for the presence of harbour seals at the harvest site. If seals are spotted either on the site or in the water along the shoreline, leave the area immediately and proceed to alternative harvest site. If any disturbance of the seals occurs, e.g. flushing into the water, details of this incident must be recorded in the Incident Report section of the GRN (please see 'Code of Practice for protecting the Harbour seal' for more details).

Arrival at the harvest site:

First, check for the presence of seals, mudflats, sandflats or intertidal sandy mud areas in the harvest location. If these species or habitats are present, leave the site immediately and proceed to alternative harvest site. This is explained in detail in Section 2 and 3 of this Appendix (i.e. Codes of Practise for protecting the Harbour seal and mudflat/sandflat, intertidal sandy mud and fine sand areas respectively).

Density of seaweed on site (Low/ Medium / High): Harvest can only occur at sites which contain high density of *A. nodosum* and which have been approved BioAtlantis Ltd. This will be determined initially by the Science and Engineering teams BioAtlantis Ltd. However, on arrival, the harvesters must determine whether or not the site is suitable for harvest. This can be determined through use of binoculars from the boat but in most cases this will require direct landing, followed by visual inspection. Harvesters will receive training by BioAtlantis as to the criteria required in conducting the assessment.

Harvest of A. nodosum:

Once a site has been approved for harvest, the following details must be recorded:

- Date & time of harvest, site name and location within the site (i.e. northern shore, etc). This information is required for completing the GRN.
- When cutting *A. nodosum*, at least 300mm of material must be left behind.
- The holdfast or 'root' of the *A. nodosum*, must be left fully intact and attached to the underlying rock, stone or growth substrate so as to allow for recovery and re-growth in subsequent years.
- Ensure that no other types of seaweed other than *A. nodosum* are harvested and/or placed into harvest nets. Inspections will be carried out at both the pick-up point in Clew Bay and also at production facilitates in Kanturk, Co. Cork. The presence of these contaminants may result in potential non-payment, re-training or disciplinary action, depending on the severity of the non-conformance.

- When cutting the weed and filling the harvest nets, ensure that there is absolutely no sand, shingle, pebbles, stones or *A. nodosum* holdfasts inadvertently included. As indicated above, penalties may be incurred due to such non-conformances.

Completion of harvest and subsequent pick-up:

The following must be recorded on the GRN. :

- Date:
- Harvester Name / No.:
- Pick-up location:
- Harvest Location
    - Site name
    - Region (i.e.. northern shore)

For a copy of the GRN, see Appendix 3 of BioAtlantis Foreshore Licence Application, 2014.

Quality Check:

Is seaweed free of the following:

- Sand, gravel, stones or debris
- *A. nodosum* holdfasts.
- Other species (e.g. *Fucus*)

Assessment of harvest operations

Have harvesters worked to ensure:

1. Cutting of *A. nodosum* ≥300mm above holdfast
2. No more than 20% of area is harvested
3. Activities only take place at approved sites
4. Health and safety requirements are adhered to

Harvest Quantity

Quantity of harvest (no. bags and weight per bag).
Time and data of harvest

BioAtlantis batch code

Inspection check (pass: Y/N)

Health and safety:

All necessary health and safety equipment must be maintained by harvesters. Adherence to health and safety practices will be checked by the Resource Manager and noted in the GRN.

Communicating with BioAtlantis:

BioAtlantis require harvesters to keep in regular contact and report their activities as required. In most cases reporting to BioAtlantis will be via GRN. However, harvest plans will be communicated regularly over the phone or via email or post to designated harvesters and to the Resource Manager.

SECTION 2: Protection of the Harbour Seal, Birds & Otters

Introduction:

It is well established that harbour seals are highly sensitive to human behaviour. Therefore, the key objective of the BioAtlantis Code of Practise for hand harvesting of *A. nodosum* is to ensure that "Disturbance events" do not occur. In addition, certain species of breeding and wintering birds can also be disturbed by human presence. Some bird species and otters may also be sensitive to alterations of food source and supply. Therefore, this Code of Practise will also work to ensure that behaviour and food supply to these protected species is also unaffected by harvest activities.

