Appendix 10F: River Corridor and Aquatic Invertebrate Survey Report

Eggborough CCGT

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Eggborough Power Limited

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Quality information

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1. Introduction

1.1 Background

This report details the findings of the River Corridor Survey (RCS) and other macrophyte (aquatic plant) and aquatic invertebrate surveys undertaken to inform the ecological impact assessment (EcIA) of the Proposed Development.

The terms of reference used in this report to describe the Proposed Development are consistent with those defined within the main chapters of the Environmental Statement (ES).

1.2 Scope of works

1.2.1 River Corridor Survey

A RCS was completed to better understand the existing morphology, and associated habitat conditions and macrophytes of the sections of the River Aire to be impacted by the Proposed Cooling Water Connections. This is necessary to both better understand the potential of the Proposed Development to impact the River and subsequent requirements for mitigation and risk management, and also to help interpret the results of the aquatic invertebrate and fish surveys (the latter reported separately in Appendix 10G in ES Volume III) in their correct habitat context.

1.2.2 Other Macrophyte Survey

Macrophyte data was collected for Ings and Tetherings Drain, which will be crossed by the Proposed Cooling Water Connections and the Proposed Gas Connection. The rationale for the survey was similar to that for the RCS, although the drain is unlikely to be of importance for fish and fish surveys were scoped out.

The lagoon within the existing power station was not subject to macrophyte survey. Sufficient information for this man-made reservoir was gathered as part of the Phase 1 Habitat survey.

1.2.3 Aquatic Invertebrate Survey

Aquatic invertebrate surveys were conducted on the River Aire, Ings and Tetherings Drain and the lagoon within the existing coal-fired power station to gather information on the invertebrate communities present and determine whether rare or notable species or communities are likely to be impacted by the Proposed Development. Aquatic invertebrates can also be used as indicators of water quality, and therefore the data gathered can also be used at a future data (if required) to monitor the ecological effects of the Proposed Development.

Hensall Dyke was not considered to provide suitable habitat for any rare or notable aquatic invertebrate species due to the general absence of macrophytes and the heavily shaded nature of the drain. Aquatic invertebrate surveys within this drain were therefore scoped out (Appendix 10C in ES Volume III).

2. Methods

2.1 River Corridor Survey

A RCS was undertaken by an experienced macrophyte surveyor and an assistant on 19th October 2016. The focus of the RCS was the section of the River Aire located between Haddlesey Bridge, where the existing cooling water abstraction point is located, and Goose Hill Reach, downstream of the existing cooling water discharge point. The timing of the survey coincided with the recommended survey period for RCS.

RCS is a standardised technique for the ecological survey and description of the habitats and associated physical characteristics of river corridors (National Rivers Authority, 1992). A river corridor comprises the river, its banks and land close by. The width of the corridor depends on how much the nearby land is affected by the river and vice versa.

RCS is typically undertaken over survey sections of 500 m length. As such, for the purpose of this survey four river sections were surveyed based on the position of the existing cooling water abstraction and discharge points. Survey sections were positioned so that one was upstream of and one downstream of both the cooling water abstraction and discharge points, in order to define the habitat context in these areas. This information can be used to assess the potential impacts of the Proposed Development on the River Aire habitat corridor.

The survey was undertaken from the south bank of the River Aire only, as this was the limit of land access for survey. However, the presence of a flood embankment afforded the surveyor a clear view over the land area on the north bank of the river.

A RCS map was produced for each 500 m survey section, recording and mapping the following:

- aquatic zone (plant communities, flow and current features, substrate/physical features);
- marginal zone (plant communities, substrate/physical features);
- bank zone (tree species, other plant communities, physical features); and
- adjacent land zone (habitat type, land use).

For aquatic, marginal and bank zones the visually dominant plant species were annotated onto the map. Plant names are abbreviated to the first letter of the genus followed by the first three letters of the species e.g. *Phalaris arundinacea* = Paru. Adjacent land zone features were recorded as per standard Phase 1 Habitat survey techniques (JNCC, 2010).

Critical areas that are potential constraints to the Proposed Development are highlighted on the RCS maps with an asterisk (*). These cover habitats that would be easily damaged or that are of low substitutability, as well as discrete stands of controlled weed species.

It was not possible for the surveyors to access the river channel due to the steep erosive river banks, and the depth of the river at this location. This meant water depths and channel profiles could not be determined. To compensate for the lack of access, a grapnel was used at approximately 20 m intervals to sample the channel. No macrophytes were detected so there is confidence that the river at this location is not suitable for submerged flora.

2.2 Other Macrophyte Survey

Ings and Tetherings Drain is too small and uniform for RCS to be an appropriate method, and the scale of the potential impact from the Proposed Development is more localised. Accordingly, a macrophyte survey was undertaken along the section of drain within the Site boundary to provide botanical data to supplement data gathered during the preceding Phase 1 Habitat survey (see Appendix 10C (Preliminary Ecological Appraisal Report) of ES Volume III.

The survey was undertaken on 19th October 2016 by the same macrophyte specialist and assistant who undertook the RCS survey. Water levels were suitable for survey and macrophyte vegetation was well developed.

Visual and grapnel survey was used to detect macrophytes. All of the macrophyte species observed were recorded, along with their relative abundance using the DAFOR scale. The DAFOR scale is:

- Dominant (>75% cover)
- Abundant (51-75% cover)
- Frequent (26-50% cover)
- Occasional (11-25% cover)
- Rare (1-10% cover)

2.3 Aquatic Invertebrate Survey

Aquatic invertebrate sampling of the River Aire, Ings and Tetherings Drain and the lagoon within the existing coal-fired power station was carried out on 29th and 30th November 2016 by two experienced AECOM freshwater ecologists.

The surveys followed the aquatic invertebrate sampling procedures standardised by the Environment Agency (Environment Agency, 2014), except for the lagoon which followed the Predictive System for Multimetrics (PSYM) protocols used for ponds (Pond Action, 2002) (see below for further details). These methods allow characterisation of aquatic invertebrate communities and can be used to determine whether rare or notable species or communities are present.

The samples collected were subsequently preserved in Industrial Methylated Spirits (IMS) for laboratory processing.

2.3.1 River Aire

The data collected from the River Corridor Survey helped to inform the methodology of the aquatic invertebrate survey for the River Aire. The uniform character and clay-dominated substrates provide similar physical and biological niche along the river, and therefore it will support a similar assemblage of invertebrates. Two samples were considered sufficient to determine the nature conservation value of this section of the River. Furthermore, due to the clay-dominated substrate, it was considered fine sediments within the water column would be widespread and sediment sensitive species would be limited. Therefore, baseline data downstream of the cooling water abstraction and discharge point was not considered necessary, as even if sediments were mobilised the consequences of this would be limited and unlikely to impact the ecology of the River.

