



Tata Steel UK Limited

# Electric Arc Furnace

National Vegetation Classification (NVC) survey



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## RSK GENERAL NOTES

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## EXECUTIVE SUMMARY

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- Initial Phase 1 surveys (included as part of a preliminary ecological appraisal) of the Tata Steelworks outlined the existence of priority habitats onsite and recommended further NVC surveys for rare and notable species.
- RSK Biocensus ecologists visited the site in June 2022 and surveyed the area, taking 44 quadrats at 5 locations.
- Priority habitats, listed under Section 7 of the Environment (Wales) Act 2016 were found, including Open Mosaic Habitat on Previously Developed Land, Coastal and Floodplain Grazing Marsh and Sand Dune grassland. These habitats should where possible be protected from development, although in cases of Open Mosaic Habitat, biodiversity offsetting will be required to allow development plans to proceed.
- Habitats on the southern margin of the site provide an important ecological buffer between the steelworks and designated sites to the south.
- Habitats were generally species-rich, providing ample flower and seed forage for invertebrates, birds and mammals.
- A small degree of habitat management will be required in order to keep/restore these habitats to optimum condition.
- While floristic diversity was high, few rare or threatened species were present. The exceptions to this were the IUCN GB Red List 'Near Threatened' species Common Eyebright, Sand Cat's-tail and Creeping Willow, all present in dune grassland to the south of the site (Common Eyebright is also present on open mosaic habitat north of the gas holder).
- With the exception of the above-listed species, notable plants recorded at neighbouring designated sites were not found.

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# 1.0 INTRODUCTION

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## 1.1 Background

- 1.1.1 This report details the results of phase 2 National Vegetation Classification (NVC) surveys of land at Tata Steelworks in Port Talbot, South Wales (centroid Grid Ref SS 77524 86021). The survey area included the land within the red-line boundary (the site), the site and survey area are shown in Figure 1.
- 1.1.2 A Preliminary Ecological Appraisal (PEA) of the site (RSK, 2022) identified species-rich habitats onsite including ephemeral and short perennial vegetation, lichen heath and semi-improved neutral grassland, these habitats together comprising Open Mosaic Habitat on Previously-Developed Land. In addition, a number of fields in the southern portion of the site were identified as Coastal and Floodplain Grazing Marsh (CFGM). Both of the above habitats are priority habitats, listed under Section 7 of the Environment (Wales) Act 2016.
- 1.1.3 The report therefore recommended further surveys in order to provide more detailed information on the protected and notable plants or assemblages found onsite.
- 1.1.4 The NVC surveys were carried out in June 2022 within the 2021/2022 survey area (shown in purple in Figure 1). Subsequently, adjustments were made to the proposed development, however, no additional surveys were undertaken as the habitats within the updated red line boundary were already represented by this survey (shown in red in Figure 1).

## 1.2 Purpose of this report

- 1.2.1 This report presents the results of botanical surveys of five separate areas of species-rich habitat onsite, including:
- Early and mid-successional grassland on ballast and rail verges at 'Pea Field' (centroid grid reference: SS 78174 85824);
  - Coastal and Floodplain Grazing Marsh and shallow ditch communities at 'the southern fields' (centroid grid reference: SS 78101 85270);
  - Ephemeral communities on well-drained skeletal soils comprised of pulverised fuel ash at 'Gas Holder' (centroid grid reference: SS 77671 85431);
  - Ephemeral communities on well-drained skeletal soils comprised of slag and pulverised fuel ash at 'Regen' (centroid grid reference: SS 77576 85803), and;
  - Fixed dune communities on land west of Margam Moors SSSI (centroid grid reference: SS 77707 84490). This area is outside of the red line boundary provided.
- 1.2.2 The aims of the surveys are to evaluate the importance of each area for nature conservation, appraising them in terms of the 'Ratcliffe criteria': size, diversity, naturalness, rarity, fragility, typicalness, recorded history, position in an ecological/geographical unit, potential value and intrinsic appeal.

- 1.2.3 The surveys were carried out in June 2022 by RSK Biocensus on behalf of Tata Steel UK Limited.

## 1.3 Landscape context

- 1.3.1 The 162.7 ha site is located to the south-east of the town of Port Talbot. The site is predominately bare ground/ developed land. Open mosaic habitat is the most dominant habitat type comprising a mixture of scrub, grassland and ephemeral vegetation. There are a number of channels throughout the site and one large lake associated with the steelworks, located at the northern extent of the site.
- 1.3.2 The site is immediately bordered to the north, east and west by Tata Steelworks with green fields, an access road and Margam Moors Site of Special Scientific Interest (SSSI) adjacent to the south of the site. The surrounding landscape is a mixture of woodland, hedgerows, waterbodies (reservoir), grassland and residential properties within Margam. Swansea Bay (Bristol Channel) is located approximately 880 m west of the site.

## 1.4 Development proposals

- 1.4.1 The Proposed Development will require the demolition of existing buildings and structures, and the construction of a new EAF steel production facility. The Proposed Development also includes a scrap metal handling facility and associated scrap yards, slag processing facility, chemical and material storage structures, buildings, handling systems, electrical control rooms and power infrastructure, laboratories, offices and ancillary facilities, together with new and amended transport infrastructure, landscaping and associated development.

## 2.0 METHODS

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### 2.1 Surveys

- 2.1.1 The botanical surveys were undertaken on 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> June and 2nd July 2022 by Pete Flood MSc, a senior ecology consultant at RSK Biocensus. Pete is an experienced botanist with a Field Identification Skills Certificate (FISC) at level 5. The surveys were carried out in weather which was largely dry, with sustained light rainfall on the 9<sup>th</sup>.
- 2.1.2 A walkover survey was first undertaken of each of the four areas to identify and map the principal vegetation types or any differences in gradient or drainage. Areas of grassland were divided into 'homogenous types', where possible, based on structure and dominant species. The vegetation of each 'grassland type' was described and supported by quadrat recording using the NVC system. At least five quadrats (2m x 2m) were sampled in homogenous vegetation in most of the grassland areas. .
- 2.1.3 The NVC is a system which aims to describe every broad plant community type in the British Isles, and standard methods are used in the field and for data analysis (Rodwell, 1991a, 1991b, 1992, 1995, 2000). Species are assigned estimates of abundance for quadrats of 2 x 2 m size (the standard size used for NVC grassland survey), taken in homogenous areas (stands) of vegetation.
- 2.1.4 Vegetation abundance is measured using the Domin-scale which gives a percentage-cover class for every species as follows: 10 = 100 - 91%; 9 = 76% - 90%; 8 = 75 - 51%; 7 = 50 - 34%; 6 = 33 - 26%; 5 = 25 - 11%; 4 = 10 - 5%; 3 = 1 - 4% cover; 2 = several individuals but less than 1% cover; 1 = few individuals no measurable cover.
- 2.1.5 Care was taken to avoid transitional vegetation and boundaries between vegetation, so that the perceived types were adequately sampled.
- 2.1.6 Topography, aspect, management and sward height/type was noted, and quadrats were documented photographically.

### 2.2 Data analysis

- 2.2.1 Analysis of quadrat data was carried out using the computer programme MAVIS (CEH 2017) which helps assign vegetation records to an NVC habitat classification.
- 2.2.2 Species % cover from each quadrat (plot) was inputted and plots combined to provide a measure of constancy (frequency) for each species surveyed. The analysis also provided Ellenberg scores (see below) for light, fertility, wetness and substrate pH and % 'best fit' to NVC grassland types.
- 2.2.3 Keys for mesotrophic grassland (MG), sand dune (SD) and open vegetation (OV) communities were also used (Rodwell 1992) to determine NVC community type. Results were compared with NVC descriptions (Rodwell 1992; Cooper 2017) to check whether the 'best fit' NVC types produced by MAVIS matched the actual community description.
- 2.2.4 Plants rely on various environmental factors in different proportions. Some of the common environmental factors that have a huge influence on the survival and optimal

growth of plants are Light, Temperature, Continentality, Moisture, Soil PH, Nitrogen, and Salinity. Ellenberg indicator values are based on a simple ordinal classification of plants according to the position of their realized ecological niche along an environmental gradient. In MAVIS analysis they are cover-weighted by species abundance within plots and/or groups of plots. Indicator values do not give information about the physiological requirements of a species but provide information on the ecological performance of species under competition, i.e. the performance of a plant in its niche. They can be used to estimate (abiotic) conditions/key parameters at a site and can also be used to monitor changes of key parameters over time. The table below gives an illustration of some indicator values for various environmental factors.

**Table 1. Ellenberg values**

The indicator values refer to what conditions the plant prefers.

Environmental Factor	Indicator value
Light value	1=deep shade, 5=semi-shade, 9=full light
Moisture value	1=strong soil dryness, 5=moist, 9=wet, 10=aquatic, 12=underwater
Reaction of soil value (PH)	1=extremely acidic, 5=mildly acidic, 9=alkaline
Nitrogen value	1=least, 5=average, 9=excessive supply

## 2.3 Nomenclature

2.3.1 Vascular plant nomenclature in this report follows Stace (2019) for native and naturalised species of vascular plant. Bryophyte nomenclature follows Hill et al., 2021) and Lichen nomenclature follows Dobson (2018). The names of NVC communities and sub-communities follow Rodwell (1992).

## 2.4 Constraints and limitations

2.4.1 The surveys were completed in early June which is an optimal time for grassland surveys.

2.4.2 The vast majority of vascular plants and bryophytes were confidently identified to species level. The exceptions to this rule were those genera with large numbers of superficially similar 'microspecies': Dandelions (*Taraxacum* sp.) and Hawkweeds (*Hieracium* sp.) were identified to section level, and Brambles (*Rubus* sp.) were identified as an aggregate (*Rubus fruticosus* agg.) except for the distinct congeners Dewberry (*Rubus caesius*) and Raspberry (*Rubus idaeus*). The common moss species Bicoloured Bryum (*Bryum dichotomum*) and Silver-moss (*Bryum argenteum*) were often present in minute quantities among other bryophytes, particularly in early-successional communities, but as finding them would have entailed a painstaking search for very little return, these were not always recorded. Lichens were collected and later identified using microscopy and chemical tests. Non-fertile samples of *Peltigera* species were not



possible to determine to species level, and these were labelled 'c.f.' to denote their putative status. The abbreviation 's.l.' (*sensu lato*) is used where a taxon name is given in its lax sense, as in the case of Ivy (*Hedera helix*) where no attempt has been made to differentiate the two former subspecies (now both elevated to species level).

- 2.4.3 Some taxa were not represented by MAVIS software, including the alien grass Compact Brome (*Anisantha madritensis*) and the vigorous hybrid Intermediate Evening-primrose (*Oenothera ×fallax*), both frequent onsite. In these cases they have been represented during data analysis by congeners with similar ecological niches such as Barren Brome (*Anisantha sterilis*) and Large-flowered Evening-primrose (*Oenothera glazioviana*).
- 2.4.4 The steelworks is an active industrial site, with a range of activities which might impact the future integrity and composition of the habitats sampled, including the dumping of spoil and ballast, excavation of dunes, off-road vehicular traffic and air and water-borne pollution.
- 2.4.5 Additionally, many of the communities sampled are transitory by nature. While all habitats will evolve over time, more rapid change is to be expected in communities dominated by ruderal and ephemeral plants as they succeed to grassland and scrub. The snapshot presented here is therefore time-limited.
- 2.4.6 Surveys were not accompanied by detailed analysis of soils and substrates, and therefore some assumptions have been made about current and historical conditions and processes onsite.
- 2.4.7 The surveys do not provide species lists for the entire site, being limited to the particular habitats sampled. Trees, shrubs and woodland species are therefore under-represented, as are obligate aquatic species.