Harbour Seals:

Disturbance events are caused by factors which result in alterations to seal behaviour, particularly during breeding, moulting and resting periods. This can culminate in significant numbers leaving haul-out sites during periods of time important to their life-cycle. Recent analysis of anthropogenic disturbances on seals in Clew Bay and other regions have provided an important platform in which to make informed management decisions which prevent harmful or potentially harmful activities from occurring. Assessments in Clew Bay are being undertaken by the NPWS on an ongoing basis as part of the "Harbour Seal Pilot Monitoring Project". The overall benefits of assessments of harbour seal behaviour is that they establish the impact of human activity on behavioural responses and in doing so, provide crucial practical information. In turn, they provide a platform for more informed management decisions which are based on both science and the practicalities of modern life. These studies often provide information on:

(1) Characterisation of human causes (human activities), and their effects on wildlife behaviour

(2) Characterisation of long-term biological significance of short-term responses.

Important aspects of seal behaviour, sensitivity, tolerance, recovery and habituation are described below. On the basis of this data and others, a code of practice has been developed to ensure that harvesters are fully informed and equipped with best practice knowledge on how to ensure that disturbances of seal behaviour does not occur.

Sensitivity

The Harbour Seal Pilot Monitoring Project, 2010 (NPWS 2011C) has identified a number of activities which led to disturbance of the harbour seals in selected sites in Ireland, including: occupation of shorelines adjacent to hauled out seals (e.g. by shellfish harvesters), quad bike activity on sandflats, approach of a low-flying aircraft, wildlife tour vessels, sea kayak activity, presence of small inshore fishing vessels, people walking recreationally, passing small fishing/angling boats, horse riders and dogs. NPWS also recorded instances where even members of scientific survey teams impacted on seal behaviour. The effectiveness of reserves to prevent human-induced disturbances to harbour seal population were recently evaluated in the Anholt seal reserve of Denmark (Andersen et al., 2011 & 2012). In this study, harbour seals were found to be alerted by boats at a distance of 560–850m and pedestrians at a distance of 200–425m. Flight initiation was observed at 510–830m for boats and 165–260m for pedestrians. These studies highlight the sensitivity of harbour seals to human presence. However, harbour seal behaviour is highly complex and seals are known to exhibit varying levels of tolerance to human, depending on the nature of the contact and the time of year.

Varying levels of tolerance to human activities

Tolerance is defined as 'the intensity of disturbance that an individual tolerates without responding in a defined way' (Bejder et al., 2009 and references therein) and is measured over short term periods. Tolerance is distinct from processes of habituation or sensitisation which are only measurable over the long term. For example, during habituation, individual tolerance levels increase, while during

sensitisation, tolerance levels will decrease (Bejder et al., 2009). Habituation may occur following repeated exposure to a specific stimulus. In the case of the harbour seal, several studies indicate varying levels of tolerance to human activities.

Boat Traffic

Henry et al., (2001) demonstrated that boat traffic in Métis Bay area of Canada have only a temporary effect on the haul-out behaviour of harbour seals. Several studies point to slow moving or stopped vessels such as kayaks as causing the most severe disturbance to seals (Johnson et al., 2007, Allen et al., 1984, Suryan and Harvey 1999, Henry and Hammill 2001). In particular, Johnson et al., (2007) demonstrate that seals were disturbed by kayaks and by stopped powerboats at distances of >91m from haul out sites, while being unaffected by moving powerboats approaching as close as 39m. Effects of Kayak activities have also been reported in Ireland by the NPWS (2011C). This data suggests tolerance to brief and passing presence of vessels which do not pay attention to the seals themselves (Johnson et al., 2007), while disturbances are mainly caused by vessels that linger or move at slow pace (e.g. kayaks and stalled boats) along haul out sites. These effects were reported by Allen et al., (1984), Suryan and Harvey (1999), Henry and Hammill (2001). These findings indicate that boating activities themselves will have minimal impacts on seal populations, provided that boats refrain from running at low speed for prolonged durations or stall. In order to minimise the effects of boats on the behaviour of seals in Clew Bay in general, best practice for boating activities will require that harvesters:

- Work in accordance with pre-planned schedules.
- Avoid stalling or slowing down unnecessarily en route to harvest locations or pick up points (pier, etc).

These preventative measures will reduce the risk of being noticed by seals at haul out sites, not subject to harvest activities at a given time.

