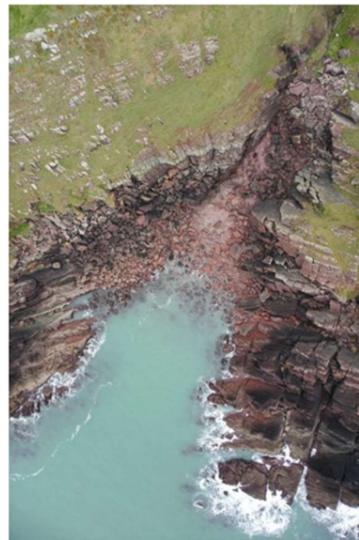




**mWave Marine Energy Device
and Onshore Infrastructure**

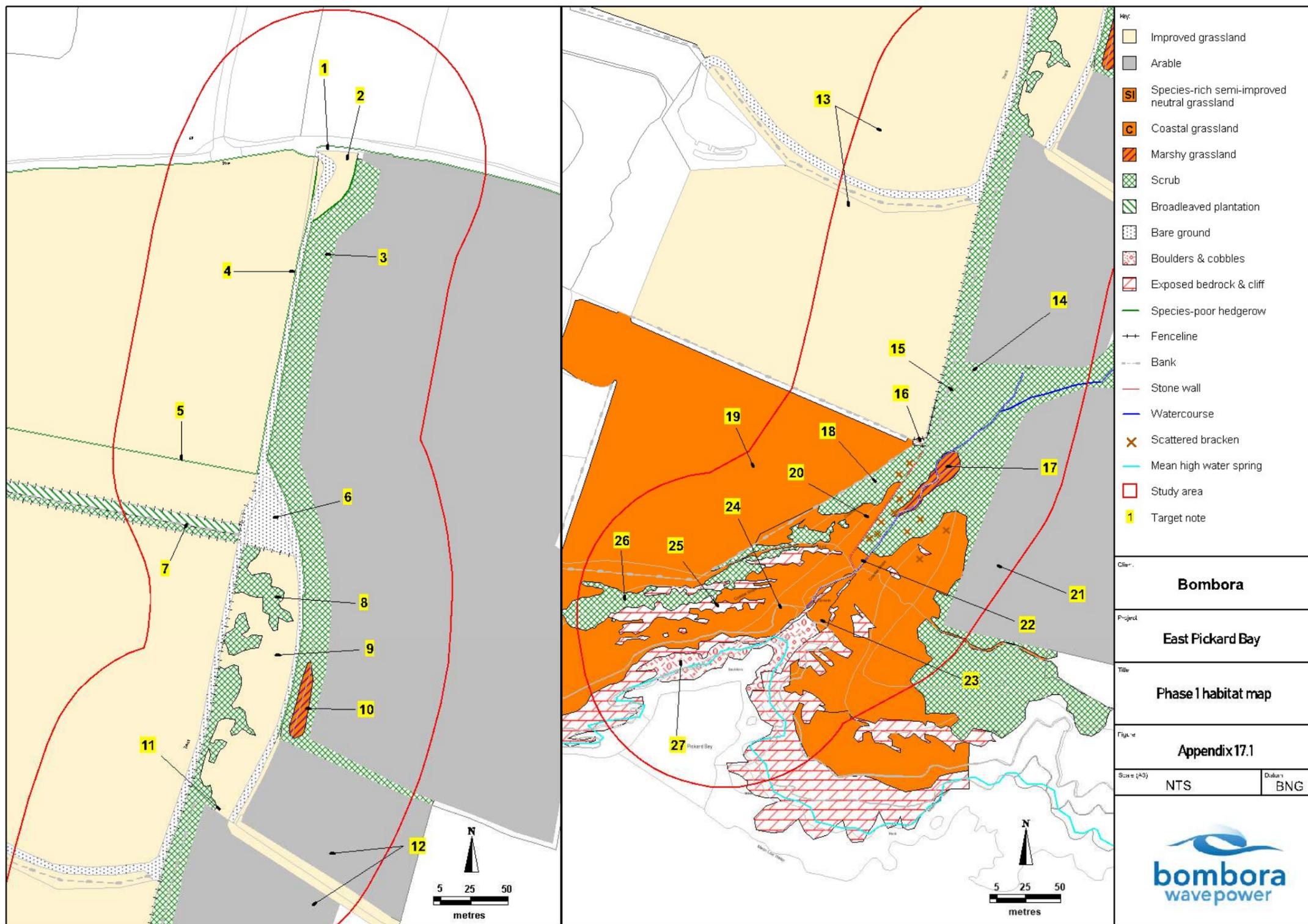
ENVIRONMENTAL STATEMENT



June 2019

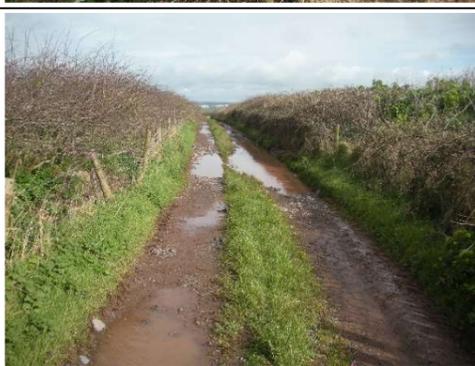
APPENDIX 17.1-17.4: Terrestrial Ecology

APPENDIX 17.1 – Phase 1 habitat survey map and notes



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Table 17.1: Phase 1 habitat survey target notes

Target note (TN)	Photograph	Description
1		<p>Hedgerow. A species-poor clipped roadside hedgerow (approximately 1.5m high by 1-1.5m wide) dominated by blackthorn (<i>Prunus spinosa</i>) but including a 5m section of bramble (<i>Rubus fruticosus</i>). An unremarkable ground flora supported ivy (<i>Hedera helix</i>), cleavers (<i>Galium aparine</i>), and nettle (<i>Urtica dioica</i>) with a fringe of cock's-foot (<i>Dactylis glomerata</i>), Yorkshire-fog (<i>Holcus lanatus</i>), false oat-grass (<i>Arrhenatherum elatius</i>), cow parsley (<i>Anthriscus sylvestris</i>) and red campion (<i>Silene dioica</i>). Red fescue (<i>Festuca rubra</i>), false brome (<i>Brachypodium sylvaticum</i>) and shining crane's-bill (<i>Geranium lucidum</i>) were also present at the edge of the road verge.</p>
2		<p>Improved grassland. An access track and turning / storage area with three gateways providing access from the B4320 as well as to agricultural fields to the east and west. The grassland sward was largely dominated by Yorkshire-fog, creeping bent (<i>Agrostis stolonifera</i>), cock's-foot, red fescue and false oat-grass.</p>