## 3.0 RESULTS AND EVALUATION

### 3.1 Pea field

3.1.1 This area describes a linear corridor along a railway line, running north-northwest from the southern margin of the site for just over a kilometer. Soils here are typically thin and the area contains plentiful scrap metal and other industrial debris, as well as railway ballast on land adjacent to the tracks. The margins of this section are partly lined with scrub, with plentiful Butterfly-bush (*Buddleja davidii*) and Rusty Willow (*Salix cinerea* ssp. *oleifolia*). Fifteen quadrats were taken of habitats encountered here:

- Series 1: Five quadrats of rough grassland in the northern portion of the site, a 0.45 ha area of grassland enclosed by scrub;
- Series 2; Five quadrats of short ruderal/ephemeral vegetation on old railway ballast adjacent to railway tracks, and;
- Series 3: Five quadrats from a narrow 0.5 ha corridor of rough grassland to the south of the railway tracks, enclosed by scrub.

#### Series 1

3.1.2 This area was species-rich, with an average of 26.6 species recorded in each 2x2 m quadrat. No notable species were recorded. Ellenberg values suggest weakly acid soils of average dampness. The sward was typically moderately-high, and dominated by herbaceous species such as Dewberry, Strawberry (*Fragaria vesca*) and Selfheal (*Prunella vulgaris*). Grasses were present in lower abundance, with Cock's-foot (*Dactylis glomerata*), Red Fescue (*Festuca rubra*) and False Oat-grass (*Arrhenatherum elatius*) present in most quadrats. Sand Sedge (*Carex arenaria*), a plant mostly associated with sand dunes, was moderately abundant in most quadrats, suggesting a strong sandy component to the soils.

**Table 1: five 2x2 m quadrats of short vegetation at the northern end of Pea Field**

Name	1	2	3	4	5	Freq.	Range
<i>Fragaria vesca</i> (Wild Strawberry)	7	6	6	6	8	V	6-8
<i>Rubus caesius</i> (Dewberry)	4	8	7	6	7	V	4-8
<i>Prunella vulgaris</i> (Selfheal)	4	1	5	2	6	V	1-6
<i>Dactylis glomerata</i> (Cock's-foot)	2	5	4	3	1	V	1-5
<i>Linaria vulgaris</i> (Common Toadflax)	3	2	4	2	3	V	2-4
<i>Plantago lanceolata</i> (Ribwort Plantain)	3	2	3	4	2	V	2-4
<i>Carex arenaria</i> (Sand Sedge)	2	7	6	4	-	IV	0-7
<i>Lotus corniculatus</i> (Common Bird's-foot-trefoil)	7	4	4	4	-	IV	0-7
<i>Pastinaca sativa</i> (Wild Parsnip)	-	2	5	6	4	IV	0-6

Name	1	2	3	4	5	Freq.	Range
<i>Achillea millefolium</i> (Yarrow)	-	5	5	4	1	IV	0-5
<i>Dipsacus fullonum</i> (Teasel)	4	2	-	1	1	IV	0-4
<i>Geranium dissectum</i> (Cut-leaved Crane's-bill)	-	2	2	2	4	IV	0-4
<i>Hypericum perforatum</i> (Perforate St John's-wort)	3	3	2	4	-	IV	0-4
<i>Myosotis arvensis</i> (Field Forget-me-not)	4	3	3	-	3	IV	0-4
<i>Festuca rubra</i> (Red Fescue)	-	3	3	1	3	IV	0-3
<i>Veronica arvensis</i> (Wall Speedwell)	3	3	3	-	2	IV	0-3
<i>Arrhenatherum elatius</i> (False Oat-grass)	-	2	2	1	1	IV	0-2
<i>Glechoma hederacea</i> (Ground-ivy)	5	-	-	5	4	III	0-5
<i>Homalothecium lutescens</i> (Golden Feather-moss)	5	2	-	-	2	III	0-5
<i>Ervilia hirsuta</i> (Hairy Tare)	1	4	-	-	1	III	0-4
<i>Holcus lanatus</i> (Yorkshire-fog)	-	4	3	4	-	III	0-4
<i>Poa trivialis</i> (Rough Meadow-grass)	-	4	2	-	2	III	0-4
<i>Oenothera ×fallax</i> (Intermediate Evening-	4	-	1	1	-	III	0-3
<i>Vicia sativa</i> (Common Vetch)	-	2	2	-	3	III	0-3
<i>Echium vulgare</i> (Viper's-bugloss)	1	-	1	1	-	III	0-1
<i>Rosa canina</i> (Dog-rose)	-	1	1	-	1	III	0-1
<i>Pseudoscleropodium purum</i> (Neat Feather-moss)	-	1	-	-	3	II	0-3
<i>Crataegus monogyna</i> (Hawthorn)	-	1	-	1	-	II	0-1
<i>Crepis vesicaria</i> (Beaked Hawk's-beard)	1	-	-	-	2	II	0-2
<i>Taraxacum</i> sect. <i>Taraxacum</i> (Common	1	1	-	-	-	II	0-2
<i>Erigeron</i> sp. (a Fleabane)	1	-	-	-	1	II	0-1
<i>Sonchus asper</i> (Prickly Sow-thistle)	-	-	-	1	1	II	0-1
<i>Carex hirta</i> (Hairy Sedge)	-	-	-	5	-	I	0-5
<i>Pulicaria dysenterica</i> (Common Fleabane)	-	-	-	5	-	I	0-5
<i>Cerastium fontanum</i> (Common Mouse-ear)	-	-	-	3	-	I	0-3
<i>Coincya monensis</i> ssp. <i>cheiranthos</i> (Wallflower Cabbage)	-	-	-	3	-	I	0-3
<i>Geranium robertianum</i> (Herb-Robert)	-	-	-	2	-	I	0-2
<i>Ophrys apifera</i> (Bee Orchid)	2	-	-	-	-	I	0-2
<i>Senecio inaequidens</i> (Narrow-leaved Ragwort)	2	-	-	-	-	I	0-2
<i>Trifolium repens</i> (White Clover)	-	2	-	-	-	I	0-2

Name	1	2	3	4	5	Freq.	Range
<i>Vicia cracca</i> (Tufted Vetch)	-	-	2	-	-	I	0-2
<i>Anisantha sterilis</i> (Barren Brome)	-	-	1	-	-	I	0-1
<i>Arenaria serpyllifolia</i> (Thyme-leaved Sandwort)	-	-	-	1	-	I	0-1
<i>Centaurea debeauxii</i> (Chalk knapweed)	-	-	-	-	2	I	0-2
<i>Cirsium vulgare</i> (Spear Thistle)	-	-	1	-	-	I	0-1
<i>Phleum pratense</i> (Timothy)	1	-	-	-	-	I	0-1
<i>Picris hieracioides</i> (Hawkweed Oxtongue)	1	-	-	-	-	I	0-1
<i>Plantago major</i> (Greater Plantain)	-	-	-	1	-	I	0-1
<i>Poa compressa</i> (Flattened Meadow-grass)	-	-	-	-	2	I	0-2
<i>Rubus fruticosus</i> agg. (Bramble)	-	-	-	1	-	I	0-1
<i>Rumex crispus</i> (Curled Dock)	-	-	-	1	-	I	0-1
<i>Verbascum thapsus</i> (Great Mullein)	-	-	-	1	-	I	0-1
Matching co-efficients: MG1a 38.15; MG1 37.88; MG1d 37.18; MG1e 35.53; SD8 34.69; MG9b 33.57; SD8a 32.80; SD8d 32.17; MG1b 32.15; SD9 31.75							

- 3.1.3 This vegetation community is not easily assignable to any NVC type at first glance. MAVIS analysis suggested affinities with MG1 *Arrhenatherum elatius* grassland, which is plausible with regard to the grass species present. But the high frequency of herbaceous species and comparatively low sward are atypical of this community, which is normally characterized by an abundance of tall, rank grasses. The sand dune communities SD8 *Festuca rubra* - *Galium verum* fixed dune grassland and SD9 *Ammophila arenaria*-*Arrhenatherum elatius* dune grassland were also returned as possible matches for this area, although with low confidence values. This may reflect the presence of drought-tolerant plants such as Sand Sedge and Ribwort Plantain (*Plantago lanceolata*). The results suggest that this is a community subject to higher-than-average amounts of disturbance and stress and transitional between early-successional open vegetation and mesotrophic grassland. Such a habitat could be described as occupying a median point between series 2 and 3, below.

## Series 2

- 3.1.4 The location of this series is no longer present within the red line boundary.
- 3.1.5 This series specifically targeted areas of short vegetation with abundant lichens and bryophytes. Patches meeting this description were dispersed throughout the middle and northern parts of the wider Pea Field area, usually with close proximity to railway infrastructure (although not so close as to be bare ballast). Typically, these were areas in which ballast had settled and a skeletal soil had developed through accumulation of organic material between stones. A lack of recent management or anthropogenic disturbance through compaction had allowed vegetation communities to develop to some degree.



3.1.6 Species-richness in these quadrats was quite high, with an average of 23 species recorded in each 2x2 m quadrat, although no notable species were found. Ellenberg values confirmed that these were dry sites with low soil fertility, while CSR analysis indicated that the plots were dominated by ruderal and stress-tolerant plants. Analysis and use of the NVC keys revealed no strong affinities with any described NVC community. The highest matches were for MG1 *Arrhenatherum elatius* grassland (29.02), OV23 *Lolium perenne* – *Dactylis glomerata* open vegetation (28.87), and MC5 *Armeria maritima*-*Cerastium diffusum* maritime therophyte (27.53) communities.

**Table 2: five 2x2 m quadrats of short early-mid successional trackside ballast communities at 'Pea Field'**

Name	1	2	3	4	5	Freq.	Range
<i>Homalothecium lutescens</i> (Golden Feather-moss)	8	9	8	8	8	V	8-9
<i>Hypericum perforatum</i> (Perforate St John's-wort)	3	4	5	2	4	V	2-5
<i>Picris hieracioides</i> (Hawkweed Oxtongue)	2	5	3	2	3	V	2-5
<i>Arenaria serpyllifolia</i> (Thyme-leaved Sandwort)	1	2	4	2	4	V	1-4
<i>Anisantha sterilis/madritensis</i> (Barren/Compact Brome)	2	1	1	5	-	IV	0-5
<i>Arrhenatherum elatius</i> (False Oat-grass)	2	5	2	-	2	IV	0-5
<i>Peltigera</i> c.f. <i>membranacea</i> (a Dog-lichen)	-	1	2	2	5	IV	0-5
<i>Pilosella officinarum</i> (Mouse-ear-hawkweed)	3	4	2	2	-	IV	0-4
<i>Plantago lanceolata</i> (Ribwort Plantain)	2	2	2	-	4	IV	0-4
<i>Holcus lanatus</i> (Yorkshire-fog)	2	3	-	1	1	IV	0-3
<i>Fragaria vesca</i> (Wild Strawberry)	7	3	2	-	-	III	0-7
<i>Lotus corniculatus</i> (Common Bird's-foot-trefoil)	4	-	5	-	6	III	0-6
<i>Sedum acre</i> (Biting Stonecrop)	-	1	5	2	-	III	0-5
<i>Echium vulgare</i> (Viper's-bugloss)	-	3	4	-	3	III	0-4
<i>Senecio inaequidens</i> (Narrow-leaved Ragwort)	-	1	3	4	-	III	0-4
<i>Bromus hordeaceus</i> (Soft-brome)	-	-	3	3	1	III	0-3
<i>Pastinaca sativa</i> (Wild Parsnip)	3	3	-	-	2	III	0-3
<i>Dactylis glomerata</i> (Cock's-foot)	2	1	2	-	-	III	0-2
<i>Geranium robertianum</i> (Herb-Robert)	2	-	2	1	-	III	0-2
<i>Sinapis arvensis</i> (Charlock)	-	-	1	2	1	III	0-2
<i>Carduus nutans</i> (Musk Thistle)	1	1	-	1	-	III	0-1
<i>Medicago lupulina</i> (Black Medick)	2	4	-	-	-	II	0-4
<i>Oenothera × fallax</i> (Intermediate Evening-primrose)	-	4	-	-	1	II	0-4
<i>Erodium cicutarium</i> (Common Stork's-bill)	-	-	3	1	-	II	0-3