Two aquatic invertebrate samples were taken, one centred on the cooling water abstraction point (SE 579 261) and one centred on the discharge location (SE 584 251). At the upstream cooling water abstraction point, the sample was collected from a boat using an Environment Agency approved ‘Yorkshire pattern’ airlift sampler. A standard airlift survey approach requires the use of three different sampling techniques (Environment Agency, 2014), as follows:

- transects across the river with the airlift sampler for four minutes, covering a representative range of the habitats present at the site;
- one minute sweep of marginal habitats (using a Freshwater Biological Association (FBA) pattern pond net (mesh size: 1 mm)); and
- one minute hand search, conducted for taxa that might have been missed using the other methods e.g. surface dwelling animals and taxa attached to larger substrate.

At the downstream cooling water discharge location, the airlift sampler was unsuitable due to the predominantly clay substrate, and as such a dredge sample was collected. This was taken by throwing a medium-weight naturalist dredge with 1 mm mesh net from the boat. Following the standardised sampling for a naturalists dredge, this survey approach required application of three different sampling techniques (Environment Agency, 2013) as set out below.

- the main channel was dredged by throwing the dredge and trawling across the channel. The number of trawls is not fixed, however it should be between three and five with the aim of obtaining a sample of similar size to other techniques. Three throws were sufficient to achieve this, at this Site;

- one minute sweep of marginal habitats (using a FBA pattern pond net (mesh size: 1 mm)); and
- one minute hand search.

2.3.2 Ings and Tetherings Drain

The aquatic invertebrate sample was taken with a standard FBA pattern pond net (mesh size: 1 mm) along a 50 m section of the Drain (Central Grid Reference: SE 582 250) coinciding with the alignment of the crossing for the Proposed Gas Connection. The habitats present were kick sampled for three minutes followed by a one-minute hand search of larger substrates in accordance with the methodology standardised by the Environment Agency (Environment Agency, 2014). Due to the uniformity of the channel only one invertebrate sample was considered necessary. Therefore, further samples were considered unlikely to add further information on the nature conservation value of the drain.

2.3.3 Lagoon

The lagoon (SE 581 242) was sampled using the PSYM method for aquatic invertebrates (Pond Action, 2002). This method is similar to the kick sampling method detailed above, however the three minutes are equally divided between the number of mesohabitats present at the site (e.g. open water, reed bed etc). This is also followed by a one-minute hand search.

2.3.4 Analysis of Aquatic Invertebrate Data

Each of the samples collected was sorted and analysed in a laboratory setting by suitably trained and experienced aquatic ecologists. Lists of the aquatic invertebrate taxa present were produced in line with Environment Agency guidance (Environment Agency, 2014). The aquatic invertebrate samples were identified to 'mixed taxon level' using stereo-microscopes. Most groups were identified to species level (where practicable), with the exception of the following:

- Chironomidae, which were identified to sub-family;
- Oligochaeta, which were identified to order;
- Ostracoda, which were identified to order; and
- immature or damaged specimens, which were identified to the maximum resolution possible on a case-by-case basis.

The conservation value of the different aquatic invertebrate species and communities was assessed using the Community Conservation Index (CCI) (Chadd & Extence, 2004). The CCI classifies many groups of freshwater invertebrates according to their scarcity and nature conservation value in England as understood at the time that the classification was developed. Species scores range from 1 to 10, with 1 being very common and 10 being endangered (see Table 2.1). In some cases, the references used in the CCI classification to define scarcity and value have since been superceded by more recent assessments (e.g. Wallace 1991; Daguet *et al*, 2008; Seddon *et al*. 2014; Wallace, 2016). The CCI cannot be modified to take account of such new information, but it has been considered when making the wider assessment of nature conservation value provided in this report.

Table 2.1. Conservation Scores from the Community Conservation Index

Conservation Score	Conservation Status
10	RDB1 (Endangered)
9	RDB2 (Vulnerable)
8	RDB3 (Rare)
7	Notable (but not RDB status)
6	Regionally notable
5	Local
4	Occasional (species not in categories 10-5, which occur in up to 10% of all samples from similar habitats)

Conservation Score	Conservation Status
3	Frequent (species not in categories 10-5, which occur in up to >10-25% of all samples from similar habitats)
2	Common (species not in categories 10-5, which occur in up to >25-50% of all samples from similar habitats)
1	Very common (species not in categories 10-5, which occur in up to >50-100 % of all samples from similar habitats)

The overall CCI derived provides an indication of the conservation value of the community sampled, based on a combination of the rarity of the different aquatic invertebrate species present and overall community richness, as shown on the Table 2.2 below. As indicated above, in some cases expert judgment may be needed to moderate these assessments with reference to current information on status and distribution.

Table 2.2. Community Conservation Index Interpretation Guidance (Chadd & Extence, 2004)

Community Conservation Index (CCI)	Expected conservation value
< 5	Low conservation value
5 to 10	Moderate conservation value
10 to 15	Fairly high conservation value
15 to 20	High conservation value
> 20	Very high conservation value

Further to the assessed nature conservation value of the waterbodies surveyed, calculations were made to assess the proportion of sediment sensitive macro-invertebrates present within the River Aire. This was undertaken using the Proportion of Sediment-sensitive Invertebrates (PSI) index (Extence *et al*., 2013). Using this approach, individual species of aquatic invertebrates are assigned a Fine Sediment Sensitivity Rating (FSSR) raging from A to D, as detailed in Annex A. The PSI score for an aquatic invertebrate sample is then derived from individual species scores and abundances.

The derived PSI score corresponds to the percentage of fine sediment-sensitive taxa present in a sample and ranges from 0 to 100, where low scores correspond to watercourses with high fine sediment cover. The PSI score therefore provides an indication of the extent to which the river bed is composed of, or covered by, fine sediments and therefore by inference the potential sensitivity of the associated aquatic invertebrate community to changes in silt load and deposition.

2.4 Survey Limitations

2.4.1 Macrophyte Surveys

There are no significant limitations to the work undertaken. The survey was undertaken during appropriate weather conditions and at an appropriate time of year.

The north bank of the River Aire was not accessible during the RCS. This is not a limitation as this bank was fully visible from the south bank. The steep banks on the north side of the River would have meant that the channel would have needed to be observed at distance, even if access had been possible to land on the north side of the River.

Land immediately downstream of the existing cooling water abstraction point on the River Aire was being developed for a hydro-electric scheme at the time of survey and access was not possible. This is not considered a limitation, as these construction works have disturbed land adjacent to the River such that the baseline habitat conditions have been removed i.e. the survey would have recorded the current disturbed state of the land present rather than the habitat conditions present, or likely to be present, both before the commencement of works and after the completion of works. The relevant section of the River was visible from land immediately upstream and downstream. As such, there can be confidence over the nature of the channel and its likely nature conservation interest, even though it was not possible to inspect this section of River at close quarters.

