

Rationale for the SSSI designation of the Garnock Estuary

A report by the Ardeer Action Group

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1.0 Introduction

A group of local naturalists, supported by the Scottish Wildlife Trust, the RSPB, Buglife, Butterfly Conservation and Plantlife came together to gather more information on wildlife of the Garnock estuary. This document outlines a rationale for the designation of the Garnock Estuary (Fig 1), including parts of the former ICI Ardeer site as a Site of Special Scientific Interest (SSSI). It brings together information on the biodiversity value of the area and assesses it against the Joint Nature Conservation Committee (JNCC) '*Guidelines for the Selection of Biological SSSIs*' documents.¹ The assessment against the criteria is presented first, followed by an overview of the biological interest across all taxa.



Fig 1: Garnock Estuary © Google Images

¹ JNCC (2019) *Guidelines for selection of biological SSSIs*. JNCC, Peterborough. Available from: <https://jncc.gov.uk/our-work/guidelines-for-selectio-of-sssis/> [Accessed August 2021].

Paragraph 3.4 of the SSSI Guidelines outlines a two-step process to determine the special interest, firstly the descriptive recording of the biological attributes and physical environment and then 'the evaluation of this information using established criteria, to determine the nature conservation value of a site'.

1.1 Location and description

The Garnock Estuary is located on the coast of the Firth of Clyde to the north of Irvine in North Ayrshire. It is the largest estuary on the east coast of the Firth and includes the estuarine mudflats, and saltmarsh at the mouth of the River Garnock and River Irvine, but also the sand dunes, wetland, woodland and grassland that surround the river mouth. In total the whole area extends to around 880ha. The saltmarsh and mudflats are already part of Bogside Flats SSSI², (Area 2, Fig. 2), part of which is owned by the RSPB. The estuary has formed behind the shelter of the dunes of the Ardeer Peninsula (Area 1, Fig. 2) which is one of the largest sand spits in the United Kingdom³ A summary of the site and its biodiversity interest was published recently in the Journal British Wildlife⁴

Much of the vegetation on the western side of River Garnock has developed on a sand dune system which, in spite of some modification due to past industrial activity, still remains the largest and most complete dune system in Ayrshire. In places, such as the southern Ardeer Peninsula, the modification has been relatively slight with the dune system still being easily recognisable and here it has retained much of its original biodiversity interest. Further north on the Ardeer Peninsula, the Garnock West area has retained much of its topography but has been more obviously modified in places. Woodland planting in the mid-20th century and natural succession on of some of the remaining tall dunes has combined with this modified dune topography to produce a diverse mosaic of woodland, wetland and open habitats.

The eastern side of the River Garnock includes much of the saltmarsh plus large areas of flood plain grassland and wetland. The creation of pools (possibly fire ponds) around 90 years ago⁵ has resulted in a complex mix of open water, flood plain mire, *Typha* swamp and naturally regenerated wet woodland that is unique in Ayrshire.

The Garnock Estuary lies at the north end of a series of coastal sand dune sites that extends north from Ayr, two of which, Western Gailes and Troon have been designated as SSSIs for their dune habitat. Like many 'soft' coastal locations the Ayrshire dunes have been subject to a variety of development pressures for many years. Initially agricultural improvement brought the well-drained sandy soils of the raised beach deposits into arable cultivation while urban and industrial development, particularly around Ayr, Irvine and Troon has reduced the area of dunes, in some cases to a remnant fringe.

² Bogside Flats SSSI. <https://sitelink.nature.scot/site/239>

³ Dargie, T. D. C. 1998. *Sand dune vegetation of Scotland: South West. Volume 2: Site Reports*. SNH Research, Survey and Monitoring Report No. 125. Scottish Natural Heritage, Edinburgh.

⁴ Philp, B. 2020. *Ardeer – Ayrshire's overlooked gem*. British Wildlife 31(5) 332-340.

⁵ Dolan, J. E. & Oglethorpe, M. K. 1996. *Explosives in the Service of Man: Ardeer and the Nobel Heritage*. RCAHMS, Edinburgh.

The well drained soils on the raised beaches at the back of the dunes are also ideal for the creation of 'links' type golf courses and there are now more than 10 courses built wholly or partly on these former dune complexes. The only other sizeable area of undisturbed dune habitat in Ayrshire, situated to the north of the Western Gailes SSSI, has been the subject of multiple golf course proposals in recent years. While remnants of semi-natural dune vegetation have been retained within these courses, they are in most cases fairly small and fragmented and subject to ongoing disturbance by course management, players and, in the case of Royal Troon, large numbers of spectators during important competitions. In recent years the dune fronts on these courses have suffered from erosion which is threatening the dune ridges and even, in some cases, the main playing areas.

The establishment of the Nobel Explosives Works in 1870 (later taken over by ICI) had a major impact on parts of the estuary. Much of the area was used for the storage of explosives and other materials but the impact has been much less than might have been expected and the original sand dune habitat and vegetation has been maintained alongside areas of Open Mosaic Habitats on Previously Developed Land (OMHPDL). Consequently, although the area around Ardeer is officially classed as one of the largest brownfield sites in Scotland⁶, this does not do justice to what is present on the ground.

The Garnock Estuary now supports a unique mosaic of dune habitats, grassland, woodlands, scrub and wetlands that have developed as a result of the interaction between the original dune system and the site's complex human history. This diversity is unrivalled in Ayrshire and within the local Areas of Search (Cumnock and Kyle and Renfrew and Cunnghame⁷). The Ardeer Peninsula also constitutes the largest area of dune habitats on the coast of the Firth of Clyde. While it is difficult to make comparisons with other sites at a national level there can be very few if any in Scotland that can equal this variety.

In spite of, and in some cases because of, the past modification by industry, the mild climate and relatively sheltered location of the estuary has helped a rich and varied fauna and flora to develop. The habitat complex represents a natural habitat succession from fore dunes to fixed dunes, acid dune grassland, dune heath and dune slacks giving way to flood plain wetland and woodland as you move away from the coast.

For convenience and to make subsequent discussion easier the estuary can be divided into 5 areas (Fig.2) that form coherent units.

⁶ Scottish Vacant and Derelict Land Survey Site Register. <https://www.gov.scot/publications/scottish-vacant-and-derelict-land-survey---site-register/>

⁷ NCC (2019) *Guidelines for selection of biological SSSIs*. JNCC, Peterborough. Available from: <https://jncc.gov.uk/our-work/guidelines-for-selectio-of-sssis/> [Accessed August 2021].



Fig. 2: Subdivisions of the Garnock Estuary. (Area 1: Ardeer Peninsula; Area 2: Estuary and Bogside Racecourse; Area 3: Garnock West; Area 4: Garnock East; Area 5: Industrial Zone).

Ardeer Peninsula (area 1): This large sand spit is the least altered part of a much larger dune system that can be seen on old maps⁸ and which was characterised by large dune ‘hills’. Perhaps the most obvious alteration is the construction of a high sea wall along much of the coastal margin to protect the former industrial activity and this has reduced the extent of the strand line and fore dune habitats. Despite the impediment to windblown sand presented by the wall, the seaward edge of the dune system still exhibits some dynamism, with new dunes forming on and above the sea wall and in the southern few hundred metres of the spit, where there are no sea defences. The sea wall is now starting to break up and it seems likely that its future deterioration will bring greater dynamism to the dune system.

⁸ Armstrong, A. 1775. A new map of Ayrshire. <https://maps.nls.uk/joins/797/html>.

Behind the sea wall the dune ridges and hills are dominated by acid dune grassland interspersed with areas of dune heath, dune slacks, scrub and bare sand. This complex mosaic of habitats is also well known for its invertebrate fauna and is reportedly the best site in Scotland for bees and wasps⁹. Its location at the northern end of Ayrshire's coastal dunes means that it is home to many species that are at, or near, their northern limits in Britain.

Estuary, Bogside Racecourse and RSPB Reserve (Area 2): This includes the only extensive area of saltmarsh and mud flats between the Solway and the inner Clyde Estuary and is highlighted in the Bogside Flats SSSI citation. The upper, middle and lower saltmarsh zone habitats are all present which is unusual for Scotland where the lower zone is not common¹⁰. The SSSI includes the adjacent coastal grassland and former Bogside Racecourse and is of note for its wintering populations of wildfowl and waders with the Marress Field on the eastern bank having been acquired by the RSPB as its Bogside Reserve. Some noteworthy estuarine habitats are not included in the SSSI designation including an area of saltmarsh towards the southern end of the Ardeer Peninsula and an area of saltmarsh at Garnock East, notable for its permanent brackish pools and some inundation grassland at the very top of the estuary.

Garnock West (Area 3): The habitats of the northern peninsula are more varied than those of the south. The area is characterised by a mix of open dune habitats, dune scrub, extensive mixed woodland consisting mainly of birch, willow, sycamore (*Acer pseudoplatanus*) and plantations of Corsican pine (*Pinus nigra*) along with a wetland complex of interlinked swamps and ponds. The plantations have not been managed for decades and so a lot of dead wood has accumulated allowing saproxylic Coleoptera, Hymenoptera and Diptera to thrive¹¹, which add an extra dimension to the biological importance of the site.