Name	1	2	3	4	5	Freq.	Range
<i>Myosotis arvensis</i> (Field Forget-me-not)	2	3	-	-	-	II	0-3
<i>Catapodium rigidum</i> (Fern-grass)	-	1	-	-	2	II	0-2
<i>Daucus carota</i> (Wild Carrot)	-	2	2	-	-	II	0-2
<i>Geranium macrorrhizum</i> (Rock Crane's-bill)	-	-	-	2	2	II	0-2
<i>Tripleurospermum inodorum</i> (Scentless Mayweed)	-	-	2	2	-	II	0-2
<i>Cladonia rangiformis</i> (a 'reindeer-moss' lichen)	-	-	-	7	-	I	0-7
<i>Ononis repens</i> (Common Restharrow)	7	-	-	-	-	I	0-7
<i>Sedum album</i> (White Stonecrop)	-	-	-	5	-	I	0-5
<i>Achillea millefolium</i> (Yarrow)	4	-	-	-	-	I	0-4
<i>Agrostis stolonifera</i> (Creeping Bent)	-	-	-	-	3	I	0-3
<i>Cerastium fontanum</i> (Common Mouse-ear)	-	-	-	-	3	I	0-3
<i>Hieracium</i> sect. <i>Vulgata</i> (a Hawkweed)	-	3	-	-	-	I	0-3
<i>Orobanche minor</i> (Common Broomrape)	-	3	-	-	-	I	0-3
<i>Dipsacus fullonum</i> (Teasel)	1	-	-	-	-	I	0-1
<i>Carex arenaria</i> (Sand Sedge)	2	-	-	-	-	I	0-2
<i>Centaurea debeauxii</i> (Chalk knapweed)	2	-	-	-	-	I	0-2
<i>Geranium dissectum</i> (Cut-leaved Crane's-bill)	-	-	-	2	-	I	0-2
<i>Jacobaea vulgaris</i> (Common Ragwort)	-	-	-	-	2	I	0-2
<i>Linaria vulgaris</i> (Common Toadflax)	-	-	-	-	2	I	0-2
<i>Trifolium arvense</i> (Hare's-foot Clover)	2	-	-	-	-	I	0-2
<i>Trifolium campestre</i> (Hop Trefoil)	-	2	-	-	-	I	0-2
<i>Urtica dioica</i> (Common Nettle)	2	-	-	-	-	I	0-2
<i>Ophrys apifera</i> (Bee Orchid)	-	-	-	1	-	I	0-1
<i>Quercus robur</i> (Pedunculate Oak) seedling	-	-	-	-	1	I	0-1
<i>Rumex crispus</i> (Curled Dock)	-	-	1	-	-	I	0-1
<i>Sonchus asper</i> (Prickly Sow-thistle)	-	1	-	-	-	I	0-1
<i>Taraxacum</i> sect. <i>Taraxacum</i> (Common Dandelion)	-	-	-	1	-	I	0-1
Matching co-efficients: MG1 29.02; OV23 28.87; MG1a 28.46; MG1d 27.79; MC5d 27.53; OV23d 27.20; SD8 26.75; SD8a 26.09; OV25 25.84; OV10d 25.67							

3.1.7 Despite the lack of matches with previously-described vegetation communities, this series is fairly homogeneous in nature. Golden Feather-moss (*Homalothecium lutescens*) forms wefts over the substrate, affording many plants a foothold in the hard ground. The lichens *Cladonia rangiformis* and *Peltigera membranacea* are often

present, sometimes in abundance. Perennials of rocky ground such as Perforate St John's Wort (*Hypericum perforatum*) and Hawkweed Oxtongue (*Picris hieracioides*) are plentiful alongside a wide range of annuals and biennials such as Compact Brome, Thyme-leaved Sandwort (*Arenaria serpyllifolia*) and Viper's-bugloss (*Echium vulgare*).

### Series 3

- 3.1.8 The southern reach of Pea Field is characterized by tall grassland with tall herbs. The area is also quite species-rich (with a mean 22 species per 2x2 m quadrat), but in some areas the dominance of grasses is accompanied by a lower diversity in herbaceous species. The sward is apparently unmanaged and ungrazed. Ellenberg values for the quadrats indicated that the area is intermediate in terms of moisture, reaction (pH) and soil fertility.

**Table 3: five 2x2 m quadrats on established grassland at 'Pea Field'**

Name	1	2	3	4	5	Freq.	Range
<i>Arrhenatherum elatius</i> (False Oat-grass)	5	6	6	8	6	V	5-8
<i>Festuca rubra</i> (Red Fescue)	-	5	6	8	5	IV	0-8
<i>Homalothecium lutescens</i> (Golden Feather-moss)	2	-	5	6	4	IV	0-6
<i>Anisantha sterilis</i> (Barren Brome)	3	3	5	4	-	IV	0-5
<i>Ervilia hirsuta</i> (Hairy Tare)	-	3	5	4	5	IV	0-5
<i>Poa pratensis</i> (Smooth Meadow-grass)	-	3	3	4	5	IV	0-5
<i>Pseudoscleropodium purum</i> (Neat Feather-moss)	5	2	5	-	5	IV	0-5
<i>Achillea millefolium</i> (Yarrow)	-	4	3	2	2	IV	0-4
<i>Linaria vulgaris</i> (Common Toadflax)	4	-	4	4	3	IV	0-4
<i>Plantago lanceolata</i> (Ribwort Plantain)	4	-	3	3	3	IV	0-4
<i>Bromus hordeaceus</i> (Soft-brome)	2	3	2	2	-	IV	0-3
<i>Medicago lupulina</i> (Black Medick)	1	-	2	3	3	IV	0-3
<i>Vicia sativa</i> (Common Vetch)	2	2	3	-	2	IV	0-3
<i>Dactylis glomerata</i> (Cock's-foot)	-	6	-	3	2	III	0-6
<i>Rubus caesius</i> (Dewberry)	-	6	2	-	2	III	0-6
<i>Lotus corniculatus</i> (Common Bird's-foot-trefoil)	5	-	2	-	3	III	0-5
<i>Anisantha madritensis</i> (Compact Brome)	4	-	1	1	-	III	0-4
<i>Picris hieracioides</i> (Hawkweed Oxtongue)	3	3	-	-	3	III	0-3
<i>Leucanthemum vulgare</i> (Oxeye Daisy)	-	1	-	-	6	II	0-6
<i>Pilosella officinarum</i> (Mouse-ear-hawkweed)	5	-	1	-	-	II	0-5
<i>Daucus carota</i> (Wild Carrot)	4	-	2	-	-	II	0-4

Name	1	2	3	4	5	Freq.	Range
<i>Trisetum flavescens</i> (Yellow Oat-grass)	2	-	-	-	4	II	0-4
<i>Poa compressa</i> (Flattened Meadow-grass)	3	-	-	-	3	II	0-3
<i>Agrostis stolonifera</i> (Creeping Bent)	2	-	-	-	2	II	0-2
<i>Geranium dissectum</i> (Cut-leaved Crane's-bill)	-	-	2	1	-	II	0-2
<i>Holcus lanatus</i> (Yorkshire-fog)	-	2	-	-	2	II	0-2
<i>Pastinaca sativa</i> (Wild Parsnip)	-	-	2	-	2	II	0-2
<i>Trifolium dubium</i> (Lesser Trefoil)	2	-	1	-	-	II	0-2
<i>Trifolium repens</i> (White Clover)	2	-	-	-	3	II	0-2
<i>Hedera helix</i> s.l. (Ivy)	-	-	-	-	5	I	0-5
<i>Anthoxanthum odoratum</i> (Sweet Vernal-grass)	3	-	-	-	-	I	0-3
<i>Anthyllis vulneraria</i> (Kidney Vetch)	3	-	-	-	-	I	0-3
<i>Centaurea debeauxii</i> (Chalk knapweed)	-	3	-	-	-	I	0-3
<i>Artemisia vulgaris</i> (Mugwort)	-	-	-	-	2	I	0-2
<i>Eupatorium cannabinum</i> (Hemp-agrimony)	-	2	-	-	-	I	0-2
<i>Hypericum perforatum</i> (Perforate St John's-wort)	2	-	-	-	-	I	0-2
<i>Myosotis arvensis</i> (Field Forget-me-not)	-	2	-	-	-	I	0-2
<i>Phragmites australis</i> (Common Reed)	-	2	-	-	-	I	0-2
<i>Prunus spinosa</i> (Blackthorn) seedling	-	2	-	-	-	I	0-2
<i>Verbena officinalis</i> (Vervain)	-	-	-	2	-	I	0-2
<i>Galium aparine</i> (Cleavers)	-	1	-	-	-	I	0-1
<i>Heracleum sphondylium</i> (Hogweed)	-	-	-	-	1	I	0-1
<i>Jacobaea vulgaris</i> (Common Ragwort)	-	-	1	-	-	I	0-1
<i>Prunella vulgaris</i> (Selfheal)	-	-	1	-	-	I	0-1
<i>Quercus robur</i> (Pedunculate Oak) seedling	-	-	1	-	-	I	0-1
<i>Rubus fruticosus</i> agg. (Bramble)	-	-	-	-	1	I	0-1
<i>Rumex conglomeratus</i> (Clustered Dock)	-	-	1	-	-	I	0-1
<i>Trifolium campestre</i> (Hop Trefoil)	1	-	-	-	-	I	0-1
<i>Verbascum thapsus</i> (Great Mullein)	-	-	1	-	-	I	0-1
Mathcing co-effieicients: MG1a 44.50; MG1 44.44; SD9 41.23; SD9a 41.19; MG1e 40.60; SD8 40.42; SD8a 39.80; SD9b 39.57; OV23 39.35; MG1d 38.57							

3.1.9 This area showed strong affinities with MG1a *Arrhenatherum elatius* grassland, *Festuca rubra* subcommunity (44.50) and SD9 *Ammophila arenaria*-*Arrhenatherum elatius*



dune grassland (44.23), suggesting a stable MG1 *Arrhenatherum elatius* grassland with maritime influences befitting its coastal location.

## 3.2 Southern fields

3.2.1 This was a 25 ha area within the 2021/2022 survey area and comprised of 9 wet, unmanaged fields on the southern margin of the steelworks. The land, although flat, has an undulating topography caused by parallel shallow scrapes which traverse the length of each field. Margins are typically bordered by a band of scrub and wet ditches, which are heavily shaded and as a result seem to lack established macrophyte communities. Attention was paid during surveys to the existence of records of notable plants at Margam Moors SSSI to the south. Nine quadrats were sampled here:

- Series 4: Six quadrats of Coastal Floodplain Grazing Marsh (CFGM) sampled across the site, and;
- Series 5: Three quadrats of plant communities of wetter ground sampled from the scrapes.

3.2.2 The updated red line boundary comprises 11.55 ha of grassland within the south of the site.

### Series 4

3.2.3 These quadrats were taken across a large area of moderate diversity, with an average of 15 species per 2x2 m quadrat. This figure alone gives a slightly misleading sense of the general species-richness however as the vegetation was characterized by comparatively large, dense stands of individual species. 47 species recorded across 6 quadrats in this series compares well to 52 records from the 5 quadrats in series 1, and perhaps gives a better picture of the species-richness present. Ellenberg values suggest moderately damp, neutral soils of intermediate fertility. No notable species were found.

3.2.4 The sward was typically over 40 cm high and dominated by grasses, sedges and rushes, with scattered competitive tall herb species. Yorkshire-fog (*Holcus lanatus*) was constant across the 6 quadrats, and Cock's-foot (*Dactylis glomerata*), Soft-rush (*Juncus effusus*) and Meadow Foxtail (*Alopecurus pratensis*) were often abundant. Herbaceous species were represented by Redshank (*Persicaria maculosa*) constant in fairly small quantities, with smaller amounts of Meadow Vetchling (*Lathyrus pratensis*), Marsh Horsetail (*Equisetum pratense*), Creeping Thistle (*Cirsium arvense* (Creeping Thistle), Cleavers (*Galium aparine* (Cleavers) and Nettle (*Urtica dioica*).