As stated in the methods, it was not possible to wade in the channel of the River Aire. This is not a limitation on the detection of aquatic flora, as a grapnel was used, but it does mean that water depths and the composition of river bed substrates are not known.

2.4.2 Aquatic Invertebrate Survey

There are no significant limitations to the work undertaken. The survey was undertaken within an optimal season for survey (autumn, defined as September to November for the purpose of aquatic invertebrate survey) and during good weather conditions.

Not all species that use waterbodies are present at all times of year and therefore some may be overlooked. In addition, the survey recorded species and conditions that could be identified at the time of the survey and other species that may be present at other times of year, sporadically and/or in low numbers may not have been recorded. Where juvenile or damaged specimens were collected, species level identification is not always possible. The implications of these limitations are limited as the favourable timing of the survey provided the best opportunity to collect a robust dataset suitable for the needs of the Proposed Development, and the approach taken is consistent with standard methods.

3. Results

3.1 River Corridor Survey

The RCS survey maps are provided in Annex B of this report, with the associated photographs (Photographs 1 to 6) included in Annex C.

The River Aire is very uniform in character across the four survey sections and is a typical example of a Group A Type IIc river (Holmes *et al*. 1999). Rivers of the AIIc type occur on clay-dominated substrates, have an impoverished flora that is often restricted to marginal species only, and that are often heavily managed. In the study area, regular tidal variation in water levels may also limit species diversity in the macrophyte community, as the tidal limit coincides with the weir at Chapel Haddlesey approximately midway between the intake and outfall locations. The steep banks which limit access for management and/ or grazing also limits botanical diversity, as such conditions tend to favour tall marginal species which in turn exclude the potential for a greater range of less competitive plant species to occur.

The characteristics of the River at the existing cooling water abstraction and discharge points are summarised below.

3.1.1 Description of the River Aire in the Vicinity of the Cooling Water Abstraction Point

The River Aire either side of the existing cooling water abstraction point (Photographs 1 and 2) is a partially embanked high level carrier river. Embankments are present along the south bank of the river and on the north bank downstream of Chapel Haddlesey. The section of north bank associated with the curtilage of the village is not embanked and instead gardens and small grassland fields run down to meet the river bank. The predominant land-use types to the south of the River are arable farmland and pasture.

Along most of this section, the River is in the order of 30 m wide, with banks rising approximately 5 m above water level. Water depth is not known but is likely to be several metres, and the water carries a high sediment load making it very turbid. The flow is generally slack, but there is a large weir downstream of the intake. Trees and shrubs are locally frequent on the river banks but cast negligible shade over the channel.

The faces of the river banks are generally dominated by a species-poor tall ruderal herb community comprising dominant common nettle (*Urtica dioica*), growing with frequent to abundant Russian comfrey (*Symphytum x uplandicum*), cow parsley (*Anthriscus sylvestris*), and Himalayan balsam (*Impatiens glandulifera)*. The last species is a controlled weed species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). Locally stands of shrubby willows occur, particularly osier (*Salix viminalis*). Rarely isolated trees of weeping willow (*Salix x sepulchralis*) and white poplar (*Populus alba*) occur and are of planted origin.

Only two macrophyte species were observed, both of which occurred at low incidence (less than 1% total cover) at the margins of the channel. These species were reed canary-grass (*Phalaris arundinacea*) and common water-starwort (*Callitriche stagnalis*).

3.1.2 Description of the River Aire in the Vicinity of the Discharge Point

The River Aire either side of the existing cooling water discharge point (Photographs 3 to 6) is permanently embanked on both sides and is a high level carrier river. To the south of the River the predominant land-uses are arable farmland and species-poor ley grassland. To the north of the River, the closest land (Boynton Reach, located within the flood embankment) is unmanaged tall ruderal herbs, and beyond this is arable farmland. The flood embankments support semi-improved grassland.

Along most of this section, the river channel is in the order of 25 to 30 m wide, with an embanked channel width of approximately 40 m. The flood embankments rise approximately 3 m above ground level, and the river banks rise 3 m above the summer water level. There is a 5 m wide toe between the top of the river bank and the base of the adjacent flood embankment.

The river banks are comprised of earth and are steep, and there is evidence of previous localised bank slumping and erosion. Water depth is not known but is likely to be several metres, and the water carries a high sediment load making it very turbid. The flow is entirely slack along the surveyed section. Shrubs of osier occur sparsely, typically as individual bushes, along the river banks and encroach a short distance into the channel. These shrubs cast negligible shade over the channel.

The faces of the river banks are generally dominated by a species-poor tall ruderal herb community comprising dominant common nettle, growing with frequent to abundant Russian comfrey, wild turnip (*Brassica rapa* ssp. *campestris*), cow parsley, broad-leaved dock (*Rumex obtusifolius*) and Himalayan balsam. The last species is a controlled weed species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). Two other Schedule 9 weed species occur locally. Downstream of the outfall there is a large stand (10 x 5 m) of Japanese knotweed (*Fallopia japonica*) on the southern river bank at SE 585 252. Giant hogweed (*Heracleum mantegazzianum*) occurs at scattered locations on the southern river bank and flood embankment, both immediately upstream and downstream of the outfall location. These locations coincide with grid references SE 584 251 and SE 283 251.

Only three macrophyte species were observed, all of which occurred at low incidence (less than 1% total cover) at the margins of the channel. These species were reed canary-grass, which is widespread, and water-pepper (*Persicaria hydropiper*) and common duckweed (*Lemna minor*), both of which were rare and only observed at single locations.

3.2 Other Macrophyte Survey

Ings and Tetherings Drain has a channel width of approximately 5 m, and a wetted width of approximately 2 m. The banks are approximately 1.5 m high and the wetted channel is up to 1 m deep, giving a channel depth of approximately 2.5 m. There is a relatively sharp transition from dry land to open deep water, and there is no visible flow.

East of the farm bridge crossing, the north bank is closely mown grassland and the south bank is dominated by tall ruderal herbs, predominantly common nettle, and locally abundant bramble (*Rubus fruticosus* agg.). These habitats are also present to the west of the farm bridge crossing, but the situation is reversed with grassland on the south bank, and tall ruderal herbs and bramble on the north bank.

The drain is densely and relatively uniformly vegetated throughout the survey section (Photographs 7 to 10) and, as confirmed during the preceding Phase 1 Habitat survey, along its wider extent.

