NPWS (2012)

Lower River Shannon SAC (site code: 2165)

Conservation objectives supporting document-marine habitats and species

Version 1

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Introduction

The Lower River Shannon SAC is designated for the Annex I qualifying interests of Large shallow inlets and bays (EU habitat code 1160), Estuaries (1130), Mudflats and sandflats not covered by seawater at low tide (1140), Sandbanks which are slightly covered by sea water all the time (1110) and Reefs (1170) (Figures 1, 2, 3, 4 and 5) and the Annex II species *Tursiops truncatus* (common bottlenose dolphin, also known as bottlenose dolphin or bottle-nosed dolphin). The Annex I habitat shallow inlets and bays is a large physiographic feature that may wholly or partly incorporate other Annex I habitats including reefs, sandbanks and mudflats and sandflats within its area. This is also the case for estuaries, which may wholly or partly incorporate other Annex I habitats including reefs and mudflats and sandflats within its area.

A survey of the Ballybunnion and the Turbot Banks was carried out in 2007 (Aquafact, 2007). Intertidal and subtidal surveys were undertaken in 2010 to investigate the physical and biological structure of marine communities within this SAC and the overlapping areas that are contained within the two Special Protection Areas (SPAs), i.e. Loop Head SPA (site code 4119) and River Shannon and River Fergus Estuaries SPA (4077) (Aquafact, 2011a, 2011b and 2011c).

Following initial investigations of a bottlenose dolphin community occurring in the Shannon Estuary (Berrow et al., 1996), surveys of the size, structure and distribution of the population inhabiting the Lower River Shannon SAC have been conducted over several years since the mid-1990's (Ingram, 2000; Rogan et al., 2000; Ingram and Rogan, 2002; Ingram and Rogan, 2003; Rogan et al., 2003; Englund et al., 2007; Englund et al., 2008; Berrow, 2009; Berrow et al., 2010; Foley et al., 2010; Mirimin et al., 2011). These studies and additional research effort facilitated the estimation and monitoring of the population and knowledge of the ecology of the species within the site.

Aspects of the biology and ecology of Annex I habitats and Annex II species are provided in Section 1. The corresponding site-specific conservation objectives will facilitate Ireland delivering on its surveillance and reporting obligations under the EU Habitats Directive (92/43/EC).

Ireland also has an obligation to ensure that consent decisions concerning operations/activities planned for Natura 2000 sites are informed by an appropriate assessment where the likelihood of such operations or activities having a significant effect on the site cannot be excluded. Further ancillary information concerning the practical application of the site-specific objectives and targets in the completion of such assessments is provided in Section 2.

Section 1

Principal Benthic Communities

Within the Lower River Shannon SAC ten community types are recorded. These community types are described below. Table 1 shows which community types are found in each of the five Annex I habitats. Their interpolated distribution is shown in figure 6. Estimated areas, based on interpolation, are given in the objective targets in section 2.

Community type	Habitat Code				
	1110	1130	1140	1160	1170
Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community			✓	✓	
Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex		✓	✓	✓	
Estuarine subtidal muddy sand to mixed sediment with gammarids community complex		✓			
Subtidal sand to mixed sediment with *Nucula nucleus* community complex		✓		✓	
Subtidal sand to mixed sediment with *Nephtys* spp. community complex	✓	✓		✓	
Fucoid-dominated intertidal reef community complex				✓	✓
Mixed subtidal reef community complex				✓	✓
Faunal turf-dominated subtidal reef community		✓		✓	✓
Anemone-dominated subtidal reef community		✓		✓	✓
Laminaria-dominated community complex		✓		✓	✓

Table 1 Community types found in each Annex I habitat.

The development of a community complex target 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 Lower River Shannon SAC 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 conservation targets.

INTERTIDAL SAND WITH *SCOLELEPIS SQUAMATA* AND *PONTOCRATES* SPP. COMMUNITY

This intertidal community is recorded from Ballybunnion Strand, from Dooneen Point to Beal Point and on the beach due east of Beal Point. It also occurs on the White Strand in Carrigaholt Bay (Figure 6).

The sediment is that of sand with fine sand ranging from 87% to 47.5% and medium sand from 42.5% to 2.9%. Negligible amounts of gravel and silt-clay occur here (<0.5%).

The polychaete *Scolelepis squamata* occurs in moderate to high abundances in Ballybunnion Strand. The amphipod *Pontocrates* sp. occurs throughout this community complex while *Pontocrates arenarius* is only recorded from Ballybunnion Strand and *P. altamarinus* only from White Strand. The cumacean *Cumopsis fagei* is recorded in low abundances in Ballybunnion Strand (Table 2).

Distinguishing species of the Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community	
Scolelepis squamata	*Pontocrates* sp.
Pontocrates arenarius	*Pontocrates altamarinus*
Cumopsis fagei	

Table 2 Distinguishing species of the Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community.

INTERTIDAL SAND TO MIXED SEDIMENT WITH POLYCHAETES, MOLLUSCS AND CRUSTACEANS COMMUNITY COMPLEX

This intertidal community complex occurs extensively within the site. On the northern shore of the Shannon Estuary it occurs from Shannon Bridge to the quay west of Ballynacragga Point, from Querrin Point to Doonaha, and in Carrigaholt Bay. It also occurs extensively throughout the Fergus Estuary, Clonderalaw Bay and Poulnasherry Bay. On the southern shore it is recorded from Corkanree to the White River Estuary at Loghill, in Tarbert Bay, Ballylongford Creek and around Carrig Island. It is also recorded in the estuary of the Casheen River towards the southern margin of the site (Figure 6).

Mixed sediment is the dominant sediment type within this community complex. However, pockets of sand occur to the south of Carrig Island, west of Aughinish Island and west of Querrin Point while in the northwest of Poulnasherry Bay the substrate is that of muddy sand. This variability in the sediment type is evident by the wide range of the values of the sediment fractions. Gravel ranges from 68.3% to 0.1%, very coarse sand from 16.6% to 0.2%, coarse sand from 13% to 0.3%, medium sand from 51.6% to 0.9%, fine sand from 85.3% to 2.2%, very fine sand from 66.4% to 2.2% and silt-clay from 52.6% to 0.3%.

The polychaete *Hediste diversicolor* and the bivalve *Macoma balthica* are recorded in moderate to high abundances throughout this community complex. The gastropod *Hydrobia ulvae* also generally occurs in moderate to high abundances here. However in more sheltered area such as between the islands in the Fergus Estuary and inside headlands such as Burrane Point and Kilanna Point it is recorded in low abundances. The amphipod *Corophium volutator* is recorded in high abundances from Meelick Rock to the Middle Ground, in the upper Fergus Estuary and in the Casheen Estuary. *Nephtys hombergii* is recorded in moderate to low abundances from the lower Fergus Estuary to Carrig Island. The polychaete *Malacoceros fuliginosus* occurs in high densities near the quay in Kilbaha (Table 3).

In the upper reaches of the Shannon Estuary and in the Fergus Estuary the endo-commensal nemertean *Tetrastemma fozensis* is recorded from the mantle cavity of the bivalve *Scrobicularia plana.* Known from the north west of Spain and Portugal and from Poole in southern England, this is the first documented occurrence of *T. fozensis* in Irish waters.

Distinguishing species of the Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex	
Hediste diversicolor	*Macoma balthica*
Hydrobia ulvae	*Corophium volutator*
Nephtys hombergii	

Table 3 Distinguishing species of the Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex.

ESTUARINE SUBTIDAL MUDDY SAND TO MIXED SEDIMENT WITH GAMMARIDS COMMUNITY COMPLEX

This community complex occurs at the eastern extreme of the site from Cock Rock to Scarlet Reach in water depths between 2.5 and 7m (Figure 6).

The sediment of this community complex is that of muddy sand (silt-clay ranging from 50.7% to 34.4% and very fine sand from 29.3% to 11.2%) with patches of gravel (ranging from 24.1% to 0.5%).

This fauna community complex consists of Gammaridae amphipods with *Bathyporeia* sp. *Bathyporeia pelagica*, *Leptocheirus* sp., *Gammarus* sp. and *Gammarus zaddachi* all recorded in low abundances here (Table 4).