Seasonal tolerance

Henry et al., (2001) demonstrate that seals were less affected during August, potentially due to increased tolerance associated with hormonal and physiological changes which occur during moulting (Ashwell-Erickson et al., 1986). Greater motivation to remain hauled out was also observed during moulting periods. Seasonal tolerance was also observed in a study of the Anholt seal reserve of Denmark (Andersen et al., 2011 & 2012) in which an increased tendency to return to haul out sites following disturbance during the breeding season was identified. However, tolerance was not identified before or after the breeding period, therefore suggesting that the tolerance did not give rise to habituation. Harbour seals are also more sensitive to human activities during obligate resting periods (October to April). In the context of seasonal variation, best practice for harvest activities will require that:

- Activities are prohibited at breeding and moulting sites during the periods of approx. May-July and August-September respectively.
- Activities permitted during these times will be limited to sites not associated with moulting or breeding, i.e. resting sites.

Recovery

Data from Henry et al., (2001) indicates a limited effect of disturbance on the recovery of seal numbers on haul out sites to pre-disturbance levels. Johnson et al., (2007), also reported that seals quickly recover from disturbance, returning back to haul out sites in less than 1 hour. In only 21% of disturbance cases did seal numbers not reach pre-disturbance levels.

Habituation or site-specific tolerance

There is some evidence for habituation of harbour seals to high traffic levels. In a study by Osborn (1985), of an area close to a busy harbour in Elkhorn Slough, Monteret Bay, California, 74%

flushing was observed with disturbance at <30m. While habituation may explain these observations, findings such as these may be attributed to increased tolerance to human activities, such as during the breeding season.

Birds

Clew Bay supports a number of breeding and wintering bird populations of national importance. These species have important breeding, nesting, feeding and wintering requirements and activities during hand harvest of *A. nodosum* should be carried out in a manner which does not impact on their key biological imperatives. Species vary in their dietary requirements, habitats and sensitivity to human disturbance. Several areas of Clew Bay will be designated as inaccessible for certain times of year. See Appendix 6 of BioAtlantis Foreshore Licence Application, 2014 and table 1 below for details.

Otters

Otters occupy both freshwater aquatic, marine aquatic and associated terrestrial habitats. An important requirement of otters is an adequate food supply and unrestricted access to sites and islands throughout Clew Bay. As such, Lough Furnace and the Burrishoole Catchment are designated as inaccessible all year round to harvesters. In addition, the Code of Practice outlines important requirements by harvesters to ensure that otters are unaffected by their presence.

The Code of Practice for the protections of harbour seals, birds & otters

The following rules and guidelines have been developed based on findings from the published peer-reviewed literature, NPWS guidelines and recommendations from organizations such as the Hampshire & Isle of Wight Wildlife Trust (Anon 2013). Furthermore, harvesters will receive in depth training on seal behaviour by biologists and QC personnel at BioAtlantis Ltd., prior to being officially certified to engage in hand harvest activities in Clew Bay. The code of practise is explained as follows:

Seasons: Harbour seals are present throughout the year on both aquatic and terrestrial habitats of Clew Bay SAC, including intertidal shorelines. As such, equal emphasis will be placed on not disturbing the behaviour throughout the year. Important aspects of the annual life cycle includes:

- Breeding (May-July approx.)
- Moulting (August-September approx.)
- Outside the breeding and moulting seasons (i.e., from October-April, 'resting sites').
- In addition, several species of breeding and wintering birds must not be disturbed at established sites during sensitive times. Harvesters will operate on the basis of known locations of established breeding, moulting and resting sites of harbour seals (NPWS, 2011A) and breeding and wintering sites of known relevance to important bird species.

Data Recording: Harvest vessels will not be permitted to land at breeding or moulting sites between May-July and August-September respectively. Harvest location and pick-up points will be recorded on GRNs (see Appendix 3 of BioAtlantis Foreshore Licence Application, 2014). GRNs will be checked by quality personnel by means of regular audits to ensure compliance. Harvesters must report any incidence of seal disturbance by means of the GRN.

Locations and Sites: Clew Bay has been sectioned into distinct areas in the current application to ensure optimal management of harvest activities in the SAC. Each haul out site is assigned a distinct 6-figure grid reference. In cases where haul out sites occur together in numbers, they may be distinguished and defined further by their geographical names or grouped together into single units.