Thirteen species of macrophyte were recorded along the survey section, as summarised in Table 3.1. No rare or notable species were recorded, and the assemblage present is considered typical of the habitat conditions. The assemblage is moderately diverse, but species diversity is limited by the abrupt transition from bank to main channel, and the drain lacks the transitional shallow water conditions required by many macrophytes.

The dominant macrophyte species is Nuttall's waterweed (*Elodea nuttallii*), which occupies most of the channel. Nuttall's waterweed is a controlled weed species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

The margins of the drain are dominated by stands of reed sweet-grass (*Glyceria maxima*), but branched bur-reed (*Sparganium erectum*) is also frequent.

Table 3.1. Macrophyte species recorded from Ings and Tetherings Drain

Common name	Scientific name	DAFOR rating
Branched bur-reed	*Sparganium erectum*	Frequent
Broad-leaved pondweed	*Potamogeton natans*	Locally occasional
Common duckweed	*Lemna minor*	Locally occasional
Common water-starwort	*Callitriche stagnalis*	Locally occasional
Curled pondweed	*Potamogeton crispus*	Rare
Green filamentous algae	-	Rare
Marsh bedstraw	*Galium palustre* ssp. *palustre*	Locally occasional
Meadowsweet	*Filipendula ulmaria*	Occasional
Nuttall's water-weed	*Elodea nuttallii*	Dominant
Reed canary-grass	*Phalaris arundinacea*	Locally occasional
Reed sweet-grass	*Glyceria maxima*	Abundant
Soft rush	*Juncus effusus*	Locally occasional
Water-plantain	*Alisma plantago-aquatica*	Rare

3.3 Aquatic Invertebrate Survey

The aquatic invertebrate species recorded from each of the sample sites is detailed in Annex D. This includes each species conservation score, FSSR score and the calculated CCI and PSI index for each of the samples.

3.3.1 River Aire – Cooling Water Abstraction Point

A moderate/high diversity of aquatic invertebrates was present at the cooling water abstraction point (NTAXA: 19). The CCI score calculated was 4.62, indicating that the river at this location is of low conservation value. All of the species recorded are of occasional to very common status. All of the species present are tolerant of fine sediments (PSI: 0). The aquatic invertebrate species recorded are typical of large silty rivers near the tidal limit and include crustaceans (*Gammarus zaddachi, Asellus aquaticus, Corophium curvispinum*), pea mussels (*Pisidium henslowanum, Sphaerium corneum*), non-biting midges (*Chironomini*) and worms (*Oligochaeta*). No protected, threatened, or priority species were recorded or are likely to occur based on the habitat conditions present (as defined by the River Corridor Survey).

3.3.2 River Aire – Cooling Water Discharge Point

The aquatic invertebrate diversity was poor (NTAXA: 10). The CCI score calculated was 12.50, indicating that the river at this location is of fairly high conservation value. The majority of the taxa present are of common and very common status, with the exception of a single individual of the snail *Bithynia leachii,* which is of local status (known from 101 to 300 hectads nationally). Recent information on the status of this snail establishes that it is not threatened and is still common and widespread in suitable habitats (Seddon *et al*., 2014). All of the species present are tolerant of fine sediments (PSI: 0). The aquatic invertebrate species recorded are typical of large silty rivers near the tidal limit and include crustaceans (*Gammarus zaddachi, Asellus aquaticus, Corophium curvispinum*), pea mussels (*Pisidium henslowanum, Sphaerium corneum*) and worms (*Oligochaeta*). No protected, threatened, or priority species were recorded or are likely to occur based on the habitat conditions present (as defined by the River Corridor Survey).

3.3.3 Ings and Tetherings Drain

A low diversity of aquatic invertebrates was present (NTAXA: 10). The CCI score calculated was 1.14, indicating that the Drain is of low conservation value. All of the species recorded are of common and very common status. The aquatic invertebrate community was dominated by the crustacean *Asellus*

aquaticus and worms (Oligochaeta). All of the remaining taxa recorded had abundances lower than 10. No protected, threatened, or priority species were recorded or are likely to occur based on the habitat conditions present (as defined by the River Corridor Survey).

3.3.4 Lagoon

The lagoon is a man-made reservoir constructed in the 1960s with a butyl liner (see Appendix 10C: Preliminary Ecological Appraisal in ES Volume III for further habitat information). The survey findings show that the lagoon was characterised by a moderate diversity of aquatic invertebrate species (19 taxa). The communities were dominated by groups typical of lakes and other still waterbodies. Invertebrates recorded included non-biting midges (*Chironomini, Tanypodinae*), crustaceans (*Asellus aquaticus*), snails (*Gyraulus laevis, Succinea putris*), mayflies (*Cloeon dipterum, Caenis horaria*) and damselflies (*Ischnura elegans*). Although this waterbody supports a moderately diverse invertebrate fauna, most of the taxa present are classified as common or very common. However, two species are present which are of local value (the caddisfly *Ecnomus tenellus* and dragonfly *Sympetrum sanguineum*) and one species which is regionally notable, the snail *Gyraulus laevis*. Further information on these species is provided in Table 4.2 below. Overall the lagoon is assessed as being of fairly high conservation value (CCI: 10.33).

Table 3.2. Summary of the notable species recorded (Conservation Scores > 6)

Species	Habitat and distribution	Current status
Smooth Ram's-horn snail (*Gyraulus laevis*)	This snail species is associated with shallow, slow flowing waters, rivers, lakes and ponds, usually found on weeds but sometimes on muddy bottoms and on stones. It has the ability to colonise new artificial habitats and can be found in gravel pits, reservoirs and fish ponds (Van Damme, 2012)	Nationally Scarce (found in 16 to 100 hectads nationally) (Seddon *et al*., 2014). Notable (Conservation Score 6) in the CCI system; no statutory protection. This species is not currently threatened in Great Britain, it is present in 70 hectads but is suffering from adverse habitat loss (Seddon *et al*., 2014).
Ecnomus tenellus	This caddisfly occurs in large slow flowing rivers, large ponds, canals and lakes (Wallace, 1991). It is present in England and Wales and its range may be expanding. The number of hectads where it has been recorded has increased from 40 prior to 1980 to 125 (1980 – 2014) (Wallace, 2016).	Least Concern (Wallace, 2016) Local (Conservation Score 5) in the CCI system; no statutory protection. Previous literature states that this species may have been overlooked, due to the larvae occurring at considerable depth (Wallace, 1991). This might explain the increase in the number of records since 1980.
Ruddy Darter (*Sympetrum sanguineum)*	This dragonfly breeds in permanent waterbodies, although it can exploit other areas if its preferred habitat is not available (Clausnitzer, 2009). It mainly has a southern distribution in the UK but it is increasing its range (British Dragonfly Society, 2017). Yorkshire is towards the northern limit of its geographic range, however it has been recorded in 27 sites across the county (Yorkshire Dragonfly Group, 2017)	Least Concern (Daguet *et al*, 2008) Local (Conservation Score 5) in the CCI system; no statutory protection.