Garnock East (Area 4): The water table in the poorly drained, low-lying floodplain adjacent to the river Garnock (known locally as a 'misk') was manipulated in the past to create fire ponds. The area supports a regionally important mosaic of freshwater habitats including *Typha* swamp, flood plain mire, wet woodland, marshy grassland and open water. The extensive alder carr at the site not only supports a wide variety of invertebrates with aquatic phases but also supports a noteworthy assemblage of saproxylic insects that make use of the large amounts of standing, fallen and submerged dead wood. The drier areas still contain significant areas of unimproved neutral and acid grassland, patches of heath, a Scots pine plantation with ash, sycamore and willow and extensive areas of naturally regenerating birch woodland.

Industrial area (Area 5): Most of the industrial activity, including an explosives factory, lies within this area which is fenced off from the remainder of the site. There are many abandoned buildings and hard standing but there are also large areas of acid dune grassland and woodland that are of conservation interest. A lack of access and recording means that the wildlife value of the area has not been assessed.

⁹ Stephen Falk pers. com.

¹⁰ Bogside Flats SSSI. <https://sitelink.nature.scot/site/239>

¹¹ Shanks, S. 2014. *A Survey of the pollinators and other insects of Garnock West, Ardeer, Stevenston, Ayrshire*. Buglife.

1.2 Site history

The Nobel Explosives Works which eventually became part of ICI, began operation in 1872, and continued to expand until, after the Second World War, it employed 13000 people. As a consequence of its strategic importance both for the manufacture of explosives and the cutting-edge research that was carried out there the UK Government decided to enact a Special Development Order (SDO) in 1953 which covered the whole 880ha¹². This, in effect, stated that there was no need to seek planning permission for any future developments. Although this SDO is still valid there have, other than sand extraction, been few major developments on the land. However, following the decline of industry at the site in the second half of the 20th century most of the land was acquired by development companies, who view the site as a major development opportunity. There have been several proposals to develop Ardeer for a land-raise site, housing, industry, a golf course¹³, a wind farm and even a 100+ hectare nuclear plant. While these have not come to fruition so far there are new threats to the site with funding from central and local government aimed at developing the site through the Ayrshire Growth Deal¹⁴ and also through proposals submitted by the landowner for the review of the Scottish Government's National Planning Framework. Currently, the Ardeer Peninsula is included in the draft NPF4 as a potential development site suggesting Exa "masterplan including coastal tourism and recreation destination, residential community with associated education, Energy Centre, retail business and industrial/logistics uses, and green space/outdoor recreation"¹⁵.

2.0 The biological SSSI selection criteria

2.1 The recognition of former industrial sites in the SSSI series

The JNCC's '*Guidelines for the Selection of Biological SSSIs: Part 1*' clarifies the rationale for having SSSIs and outlines the principles by which they are selected. In Scotland the concept of Areas of Search (AoS) is still applied when considering sites for selection. In this respect mainland Ayrshire is split between two AoS, Carrick and Kyle, which includes the southern half of the county, and Cunninghame which includes the northern part of the county plus Renfrewshire.

When the SSSI system was established under the 1949 Access to the Countryside Act¹⁶ it was assumed that the sites chosen would be the best examples of natural and semi-natural habitats. However, it has become apparent that many former industrial sites, for example former quarries, brick-pits, old railway lines, landfill sites and disused airfields, may have

¹² see Appendix 5.

¹³ Vision for Ardeer. <https://www.transformingplanning.scot/media/1685/069-npl-group-appendix-b.pdf>

¹⁴ Ayrshire Growth Deal. <https://www.ayrshiregrowthdeal.co.uk/>

¹⁵ <https://www.gov.scot/publications/scotland-2045-fourth-national-planning-framework-draft-national-developments-report-assessment/pages/9/>

¹⁶ National Parks and Access to the Countryside Act 1949. <https://www.legislation.gov.uk/ukpga/Geo6/12-13-14/97>

considerable biodiversity interest. In Scotland no former industrial sites have so far been designated as SSSIs, but this is not the case in England as the recent designation of the Swanscombe Peninsula SSSI demonstrates. The Garnock Estuary similarly consists largely of natural and semi-natural habitats that have, to varying degrees, been influenced by industrial activity to create diverse new features while still retaining most of their original wildlife interest.

2.2 Site selection criteria

This section outlines the biological interest and importance of the Garnock Estuary in the national context, but specifically within the two local Areas of Search. As a general principle the best sites for each habitat within an AoS should be considered for designation as an SSSI. Under the Nature Conservation (Scotland) Act 2004 the statutory conservation body (NatureScot) has *a duty under section 3 of the Act, to notify as SSSIs areas of land that are considered of special interest for flora or fauna, geology or geomorphology*¹⁷.

The process by which such sites are identified is outlined in the *Guidelines for the Selection of Biological SSSIs*. Because of the complexity and variety of habitats and species and the variation in local circumstance these guidelines are not prescriptive but instead outline a process by which each candidate site can be assessed against a number of criteria. The judgement arrived at for each criterion is inevitably partly subjective but they allow for the comparison of sites under a standardised system.

The number of broad habitat types at the Garnock Estuary makes the assessment of their importance more problematic as each needs some separate treatment while at the same time seeking to maintain the integrity of the whole site as a single unit. It is essential that their value is therefore considered in combination and not entirely by their individual constituent parts, as it is this intricate mosaic that underpins much of its biodiversity significance. In the following analysis it is assumed that the status of the saltmarsh and mudflats of the Bogside Flats are indeed worthy of SSSI status.

- **Typicalness** – The west side of the Garnock Estuary hosts the only dune system in the two AoS to contain a full successional spectrum of dune habitats from embryo and mobile dunes through fixed dunes and dune heath with dune slacks, to significant areas of dune scrub and dune woodland. Because the dunes at Ardeer have not been significantly fragmented by urban, industrial and recreational developments there is a more complete suite of sub-habitats including a much larger proportion of fixed acid grassland (a complex of SD12 *Carex arenaria* – *Festuca ovina* – *Agrostis capillaris* sub-communities) and more high sand hills than other dune sites in Ayrshire. This variety of dune habitats supports a particularly interesting invertebrate fauna with coastal aculeate Hymenoptera and Coleoptera being particularly well represented making it

¹⁷ Nature Conservation (Scotland) Act 2004. <https://www.legislation.gov.uk/asp/2004/6/section/3>

the richest site on the Clyde coast. These include many species that are at or near their northern geographical limits such as the beetles *Stenolophus mixtus*, *Harpalus neglectus*, *Typhaeus typhoeus*, *Phylan gibbus* and *Hypocaccus rugiceps* and the bees *Colletes fodiens*, *Epeolus cruciger*, *Lasioglossum fulvicorne*, *Hylaeus brevicornis* and *Megachile maritima*.

The low-lying land at Garnock East was originally called a 'misk', the local name for an area of wet grassland that has a high water-table with areas of open water. Most other floodplain wetlands have been drained to make way for agriculture or development but, being within the holdings of the explosives factory, Garnock East escaped drainage. Indeed, the wetness of the site was viewed as an asset by the factory, which kept the site wet and created a series of ponds to mitigate against the possibility of uncontrolled fires occurring at the site. This continuity has resulted in Garnock East being the best example of floodplain wetland in Ayrshire. The more recent wetland features, such as the ponds and the neighbouring swamp and carr woodland have now been in existence for around 90 years and so have accumulated a significant diversity of flora and fauna.

Fragility – By their very nature sand dune systems take many centuries to form, requiring a regular and extensive supply of sand. However, the geological conditions for large-scale dune formation appear to no longer exist here with several parts of the Ayrshire coastline eroding rather than accreting. If the dunes were lost, they would not reform naturally. It is also worth noting that most of the untouched dunes are currently fairly stable in terms of their habitats and are free from scrub growth. Any disturbance to them risks allowing scrub to gain a foothold and then to spread more widely across the site.

Simple drainage techniques could change the habitats at Garnock East from wetland to scrub in a relatively short time. Because the landowner aspires to develop the site, with plans for housing and a golf course being mooted in recent years, drainage of the entire site at any time is a possibility. As the habitats are on a flood plain there is the possibility of inundation from the River Garnock. The river water could carry sewage or industrial effluent, toxic waste or diffuse pollution from agriculture any of which would disrupt the nutrient status of the wetlands. The location at the upper end of the Garnock Estuary also makes the wetlands vulnerable to inundation by salt water at very high tides, a risk that will become greater as a consequence of sea level rise.

- **Size (habitats)** – The total area of dune habitat at the Garnock Estuary is in excess of 100ha¹⁸, making it by far the largest on the Firth of Clyde (Table 1). In particular the area of acid, dry dune grassland represents 62% of this habitat in west central Scotland and 12% of the Scottish total underlining the importance of this site for this plant community.

¹⁸ Dargie, T.C.D. 2000. *Ardeer Proposed Windfarm Development Phase 1: Habitat and NVC Survey*. A report to INGENCO Limited.