General Measures:

Sites which are not used by seals during breeding and moulting seasons may be accessed between May-September. Several of these sites lie in close proximity to breeding & moulting sites throughout the north of the complex. Harvest vessels must not enter within 100m of breeding and moulting sites during these sensitive times. Likewise, there are a number of established bird sites which cannot be entered at sensitive times of the year.

Site Specific measures:

Inisherkin:

There are a number of breeding/moulting sites (e.g. Inishgowla, Inishnacross and Inishcooa) which lie in close proximity to resting sites at Inisherkin. Between October-April, seals will be resting at Inisherkin. Thus, harvest activities at nearby breeding/moulting sites could potentially impact on resting behaviour. To prevent effects on resting seals, the vessel will not be permitted within less than 100 meters of the resting sites at Inishskerkin.

Inishcull:

There are several islands (Inishpult, Inishfeis and Freaghhillaun-luggagh) and a number of small seal breeding sites surrounding the resting site at Inishcull. Between October to April navigation will not be permitted within 100 meters of Inishcull.

Inishturbid-Inishquirk:

Between these two island lies an important resting site for harbour seals. Navigation between October to April will not be permitted within 100 meters of this resting site.

Additional sites:
An important seal breeding site lies between Derrynish, Lanhoney, and Inishbarnagh. Access to the islands surrounding this breeding site will not be permitted within 100 meters during the breeding season.

Several islands have been identified as important for sensitive breeding and wintering birds (pers. comm. NPWS). These are listed in Table 1, and similar to harbour seal sites, they will be avoided at sensitive times of the year.

Avoidance of sensitive locations:
The Burrishoole Catchment area and mouth of Lough Furnace are out of bounds for harvesters, as are all fresh water habitats. This will ensure that otters are unaffected.

Working summary of the Code of Practice for Protecting the Harbour seals, birds and otters:

Harbour Seals

- Always follow clearly defined routes according to pre-planned harvest schedules provided by BioAtlantis.
- Avoid stalling or slowing down unnecessarily en route to harvest locations or pick up points (pier, etc), as such actions will lead to alterations in nearby seal behaviour (flushing, etc). This is particularly relevant when operating within 100m of haul out sites.
- When navigating within 100m of haul out sites, at least one harvester should observe the sites from a distance using binoculars. If avoidance or disturbed behaviour is observed (e.g. rapid or frequent changes in direction away from the vessel), immediately increase distance between the vessel and the site if possible.
- Never approach seals in a 'bow on' manner. When in proximity to their sites approach from the side and maintain a constant speed.
- If a seal is observed in open water, slow down the vessel to less than 5knts or no-wake speed. To minimise disturbance, ensure that movements are steady and in parallel to the animal.
- In the event that a seal is encountered, ensure that an escape route is provided, avoid 'boxing-in' the animal or blocking narrow channels.

Harvest times (See table 1 for details)

- Seal are highly sensitive during moulting. Harvesting activities are prohibited at moulting sites between August-September, while permitted between October-July.
- Harvesting activities are prohibited at breeding sites between May-July, while permitted between August-April.
- Harvesting activities are prohibited at resting sites between October-April, while permitted between May-September.
- However, in cases where sites serve dual functions (e.g. breeding & moulting), avoidance times may be prolonged.
- In cases where sites serve triple functions of breeding, moulting & resting, these sites must be avoided all year around.
- During times in which a site is prohibited due to the presence of seals, navigation will not be permitted within 100 meters of these sites.

- In the event that seal disturbance is observed, the event must be reported in the GRN.
- Noise must be kept to a minimum, for example, avoid revving of engines or shouting.
- On rare occasions, seals can display curiosity towards humans. In the event that seals approach the vessel, maintain the course at constant speed or remain stationary. Do not approach the seal.
- In the rare event that a mother and her pup are encountered, leave the vicinity immediately and slowly.
- In the rare event that you encounter seals on a site not currently recognised as a seal haul-out site, leave the area promptly and quietly and record the event in the GRN.

Birds (Breeding and Wintering)

- Always follow clearly defined routes according to pre-planned harvest schedules provided by BioAtlantis.