Distinguishing species of the Estuarine subtidal muddy sand to mixed sediment with gammarids community complex	
Bathyporeia sp.	*Bathyporeia pelagica*
Leptocheirus sp.	*Gammarus* sp.
Gammarus zaddachi	

Table 4 Distinguishing species of the Estuarine subtidal muddy sand to mixed sediment with gammarids community complex.

SUBTIDAL SAND TO MIXED SEDIMENT WITH *NUCULA NUCLEUS* COMMUNITY COMPLEX

This community complex occurs in the area from Foynes Island to Kilcredaun Point; it is recorded due west of Leck Point and to the south of Kilbaha Bay. The community complex occurs in depths of 3m to 43m (Figure 6).

The sediment of this community complex varies from sand to mixed sediment. This variability is reflected in the range of the various sediment fractions, with gravel ranging from 51.4% to 0.2%, very coarse sand from 20.7% to 0.4%, coarse sand from 35.1% to 0.7%, medium sand from 26.4% to 2.3%, fine sand from 80.4% to 3.7%, very fine sand from 60.5% to 1.3% and silt-clay from 20.7% to 0.3%.

The bivalve *Nucula nucleus* and the polychaete *Paradoneis lyra* are ubiquitous throughout the complex, occurring in moderate to low abundances. The polychaete *Scoloplos armiger* is recorded in moderate to low abundances in the lower Shannon Estuary around Carrig Island and Scattery Island.

The occurrence of the calcareous tube dwelling polychaetes *Pomatoceros* sp. and *Pomatoceros triqueter* along with the amphipods *Metaphoxus simplex* and *Urothoe elegans*, all in moderate to low abundances reflects the variability of the sediment within this complex (Table 5).

From Kilcredaun Point to Foynes the reef-building polychaete *Sabellaria spinulosa* occurs in low abundances. West of Scattery Island it occurs in high abundances but not in such densities as to constitute a biogenic reef.

Distinguishing species of the Subtidal sand to mixed sediment with *Nucula nucleus* community complex	
Nucula nucleus	*Paradoneis lyra*
Scoloplos armiger	*Pomatoceros* sp.
Pomatoceros triqueter	*Sabellaria spinulosa*
Urothoe elegans	*Metaphoxus pectinatus*

Table 5 Distinguishing species of the Subtidal sand to mixed sediment with *Nucula nucleus* community complex.

SUBTIDAL SAND TO MIXED SEDIMENT WITH *NEPHTYS* SPP. COMMUNITY COMPLEX

This community complex occurs extensively east of Battle Island to Foynes; elsewhere it is recorded from Labasheeda Bay, Clonderalaw Bay, Ballymacrinan Bay, Ballylongford Bay and Carrigaholt Bay. It also occurs from Kilconly Point along the Loop Head Peninsula to the western boundary of the site. It occurs in depths between 2m and 44m (Figure 6).

The sediment of the complex is that of sand to mixed sediment with a great deal of variation within the sediment fractions. Gravel ranges from 59% to 0%, very coarse sand from 28% to 0%, coarse sand from 42.8% to 0%, medium sand from 70.6% to 0%, fine sand from 91.7% to 0.8%, very fine sand from 66.6% to 0.1% and silt-clay from 52.5% to 0%. In the upper to mid estuary the sediment is predominately mixed sediment with pockets of muddy sand while the sediment of the outer estuary is that of sand.

The community is distinguished by the polychaete genera *Nephtys* spp.. *Nephtys* sp. occurs in moderate to low abundances at the confluence of the Fergus and Shannon, in Clonderalaw Bay and on the Ballybunnion Bank. *Nephtys cirrosa* occurs in moderate to low abundances northeast of Aughinish Island and throughout the Turbot and Ballybunnion Banks. The amphipod *Bathyporeia elegans* is recorded in moderate to low abundances at Foynes and on the Turbot and Ballybunnion Banks. The polychaete *Magelona johnstoni* generally occurs in low abundances in the western part of the site (Table 6).

Distinguishing species of the Subtidal sand to mixed sediment with *Nephtys* spp. community complex	
Nephtys sp.	*Nephtys cirrosa*
Bathyporeia elegans	*Magelona johnstoni*

Table 6 Distinguishing species of the Subtidal sand to mixed sediment with *Nephtys* spp. community complex.

FUCOID-DOMINATED INTERTIDAL REEF COMMUNITY COMPLEX

This community complex is recorded intertidally in the western reaches of the site from Kerry Head to Tarbert in the south and from Ross Bay to Kilkerin Point in the north (Figure 6).

Where the community occurs in the outer more exposed shores, north of Kerry Head and south of Loop Head, the substrate is predominantly bedrock. Elsewhere the substrate is that of cobbles or boulders or a combination of these. The exposure regime is that of exposed to moderately exposed reef.

The biota of this community is dominated by the fucoid algae *Fucus vesiculosus*, *F. spiralis* and *F. serratus*. The associated flora includes *Ulva* sp., *Porphyra umbilicalis*, *Ralfsia* sp., *Corallina officinalis* and encrusting red algae. The associated fauna includes the gastropods *Patella* sp., *Littorina saxatilis*, *Melarhaphe neritoides* and *Nucella* sp., the polychaetes *Pomatoceros* sp. and Spirorbid spp. and barnacles including *Elminius modestus*, *Chthamalus montagui* and *C. stellatus* (Table 7).

Species associated with the Fucoid-dominated intertidal reef community complex	
Fucus vesiculosus	*Littorina saxatilis*
Fucus spiralis	*Melarhaphe neritoides*
Fucus serratus	*Nucella* sp.
Ulva sp.	Barnacles
Porphyra umbilicalis	*Elminius modestus*
Ralfsia sp.	*Chthamalus montagui*
Corallina officinalis	*Chthamalus stellatus*
Encrusting red algae	*Pomatoceros* sp.
Patella sp.	Spirorbid spp.

Table 7 Species associated with the Fucoid-dominated intertidal reef community complex.

A variation of this community occurs in more sheltered environs to the east of Tarbert where the brown alga *Ascophyllum nodosum* replaces *Fucus spiralis* with no difference in the remaining associated species.

MIXED SUBTIDAL REEF COMMUNITY COMPLEX.

This reef community complex is recorded north of the Kerry Head, from Leck Point to the Beal Bar, outside Rinevella Bay and at Loop Head. It is recorded in depths between 5m and 50m (Figure 6).

The substrate is that of bedrock and the exposure regime is exposed to moderately exposed reef.

The fauna associated with this community complex includes the echinoderms *Echinus* sp., *Asterias* sp., *Marthasterias glacialis*, *Holothuria forskali*, ophiuroids, the anthozoan *Caryophyllia* sp., the polychaetes *Pomatoceros* sp. and Serpulidae spp. and hydroids. The sponges *Cliona celata*, *Alcyonium* sp., *Pachymatisma johnstonia*, *Esperiopsis* sp., together with encrusting forms are also recorded. In depths of less than 26m, encrusting calcareous red algae dominate with an associated flora that includes *Dilsea carnosa*, *Delesseria sanguinea*, *Dictyota* sp, *Furcellaria* sp. and *Ahnfeltia* sp. and *Alaria* sp. (Table 8).

Species associated with the Mixed subtidal reef community complex	
Encrusting calcareous red algae	*Dilsea carnosa*
Delesseria sanguinea	*Dictyota* sp.
Furcellaria sp.	*Ahnfeltia* sp.
Alaria sp.	*Echinus* sp.
Asterias sp.	*Marthasterias glacialis*
Holothuria forskali	Encrusting sponges
Ophiuroids	*Cliona celata*
Alcyonium sp.	*Esperiopsis* sp.
Pachymatisma johnstoni	*Caryophyllia* sp.
Pomatoceros sp.	Serpulidae spp.

Table 8 Species associated with the Mixed subtidal reef community complex.

FAUNAL TURF-DOMINATED SUBTIDAL REEF COMMUNITY

This community is recorded from Kilkerin Point to Ballylongford Bay and from Beal Point to Kilcredaun Head in depths between 10m and 30m (Figure 6).