Although Dargie's figures are now 20 years old and there have been changes on the peninsula the relative importance of the site in comparison to the other Ayrshire sand dune sites remains significant.

Table 1. The area of dune habitats in Ayrshire (from Dargie 2000).

Vegetation type	Ardeer (ha)	Western Gailes (ha)	Troon (ha)	Turnberry (ha)	West central Scotland (ha)	Scotland (ha)
Strand	-	0.1	0.1	1.7	2.7	104.1
Yellow dunes	59.2	7.0	6.4	5.1	120.2	5802.5
Dune grasslands	-	0.1	33.6	5.9	113.0	10604.5
Acid-dry-dune grasslands	93.0	12.0	5.2	-	148.4	3325.0
Dune heath	6.5	6.0	5.3	-	28.7	1900.5
Dune slacks	1.6	-	0.8	0.2	2.5	5485.7
Dune scrub	21.1	3.0	5.5	0.1	108.8	1339.1
Total dune habitat	113.7	28.2	56.8	13.0	524.3	28561.1

Within the AoS there are six wetland SSSIs and all of these are predominantly open water sites with limited swamp and fen habitats (Table 2). None of these has the same mosaic of wetland types as Garnock East, being generally nutrient rich open water sites and they are generally much smaller (Table 2).

Table 2. Existing wetland SSSIs in local AoS¹⁹ in comparison to Garnock East

Site	Area (ha)	Habitat
Garnock East	50	Fen, swamp, open water mosaic
Bogton Loch	76	Open water transition fen
Loch Libo	17	Eutrophic loch
Castle Semple	267	Eutrophic loch
Ashgrove Loch	22	Mesotrophic loch, Open water transition fen
Barmufflock Dam	8	Basin fen
Glen Moss	19	Basin fen

- **Size (species)** - The variety and complexity of the habitat mosaic at the Garnock Estuary is reflected in the number of species recorded there. With over 1500 species of plants and animals recorded it is the most species rich site in the two AoS. However, because the recording effort across other sites in the AoS and across the same spread

¹⁹ NatureScot SiteLink. <https://sitelink.nature.scot/home>

of taxa is very variable it is difficult to make direct comparisons but some conclusions can be made.

Site condition monitoring for Coleoptera at coastal sites was carried out in 2003 and 2004 and these highlight the importance of the Garnock Estuary for this group.

Table 3. Beetle numbers in coastal SSSIs

	Garnock Estuary	Western Gales ²⁰	Turnberry ²¹
Coleoptera	351	108	92

The other invertebrate group that has received considerable attention is the aculeate Hymenoptera. While it is difficult to find actual figures for other sites, Stephen Falk (per. com.) has said that Ardeer is the richest site in Scotland for this group. The Scottish Aculeate List²² gives only two Vice-Counties (East Ross and Fife) with more species than the Garnock Estuary making it highly unlikely that there are any individual sites more species rich.

Ardeer is one of the best sites for birds on the lower Clyde coast, with a list of 184 resident and migratory species, 68 of which have been recorded breeding (see Appendix 4). Of the 68 breeding species 9 are Red-listed and 25 are Amber-listed in the most recent update of the Birds of Conservation Concern 5²³.

As the assemblage and extent of habitats found on the Garnock Estuary is unique, plant lists were examined for the largest, most species-rich sites comprising of the individual components of sand-based habitats and wetland in the area of search. Lists were source from the Botanical Society of Britain and Ireland's database and Scottish Wildlife Trust reserve records.

Table 4. Vascular plant species in coastal and wetland SSSIs

	Garnock Estuary (845ha)	Bogton Loch (77ha)	Castle Semple (268ha)	Garnock Floods (17ha)	Gailes Marsh (18ha)	Shewalton Wood (134ha)	Shewalton Sandpits (15ha)
Vascular Plants	333	315	276	213	202	245	233

²⁰ Blake, S. 2004. *Site condition monitoring: beetles in Western Gales Dunes Site of Special Scientific Interest*. Scottish Natural Heritage Commissioned Report No. 041 (ROAME No. F02AC322). Scottish Natural Heritage, Edinburgh.

²¹ Blake, S. 2003. *Site condition monitoring: beetles in Turnberry Dunes Site of Special Scientific Interest*. Scottish Natural Heritage Commissioned Report No. 040 (ROAME No. F02AC322). Scottish Natural Heritage, Edinburgh.

²² Scottish Aculeate List. <https://www.hbrg.org.uk/SAL/>

²³ Birds of Conservation Concern 2021. <https://www.bto.org/sites/default/files/publications/bocc-5-a5-4pp-single-pages.pdf>

- **Diversity** – The Garnock Estuary contains a greater range of habitats than any of the other coastal sites in the Area of Search and perhaps of any sites in all of Ayrshire. Moreover, most of the habitats, their juxtapositions and their transitions are rare. Habitat diversity does not, in itself translate directly into biodiversity value but it is clear from the species data that has been gathered that these habitats are particularly rich.

- **Naturalness** – Following over a hundred years of industrial activity there are few parts of the Garnock Estuary that can be said to be completely unaffected by the actions of man but, as has been said, there are significant areas that have remained relatively unaffected. In particular the Peninsula shows much of the natural topographical variation and successional stages typical of a dune system. The restricted amount of strand line and embryo dunes as a result of the presence of the sea wall is a notable exception but this may change in the future. A more natural fore-dune structure is present at the south end of the wall and is starting to develop where the wall has begun to break up. The extent of the dune system on the Peninsula and Garnock West is much greater than any other coastal site in the AoS resulting in a greater diversity and extent of ‘sub-dune’ habitats such as dune heath and dune slacks.

The wetland at Garnock East may have been, in part, created by the manipulation of a naturally high water table on a flood plain to create ponds but the resulting open water – swamp – carr woodland and scrub – grassland transition appears to be as complete as any in the AoS. In particular the presence of the carr woodland is notable as it is an uncommon habitat and even more so in conjunction with the rest of the transitional sequence.

- **Rarity (habitats)** – Sand dune systems are considered to be of national and European conservation importance due to their relative rarity and the threats that face them²⁴. While there are three dune SSSIs within the AoS the Garnock Estuary holds by far the largest areas of fixed acid dune grassland (mainly on the Ardeer Peninsula)²⁵. Dargie²⁶ has proposed a new sub-community (SD12y *Carex arenaria-Festuca ovina-Agrostis capillaris* acid dune grassland, *Carex arenaria* sub-community) for this type of vegetation which covers large areas at Ardeer, particularly on the sand hills (see Table 1).

²⁴ Guidelines for the Selection of biological SSSIs: Part 2: Detailed guidelines for habitats and species groups. <https://data.jncc.gov.uk/data/36b59d93-8487-471d-9428-bc3d7dff0423/SSSI-Guidelines-1a-Coastlands-2019.pdf>

²⁵ Dargie, T. C. D. 2000. *Ardeer proposed windfarm development; Phase 1 and NVC survey*. Report for INGENCO Limited.

²⁶ Mountford, E. 2011. *A compilation of proposed additions and revisions to vegetation types in the National Vegetation Classification*. JNCC Peterborough. <https://data.jncc.gov.uk/data/47b0a5d2-5e2f-41ef-afc5-90e409b38615/JNCC-Report-448-FINAL-WEB.pdf>

- **Rarity (species)** – Rarity can refer to individual species or to species assemblages and the importance of both is recognised in the *Guidelines for the Selection of Biological SSSIs*²⁷. The Guidelines also recognise that species at, or near, their distributional limits are also worthy of consideration. A fuller analysis of the species found at the Garnock Estuary is given in Appendix 2 and 3.

Although the site has few Red Data Book invertebrate species its location and latitude put it at the northern limit of large sand dune systems in southern Scotland and therefore at the distributional limit of a significant number of species and of rare and uncommon species. The beetles *Chilothorax paykulli* (Nationally Rare), *Hypocaccus rugiceps* (Nationally Scarce), and *Harpalus neglectus* (Nationally Scarce); the Hymenoptera *Lasioglossum punctatissimum*, *Colletes fodiens* and *Epiolus cruciger*; and the Nationally Scarce hoverfly *Eumerus sabulonum* are all at the northern limit of their range here. In contrast there are a few other scarce species that reach their southern limits at the Garnock Estuary including the Nationally Rare weevil *Magdalis duplicata*.

The site holds the Red Data listed deadly nightshade (*Atropa belladonna*) and the endangered heath cudweed (*Gnaphalium sylvaticum*). There are also four nationally near threatened and three nationally vulnerable plants. Having five locally rare and 17 locally scarce plants ranks the Garnock Estuary as one of the top botanical sites in Ayrshire²⁸.

- **Ecological coherence** – The Garnock Estuary is not only the largest and most complex coastal site in Ayrshire; it is also the most robust. The other coastal SSSIs in the Area of Search have habitats that are more fragmented, have dune fronts that are under increasing threat of erosion from the sea and are subject to land management practices that often compete with the biodiversity interests. This means that the Estuary is the place best able to maintain its own conservation interest but also to act as the ‘reservoir’ that can sustain the other coastal sites. In this sense it is a core site which can help to sustain metapopulations at Western Gailes SSSI and Stevenston Beach Local Nature Reserve.