Harvest times

- Harvesting activities are prohibited at a number of important breeding sites for certain periods during Spring/Summer (see table 1 for details).
- Harvest activitites are prohibited at a number of wintering sites during certain periods of autumn/winter (see table 1 for details).
- Sites which are out of bounds are indicated in Table 1 below.
- To minimise disturbance of birds, ensure that all activities on islands are maintained within the intertidal Ascophyllum nodosum zone.

Otters

- Always follow clearly defined routes according to pre-planned harvest schedules provided by BioAtlantis.
- Harvest areas are defined by BioAtlantis (see Table 1 below)
- Harvest activities are prohibited within the Burrishoole Catchment.
- Harvest activities are prohibited at the mouth of Lough Furnace.
- All freshwater areas are prohibited from harvest activities (e.g. east side of InishGowla South).
- To minimise disturbance of interaction with otters, ensure:
    - All activities are maintained within the intertidal *Ascophyllum nodosum* zone.
    - Never interfere with otter couching sites, holts or access paths/routes.

Table 1: Sensitive ecological receptors within the study area and control measures implemented for mitigation.

Island No.	Site Name	Harbour seals			Birds		Control measures	
		Breeding Site	Moulting Site	Resting Site	Breeding site	Wintering site	Avoidance	Attendance
3	Roslynagh	Yes					May, June, July	Aug to April
5	Inishdasky	Yes					May, June, July	Aug to April
7	Inishtubrid			Yes			Oct to April	May to Sept
17	Moynish More	Yes				Yes	Oct-July	Aug to Sept
21	Inishilra	Yes					May to July	Aug to April
24	Inishdeashbeag	Yes	Yes	Yes			Avoid all year round	
24	Inishdeashmore	Yes	Yes				May to Sept	Oct to April
25	Inishcorky	Yes			Yes		March to Sept	Oct to Feb
26	Inishcarrick	Yes					May to July	Aug to April
28	Muckinish	Yes					May to July	Aug to April
29	Inishdaweel	Yes					May to July	Aug to April
34	Freaghillanluggagh	Yes					May to July	Aug to April
45	Inishcuill			Yes			Oct to April	May to Sept
59	Inishakillew		Yes				Aug, Sept	Oct to July
80	Forilan		Yes				Aug, Sept	Oct to July
82	Ininhgowla South	Yes	Yes				May to Sept	Oct to April
82	Carrickwee	Yes	Yes				May to Sept	Oct to April
-	Carrickawart Island			Yes			Oct to April	May to Sept
-	Stony Island			Yes	Yes		Avoid all year round	
-	Green Islands			Yes	Yes		Avoid all year round	
46	Mauherillan (L920919)				Yes		March to Sept	Oct to Feb
84	Inishimmel (L908857)				Yes		March to Sept	Oct to Feb
18	Moynish Beg (L865938)				Yes		March to Sept	Oct to Feb
85	Dorinish (L9086)				Yes		March to Sept	Oct to Feb
23	Roeillaun (L875930)				Yes		March to Sept	Oct to Feb
	Mulranny Saltmarsh (L827963)					Yes	Outside of licence application area. No harvest will take place here.	
	Rosmurrevagh (L852958)					Yes	Oct to March	April to Sept
	Carrowholly (L965850)					Yes	Oct to March	April to Sept
	Bertraw (L903834).					Yes	Oct to March	April to Sept
	Rosturk (L869956),					Yes	Oct to March	April to Sept
93	Inisheeny (L920845)					Yes	Oct to March	April to Sept
	Pigeon Pt. (L949850).					Yes	Oct to March	April to Sept

Island No.	Site Name	Harbour seals			Birds		Control measures	
		Breeding Site	Moulting Site	Resting Site	Breeding site	Wintering site	Avoidance	Attendance
	Burrishoole Channel						Avoid all year round to ensure no impact on catchment, connected lakes, fish and otters.	

SECTION 3: Environmentally safe navigation

Introduction:

The following rules and guidelines have been developed on the basis of NPWS objectives for ensuring protection of mudflat, sandflat, intertidal sandy mud and fine-sand environs of Clew Bay. These guidelines must be adhered to by all harvesters supplying *A. nodosum* to BioAtlantis Ltd.