4. Discussion

4.1 Habitat Quality – Macrophytes

4.1.1 River Aire

The RCS has confirmed the uniformity of the sections of the River Aire associated with the locations of the existing cooling water abstraction and discharge points. The River is constrained throughout by a combination of both high, steep banks and flood embankments. Consequently, the River is relatively uniform in both channel morphology and the associated habitat conditions, which are limited.

As a consequence of the limited habitat diversity and the constraints posed by the channel morphology, only four macrophyte species were recorded from the River, all of which occurred at very low cover values. No submerged macrophytes were found, and macrophytes were restricted to narrow, patchily distributed stands in the river margins. Such a limited macrophyte community is unlikely to be considered of nature conservation importance, and no rare or threatened macrophyte species were found. The community present is typical of lowland species-poor reaches located near the tidal limit.

There are no notable habitats or vegetation associated with land immediately adjacent to the River, which passes through a landscape that has been heavily modified for agriculture. The isolation of the river from its floodplain by flood embankments is also a factor in the relatively low habitat diversity associated with adjacent land.

4.1.2 Ings and Tetherings Drain

The Drain is dominated by macrophytes and supports a moderate species diversity. None of the macrophyte species present are rare or threatened, and instead all of the species present are typical of the habitat conditions present. The section of Drain within the Site is typical of the wider Drain, and therefore is not specifically notable on habitat or macrophyte grounds.

The dominant macrophyte species in the drain is the non-native Nuttall's waterweed. While this is undesirable, it does potentially contribute to the wider biodiversity value of the Drain for aquatic invertebrates and therefore it is not a factor to be given undue weight when assessing the relative nature conservation value of the Drain.

Based on considerations of habitat uniformity and the species present, the macrophyte community is considered to be of no greater than local nature conservation value. However, the final value assigned to the Drain should be made with reference to the findings of the aquatic invertebrate survey.

4.2 Controlled Weed Species

Three controlled weed species were recorded in association with the River Aire, and one from Ings and Tetherings Drain. These species will need to be addressed when planning and implementing the Proposed Development to ensure compliance with relevant legislation. The Wildlife and Countryside Act 1981 (as amended) makes it an offence to spread these species or to otherwise cause them to grow in the wild. The relevant controlled weed species are:

- Nuttall's waterweed – in Ings and Tetherings Drain;
- Himalayan balsam - ubiquitous along the banks of the River Aire, at both the existing cooling water abstraction and discharge points;
- Giant hogweed – present in the vicinity of the existing cooling water discharge point; and
- Japanese knotweed – located downstream of the existing cooling water discharge point, where it may be beyond the footprint of the proposed works.

While Japanese knotweed is not currently believed to be a constraint, it may have potential to cause problems in the future if it is allowed to establish further. This might include damage to structures, loss of land value, increased land management costs, and restrictions on land management and disposal of arising from land management.

In addition to the legal constraints posed by the above species, it should also be noted that giant hogweed represents a potential health and safety risk. The sap of giant hogweed can cause serious inflammation and blistering when it comes into contact with the skin.

An Invasive Species Management Plan (ISMP) will be required to guide the undertaking of works in accordance with relevant legislation. This should ideally include measures to treat and eradicate giant hogweed and Japanese knotweed from the Site and adjacent land.

Measures will also be needed to control and prevent the further spread of Nuttall's waterweed and Himalayan balsam, but complete eradication is unrealistic. These species are catchment level weed management problems and, regardless of measures taken on site, these species will continue to arrive and re-establish from upstream sources of propagules.

4.3 Habitat Quality - Aquatic Invertebrates

4.3.1 River Aire – Cooling Water Abstraction Point

The aquatic invertebrate survey found no notable species in association with this river reach. All of the aquatic invertebrate species recorded are common and typical of the habitats present. The River Corridor Survey has demonstrated that the River Aire is relatively uniform in morphology and has limited habitat structure and diversity upstream and downstream of the cooling water abstraction point. Therefore the aquatic invertebrate species recorded are unlikely to be habitat limited and can be expected to occur more widely along the River Aire. Given this, the aquatic invertebrate community present is considered to be of no more than local nature conservation value.

4.3.2 River Aire – Cooling Water Discharge Point

The aquatic invertebrate survey found no notable species in association with this river reach. All of the aquatic invertebrate species recorded are common and typical of the habitats present. This includes the snail *Bithynia leachii* which recent literature demonstrates is still common and widespread in suitable habitats (Seddon et al., 2014). The River Corridor Survey has demonstrated that the River Aire is relatively uniform in morphology and has limited habitat structure and diversity upstream and downstream of the cooling water discharge point. Therefore the aquatic invertebrate species recorded are unlikely to be habitat limited and can be expected to occur more widely along the River Aire. Given this, the aquatic invertebrate community present is considered to be of no more than local nature conservation value.

4.3.3 Ings and Tetherings Drain

The aquatic invertebrate survey found no notable species in association with the Drain. All the species recorded are common within this habitat, none are rare, threatened or legally protected. The drain is uniform in nature and is dominated by Nuttall's waterweed which provides limited niches for aquatic invertebrate species to exploit. Therefore the community is likely to be similar in composition along the length of the watercourse and is not considered more than of local nature conservation value.

4.3.4 Lagoon

The majority of the aquatic invertebrate species recorded are common and typical of the habitats present and therefore the general assemblage is of local value. However there are three species of note present:

- *Gyraulus laevis* – This Nationally Scarce species is found within 70 hectads, which is towards the upper end of this this category (the definition is a species which occurs between 16 and 100 hectads). Although habitat loss appears to be the main factor in its decline, it occurs in a range of habitats and is able colonise new artificial habitats. As such this population is assessed to be to be of local value.
- *Ecnomus tenellus* – This caddisfly is either expanding its range or has been unrecorded previously (or a combination of both factors). This species is not threatened and can occur in a range of habitats and the CCI is judged to inflate the rarity of this species. As such, the population present is assessed to be no more than local nature conservation value.

- *Sympetrum sanguineum* – Yorkshire is towards the northern limit of this damselfly species geographic range but it is currently expanding further north. The limiting factor to this species distribution appears to be related to climate and not habitat. It is able to exploit a wide range of habitats and records are present across a range of sites in Yorkshire. This species is likely to become more common through the impacts of climate change in Britain and as such this population is assessed to be no more than local nature conservation value.

The lagoon does not meet the SINC criteria for either the aquatic invertebrate assemblage or species present.