- **Potential value** – For more than 20 years the site has been largely abandoned and left to its own devices. While its current biodiversity interest suggests that it is fairly robust there is no doubt that a programme of sympathetic management could enhance this interest. Any management programme should not seek to intervene too dramatically, seeking to maintain and enhance the dune and wetland habitats and targeting at specific issues such as, for example, control of gorse and the spread of

²⁷ *Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 20 Terrestrial and Freshwater Invertebrates.*

²⁸ BSBI Rare Plant Register, Ayrshire. <https://bsbi.org/ayrshire-v-c-75>

sycamore. There is an opportunity here to create an SSSI on what is classified as a brownfield site and one which, because of the range and coherence of its constituent habitats, would have significant biodiversity conservation, educational and demonstration potential.

- **Recorded history** – From old maps (e.g. Armstrong²⁹) it is clear that much of the site was an uninhabited dune system for hundreds of years with some agricultural activity on the associated wet grassland. The earliest biological records date from the end of the 19th century (e.g. Fergusson³⁰) before the explosives factory had expanded to its full extent. The dangerous nature of manufacturing explosives effectively put the area ‘out of bounds’ for biological recording for many years but, since the site closed down, it has received a lot of attention, in particular for its birds, plants, beetles and aculeate Hymenoptera. However, there remain many gaps and further attention should be given to relatively under-recorded groups such as the Diptera and the estuarine invertebrates.

- **Exemplary site** – The selection guidelines (Section 4.6) state that “*all of the examples of habitats and assemblages within an Area of Search are compared to identify the best, and it is only these which are selected*”³¹. On the basis of the information that is available on the Garnock Estuary and the other coastal SSSIs in the AoS it is clear that the Estuary is the best example on the Ayrshire coast.

3.0 Appraisal of the Biological Interest of the Garnock Estuary

It is noted in Paragraph 7.1 of the SSSI Guidance that “*In practice, there are often both habitat and species qualifying interests on a single site Thus, while the evaluation process is dealt with in a sectional way, it is necessary to take account of the combined value of habitats and species groups*”. Paragraph 7.3 states that “*the guiding principle is that for sites which are considered to be important but which do not clearly qualify on a single feature interest, specialist advice should be sought and the combined value of all biological components should be taken into account, as long as the decision-making is transparent and explicable*”.³²

This section draws together the known information on the site’s various habitats and species to judge the case for the SSSI designation of the Garnock Estuary taking account of the site’s location and the combined value of its biological components.

²⁹ Armstrong, A. 1775. A new map of Ayrshire. <https://maps.nls.uk/joins/797.html>.

³⁰ Balfour Browne 1911

³¹ Guidelines for the Selection of Biological SSSIs; Part 1: Rationale, Operational Approach and Criteria for Site Selection. <https://data.jncc.gov.uk/data/dc6466a6-1c27-46a0-96c5-b9022774f292/SSSI-Guidelines-Part1-Rationale-2013.pdf>

³² Guidelines for the Selection of Biological SSSIs; Part 1: Rationale, Operational Approach and Criteria for Site Selection. <https://data.jncc.gov.uk/data/dc6466a6-1c27-46a0-96c5-b9022774f292/SSSI-Guidelines-Part1-Rationale-2013.pdf>

3.1 Invertebrates – Terrestrial and Freshwater

Paragraph 3.10 of the JNCC's guidance document '*Part 2: Species Chapters*', Chapter 20 for Terrestrial and Freshwater Invertebrates states that "*All sites that support assemblages which are of either national or international importance should be selected*" and that "*Habitat based assemblages that should be represented in the series are those whose quality is high when compared to similar sites in the same geographical area or AoS*".³³

The most speciose group of insects is the Coleoptera and it is clear from them that the beetle fauna contains many rare and scarce species. With two Nationally Rare and 13 Nationally Scarce species that are not represented in the SSSI series in the AoS, the site fulfils some of the SSSI criteria for this group alone. In addition, there are many species that reach their distributional limits at the Garnock Estuary. A selection of examples from different habitat types is shown below.

It is important to note that the national status assessments are done on a GB basis and do not necessarily give an accurate impression of the situation in Scotland. Focusing on the beetles there are many species from a variety of habitats that, although commoner in other parts of the UK, are very scarce in Scotland such as *Typhaeus typhoeus* and *Phylan gibbus* (sand dunes); *Dacne bipustulata* and *Ptilinus pectinicornus* (dead wood); *Olibrus aeneus* and *Meligethes planiusculus* (flowers); *Nartus grapii* and *Scirtes hemisphaericus* (wetland); and *Telmatophilus typhae* and *Anisosticta novemdecimpunctata* (swamp). With over 350 species of beetles recorded it is clear that the Garnock Estuary is both the most speciose and diverse in the AoS. Of the other coastal SSSIs Western Gales has 108 species³⁴ and Turnberry has around 90³⁵ species. Some of the difference in numbers is obviously due to the greater variety of habitats present at Garnock Estuary but also to the larger area and more complete representation of dune habitats.

The Garnock Estuary is also the most important site in the AoS for aculeate Hymenoptera, with 124 species having been recorded there. As well as supporting 2 Red Data Book and 4 Nationally Scarce species (all but one of which have not been recorded from the other SSSIs in the Area of Search), the site supports many species that are exceptionally rare in Scotland. It is the only Scottish site for *Megachile maritima*, a coastal leafcutter bee, the first Scottish record for *Anthophora plumipes*, the only modern Scottish location for the mason wasp *Odynerus spinipes*, and one of only four Scottish sites (and the only western one) for the wetland solitary wasp *Crossocerus styrius*. Many species that are on the Scottish Biodiversity List because of their rarity in Scotland have been recorded at Ardeer, including the coastal solitary wasps *Harpactus tumidus*, *Dryudella pingus*, *Crabro peltarius*, *Tachysphex pompiliformis* and *Oxybelus uniglumis*, the spider-hunting wasps *Dipogon variegatus*,

³³ Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 20 Terrestrial and Freshwater Invertebrates.

³⁴ Blake, S. 2004. *Site condition monitoring: beetles in Western Gales Dunes Site of Special Scientific Interest*. Scottish Natural Heritage Commissioned Report No. 041 (ROAME No. F02AC322) Scottish Natural Heritage.

³⁵ Blake, S. 2003. *Site condition monitoring: beetles in Western Gales Dunes Site of Special Scientific Interest*. Scottish Natural Heritage Commissioned Report No. 041 (ROAME No. F02AC322) Scottish Natural Heritage.

Evagetus crassicornis, *Anoplius concinnus* and *Ceropales maculata*, the solitary bees *Osmia caerulescens*, *Sphecodes gibbus*, *Nomada obtusifrons* and *Andrena tarsata*, and the cuckoo wasp *Pseudomalus auratus*.

In part, it is the diversity of the Garnock Estuary area that accounts for the presence of so many species, many of which are confined to specific habitats. For example, *Pseudomalus auratus* (and its host, *Pemphredon lethifer*) are largely restricted to bramble patches in full sunlight; *Andrena tarsata* is found in areas of acid grassland rich in Tormentil (*Potentilla erecta*); *Anoplius concinnus* is confined to the edges of sandy pools; *Crossocerus styrius* is associated with wetland deadwood; *Nomada obtusifrons* is found in the scrub/tall grassland mosaic where its host *Andrena coitana* is found in numbers; and the above-listed coastal solitary wasps are restricted to sandhills with open sand.

A significant assemblage of Nationally Scarce coastal moths is present at the site. As well as being the only known Ayrshire site for Thyme Pug (*Eupithecia distinctaria* Nb), the Garnock Estuary also supports Coast Dart (*Euxoa cursorial* Nb), Shore Wainscot (*Mythimna litoralis* Nb), Marsh Oblique-barred (*Hypenodes humidalis* Nb), Creeping Willow Roller (*Ancylis subarcuana* Na) Sandhill Midget (*Phyllonorycter quinqueguttella* Nb) and, in the dune scrub, Broom-tip (*Chesias rufata* Nb). The site is also one of the only Ayrshire locations for Dog's Tooth (*Lacanobia suasa*), the Anomalous (*Stilbia anomala*), Small Yellow Wave (*Hydrelia flammeolaria*) and Beautiful Yellow Underwing (*Anarta myrtillin*). The Ardeer Peninsula supports Ayrshire's largest population of Dark Green Fritillary (*Argynnis aglaja*), as well as the local butterflies Grayling (*Hipparchia Semele*) and Small Pearl-bordered Fritillary (*Boloria selene*).