The Code of Practice for protecting mudflat, sandflat, intertidal sandy mud, fine-sand and reef areas

Harvesting *A. nodosum* along rocky shorelines located beyond mudflat, sandflat, intertidal sandy mud or fine-sand areas requires that work be done exclusively at high tide. Training will be provided to ensure that all harvesters are aware of their obligations towards protecting these areas and species residing within these habitats in the SAC.

- Advanced preparations will be necessary in advance of work in these locations. Always follow clearly defined routes according to clearly defined harvesting schedules provided by BioAtlantis.
- It is essential not to enter into these areas during low tide. Entry into these areas at low tide will cause serious physical damage to these environs and the associated species. These areas will be indicated clearly in the maps provided.
- If mudflat, sandflat, intertidal sandy mud or fine-sand areas are entered into inadvertently, promptly leave and record details of the incident in the GRN. Report the incident to BioAtlantis immediately.
- When approaching coastal areas in small boats, care must be taken in order to ensure that contact with reef is minimal. This will ensure that no damage is inflicted to either the vessel or reef.
- In smaller boats, always approach the shore at slow pace so as to avoid intertidal reef (i.e. mixed substrate of pebbles and cobbles. Along the western margin of Clew Bay there are small patches of subtidal boulders and cobbles which must be avoided.
- The harvest collection boat will be fitted with a depth sounder to ensure that contact with the reef is avoided. Hard substrate will be encountered between 2-14m and should be avoided. The sonar depth sounder must be in working order during all collection activities.

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APPENDIX 2 Clew Bay Complex cSAC Site Synopsis

SITE NAME: CLEW BAY COMPLEX
SITE CODE: 001482

Clew Bay is a wide, west-facing bay on the west coast of Co. Mayo. It is open to the westerly swells and winds from the Atlantic with Clare Island giving only a small amount of protection. The drumlin landscape was formed during the last glacial period when sediments were laid down and smoothed over by advancing ice - the sea has subsequently inundated this area, creating a multitude of islands. The geomorphology of the bay has resulted in a complex series of interlocking bays creating a wide variety of marine and terrestrial habitats, including several listed on Annex I of the E.U. Habitats Directive: large shallow bay, lagoon, Atlantic salt-meadows, drift lines, perennial vegetation of stony banks, embryonic shifting dunes, Marram dunes, dune slacks and old Oak woodland.

Within the shallow bay, subtidal sediments are characterised by typical bivalve communities in fine sand (*Chamelea striatula* and *Ensis* sp.), and by the polychaete worm *Euclymene* and the bivalve *Thyasira flexuosa* in muddy sand. The intertidal sediment communities are characterised by polychaetes and bivalves in the mid-shore and by the sand mason worm *Lanice conchilega* in the low shore. In areas where there is maerl debris with small amounts of live maerl the infaunal community has a mixture of species characteristic of coarse sand (e.g. the bivalves *Timoclea ovata*, *Spisula* sp., and the polychaetes *Nepthys cirrosa* and *Glycera lapidum*) and medium sand (e.g., the bivalve *Ensis* sp. and the polychaetes *Lanice conchilega*, *Scoloplos armiger* and *Sthenelais boa*). The bivalves *Timoclea ovata*, *Tapes rhomboides* and the polychaetes *Branchiomma bombyx* and *Glycera lapidum* are typical of gravels and medium sands, whereas the bivalves *Abra alba, Corbula gibba*, *Thyasira flexuosa* and *Mysella bidentata* and the polychaete *Euclymene* are characteristic of muddy sands. Beds of live maerl of *Lithothamnion corallioides* are also present in a number of areas. Around the edges of the inner part of the bay are shores of mixed boulders, cobbles, gravel with some sand and mud. They have a typical zonation of intertidal communities found on sheltered shores of mixed substratum. The shore at Murisk is unusual as a distinct zone characterised by archiannelids occurs above the sandhopper zone in the upper shore under the boulders and cobbles. This is an unusual habitat. In sheltered areas of shallow water with little sand scour a well developed community of hydroids, sponges and solitary sea squirts is present. Where the sediments includes gravel and mud the species richness in the area can be exceptionally high (180 species). A number of marine species that are rarely recorded are found in Clew Bay: the stalked jellyfish *Lucernariopsis cruxmelitensis*; the polycheates *Anitides rosea*, *Clymenura clypeata*, *Pterosyllis formosa* and *Pionosylis* sp. and the snail *Clypterea chinensis.*