**Table 4: Six 2x2 m quadrats on drier ground in Coastal Floodplain Grazing Marsh (CFGM) at the southern fields**

Name	1	2	3	4	5	6	Freq.	Range
<i>Holcus lanatus</i> (Yorkshire-fog)	2	8	4	7	4	6	V	2-8
<i>Persicaria maculosa</i> (Redshank)	4	4	3	3	2	2	V	2-4
<i>Dactylis glomerata</i> (Cock's-foot)	3	7	-	4	1	-	IV	0-7

Name	1	2	3	4	5	6	Freq.	Range
<i>Juncus effusus</i> (Soft-rush)	7	5	1	-	2	-	IV	0-7
<i>Lathyrus pratensis</i> (Meadow Vetchling)	2	3	2	3	-	1	IV	0-3
<i>Alopecurus pratensis</i> (Meadow Foxtail)	-	-	8	3	-	4	III	0-8
<i>Juncus articulatus</i> (Jointed Rush)	-	-	6	2	6	-	III	0-6
<i>Arrhenatherum elatius</i> (False Oat-grass)	5	-	2	-	4	-	III	0-5
<i>Festuca rubra</i> (Red Fescue)	4	-	-	3	-	4	III	0-4
<i>Poa trivialis</i> (Rough Meadow-grass)	-	-	3	2	1	-	III	0-3
<i>Equisetum palustre</i> (Marsh Horsetail)	-	1	-	2	2	-	III	0-2
<i>Agrostis stolonifera</i> (Creeping Bent)	-	-	4	-	-	2	II	0-4
<i>Cirsium arvense</i> (Creeping Thistle)	-	4	-	-	4	-	II	0-4
<i>Galium aparine</i> (Cleavers)	4	3	-	-	-	-	II	0-4
<i>Phragmites australis</i> (Common Reed)	-	-	3	4	-	-	II	0-4
<i>Urtica dioica</i> (Common Nettle)	4	-	-	-	3	-	II	0-4
<i>Potentilla anserina</i> (Silverweed)	-	-	-	-	3	3	II	0-3
<i>Ranunculus repens</i> (Creeping Buttercup)	-	3	1	-	-	-	II	0-3
<i>Rubus caesius</i> (Dewberry)	-	-	2	-	3	-	II	0-3
<i>Rumex acetosa</i> (Common Sorrel)	3	1	-	-	-	-	II	0-3
<i>Rumex crispus</i> (Curled Dock)	-	2	-	1	-	-	II	0-2
<i>Carex hirta</i> (Hairy Sedge)	2	-	-	-	-	2	II	0-2
<i>Carex leporina</i> (Oval Sedge)	-	-	2	-	-	1	II	0-2
<i>Oxyrhygium speciosum</i> (Showy Feather-moss)	6	-	-	-	-	-	I	0-6
<i>Anthoxanthum odoratum</i> (Sweet Vernal-	-	-	-	-	-	5	I	0-5
<i>Juncus inflexus</i> (Hard Rush)	-	4	-	-	-	-	I	0-4
<i>Rumex obtusifolius</i> (Broad-leaved Dock)	-	4	-	-	-	-	I	0-4
<i>Schedonorus arundinaceus</i> (Tall Fescue)	-	4	-	-	-	-	I	0-4
<i>Schedonorus pratensis</i> (Meadow Fescue)	-	-	-	-	-	4	I	0-4
<i>Carex otrubae</i> (False Fox-sedge)	-	-	-	-	-	3	I	0-3
<i>Heracleum sphondylium</i> (Hogweed)	-	3	-	-	-	-	I	0-3
<i>Ranunculus acris</i> (Meadow Buttercup)	-	-	-	3	-	-	I	0-3
<i>Carex nigra</i> (Common Sedge)	-	-	2	-	-	-	I	0-2
<i>Centaurea debeauxii</i> (Chalk knapweed)	2	-	-	-	-	-	I	0-2

Name	1	2	3	4	5	6	Freq.	Range
<i>Cirsium palustre</i> (Marsh Thistle)	1	-	-	-	-	-	I	0-1
<i>Epilobium hirsutum</i> (Great Willowherb)	-	-	-	-	2	-	I	0-2
<i>Epilobium lanceolatum</i> (Spear-leaved	2	-	-	-	-	-	I	0-2
<i>Equisetum arvense</i> (Field Horsetail)	2	-	-	-	-	-	I	0-2
<i>Galium palustre</i> (Common Marsh-	-	-	2	-	-	-	I	0-2
<i>Geum rivale</i> (Water Avens)	1	-	-	-	-	-	I	0-1
<i>Lotus pedunculatus</i> (Greater Bird's-foot-	-	-	-	-	-	1	I	0-1
<i>Lythrum salicaria</i> (Purple-loosestrife)	-	-	2	-	-	-	I	0-2
<i>Persicaria hydropiper</i> (Water-pepper)	-	-	-	-	2	-	I	0-2
<i>Rumex conglomeratus</i> (Clustered Dock)	-	-	-	-	2	-	I	0-2
<i>Vicia cracca</i> (Tufted Vetch)	-	-	1	-	-	-	I	0-1
<i>Vicia sativa</i> (Common Vetch)	-	1	-	-	-	-	I	0-1
Matching co-efficients: MG9 58.24; MG9b 57.54; M27 53.95; MG9a 51.83; MG10 51.45; MG10a 50.18; OV26 48.95; MG1c 47.91; M27b 47.42; M27c 47.34								

- 3.2.5 The strong match with MG9 *Holcus lanatus-Deschampsia cespitosa* grassland is perhaps misleading as the latter species was not recorded. M27 *Filipendula ulmaria-Angelica sylvestris* mire is unlikely for the same reason, although the community recorded here certainly has affinities with both designations. It seems likely that this is a transitional community intermediate between the two nodes.

### Series 5

- 3.2.6 Wet hollows at the southern fields have a range of different vegetation types, typically occurring in large monospecific stands with moderate species-richness when sampled in a quadrat (average 11 species). The hollows sampled were typically damp rather than wet, while the species present suggested soils of slightly higher fertility than found on the surrounding land, with swards often over 60 cm in height. No notable species were found.
- 3.2.7 The constant species Greater Pond-sedge (*Carex riparia*), Yellow Iris (*Iris pseudacorus*), Redshank and Soft-rush were joined in these quadrats by a range of common species including the grasses Yorkshire-fog and Creeping Bent (*Agrostis stolonifera*), with herbs dominated by tall competitive species such as Creeping Thistle and Clustered Dock (*Rumex conglomeratus*).

**Table 5: three 2x2 m quadrats from wet hollows in Coastal Floodplain Grazing Marsh (CFGM) at the southern fields**

Name	1	2	3	Freq.	Range
<i>Carex riparia</i> (Greater Pond-sedge)	8	1	9	V	1-9
<i>Iris pseudacorus</i> (Yellow Iris)	6	8	5	V	5-8
<i>Persicaria maculosa</i> (Redshank)	4	3	4	V	3-4
<i>Juncus effusus</i> (Soft-rush)	3	2	2	V	2-3
<i>Geum urbanum</i> (Wood Avens)	1	2	-	III	0-2
<i>Holcus lanatus</i> (Yorkshire-fog)	-	2	2	III	0-2
<i>Cirsium arvense</i> (Creeping Thistle)	-	5	-	I	0-5
<i>Rumex conglomeratus</i> (Clustered Dock)	-	5	-	I	0-5
<i>Filipendula ulmaria</i> (Meadowsweet)	4	-	-	I	0-4
<i>Solanum dulcamara</i> (Bittersweet)	-	4	-	I	0-4
<i>Agrostis stolonifera</i> (Creeping Bent)	-	3	-	I	0-3
<i>Arrhenatherum elatius</i> (False Oat-grass)	-	3	-	I	0-3
<i>Epilobium hirsutum</i> (Great Willowherb)	-	3	-	I	0-3
<i>Juncus articulatus</i> (Jointed Rush)	-	3	-	I	0-3
<i>Persicaria hydropiper</i> (Water-pepper)	-	3	-	I	0-3
<i>Alopecurus pratensis</i> (Meadow Foxtail)	-	-	2	I	0-2
<i>Carex hirta</i> (Hairy Sedge)	-	-	2	I	0-2
<i>Equisetum palustre</i> (Marsh Horsetail)	2	-	-	I	0-2
<i>Juncus inflexus</i> (Hard Rush)	-	2	-	I	0-2
<i>Lathyrus pratensis</i> (Meadow Vetchling)	2	-	-	I	0-2
<i>Phragmites australis</i> (Common Reed)	-	-	2	I	0-2
<i>Ranunculus repens</i> (Creeping Buttercup)	-	2	-	I	0-2
<i>Galium aparine</i> (Cleavers)	-	-	1	I	0-1
Matching co-efficients: OV26 44.40; S26 42.30; OV26a 41.78; M27c 40.58; S6 40.55; MG10 38.65; M27 38.55; M27b 38.08; S26d 37.96; MG9 37.94					

3.2.8 Data analysis suggested a vegetation community with a range of affinities including: OV26 *Epilobium hirsutum* community (44.40), S26 *Phragmites australis-Urtica dioica* tall herb fen, M27 *Filipendula ulmaria-Angelica sylvestris* mire and S6 *Carex riparia* swamp. The high number of communities for which this series shows matches suggests either that the series is comprised of disparate vegetation communities, or that a



number of fine mosaics are present, with transitions within each quadrat. While quadrat species-richness for this series was lower than elsewhere, this 'community-richness' suggests an area of high biodiversity value.

### 3.3 Gas Holder

3.3.1 An area of early-successional grassland just over 1 ha in size, directly southeast of the gas holder and surrounded by dense scrub to the south and east. Soils here were free-draining and comprised of pulverized fuel ash and clinkers, and the area was relatively undisturbed with the exception of a moderate degree of grazing by rabbits. Ten quadrats were sampled here, including:

- Series 6: five 2x2 m quadrats taken in long vegetation close to scrub margins, and;
- Series 7: five 2x2 m quadrats of short, lichen and bryophyte-rich grassland.

#### Series 6

3.3.2 Marginal vegetation in this area was generally taller than that in more central parts, in a band 3-4 m thick which graded to shorter vegetation gradually, possibly reflecting patterns of fuel ash deposition and/or greater desiccation of unshaded areas. Quadrats were mostly taken from the centre of this band, focusing on a vegetation type of considerable homogeneity. Here, the sward was typically 30-40 cm high and species-rich, with an average of 26 species per quadrat. Based on cover-weighted Ellenberg values, moisture was fairly low, pH neutral and fertility low.

3.3.3 Diversity in the quadrats was high, with no single species dominating. Among constant and abundant species, herbs were more numerous than grasses, with Mouse-ear-hawkweed (*Pilosella officinarum*), Hop Trefoil (*Trifolium campestre*), Common Vetch (*Vicia sativa*), Common Mouse-ear (*Cerastium fontanum*) and Hare's-foot Clover (*Trifolium campestre*) constant. Yorkshire-fog was the most abundant grass, with lesser amounts of False Oat-grass, Squirreltail Fescue (*Vulpia bromoides*) and Soft-brome (*Bromus hordeaceus*). The 'difficulty' of the habitat was shown by the absence of nutrient-demanding tall herbs such as nettles and thistles, and the abundance of nitrogen-fixing legumes (8 species recorded) such as Common Bird's-foot Trefoil (*Lotus corniculatus*). Bryophytes were generally present in low quantities, with the exception of Golden Feather-moss, which dominated the ground layer of quadrat 4.

