



APPENDIX 3

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National Parks and Wildlife Service

Conservation Objectives Series

Lower River Shannon SAC 002165



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An Roinn
Ealaíon, Oidhreacht agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht



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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at 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.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

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, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- 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, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

* indicates a priority habitat under the Habitats Directive

Code	Qualifying Interest
002165	Lower River Shannon SAC
1029	Freshwater Pearl Mussel <i>Margaritifera margaritifera</i>
1095	Sea Lamprey <i>Petromyzon marinus</i>
1096	Brook Lamprey <i>Lampetra planeri</i>
1099	River Lamprey <i>Lampetra fluviatilis</i>
1106	Atlantic Salmon <i>Salmo salar</i> (only in fresh water)
1110	Sandbanks which are slightly covered by sea water all the time
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1150	*Coastal lagoons
1160	Large shallow inlets and bays
1170	Reefs
1220	Perennial vegetation of stony banks
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts
1310	<i>Salicornia</i> and other annuals colonizing mud and sand
1330	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)
1349	Bottlenose Dolphin <i>Tursiops truncatus</i>
1355	Otter <i>Lutra lutra</i>
1410	Mediterranean salt meadows (<i>Juncetalia maritimi</i>)
3260	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation
6410	<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>)
91E0	*Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)



Please note that this SAC overlaps with River Shannon and River Fergus Estuaries SPA (004077), Loop Head SPA (004119), Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161), Slievefelim to Silvermines Mountains SPA (004165) and Kerry Head SPA (004189). It is also adjacent to Clare Glen SAC (00930). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

- Title:** Aspects of brook lamprey (*Lampetra planeri* Bloch) spawning in Irish waters
Year: in press
Author: Rooney, S.M.; O'Gorman, N.M.; Green, F.; King, J.J.
Series: Biology and Environment
-
- Title:** Lower River Shannon SAC (002170): Conservation objectives supporting document - Coastal lagoons [Version 1]
Year: 2012
Author: NPWS
Series: Unpublished Report to NPWS
-
- Title:** Lower River Shannon SAC (002170): Conservation objectives supporting document - Marine habitats and species [Version 1]
Year: 2012
Author: NPWS
Series: Unpublished Report to NPWS
-
- Title:** Lower River Shannon SAC (002170): Conservation objectives supporting document - Coastal habitats [Version 1]
Year: 2012
Author: NPWS
Series: Unpublished Report to NPWS
-
- Title:** Lower River Shannon SAC (002170): Conservation objectives supporting document - Woodland habitats [Version 1]
Year: 2012
Author: NPWS
Series: Unpublished Report to NPWS
-
- Title:** Lower River Shannon SAC (002170): Conservation objectives supporting document - Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation [Version 1]
Year: 2012
Author: NPWS
Series: Unpublished Report to NPWS
-
- Title:** Intertidal Hard and Soft Bottom Investigations in Lower River Shannon cSAC (Site Code: IE002165)/Shannon Fergus Estuary SPA (Site Code: IE004077)
Year: 2011c
Author: Aquafact
Series: Unpublished Report to NPWS
-
- Title:** Reef Investigations in Lower River Shannon cSAC (cSAC Site Code: IE002165)
Year: 2011b
Author: Aquafact
Series: Unpublished Report to NPWS

Title: Subtidal Benthic Investigations in Lower River Shannon cSAC (cSAC Site Code: IE002165)

Year: 2011a

Author: Aquafact

Series: Unpublished Report to NPWS

Title: National survey and assessment of the conservation status of Irish sea cliffs

Year: 2011

Author: Barron, S.J.; Delaney, A.; Perrin, P.M.; Martin, J.; O'Neill, F.

Series: Irish Wildlife Manuals No. 53

Title: Comparison of field- and GIS-based assessments of barriers to Atlantic salmon migration: a case study in the Nore Catchment, Republic of Ireland

Year: 2011

Author: Gargan, P. G.; Roche, W. K.; Keane, S.; King, J.J.; Cullagh, A.; Mills, P.; O'Keeffe, J.

Series: J. Appl. Ichthyol. 27 (Suppl. 3), 66–72

Title: Fine-scale population genetic structuring of bottlenose dolphins in Irish coastal waters

Year: 2011

Author: Mirimin, L.; Miller, R.; Dillane, E.; Berrow, S.D.; Ingram, S.; Cross, T.F.; Rogan, E.

Series: Animal Conservation 2011: 1–12

Title: The use of Cork Harbour by bottlenose dolphins (*Tursiops truncatus* (Montagu, 1821))

Year: 2011

Author: Ryan, C.; Cross, T.F.; Rogan, E.

Series: Irish Naturalists' Journal 31(1): 1-9

Title: Irish cetacean review (2000-2009)

Year: 2010

Author: Berrow, S.D.; Whooley, P.; O'Connell, M.; Wall, D.

Series: Irish Whale and Dolphin Group

Title: Bottlenose Dolphin SAC Survey 2010

Year: 2010

Author: Berrow, S.D.; O'Brien, J.; Groth, L.; Foley, A.; Voigt, K.

Series: Unpublished Report to NPWS

Title: Otter tracking study of Roaringwater Bay

Year: 2010

Author: De Jongh, A.; O'Neill, L.

Series: Unpublished Draft Report to NPWS

Title: Second Draft Cloon (Shannon Estuary) Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015)

Year: 2010

Author: DEHLG

Series: Unpublished Report to NPWS



Title: Social structure within the bottlenose dolphin (*Tursiops truncatus*) population in the Shannon Estuary, Ireland

Year: 2010

Author: Foley, A.; McGrath, D.; Berrow, S.D.; Gerritsen, H.

Series: Aquatic Mammals 36(4): 372-381

Title: Irish Semi-natural Grasslands Survey. Annual report no. 3: Counties Donegal, Dublin, Kildare & Sligo

Year: 2010

Author: O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; McNutt, K.E.; Perrin, P.M.; Delaney, A.

Series: Unpublished Report to NPWS

Title: A provisional inventory of ancient and long-established woodland in Ireland

Year: 2010

Author: Perrin, P.M.; Daly, O.H.

Series: Irish Wildlife Manuals No. 46

Title: Monitoring and Assessment of Irish Lagoons for the purpose of the EU Water Framework Directive

Year: 2010

Author: Roden, C.M.; Oliver, G.

Series: EPA

Title: Report of the standing scientific committee to the DCENR. The status of Irish salmon stocks in 2010 and precautionary catch advice for 2011

Year: 2010

Author: SSC

Series: Unpublished Report to DCENR

Title: The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. [S.I. 296 of 2009]

Year: 2009b

Author: Government of Ireland

Series: Irish Statute Book

Title: The European Communities Environmental Objectives (Surface Water) Regulations 2009. [S.I. 272 of 2009]

Year: 2009a

Author: Government of Ireland

Series: Irish Statute Book

Title: Winter distribution of bottle-nosed dolphins (*Tursiops truncatus* (Montagu)) in the inner Shannon Estuary

Year: 2009

Author: Berrow, S.D.

Series: Irish Naturalists' Journal 30(1): 35-39

Title: Towards a bottlenose dolphin whistle ethogram from the Shannon Estuary, Ireland

Year: 2009

Author: Hickey, R.; Berrow, S.D.; Goold, J.

Series: Biology and Environment: Proceedings of the Royal Irish Academy 109B (2), 89-94

- Title:** Saltmarsh Monitoring Report 2007-2008
Year: 2009
Author: McCorry, M.; Ryle, T.
Series: Unpublished Report to NPWS
-
- Title:** Cetaceans in Irish waters: A review of recent research
Year: 2009
Author: O'Brien, J.; Berrow, S.D.; McGrath, D.; Evans, P.G.H.
Series: Biology and Environment: Proceedings of the Royal Irish Academy 109B (2): 63-88
-
- Title:** A note on long-distance matches of bottlenose dolphins (*Tursiops truncatus*) around the Irish coast using photoidentification
Year: 2009
Author: O'Brien, J.; Berrow, S.D.; Ryan, C.; McGrath, D.; O'Connor, I.; Pesante, G.; Burrows, G.; Massett, N.; Klotzer, V.; Whooley, P.
Series: Journal Cetacean Res. Mgmt. 11: 69-74
-
- Title:** An updated population status report for bottlenose dolphins using the Lower River Shannon SAC in 2008
Year: 2008
Author: Englund, A.; Ingram, S.; Rogan, E.
Series: Unpublished Report to NPWS
-
- Title:** National Survey of Native Woodlands 2003-2008
Year: 2008
Author: Perrin, P.; Martin, J.; Barron, S.; O'Neil, F.; McNutt, K.; Delaney, A.
Series: Unpublished Report to NPWS
-
- Title:** Rapid Assessment of *Margaritifera margaritifera* (L.) populations in Ireland: Rivers assessed in 2007
Year: 2008
Author: Ross, E.D.
Series: Unpublished Report to NPWS
-
- Title:** Marine surveys of two Irish sandbank cSACs
Year: 2007
Author: Aquafact
Series: Unpublished Report to NPWS
-
- Title:** Population status report for bottlenose dolphins using the Lower River Shannon SAC, 2006-2007
Year: 2007
Author: Englund, A.; Ingram, S.; Rogan, E.
Series: Unpublished Report to NPWS
-
- Title:** Evolutionary history of lamprey paired species *Lampetra fluviatilis* (L.) and *Lampetra planeri* (Bloch) as inferred from mitochondrial DNA variation
Year: 2007
Author: Espanhol, R.; Almeida, P.R.; Alves, M.J.
Series: Molecular Ecology 16, 1909-1924



- Title:** Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents, Article 17 forms and supporting maps
- Year:** 2007
- Author:** NPWS
- Series:** Unpublished Report to NPWS
-
- Title:** A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments
- Year:** 2007
- Author:** O'Connor, W.
- Series:** Irish Wildlife Manuals No. 26
-
- Title:** Inventory of Irish coastal lagoons
- Year:** 2007
- Author:** Oliver, G.
- Series:** Unpublished Report to NPWS
-
- Title:** Using T-PODs to investigate the echolocation of coastal bottlenose dolphins
- Year:** 2007
- Author:** Philpott, E.; Englund, A.; Ingram, S.; Rogan, E.
- Series:** Journal of Marine Biological Association, UK. 87: 11-17
-
- Title:** Otter Survey of Ireland 2004/2005
- Year:** 2006
- Author:** Bailey, M.; Rochford, J.
- Series:** Irish Wildlife Manuals No. 23
-
- Title:** Whistle Production by Bottlenose Dolphins *Tursiops truncatus* in the Shannon Estuary
- Year:** 2006
- Author:** Berrow, S.D.; O'Brien, J.; Holmes, B.
- Series:** Irish Naturalists' Journal 28(5): 208-213
-
- Title:** The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams
- Year:** 2006
- Author:** Geist, J.; Porkka, M.; Kuehn, R.
- Series:** Aquatic Conservation: Marine and Freshwater Ecosystems 16, 251-266
-
- Title:** Otters - ecology, behaviour and conservation
- Year:** 2006
- Author:** Kruuk, H.
- Series:** Oxford University Press
-
- Title:** A survey of rare and scarce vascular plants in County Limerick
- Year:** 2006
- Author:** Reynolds, S.; Conaghan, J.; Fuller, J.
- Series:** Unpublished Report to NPWS

Title: National Inventory of sea cliffs and coastal heaths

Year: 2005

Author: Browne, A.

Series: Unpublished Report to NPWS

Title: Developing sustainable whalewatching in the Shannon estuary

Year: 2003

Author: Berrow, S.D.

Series: p198-203; In Marine Ecotourism: Issues and Experiences. Garrod, B and Wilson, J. (Eds.) Channel View Publications

Title: Identifying lamprey. A field key for sea, river and brook lamprey

Year: 2003

Author: Gardiner, R.

Series: Conserving Natura 2000 rivers, Conservation techniques No. 4. English Nature, Peterborough

Title: Monitoring the river, sea and brook lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus*

Year: 2003

Author: Harvey, J.; Cowx, I.

Series: Conserving Natura 2000 Rivers Monitoring Series No. 5. English Nature, Peterborough

Title: Bottlenose dolphins (*Tursiops truncatus*) in the Shannon Estuary and selected areas of the west-coast of Ireland

Year: 2003

Author: Ingram, S.; Rogan, E.

Series: Unpublished Report to NPWS

Title: The ecology of seabirds and marine mammals in a fluctuating marine environment

Year: 2003

Author: Rogan, E.; Kelly, T.; Ingram, S.; Roycroft, D.

Series: Unpublished Report to Higher Education Authority of Ireland

Title: Irish Whale and Dolphin Group cetacean sighting review (1991-2001)

Year: 2002

Author: Berrow, S.D.; Whooley, P.; Ferriss, S.

Series: Irish Whale and Dolphin Group

Title: Organochlorine concentrations in resident bottlenose dolphins (*Tursiops truncatus*) in the Shannon estuary, Ireland

Year: 2002

Author: Berrow, S.D.; McHugh, B.; Glynn, D.; McGovern, E.; Parsons, K.; Baird, R.W.; Hooker, S.D.

Series: Marine Pollution Bulletin 44: 1296-1313

Title: Identifying critical areas and habitat preferences of bottlenose dolphins (*Tursiops truncatus*)

Year: 2002

Author: Ingram, S.; Rogan, E.

Series: Marine Ecology Progress Series 244: 247-255



- Title:** Reversing the habitat fragmentation of British woodlands
Year: 2002
Author: Peterken, G.
Series: WWF-UK, London
-
- Title:** An extensive survey of bottlenose dolphins (*Tursiops truncatus*) on the west coast of Ireland
Year: 2001
Author: Ingram, S.; Englund, A.; Rogan, E.
Series: Unpublished Report to the Heritage Council
-
- Title:** The ecology and conservation of bottlenose dolphins in the Shannon Estuary, Ireland
Year: 2000
Author: Ingram, S.
Series: Unpublished PhD thesis, University College Cork
-
- Title:** A survey of bottlenose dolphins (*Tursiops truncatus*) in the Shannon Estuary
Year: 2000
Author: Rogan, E.; Ingram, S.; Holmes, B.; O'Flanagan, C.
Series: Marine Institute Marine Resource Series No. 9
-
- Title:** Tour boats and dolphins: A note on quantifying the activities of whale watching boats in the Shannon estuary, Ireland
Year: 1999
Author: Berrow, S.D.; Holmes, B.
Series: Journal of Cetacean Research and Management 1(2): 199-200
-
- Title:** Diet of Otters *Lutra lutra* on Inishmore, Aran Islands, west coast of Ireland
Year: 1999
Author: Kingston, S.; O'Connell, M.; Fairley, J.S.
Series: Biol & Environ Proc R Ir Acad B 99B:173-182
-
- Title:** National Shingle Beach Survey of Ireland 1999
Year: 1999
Author: Moore, D.; Wilson, F.
Series: Unpublished Report to NPWS
-
- Title:** The saltmarshes of Ireland: an inventory and account of their geographical variation
Year: 1998
Author: Curtis, T.G.F.; Sheehy-Skeffington, M.J.
Series: Biology and Environment, Proceedings of the Royal Irish Academy 98B: 87-104
-
- Title:** A survey of intertidal sediment biotopes in estuaries in Ireland
Year: 1997
Author: Falvey, J.P.; Costello, M.J.; Dempsey, S.
Series: Unpublished Report



Title: Distribution and Abundance of Bottle-nosed Dolphins *Tursiops truncatus* (Montagu) in the Shannon Estuary, Ireland

Year: 1996

Author: Berrow, S.D.; Holmes, B.; Kiely, O.

Series: Biology and Environment: Proceedings of the Royal Irish Academy 96B (1), 1-9

Title: The spatial organization of otters (*Lutra lutra*) in Shetland

Year: 1991

Author: Kruuk, H.; Moorhouse, A.

Series: J. Zool, 224: 41-57

Title: Otter survey of Ireland

Year: 1982

Author: Chapman, P.J.; Chapman, L.L.