3		<p>Scrub. A broad (15m wide) band of scrub lies to the east of an access track. The scrub is dominated by blackthorn and bramble but includes a thin line of young ash (<i>Fraxinus excelsior</i>) and sycamore (<i>Acer pseudoplatanus</i>) trees beside a field boundary at the eastern side. The scrub is associated with a raised bank then a hollow which rises to meet a fence-lined agricultural field. Alexanders (<i>Smyrnium olusatrum</i>) supporting the rust fungus <i>Puccinia smyrnii</i> was noted from the eastern fenceline.</p>
4		<p>Hedgerow. A species-poor hedgerow at the western side of an access track (left hand side of photo). The hedgerow (approximately 1-1.5m high by 1m wide) was dominated by hawthorn (<i>Crataegus monogyna</i>), blackthorn and bramble. The hedgerow supported an impoverished ground flora of cleavers, nettle and occasional plants of hart's-tongue fern (<i>Phyllitis scolopendrium</i>).</p>

Target note (TN)	Photograph	Description
5		Hedgerow. Continuation of the hedgerow described in TN4.
6		Disturbed ground and ephemeral vegetation. An area used for agricultural storage currently hosting a silage clamp.
7		Plantation woodland. A line of young maples forms a (10m wide) belt of broadleaved plantation woodland partly protected from south-westerly winds by a scrub covered (4-5m wide) earth bank.
8 & 9		Scrub and improved grassland. An area of improved grassland with patches of bramble punctuated by occasional hawthorn and less frequent gorse (<i>Ulex europaeus</i>). Badger (<i>Meles meles</i>) tracks were evident and latrines were noted from the western boundary.