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Annex A: Proportion of Sediment-sensitive Invertebrates (PSI) Methodology

The Proportion of Sediment-sensitive Invertebrates (PSI) index allows an assessment of the extent to which the river bed is composed of, or covered by, fine sediments. This follows the method stated in Extence *et al*., 2013. Under this system, individual species of aquatic invertebrates are assigned a Fine Sediment Sensitivity Rating (FSSR) as detailed in Table A1, and abundance rating based on LIFE scores as detailed in Table A2. The PSI score for the aquatic invertebrate sample is then derived from the individual species scores and abundances, as detailed in Table A3. The PSI score corresponds to the percentage of fine sediment-sensitive taxa present in a sample and ranges from from 0 to 100, with low scores corresponding to waterbodies with high fine sediment cover.

Table A1 Fine Sediment Sensitivity Rating (FSSR) groups used to derive PSI scores

FSSR group	Description
A	Highly sensitive
B	Moderately insensitive
C	Moderately insensitive
D	Highly insensitive

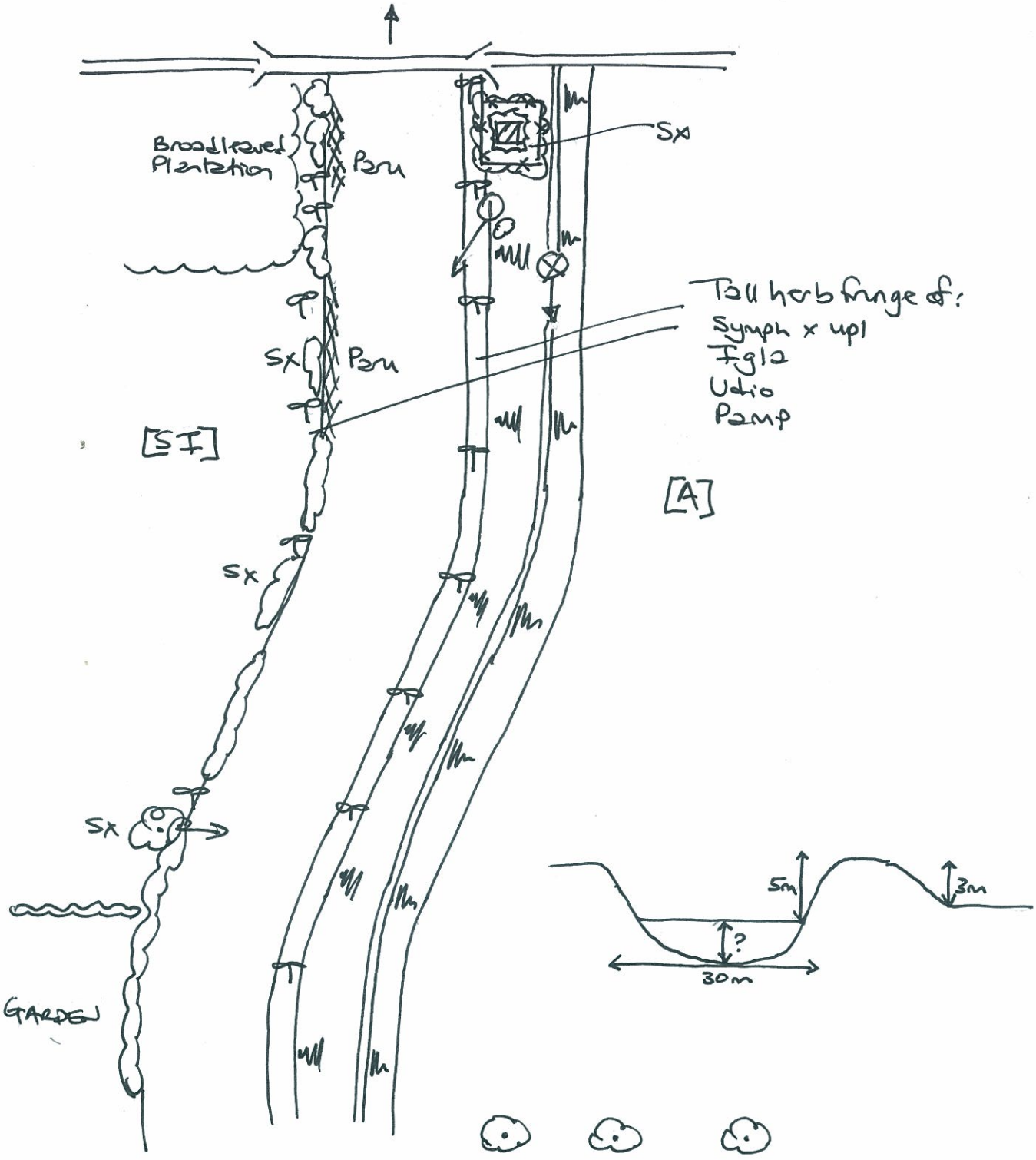
Table A2 Abundance categories used to derive LIFE scores

FSSR group	Abundance			
	1-9	**10-99**	**100-999**	**>999**
A	2	3	4	5
B	1	2	3	4
C	1	2	3	4
D	2	3	4	5