Series: Unpublished Report to Vincent Wildlife Trust



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Spatial data sources

Year:	Interpolated 2012
Title:	Sandbank Survey 2007
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1110 (map 3)
Year:	Interpolated 2012
Title:	Sandbank survey 2007; subtidal benthic survey 2010; reef survey 2010; intertidal hard and soft bottom survey 2010
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used for:	Marine community types, 1110, 1140, 1170 (maps 3, 5, 8, 9)
Year:	2010
Title:	EPA WFD transitional waterbody data
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1130 (map 4)
Year:	Revision 2011
Title:	Inventory of Irish Coastal Lagoons. Version 3
GIS operations:	Clipped to SAC boundary
Used for:	1150 (map 6)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. EPA WFD transitional waterbody data erased from extent. Expert opinion used as necessary to resolve any issues arising
Used for:	1160 (map 7)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; EU Annex I Saltmarsh and Coastal data erased out if present
Used for:	Marine community types base data (map 9)
Year:	Revision 2012
Title:	National Shingle Beach Survey
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1220 (map 10)
Year:	2011
Title:	National Survey and assessment of the conservation status of Irish sea cliffs
GIS operations:	Clipped to SAC boundary
Used for:	1230 (map 11)



Year: Revision 2010
Title: Saltmarsh Monitoring Project 2007-2008. Version 1
GIS operations: QIs selected; clipped to SAC boundary; overlapping regions with Coastal CO data investigated and resolved with expert opinion used
Used for: 1310, 1330, 1410 (map 12)

Year: Derived 2012
Title: Internal NPWS files
GIS operations: Dataset created from spatial references supplied by NPWS experts. Expert opinion used as necessary to resolve any issues arising
Used for: 3260 (map 13)

Year: Revision 2010
Title: National Survey of Native Woodlands 2003-2008. Version 1
GIS operations: QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for: 91E0 (map 14)

Year: 2012
Title: NPWS rare and threatened species database
GIS operations: Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used for: 1029 (map 15)

Year: Revision 2012
Title: Margaritifera Sensitive Areas data
GIS operations: Relevant catchment boundaries identified. Expert opinion used as necessary to resolve any issues arising
Used for: 1029 (map 15)

Year: 2005
Title: OSi Discovery series vector data
GIS operations: Low Water Mark (LWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for: 1349 (map 16)

Year: 2005
Title: OSi Discovery series vector data
GIS operations: Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the terrestrial side of the river banks data; creation of 20m buffer applied to canal centreline data. These datasets are combined with the derived EPA WFD Waterbodies data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on marine side of HWM to highlight potential commuting points
Used for: 1355 (map 17)



Year: 2010

Title: EPA WFD Waterbodies data

GIS operations: Creation of a 20m buffer applied to river and stream centreline data; creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets are combined with the derived OSi data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising

Used for: 1355 (no map)

Year: Revision 2011

Title: Inventory of Irish Coastal Lagoons. Version 3

GIS operations: Creation of 80m buffer on the aquatic side of lagoon data; creation of 10m buffer on the terrestrial side of lagoon data. These datasets are combined with the derived OSi data and EPA WFD Waterbodies data for the 1355 CO. Overlapping regions are investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising

Used for: 1355 (no map)



Conservation objectives for: Lower River Shannon SAC [002165]

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	Maintain at 7km. See map 15	This conservation objective applies to the freshwater pearl mussel population in the Cloon River, Co. Clare only (see also the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (Government of Ireland, 2009b)). The Cloon population is confined to the main channel and is distributed from Croany Bridge to approx. 1.5km upstream of Clonderalaw Bridge (Ross, 2008; DEHLG, 2010)
Population size	Number of adult mussels	Restore to 10,000 adult mussels	The Cloon population was estimated as less than 10,000 in 2009 (DEHLG, 2010)
Population structure: recruitment	Percentage per size class	Restore to least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. No juvenile or young mussels were found in the Cloon in 2007, with the smallest mussel measuring 80.3mm (Ross, 2008). A single 'young mussel' measuring 61.3mm was recorded in 2009 (DEHLG, 2010)
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses. The Cloon failed the target for dead shells in 2009, with 31% dead shells across the single transect counted. There were no previous data on the number of live adults (DEHLG, 2010)



Conservation objectives for: Lower River Shannon SAC [002165]

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat extent	Kilometres	Restore suitable habitat in more than 3.3km (see map 15) and any additional stretches necessary for salmonid spawning	The species' habitat covers stretches of a short coastal river; and is a combination of 1) the area of habitat adult and juvenile mussels can occupy and 2) the area of spawning and nursery habitats the host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only those salmonid spawning areas that could regularly contribute juvenile fish to the areas occupied by adult mussels should be considered. The availability of mussel habitat and fish spawning and nursery habitats are determined by flow and substratum conditions. The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles (DEHLG, 2010). The target is based on the stretches of river identified, from a combination of dedicated survey and incidental records, as having habitat for the species
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality-macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93	These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). The habitat in the Cloon failed both standards during 2009 sampling for the Sub-basin Management Plans (DEHLG, 2010). See also The European Communities Environmental Objectives (Surface Water) Regulations 2009 (Government of Ireland, 2009a)
Substratum quality: filamentous algae (macroalgae), macrophytes (rooted higher plants)	Percentage	Restore substratum quality-filamentous algae: absent or trace (<5%); macrophytes: absent or trace (<5%)	The habitat in the Cloon failed both standards during 2009 sampling for the Sub-basin Management Plans, with cover abundance values of up to 50% recorded for filamentous algae and 80% for macrophytes (DEHLG, 2010). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrata



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Conservation objectives for: Lower River Shannon SAC [002165]

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Substratum quality: sediment	Occurrence	Restore substratum quality-stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The habitat for the species is currently unsuitable for the recruitment of juveniles owing to sedimentation of the substratum. In many locations, it is also unsuitable for the survival of adult mussels (DEHLG, 2010). Significant sedimentation has been recorded during all recent mussel monitoring surveys (Ross, 2008; DEHLG, 2010). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. Redox potential measurements in 2009 yielded losses of 32.3 - 43.5% (average of 39%) at 5cm depth (DEHLG, 2010)
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle



Conservation objectives for: Lower River Shannon SAC [002165]

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval form of the freshwater pearl mussel and, thus, they are essential to the completion of the life cycle. 0+ and 1+ fish are typically used, both because of the habitat overlaps and the development of immunity with age in the fish. Fish presence is considered sufficient, as higher densities and biomass of fish are indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for pearl mussels and a lack of pearl mussel recruitment, while significantly lower densities and biomass of host fish were associated with high numbers of juvenile mussels. Fish movement patterns must be such that 0+ fish in the vicinity of the mussel habitat remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. The Cloon freshwater pearl mussel population appears to favour native brown trout, with 17.2% of 1+ and older trout caught in 2009 hosting glochidia (DEHLG, 2010). Therefore, it is particularly important that trout are not out-competed by stocked fish

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Conservation objectives for: Lower River Shannon SAC [002165]

1095 Sea Lamprey *Petromyzon marinus*

To restore the favourable conservation condition of Sea Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. See Gargan et al. (2011). Specific barriers serve to constrain the up-river migration of sea lamprey. The upper extent of the SAC in the R. Fergus is delineated by a barrier to migration. Barriers are also present in the Mulkear and Feale
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007)
Juvenile density in fine sediment	Juveniles/m ²	Juvenile density at least 1/m ²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003)
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	Lampreys spawn in clean gravels. Surveys by Inland Fisheries Ireland (IFI) commonly indicated accumulations of redds downstream of major weirs. (See also Gargan et al., 2011)
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Despite observed spawning activity, sampling for ammocoetes consistently fails to find these in many sampling stations and never in any great numbers



Conservation objectives for: Lower River Shannon SAC [002165]

1096 Brook Lamprey *Lampetra planeri*

To maintain the favourable conservation condition of Brook Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to brook lampreys' migration, both up- and downstream, thereby possibly limiting the species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m ²	Mean catchment juvenile density of brook/river lamprey at least 2/m ²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m ² in optimal conditions and more than 2/m ² on a catchment basis
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	Spawning site and redd attributes established by IFI (Rooney et al., in press)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King et al., unpublished data)

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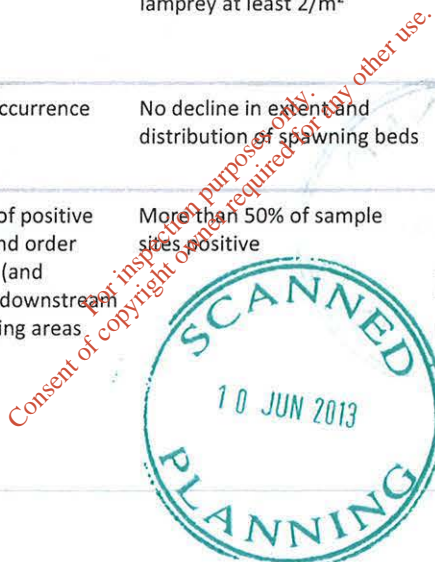


Conservation objectives for: Lower River Shannon SAC [002165]

1099 River Lamprey *Lampetra fluviatilis*

To maintain the favourable conservation condition of River Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to river lampreys' migration, both up- and downstream, thereby possibly limiting species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between river and brook lamprey juveniles in the field (Gardiner 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m ²	Mean catchment juvenile density of river/brook lamprey at least 2/m ²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m ² in optimal conditions and more than 2/m ² on a catchment basis
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King et al., unpublished data)



Conservation objectives for: Lower River Shannon SAC [002165]

1106 Atlantic Salmon *Salmo salar* (only in fresh water)

To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmon's upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. The large hydro-electric station at Ardnacrusha and the Parteen regulating weir present considerable obstructions to upstream passage of salmon on the Shannon main channel. While both have fish passes installed, upstream migration of salmon is still problematical. Further weirs upstream on the Shannon also restrict access to spawning habitat. No such obstacles, causing significant fish passage issues for salmon are present on the Feale and Mulkear rivers
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	A conservation limit is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee of the National Salmon Commission's annual model output of CL attainment levels. See SSC (2010). Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The salmon stocks in the Shannon above the impoundments are significantly below their Conservation Limits. Salmon stocks in the Feale and Mulkear rivers are above CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL). The abundance of salmon fry at monitored sites on the Shannon main channel, above the hydro-electric station, is significantly below this target
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (<i>Lepeophtheirus salmonis</i>). On the Shannon main channel, salmon smolt abundance may be significantly affected by mortality passing through hydro-electric turbines
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. Artificial barriers are currently preventing salmon from accessing suitable spawning habitat on the Shannon main channel



Conservation objectives for: Lower River Shannon SAC [002165]

1106 Atlantic Salmon *Salmo salar* (only in fresh water)

To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)



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Conservation objectives for: Lower River Shannon SAC [002165]

1110 Sandbanks which are slightly covered by sea water all the time

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:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	The distribution of sandbanks is stable, subject to natural processes. See map 3	Distribution established using the Valentia Island to River Shannon Admiralty Chart (no. 1819_0)
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated as 1,353ha using the Valentia Island to River Shannon Admiralty Chart (no. 1819_0)
Community distribution	Hectares	Conserve the following community type in a natural condition: Subtidal sand to mixed sediment with <i>Nephtys</i> spp. community complex. See map 9	The likely area of the community was derived from a sandbank survey in 2007 (Aquafact, 2007) and a subtidal survey in 2010 (Aquafact, 2011a). See marine supporting document for further details



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Conservation objectives for: Lower River Shannon SAC [002165]

1130 Estuaries

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:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 4	Habitat area was estimated as 24,273ha using OSI data and the Transitional Water Body area as defined under the Water Framework Directive
Community distribution	Hectares	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 <i>Nucula nucleus</i> community complex; Subtidal sand to mixed sediment with <i>Nephtys</i> spp. community complex; Fucoid-dominated intertidal reef community complex; Faunal turf dominated subtidal reef community; and Anemone-dominated subtidal reef community. See map 9	The likely area of these communities was derived from intertidal and subtidal surveys undertaken in 2010 (Aquafact, 2011a and c). See marine supporting document for further details



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Conservation objectives for: Lower River Shannon SAC [002165]

1150 *Coastal lagoons

To restore the favourable conservation condition of Coastal lagoons in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes. Favourable reference area 33.4ha- Shannon Airport Lagoon 24.2ha; Cloonconeen Pool 3.9ha; Scattery Lagoon 2.8ha; Quayfield and Poulaweala Loughs 2.5ha. See map 6	Areas calculated from spatial data derived from Oliver, 2007. Site codes IL031- IL034. See lagoon supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6	Sites IL031-IL034 in Oliver, 2007. See lagoon supporting document for further details
Salinity regime	practical salinity units (psu)	Median annual salinity and temporal variation within natural ranges	The lagoons in the site vary from oligohaline to euhaline. See lagoon supporting document for further details
Hydrological regime	Metres	Annual water level fluctuations and minima within natural ranges	Lagoons listed for this site are all considered to be shallow. See lagoon supporting document for further details
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management	The lagoons within this site exhibit a variety of barrier types including cobble/shingle, karst and artificial embankment. See lagoon supporting document for further details
Water quality: chlorophyll a	µg/L	Annual median chlorophyll a within natural ranges and less than 5µg/L	Target based on Roden and Oliver (2010). See lagoon supporting document for further details
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural ranges and less than 0.1mg/L	Target based on Roden and Oliver (2010). See lagoon supporting document for further details
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Annual median DIN within natural ranges and less than 0.15mg/L	Target based on Roden and Oliver, 2010). See lagoon supporting document for further details
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to maximum depth of lagoons	As these lagoons are all shallow, it is expected the macrophytes should extend to their deepest points. See lagoon supporting document for further details
Typical plant species	number and m ²	Maintain number and extent of listed lagoonal specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoon supporting document for further details
Typical animal species	number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoon supporting document for further details
Negative indicator species	Number and % cover	Negative indicator species absent or under control	Low salinity, shallow water and elevated nutrient levels increase the threat of unnatural encroachment by reedbeds



Conservation objectives for: Lower River Shannon SAC [002165]

1170 Reefs

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:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	The distribution of Reefs is stable, subject to natural processes. See map 8	Distribution is established from intertidal and subtidal reef surveys in 2010 (Aquafact, 2011b and c)
Habitat area	Hectares	The permanent habitat area is stable, subject to natural processes. See map 8	Habitat area was estimated as 21,421ha from the 2010 intertidal and subtidal reef survey (Aquafact 2011b and c)
Community distribution	Hectares	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 <i>Laminaria</i> dominated community complex. See map 9	Based on the 2010 intertidal and subtidal reef survey (Aquafact, 2011b and c). See marine supporting document for further details

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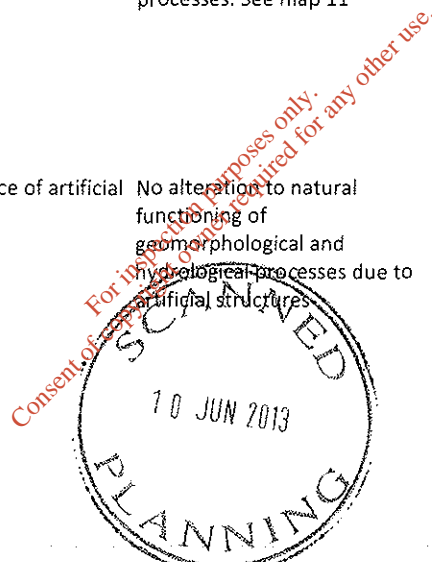


Conservation objectives for: Lower River Shannon SAC [002165]

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat length	Kilometres	Area stable or increasing, subject to natural processes, including erosion. For sub-sites mapped: Kilbaha- 4.1km; Ladder Rock- 1.0km; Moyarta- 0.9km; Lisheenrony- 1.1km; Burrane- 0.2km; Kerry Head- 33.4km; Ballybunion- 15.6km; Kilclogher- 4.9km; Loop Head- 6.1km. See map 11	Based on data from the Irish Sea Cliff Survey (ISCS) (Barron et al., 2011). Nine sub-sites were identified using a combination of aerial photos and the DCENR helicopter viewer. The length of each cliff was measured (in some cases the cliff was measured in sections) to give a total estimated area of 67.3km within the SAC. Cliffs are linear features and are therefore measured in kilometres. Length of cliff likely to be underestimated. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 11	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). Most of the SAC west of Kilcredaun Point and Kilconly Point is bounded by high rocky sea cliffs. Both hard and soft cliffs occur in this SAC (ISCS; Browne, 2005). See coastal habitats supporting document for further details
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). Maintaining natural geomorphological processes including natural erosion is important for the health of vegetated sea cliff. Hydrological processes maintain flushes and in some cases tufa formations that can be associated with sea cliffs. Freshwater seepage was noted from the cliffs at Loop Head and Kilclogher. Stream or cascade was noted from Kerry Head. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonation including transitional zones, subject to natural processes including erosion and succession	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). At Loop Head sub-site the zones recorded were: splash, crevice ledge and ungrazed coastal grassland on hard cliffs. At Kerry Head sub-site the zones recorded were: splash, pioneer, crevice ledge, ungrazed/grazed coastal grassland on hard cliffs and coastal grassland on soft cliffs. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details



Conservation objectives for: Lower River Shannon SAC [002165]