Target note (TN)	Photograph	Description
10		<p>Waterlogged hollow. At the southern end of the scrub feature described by TN3, a reduction in woody cover as well as waterlogging had created a marshy area dominated by creeping bent and common spike-rush (<i>Eleocharis palustris</i>). Immediately to the north of the more waterlogged ground, fleabane (<i>Pulicaria dysenterica</i>) and hemp-agrimony (<i>Eupatorium cannabinum</i>) were also present.</p>
11		<p>Improved grassland. Rank grassland dotted by patches of nettle at the southern end of the feature described by TN8 and TN9. This area is the proposed location for the mWave control station.</p>
12		<p>Arable. Two small arable fields (visible in the background of the photo) separated by a earth bank supporting rank grassland and low bramble scrub.</p>
13		<p>Improved grassland. Two large improved grassland fields associated with the former airfield. The northern most grassland may alternate between arable and a grassland ley. The sward comprised perennial ryegrass (<i>Lolium perenne</i>), creeping bent, timothy (<i>Phleum pratense</i>) and white clover (<i>Trifolium repens</i>). The southern field was more diverse but still improved and supported perennial ryegrass, creeping bent, Yorkshire-fog and cock's-foot as well as creeping buttercup (<i>Ranunculus repens</i>), curled dock (<i>Rumex crispus</i>) and hogweed (<i>Heracleum sphondylium</i>). A few plants of common knapweed (<i>Centaurea nigra</i>) were also present and were considered to have originated from a seed source to the south. The proposed cable route passes along the fenceline at the western edge of the field (left-hand side of photograph).</p>

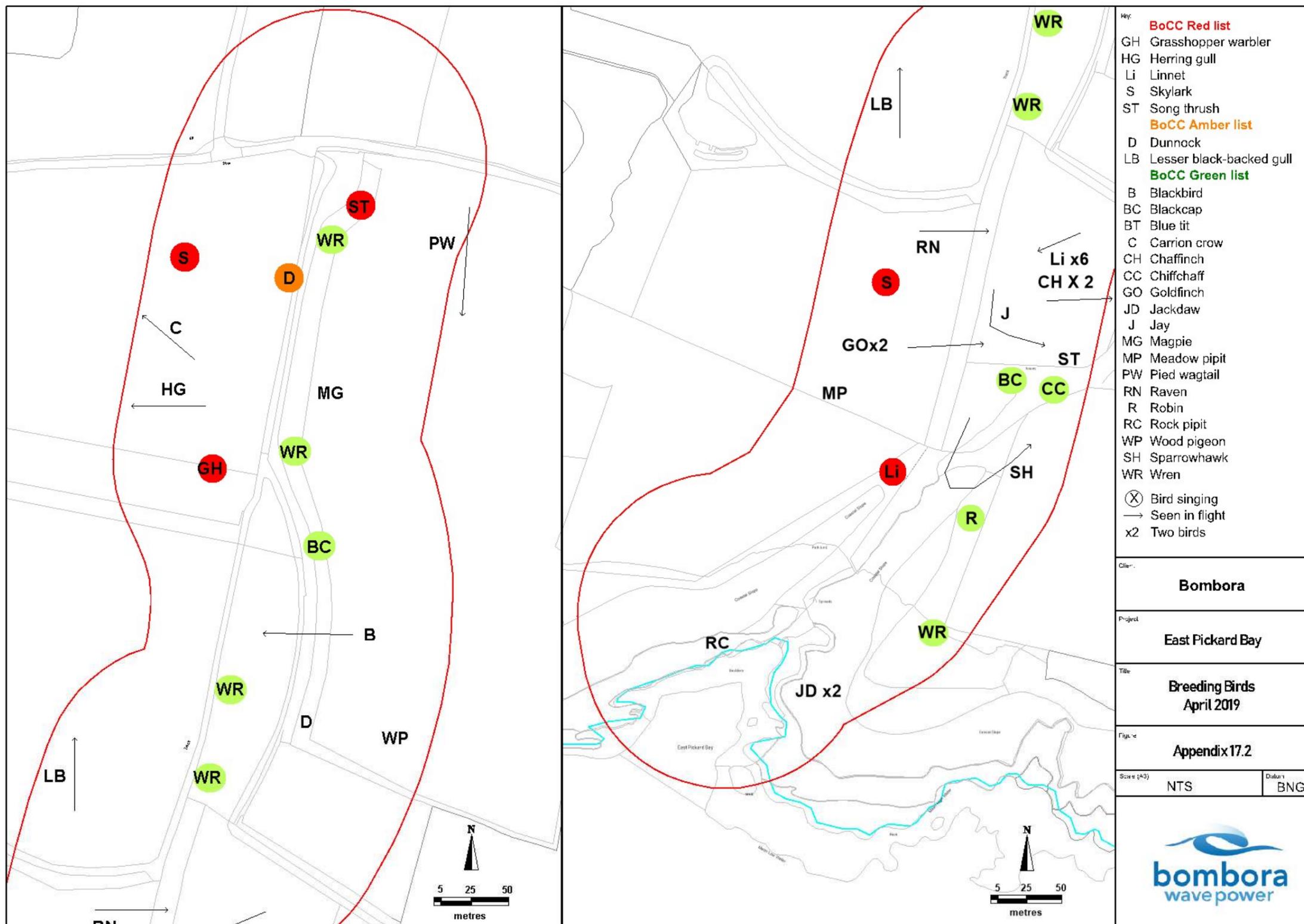
Target note (TN)	Photograph	Description
14		<p>Badger sett. A sett with at least three holes was identified at the northern end of scrub associated with the East Pickard Bay gully and watercourse. Density of the vegetation meant that further investigation was inhibited and it was considered possible that this forms the edge of a much larger sett.</p>
15		<p>Scrub. Bank supporting sprawling bramble scrub. The proposed cable route passes along the fenceline at the western edge of the bank (left-hand side of photograph).</p>
16		<p>Tall ruderals and scrub. Nettle dominated area interspersed by low bramble scrub.</p>
17		<p>Marshy grassland. A small area of marshy grassland dominated by ungrazed tussocks of purple moor-grass. Drier grassland at the edges supported low bramble scrub and herbs including red campion (<i>Silene dioica</i>), primroses (<i>Primula vulgaris</i>) and hemp-agrimony.</p>