The substrate here is that of boulders and cobbles in an exposure regime of exposed to moderately exposed reef.

The community is dominated by a faunal turf comprising of hydroids, bryozoans and encrusting sponges. The remaining fauna is primarily echinoderms including ophiuroids, *Echinus esculentus*, *Asterias* sp. and *Holothuria forskali* and crustaceans including *Carcinus*

maenas, *Necora puber*, *Liocarcinus* sp. and *Cancer pagurus*. Other fauna recorded here include the anemone *Urticina* sp. and the polychaete *Pomatoceros* sp. (Table 9).

Species associated with the Faunal turf-dominated subtidal reef community	
Hydroids	Bryozoans
Encrusting sponges	*Echinus esculentus*
Ophiuroids	*Asterias* sp.
Holothuria forskali	*Carcinus maenas*
Necora puber	*Liocarcinus* sp.
Cancer pagurus	*Urticina* sp.
Pomatoceros sp.	

Table 9 Species associated with the Faunal turf-dominated subtidal reef community.

ANEMONE-DOMINATED SUBTIDAL REEF COMMUNITY

This community occurs to the east of Tarbert Island and in Carrigaholt Bay in depths between 2m and 20m (Figure 6).

It is recorded on a substrate of boulders and cobbles; the exposure regime is that of sheltered reef.

The fauna is dominated by unidentified anemones and *Actinothoe* sp. with an associated fauna of the echinoderm *Echinus* sp., tunicates and *Pomatoceros* sp. (Table 10).

Species associated with the Anemone-dominated subtidal reef community	
Anemones	*Actinothoe* sp.
Echinus sp.	Tunicates
Pomatoceros sp.	

Table 10 Species associated with the Anemone-dominated subtidal reef community.

LAMINARIA-DOMINATED COMMUNITY COMPLEX

This reef community occurs largely in the western margin of the site; off Kerry Head, Inshaboy Point and Ballybunnion in the south and from Kilbaha Bay to Rinevella Point in the north. Within the Shannon estuary this community is recorded off Scattery Island and Ballymacrinan Bay (Figure 6).

The community complex occurs primarily on bedrock in water depths of 0m and 10m.

The biota is dominated by the kelp species *Laminaria hyperborea*. Other kelp species present include *L. digitata* and *Saccharina latissima*. The associated flora include unidentified fucoids and red algae, encrusting calcareous red algae, *Corallina* sp., *Halidrys siliquosa*, *Dilsea carnosa*, *Desmarestia* sp., *Saccorhiza polyschides*, *Dictyota* sp., *Delessaria sanguinea*, *Palmaria palmata* and *Ulva* sp. The fauna associated with this community include encrusting bryozoans, the echinoderms *Luidia* sp., *Marthasterias glacialis*, *Asterias rubens* and *Holothuria forskali*, *Alaria* sp. and the polychaete *Pomatoceros* sp. The sponges *Cliona celata* and *Alcyonium* sp., together with encrusting forms are also recorded (Table 11).

Species associated with the *Laminaria*-dominated community complex	
Laminaria hyperborea	*Laminaria digitata*
Saccharina latissima	Fucoids (unidentified)
Encrusting calcareous red algae	*Corallina* sp.
Halidrys siliquosa	*Dilsea carnosa*
Desmarestia sp.	*Saccorhiza polyschides*
Dictyota sp.	*Delessaria sanguinea*
Palmaria palmata	*Ulva* sp.
Encrusting bryozoans	Encrusting sponges
Cliona celata	*Alcyonium* sp.
Luidia sp.	*Marthasterias glacialis*
Asterias rubens	*Holothuria forskali*
Alaria sp.	*Pomatoceros* sp.

Table 11 Species associated with the *Laminaria*-dominated community complex.

Annex II Marine Species

TURSIOPS TRUNCATUS (BOTTLENOSE DOLPHIN)

This toothed cetacean species (from the mammal Order Cetacea - whales, dolphins and porpoises) occurs in estuarine, coastal and offshore waters where it carries out breeding, foraging, resting, social activity and other life history functions. As air-breathing mammals, bottlenose dolphins must return to the water surface to breathe but they are otherwise wholly aquatic. Individual dolphins of all ages use sound as their primary sensory tool in order to navigate, communicate, avoid predators, or locate and facilitate the capture of prey under water. As a comparatively large dolphin species, it is conspicuous due to its regular occurrence in shallower coastal areas and its willingness to approach vessels and persons at sea. Its distribution extends throughout continental shelf and slope waters, and groups have also occasionally been recorded in waters >2,000m deep. Several resident coastal populations are described in western European waters. However, individuals and/or groups of the species may also range over many hundreds or even thousands of kilometres. Recently there have been records of a few individual dolphins ranging extensively through Irish coastal waters and into Northern Irish, Scottish and southern English waters.

The occurrence of dolphins within a prescribed marine area can be estimated using visual observation, photo-identification (for certain species including *Tursiops truncatus*) and passive acoustic methods in order to deliver an assessment of community or population size (i.e. relative abundance or absolute abundance), density and distribution. The size, community structure, distribution and habitat use of bottlenose dolphin inhabiting the Lower River Shannon SAC are quite well understood. The population is described as resident within the site with dolphin groups present in the estuary throughout the year, repeated occurrence of known individuals within and between years, and a fine scale genetic distinction evident between members of the Shannon population and populations or communities occurring outside the estuary. Survey efforts primarily targeting the summer-autumn period and using a photo-ID based mark-recapture technique have delivered population estimates for the site in 2000, 2003, 2007, 2008 and 2010 which have been relatively consistent between years. The most recent (i.e. fifth) population estimation survey conducted in the summer of 2010 resulted in an estimate of 107 ±12 individuals (95% Confidence Intervals: 83-131, Coefficient of Variation=0.12) and it concluded that the population trajectory has been relatively stable since estimation efforts began. Studies of community (social) structure have also been undertaken within the site and these describe a very dynamic, fluid model often termed as a 'fission-fusion' model of social structure. Group sizes tend to be comparatively small (i.e. in single figures or low double figures, more commonly 3-15 individuals, median=6) but highly variable in composition. However larger aggregations may occasionally be recorded, as is the case both in coastal waters and further offshore, particularly in the summer months.

Important cohorts within the Lower River Shannon bottlenose dolphin community, such as free-ranging and site-faithful adults, juveniles and newborn calves, have consistently been recorded since research studies began at the site. The species breeds annually in Irish waters and indications are that the birth and early rearing of newborn calves takes place predominantly during the summer and early autumn months (i.e. May to September). Calving in the Lower River Shannon, which is the best-studied location in Ireland, occurs annually within the same 5-month period. However female bottlenose dolphins do not produce a new calf each year and instead a minimum interval of 2-3 years or more between individual calving is described. Newborn dolphin calves depend primarily upon their mother's nutrient-rich milk for at least their first year and are generally weaned before they are two years old. Maternal investment in the growing juvenile typically continues until the birth of a new calf, while successful mating activity appears to take place primarily during the same season that calving is taking place (i.e. May to September).

Bottlenose dolphins are known to range widely throughout the site and, due to the size of the site and consistent data available, research effort has predominantly targeted the broader downstream area lying to the west of Tarbert and extending as far as Kerry Head and Loop Head. Members of the Shannon dolphin population have occasionally been recorded outside the site (e.g. within Tralee Bay or Brandon Bay; generally within 25km of the estuary) while a lower-level genetic connection is described to a small semi-resident community recently utilising waters in outer Cork Harbour. However the vast majority of records are contained within the Lower River Shannon site. Within its downstream study area, continued robust research effort has led to the identification of two core locations within which the majority of dolphin records occur. These 'critical areas' (figure 7) represent high value habitats used preferentially by the species within its overall range at the site and they broadly coincide with areas of steep benthic (i.e. seafloor) slope, greater depth and stronger currents. A degree of community partitioning is also described, whereby certain individuals/groups are more likely to occur further upstream than others. Records are also available of dolphins occurring east of Tarbert, e.g. off Foynes Island, Aughinish Island and the Fergus Estuary and occasionally as far upstream as Limerick City. Since the upstream area within this extensive and complex site has seen significantly less survey coverage, both spatially and temporally, it should be noted that all suitable aquatic habitat (figure 7) is considered relevant to the species' range and ecological requirements within the site and is therefore of potential use by bottlenose dolphins.