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle - 0.005ha; Inishdea, Owenshere - 0.003ha; Knock - 0.029ha; Querin - 0.185ha; Rinevilla Bay - 0.001ha. See map 12	Based on data from Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Habitat recorded at five of the ten sub-sites surveyed and mapped, giving a total estimated area of 0.223ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 12 for known distribution	Based on data from McCorry and Ryle (2009). Habitat recorded at six out of ten sub-sites by McCorry and Ryle (2009). NB further unsurveyed areas maybe present within the site. <i>Salicornia</i> is an annual species, so its distribution can vary significantly from year to year. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Sediment supply is particularly important for this pioneer saltmarsh community, as the distribution of this habitat depends on accretion rates. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks deliver sediment throughout saltmarsh system. Creeks and pan structures well developed in the larger sections of the marsh at Carrigafoyle, Shepperton/Fergus Estuary and Inishdea/Owenshere. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	This pioneer saltmarsh community requires regular tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

Conservation objectives for: Lower River Shannon SAC [002165]

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 6.774ha; Barrigone, Aughinish- 10.288ha; Beagh- 0.517ha; Bunratty- 26.939ha; Shepperton, Fergus Estuary- 37.925ha; Inishdea, Owenshere- 18.127ha; Killadysert, Inishcorker- 2.604ha; Knock- 0.576ha; Querin- 3.726ha; Rinevilla Bay- 11.883ha. See map 12	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle 2009). Ten sub-sites that supported Atlantic salt meadow were mapped (119.36ha) and additional areas of potential saltmarsh (376.07ha) were identified from an examination of aerial photographs, giving a total estimated area of 495.43ha. Saltmarsh habitat also occurs at 11 other sub-sites within the SAC (Curtis and Sheehy-Skeffington, 1998). NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 12 for mapped distribution	Based on data from McCorry and Ryle (2009). Within the sites surveyed by the SMP, estuary type saltmarsh over a mud substrate is most common and ASM is the dominant saltmarsh habitat. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). Embankments along much of the shoreline are a feature of this SAC. These embankments were erected in the past and much of the site has been remodelled and large areas of land reclaimed as a result. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks and pan structures well developed at the larger sections of ASM in the Carrigafoyle sub-site. At the ASM at Shepperton, Fergus Estuary, the larger patches still retain a natural creek and salt pan structure. At Inishdea, Owenshere sub-site within some of the intact saltmarsh, there is a complex network of creeks, salt pans and depressions. At Killadysart, Inishcorker and Querin, creek and pan development is generally poor. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details

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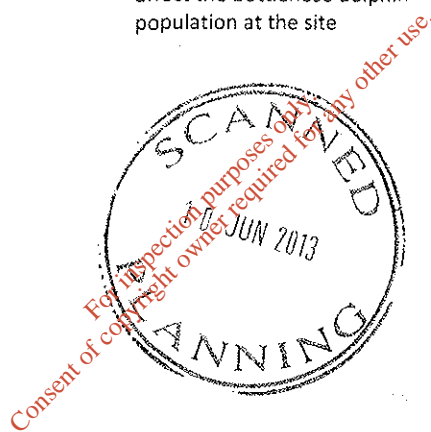
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Conservation objectives for: Lower River Shannon SAC [002165]

1349 Bottlenose Dolphin *Tursiops truncatus*

To maintain the favourable conservation condition of Bottlenose Dolphin in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use. See map 16 for suitable habitat	See marine supporting document for further details
Habitat use: critical areas	Location and hectares	Critical areas, representing habitat used preferentially by bottlenose dolphin, should be maintained in a natural condition. See map 16	Attribute and target based on Ingram and Rogan (2002), Englund et al. (2007), Englund et al. (2008), Berrow (2009), Berrow et al. (2010) and review of data from other studies. See marine supporting document for further details
Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site	See marine supporting document for further details



Conservation objectives for: Lower River Shannon SAC [002165]

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 4.193ha; Barrigone, Auhinish- 2.407ha; Bunratty- 0.865ha; Inishdea, Owenshere- 11.609ha; Killadysert, Inishcorker- 0.705ha; Knock- 0.143ha, Querin- 0.008ha; Rinevilla Bay- 2.449ha. See map 12	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Eight sub-sites that support Mediterranean salt meadow were mapped (22.379ha) and additional areas of potential saltmarsh (25.646ha) were identified from an examination of aerial photographs, giving a total estimated area of 48.025ha. Saltmarsh habitat also occurs at 11 other sub-sites within the SAC (Curtis and Sheehy-Skeffington, 1998). NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 12 for known distribution	Based on data from McCorry and Ryle (2009). Within the sites surveyed by the SMP, estuary type saltmarsh over a mud substrate is most common. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). Embankments along much of the shoreline are a feature of this SAC. These embankments were erected in the past and much of the site has been remodelled and large areas of land reclaimed because of them. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). The MSM at Carrigafoyle contains some large salt pans. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Mediterranean salt meadow is found high up in the saltmarsh but requires occasional tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). Zonations to other saltmarsh habitats as well as brackish and terrestrial habitats were recorded at most sub-sites. See coastal habitats supporting document for further details

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Conservation objectives for: Lower River Shannon SAC [002165]

6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Full extent of this habitat in this site is currently unknown- see distribution below
Habitat distribution	Occurrence	No decline, subject to natural processes	This habitat has been recorded on the eastern bank of the Shannon, just north of Castleconnell, Co. Limerick (NPWS internal files). Full distribution of this habitat in this site is currently unknown and it almost certainly occurs elsewhere. The Irish semi-natural grasslands survey will cover Co. Limerick in 2012 and additional information is likely to be available following this survey
Vegetation structure: broadleaf herb: grass ratio	Percentage	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2010)
Vegetation structure: sward height	Percentage	30-70% of sward between 10 and 80cm high	Attribute and target based on O'Neill et al. (2010)
Vegetation composition: typical species	Number	At least 7 positive indicator species present, including 1 "high quality" species	List of positive indicator species, including high quality species, identified by O'Neill et al. (2010). Note that purple moor-grass (<i>Molinia caerulea</i>) is a positive indicator species, but not necessarily an essential component of the habitat
Vegetation composition: notable species	Number	No decline, subject to natural processes	A number of notable species have been recorded in this habitat at this site including smooth brome (<i>Bromus racemosus</i>), pale sedge (<i>Carex pallescens</i>) and blue-eyed grass (<i>Sisyrinchium bermudiana</i>) (Reynolds et al., 2006)
Vegetation composition: negative indicator species	Percentage	Negative indicator species collectively not more than 20% cover, with cover by an individual species less than 10%. Non-native invasive species, absent or under control	List of negative indicator species identified by O'Neill et al. (2010)
Vegetation composition: negative indicator moss species	Percentage	Bog mosses (<i>Sphagnum</i> spp.) not more than 10% cover; hair mosses (<i>Polytrichum</i> spp.) not more than 25% cover	Attribute and target based on O'Neill et al. (2010)



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Conservation objectives for: Lower River Shannon SAC [002165]

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	Three sub-types of high conservation value are known to occur in the site. See Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation supporting document for further details. Note: rooted macrophytes should be absent or trace (< 5% cover) in freshwater pearl mussel (<i>Margaritifera margaritifera</i>) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in the Cloon River within this SAC, because the mussel requires environmental conditions closer to natural background levels
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 13	See Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation supporting document for further details
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	See Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation supporting document for further details
Hydrological regime: tidal influence	Daily water level fluctuations metres	Maintain natural tidal regime	See Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation supporting document for further details
Hydrological regime: freshwater seepages	Metres per second	Maintain appropriate freshwater seepage regimes	See Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation supporting document for further details
Substratum composition: particle size range	Millimetres	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles)	Although many of the high-conservation-value sub-types are dominated by coarse substrata, for certain sub-types, notably triangular club-rush (<i>Schoenoplectus triquetus</i>) and opposite-leaved pondweed (<i>Groenlandia densa</i>), fine substrata are required. See Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation supporting document for further details

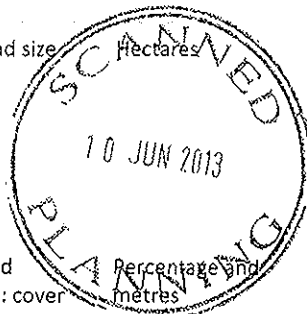


Conservation objectives for: Lower River Shannon SAC [002165]

91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*)

To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least c.8.5ha for sites surveyed. See map 14	Minimum area, based on 5 sites surveyed by Perrin et al. (2008) - site codes 1286, 1577, 1857, 1861, 1995. See woodland habitats supporting document for further details. NB further areas are likely to be present within the SAC
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 14	Distribution based on Perrin et al. (2008). NB further areas are likely to be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). Topographical and land-ownership constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder and oak regenerate poorly. Ash often regenerates in large numbers although few seedlings reach pole size
Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river floodplains
Woodland structure: dead wood	m ³ per hectare; number per hectare	At least 30m ³ /ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem



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National Parks and Wildlife Service

Conservation Objectives Series

River Shannon and River Fergus Estuaries SPA 004077

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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at 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.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

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, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- 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, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

* indicates a priority habitat under the Habitats Directive

004077 River Shannon and River Fergus Estuaries SPA

A017	Cormorant <i>Phalacrocorax carbo</i>	breeding + wintering
A038	Whooper Swan <i>Cygnus cygnus</i>	wintering
A046	Light-bellied Brent Goose <i>Branta bernicla hrota</i>	wintering
A048	Shelduck <i>Tadorna tadorna</i>	wintering
A050	Wigeon <i>Anas penelope</i>	wintering
A052	Teal <i>Anas crecca</i>	wintering
A054	Pintail <i>Anas acuta</i>	wintering
A056	Shoveler <i>Anas clypeata</i>	wintering
A062	Scaup <i>Aythya marila</i>	wintering
A137	Ringed Plover <i>Charadrius hiaticula</i>	wintering
A140	Golden Plover <i>Pluvialis apricaria</i>	wintering
A141	Grey Plover <i>Pluvialis squatarola</i>	wintering
A142	Lapwing <i>Vanellus vanellus</i>	wintering
A143	Knot <i>Calidris canutus</i>	wintering
A149	Dunlin <i>Calidris alpina</i>	wintering
A156	Black-tailed Godwit <i>Limosa limosa</i>	wintering
A157	Bar-tailed Godwit <i>Limosa lapponica</i>	wintering
A160	Curlew <i>Numenius arquata</i>	wintering
A162	Redshank <i>Tringa totanus</i>	wintering
A164	Greenshank <i>Tringa nebularia</i>	wintering
A179	Black-headed Gull <i>Chroicocephalus ridibundus</i>	wintering
A999	Wetlands	

Please note that this SPA overlaps with Lower River Shannon SAC (002165). See map 2.
The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.



Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

- Title:** BirdLife International Seabird Ecology and Foraging Range Database
Year: 2012
Author: BirdLife International
Series: <http://seabird.wikispaces.com>
- Title:** Seabird Monitoring Programme (SMP) Database
Year: 2012
Author: JNCC
Series: <http://jncc.defra.gov.uk/smp/Default.aspx>
- Title:** River Shannon and River Fergus Estuaries SPA (004077). Conservation objectives supporting document. [Version 1]
Year: 2012
Author: NPWS
Series: Unpublished Report to NPWS
- Title:** Seabird Populations of Britain and Ireland
Year: 2004
Author: Mitchell, P.I.; Newton, S.F.; Ratcliffe, N.; Dunn, T.E.
Series: Poyser, London
- Title:** Seabird monitoring handbook for Britain and Ireland: a compilation of methods for survey and monitoring of breeding seabirds.
Year: 1995
Author: Walsh, P.; Halley, D.J.; Harris, M.A.; del Nevo, A.; Sim, I.M.W.; Tasker, M.L.
Series: JNCC, Peterborough

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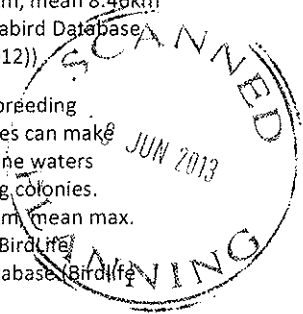
Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A017 Cormorant *Phalacrocorax carbo*

To maintain the favourable conservation condition of Cormorant in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	This attribute applies to breeding cormorant. Measure based on standard survey methods (see Walsh et al., 1995). Mitchell et al. (2004) provides summary population information. The Seabird Monitoring Programme (SMP) online database (JNCC, 2012) provides population data for this species
Productivity rate	Mean number	No significant decline	This attribute applies to breeding cormorant. Measure based on standard survey methods (see Walsh et al., 1995). The Seabird Monitoring Programme (SMP) online database (JNCC, 2012) provides population data for this species
Distribution: breeding colonies	Number; location; area (hectares)	No significant decline	This attribute applies to breeding cormorant. Cormorant colonies are usually sited on flat or rocky islets or sea stack tops, less often on cliffs but they can also nest in trees (Walsh et al., 1995)
Prey biomass available	Kilogrammes	No significant decline	This attribute applies to breeding cormorant. Key prey items: fish (mostly benthic), some crustaceans. Key habitats: populations use sandy areas, rocky and vegetated substrate. Foraging range: max. 50km, mean max. 31.67km, mean 8.46km (BirdLife International Seabird Database, (Birdlife International, 2012))
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	This attribute applies to breeding cormorant. Seabird species can make extensive use of the marine waters adjacent to their breeding colonies. Foraging range: max. 50km, mean max. 31.67km, mean 8.46km (BirdLife International Seabird Database, (Birdlife International, 2012))
Disturbance at the breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding cormorant population	This attribute applies to breeding cormorant. Cormorant colonies are usually sited on flat or rocky islets or sea stack tops, less often on cliffs but they can also nest in trees (Walsh et al., 1995)
Population trend	Percentage change	Long term population trend stable or increasing	This attribute applies to non-breeding cormorant. Waterbird population trends are presented in part four of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A046 Light-bellied Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Goose in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by light-bellied brent goose other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A048 Shelduck *Tadorna tadorna*

To maintain the favourable conservation condition of Shelduck in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by shelduck other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A050 Wigeon *Anas penelope*

To maintain the favourable conservation condition of Wigeon in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by wigeon other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A052 Teal *Anas crecca*

To maintain the favourable conservation condition of Teal in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by teal other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A054 Pintail *Anas acuta*

To maintain the favourable conservation condition of Pintail in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by pintail other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A056 Shoveler *Anas clypeata*

To maintain the favourable conservation condition of Shoveler in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by shoveler other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A062 Scaup *Aythya marila*

To maintain the favourable conservation condition of Scaup in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by scaup other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A137 Ringed Plover *Charadrius hiaticula*

To maintain the favourable conservation condition of Ringed Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by ringed plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for River Shannon and River Fergus Estuaries SPA [004077]

A140 Golden Plover *Pluvialis apricaria*

To maintain the favourable conservation condition of Golden Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by golden plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for River Shannon and River Fergus Estuaries SPA [004077]

A141 Grey Plover *Pluvialis squatarola*

To maintain the favourable conservation condition of Grey Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by grey plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A142 Lapwing *Vanellus vanellus*

To maintain the favourable conservation condition of Lapwing in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by lapwing other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A143 Knot *Calidris canutus*

To maintain the favourable conservation condition of Knot in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by knot other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A149 Dunlin *Calidris alpina*

To maintain the favourable conservation condition of Dunlin in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by dunlin other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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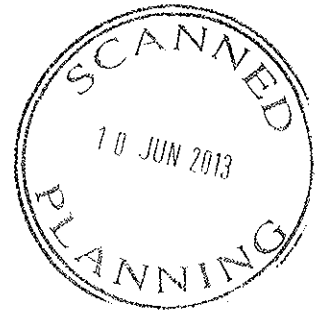
Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A156 Black-tailed Godwit *Limosa limosa*

To maintain the favourable conservation condition of Black-tailed Godwit in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by black-tailed godwit other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for River Shannon and River Fergus Estuaries SPA (004077)

A157 Bar-tailed Godwit *Limosa lapponica*

To maintain the favourable conservation condition of Bar-tailed Godwit in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by bar-tailed godwit other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A160 Curlew *Numenius arquata*

To maintain the favourable conservation condition of Curlew in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by curlew other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A162 Redshank *Tringa totanus*

To maintain the favourable conservation condition of Redshank in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by redshank other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A164 Greenshank *Tringa nebularia*

To maintain the favourable conservation condition of Greenshank in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by greenshank other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

A179 Black-headed Gull *Chroicocephalus ridibundus*

To maintain the favourable conservation condition of Black-headed Gull in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by black-headed gull other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

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Conservation objectives for: River Shannon and River Fergus Estuaries SPA [004077]