**Table 6: five 2x2 m quadrats in long vegetation at Gas Holder**

Name	1	2	3	4	5	Freq.	Range
<i>Pilosella officinarum</i> (Mouse-ear-hawkweed)	9	3	3	3	1	V	1-9
<i>Holcus lanatus</i> (Yorkshire-fog)	4	4	7	2	4	V	2-7
<i>Trifolium campestre</i> (Hop Trefoil)	2	3	4	3	4	V	2-4
<i>Vicia sativa</i> (Common Vetch)	2	3	2	2	2	V	2-3

Name	1	2	3	4	5	Freq.	Range
<i>Cerastium fontanum</i> (Common Mouse-ear)	2	2	1	2	3	V	1-3
<i>Trifolium arvense</i> (Hare's-foot Clover)	1	3	1	2	1	V	1-3
<i>Homalothecium lutescens</i> (Golden Feather-moss)	3	4	2	9	-	IV	0-9
<i>Arrhenatherum elatius</i> (False Oat-grass)	2	7	2	2	-	IV	0-7
<i>Vulpia bromoides</i> (Squirreltail Fescue)	5	2	-	6	3	IV	0-6
<i>Picris hieracioides</i> (Hawkweed Oxtongue)	2	3	3	5	-	IV	0-5
<i>Anthyllis vulneraria</i> (Kidney Vetch)	4	4	5	-	3	IV	0-5
<i>Bromus hordeaceus</i> (Soft-brome)	-	2	4	3	2	IV	0-4
<i>Lotus corniculatus</i> (Common Bird's-foot-trefoil)	4	1	2	3	-	IV	0-4
<i>Plantago lanceolata</i> (Ribwort Plantain)	-	4	2	3	3	IV	0-4
<i>Agrostis stolonifera</i> (Creeping Bent)	2	2	2	2	-	IV	0-2
<i>Anisantha madritensis</i> (Compact Brome)	2	2	-	7	-	III	0-7
<i>Arenaria serpyllifolia</i> (Thyme-leaved Sandwort)	2	2	1	-	-	III	0-2
<i>Oenothera ×fallax</i> (Intermediate Evening-	-	2	2	1	-	III	0-2
<i>Poa pratensis</i> (Smooth Meadow-grass)	2	-	-	-	6	II	0-6
<i>Crepis vesicaria</i> (Beaked Hawk's-beard)	-	-	-	5	4	II	0-5
<i>Anisantha sterilis</i> (Barren Brome)	3	-	4	-	-	II	0-4
<i>Festuca rubra</i> (Red Fescue)	3	-	-	-	4	II	0-4
<i>Hieracium</i> sect. <i>Vulgata</i> (a Hawkweed)	-	4	-	-	3	II	0-4
<i>Pastinaca sativa</i> (Wild Parsnip)	3	-	4	-	-	II	0-4
<i>Geranium dissectum</i> (Cut-leaved Crane's-bill)	1	-	-	3	-	II	0-3
<i>Bryum</i> c.f. <i>caespiticum</i> (Tufted Thread-moss)	1	2	-	-	-	II	0-2
<i>Cladonia rangiformis</i> (a Reindeer-moss)	-	-	2	1	-	II	0-2
<i>Dactylis glomerata</i> (Cock's-foot)	1	-	-	2	-	II	0-2
<i>Erigeron</i> sp. (a Fleabane)	-	2	2	-	-	II	0-2
<i>Linaria vulgaris</i> (Common Toadflax)	-	-	1	2	-	II	0-2
<i>Orobanche minor</i> (Common Broomrape)	2	-	-	-	1	II	0-2
<i>Sonchus asper</i> (Prickly Sow-thistle)	-	1	-	2	-	II	0-2
<i>Veronica arvensis</i> (Wall Speedwell)	-	-	1	-	2	II	0-2
<i>Streblotrichum convolutum</i> (Lesser Bird's-claw Beard-moss)	1	1	-	-	-	II	0-1
<i>Taraxacum</i> sect. <i>Taraxacum</i> (Common	-	-	1	-	1	II	0-1

Name	1	2	3	4	5	Freq.	Range
<i>Ononis repens</i> (Common Restharrow)	-	-	7	-	-	I	0-7
<i>Poa compressa</i> (Flattened Meadow-grass)	-	5	-	-	-	I	0-5
<i>Syntrichia ruraliformis</i> (Sand-hill Screw-moss)	-	-	-	4	-	I	0-4
<i>Leucanthemum vulgare</i> (Oxeye Daisy)	3	-	-	-	-	I	0-3
<i>Alopecurus pratensis</i> (Meadow Foxtail)	2	-	-	-	-	I	0-2
<i>Anthoxanthum odoratum</i> (Sweet Vernal-grass)	2	-	-	-	-	I	0-2
<i>Geranium molle</i> (Dove's-foot Crane's-bill)	-	2	-	-	-	I	0-2
<i>Medicago lupulina</i> (Black Medick)	2	-	-	-	-	I	0-2
<i>Rubus caesius</i> (Dewberry)	-	-	2	-	-	I	0-2
<i>Sedum acre</i> (Biting Stonecrop)	2	-	-	-	-	I	0-2
<i>Sinapis arvensis</i> (Charlock)	2	-	-	-	-	I	0-2
<i>Trifolium dubium</i> (Lesser Trefoil)	2	-	-	-	-	I	0-2
<i>Achillea millefolium</i> (Yarrow)	1	-	-	-	-	I	0-1
<i>Barbula unguiculata</i> (Bird's-claw Beard-moss)	1	-	-	-	-	I	0-1
<i>Calliergonella cuspidata</i> (Pointed Spear-moss)	-	-	-	-	1	I	0-1
<i>Carduus nutans</i> (Musk Thistle)	-	-	1	-	-	I	0-1
<i>Catapodium rigidum</i> (Fern-grass)	1	-	-	-	-	I	0-1
<i>Prunella vulgaris</i> (Selfheal)	-	1	-	-	-	I	0-1
<i>Pseudoscleropodium purum</i> (Neat Feather-moss)	-	-	1	-	-	I	0-1
<i>Rumex acetosa</i> (Common Sorrel)	-	-	1	-	-	I	0-1
<i>Rumex crispus</i> (Curled Dock)	-	1	-	-	-	I	0-1
Matching co-efficients: MG1a 34.13; MG1 33.88; SD8 32.01; SD8a 30.88; OV23 30.38; MG1d 29.80; MG9b 29.77; SD7 29.23; MG6b 29.22; SD8d 29.12							

- 3.3.4 The general homogeneity of this area is demonstrated by the high number of constant and abundant species, but despite this it has only weak affinities with the following NVC communities: MG1 *Arrhenatherum elatius* grassland, *Festuca rubra* subcommunity (34.13); SD8 *Festuca rubra* - *Galium verum* fixed dune grassland (32.01), and; OV23 *Lolium perenne* – *Dactylis glomerata* community (30.23). It is likely that the community present is particular to the unusual soil conditions found onsite, and characteristic of areas of lower disturbance on scrub margins.

### Series 7

- 3.3.5 Central sections of grassland near the Gas Holder were dominated by lichens and bryophytes, which formed a near-total cover on the ground layer, surmounted by

grasses and herbs in a low sward. The vegetation was once again homogeneous, with 9 species occurring in every quadrat. Species-richness was lower than in the marginal quadrats, at an average of 20.5 species per quadrat. Ellenberg values indicate that the sampled areas were slightly drier than in series 6, with infertile soils low in nitrogen.

- 3.3.6 Constancy tables for these quadrats are apt to mislead about bryophyte cover as the characteristic dense weft of Golden Feather-moss was replaced by a similar cover of Great Plait-moss (*Hypnum lacunosum*) in a single quadrat, so that neither species is found in all quadrats. However, total bryophyte cover was typically over 75%, and often higher. The lichen *Cladonia rangiformis* was also ubiquitous in high quantities. Aside from the alien grass Compact Brome, all other constant species were herbs, including Mouse-ear Hawkweed, Hawkweed Ox-tongue, Intermediate Evening-primrose, Hop Trefoil and Musk Thistle (*Carduus nutans*). Grasses were few, and mostly represented by annuals such as Squirreltail Fescue, Soft-brome and Early Hair-grass (*Aira praecox*). Annual herbs such as Beaked Hawk's-beard (*Crepis vesicaria*), Thyme-leaved Sandwort (*Arenaria serpyllifolia*), and those with desiccation-tolerance such as Biting Stonecrop (*Sedum acre*) and Buck's-horn Plantain (*Plantago coronopus*) were also prominent.

**Table 7: five 2x2 m quadrats of short lichen heath vegetation at Gas Holder**

Name	1	2	3	4	5	Freq.	Range
<i>Cladonia rangiformis</i> (a Reindeer-moss)	3	8	7	9	6	V	3-9
<i>Pilosella officinarum</i> (Mouse-ear-hawkweed)	6	6	6	4	6	V	4-6
<i>Picris hieracioides</i> (Hawkweed Oxtongue)	4	4	3	5	3	V	3-5
<i>Anisantha madritensis</i> (Compact Brome)	3	4	2	2	2	V	2-4
<i>Oenothera ×fallax</i> (Intermediate Evening-primrose)	3	1	2	2	1	V	1-3
<i>Trifolium campestre</i> (Hop Trefoil)	2	1	1	3	2	V	1-3
<i>Arenaria serpyllifolia</i> (Thyme-leaved Sandwort)	1	2	2	2	2	V	1-2
<i>Carduus nutans</i> (Musk Thistle)	2	1	1	1	1	V	1-2
<i>Crepis vesicaria</i> (Beaked Hawk's-beard)	2	1	1	1	1	V	1-2
<i>Homalothecium lutescens</i> (Golden Feather-moss)	9	-	7	9	8	IV	0-9
<i>Linaria vulgaris</i> (Common Toadflax)	3	2	-	1	4	IV	0-4
<i>Bromus hordeaceus</i> (Soft-brome)	2	1	1	-	3	IV	0-3
<i>Hieracium</i> sect. <i>Vulgata</i> (a Hawkweed)	-	3	3	1	1	IV	0-3
<i>Vulpia bromoides</i> (Squirreltail Fescue)	-	2	2	2	2	IV	0-2
<i>Rubus caesius</i> (Dewberry)	5	2	1	-	-	III	0-5
<i>Sedum acre</i> (Biting Stonecrop)	-	-	1	3	4	III	0-4
<i>Trifolium arvense</i> (Hare's-foot Clover)	-	1	-	2	4	III	0-4
<i>Cerastium fontanum</i> (Common Mouse-ear)	2	-	-	2	3	III	0-3

Name	1	2	3	4	5	Freq.	Range
<i>Plantago coronopus</i> (Buck's-horn Plantain)	3	-	2	3	-	III	0-3
<i>Peltigera</i> sp. (a Dog-lichen)	-	-	2	2	2	III	0-2
<i>Hypochaeris radicata</i> (Cat's-ear)	-	1	1	1	-	III	0-1
<i>Hypnum lacunosum</i> (Great Plait-moss)	-	9	7	-	-	II	0-9
<i>Aira praecox</i> (Early Hair-grass)	-	2	1	-	1	II	0-2
<i>Vicia sativa</i> (Common Vetch)	2	-	-	-	1	II	0-2
<i>Fragaria vesca</i> (Wild Strawberry)	-	-	4	-	-	I	0-4
<i>Centaurea erythraea</i> (Common Centaury)	-	-	3	-	-	I	0-3
<i>Holcus lanatus</i> (Yorkshire-fog)	2	-	-	-	-	I	0-2
<i>Ononis repens</i> (Common Restharrow)	-	-	2	-	-	I	0-2
<i>Trifolium scabrum</i> (Rough Clover)	2	-	-	-	-	I	0-2
<i>Erigeron</i> sp. (a Fleabane)	-	1	-	-	-	I	0-1
<i>Medicago lupulina</i> (Black Medick)	-	1	-	-	-	I	0-1
<i>Poa compressa</i> (Flattened Meadow-grass)	-	-	1	-	-	I	0-1
<i>Sonchus arvensis</i> (Perennial Sow-thistle)	1	-	-	-	-	I	0-1
<i>Verbascum thapsus</i> (Great Mullein)	1	-	-	-	-	I	0-1
Matching co-efficients: SD7 20.95; SD7d 20.95; SD7e 20.08; SD7a 18.66; U1f 18.03; SD7c 17.77; MC5d 16.58; MC5 16.37; U1 16.36; MC5c 15.48							

- 3.3.7 This series, despite high homogeneity, has very weak affinities with previously-described NVC communities, as might be expected due to its very particular nature. There is a 20.95% match for SD7 *Ammophila arenaria* - *Festuca rubra* semi-fixed dune community, but the two named constants of this vegetation type are absent.