Bottlenose dolphin is a successful aquatic predator that feeds on a wide variety of fish (e.g, horse mackerel, mackerel, salmon, eels, gadoids, *Trisopterus* spp., flatfish, dogfish), cephalopods (e.g. squid) and occasionally crustacean species occurring in the water column or close to/within the seabed. Foraging areas for bottlenose dolphin are often associated with areas of strong tidal current and associated eddies, therefore the occurrence of foraging dolphins close to shore or adjacent to cliffs, islands, prominent headlands and tidal narrows is commonly reported. This is also the case in the Lower River Shannon site where co-operative

foraging behaviour and prey capture are well documented across a range of studies, and where the critical areas described above contain a variety of such habitat features.

Section 2: Appropriate Assessment Notes

Many operations/activities of a particular nature and/or size require the preparation of an environmental impact statement of the likely effects of their planned development. While smaller operations/activities (i.e. sub threshold developments) are not required to prepare such statements, an appropriate assessment and Natura Impact Statement is required to inform the decision-making process in or adjacent to Natura 2000 sites. The purpose of such an assessment is to record in a transparent and reasoned manner the likely effects on a Natura 2000 site of a proposed development. General guidance on the completion of such assessments has been prepared and is available at www.npws.ie.

Annex I Habitats

It is worth considering at the outset that in relation to Annex I habitat structure and function, the extent and quality of all habitats varies considerably in space and time and marine habitats are particularly prone to such variation. Habitats which vary naturally, i.e. biotic and/or abiotic variables are changing within an envelope of natural variation, must be considered to have favourable conservation condition. Anthropogenic disturbance may be considered significant when it causes a change in biotic and/or abiotic variables in excess of what could reasonably be envisaged under natural processes. The capacity of the habitat to recover from this change is obviously an important consideration (i.e. habitat resilience) thereafter.

This Department has adopted a prioritized approach to conservation of structure and function in marine Annex I habitats.

1. Those communities that are key contributors to overall biodiversity at a site by virtue of their structure and/or function (keystone communities) and their low resilience should be afforded the highest degree of protection and any significant anthropogenic disturbance should be avoided.
2. In relation to the remaining constituent communities that are structurally important (e.g. broad sedimentary communities) within an Annex I marine habitat, there are two considerations.
    2.1. Significant anthropogenic disturbance may occur with such intensity and/or frequency as to effectively represent a continuous or ongoing source of disturbance over time and space (e.g. effluent discharge within a given area). Drawing from the principle outlined in the European Commission's Article 17 reporting framework that disturbance of greater than 25% of the area of an Annex I habitat represents unfavourable conservation status, this Department takes the view that licensing of activities likely to cause continuous disturbance of each community type should not exceed an approximate area of 15%. Thereafter, an increasingly cautious approach is advocated. Prior to any further licensing of this category of activities, an inter-

Departmental management review (considering *inter alia* robustness of available scientific knowledge, future site requirements, etc) of the site is recommended.

2.2. Some activities may cause significant disturbance but may not necessarily represent a continuous or ongoing source of disturbance over time and space. This may arise for intermittent or episodic activities for which the receiving environment would have some resilience and may be expected to recover within a reasonable timeframe relative to the six-year reporting cycle (as required under Article 17 of the Directive). This Department is satisfied that such activities could be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

The following technical clarification is provided in relation to specific conservation objectives and targets for Annex I habitats to facilitate the appropriate assessment process:

Objective **To maintain the favourable conservation condition of Large shallow inlets and bays in the Lower River Shannon SAC, which is defined by the following list of attributes and targets**

Target 1	The permanent habitat area is stable or increasing, subject to natural processes.

- This habitat also encompasses the Annex I habitats, Mudflats and sandflats not covered by water at low tide, Sandbanks which are slightly covered by sea water all the time and Reefs. Targets for these habitats should be addressed in their own right.
- This target refers to activities or operations that propose to permanently remove habitat from the site, thereby reducing the permanent amount of habitat area. It does not refer to long or short term disturbance of the biology of a site.
- Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.

Target 2	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community; Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys* spp. community complex; Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and *Laminaria*-dominated community complex.

- A semi-quantitative description of the communities has been provided in Section 1.
- An interpolation of their likely distribution is provided in figure 6.
- The estimated areas of the communities given below are based on spatial interpolation and therefore should be considered indicative:
    - Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community - 211ha
    - Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex – 466ha
    - Subtidal sand to mixed sediment with *Nucula nucleus* community complex – 6095ha
    - Subtidal sand to mixed sediment with *Nephtys* spp. community complex – 9431ha
    - Fucoid-dominated intertidal reef community complex – 616ha
    - Mixed subtidal reef community complex – 7464ha
    - Faunal turf-dominated subtidal reef – 8710ha
    - Anemone-dominated subtidal reef community – 34ha
    - Laminaria-dominated community complex - 2221ha
- Significant continuous or ongoing disturbance of communities should not exceed an approximate area of 15% of the interpolated area of each community type, at which point an inter-Departmental management review is recommended prior to further licensing of such activities.
- Proposed activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Objective **To maintain the favourable conservation condition of Estuaries in the Lower River Shannon SAC, which is defined by the following list of attributes and targets.**

Target 1	The permanent habitat area is stable or increasing, subject to natural processes.

- This habitat also encompasses the Annex I habitat of Mudflats and sandflats not covered by seawater at low tide. In such areas, the specific targets for that Annex I habitat will address requirements within the Annex I habitat Estuaries.
- This target refers to activities or operations that propose to permanently remove habitat from a site, thereby reducing the permanent amount of habitat area. It does not refer to long or short term disturbance of the biology of a site.
- Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.

Target 2	Conserve the following community types in a natural condition: Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Estuarine subtidal muddy sand to mixed sediment with gammarids community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex and Subtidal sand to mixed sediment with *Nephtys* spp. community complex.

- A semi-quantitative description of these communities has been provided in Section 1.
- An interpolation of their likely distribution is provided in figure 6.
- The estimated area of these communities within the Estuaries habitat given below is based on spatial interpolation and therefore should be considered indicative:
    - Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex – 8130ha
    - Estuarine subtidal muddy sand to mixed sediment with gammarids community complex – 268ha
    - Subtidal sand to mixed sediment with *Nucula nucleus* community complex – 4196ha
    - Subtidal sand to mixed sediment with *Nephtys* spp. community complex – 8404ha
    - Fucoid-dominated intertidal reef community complex – 678ha
    - Faunal turf-dominated subtidal reef – 981ha
    - Anemone-dominated subtidal reef community – 713ha
- Significant continuous or ongoing disturbance of communities should not exceed an approximate area of 15% of the interpolated area, at which point an inter-Departmental management review is recommended prior to further licensing of such activities.
- Proposed activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over

time and space may be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Objective	**To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Lower River Shannon SAC, which is defined by the following list of attributes and targets.**

Target 1	The permanent habitat area is stable or increasing, subject to natural processes.

- This target refers to activities or operations that propose to permanently remove habitat from a site, thereby reducing the permanent amount of habitat area. It does not refer to long or short term disturbance of the biology of a site.
- Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.

Target 2	Conserve the following communities types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community and Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex.

- A semi-quantitative description of the communities has been provided in Section 1.
- An interpolation of their likely distribution is provided in figure 6.
- The estimated areas of the communities within the Mudflats and sandflats not covered by seawater at low tide habitat given below are based on spatial interpolation and therefore should be considered indicative:
  - Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community – 213ha
  - Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex – 8596ha
- Significant continuous or ongoing disturbance of communities should not exceed an approximate area of 15% of the interpolated area of each community type, at which point an inter-Departmental management review is recommended prior to further licensing of such activities.
- Proposed activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Objective **To maintain the favourable conservation condition of Sandbanks which are slightly covered by sea water all the time in the Lower River Shannon SAC, which is defined by the following list of attributes and targets.**

Target 1	The distribution of sandbanks is stable, subject to natural processes.