Clew Bay is considered to have the most significant shingle reserves in the country, and has (on the islands) the only examples of incipient gravel barriers in Ireland. Associated with the shingle (and dunes) are good examples of annual vegetation of drift lines. Characteristic species found in these habitats include: Spear-leaved Orache (*Atriplex prostrata*), Red Fescue (*Festuca rubra*), Sea Sandwort (*Honkenya peploides*), Thrift (*Armeria maritima*), Common Scurvygrass (*Cochlearia officinalis*), Sea Mayweed (*Matricaria maritima*) and Sea Campion (*Silene vulgaris* subsp*. maritima*).

Lough Furnace is located at the north-eastern corner of Clew Bay. The lough is a good example of a deep, stratified, saline lake lagoon in a very natural state. Salinity levels can vary considerably here depending on rainfall and tides. The lake is one of the very few permanently stratified lakes known in Ireland and Britain. The lake is ringed by Common

Reed (*Phragmites australis*) and Common Club-rush (*Scirpus lacustris*), with small patches of Great Fen-sedge (*Cladium mariscus*) and Bottle Sedge (*Carex rostrata*). Lough Furnace supports a relatively high faunal diversity (41 taxa recorded in the 1996 survey) including a number of important invertebrate species. The relict mysid species *Neomysis integer*, the isopods *Jaera albifrons, J. ischiosetosa* and *J. nordmanni*, and two rare amphipods (*Lembos longipes* and *Leptocheirus pilosus*) have all been recorded from the lake. Both Irish species of tasselweed (*Ruppia maritima* and *R. cirrhosa*) occur in the lagoon. Eel, Flounder and Mullet also occur in the lake waters. Mallard nest around the lough, while Saint's Island contains nesting Black-headed Gull.

At the north-western end of Lough Furnace lie two associated lakes, Lough Napransky and Lough Navroony. A stream drains from the latter into the main lake. The area contains flush and quaking-mire vegetation, which is of interest as Irish Heath (*Erica erigena*) is found there, with Bog Moss (*Sphagnum* spp.), Black Bog-rush (*Schoenus nigricans*), Bog Asphodel (*Narthecium ossifragum*), Common Cottongrass (*Eriophorum angustifolium*) and Round-leaved Sundew (*Drosera rotundifolia*). Bog Orchid (*Hammarbya paludosa*), a species listed in the Irish Red Data Book is also found in this area. Beyond the wet area there is a Hazel (*Corylus avellana*) dominated woodland growing over abandoned fields. Birch (*Betula pubescens*), Hawthorn (*Crataegus monogyna*) and Holly (*Ilex aquifolium*) are common, with occasional Sessile Oak (*Quercus petraea*). The ground flora contains such species as Bluebell (*Hyacinthoides non-scripta*), Sanicle (*Sanicula europaea*) and Wood-sorrel (*Oxalis acetosella*).

Keeloges Wood is a medium-sized woodland on the north-east corner of Clew Bay. The woodland lies in a sheltered location between several drumlins and occurs on a shallow, moist, brown-earth soil with an organic-rich A horizon which is occasionally peaty. The soil is gleyed near streams and flushes. The woodland is dominated by Sessile Oak, with Birch and occasional ash. Hazel, Holly and Hawthorn are the principal components of the shrub layer. In moister sites Grey Willow (*Salix cinerea*) and Alder (*Alnus glutinosa*) occur. The woodland is at the more fertile end of the spectrum of Oak woodlands and is transitional to Ash woodland. Consequently the field layer is species-rich. Elements of Oak woodland, e.g. Hard Fern (*Blechnum spicant*), Greater Stitchwort (*Stellaria holostea*), Great Wood-rush (*Luzula sylvatica*) and Honeysuckle (*Lonicera periclymenum*), are mixed with elements of Ash woodland, e.g. False Brome (*Brachypodium sylvaticum*), Lords-and-ladies (*Arum maculatum*), Enchanter's-nightshade (*Circaea lutetiana*) and Wood Speedwell (*Veronica montana*), as well as indicators of poorly-drained soil, e.g. Tufted Hair-grass (*Deschampsia cespitosa*), Meadowsweet (*Filipendula ulmaria*) and Marsh Hawk's-beard (*Crepis paludosa*). The epiphyte *Lobaria pulmonaria* is also present, together with numerous other lichen and bryophyte species (including *Usnea* spp).