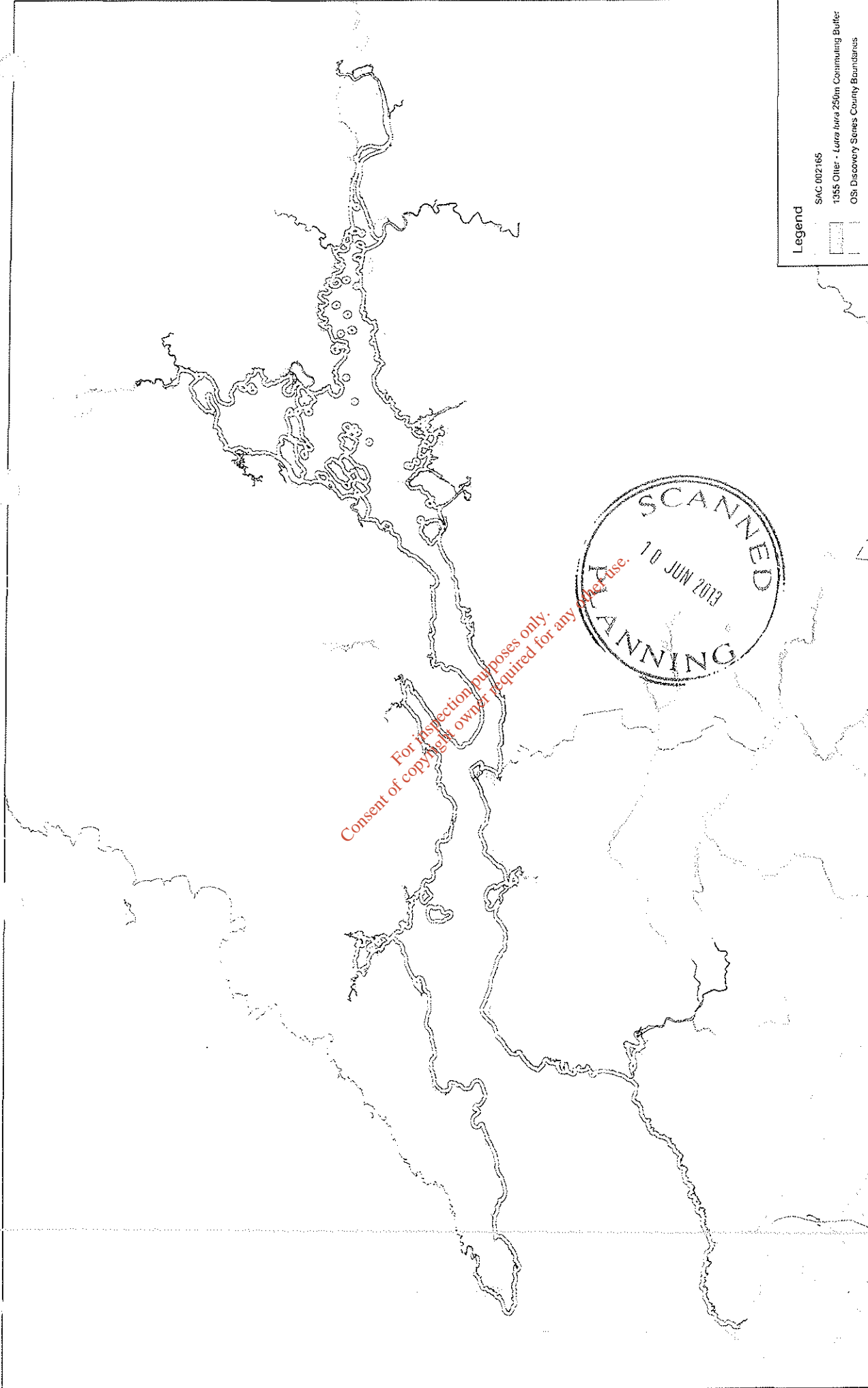
A999 Wetlands

To maintain the favourable conservation condition of the wetland habitat in the River Shannon and River Fergus Estuaries SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:

Attribute	Measure	Target	Notes
Wetland habitat area	hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 32,261ha, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 32,261ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document


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Legend

- SAC 002165
- 1955 Otter - Lura Lura 250m Commuting Buffer
- OSI Discovery Series County Boundaries

N 
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 Date: June 2012

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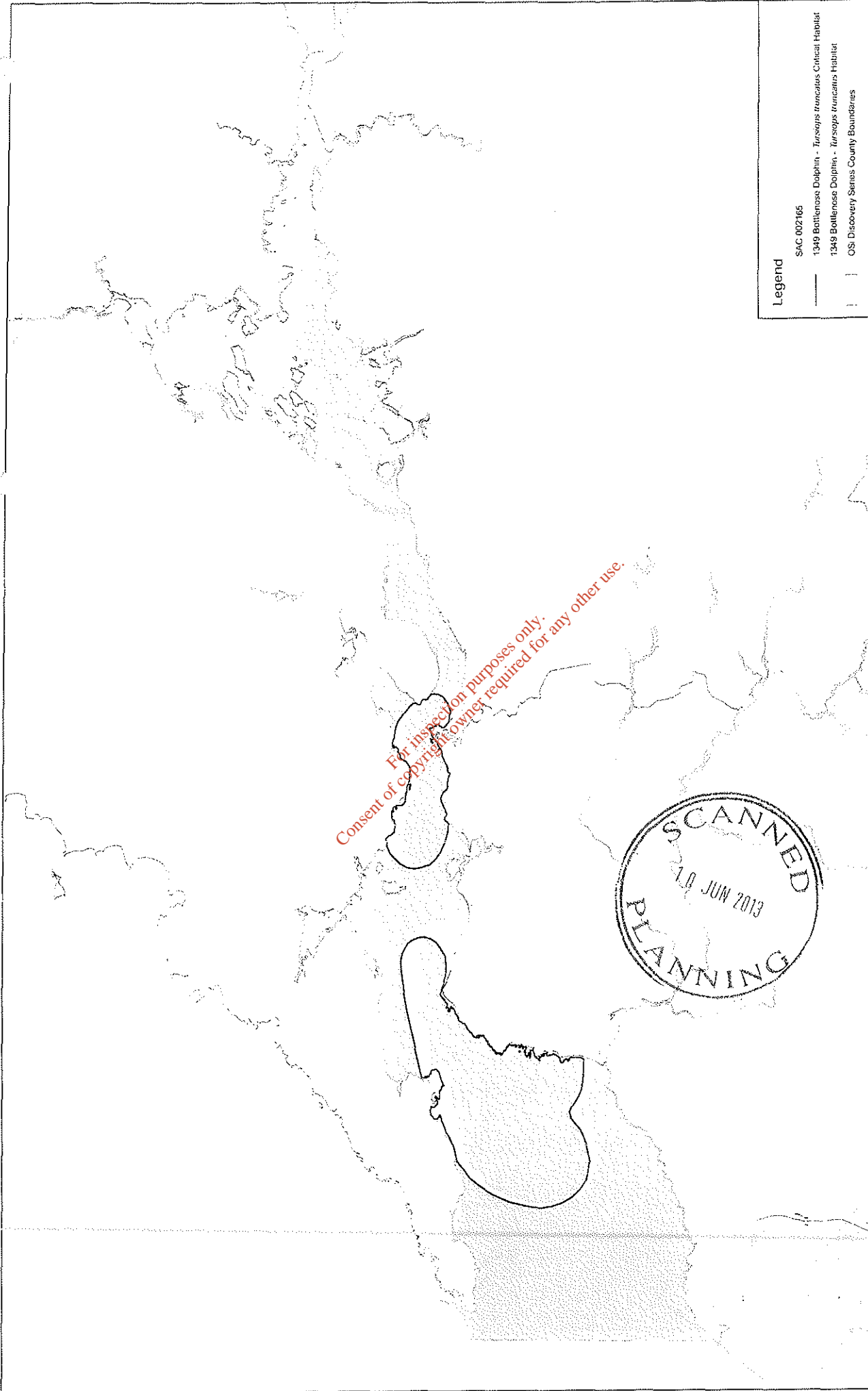


SITE CODE: SAC 002165
 OS CLASS: SAC 002165
 OS LAYER: SAC 002165



**MAP 17:
 LOWER RIVER SHANNON SAC
 CONSERVATION OBJECTIVES
 OTTER COMMUTING**

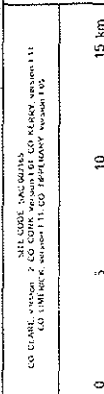
Map is based in conjunction with the NPSYS Conservation Objectives Document.



Legend

- SAC 002165
- 1349 Bottlenose Dolphin - *Tursiops truncatus* Critical Habitat
- 1349 Bottlenose Dolphin - *Tursiops truncatus* Habitat
- OSI Discovery Series County Boundaries

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 comhairle. Tá ceannas ar na léaslíneanna a gceannas ar bhíodannú na gceannas

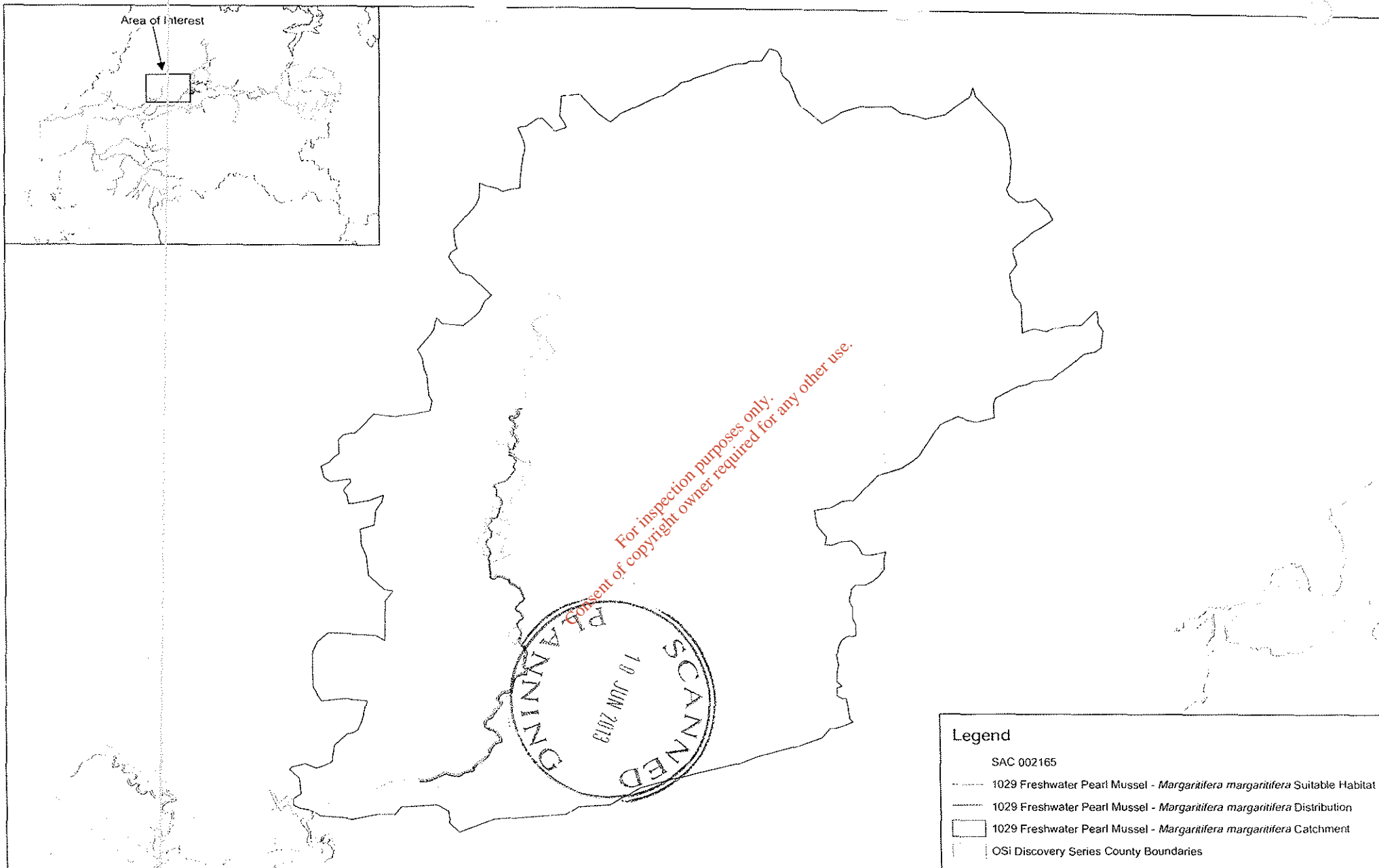


MAP 16:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
BOTTLENOSE DOLPHIN

Map is prepared in consultation with the NPWS Conservation Objectives Department

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Map Version 1
 Date: June 2012



Area of Interest

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10 JUN 2013

Legend

- SAC 002165
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Suitable Habitat
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Distribution
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Catchment
- OSi Discovery Series County Boundaries

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Department of
Arts, Heritage and the Gaeltacht

MAP 15:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
FRESHWATER PEARL MUSSEL

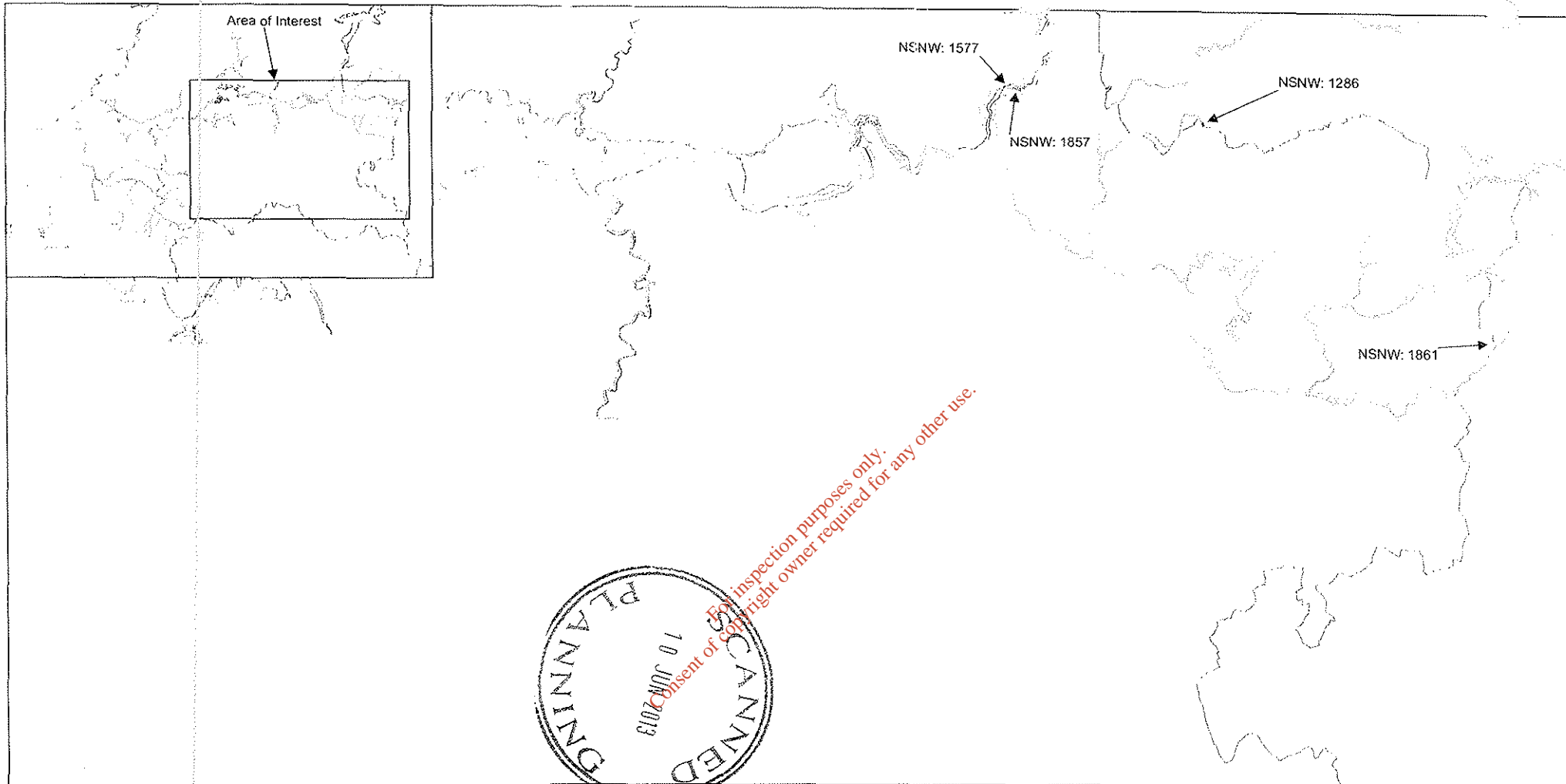
Map to be read in conjunction with the NPWS Conservation Objectives Document

SHL CODE SAC 002165
CG EARS version 1.2, CG CORN version 1.01, CG KERRY version 1.11
CG LIMERICK version 1.11, CG TEMPORARY version 1.05

0 0.5 1 1.5 2 km

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N
Map Version 1
Date June 2012