- The likely distribution of sandbank habitat in this SAC is indicated in figure 4.
- This target refers to activities or operations that propose to permanently remove sandbank habitat, thus reducing the range over which this habitat occurs within the site. It does not refer to long or short term disturbance of the biology of sandbank habitats.
- Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.

Target 2	The permanent habitat area is stable or increasing, subject to natural processes.

- This target refers to activities or operations that propose to permanently remove habitat from the site, thereby reducing the permanent amount of habitat area. It does not refer to long or short term disturbance of the biology of a site.
- Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.

Target 3	Conserve the following community type in a natural condition: Subtidal sand to mixed sediment with *Nephtys* spp. community complex.

- A semi-quantitative description of this community has been provided in Section 1.
- An interpolation of its likely distribution is provided in figure 6.
- The estimated areas of this community within the Sandbanks habitat given below is based on spatial interpolation and therefore should considered indicative:
  - Subtidal sand to mixed sediment with *Nephtys* spp. community complex - 1353ha
- Significant continuous or ongoing disturbance of the community should not exceed an approximate area of 15% of the interpolated area of this community type, at which point an inter-Departmental management review is recommended prior to further licensing of such activities.
- Proposed activities or operations that cause significant disturbance to the community but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Objective **To maintain the favourable conservation condition of Reefs in the Lower River Shannon SAC, which is defined by the following list of attributes and targets.**

Target 1	The distribution of reefs is stable, subject to natural processes.

- The likely distribution of reef habitat in this SAC is indicated in figure 5.
- This target refers to activities or operations that propose to permanently remove reef habitat, thus reducing the range over which this habitat occurs within the site. It does not refer to long or short term disturbance of the biology of reef habitats.
- Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.

Target 2	The permanent habitat area is stable, subject to natural processes.

- This target refers to activities or operations that propose to permanently remove habitat from the site, thereby reducing the permanent amount of habitat area. It does not refer to long or short term disturbance of the biology of a site.
- Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.

Target 3	Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community and *Laminaria*-dominated community complex.

- A semi-quantitative description of these communities has been provided in Section 1.
- An interpolation of their likely distribution is provided in figure 6.
- The estimated areas of the communities within the Reefs habitat given below are based on spatial interpolation and therefore should considered indicative:
  - Fucoid-dominated intertidal reef community complex - 1294ha
  - Mixed subtidal reef community complex - 7464ha
  - Faunal turf-dominated subtidal reef community - 9692ha
  - Anemone-dominated subtidal reef community – 747ha
  - *Laminaria*-dominated community complex – 2224ha
- This target relates to the structure and function of the reef and therefore it is of relevance to those activities that may cause disturbance to the ecology of the habitat.
- Significant continuous or ongoing disturbance of communities should not exceed an approximate area of 15% of the interpolated area of each community type, at which point an inter-Departmental management review is recommended prior to further licensing of such activities.
- Proposed activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over

time and space may be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

The following technical clarification is provided in relation to specific conservation objectives and targets for Annex II species to facilitate the appropriate assessment process:

Objective **To maintain the favourable conservation condition of bottlenose dolphin in Lower River Shannon, which is defined by the following list of attributes and targets**

Target 1	Species range within the site should not be restricted by artificial barriers to site use.

- This target may be considered relevant to proposed activities or operations that will result in the permanent exclusion of bottlenose dolphin from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein.
- It does not refer to short-term or temporary restriction of access or range.
- Early consultation or scoping with the Department in advance of formal application is advisable for proposals that are likely to result in permanent exclusion.

Target 2	Critical areas, representing habitat used preferentially by bottlenose dolphin, should be conserved in a natural condition.

- This target 3 is relevant to proposed activities or operations that will result in significant interference with or disturbance of (a) aquatic habitat used preferentially by bottlenose dolphin during the annual cycle and (b) the natural behaviour of bottlenose dolphin within such critical areas (i.e., preferred habitat).
- Operations or activities that cause displacement of individuals from a critical area (i.e. preferred habitat) or alteration of natural behaviour to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.

Target 3	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site.

- Proposed activities or operations should not introduce man-made energy (e.g. aerial or underwater noise, light or thermal energy) at levels that could result in a significant negative impact on individuals and/or the population of bottlenose dolphin within the site. This refers to the aquatic habitats used by the species in addition to important natural behaviours during the species' annual cycle.

- This target also relates to proposed activities or operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc) upon which bottlenose dolphins depend. In the absence of complete knowledge on the species' ecological requirements in this site, such considerations should be assessed where appropriate on a case-by-case basis.
- Proposed activities or operations should not cause death or injury to individuals to an extent that may ultimately affect the bottlenose dolphin population at the site.

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Figure 1. Extent of Large shallow inlets and bays in Lower River Shannon SAC