Table A3 Interpretation of PSI scores

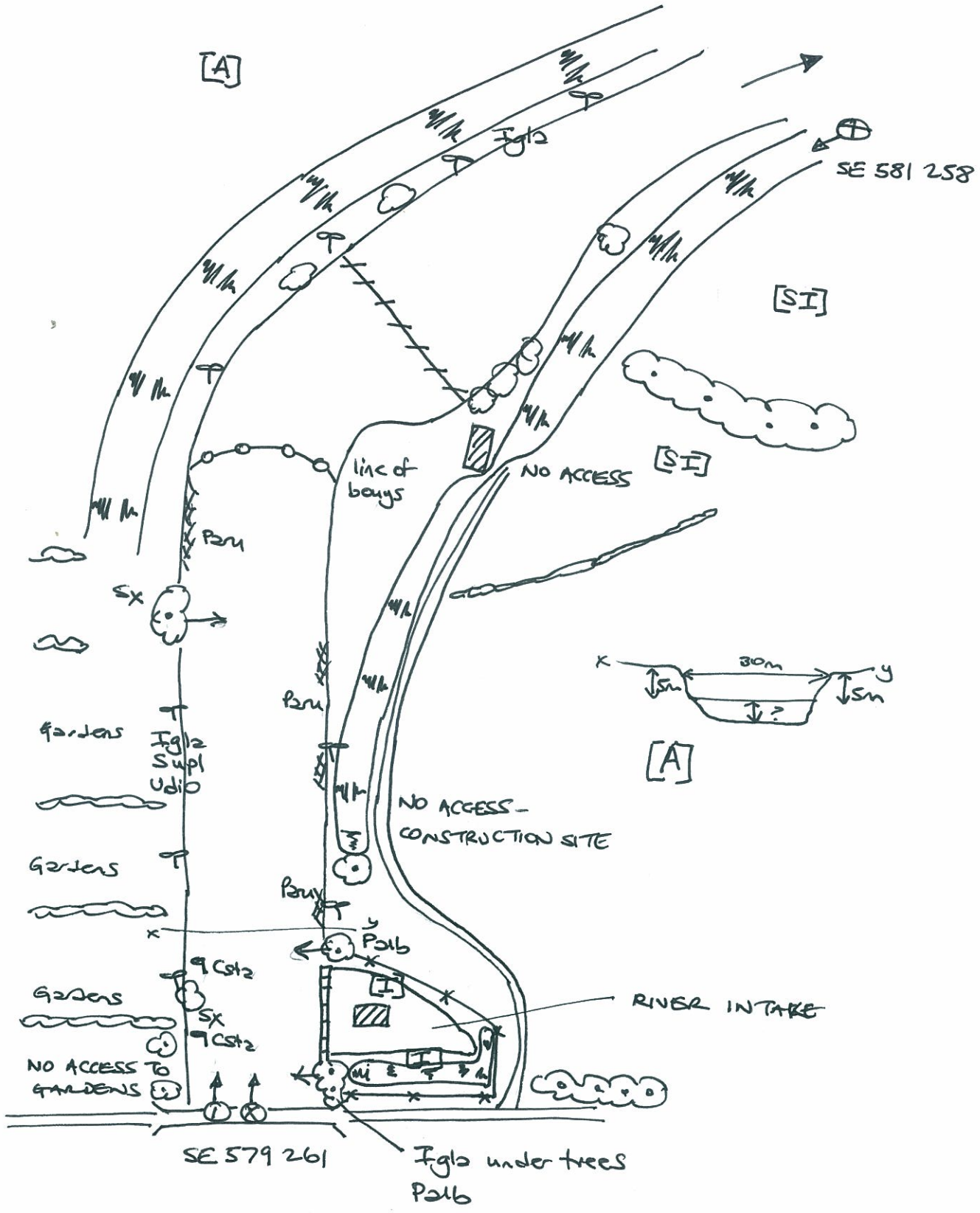
PSI	Description
81-100	Minimally sedimented
61-80	Slightly sedimented
41-60	Moderately sedimented
21-40	Sedimented
0-20	Heavily sedimented