Legend

- OS Discovery Series County Boundaries
- NSNW: 1857 National Survey of Native Woodland Site Codes
- Woodland Habitats**
- 91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Aino-páidín, Ailínín incanae, Salicóin albae) Qualifying Interest
- 91A0 / 91E0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles / *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Aino-páidín, Ailínín incanae, Salicóin albae) Qualifying Interest
- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- WH2 Oak-ash-hazel woodland

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MAP 14:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

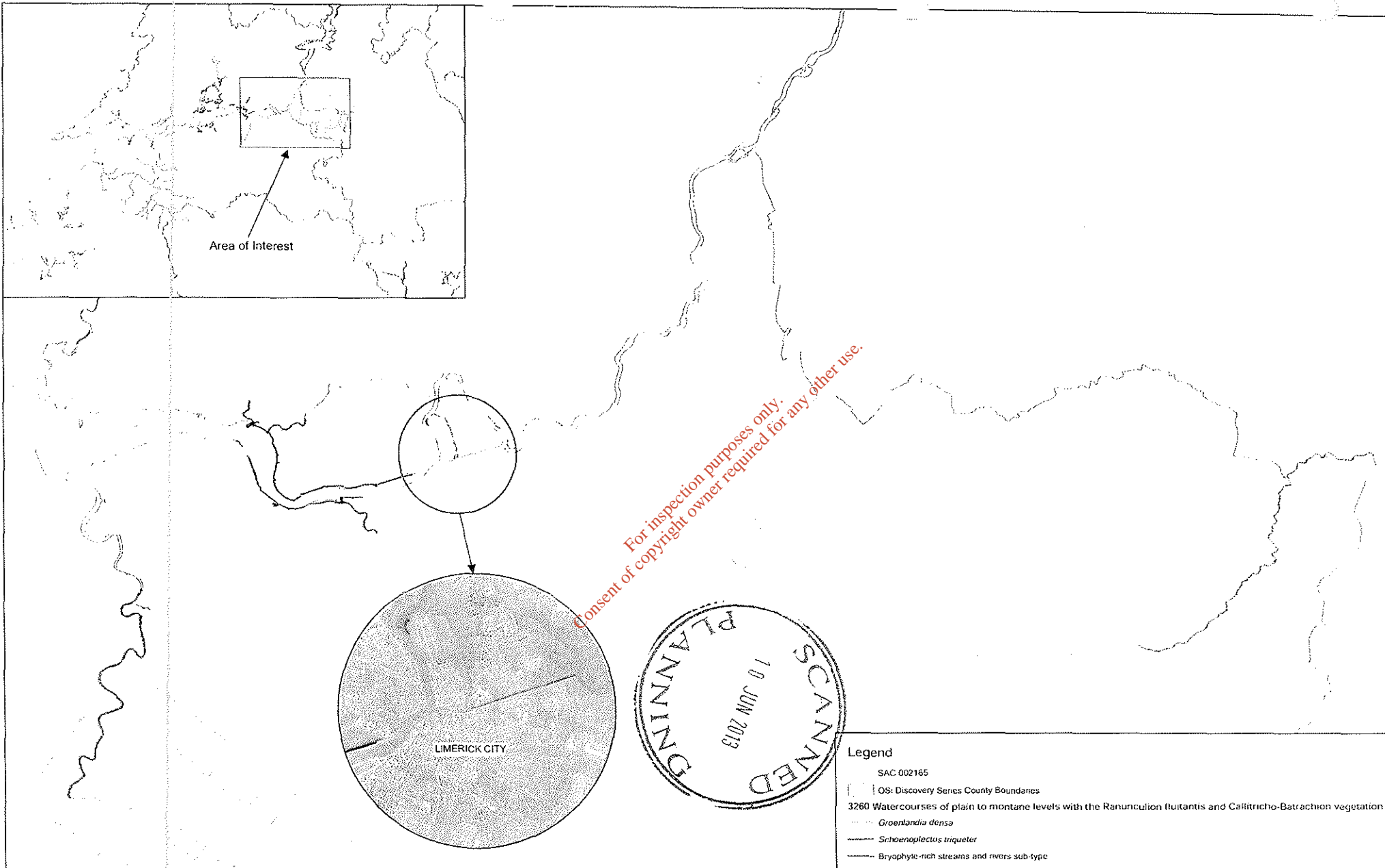
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE: SAG 002165
 CO. CLARE version 2 CO. CLARK version 1.01 CO. KERRY version 1.11
 CO. L. MERICK version 1.11 CO. TIPPERARY version 1.05

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N

Map Version 1
 Date: June 2012



Legend

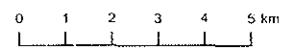
- SAC 002165
- OS: Discovery Series County Boundaries
- 3260 Watercourses of plain to montane levels with the Ranunculus fluitans and Callitriche-Batrachion vegetation
 - *Groenlandia densa*
 - *Schoenoplectus triquetus*
 - Bryophyte-rich streams and rivers sub-type

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**MAP 13:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
FLOATING RIVER VEGETATION**

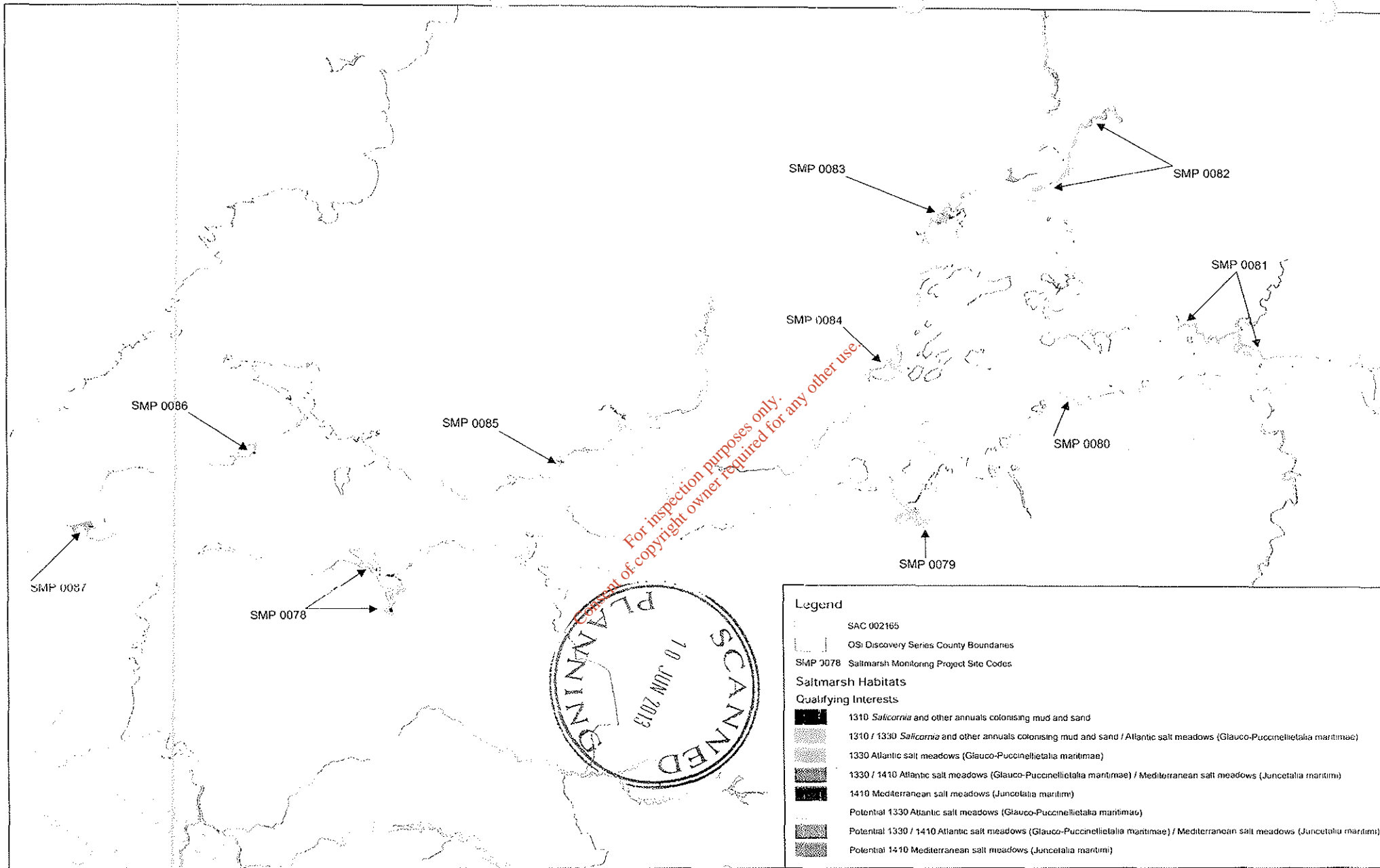
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE GUIDE SAC 002165
GO CLARE, version 1.7; GO CLR, version 1.0; GO KERRY, version 1.11
GO LIMERICK, version 1.11; GO TIPPERARY, version 1.05



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Na líne tuairimneacha ar na foinsí ábhartha a bhfuil gníomhaíocht ginearálta. Feidh ar bhunús a dárann ar theorainneacha na gceantar coimeádaithe. Macasamhail gabtar na Suidheachtaí Ordúnas le chead on Rialtas (Ceardúnas Úinéir: EN 0056208)

N
Map Version 1
Date: June 2012



Legend

- SAC 002165
- OS: Discovery Series County Boundaries
- SMP 0078 Saltmarsh Monitoring Project Site Codes
- Saltmarsh Habitats**
- Qualifying Interests**
- 1310 *Salicornia* and other annuals colonising mud and sand
- 1310 / 1330 *Salicornia* and other annuals colonising mud and sand / Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- 1330 / 1410 Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) / Mediterranean salt meadows (*Juncetalia maritimi*)
- 1410 Mediterranean salt meadows (*Juncetalia maritimi*)
- Potential 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- Potential 1330 / 1410 Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) / Mediterranean salt meadows (*Juncetalia maritimi*)
- Potential 1410 Mediterranean salt meadows (*Juncetalia maritimi*)



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**MAP 12:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
SALTMARSH HABITATS**

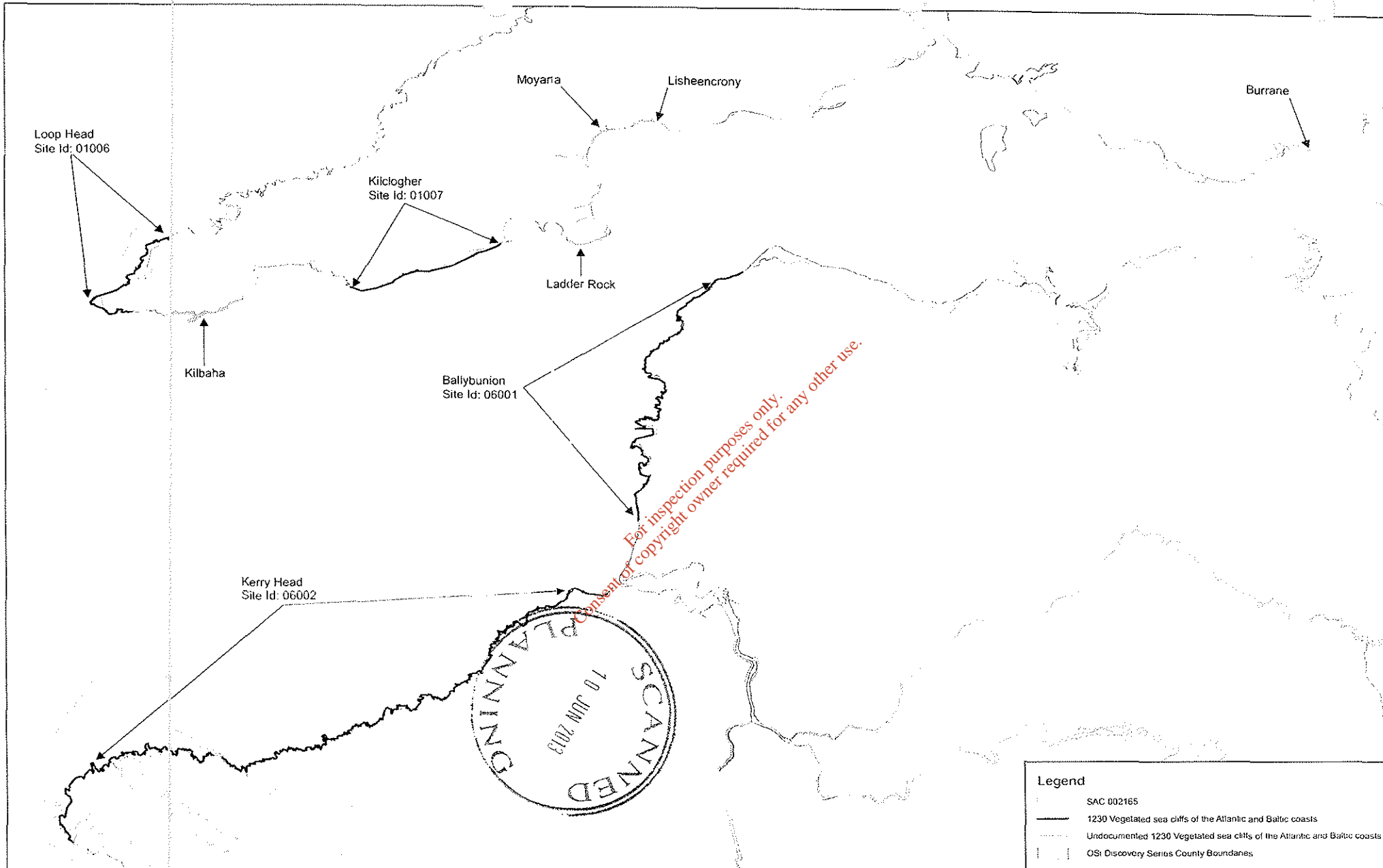
Map to be read in conjunction with the NPWS Conservation Objectives Document

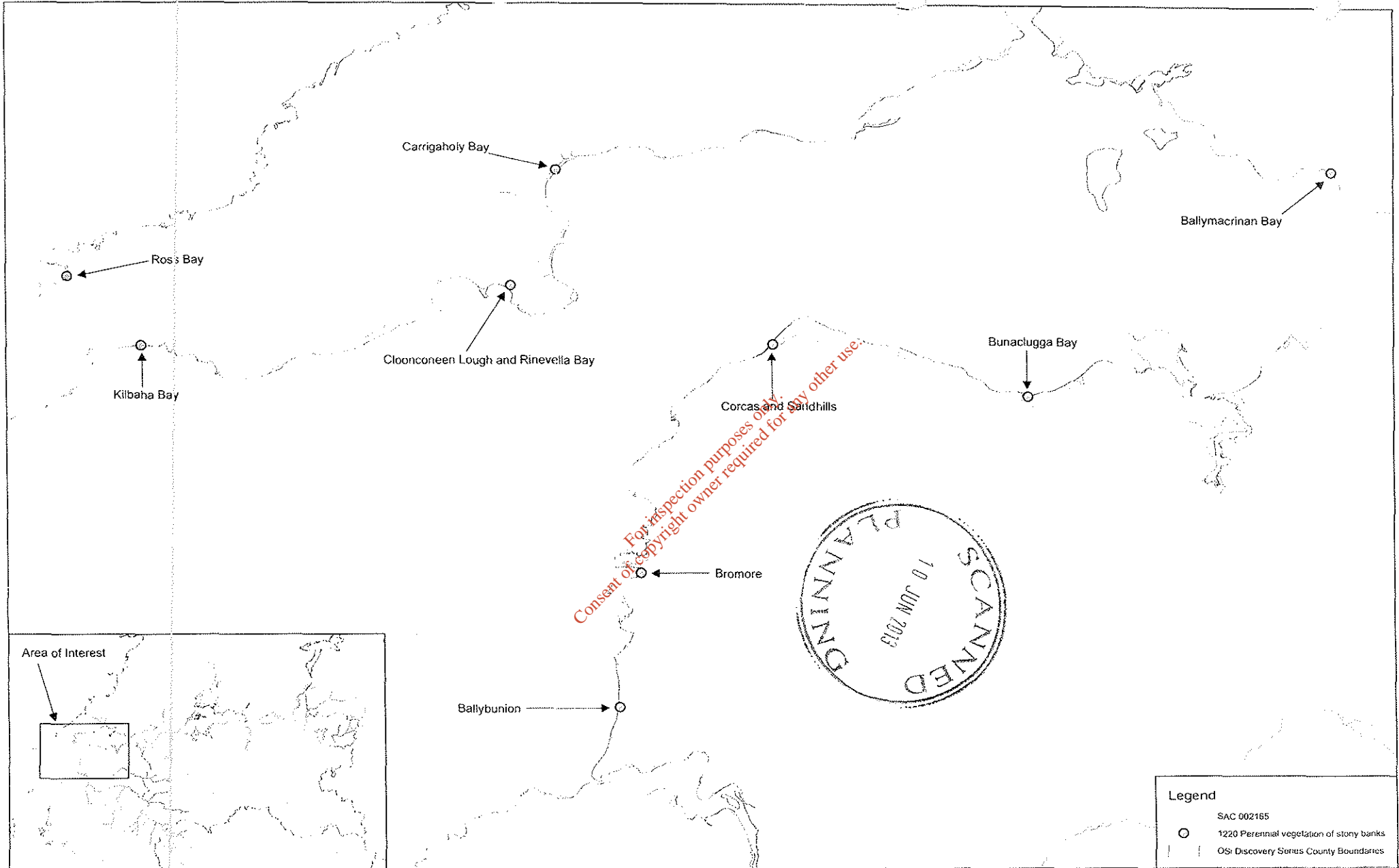
SEE CODE SAC 002165
CO CLARE, version 2 CO CORK, version 1.05, CO KERRY, version 1.11
CO LIMERICK, version 1.11 CO TIPPERARY, version 1.05