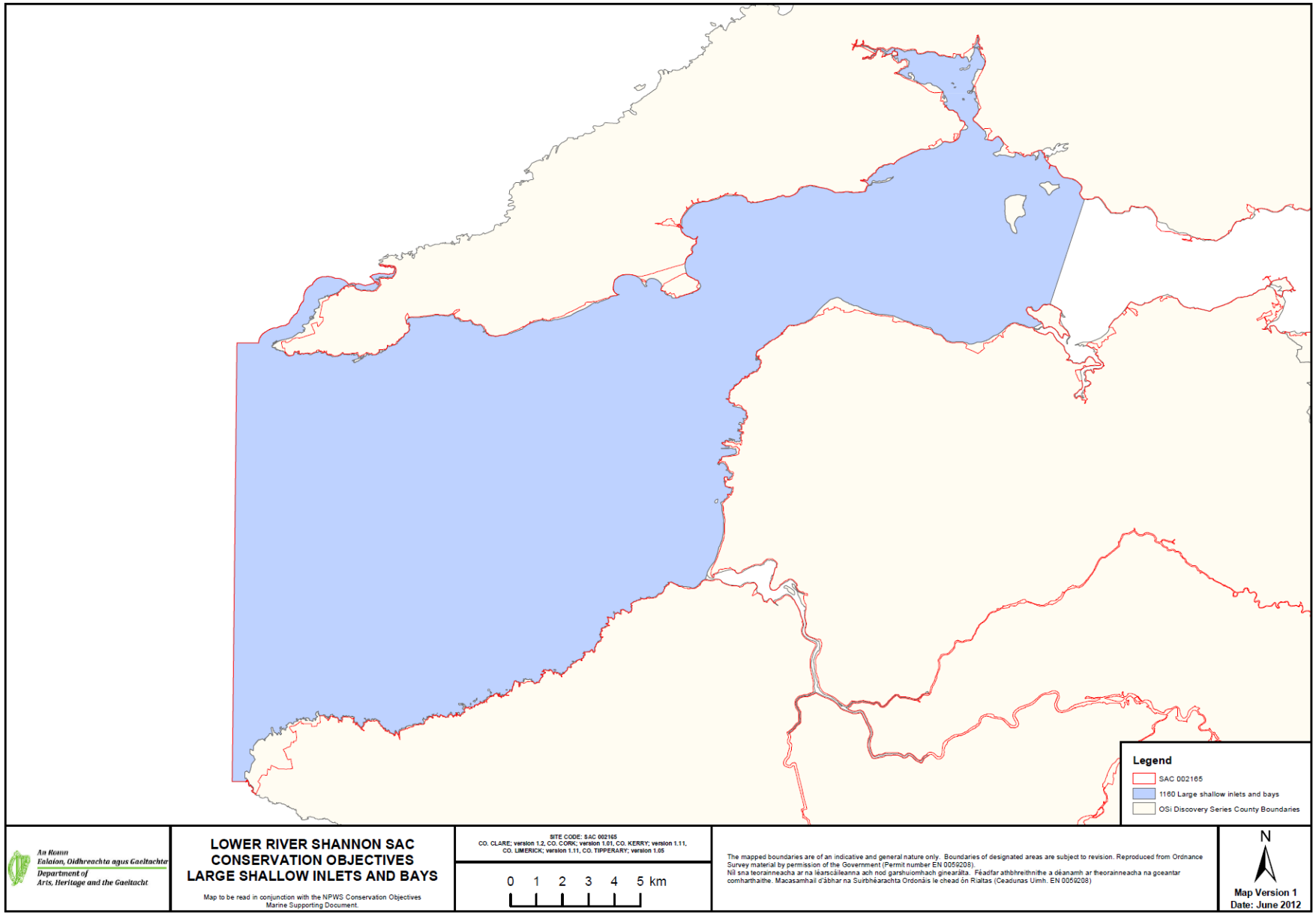

Figure 2. Extent of Estuaries in Lower River Shannon SAC

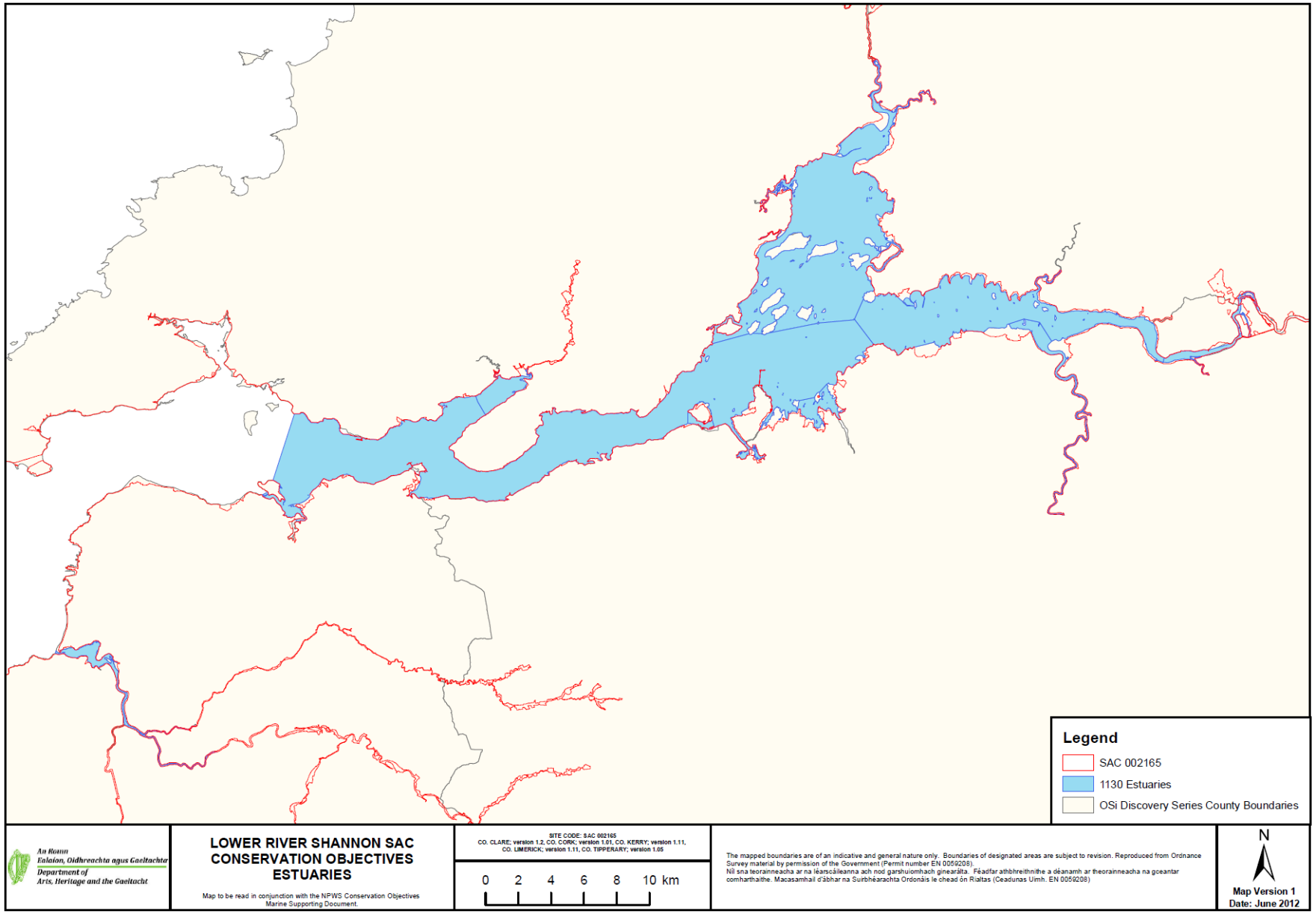

Figure 3. Extent of Mudflats and sandflats not covered by seawater at low tide in Lower River Shannon SAC

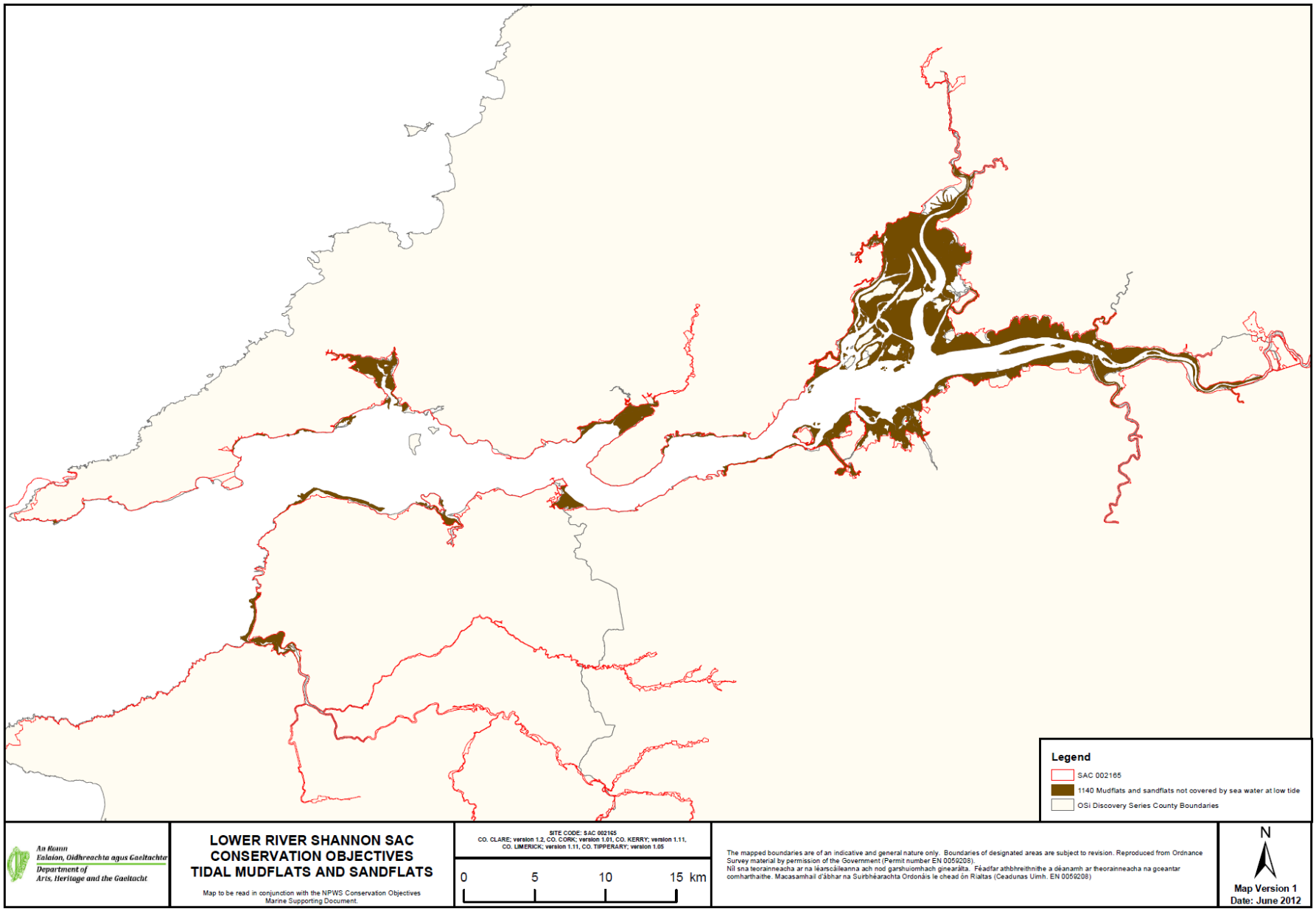

Figure 4. Extent of Sandbanks which are slightly covered by seawater all the time in Lower River Shannon SAC.