Relatively little data exists on other invertebrate species. However, several rare flies have been recorded, including the sand dune hoverfly *Eumerus sabulorum* (NS), the sand dune bee-fly *Phthiria pulicaria* (NS) and the stilt-legged fly *Micropeza lateralis* (NS). Ardeer is also one of only five known Scottish sites for *Cheilosia psilophthalma*, a hoverfly associated with dry grassland. Part of Ardeer's assemblage of invertebrates associated with dry, sandy ground includes several Nationally Scarce spiders: *Cheiracanthium virescens*, *Pardosa agrestis*, *Xerolycosa miniata* and *Scotina gracillipes*. The Nationally Scarce wetland spider *Meioneta mossica* has also been recorded in the dunes, perhaps reflecting the presence of several large dune slacks.

3.2 Marine and Estuarine species

In spite of the designation of the estuary and saltmarsh there has been relatively little recording of the invertebrates or the fish. The Scottish Environment Protection Agency (SEPA) have carried out surveys of the fish and invertebrates as proxy for assessing water quality. Estuarine conditions are demanding for both fish and invertebrates with large diurnal fluctuations in salinity and, for some, exposure and the risk of desiccation. Three of the indicator fish species were found in the Garnock, namely Eel (*Anguilla anguilla*), Salmon (*Salmo salar*) and Sea trout (*Salmo trutta*) amongst a total of 27 fish species³⁶. Of particular

³⁶ Sepa unpublished.

interest was the presence of both River lamprey (*Lampetra fluviatilis*) and Sea lamprey (*Petromyzon marinus*)³⁷, the latter being a priority species on the Scottish Biodiversity List under Section 2(4) of the Nature Conservation (Scotland) Act 2004.

Full details of SEPA's invertebrate surveys are not available due to the ongoing impacts of a computer 'hack' but the estuary is understood to support a fairly typical fauna including large numbers of *Corophium volutator*, a major food source for many wading birds, and gaper clams (*Mya arenaria*). One significant find was the first west coast record of the black-headed ribbon worm (*Tetrastemma melanocephala*), a species that is otherwise fairly widespread³⁸. One other species of note is the Nationally Scarce saltmarsh leaf beetle (*Phaedon concinnus*), another species near the northern limits of its range.

3.3 Birds

Ardeer is one of the best sites for birds on the lower Clyde coast, with a list of 166 resident and migratory species. At least 68 of these species have been recorded as breeding at Ardeer (see Appendix 4).

Section 3.8 of the "Guidelines for the Selection of Biological SSSIs" Part 2: Species, Chapter 17 for Birds³⁹ sets out the localities which support an especially good range of bird species characteristic of a particular habitat, as defined by an index value, which will qualify for SSSI selection. Different habitats support different numbers of bird species, and there can be geographical differences within the same habitat type. Each species is assigned a value based on a number of breeding pairs in the UK, with rarer breeding species having a higher number. An assessment of the Ardeer breeding bird species list (Appendix 4) was made by comparing the qualifying species for each habitat against the SSSI index threshold value for various habitats individually. To qualify under section 3.8 of the SSSI selection guidelines the sum of species index values for a site should exceed the threshold value given for the relevant habitat.

The sum of species index values reached or exceeded the qualifying threshold for the following habitats: Damp grassland (SSSI index value: 23.5, Ardeer score: 24.5); Lowland open waters and margins (SSSI index value: 38.5, Ardeer score: 38.5); Lowland Fen (SSSI Index value: 12.5, Ardeer value: 15.5) and Lowland scrub (SSSI index value: 14.5, Ardeer value: 14.5). However, the score was not reached for Sand dune and saltmarsh (SSSI index value: 26.5, Ardeer value 22.5) or for Woodland habitats (SSSI index value: 38.5, Ardeer value: 36).

The guidance in section 3.8 of the 'Guidelines for the Selection of Biological SSSIs' Part 2: Species, Chapter 17 for Birds⁴⁰ relating to mixed habitats recognises that many bird species

³⁷ O'Reilly, M. et al. 2016. A Citizen Science approach to monitoring migratory lampreys under the Water Framework Directive, with some new accounts of Sea Lampreys (*Petromyzon marinus*) from south west Scotland. *Glasgow Naturalist* 26 part 2: 102-105.

³⁸ O'Reilly, M. and Nowacki, S. 1998. The Black-Headed Ribbon Worm (Nemertea: Tetrastemmatidae) in the Clyde Sea Area. *Glasgow Naturalist* 23 part 3: 62.

³⁹ Drewitt, A.L., Whitehead, S. and Cohen, S. (2020). Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 17 Birds (version 1.1). Joint Nature Conservation Committee, Peterborough. Available from: <https://data.jncc.gov.uk/data/16bd76ad-bb74->

⁴⁰ Drewitt, A.L., Whitehead, S. and Cohen, S. (2020). Guidelines for the Selection of Biological SSSIs. Part 2:

depend on a combination of habitats and that such habitats might exist within one site. When assessing sites with mixed habitats two approaches are possible:

- (i) if one (or more) of the composite habitats reaches the threshold value for that habitat, the whole site may be selected if the other habitats clearly form integral parts of the site.
- (ii) if two habitats are included in one well-defined site, the indices for species which are on both habitat lists and have been recorded for the site should be double-counted; other species score in the usual way; for the site to qualify on this basis, its total score should exceed the qualifying threshold value for the two habitats combined.

For example, a site in southern Scotland such as Ardeer, with a mixture of habitats consisting of damp grassland, lowland open waters and margins, lowland fen and lowland scrub would have a combined index value threshold of 89. The combined index values for these habitats at Ardeer give a value of 93. Including the sand dunes and saltmarsh habitats in the mixed habitat assessment would increase the threshold value to 115.5. The combined index values for these habitats at Ardeer is 115.5.

As previously stated, the Garnock/Irvine Estuary is the largest estuary on the Clyde coast and its mudflats hold significant numbers of wintering waders and waterfowl. Data from the WeBsS counts show that, while it attracts more of these birds than any other site in Ayrshire and is therefore crucial in a local context, the numbers are not nationally significant.

3.4 Plants

Ardeer's list of vascular plants was compared with the Botanical Society of Britain & Ireland (BSBI) Rare Plant Register⁴¹ and the BSBI's Distribution Database. Appendix 5 contains the 46 species that were found to have some form of rarity status:

According to the "Guidelines for the Selection of Biological SSSIs⁴² Part 2: Detailed Guidelines for Habitats and Species Groups Chapter 11 Vascular Plants", threatened, rare or scarce taxa not qualifying as features in their own right should nevertheless be highlighted, wherever possible, in site descriptions or citations and as supporting indicators of the value of a qualifying habitat.

Smith's pepperwort *Lepidium heterophyllum* is included on the above list because it is a species for which we have international responsibility⁴³. While there is no selection requirement for taxa for which GB has 'international responsibility', every effort should be made to ensure that they are well represented within sites selected for other reasons; when appropriate, they should also be mentioned in site descriptions or citations.

Deadly nightshade *Atropa belladonna*, the other Red Data Book species, was thought to be extinct in the county until it was re-discovered at Ardeer in 2018. Similarly, the locally rare

Detailed Guidelines for Habitats and Species Groups. Chapter 17 Birds (version 1.1). Joint Nature Conservation Committee, Peterborough. Available from: <https://data.jncc.gov.uk/data/16bd76ad-bb74->

⁴¹ Lang, D. 2016. Ayrshire Vice-county 75 Scarce, Rare, Threatened & Extinct Vascular Plant Register. BSBI

⁴² Guidelines for the Selection of Biological SSSIs Part 2: Detailed Guidelines for Habitats and Species Groups Chapter 11 Vascular Plants

⁴³ Dines, TD. et al, 2005. Species Status No. 7 The Vascular Plant Red Data List for Great Britain. JNCC

fool's water-cress *Helosciadium nodiflorum* was not thought to occur at all in Ayrshire prior to its discovery in the far south of the county in 2018, then at Ardeer in 2021.

The guidelines for SSSI selection state that a locality with a sustainable population of one GB or country-level rare taxon qualifies for consideration if it is the largest sustainable population within an AOS. The population of Isle of Man cabbage *Coincea monensis subsp. monensis* runs the length of the crumbling sea wall and has been found at several other parts of the site so is certainly the largest sustainable population of this plant in the AOS. It is thought to naturally occur in only 22 localities and is endemic to the British Isles. It is listed as a nationally scarce British species and is in serious risk of extinction.

3.5 Habitats

The Garnock Estuary contains the best example of dune habitats in the Area of Search. A complete continuum of dune habitats is present: embryo dunes on the beach; yellow dunes on the southern peninsula; extensive fixed dunes which stretch over a kilometre inland and support the largest area of acid dune grassland in the UK⁴⁴; large dune slacks created as a result of 20th century earthworks; extensive area of dune heath, ranging from dense, leggy stands of heather to more sparsely vegetated areas of sand with low, rabbit-grazed heather and gorse; and large areas of dune scrub and natural Birch-dominated dune woodland. The site also contains the only sizeable area of saltmarsh in Ayrshire, a significant quantity of which lies outside the current SSSI. The saltmarsh outside the SSSI boundary includes the best examples of brackish pools at the site. The presence of industry protected and diversified the extensive wetland habitats at Garnock East, making the site one of the most diverse and important shallow wetlands in the AoS. Of particular interest at the site are the interesting combinations of dune habitats and OMHPDL. For example, the former blast walls surrounding disused explosive manufacturing huts are now warm, sheltered sun traps covered in dune heath; former industrial cooling ponds are now heavily vegetated and rich in birds, amphibians and invertebrates; abandoned sand quarries now support topographically and hydrologically diverse collection of habitats containing a diverse array of dune invertebrates; and the OMHPDL on the abandoned concrete footprints has become colonised by an assemblage of plants characteristic of the neighbouring dune habitats, including Creeping Willow (*Salix repens*), Heather (*Calluna vulgaris*), Viper's-bugloss (*Echium vulgare*), and Bird's-foot Trefoil (*Lotus corniculatus*).