0 2 4 6 8 10 km

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comhairleacha. Macasamhail d'ádhair na Sainleathachtaí Oidhreachta le chead na hEolaíochtaí Umh. EN 00592028

N
Map Version 1
Date, June 2012



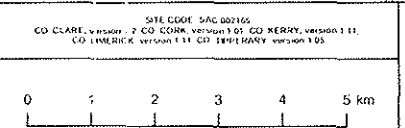


- Legend**
- SAC 002165
 - 1220 Perennial vegetation of stony banks
 - OS Discovery Series County Boundaries

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MAP 10:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
PERENNIAL VEGETATION OF STONY BANKS

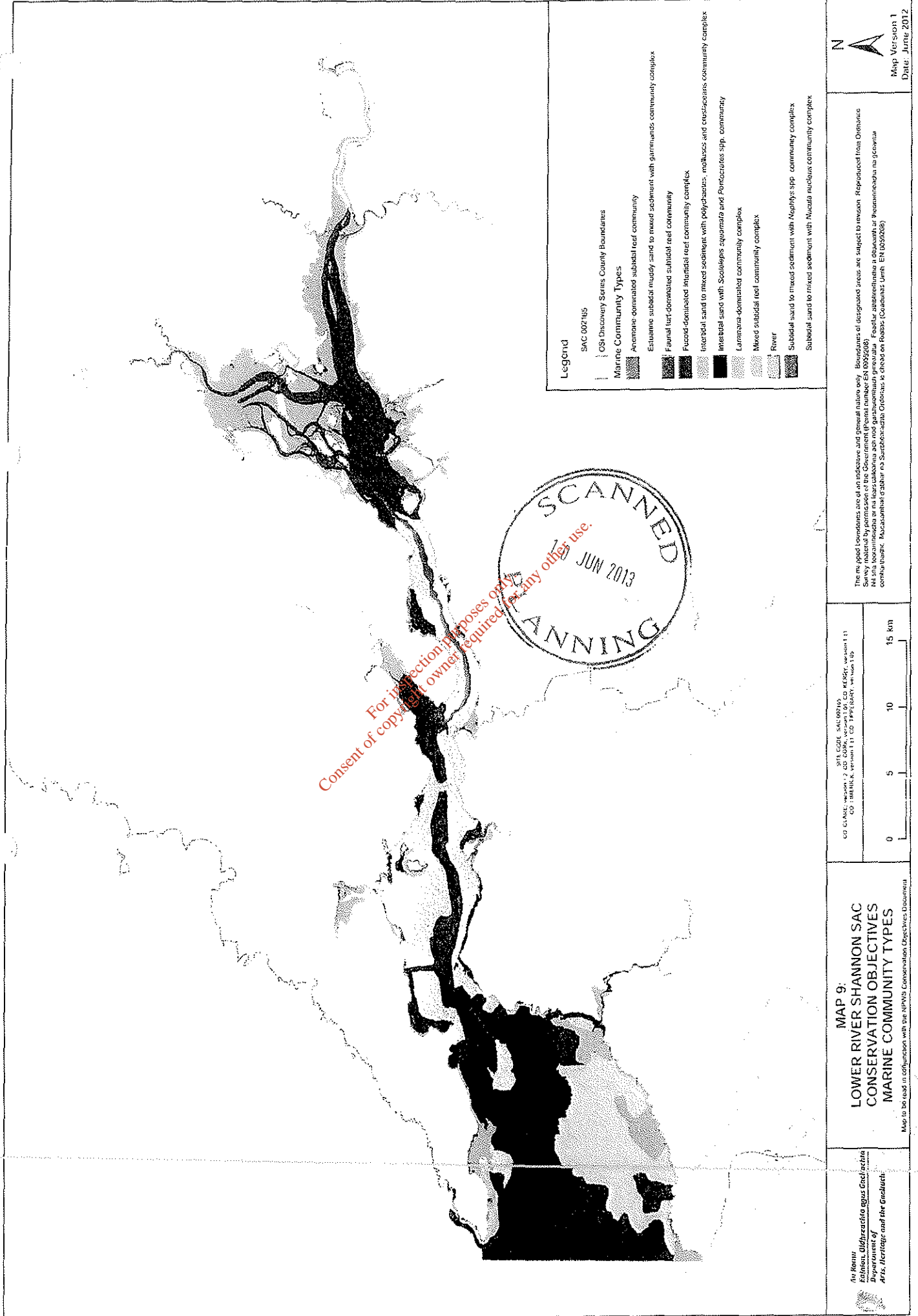
Map to be read in conjunction with the NPWS Conservation Objectives Document



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N

 Map Version 1
 Date: June 2012



Legend

SAC 002165

OSI/Discovery Sites County Boundaries

Marine Community Types

- Artemia dominated subtidal reef community
- Estuarine subtidal muddy sand to mixed sediment with gerrinnids community complex
- Fucus dominated subtidal reef community
- Fucus-dominated intertidal reef community complex
- Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex
- Intertidal sands with *Scoloplos squamata* and *Pontocrates* spp. community
- Lumina-dominated community complex
- Mixed subtidal reef community complex
- River
- Subtidal sand to mixed sediment with *Nephtys* spp. community complex
- Subtidal sand to mixed sediment with *Nucula nucleus* community complex

N

Map Version 1
Date: June 2012

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 Mí léinn, léaráinmíneacha ar na léaráinmíneacha seo ní gá aistriú nó aistriú eile. Faisnéis a bhaineann le aistriú nó le hionannú na gcearta comharthaíochta. Macasamhlaíocht le h-ardán-ábairt Ordnáire is le h-ardán-ábairt Ordnáire is le h-ardán-ábairt Ordnáire. EN 00520268

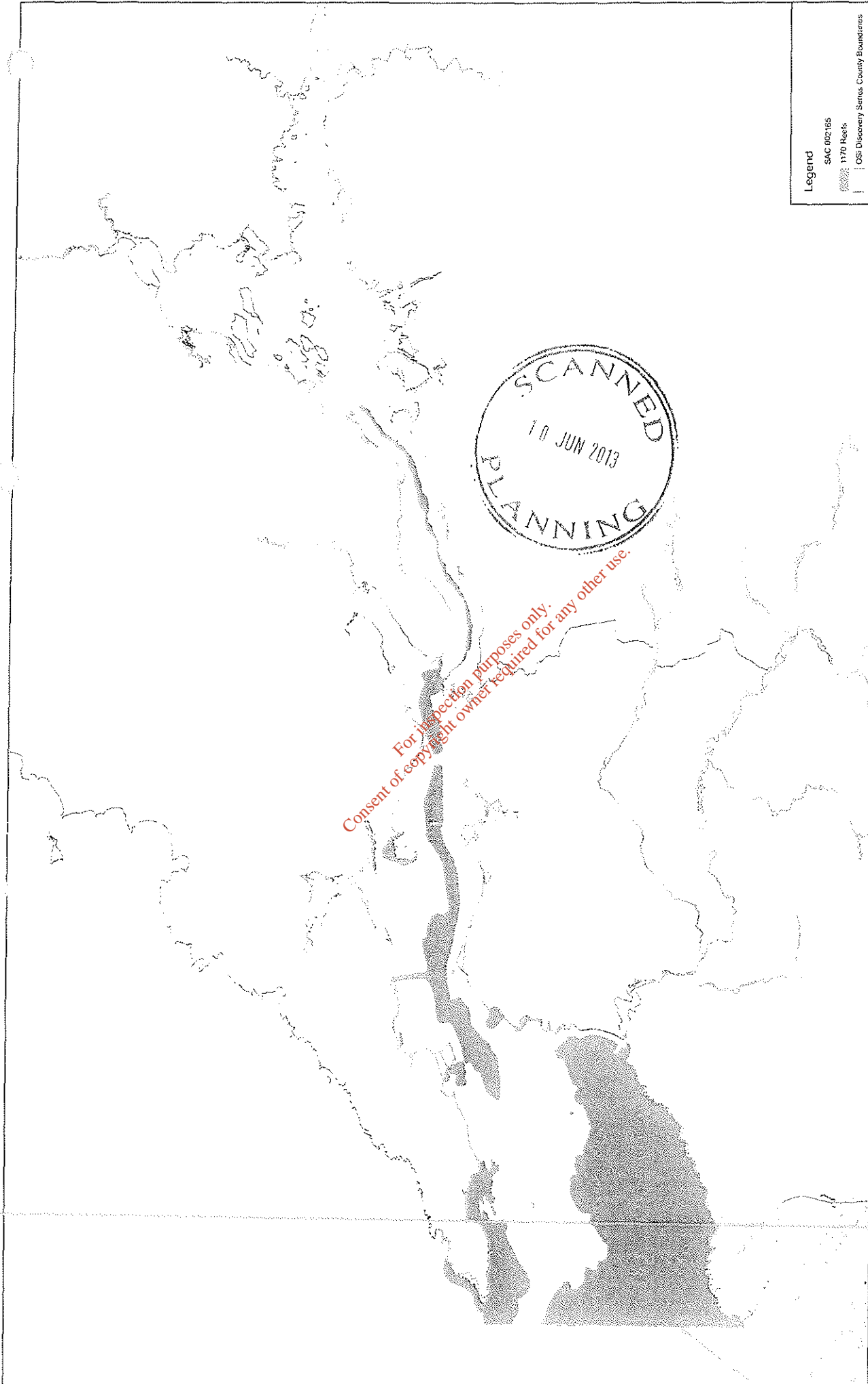
GD CLÁINE, version 1.11 CD 13991247, version 1.11
 SD CLÁINE, version 1.11 CD 13991247, version 1.11
 SD CLÁINE, version 1.11 CD 13991247, version 1.11
 SD CLÁINE, version 1.11 CD 13991247, version 1.11

0 5 10 15 km

**MAP 9:
 LOWER RIVER SHANNON SAC
 CONSERVATION OBJECTIVES
 MARINE COMMUNITY TYPES**

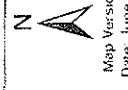
Map to be read in conjunction with the NPWS Conservation Objectives Document

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Legend

- SAC 002165
- 1170 Reefs
- OSI Discovery Series County Boundaries



Map Version 1
Date: June 2012

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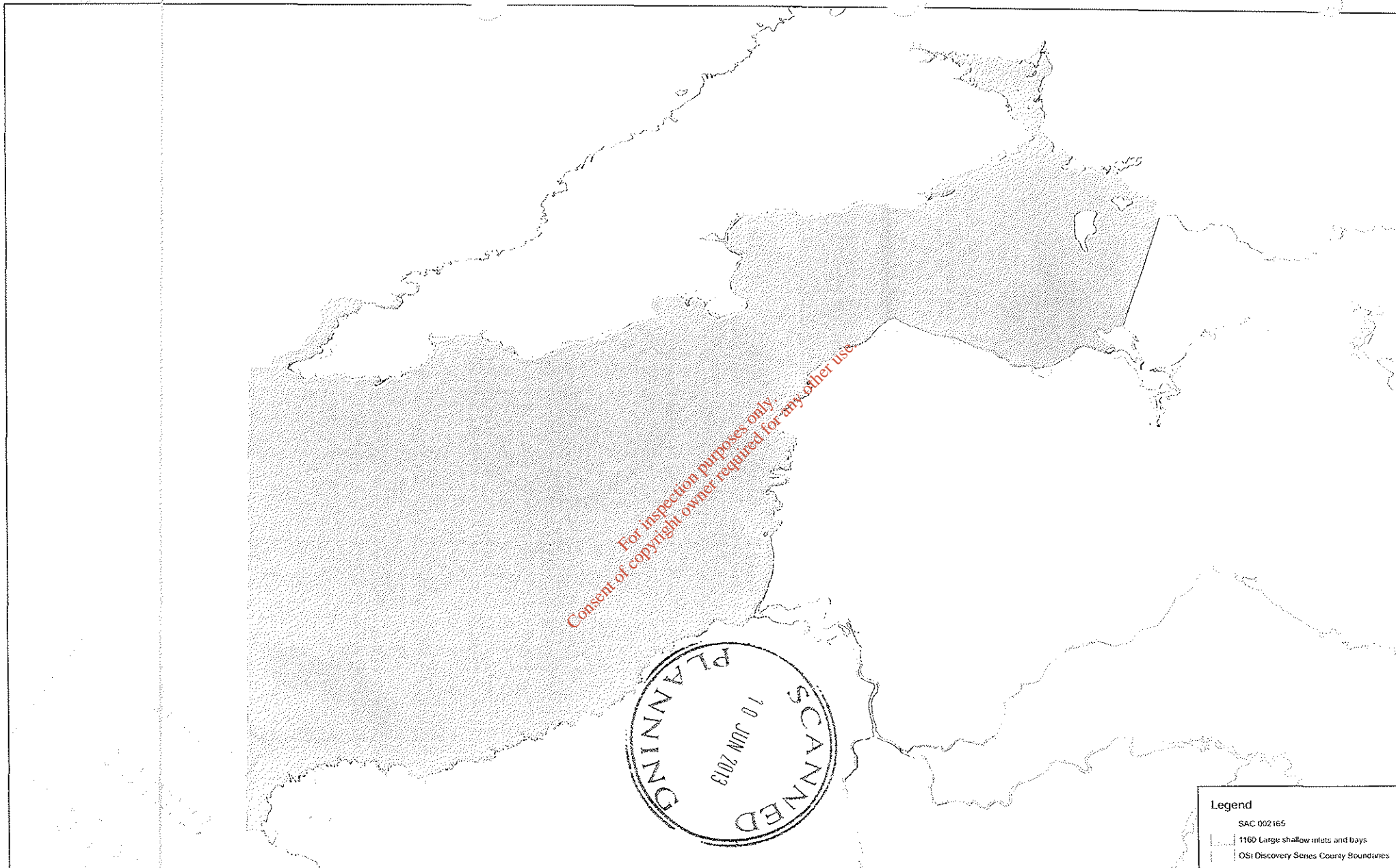
OS NAME: SAC 002165
 OS GRID REFERENCE: SJ 1170
 OS GRID REFERENCE: SJ 1170



**MAP 8:
 LOWER RIVER SHANNON SAC
 CONSERVATION OBJECTIVES
 REEFS**

Map to be read in conjunction with the NPWS Conservation Objectives Document

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Legend

- SAC 002165
- 1160 Large shallow inlets and bays
- OSi Discovery Series County Boundaries