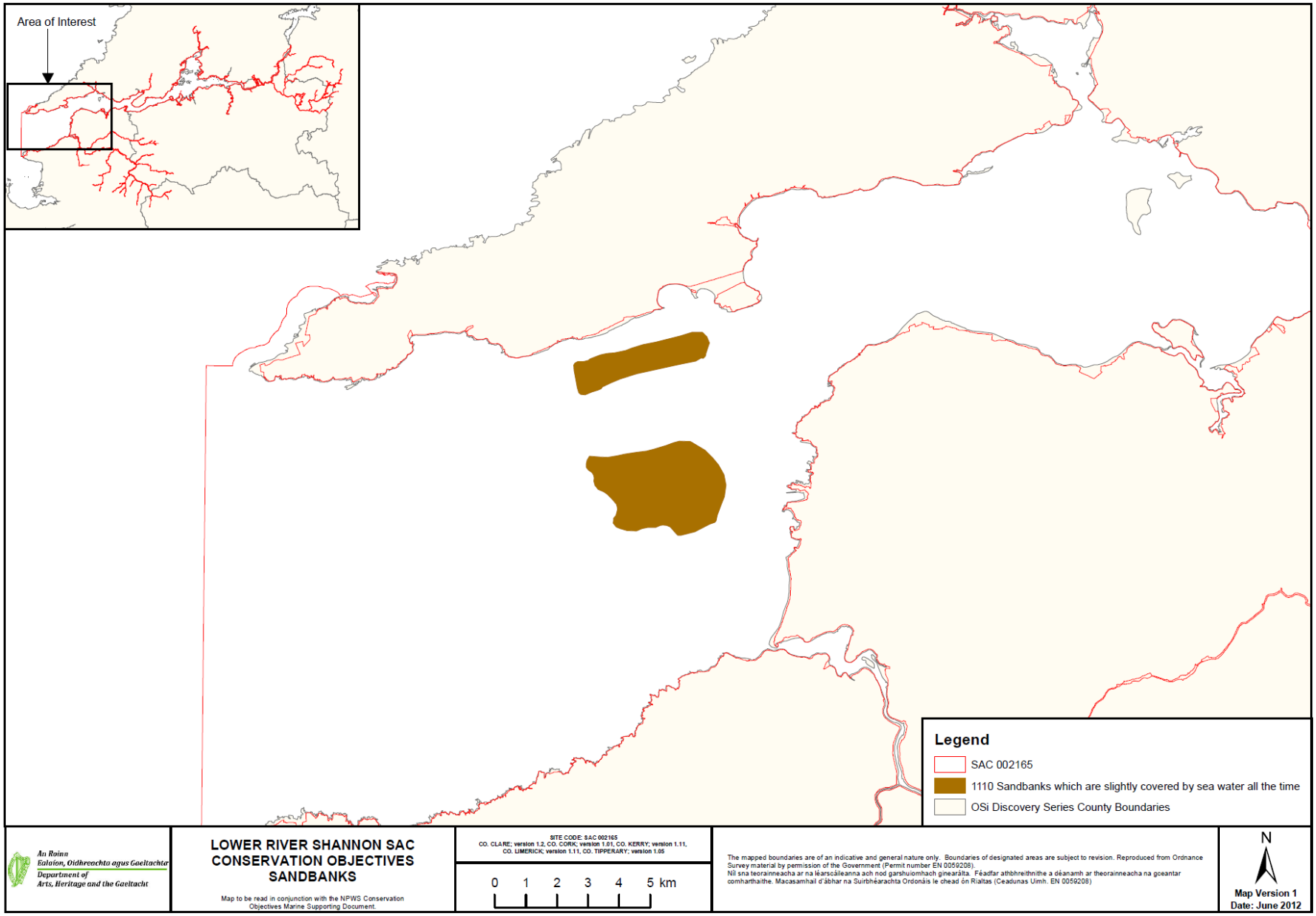

Figure 5. Extent of Reefs in Lower River Shannon SAC

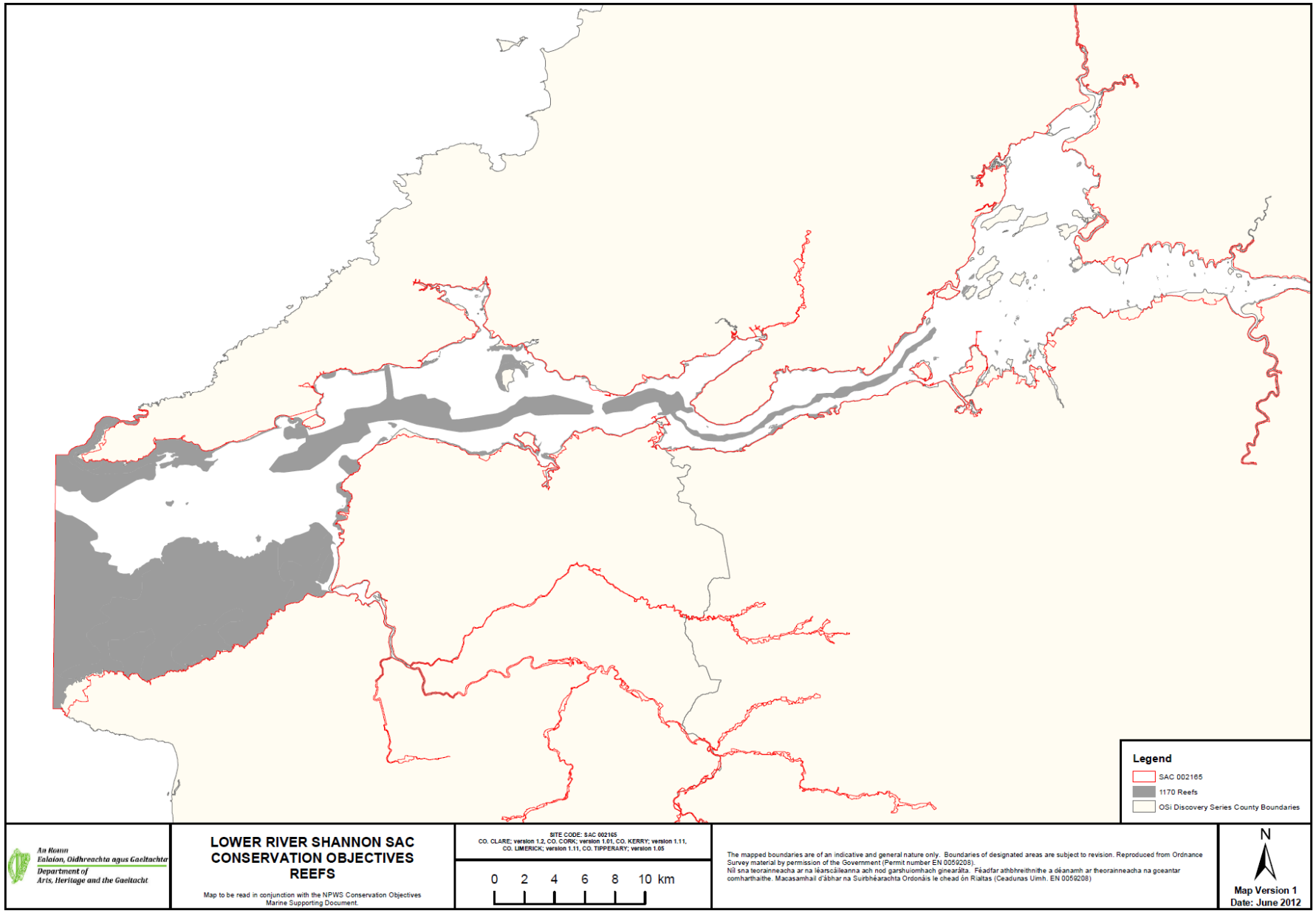

Figure 6a. Distribution of marine community types in Lower River Shannon SAC

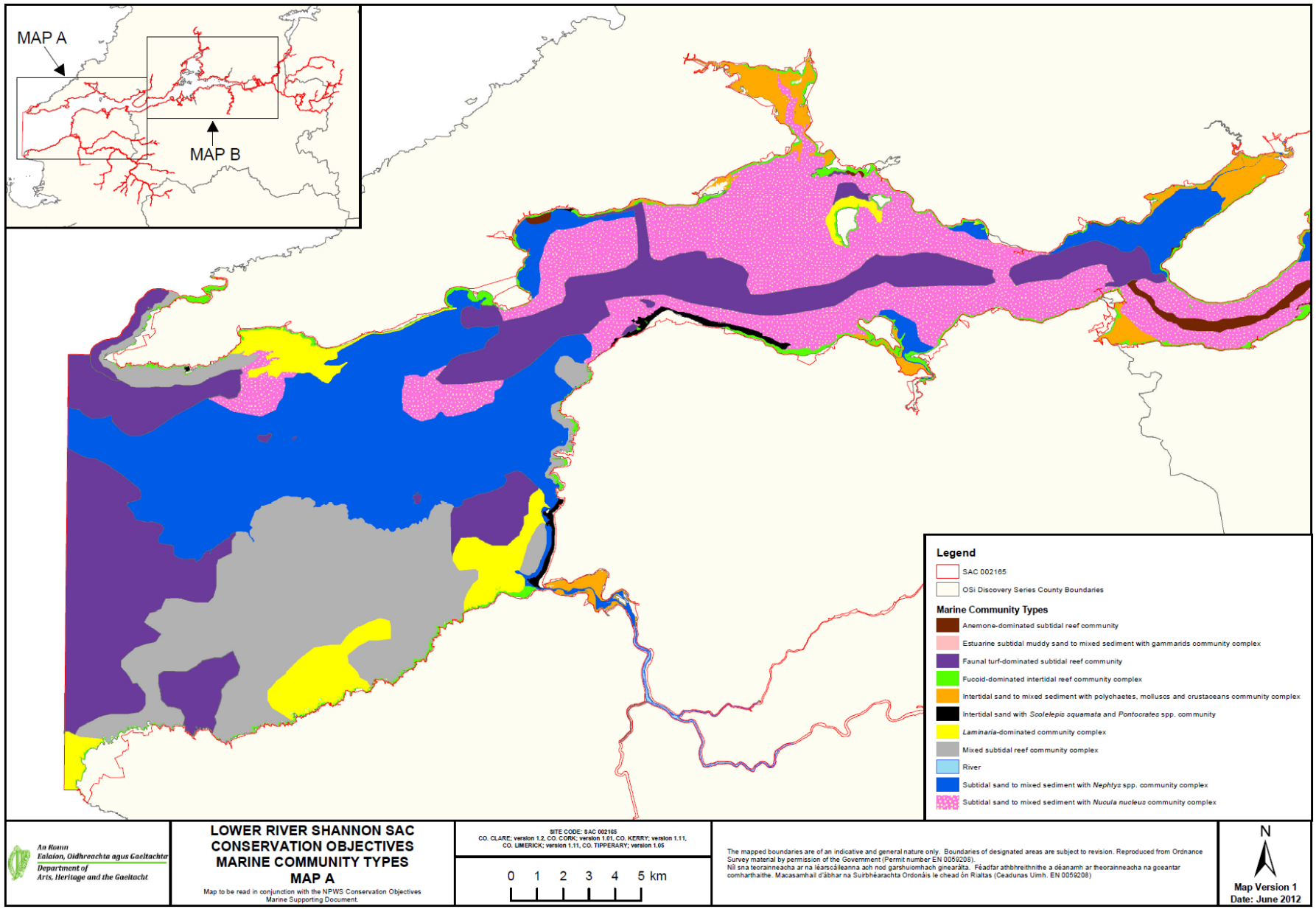