Target note (TN)	Photograph	Description
18 & 19		<p>18 - Scrub. Bramble dominated scrub interspersed with bracken (<i>Pteridium aquilinum</i>) on coastal slopes above East Pickard Bay.</p> <p>19 - Species-rich semi-improved neutral grassland. Visible at the top right-hand side of the photograph. Grazed by sheep and cattle, the field supported a short turf with red fescue, Yorkshire-fog, common bent (<i>Agrostis capillaris</i>), sweet vernal-grass (<i>Anthoxanthum odoratum</i>), field woodrush (<i>Luzula campestris</i>), ribwort plantain (<i>Plantago lanceolata</i>), common knapweed (<i>Centaurea nigra</i>), common bird's-foot-trefoil and the semi-parasitic herb, yellow rattle (<i>Rhinanthus minor</i>).</p>
20		<p>Coastal grassland. The grassland sward away from the clifftops was dominated by carpets of red fescue. Outcropping rock and occasional anthills often provided pockets of English stonecrop (<i>Sedum anglicum</i>) and thinner turf with stag's-horn plantain. The cable route alignment passes along the base of the existing wall to the left of the photograph.</p>
21		<p>Arable. Ploughed at the time of the site visit, the field is visible above scrub associated with the East Pickard Bay gully.</p>
22		<p>Watercourse, coastal grassland and scrub. Watercourse lined with rosettes of hemlock water dropwort (<i>Oenanthe crocata</i>) dissecting red fescue dominated coastal grassland and bramble dominated low scrub. The presence of primroses and lesser celandine (<i>Ficaria verna</i>) indicate the less exposed maritime influence back from the cliffs.</p>

Target note (TN)	Photograph	Description
23		<p>Watercourse and coastal grassland. The watercourse at East Pickard Bay passes through a steep sided gully supporting red fescue dominated grassland dotted with lesser celandine and occasional primroses. Common scurvygrass (<i>Cochlearia officinalis</i>) was increasingly frequent towards the sea.</p> <p>Bryophytes were conspicuous where the watercourse flowed over rocky substrates. Long-beaked water feather-moss (<i>Platyhypnidium riparioides</i>) was locally abundant within the channel. Wet ground and rock surfaces near the watercourse (including small flushes seeping into it) were found to support fern-leaved hook-moss (<i>Crataneuron filicinum</i>) and endive peltia (<i>Pellia endiviifolia</i>). Seaside Grimmia (<i>Schistidium maritimum</i>) was also noted</p>
24		<p>Coastal grassland. Grassland on the clifftops above East Pickard Bay were typically dominated by red fescue, Yorkshire-fog and Cock's-foot. Locally, spring squill (<i>Scilla verna</i>) formed a significant component of the sward. Other grassland herbs included sea thrift (<i>Armeria maritima</i>), English stonecropkidney vetch (<i>Anthyllis vulneraria</i>), common bird's-foot-trefoil (<i>Lotus corniculatus</i>) and sea campion (<i>Silene uniflora</i>).</p>
25		<p>Outcropping rocks. Outcropping rocks punctuating the grassland above East Pickard Bay supported abundant growth of the lichen, sea ivory (<i>Ramalina siliquosa</i>) where they were not subject to trampling or rubbing by livestock.</p>
26		<p>Scrub. Scrub associated with outcropping rock above the cliff top grasslands was largely dominated by a mix of gorse and bramble.</p>

Target note (TN)	Photograph	Description
27		Rockface. Vegetation of the coastal cliffs, particularly in cracks and crevices, included red fescue, sea thrift, golden samphire (<i>Inula crithmoides</i>) and common scurvygrass. Cable route option 1 passes up this particular face.