The wood was cut during the second World War so most of the trees are c. 60 years old but a few very much larger Oaks occur, principally on the shore-line. There is a low but well-developed canopy with a well-developed shrub layer and often luxuriant field layer. There is good regeneration of trees. A most unusual feature is the juxtaposition of Oak woodland with salt-marsh where the woodland borders the shore-line. The wood has been well-managed in recent times with occasional filling in of wind-blown coupes with trees derived from seed collected on-site. A stock-proof fence has been maintained along the land boundary. No invasive exotics were encountered during recent survey. The woodland appears on the 1st Edition OS map indicating that it is long-established and possibly ancient. The species-list also supports this contention with at least 14 species which have been found to be significantly more frequent in potentially ancient woodlands. This woodland is of particular significance in view of its location in the extreme northwest of the country where there is very

little woodland, its position on the coast, its species-richness, excellent structure and its possible ancient woodland status.

The Rosmurrevagh area in the north of Clew Bay displays a high diversity of habitats, from seashore to dunes and coastal grassland, as well as saltmarsh, bog and fen. The sandy beach on the seaward side grades into dunes of Marram (Ammophila arenaria). Adjacent to this, the saltmarsh vegetation, which is approximately 5 m wide, comprises Thrift, Common Scurvygrass, Common Saltmarsh-grass (*Puccinellia maritima*) and 'turf fucoids' (diminutive forms of brown algae). These plant species are typical of Atlantic salt meadows. Similar saltmarshes occur scattered around the entire shoreline of the bay. Next to the saltmarsh at Rosmurrevagh is an area of coastal grassland with species such as Daisy (*Bellis perennis*), Ribwort Plantain (*Plantago lanceolata*), Dandelion (*Taraxacum officinale*), Heath Wood-rush (*Luzula multiflora*), Common Ragwort (*Senecio jacobaea*) and Yarrow (*Achillea millefolium*). Flushes introduce a species-rich bog/fen type vegetation. Yellow Iris (*Iris pseudacorus*), Soft Rush (*Juncus* effusus), Irish Heath, Bog Mosses, sedges, Water Mint (*Mentha aquatica*), Bog-myrtle (*Myrica gale*), Bog Asphodel and Cuckooflower (*Cardamine pratensis*) are found.
A further dune system occurs at Bartraw in the south-west of the site. Here Marram and embryonic dunes occur along a shingle ridge which links a small island where dunes also occur. Embryonic dunes, characterised by the presence of Sand Couch (*Elymus farctus*), also occur on some of the islands in the bay.

Important populations of Otter and Common Seal are found in Clew Bay (the latter with a maximum count of 95 in the all-Ireland survey of 2003). Both of these species are listed on Annex II of the E.U. Habitats Directive.

The Clew Bay Complex supports a good diversity of wintering waterfowl, with nationally important numbers of Red-breasted Merganser (average maximum of 70 in the winters 1995/96-1999/00) and Ringed Plover (average maximum of 142 in the winters 1995/96-1999/00). A population of Barnacle Geese (between 100 and 200 birds) frequents the islands during winter. Other species which occur in significant numbers include Great Northern Diver (14), Brent Goose (118), Shelduck (74), Wigeon (112), Teal (127), Mallard (64), Oystercatcher 250), Dunlin (450), Bar-tailed Godwit (73), Curlew (373), Redshank (172), Greenshank (10) and Turnstone (27) (all figures are average maxima for the winters 1995/95-1999/00). Species which breed in important numbers include Cormorant (115 pairs in 1985), Common Tern (20+ pairs in 2000/01), Arctic Tern (100+ pairs in 2000/01) and Little Tern (9 pairs in 2000). The various tern species, as well as Barnacle Goose, Great Northern Diver and Bar-tailed Godwit, are listed on Annex I of the E.U. Birds Directive.

The juxtaposition within Clew Bay of a wide variety of habitats, including seven listed on Annex I of the E.U. Habitats Directive, and the combination of important flora and fauna, including one Red Data Book plant and two mammals listed on Annex II of the E.U. Habitats Directive, make this a site of considerable national and international importance.