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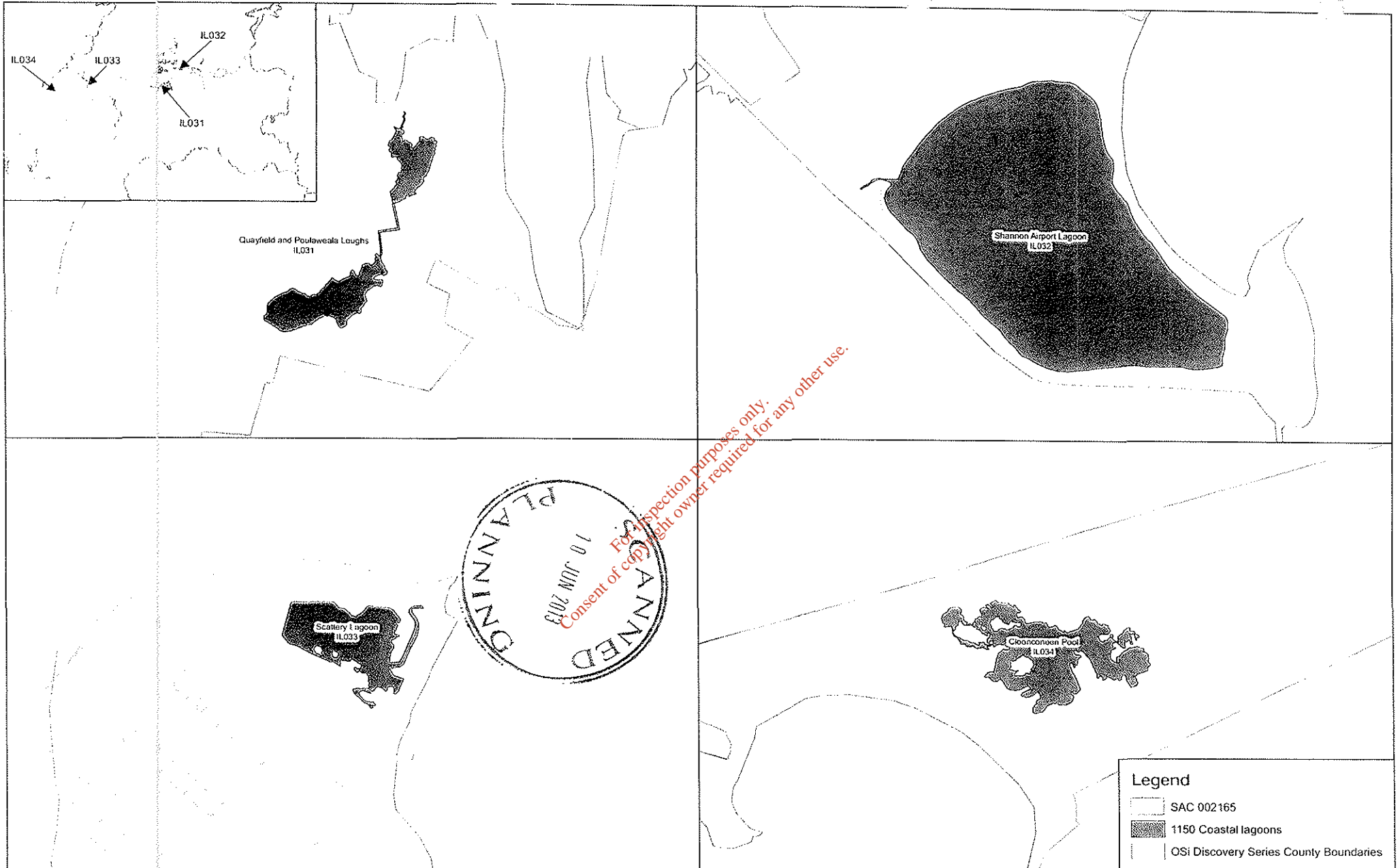
MAP 7:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS AND BAYS

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE: SAC 002165
 EU CLARE, version 1.2; CO. CORR., version 1.01; CO. KERRY, version 1.11;
 CO. LIMERICK, version 1.11; CO. TEMPERARY, version 1.05

0 1 2 3 4 5 km

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MAP 6:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
COASTAL LAGOONS

Map to be read in conjunction with the NPWS Conservation Objectives Document

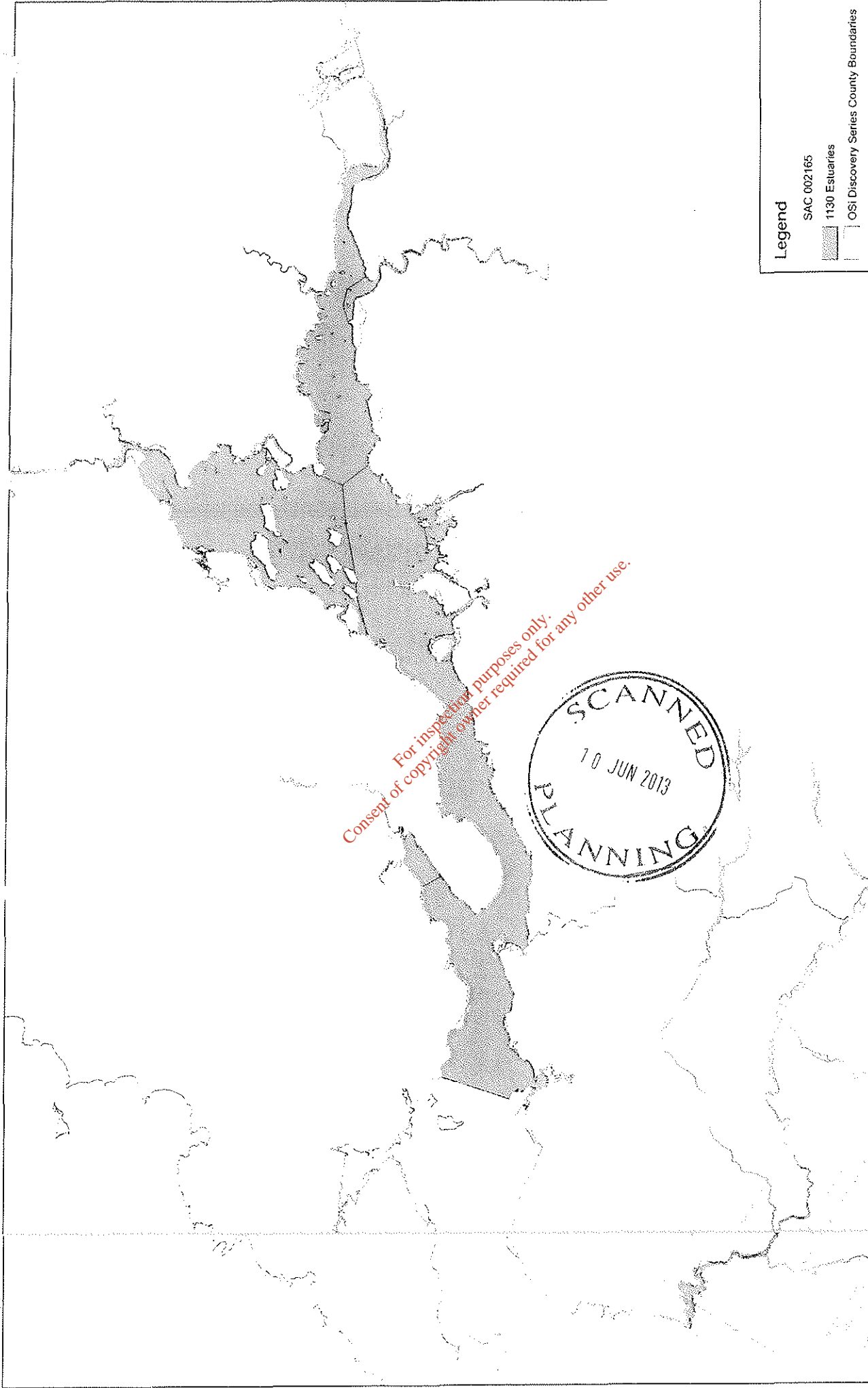
Site Code: SAC 002165
 CD CLARE, version 1.2; CD CORK, version 1.01; CD KERRY, version 1.11
 CD LIMERICK, version 1.11; CD TIPPERARY, version 1.05

0 100 200 300 400 500 m

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N

 Map Version 1
 Date: June 2012



Legend

SAC 002165

1130 Estuaries

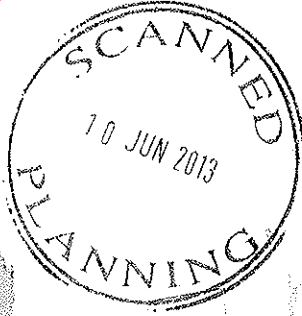
OSI Discovery Series County Boundaries

N

Map Version 1
Date: June 2012

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0 2 4 6 8 10 km

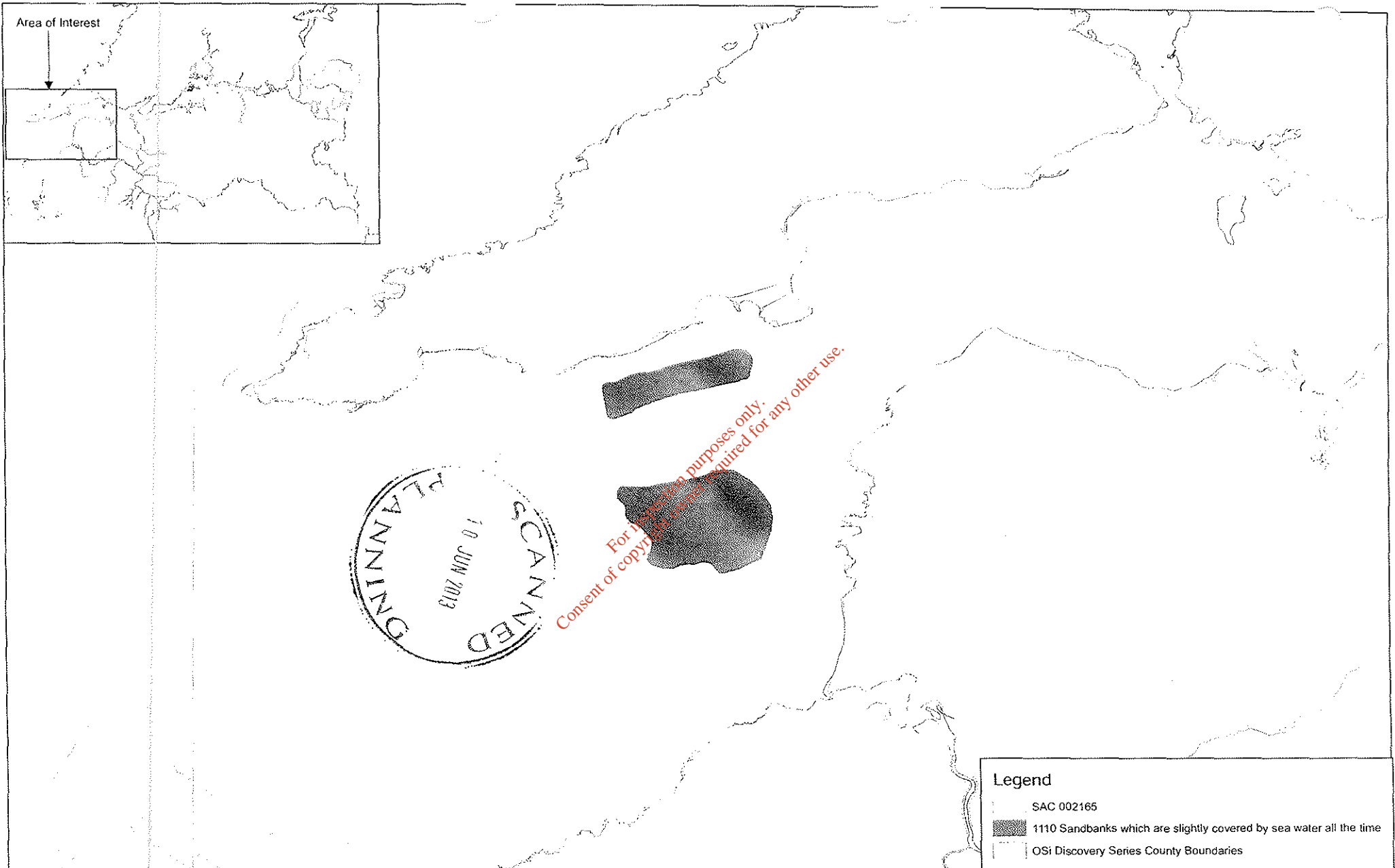
OS CLM reference: SAC 002165
OS CLM version: 1.1
OS CLM date: 10 JUN 2013

**MAP 4:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
ESTUARIES**

Map to be read in conjunction with the APPWS Conservation Objectives Document

**In Action
Coastal Conservation
Programme
2012-2015**

Heritage and the Coast



Legend

- SAC 002165
- 1110 Sandbanks which are slightly covered by sea water all the time
- OSI Discovery Series County Boundaries

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MAP 3:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
SANDBANKS

Map to be read in conjunction with the NPWS Conservation Objectives Document

Site Code: SAC 002165
 CD CLARE, version 1.2 CD CORK, version 1.01 CD KERRY, version 1.11
 CD LIMERICK, version 1.11 CD TIPPERARY, version 1.05

0 1 2 3 4 5 km

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N

 Map Version 1
 Date: June 2012

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Appendix 8

Noise Survey

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noise & ecology specialists
dixonbrosnan.com

Project				
2012 waste licence noise compliance survey at Greenstar waste management facility, Dock Road, Limerick EPA waste licence W0082-02				
Client				
O'Callaghan Moran & Associates				
Project no	No pages	Client reference	©DixonBrosnan 2012	
1148	10	W0082-02	v15/6/11	
<p>DixonBrosnan Shronagreehy Kealkil Bantry Co Cork Tel 086 813 1195 damian@dixonbrosnan.com www.dixonbrosnan.com</p>				
Report no	Date	Edit	Prepared by	Chkd
1148.2.1	02.07.12	Release	Damian Brosnan	CD
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1 Introduction	2
2 Results	2
3 Conclusions	3
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1 Introduction

1.1 DixonBrosnan was instructed by O'Callaghan Moran & Associates, on behalf of their client Greenstar, to undertake the 2012 annual environmental noise survey at the latter's waste management facility at Dock Road, Limerick. The survey is a requirement of waste licence W0082-02 issued by the Environmental Protection Agency (EPA) in respect of the facility. Several noise conditions attached to the licence are presented in **appendix 1**.

1.2 The noise survey was carried out on Thursday 24.05.12 at four stations specified in licence W0082-02 and shown in **appendix 2**. As the facility does not currently operate by night, the survey was confined to daytime hours. Survey methodology, equipment specifications and weather conditions are outlined in **appendix 3**.

1.3 Operations proceeded at the Greenstar facility throughout the survey. Noise emissions arose from the following sources:

- Front end loader in buildings.
- Clamp truck x2 in buildings and on yards.
- Tracked excavator with grab in limited use on yard.
- Cardboard baler and associated conveyor.
- Skips being manoeuvred onsite.
- Occasional truck movements onsite.
- Tracked excavator in almost continuous use near northeast corner associated with temporary onsite construction works.

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2 Results

2.1 Noise data recorded are presented in **appendix 4**. $L_{Aeq\ 30\ min}$ levels measured at the three onsite stations NI1, NI2 and NI3, were 57, 61 and 54 dB respectively. Facility operations dominated the noise environment at all three, although only at NI2 was the $L_{Aeq\ 30\ min}$ level considered entirely representative of site emissions. At NI1 and NI3, extraneous noise sources such as traffic and bird calls contributed to the $L_{Aeq\ 30\ min}$ level. The contribution attributable to site operations was estimated at 55 dB at NI1 and 53 dB at NI3.

2.2 Greenstar emissions were not audible at the only offsite station, NI4, situated at the junction of Dock Road and the commercial park roadway which serves several premises including Greenstar. Site emissions were therefore significantly lower than the 70 dB $L_{Aeq\ 30\ min}$ level which was derived entirely from road traffic noise.



2.3 Schedule C.1 of waste licence W0082-02 specifies a daytime noise emission limit of 55 dB at the measurement stations. Most waste licences currently issued by the EPA state that specified noise limits are to apply to noise sensitive locations (NSLs) only. As there are no NSLs in proximity to the Greenstar facility, it is considered impractical to enforce limits at the site boundary. The absence of NSLs outside the facility boundary is evident in **appendix 2**. Furthermore, the facility's location in an industrial area adjacent to a busy urban roadway results in relatively high ambient noise levels, regardless of Greenstar operations. It is therefore considered that W0082-02 noise limits are relevant to offsite NSLs only, and that levels measured are not relevant to limits set out in schedule C.1 of the licence.

2.4 During the survey, brief inspections were carried out at the nearest NSLs to the facility, consisting of a halting site 460 m to the east, a farmhouse 520 m to the south, and dwelling clusters approximately 1200 m to the north and northeast. No emissions were audible from the Greenstar facility at these receptors, and ambient levels were dominated by local and distant road traffic. Greenstar emissions are highly unlikely to have breached the 55 dB daytime noise limit at these or any other NSLs. It is therefore considered that site emissions were satisfactory and in compliance with applicable noise limits.

2.5 Condition 5.6 of licence W0082-02 prohibits any clearly audible tones or impulses at NSLs. None were noted at the receptors described in **paragraph 2.4**. Tones detected in the 25 and 1600 Hz bands at NI1, and in the 1600 Hz band at NI2, were traced to onsite operations. These tones were not audible offsite. Frequency spectra are presented in **appendix 5**.

3 Conclusions

3.1 $L_{Aeq\ 30\ min}$ levels measured at the three onsite stations were 54-61 dB, and dominated by site emissions. At the fourth station offsite, where Greenstar emissions were inaudible, the $L_{Aeq\ 30\ min}$ level was 70 dB. The 55 dB daytime limit specified in waste licence W0082-02 is not considered relevant to these stations due to the absence of sensitive receptors here.

3.2 Noise limits set out in the waste licence are considered applicable to NSLs. An inspection of the nearest NSLs during the survey indicated that facility operations were not audible, and thus lower than the 55 dB daytime noise limit.

3.3 No tones or impulses were noted at offsite NSLs, thus complying with condition 5.6 of the licence.

Appendix 1: W0082-02 noise conditions

1.6. Waste Acceptance Hours and Hours of Operation

The facility may operate and accept waste on a twenty-four hour basis, seven days per week.