APPENDIX 17.2 - Breeding birds – Results of site visit - 18 April 2019

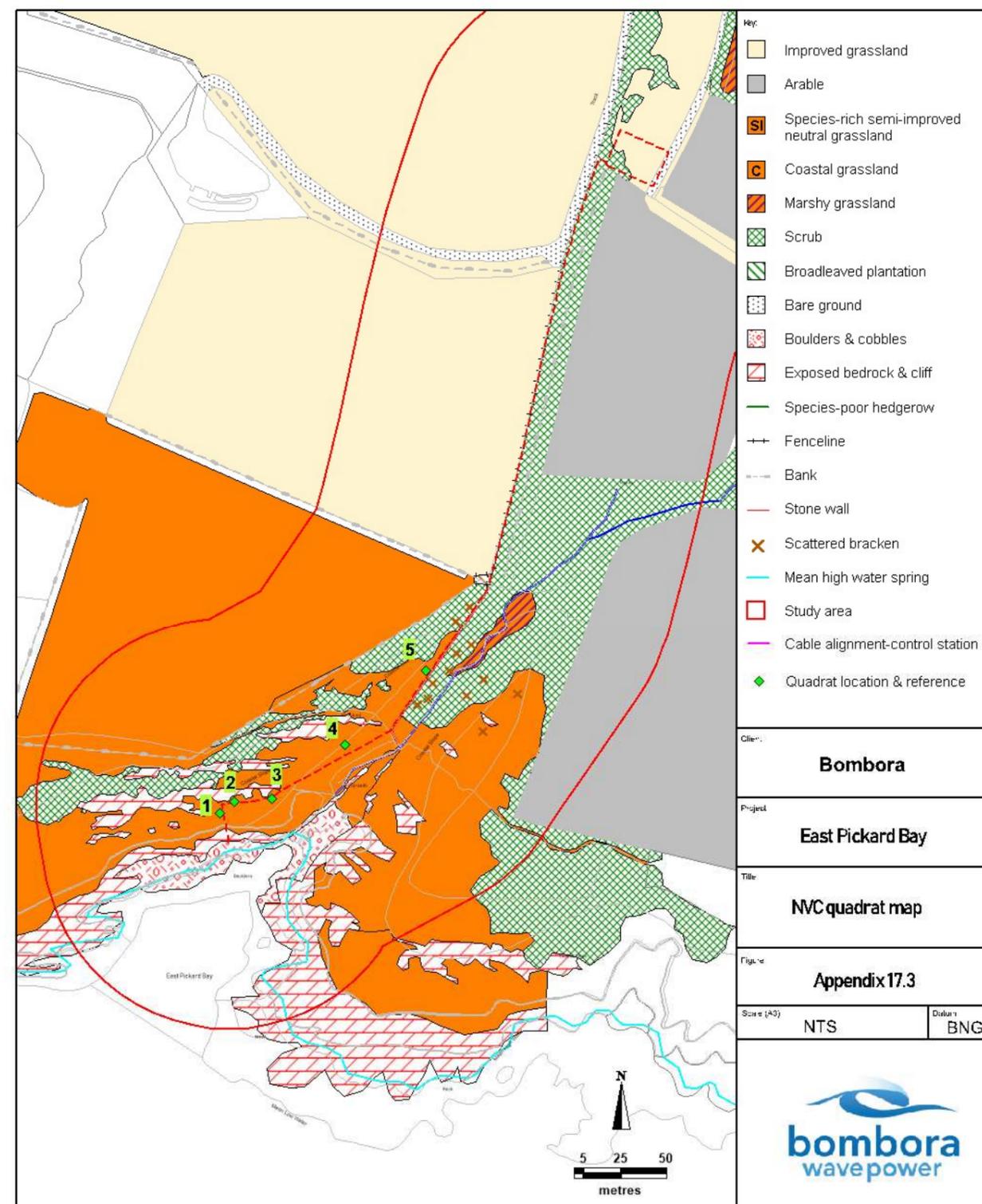


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APPENDIX 17.3 – NVC quadrat locations and results

Table 17.2: NVC constancy table.