The combination of habitats in this complex mosaic is particularly important for the site's biodiversity. For example, the freshwater pools at Garnock East exchange significant quantities of wintering wildfowl with the neighbouring saltmarsh and mudflats. The extensive flooded Alder (*Alnus glutinosa*) carr provides large quantities of invertebrate breeding habitat, including standing and submerged deadwood and large amounts of mud in the expansive summer drawdown zone, which is located next to open wetland habitats rich in invertebrate nectaring resources such as Sallow (*Salix cinerea*), Hemlock Water Dropwort (*Oenanthe crocata*) and Bogbean (*Menyanthes trifoliata*). The mid-20th century woodland creation and

⁴⁴ Dargie, T. C. D. 2000. *Ardeer proposed windfarm development: Phase 1 habitat and NVC survey*. A report to INGENCO Limited.

earthworks to increase the height of some sandhills have resulted in nearby dune habitats having an unusually hot, sheltered microclimate conducive to diverse assemblages of thermophilic insects. The combination of the flower-rich dune grassland and the deadwood littered throughout the overmature plantation woodland is particularly important for saproxylic Coleoptera and Hymenoptera.

The importance of the site increases every year as other dune systems and OMHPDL continue to be damaged by development (see table 5).

Table 5. Habitat loss at nearby dune and OMHPDL habitats.

Dune habitat	
Western Gailes, Irvine	The only other large chunk of undeveloped dune habitats remaining on the Ayrshire coast (40 hectares). It is currently the subject of a development proposal that would turn all of the dune habitat into a golf course and holiday camp. (Planning permission was granted for a similar development at the site in 2013.)
Stevenston Beach LNR	More than five hectares of dune habitat have been lost within the current reserve boundary over the past 100 years, principally due to coastal erosion (Stevenston Beach LNR is the most heavily eroding part of the Ayrshire coastline ⁴⁵). Dynamic Coast forecasts that, under a scenario of continued emissions growth, the majority of the remaining dune habitats on the reserve will be lost by the end of the century.
Dundonald Links, Irvine	Planning permission has recently been given to develop more than ten hectares of invertebrate-rich sandy habitat into holiday accommodation.
Prestwick Dunes	Two and a half hectares of dune grassland were lost to golf course expansion in the early 2000s.
OMHPDL	
Hunterston	The largest area of OMHPDL in North Ayrshire after Ardeer. There is a concerted effort to develop the site. It is a strategic development site in NPF3 and is the subject of masterplans and current development proposals
Tournament Park, Irvine	The third largest area of OMHPDL in North Ayrshire. A proposal for 520 new houses is in the early stages of the planning process.
Ardrossan North Shore	The fourth largest area of OMHPDL in North Ayrshire. It was recently approved as the site of a new educational and leisure development.
Darvel Sand Quarry	What was the best example of inland sandy habitats in Ayrshire was lost to development in 2019.
Dubbs Quarry, Stevenston	One of the best local examples of OMHPDL, and considered for SSSI status on account of its geology, this former quarry was completely restored to farmland in 2017.

West Byrehill, Kilwinning	Planning permission in principle has been granted for up to 500 houses – a development that would result in the complete loss of the 3.5 hectares of OMHPDL at the site.
Trearne Quarry, Beith	The extensive OMHPDL in this former limestone quarry was completely restored to farmland in 2021.
Kerelaw, Stevenston	North Ayrshire Council are keen to see the site developed, especially its OMHPDL, despite its status as a Local Nature Conservation Site. A development brief for the site has been produced which advocates prioritising development of the area supporting OMHPDL and is used as supplementary guidance in the current Local Development Plan.

4.0 Conclusion

The Garnock Estuary is a complex and fascinating site that has arisen from the interaction between the original estuarine sand dune system, its industrial history and 30 years of natural rewilding. The size of the site and the completeness of the successional sequence from beach to woodland and wetland is probably unrivalled in Scotland and with its proximity to the towns of Irvine and Stevenston it presents a unique opportunity to make truly wild nature accessible to the public. Already the people of Stevenston and Irvine make considerable use of the area for walking, birdwatching and for its beach and there are opportunities to enhance the experience by improving the access.

However, the threats posed by the uncertainty over its future and the various development proposals that have been put forward risk destroying this unique site. The value of the Garnock Estuary is much more than the sum of its parts and it is crucial that its importance as a whole unit is formally acknowledged. Its flower-rich vegetation is, in large part, responsible for its recognition as the best site in Scotland for its aculeate Hymenoptera, it is the richest site in the Area of Search for its Coleoptera and it has geomorphological features that are worthy of wider recognition, all within a post-industrial landscape. The designation of the area would add a new type of SSSI to NatureScot's portfolio, one that expressly acknowledges the interaction of wildlife and people and demonstrates how that interaction can benefit both. Designation of the site also would also help NatureScot to meet the three priorities set in its recent Corporate Plan⁴⁶:

- **Protecting Nature** by expanding protected areas, regulating species management, and delivering effective planning advice on land and sea.
- **Restoring Nature** through a new biodiversity strategy, restoring peatlands and aiding nature's recovery.
- **Valuing Nature** so that the many benefits it provides to society can in turn attract public, private and social enterprise financing for both protection and restoration.

⁴⁶ NatureScot. 2022. A nature-rich future for all. Corporate plan 2022-2026.

In particular, designation would help to achieve the stated objectives to have “Clearly identified locations where additional protection will help protect biodiversity” by 2026 and put in place “A strengthened range of protected areas covering at least 30% of Scotland’s land and seas” by 2030.

Appendix 1 – SSSIs within the Areas of Search

The Garnock Estuary lies within two Areas of Search: Kyle and Carrick and Cunninghame and Renfrew. Including Bogside Flats, which is part of the Garnock Estuary, there are six coastal (biological) SSSIs and seven wetland SSSIs.

Table 6. Notified features in coastal and wetland SSSIs

Coastal Sites	Notified features	Area (ha.)
Turnberry Dunes	Invertebrates: Beetle assemblage	55
Troon	Coastlands: Sand dunes	150
Wester Gables	Coastlands: Sand dunes Invertebrates: Invertebrate assemblage	92
Southannan Sands	Intertidal marine: Mudflats and saltmarsh	254
Inner Clyde	Coastlands: Saltmarsh Birds	1824
Bogside Flats	Intertidal marine: Mudflats Coastlands: Saltmarsh	254
Wetland Sites	Notified features	Area
Glen Moss	Basin fen	19
Barmufflock Dam	Basin fen	8
Loch Libo	Eutrophic loch	17
Castle Semple Loch	Eutrophic loch	267
Martnaham Loch	Mesotrophic loch	59
Ashgrove Loch	Mesotrophic loch Open water transition fen	22
Bogton Loch	Open water transition fen	76

None of the coastal sites listed above have the full transition sequence that can be found at the Garnock Estuary and all the dune sites are much smaller than the Ardeer/Garnock dunes.

Appendix 2 – Nationally Rare and Scarce Coleoptera in the coastal SSSIs in the AoS

Note that there has been no systematic recording of beetles at Troon which has only been notified for its dune habitats.

Table 7. Nationally rare and scarce beetles in coastal SSSIs in AoS

Species	Status	Garnock Estuary	Western Gales ⁴⁷	Turnberry ⁴⁸	Troon
<i>Chilothorax paykulli</i>	NR	+			
<i>Magdalis duplicata</i>	Na	+			
<i>Oedemera virescens</i>	NR	+			
<i>Orthocerus clavicornis</i>	NR	+	+		
<i>Hypocaccus rugiceps</i>	NS	+	+		
<i>Acilius canaliculatus</i>	NS	+			
<i>Aleochara ruficornis</i>	Nb	+			
<i>Amara praetermissa</i>	NS	+	+		
<i>Barynotus squamosus</i>	NS	+			
<i>Bembidion bipunctatum</i>	NS	+			
<i>Blethisa multipunctata</i>	NS	+			
<i>Cassida nobilis</i>	NS	+			
<i>Dyschirius politus</i>	NS	+			
<i>Gabrius bishopi</i>	Nb	+			
<i>Gabrius osseticus</i>	Nb	+	+	+	
<i>Grypus equiseti</i>	Nb	+			
<i>Harpalus neglectus</i>	NS	+			
<i>Oxystoma cerdo</i>	Nb	+	+		
<i>Phaedon concinnus</i>	NS	+			
<i>Tournotaris bimaculata</i>	Nb	+			
<i>Tropiphorus terricola</i>	Nb	+			
<i>Diglotia mersa</i>	N		+		
<i>Hypocaccus dimidiatus</i>	NS			+	
<i>Phaleria cadaverina</i>	NS			+	
<i>Ceutorhynchus cakilis</i>	N			+	
<i>Trichosirocalus dawsoni</i>	Nb			+	

⁴⁷ Blake, S. 2004 *Site condition monitoring: beetles in Western Gales Dunes Site of Special Scientific Interest*. Scottish Natural Heritage Commissioned Report No. 041 (ROAME No. F02AC322) Scottish Natural Heritage.