## 3.4 Regen

### Series 8

- 3.4.1 This area to the north of the gas holder is approximately 1.5 ha in size and comprised of short, dry grassland with some small-scale succession to scrub. Soils are composed of pulverized fuel ash and clinkers, and compacted by occasional vehicle traffic. Plant growth is patchy in this area and quadrat recording concentrated on contiguous areas of short herb-rich swards. A walkover was conducted of grassland to the west and north, finding low-diversity grassland dominated by False Oat-grass.
- 3.4.2 The sampled areas were dry and quite compacted, with low soil fertility. They were nonetheless species-rich, with an average of 26.4 species per quadrat. Constant and abundant species were dominated by annual herbs and grasses such as Compact Brome, Early Hair-grass, Thyme-leaved Sandwort, Soft-brome and Fern-grass

(*Catapodium rigidum*). Bryophytes, including Golden Feather-moss, Lesser Bird's-claw Beard-moss (*Streblotrichum convolutum*) and Sand-hill Screw-moss (*Syntrichia ruraliformis*) were abundant forming a ground layer which typically covered over 50% of the substrate, but the lichen *Cladonia rangiformis* which was present in other similar habitats, was absent here. Tall herbs were largely absent, but rosette-forming biennials and perennials such as Hawkweed (*Hieracium* sect. *Vulgata*), Mouse-ear Hawkweed, Viper's-bugloss (*Echium vulgare*), Hawkweed Oxtongue and Common Century (*Centaureum erythraea*) were striking in their abundance.

**Table 8: five 2x2 m quadrats in disturbed short grassland at Regen**

Name	1	2	3	4	5	Freq.	Range
<i>Homalothecium lutescens</i> (Golden Feather-moss)	2	5	2	2	9	V	2-9
<i>Anisantha madritensis</i> (Compact Brome)	2	5	3	3	3	V	2-5
<i>Plantago lanceolata</i> (Ribwort Plantain)	4	4	4	2	5	V	2-5
<i>Aira praecox</i> (Early Hair-grass)	4	2	3	2	2	V	2-4
<i>Arenaria serpyllifolia</i> (Thyme-leaved Sandwort)	2	2	2	4	3	V	2-4
<i>Holcus lanatus</i> (Yorkshire-fog)	2	3	2	2	4	V	2-4
<i>Bromus hordeaceus</i> (Soft-brome)	2	2	4	2	1	V	1-4
<i>Catapodium rigidum</i> (Fern-grass)	1	2	4	3	2	V	1-4
<i>Dactylis glomerata</i> (Cock's-foot)	3	3	1	3	2	V	1-3
<i>Achillea millefolium</i> (Yarrow)	2	3	3	1	2	V	1-3
<i>Hieracium</i> sect. <i>Vulgata</i> (a Hawkweed)	3	3	3	1	1	V	1-3
<i>Streblotrichum convolutum</i> (Lesser Bird's-claw Beard-moss)	3	2	7	7	-	IV	0-7
<i>Festuca rubra</i> (Red Fescue)	6	2	3	2	-	IV	0-6
<i>Pilosella officinarum</i> (Mouse-ear-hawkweed)	5	2	2	-	5	IV	0-5
<i>Plantago coronopus</i> (Buck's-horn Plantain)	3	-	2	5	2	IV	0-5
<i>Pseudoscleropodium purum</i> (Neat Feather-moss)	2	5	1	-	1	IV	0-5
<i>Coincya monensis</i> ssp. <i>cheiranthos</i> (Wallflower Cabbage)	2	3	4	3	-	IV	0-4
<i>Trifolium arvense</i> (Hare's-foot Clover)	-	1	2	2	2	IV	0-2
<i>Sedum acre</i> (Biting Stonecrop)	-	-	6	6	4	III	0-6
<i>Syntrichia ruraliformis</i> (Sand-hill Screw-moss)	-	2	2	6	-	III	0-6
<i>Anthyllis vulneraria</i> (Kidney Vetch)	2	5	3	-	-	III	0-5
<i>Echium vulgare</i> (Viper's-bugloss)	-	5	-	2	2	III	0-5
<i>Cerastium fontanum</i> (Common Mouse-ear)	2	-	2	-	4	III	0-4



Name	1	2	3	4	5	Freq.	Range
<i>Picris hieracioides</i> (Hawkweed Oxtongue)	-	3	1	-	2	III	0-3
<i>Daucus carota</i> (Wild Carrot)	2	-	-	2	1	III	0-2
<i>Vulpia bromoides</i> (Squirreltail Fescue)	-	2	1	-	2	III	0-2
<i>Peltigera</i> sp. (a Dog-lichen)	-	-	4	5	-	II	0-5
<i>Euphrasia nemorosa</i> (Common Eyebright)	3	-	-	-	4	II	0-4
<i>Linaria vulgaris</i> (Common Toadflax)	-	3	2	-	-	II	0-3
<i>Oenothera ×fallax</i> (Intermediate Evening-	3	-	-	2	-	II	0-3
<i>Verbascum thapsus</i> (Great Mullein)	-	1	3	-	-	II	0-3
<i>Taraxacum</i> sect. <i>Taraxacum</i> (Common	1	-	-	1	-	II	0-1
<i>Vicia sativa</i> (Common Vetch)	1	1	-	-	-	II	0-1
<i>Rubus caesius</i> (Dewberry)	-	-	-	7	-	I	0-7
<i>Centaureum erythraea</i> (Common Centaury)	4	-	-	-	-	I	0-4
<i>Lotus corniculatus</i> (Common Bird's-foot-trefoil)	4	-	-	-	-	I	0-4
<i>Poa pratensis</i> (Smooth Meadow-grass)	-	-	-	-	3	I	0-3
<i>Arrhenatherum elatius</i> (False Oat-grass)	-	-	2	-	-	I	0-2
<i>Blackstonia perfoliata</i> (Yellow-wort)	1	-	-	-	-	I	0-1
<i>Cladonia rangiformis</i> (a Reindeer-moss)	-	-	1	-	-	I	0-1
<i>Hypochaeris radicata</i> (Cat's-ear)	-	-	1	-	-	I	0-1
<i>Medicago lupulina</i> (Black Medick)	-	1	-	-	-	I	0-1
<i>Rumex crispus</i> (Curled Dock)	-	-	1	-	-	I	0-1
<i>Sinapis arvensis</i> (Charlock)	-	1	-	-	-	I	0-1
Matching co-efficients: MC5d 32.40; SD8 30.78; SD7a 30.51; SD7 30.33; SD8a 30.24; MC5 29.60; SD7d 29.41; MC11 28.56; SD7e 28.26; SD8d 28.23							

3.4.3 Once again this area shows few affinities to any NVC community. Data analysis suggests weak similarities to the MC5d *Armeria maritima*-*Cerastium diffusum* maritime therophyte community, *Arenaria serpyllifolia* subcommunity (32.40%) of sea cliffs, but this is most probably an artefact of the high number of annuals found in the samples. SD8 *Festuca rubra* - *Galium verum* fixed dune grassland is another of the matches suggested (30.78%). This is a coastal vegetation community more commonly found further north, although outliers do exist in Wales. The high incidence of matches for vegetation communities of sand dunes is likely to simply reflect common attributes of the soil onsite, namely low fertility and free-draining.

## 3.5 Sand dunes

### Series 9

- 3.5.1 A 7.5 ha area of fixed dunes to the south of the site is approximately 50% forested, the rest being comprised of a variety of sand dune communities. Five 2x2 m quadrats were taken here but contiguous stands of vegetation were hard to find and the series as a whole lacks homogeneity.
- 3.5.2 The area is species-rich, with a total of 67 taxa recorded in all quadrats and an average of 22.4 in individual quadrats. It is characterized by dry, neutral, sandy soils of low fertility.
- 3.5.3 Only Sand Sedge was present in all quadrats, and only Biting Stonecrop and Buck's-horn Plantain were present in 4 of the 5 quadrats, demonstrating the disparate nature of these samples. Some of the westernmost quadrats had a more obvious maritime influence, with species such as Sea Spurge (*Euphorbia paralias*) and Sand Cat's-tail (*Phleum arenarium*), while others to the east had characteristic species of dune slacks such as Creeping Willow (*Salix repens*) and Dewberry (*Rubus caesius*).

**Table 9: five 2x2 m quadrats of vegetation in dune grassland west of Margam Moors**

Name	1	2	3	4	5	Freq.	Range
<i>Carex arenaria</i> (Sand Sedge)	3	1	3	2	5	V	0-5
<i>Sedum acre</i> (Biting Stonecrop)	3	5	-	1	2	IV	0-5
<i>Plantago coronopus</i> (Buck's-horn Plantain)	2	4	-	2	3	IV	0-4
<i>Hypnum lacunosum</i> (Great Plait-moss)	6	6	-	-	7	III	0-7
<i>Rubus caesius</i> (Dewberry)	5	-	7	2	-	III	0-7
<i>Lotus corniculatus</i> (Common Bird's-foot-trefoil)	4	5	4	-	-	III	0-5
<i>Centaureum erythraea</i> (Common Centaury)	2	5	-	1	-	III	0-5
<i>Ononis repens</i> (Common Restharrow)	3	1	-	5	-	III	0-5
<i>Arenaria serpyllifolia</i> (Thyme-leaved Sandwort)	2	3	-	-	3	III	0-3
<i>Erodium cicutarium</i> (Common Stork's-bill)	1	3	-	-	2	III	0-3
<i>Jacobaea vulgaris</i> (Common Ragwort)	1	3	-	2	-	III	0-3
<i>Luzula campestris</i> (Field Wood-rush)	1	-	-	2	1	III	0-2
<i>Pilosella officinarum</i> (Mouse-ear-hawkweed)	2	-	-	1	1	III	0-2
<i>Festuca rubra</i> (Red Fescue)	-	-	-	8	5	II	0-8
<i>Rosa spinosissima</i> (Burnet Rose)	-	-	-	8	3	II	0-8
<i>Cladonia rangiformis</i> (a 'Reindeer-moss' lichen)	-	7	-	-	6	II	0-7
<i>Homalothecium lutescens</i> (Golden Feather-moss)	-	-	-	4	5	II	0-5
<i>Agrostis stolonifera</i> (Creeping Bent)	-	2	4	-	-	II	0-4

Name	1	2	3	4	5	Freq.	Range
<i>Fragaria vesca</i> (Wild Strawberry)	4	-	1	-	-	II	0-4
<i>Erigeron</i> sp. (a Fleabane)	1	3	-	-	-	II	0-3
<i>Euphorbia paralias</i> (Sea Spurge)	3	2	-	-	-	II	0-3
<i>Geranium molle</i> (Dove's-foot Crane's-bill)	2	-	-	-	1	II	0-2
<i>Holcus lanatus</i> (Yorkshire-fog)	-	2	-	2	-	II	0-2
<i>Lysimachia arvensis</i> (Scarlet Pimpernel)	-	2	-	-	1	II	0-2
<i>Oenothera ×fallax</i> (Intermediate Evening-primrose)	2	-	-	-	2	II	0-2
<i>Peltigera</i> c.f. <i>membranacea</i> (a Dog-lichen)	-	2	-	-	2	II	0-2
<i>Vicia sativa</i> (Common Vetch)	-	-	2	2	-	II	0-2
<i>Cirsium arvense</i> (Creeping Thistle)	1	-	-	1	-	II	0-1
<i>Taraxacum</i> sect. <i>Taraxacum</i> (Common Dandelion)	1	-	-	-	-	I	0-1
<i>Euphrasia nemorosa</i> (Common Eyebright)	-	-	5	-	-	I	0-5
<i>Potentilla reptans</i> (Creeping Cinquefoil)	-	-	5	-	-	I	0-5
<i>Salix repens</i> (Creeping Willow)	-	-	5	-	-	I	0-5
<i>Echium vulgare</i> (Viper's-bugloss)	-	4	-	-	-	I	0-4
<i>Lathyrus pratensis</i> (Meadow Vetchling)	-	-	4	-	-	I	0-4
<i>Plantago lanceolata</i> (Ribwort Plantain)	-	-	-	4	-	I	0-4
<i>Aira praecox</i> (Early Hair-grass)	-	-	-	-	3	I	0-3
<i>Anacamptis pyramidalis</i> (Pyramidal Orchid)	-	-	-	3	-	I	0-3
<i>Carduus tenuiflorus</i> (Slender Thistle)	-	-	-	-	3	I	0-3
<i>Crepis capillaris</i> (Smooth Hawk's-beard)	-	-	-	-	3	I	0-3
<i>Poa compressa</i> (Flattened Meadow-grass)	-	-	-	3	-	I	0-3
<i>Sonchus arvensis</i> (Perennial Sow-thistle)	-	-	3	-	-	I	0-3
<i>Trifolium arvense</i> (Hare's-foot Clover)	-	-	-	-	3	I	0-3
<i>Vulpia bromoides</i> (Squirreltail Fescue)	-	3	-	-	-	I	0-3
<i>Carex hirta</i> (Hairy Sedge)	-	-	2	-	-	I	0-2
<i>Carex leporina</i> (Oval Sedge)	-	-	2	-	-	I	0-2
<i>Carex flacca</i> (Glaucous Sedge)	-	-	2	-	-	I	0-2
<i>Coincya monensis</i> ssp. <i>cheiranthos</i> (Wallflower Cabbage)	2	-	-	-	-	I	0-2
<i>Dactylis glomerata</i> (Cock's-foot)	-	-	-	-	2	I	0-2