5.6 There shall be no clearly audible tonal component or impulsive component in the noise emissions from the activity at the noise sensitive locations.

C.1 *Noise Emissions:* (Measured at the monitoring points indicated in Table D.1.1).

Day dB(A) L _{Aeq} (30 minutes)	Night dB(A) L _{Aeq} (30 minutes)
55	45

Table D.1.2 Emissions to Atmosphere Monitoring Locations

DUST	NOISE STATIONS
STATIONS	STATIONS
DM1	NI1
DM2	NI2
DM3	NI3
	NI4



Table D.3.1 Noise Monitoring Frequency and Technique

Parameter	Monitoring Frequency	Analysis Method/Technique
L(A) _{EQ} [30 minutes]	Annual	Standard ^{Note 1}
L(A) ₁₀ [30 minutes]	Annual	Standard ^{Note 1}
L(A) ₉₀ [30 minutes]	Annual	Standard ^{Note 1}
Frequency Analysis(1/3 Octave band analysis)	Annual	Standard ^{Note 1}

Note 1: "International Standards Organisation. ISO 1996. Acoustics - description and Measurement of Environmental noise. Parts 1, 2 and 3."



Appendix 3: Survey details

File	Project ref.	1148
	Client	O'Callaghan Moran & Associates
	Location	Greenstar, Dock Road, Limerick
	Stations	NI2 NI4
	Purpose	2012 waste licence compliance survey
	Comment	Facility operating SLM x2 used
Event	Date	24.05.12
	Day	Thursday
	Time	0815-1015
	Operator	Damian Brosnan BSc MOA MIEI MIEEnvSc
Conditions	Cloud cover	20 %
	Precipitation	0 mm
	Temperature	16 °C
Wind	Direction	SE
	Speed	0-1 m/s
	Measurement	Anemo anemometer, 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250
	Instrument serial no.	2506594
	Microphone serial no.	2529531
	Application	BZ7224 Version 2.5
	Bandwidth	Broadband
	Max input level	141.16 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA-1650
	Sound Field correction	Free-field
	UKAS calibration	17.01.12
	Calibration certificate	Available on request
	Onsite calibration	Time
Calibration type		External
Sensitivity		47.92 mV/Pa
Post measurement check		93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	1723667
	UKAS calibration	16.01.12
	Calibration certificate	Available on request
Methodology	Standard	ISO 1996 Acoustics: Description and measurement of environmental noise - Part 1 (2003) & Part 2 (2007)
	Exceptions	-
	Intervals	30 min



File	Project ref.	1148
	Client	O'Callaghan Moran & Associates
	Location	Greenstar, Dock Road, Limerick
	Stations	NI1 NI3
	Purpose	2012 waste licence compliance survey
	Comment	Facility operating SLM x2 used
Event	Date	24.05.12
	Day	Thursday
	Time	0815-1015
	Operator	Damian Brosnan BSc MIOA MIEI MIEEnvSc
Conditions	Cloud cover	20 %
	Precipitation	0 mm
	Temperature	16 °C
Wind	Direction	SE
	Speed	0-1 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250-L
	Instrument serial no.	2566801
	Microphone serial no.	2571655
	Application	BZ7130 Version 2.0
	Bandwidth	Broadband
	Max input level	142.66 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA1404 outdoor kit
	Sound field correction	Free-field
	UKAS calibration	14.10.10
	UKAS calibration certificate	Available on request
	Onsite calibration	Time
Calibration type		External
Sensitivity		41.78 mV/Pa
Post measurement check		93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	1723667
	UKAS calibration	16.01.12
	UKAS calibration certificate	Available on request
Methodology	Standard	ISO 1996 Acoustics: Description and measurement of environmental noise - Part 1 (2003) & Part 2 (2007)
	Exceptions	-
	Intervals	30 min



Appendix 4: Noise data

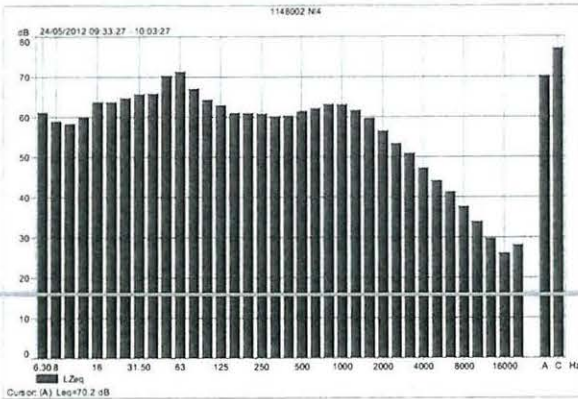
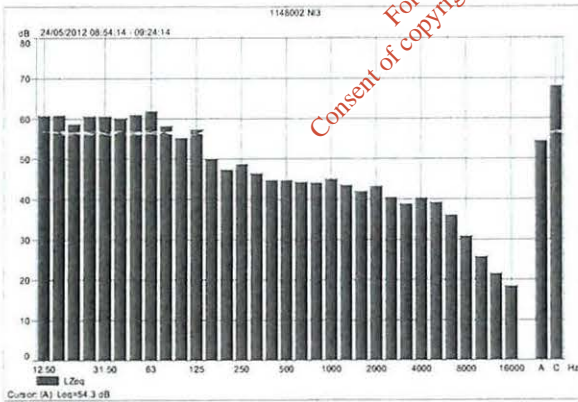
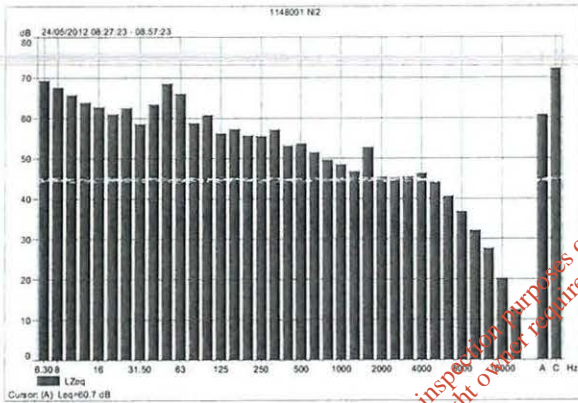
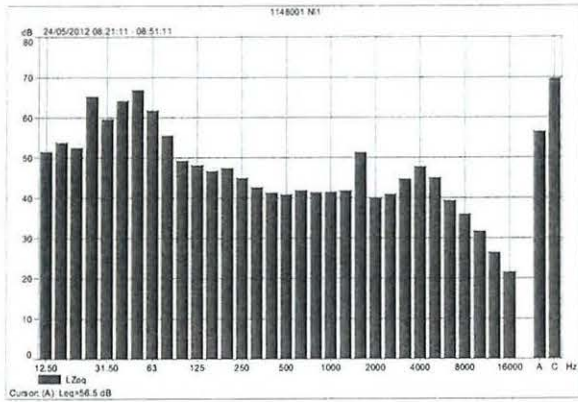
Survey date: 24.05.12

Station	Time	L _{Aeq} 30 min dB	L _{AF10} 30 min dB	L _{AF90} 30 min dB	Specific level* dB	Noise audible
NI1	0821-0851	57	58	48	55	Occasional loader and clamp truck movements audible at low level in main yard. Loader also slightly audible when in building. Loader dominant on sporadic occasions when entering N yard area. Starlings on NW boundary continuously dominant. Road traffic to E continuously significant in background.
NI2	0827-0857	61	62	50	61	Loader and clamp truck operations dominant around yard and in building. Tracked excavator on construction activity near NE corner slightly audible continuously, significantly screened by intervening structures. Tracked excavator with grab operating at 40 m from 0853. Bird calls and offsite road traffic significant.
NI3	0854-0924	54	56	51	55	Clamp truck operating almost continuously in main yard audible at low level. Baler and conveyor in nearest corner of building also continuously audible at low level. Distant road traffic to SW continuously audible at low level. Bird song/calls and rustling vegetation.
NI4	0933-1003	70	73	61	<<61	No site emissions audible, apart from sporadic trucks using access road. Dock Road traffic continuously intrusive. No other noise audible.

*Specific level: Sound pressure level contribution considered attributable to facility, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra, near field correction if applicable, and other parameters.



Appendix 5: Frequency spectra



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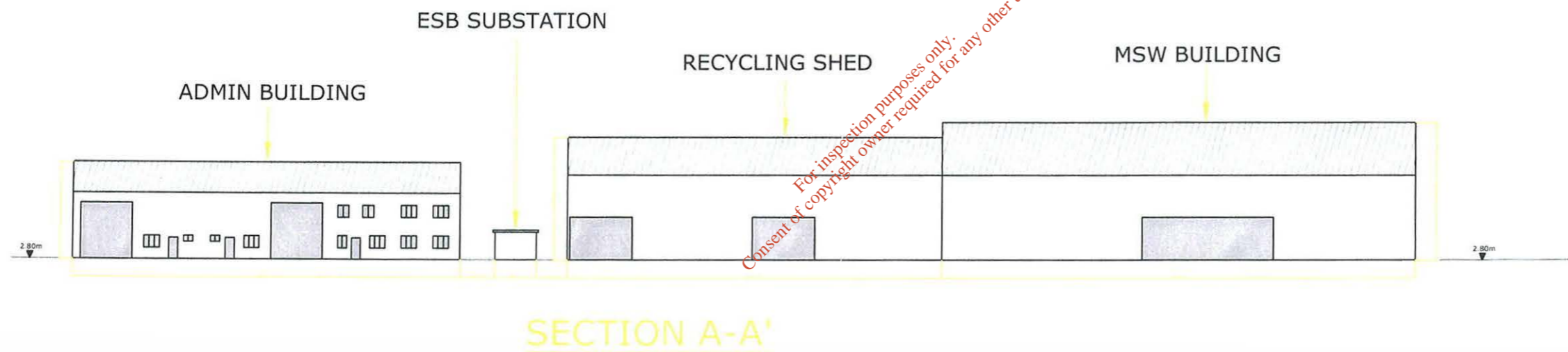


Appendix 6: Glossary

Ambient	Total noise environment at a location, including all sounds present.
A-weighting	Weighting or adjustment applied to sound level to approximate non-linear frequency response of human ear. Denoted by suffix A in parameters such as $L_{Aeq T}$, $L_{AF10 T}$, etc.
Background level	$L_{AF90 T}$. A-weighted sound pressure level of residual noise exceeded for 90 % of time interval T.
Decibel	Shortened to dB. Unit of noise measurement scale. Based on logarithmic scale so cannot be simply added or subtracted. 3 dB difference is smallest change perceptible to human ear. 10 dB difference is perceived as doubling or halving of sound level. Throughout this report noise levels are presented as decibels relative to 20 μPa. Examples of decibel levels are as follows: 20 dB: very quiet room; 30-35 dB: night-time rural environment; 55-65 dB: conversation; 80 dB: busy pub; 100 dB: nightclub.
Fast response	0.125 seconds response time of sound level meter to changing noise levels. Denoted by suffix F in parameters such as $L_{AF10 T}$, $L_{AF90 T}$, etc.
Frequency	Number of cycles per second of a sound or vibration wave. Low frequency noise may be perceived as hum, while whine represents higher frequency. Range of human hearing approaches 20-20,000 Hertz.
Hertz	Shortened to Hz. Unit of frequency measurement.
Impulse	Noise which is of short duration, typically less than one second, sound pressure level of which is significantly higher than background.
Interval	Time period T over which noise monitoring is conducted. Denoted by T in $L_{Aeq T}$, $L_{AF90 T}$, etc.
$L_{Aeq T}$	Equivalent continuous sound level during interval T, effectively representing average A-weighted noise level.
LAF	Sound pressure level averaged over one second, and changing each second in fluctuating noise environment.
$L_{AF10 T}$	Sound pressure level exceeded for 10% of interval T, usually used to quantify traffic noise.
$L_{AF90 T}$	Sound pressure level exceeded for 90% of interval T, usually used to quantify background noise. May also be used to describe noise level from continuous steady or almost-steady source, particularly where local noise environment fluctuates.
$L_{Req T}$	Rating noise level, derived from $L_{Aeq T}$ plus specified adjustments for tonal and impulsive characteristics. Equivalent to $L_{A T}$ used by EPA.
Near field	Noise levels recorded near walls or other surfaces, artificially increased due to reflections. Levels near walls may be increased by up to 3 dB, and up to 6 dB near corners. Free field conditions may be achieved by maintaining separation distance of at least 3.5 m from walls.
Noise sensitive location	Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.
1/3 octave band	Frequency spectrum may be divided into octave bands. Upper limit of each octave is twice lower limit. Each octave may be subdivided into thirds, allowing greater analysis of tones.
Residual level	Noise level remaining when specific source is absent or does not contribute to ambient.
Specific level	Sound pressure level contribution arising from specific noise source, measured directly or by estimation or calculation.
Tone	Character of noise caused by dominance of one or more frequencies which may result in increased noise nuisance.
Z-weighting	Standard weighting applied by sound level meters to represent linear scale.



NOTES



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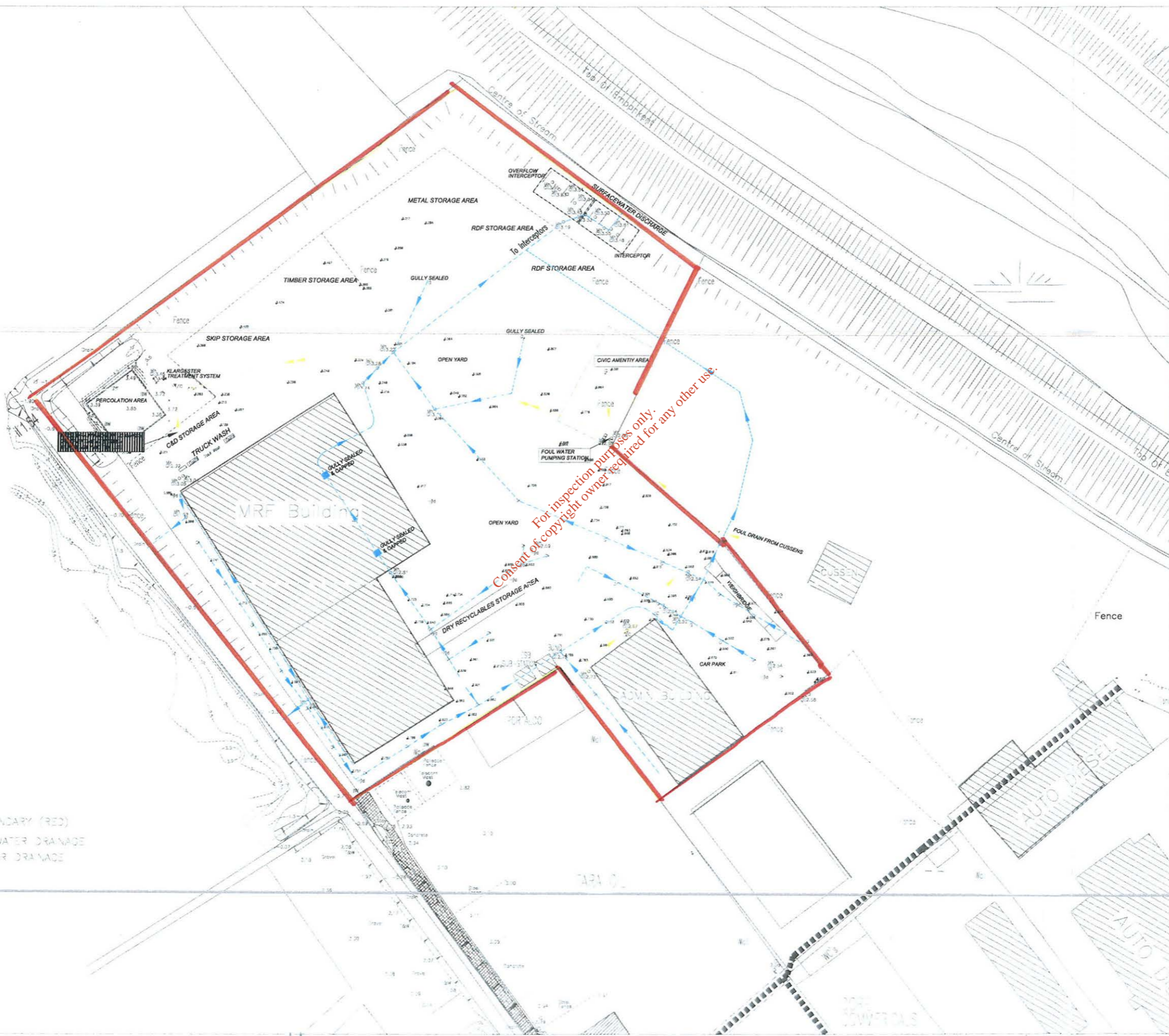
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