⁴⁸ Blake, S. 2003 *Site condition monitoring: beetles in Western Gales Dunes Site of Special Scientific Interest*. Scottish Natural Heritage Commissioned Report No. 041 (ROAME No. F02AC322) Scottish Natural Heritage.

Appendix 3 – Nationally Rare and Scarce Aculeate Hymenoptera in the coastal SSSIs in the AoS

Table 8. Nationally Rare and Scarce Aculeate Hymenoptera in the coastal SSSIs in the AoS

Species	Status	Garnock Estuary	Western Gailes	Turnberry	Troon
<i>Andrena ruficrus</i>	RDB3	+			
<i>Colletes floralis</i>	pRDB	+	+		+
<i>Crossocerus leucostomus</i>	Na	+			
<i>Oxybelus mandibularis</i>	pRDB	+	+		
<i>Priocnemis schioedtei</i>	Nb	+			
<i>Ectemnius ruficornis</i>	Nb	+			

Appendix 4 – Aculeate Hymenoptera on the Scottish Biodiversity List

Table 9. Aculeate Hymenoptera on the Scottish Biodiversity List

Species
<i>Andrena tarsata</i>
<i>Anoplius concinnus</i>
<i>Ceropales maculata</i>
<i>Colletes daviesanus</i>
<i>Crabro peltatus</i>
<i>Dryudella pinguis</i>
<i>Ectemnius continuus</i>
<i>Evagetes crassicornis</i>
<i>Harpactus tumidus</i>
<i>Hedychridium ardens</i>
<i>Lasioglossum villosus</i>
<i>Minumesa dahlblomi</i>
<i>Omada fabriciana</i>
<i>Osmia caerulea</i>
<i>Nomada leucophthalma</i>
<i>Oxybelus uniglumis</i>
<i>Pompilus cinereus</i>
<i>Sphecodes gibbus</i>
<i>Symmorphus bifasciatus</i>
<i>Tachysphex pompiliformis</i>

Appendix 5 - Breeding bird assemblages at the Garnock Estuary and SSSI habitat assessments

Scientific Name	Common	BoCCS (2021)	IUCN Red list (2021)	SSSI Score	Sand dunes and salt marsh	Damp grassland	Lowland Openwaters and margins	Lowland Fen	Lowland scrub	Woodland
<i>Tyto alba</i>	Barn Owl		LC	2.5						
<i>Turdus merula</i>	Blackbird		LC							
<i>Sylvia atricapilla</i>	Blackcap		LC							
<i>Cyanistes caeruleus</i>	Blue Tit		LC							
<i>Pyrrhula pyrrhula</i>	Bullfinch	Amber	LC	1					1	1
<i>Buteo buteo</i>	Buzzard		LC	2						2
<i>Branta canadensis</i>	Canada Goose		LC							
<i>Corvus corone</i>	Corrion Crow		LC							
<i>Fringilla coelebs</i>	Chaffinch		LC							
<i>Phylloscopus collybita</i>	Chiffchaff		LC							
<i>Periparus ater</i>	Coal Tit		LC	1						1
<i>Actitis hypoleucos</i>	Common	Amber	LC	2						
<i>Fulica atra</i>	Coot		VU							
<i>Cuculus canorus</i>	Cuckoo	Red	LC	2.5	2.5	2.5	2.5	2.5	2.5	2.5
<i>Tachybaptus ruficollis</i>	Dabchick		LC	3			3			
<i>Prunella modularis</i>	Dunnock	Amber	LC							
<i>Somateria mollissima</i>	Eider	Amber	EN	2	2					
<i>Columba livia</i>	Feral Pigeon		LC							
<i>Anas strepera</i>	Gadwall	Amber	LC	3		3	3			
<i>Sylvia borin</i>	Garden Warbler		LC	1					1	1
<i>Regulus regulus</i>	Goldcrest		LC	1						1
<i>Carduelis carduelis</i>	Goldfinch		LC							
<i>Mergus merganser</i>	Goosander		LC	3						
<i>Lacustella naevia</i>	Grasshop	Red	LC	3	3	3	3	3	3	
<i>Dendrocygna major</i>	Great Spotted Woodpe		LC	1						1
<i>Parus major</i>	Great Tit		LC							
<i>Chloris chloris</i>	Greenfinch	Red	LC							
<i>Ardea cinerea</i>	Grey Heron		LC	3		3	3	3		3
<i>Larus argentatus</i>	Herring G	Amber		1	1					
<i>Corvus monedula</i>	Jackdaw		LC							
<i>Garrulus glandarius</i>	Jay		LC	1						1
<i>Falco tinnunculus</i>	Kestrel	Amber	LC	2						
<i>Alcedo atthis</i>	Kingfisher		LC	3			3			
<i>Larus fuscus</i>	Lesser Bla	Amber	LC	1	1					
<i>Acanthis cabaret</i>	Lesser Red	Red	LC	1						1
<i>Sylvia curruca</i>	Lesser Whitethroat		LC	2					2	
<i>Linaria cannabina</i>	Linn et	Red	LC	1	1				1	
<i>Asio otus</i>	Long-eared Owl		LC						3	3
<i>Aegithalos caudatus</i>	Long-Tailed Tit		LC	1					1	1
<i>Pica pica</i>	Magpie		LC	1						
<i>Anas platyrhynchos</i>	Mallard	Amber	LC							
<i>Anthus pratensis</i>	Meadow	Amber	LC							
<i>Turdus viscivorus</i>	Mistle Thr	Red	LC							
<i>Gallinula chloropus</i>	Moorhen		LC							
<i>Cygnus olor</i>	Mute Swan		LC	3		3	3			
<i>Haematopus ostralegus</i>	Oystercat	Amber	VU	2	2					
<i>Motacilla alba subsp.</i>	Pied Wagtail		LC	1						
<i>Corvus corax</i>	Raven		LC	3						3
<i>Emberiza schoeniclus</i>	Reed Bun	Amber	LC	1	1	1	1	1		
<i>Charadrius hiaticula</i>	Ringed Plo	Red	LC	3	3		3			
<i>Erithacus rubecula</i>	Robin		LC							
<i>Riparia riparia</i>	Sand Martin		LC	1						
<i>Acrocephalus schoenobaenus</i>	Sedge Wa	Amber	LC	1	1	1	1	1		
<i>Tadorna tadorna</i>	Shelduck	Amber	LC	3	3	3	3			
<i>Spinus spinus</i>	Siskin		LC	1						1
<i>Alauda arvensis</i>	Skylark	Red	LC							
<i>Gallinago gallinago</i>	Snipe	Amber	VU	2		2	2	2		
<i>Turdus philomelos</i>	Song Thru	Amber	LC							
<i>Accipiter nisus</i>	Sparrowh	Amber	LC	2						2
<i>Muscicapa striata</i>	Spotted Flycatcher		LC	2						2
<i>Sturnus vulgaris</i>	Starling	Red	LC							
<i>Columba oenas</i>	Stock Dov	Amber	LC	1						1
<i>Saxicola rubicola</i>	Stonechat		LC	2	2					
<i>Hirundo rustica</i>	Swallow		LC	1						
<i>Strix aluco</i>	Tawny Ow	Amber	LC	2						2
<i>Anas crecca</i>	Teal	Amber	LC	3		3	3			
<i>Anthus trivialis</i>	Tree Pipit	Red	LC	1.5						1.5
<i>Certhia familiaris</i>	Treecreeper		LC	1						1
<i>Aythya fuligula</i>	Tufted Duck		NT	2			2			
<i>Rallus aquaticus</i>	Water Rail		LC	3			3	3		
<i>Sylvia communis</i>	Whitethro	Amber	LC							
<i>Phylloscopus trochilus</i>	Willow Wa	Amber	LC							
<i>Phylloscopus sibilatrix</i>	Wood Wa	Red	LC	3						3
<i>Columba palumbus</i>	Woodpige	Amber	LC							
<i>Troglodytes troglodytes</i>	Wren	Amber	LC							
Ardeer Score					22.5	24.5	38.5	15.5	14.5	35
Threshold Score					26.5	23.5	38.5	12.5	14.5	38.5