Name	1	2	3	4	5	Freq.	Range
<i>Equisetum arvense</i> (Field Horsetail)	-	-	2	-	-	I	0-2
<i>Ervilia hirsuta</i> (Hairy Tare)	-	-	2	-	-	I	0-2
<i>Helminthotheca echioides</i> (Bristly Oxtongue)	-	2	-	-	-	I	0-2
<i>Linum catharticum</i> (Fairy Flax)	-	-	2	-	-	I	0-2
<i>Ophrys apifera</i> (Bee Orchid)	-	-	-	2	-	I	0-2
<i>Phleum arenarium</i> (Sand Cat's-tail)	2	-	-	-	-	I	0-2
<i>Poa pratensis</i> (Smooth Meadow-grass)	-	2	-	-	-	I	0-2
<i>Salix cinerea</i> ssp. <i>oleifera</i> (Rusty Willow)	-	-	2	-	-	I	0-2
<i>Trifolium pratense</i> (Red Clover)	-	-	2	-	-	I	0-2
<i>Verbascum thapsus</i> (Great Mullein)	-	2	-	-	-	I	0-2
<i>Veronica arvensis</i> (Wall Speedwell)	-	-	-	-	2	I	0-2
<i>Anthyllis vulneraria</i> (Kidney Vetch)	-	-	-	1	-	I	0-1
<i>Blackstonia perfoliata</i> (Yellow-wort)	-	-	1	-	-	I	0-1
<i>Crepis vesicaria</i> (Beaked Hawk's-beard)	-	-	-	1	-	I	0-1
<i>Medicago lupulina</i> (Black Medick)	-	-	-	1	-	I	0-1
<i>Poa annua</i> (Annual Meadow-grass)	-	-	-	-	1	I	0-1
<i>Ranunculus repens</i> (Creeping Buttercup)	-	-	1	-	-	I	0-1
<i>Rumex crispus</i> (Curled Dock)	-	-	1	-	-	I	0-1
<i>Sinapis arvensis</i> (Charlock)	-	1	-	-	-	I	0-1
Matching co-efficients: SD7 43.23; SD7c 40.51; SD8 38.59; SD7a 38.38; SD7d 38.01; SD16 37.04; SD7e 36.85; SD8a 35.73; SD16a 34.70; SD16b 33.01							

- 3.5.4 Surprisingly this series showed a fairly strong affinity with the SD7 *Ammophila arenaria* - *Festuca rubra* semi-fixed dune community (undifferentiated)(43.23%), SD7c - the same community in its *Ononis repens* community (40.51%) and the SD8 *Festuca rubra* - *Galium verum* fixed dune grassland community (38.59%).

## 4.0 DISCUSSION

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### 4.1 Value of habitats

- 4.1.1 While some of the habitats surveyed fit neatly into described NVC categories, others are less obliging, in particular within open mosaic sites. Early successional vegetation communities are often transitional in nature and NVC designations have generally only been afforded to those in which environmental factors has combined to create a degree of equilibrium, hindering further succession. Substrates such as pulverized fuel ash and settled railway ballast are too uncommon to merit NVC community status, but this should not detract from the value of the communities found there.
- 4.1.2 These are highly anthropogenic habitats, which lack long-term continuity and are highly atypical of textbook sites of importance to conservation. They are nevertheless important because of their large size (the southern fields in particular was over 25 ha in extent under the 2021/2022 survey area and now 11.55 ha in extent) and high floristic diversity, which provides nectar and pollen for pollinators as well as seeds and shelter for birds and mammals. They also provide a degree of connectivity with the wider countryside, and an important buffer to nearby designated sites.

#### Open mosaic habitats

- 4.1.3 Pea Field (series 1-3), Gas Holder (series 6 and 7) and Regen (series 8) are examples of open mosaic habitats on previously developed land, a priority habitat listed under Section 7 of the Environment (Wales) Act 2016. In these areas disturbance and stress (low nitrogen availability and desiccation) limit the dominance of competitive species enabling the development of herb-rich swards of considerable conservation value. This habitat type is defined by the presence of complex mosaics of microhabitats in which the following components of early-successional vegetation can be prominent: annuals; bryophytes; lichens; ruderals; inundation species; grasslands, and; heathlands. Therefore it can (and arguably should) look quite different from one site to another. The 6 series sampled differ in character, as exemplified by the legume-rich sward of series 6 which directly borders the annual and bryophyte-dominated short turf of series 7. Although confined to relatively small pockets onsite, these areas currently account for a large proportion of the overall site biodiversity, with 121 taxa recorded in quadrats during the survey.
- 4.1.4 Open mosaic habitats develop quickly (over years rather than decades), and can rapidly succeed to scrub in the absence of management. This process is already underway onsite, with Butterfly-bush (*Buddleja davidii*) and Sea Buckthorn (*Hippophae rhamnoides*) colonizing large areas. They can be managed for the benefit of nature conservation with few interventions, as the infertility and free-draining nature of the substrate means that mowing or grazing are not required, and disturbance is . While scrub is an important part of the mosaic, providing shelter and forage for a wide range of animals, it will eventually come to dominate the area if not controlled. Conservation management of these areas will therefore consist largely of thinning scrub on an 'as needed' basis, leaving plentiful islands and edges for exploitation by nesting birds and insects.

- 4.1.5 Development of these areas may be possible if their loss is offset by the creation of new areas of similar habitat.

### **Coastal and floodplain grazing marsh**

- 4.1.6 The Moors are currently ungrazed, making this habitat designation technically a misnomer, but in all other respects the area conforms to this priority habitat designation. CFGM habitats are grasslands in which groundwater remains close to the surface throughout the year. They are not necessarily botanically-rich but are recognized instead for their value to overwintering wildfowl and waders, as well as a range of invertebrates. The fields at the southern fields are unmanaged and have consequently developed a sward transitional between grassland and tall herb fen, with a good degree of diversity (58 species were recorded here in series 4 and 5). This area is also important as it provides an effective ecological buffer between the steelworks and neighbouring designated sites such as Margam Moors SSSI.
- 4.1.7 Ditch habitats were not accessible for survey, but the examples seen were so shaded as to make the presence of valuable communities of aquatic plants unlikely. Future management of this area should focus on restoration of these important linear habitats by means of scrub removal. Extensive grazing of the grasslands might be beneficial if the right balance of stocking can be achieved and the resources exist to install/repair stock proofing, but scrub encroachment is currently limited so this is not a priority. Instead, a late-summer cut of fields on three-year rotation, with removal of arisings, would help to prevent build-up in the litter layer and keep soil fertility low.

### **Dune grassland**

- 4.1.8 The southern area of dune grassland and coniferous woodland is in some ways analogous to nearby areas of open mosaic habitat, being rich in annuals and ephemerals by virtue of low nitrogen availability and low soil moisture. The area is fairly species-rich, with 72 taxa recorded. Dune grassland is afforded priority habitat status and listed under Section 7 of the Environment (Wales) Act 2016. In addition, it forms a valuable buffer to areas of high ecological value to the east and south.
- 4.1.9 As with open mosaic habitat, this habitat can be lost to scrub and woodland encroachment. It is also vulnerable to disturbance from vehicles. Conservation efforts should focus on limiting vehicle traffic and preventing scrub encroachment. As a highly limited resource, this is not usually a habitat that can be replaced by biodiversity offsetting, limiting the potential of this area for future development.

## **4.2 Value of species**

- 4.2.1 Despite the high value of the habitats surveyed, most species found onsite are common. Three notable species were identified during the surveys; all plants with 'Near Threatened' status on the IUCN GB Red List:
- Common Eyebright, a hemiparasitic herb found in habitats of low fertility. Populations of this plant were found in series 8 and 9 on open mosaic habitat and dune grassland. There has been a 30% decline in this plant's area of occupancy since 1930.



- Sand Cat's-tail (*Phleum arenarium*), a tiny annual grass of sand dunes, found in a single quadrat in series 9. It is estimated that 31% of the GB population of this plant is found in Wales. There has been a 27% decline in this plant's area of occupancy since 1930.
- Creeping Willow, a woody species of heaths and dune slacks, found in abundance in dune grassland at series 9, and in lesser amounts within the 'regen' area. There has been a 20% decline in this plant's area of occupancy since 1930.

4.2.2 These are all plants found in neighbouring designated sites, particularly at Kenfig NNR to the south. Their presence in the small area of dune grassland and within the 'regen' grassland of series 8 underlines the importance of these areas for conservation.

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# FIGURES

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**Figure 1** - NVC series and quadrats





- Legend:
- Site boundary
  - 2021/2022 survey area
  - NVC quadrat location

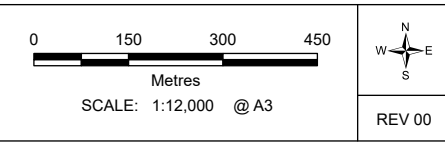


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TITLE: Figure 1:  
NVC survey locations





## APPENDIX A – PHOTOS



Photo 1: Pea Field - series 1; quadrat 1



Photo 2: Pea Field – series 2; quadrat 3



Photo 3: Pea Field – series 3; quadrat 5



Photo 4: Moors – series 4; quadrat 1



Photo 5: Moors – series 5; quadrat 1



Photo 6: Gas Holder – series 6; quadrat 3





Photo 7: Gas Holder – series 7; quadrat 1



Photo 8: Regen – series 8, quadrat 4



Photo 9: Dune grassland – series 9; quadrat 2



## APPENDIX B – SPECIES LIST

Plant species encountered during surveys are listed below by plant type and habitat in which they occurred. Records in brackets refer to species present which were not recorded in quadrats. 'NT' after a species denotes that the plant is listed as 'Near Threatened' on the IUCN GB Red List.