Figure 6b. Distribution of marine community types in Lower River Shannon SAC

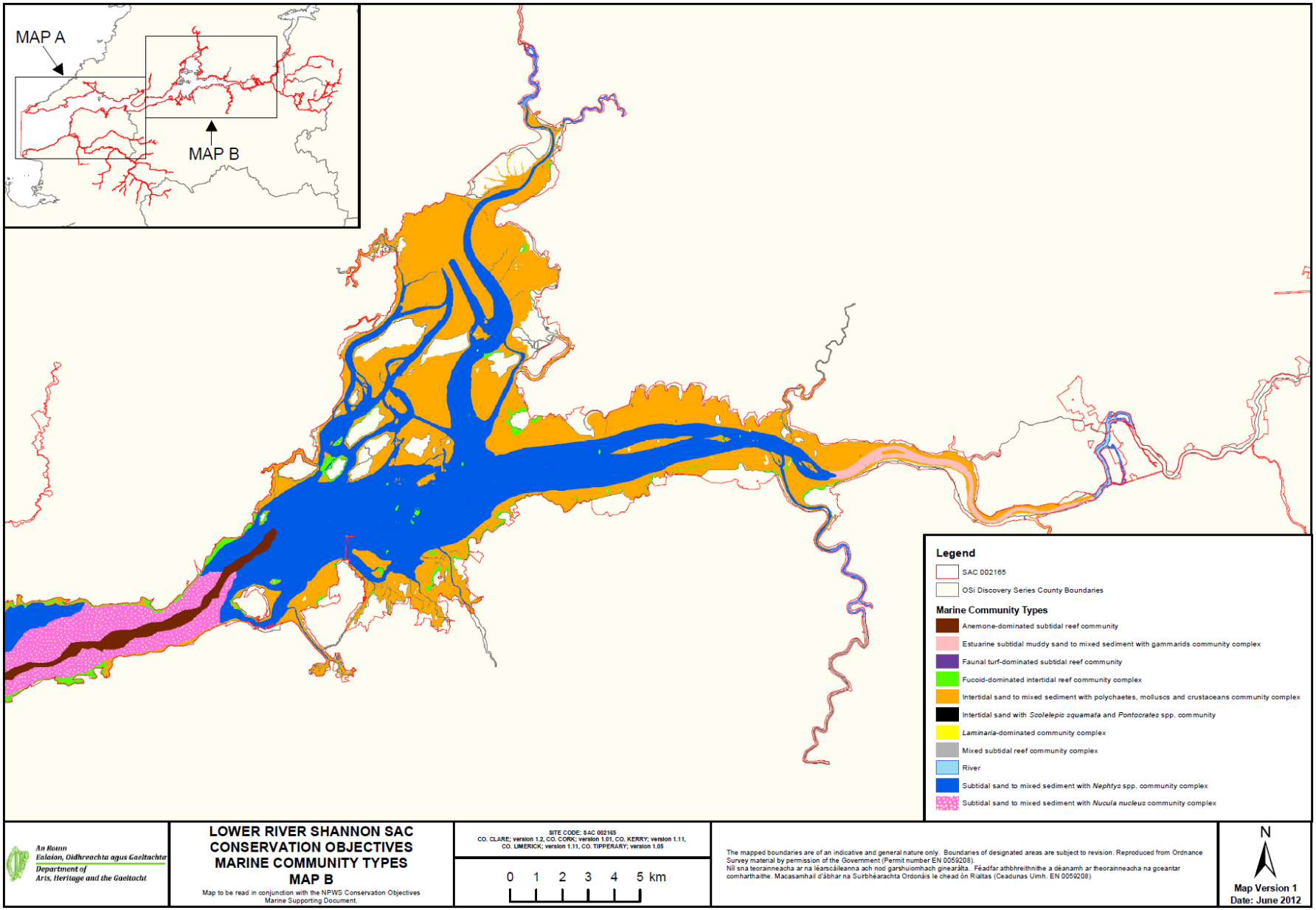

Figure 7. *Tursiops truncatus* - Habitat within Lower River Shannon SAC and known critical areas, representing habitat used preferentially by Bottlenose Dolphin.