Appendix 6 – Scarce and threatened plants

Scientific Name	Common Name	Local Status	National Status	SBAP list
<i>Atropa belladonna</i>	Deadly Nightshade	Rare	GB Red List, Least Concern	
<i>Berula erecta</i>	Lesser water-parsley	Rare	Not Scarce, Least Concern	
<i>Beta vulgaris</i>	Sea beat	Scarce	Not Scarce, Least Concern	
<i>Blysmus rufus</i>	Saltmarsh flat-sedge	Rare	Not Scarce, Least Concern	Yes
<i>Carex acuta</i>	Slender tufted-sedge	Rare*	Not Scarce, Least Concern	
<i>Catapodium maritimum</i>	Sea Fern-grass	Scarce	Not Scarce, Least Concern	
<i>Centaureum littorale</i>	Seaside centaury	Scarce	Not Scarce, Least Concern	
<i>Cicuta virosa</i>	Cowbane	Rare	Scarce, Least Concern	
<i>Coincya monensis subsp. monensis</i>	Isle-of-Man cabbage	Not Scarce	Scarce, Least Concern	
<i>Corallorhiza trifida</i>	Coralroot orchid	Rare	Scarce, Vulnerable	
<i>Cruciatum laevipes</i>	Crosswort	Rare	Not Scarce, Least Concern	Yes
<i>Diplotaxis tenuifolia</i>	Perennial wall-rocket	Rare	Not Scarce, Least Concern	
<i>Dipsacus fullonum</i>	Teasel	Scarce	Not Scarce, Least Concern	
<i>Filago minima</i>	Small Cudweed	Rare	Not Scarce, Least Concern	
<i>Gentianella campestris</i>	Field Gentian	Not Scarce	Not Scarce, Vulnerable	Yes
<i>Gnaphalium sylvaticum</i>	Heath cudweed	Rare	Not Scarce, Endangered	Yes
<i>Helosciadium nodiflorum</i>	Fool's water-cress	Rare	Common	
<i>Hypochaeris glabra</i>	Smooth cat's-ear	Rare*	Not Scarce, Vulnerable	Yes
<i>Juncus maritimus</i>	Sea rush	Scarce	Not Scarce, Least Concern	
<i>Lamium album</i>	White dead-nettle	Scarce	Not Scarce, Least Concern	
<i>Lemna trisulca</i>	Star duckweed	Scarce	Not Scarce, Least Concern	
<i>Lepidium heterophyllum</i>	Smith's pepperwort	Uncommon	international responsibility	
<i>Linaria repens</i>	Pale toadflax	Scarce	Not Scarce, Least Concern	
<i>Lythrum portula</i>	Water-purslane	Scarce	Not Scarce, Least Concern	
<i>Oenanthe lachenalii</i>	Parsley water-dropwort	Rare	Scarce, Least Concern	

<i>Osmunda regalis</i>	Royal fern	Scarce	Not Scarce, Least Concern	
<i>Pilularia globulifera</i>	Pillwort	Rare	Not Scarce, Near Threatened	Yes
<i>Ranunculus baudotii</i>	Brackish water-crowfoot	Rare	Not Scarce, Least Concern	
<i>Ranunculus scleratus</i>	Celery-leaved buttercup	Scarce	Not Scarce, Least Concern	
<i>Salicornia europaea</i>	Glasswort	Rare	Not Scarce, Least Concern	
<i>Salsola kali</i>	Prickly Saltwort	Scarce	Not Scarce, Vulnerable	Yes
<i>Saponaria officinalis</i>	Soapwort	Scarce	Not Scarce, Least Concern	
<i>Saxifraga tridactylites</i>	Rue-leaved Saxifrage	Rare	Not Scarce, Least Concern	
<i>Schoenoplectus tabernaemontani</i>	Soft-stemmed bulrush	Scarce	Not Scarce, Least Concern	
<i>Sherardia arvensis</i>	Sherardia	Scarce	Not Scarce, Least Concern	Yes
<i>Silene noctiflora</i>	Night-flowering catchfly	Rare	Not Scarce, Vulnerable	Yes
<i>Silene vulgaris</i>	Bladder campion	Scarce	Not Scarce, Least Concern	
<i>Spergularia media</i>	Greater sea-spurrey	Scarce	Not Scarce, Least Concern	
<i>Suaeda maritima</i>	Sea-blite	Scarce	Not Scarce, Least Concern	
<i>Teesdalia nudicaulis</i>	Shepherd's Cress	Scarce	Not Scarce, Near Threatened	
<i>Typha angustifolia</i>	Lesser bullrush	Rare	common	
<i>Valerianella locusta</i>	Corn salad	Scarce	Not Scarce, Least Concern	
<i>Vicia lathyroides</i>	Spring vetch	Scarce	Not Scarce, Least Concern	
<i>Viola canina</i>	Heath Dog-violet	Scarce	Not Scarce, Near Threatened	
<i>Viola tricolor ssp curtisii</i>	Dune pansy	Not Scarce	Not Scarce, Near Threatened	
<i>Zostera noltei</i>	Dwarf eelgrass	Rare	Not Scarce, Least Concern	

* Believed extinct in Ayrshire until 2000 record found

Appendix 7 – Copy of the Special Development Order

TOWN AND COUNTRY PLANNING, SCOTLAND

The Town and Country Planning (County of Ayr
No. 1 Special Development) Order, 1953

Made 28th July, 1953
Laid before Parliament 30th July, 1953
Coming into operation 15th August, 1953

In exercise of the powers conferred on me by section 11 of the Town and Country Planning (Scotland) Act, 1947(a), and of all other powers enabling me in that behalf, I hereby order as follows:-

1. This Order may be cited as the Town and Country Planning (County of Ayr No. 1 Special Development) Order, 1953, and shall come into operation on the fifteenth day of August, 1953.

2. - (1) In this Order, unless the context otherwise requires, the following expressions shall have the meanings hereby respectively assigned to them, namely:-

"the Act" means the Town and Country Planning (Scotland) Act, 1947;

"the General Development Order" means the Town and Country Planning (General Development)(Scotland) Order, 1950(b), as amended by any subsequent order;

"the deposited map" means the map which has been prepared in duplicate, sealed with the seal of the Secretary of State, and marked "Map referred to in the Town and Country Planning (County of Ayr No. 1 Special Development) Order, 1953", of which one duplicate is deposited at the office of the Department of Health for Scotland and the other at the office of the County Council of the County of Ayr.

(2) The Interpretation Act, 1889(c), shall apply to the interpretation of this Order as it applies to the interpretation of an Act of Parliament.

3. Subject to the provisions of this Order, the carrying out of any development to which this Order applies is permitted by this Order and may be undertaken on the land to which this Order applies without the permission of the local planning authority or the Secretary of State.

4. - (1) This Order shall apply to that area of land in the parishes of Stevenston and Irvine in the County of Ayr shown coloured pink on the deposited map.

(2) Subject to the provisions of this Order, the General Development Order shall apply to the land to which the Order applies.

5. This Order applies to any development not being development for which planning permission is granted or deemed to be granted otherwise than by this Order, and other than development of the following descriptions:-

(a) the erection, alteration or extension of a chimney-stack;

(b) the erection, alteration or extension of any other building where the height of the building as erected, altered or extended will exceed a height of 120 feet above ordnance datum level;

(a) 10 & 11 Geo. 6 c.53

(c) 52 & 53 Vict. c.63

erection, alteration or extension of a building for the purposes of any use within those classes.

6. Nothing in this Order shall operate so as to permit any development which involves the erection, alteration or extension of an industrial building of any class prescribed by regulations for the time being in force under subsection (4) of section 12 of the Act, unless the Board of Trade have granted the certificate which would have been required in the case of an application for planning permission for such development, or the regulations direct that no such certificate is required.

7. - (1) If either the Secretary of State or the local planning authority is satisfied that it is expedient that development of any class or description, or any particular development of any of those classes or descriptions, to which this Order applies should not be undertaken unless permission is granted on an application in that behalf, the Secretary of State or the local planning authority may direct that the permission granted by Article 3 of this Order shall not apply to all or any development of that class or description, or to that particular development.

(2) A direction by a local planning authority under this Article shall require the approval of the Secretary of State, and the Secretary of State may approve the direction with or without modifications.

(3) Notice of a direction given under this Article shall be served by the local planning authority on the owner and occupier of the land affected and any such direction shall come into force on the date on which notice thereof is served on the occupier or, if there is no occupier, on the owner.

8. - (1) Any power conferred by this Order to give a direction shall be construed as including power to cancel or vary the direction by a subsequent direction.

(2) Any notice to be served under this Order may be served in the manner prescribed by section 101 of the Act and by any regulations for the time being in force under that section.

Dated this twenty-eighth day of July, nineteen hundred and fifty-three.

(Sgd.) JAMES STUART

One of Her Majesty's Principal
Secretaries of State.

Explanatory Note

(This note is not part of this Order, but is intended to indicate its general purport.)

Under section 11(2) of the Town and Country Planning (Scotland) Act, 1947, a special development order may be made applicable to any land specified in the Order, granting planning permission for any development of that land.

This Order which applies to the factory site of a large industrial concern at Ardeer, New Stevenston, Ayrshire, grants planning permission for any development on that site required for the normal purposes of the factory subject to certain limitations as to the height of buildings and the institution of new uses of land or buildings.