**Table B1. Vascular plant, bryophyte and lichen species recorded from Tata Steelworks and adjacent land on 8-10 June 2022.**

Species	Abundance by habitat		
	OMHoPDL	CFGM	Dune grassland
<b>a) Trees, shrubs and woody climbers</b>			
<i>Buddleja davidii</i> (Butterfly-bush)	(X)		
<i>Crataegus monogyna</i> (Hawthorn)	X	(X)	
<i>Hedera helix</i> s.l. (Ivy)			
<i>Hippophae rhamnoides</i> (Sea-buckthorn)	(X)		(X)
<i>Pinus nigra</i> (Black Pine)			(X)
<i>Prunus spinosa</i> (Blackthorn) seedling	X	(X)	
<i>Quercus robur</i> (Pedunculate Oak) seedling	X		
<i>Rosa canina</i> (Dog-rose)	X		
<i>Rosa spinosissima</i> (Burnet Rose)			X
<i>Rubus caesius</i> (Dewberry)	X	X	X
<i>Rubus fruticosus</i> agg. (Bramble)	X	(X)	
<i>Salix cinerea</i> ssp. <i>oleifera</i> (Rusty Willow)	(X)	(X)	X
<i>Salix repens</i> (Creeping Willow) NT	(X)		X
<i>Sambucus nigra</i> (Elder)	(X)	(X)	
<b>b) Grasses, sedges and rushes</b>			
<i>Aira praecox</i> (Early Hair-grass)	X		X
<i>Agrostis stolonifera</i> (Creeping Bent)	X	X	X
<i>Alopecurus pratensis</i> (Meadow Foxtail)	X	X	
<i>Anisantha madritensis</i> (Compact Brome)	X		
<i>Anisantha sterilis</i> (Barren Brome)	X		
<i>Anthoxanthum odoratum</i> (Sweet Vernal-grass)	X	X	
<i>Arrhenatherum elatius</i> (False Oat-grass)	X	X	
<i>Bromus hordeaceus</i> (Soft-brome)	X		
<i>Carex arenaria</i> (Sand Sedge)	X		X
<i>Carex flacca</i> (Glaucous Sedge)			X
<i>Carex hirta</i> (Hairy Sedge)	X	X	X
<i>Carex leporina</i> (Oval Sedge)		X	X
<i>Carex otrubae</i> (False Fox-sedge)		X	
<i>Carex nigra</i> (Common Sedge)		X	
<i>Carex riparia</i> (Greater Pond-sedge)		X	
<i>Catapodium rigidum</i> (Fern-grass)	X		
<i>Dactylis glomerata</i> (Cock's-foot)	X	X	X

Species	Abundance by habitat		
<i>Festuca ovina</i> (Sheep's-fescue)	X		X
<i>Festuca rubra</i> (Red Fescue)	X	X	X
<i>Holcus lanatus</i> (Yorkshire-fog)	X	X	X
<i>Juncus articulatus</i> (Jointed Rush)		X	
<i>Juncus effusus</i> (Soft-rush)		X	
<i>Juncus inflexus</i> (Hard Rush)		X	
<i>Lolium perenne</i> (Perennial Rye-grass)	(X)	(X)	
<i>Luzula campestris</i> (Field Wood-rush)			X
<i>Phleum arenarium</i> (Sand Cat's-tail) NT			X
<i>Phleum pratense</i> (Timothy)	X		
<i>Phragmites australis</i> (Common Reed)	X	X	
<i>Poa annua</i> (Annual Meadow-grass)			X
<i>Poa compressa</i> (Flattened Meadow-grass)	X		X
<i>Poa pratensis</i> (Smooth Meadow-grass)	X		X
<i>Poa trivialis</i> (Rough Meadow-grass)	X	X	
<i>Schedonorus arundinaceus</i> (Tall Fescue)		X	
<i>Schedonorus pratensis</i> (Meadow Fescue)		X	
<i>Trisetum flavescens</i> (Yellow Oat-grass)	X		
<i>Vulpia bromoides</i> (Squirreltail Fescue)	X		X
<b>c) Herbaceous species</b>			
<i>Achillea millefolium</i> (Yarrow)	X		
<i>Anacamptis pyramidalis</i> (Pyramidal Orchid)	(X)		X
<i>Anthyllis vulneraria</i> (Kidney Vetch)	X		X
<i>Arctium lappa</i> (Greater Burdock)	(X)		
<i>Arenaria serpyllifolia</i> (Thyme-leaved Sandwort)	X		X
<i>Artemisia vulgaris</i> (Mugwort)	X		
<i>Blackstonia perfoliata</i> (Yellow-wort)	X		X
<i>Calystegia sepium</i> (Hedge Bindweed)	(X)		
<i>Carduus nutans</i> (Musk Thistle)	X		
<i>Carduus tenuiflorus</i> (Slender Thistle)			X
<i>Centaurea debeauxii</i> (Chalk knapweed)	X	X	
<i>Centaureum erythraea</i> (Common Centaury)	X		X
<i>Cerastium fontanum</i> (Common Mouse-ear)	X		
<i>Cirsium arvense</i> (Creeping Thistle)		X	X
<i>Cirsium palustre</i> (Marsh Thistle)		X	
<i>Cirsium vulgare</i> (Spear Thistle)	X		
<i>Coincya monensis</i> ssp. <i>cheiranthos</i> (Wallflower Cabbage)	X		X
<i>Crepis capillaris</i> (Smooth Hawk's-beard)			X
<i>Crepis vesicaria</i> (Beaked Hawk's-beard)	X		X
<i>Daucus carota</i> (Wild Carrot)	X		
<i>Dipsacus fullonum</i> (Teasel)	X		
<i>Echium vulgare</i> (Viper's-bugloss)	X		X
<i>Epilobium hirsutum</i> (Great Willowherb)		X	
<i>Epilobium lanceolatum</i> (Spear-leaved Willowherb)		X	
<i>Erigeron</i> sp. (a Fleabane)	X		X

Species	Abundance by habitat		
<i>Erodium cicutarium</i> (Common Stork's-bill)	X		X
<i>Ervilia hirsuta</i> (Hairy Tare)	X		X
<i>Eupatorium cannabinum</i> (Hemp-agrimony)	X		
<i>Euphorbia paralias</i> (Sea Spurge)			X
<i>Euphrasia nemorosa</i> (Common Eyebright) NT	X		X
<i>Filipendula ulmaria</i> (Meadowsweet)		X	
<i>Fragaria vesca</i> (Wild Strawberry)	X		X
<i>Galium aparine</i> (Cleavers)	X	X	
<i>Galium palustre</i> (Common Marsh-bedstraw)		X	
<i>Geranium dissectum</i> (Cut-leaved Crane's-bill)	X		
<i>Geranium macrorrhizum</i> (Rock Crane's-bill)	X		
<i>Geranium molle</i> (Dove's-foot Crane's-bill)			X
<i>Geranium pyrenaicum</i> (Hedgerow Crane's-bill)	(X)		
<i>Geranium robertianum</i> (Herb-Robert)	X		
<i>Geum rivale</i> (Water Avens)		X	
<i>Geum urbanum</i> (Wood Avens)		X	
<i>Glechoma hederacea</i> (Ground-ivy)	X		
<i>Helminthotheca echioides</i> (Bristly Oxtongue)			X
<i>Heracleum sphondylium</i> (Hogweed)	X	X	
<i>Hieracium</i> sect. <i>Vulgata</i> (a Hawkweed)	X		
<i>Helminthotheca echioides</i> (Bristly Oxtongue)			X
<i>Hypericum perforatum</i> (Perforate St John's-wort)	X		
<i>Hypochaeris radicata</i> (Cat's-ear)	X		
<i>Iris pseudacorus</i> (Yellow Iris)	X	X	
<i>Jacobaea vulgaris</i> (Common Ragwort)	X		X
<i>Lathyrus pratensis</i> (Meadow Vetchling)		X	X
<i>Leucanthemum vulgare</i> (Oxeye Daisy)	X		
<i>Linaria vulgaris</i> (Common Toadflax)	X		
<i>Linum catharticum</i> (Fairy Flax)			X
<i>Lotus corniculatus</i> (Common Bird's-foot-trefoil)	X		X
<i>Lotus pedunculatus</i> (Greater Bird's-foot-trefoil)		X	
<i>Lysimachia arvensis</i> (Scarlet Pimpernel)			X
<i>Lythrum salicaria</i> (Purple-loosestrife)		X	
<i>Medicago lupulina</i> (Black Medick)	X		X
<i>Myosotis arvensis</i> (Field Forget-me-not)	X		
<i>Oenothera ×fallax</i> (Intermediate Evening-primrose)	X		X
<i>Ononis repens</i> (Common Restharrow)	X		X
<i>Orobanche minor</i> (Common Broomrape)	X		
<i>Ophrys apifera</i> (Bee Orchid)	X		X
<i>Pastinaca sativa</i> (Wild Parsnip)	X		
<i>Persicaria hydropiper</i> (Water-pepper)		X	
<i>Persicaria maculosa</i> (Redshank)		X	
<i>Picris hieracioides</i> (Hawkweed Oxtongue)	X		
<i>Pilosella officinarum</i> (Mouse-ear-hawkweed)	X		X
<i>Plantago coronopus</i> (Buck's-horn Plantain)	X		X

Species	Abundance by habitat		
<i>Plantago lanceolata</i> (Ribwort Plantain)	X		X
<i>Plantago major</i> (Greater Plantain)	X		
<i>Potentilla anserina</i> (Silverweed)		X	
<i>Potentilla erecta</i> (Tormentil)		(X)	
<i>Potentilla reptans</i> (Creeping Cinquefoil)			X
<i>Prunella vulgaris</i> (Selfheal)	X		
<i>Pulicaria dysenterica</i> (Common Fleabane)	X		
<i>Ranunculus acris</i> (Meadow Buttercup)		X	
<i>Ranunculus repens</i> (Creeping Buttercup)		X	X
<i>Reseda luteola</i> (Weld)	(X)		
<i>Rhinanthus minor</i> (Yellow-rattle)	(X)		
<i>Rumex acetosa</i> (Common Sorrel)	X	X	
<i>Rumex conglomeratus</i> (Clustered Dock)	X	X	
<i>Rumex crispus</i> (Curled Dock)	X	X	X
<i>Rumex hydrolapathum</i> (Water Dock)		(X)	
<i>Rumex obtusifolius</i> (Broad-leaved Dock)		X	
<i>Sedum acre</i> (Biting Stonecrop)	X		X
<i>Sedum album</i> (White Stonecrop)	X		
<i>Senecio inaequidens</i> (Narrow-leaved Ragwort)	X		
<i>Senecio squalidus</i> (Oxford Ragwort)	(X)		
<i>Sinapis arvensis</i> (Charlock)	X		X
<i>Solanum dulcamara</i> (Bittersweet)		X	
<i>Sonchus arvensis</i> (Perennial Sow-thistle)	X		X
<i>Sonchus asper</i> (Prickly Sow-thistle)	X		
<i>Taraxacum</i> sect. <i>Taraxacum</i> (Common Dandelion)	X		X
<i>Trifolium arvense</i> (Hare's-foot Clover)	X		X
<i>Trifolium campestre</i> (Hop Trefoil)	X		
<i>Trifolium dubium</i> (Lesser Trefoil)	X		
<i>Trifolium pratense</i> (Red Clover)			X
<i>Trifolium repens</i> (White Clover)	X		
<i>Trifolium scabrum</i> (Rough Clover)	X		
<i>Tripleurospermum inodorum</i> (Scentless Mayweed)	X		
<i>Urtica dioica</i> (Common Nettle)	X	X	
<i>Verbascum thapsus</i> (Great Mullein)	X		X
<i>Verbena officinalis</i> (Vervain)	X		
<i>Veronica arvensis</i> (Wall Speedwell)	X		X
<i>Vicia cracca</i> (Tufted Vetch)	X	X	
<i>Vicia sativa</i> (Common Vetch)	X	X	X
d) Ferns and horsetails			
<i>Equisetum arvense</i> (Field Horsetail)		X	X
<i>Equisetum palustre</i> (Marsh Horsetail)		X	
e) Bryophytes			
<i>Barbula unguiculata</i> (Bird's-claw Beard-moss)	X		
<i>Bryum c.f. caespiticum</i> (Tufted Thread-moss)	X		
<i>Calliergonella cuspidata</i> (Pointed Spear-moss)	X		

Species	Abundance by habitat		
<i>Homalothecium lutescens</i> (Golden Feather-moss)	X		X
<i>Hypnum lacunosum</i> (Great Plait-moss)	X		X
<i>Oxyrhygium speciosum</i> (Showy Feather-moss)		X	
<i>Pseudoscleropodium purum</i> (Neat Feather-moss)	X		
<i>Streblotrichum convolutum</i> (Lesser Bird's-claw Beard-moss)	X		
<i>Syntrichia ruraliformis</i> (Sand-hill Screw-moss)	X		
f) Other (e.g. lichens, stoneworts, algae)			
<i>Cladonia rangiformis</i> (a 'reindeer-moss' lichen)	X		X
<i>Peltigera</i> c.f. <i>membranacea</i> (a Dog-lichen)	X		X