Species						Constancy
	1	2	3	4	5	
<i>Festuca rubra</i>	5	7	8	8	8	V
<i>Dactylis glomerata</i>	6	6	5	6	4	V
<i>Holcus lanatus</i>	4	5	5	4	4	V
<i>Agrostis capillaris</i>	3	3	3	4	4	V
<i>Plantago lanceolata</i>	3	4	4	2	2	V
<i>Lotus corniculatus</i>	1	3	2	3	3	V
<i>Scilla verna</i>	7	6	1	1		IV
<i>Rumex acetosa</i>		2	3	4	3	IV
<i>Armeria maritima</i>	2	3	2		1	IV
<i>Hypochaeris radicata</i>		4	2	1	1	IV
<i>Daucus carota</i>		1	3	1	1	IV
<i>Achillea millefolium</i>			1	2	1	III
<i>Ficaria verna</i>				5	5	II
<i>Plantago coronopus</i>	6	1				II
<i>Sedum anglicum</i>	1		2		A	II
<i>Potentilla erecta</i>			1	1	A	II
<i>Viola riviniana</i>				1	1	II
<i>erastium diffusum</i>	3					I
<i>Leontodon hispidus</i>	2					I
<i>Anthyllis vulneraria</i>	2					I
<i>Silene maritima</i>	2					I
<i>Anagallis arvensis</i>	2					I
<i>Aira praecox</i>	2				A	I
<i>Sonchus oleraceus</i>	1					I
<i>Cochlearia danica</i>	1					I
<i>Koeleria macrantha</i>	A					
Vegetation height (cm)	1-5	5-10	5-15	5-15	5-15	
Cover (%)	98	100	100	100	100	
NVC	MC5b	MC9b	MC9b	MC9b	MC9b	



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APPENDIX 17.4 – Chough survey winter 2018/2019

DATE	survey area*	OBS PERIOD START	OBS PERIOD END	TIME	No. Choughs	Grid Ref	Comments
28/10/2018	Freshwater west	08:30	10:00				Walk-over of site produced no records of Choughs and no waders on the beach. There were a fair number of walkers/dog-walkers already present on the beach on arrival
28/10/2018	Freshwater west	10:00	11:30	10:50	2	SM8879000215	2 Choughs calling loudly and feeding in dunes.
28/10/2018	Freshwater west	10:00	11:30	10:52	2	SM8879100194	Flew up and perched briefly on fence posts before flying off SE out of sight
28/10/2018	Freshwater west	13:00	14:30	13:12	2	SM8873300105	Flying over dunes ca 50M inland of road. Dropped out of sight into dunes.
28/10/2018	Freshwater west	13:00	14:30	13:19	2	SM8873300105	Same two birds in flight again briefly before dropping into same area
28/10/2018	Freshwater west	13:00	14:30	13:27	2	SM8873300105	Same two birds in flight again briefly before dropping into same area
28/10/2018	Freshwater west	13:00	14:30	13:28	2	SM8873300105	Same two birds in flight again with other corvids
28/10/2018	Freshwater west	13:00	14:30	13:30	2	SM8874900153	Landed in roughly the same area
28/10/2018	Freshwater west	13:00	14:30	13:33	2	SM8874900153	In flight again but flew off to SE and landed out of sight inland of car-park
23/11/2018	Freshwater west	10:00	13:00	12:20	2	SR 88557 99560	feeding in dunes
23/11/2018	Freshwater west	10:00	13:00	12:20	1	NA	Calling from dune grassland to north. Not seen.
23/11/2018	Freshwater west	10:00	13:00	12:33	2	SR 88557 99560	Came in from SE feeding along coast heading SE
01/12/2018	Angle peninsula	10:20	13:30		0	NA	No chough sightings
20/12/2018	Freshwater west	08:30	10:30	10:14	2	SR 88611 99920	2 chough flying low over dunes
20/12/2018	Freshwater west	13:30	15:30	13:44	3	SM 88750 00015	2 chough flying in from South over fieldsand down into dunes. Joined by third bird already in dunes.
20/12/2018	Angle peninsula	11:00	13:30		0	NA	No chough sightings
12/01/2019	Angle peninsula	10:00	13:00		0	NA	No chough sightings

* areas defined below.



Freshwater West Transect - as above

Angle peninsula – no transect was defined due to the small area and the site was walked in its entirety i.e. all areas were approached within 150-200m.