Annex B: River Corridor Survey Maps and Symbology

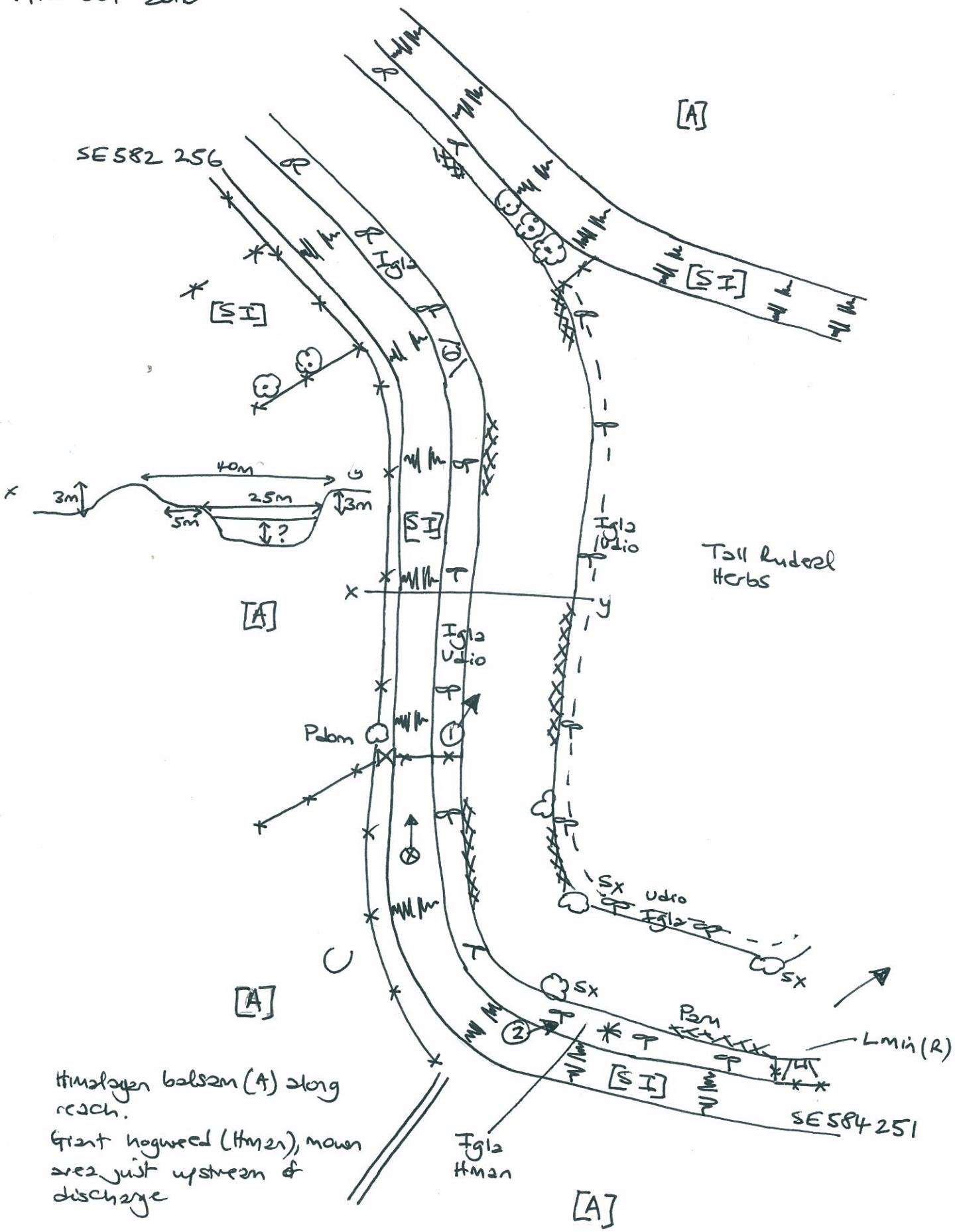


River Aire, Eggborough
u/s of intake
19th Oct 2016

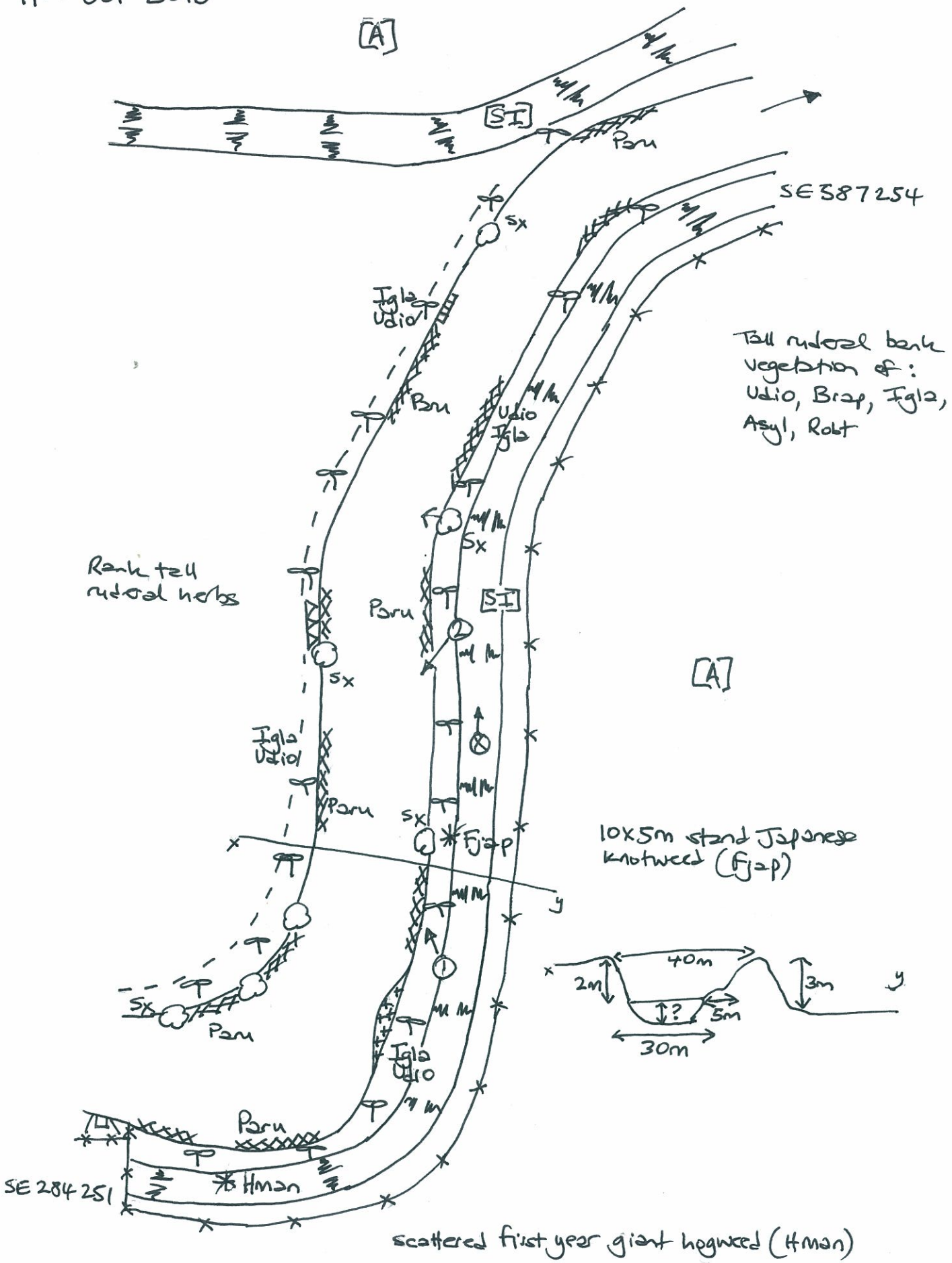
River Aire, Eggborough
d/s of intake
19th Oct 2016



River Aire, Eggborough
u/s of discharge
19th Oct 2016



River Aire, Eggborough
d/s discharge
19th Oct 2016



Annex C: Photographs

Photograph 1 – Upstream of existing cooling water abstraction point on River Aire

Photograph 2 – Downstream of existing cooling water abstraction point on River Aire

Photograph 3 – Upstream of existing cooling water discharge point on River Aire, looking upstream

Photograph 4 – Upstream of existing cooling water discharge point on River Aire, looking downstream

Photograph 5 – Downstream of existing cooling water discharge point on River Aire, looking downstream

Photograph 6 – Downstream of existing cooling water discharge point on River Aire, looking upstream

Photograph 7 – Ings and Tetherings Drain, east of farm bridge crossing

Photograph 8 – Ings and Tetherings Drain, east of farm bridge crossing

Photograph 9 – Ings and Tetherings Drain, west of farm bridge crossing

Photograph 10 – Ings and Tetherings Drain, west of farm bridge crossing

Annex D: Aquatic Invertebrate Species Data Table

			River Aire			
Taxa	Conservation Score	FSSR Score	Lagoon	Ditch	Upstream Abstraction Point	Downstream Discharge Point
Corophium curvispinum	3	D			1	5
Crangonyx pseudogracilis	1	D	8			
Gammarus pulex	1	B	2			
Gammarus zaddachi	1	D			43	45
Pisidium henslowanum	4	C			13	33
Pisidium subtruncatum	1	D		5		
Sphaerium corneum	1	D			7	2
Chironomini	N/A	N/A	43		54	3
Tanypodinae	N/A	N/A	1	1		13
Baetis *sp.*	N/A	A	1	1		
Cloeon dipterum	1	D	23		1	
Caenis horaria	1	D	6			
Bithynia leachii	5	D				1
Bithynia tentaculata	1	D			6	
Potamopyrgus antipodarum	1	C			3	
Lymnaea stagnalis	1	D			1	
Physa fontinalis	1	D			8	
Anisus vortex	1	D		1		
Gyraulus laevis	6	D	38			
Succinea putris	1	N/A	6			
Corixidae	N/A	D				1

Sigara dorsalis	1	D	5			
Erpobdella octoculata	1	C	1	7		
Glossiphonia complanata	1	C		1		
Helobdella stagnalis	1	C			1	
Asellus aquaticus	1	D	155	110	160	15
Coenagrion puella	2	N/A		3		
Ischnura elegans	1	N/A	13		6	
Coenagrionidae	N/A	D			10	
Sympetrum sanguineum	5	C	1			
Oligochaeta	N/A	D	1	19	250	35
Ostracoda	N/A	N/A			1	
Hypania invalida	N/A	N/A			8	
Ecnomus tenellus	5	C	9			
Limnephilus lunatus	1	C	1			
Plectrocnemia conspersa	2	B	8			
Lype reducta	3	N/A			1	
Dugesia tigrina	3	D	3			
Polycelis nigra/tenuis	1 \ 1	D		1		
CCI			10.33	1.14	4.62	12.5
PSI			14.29	11.8	0	0
NTAXA			19	10	18	10

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