Appendix A.8.20

Results of the Aquatic Habitat Surveys

A.8.20

Aquatic Habitats – Habitat Descriptions and Species Lists

The results of the aquatic habitat surveys are described below with reference to the following locations: Lough Inch, Ballindooley Lough, Coolagh Lakes, the River Corrib from Tonacurragh to Menlo Castle, the River Corrib main channel, from Menlo Castle to the Salmon Weir, the River Corrib Backwater on the east side of Jordan's Island, the River Corrib and Canals south of the Salmon Weir, and the Terryland River.

The habitat classifications attributed to waterbodies described below have been incorporated into the habitat survey results figures (see **Figures 8.14.1** to **8.14.14** and **Figures 8.15.1** to **8.15.14)**. Aquatic plant species recorded in each of the survey sites described below are provided in **Table 1** – the references to the survey sites listed in that table are given below in parenthesis for each of the survey locations.

Lough Inch (Site 1)

This lake, of about 25ha, lies to the west of Galway City on granite bedrock. The maximum depth recorded was less than 4m. Water transparency was good with plant growth occurring throughout the lake bottom. Shallow water contained a community *of Isoetes lacustris*, *Lobelia dortmanna* and *Littorella uniflora* as well as *Eriocaulon aquaticum*. At greater depth (2m), *Isoetes lacustris* and *Chara virgata* occurred. Below 3m, large areas of the charophyte *Nitella translucens* were found along with occasional patches of *Nitella confervacea* and *Elatine hexandra*. The presence of these species indicated that the lake corresponded with the Annex I habitats [3110] *Oligotrophic waters containing very few minerals of sandy plains* and [3130] *Oligotrophic to mesotrophic standing waters with vegetation of the Littorelleta uniflorae and/or of the Isoeto-Nanojuncetea*. This corresponded with the Fossitt (2000) classification of FL2 Oligotrophic lakes.

An unusual community *of Chara virgata, Potamogeton crispus, Potamogeton pectinatus*, and occasional *Nitella flexilis*, covered large areas in the centre of the lake. *Potamogeton crispus* and *Potamogeton pectinatus* are usually indicative of more eutrophic conditions. In addition, much fouling by algae, including *Cladophora* and diatoms, was noted. Other species noted were *Potamogeton berchtoldii*, *Juncus bulbosus*, and *Myriophyllum alterniflorum.*

The lake corresponded with two Annex I habitats [3110 and 3130] but these may have been negatively influenced by nutrient input. In addition, a number of aquatic plants known from Connemara, such as *Eriocaulon aquaticum* and *Elatine hexandra*, reach their eastern limit in this lake. The charophyte *Nitella confervacea* was recorded at Lough Inch. This species is rarely recorded in Irish lakes but this may be due its small size and, as a result, the species being under recorded.

Ballindooley Lough (Sites 12 to 14)

This small lake lies to the north-east of Galway City. It was surrounded by fen and reed bed vegetation with stands of *Cladium mariscus*, *Phragmites australis*, and *Schoenoplectus lacustris*. Several large drains or ditches cut into fen peat drained

into the lough. A large area of marl occurred at the north-eastern end while deeper water was present at the southern end. The shore line shelved very rapidly in the southern part of the lake. The sub-littoral vegetation was dominated by charophyte algae. *Chara rudis* was exceptionally abundant from 0-3m with some other species occurring in very shallow water including *Chara aspera*, *Chara aculeolata* and *Chara curta*. Flowering plants were rare, as is often the case in marl lakes, with only *Elodea canadensis* and *Urticularia* cf. *vulgaris* observed.

Most of the lake was deeper than the euphotic depth of about 4m and no plants were found. The marl area in the north east may contain additional species but could not be examined in detail as it was too exposed for snorkelling (due to low water) and was too liquid to allow wading.

The lake was classified as the Annex I habitat 3140 *hard oligo-mesotrophic waters with benthic vegetation of charophytes* (FL4 under the Fossitt classification). The complete dominance of *Chara rudis* however, probably indicates some degree of eutrophication. The rather turbid lake water would support this conclusion.

Some of the drainage ditches (FW4 under the Fossitt classification) were also examined. The ditches appeared to be regularly dredged and contained a limited flora of *Chara virgata*, *Chara aspera*, *Chara aculeolata*, *Chara rudis*, *Potamogeton coloratus* and *Lemna trisulca*. They did not correspond to any Annex I habitat type.

In addition to the main lake, two further small water bodies were present at this site. The southernmost pool (531244 728619 ITM) was shallow with a sublittoral flora of *Elodea canadensis*, *Lemna trisulca* and *Fontinalis antipyretica*. Floating species included *Nymphaea alba*. The abundance *of Lemna* and *Elodea* indicated a eutrophic pond (Fossitt classification FL5**)**. The smaller circular pond (531194 728778 ITM) had floating species present including *Potamogeton natans, Nymphaea alba* and *Sparganium natans*. Sublittoral species included abundant *Chara virgata* and *Urticularia* cf. *vulgaris*. This pond was classified as a mesotrophic water body under the Fossitt classification (FL4).

Ballindooley Lough was the site of an old record for the rare charophyte *Nitella tenuissima*. At present the species is known from the Burren, in Co. Clare and some sections of the Grand Canal (near Edenderry, Co. Offaly). Its most likely habitat would be the drainage ditches leading into the lough but it was not found there during these surveys.

Coolagh Lakes (Sites 6 and 7)

The open areas of deep water in the Coolagh Lakes appear to be the remnants of a large open water area shown in 19th century maps. All lakes were surrounded by dense beds of *Cladium mariscus* and *Phragmites australis*, whose spread appeared limited only by the depth of the remaining open water (>5m). As the lake bed sloped rapidly there was comparatively little ground for aquatic macrophytes. Like Ballindooley Lough, the Coolagh Lakes was a calcareous site with large areas of fen peat and no outcropping rock. In both lakes *Chara hispida* and *Chara rudis* were very abundant from the surface to 4m depth.

The upper lake contained some flowering plants including *Hippuris vulgaris*, *Myriophyllum spicatum*, *Nuphar lutea* and *Elodea Canadensis* (which grew at the

base of the euphotic zone at about 4m, as did some *Lemna trisulca*). However, *Chara rudis* or *Chara hispida* dominated most of the euphotic zone.

The lower lake also contained large stands of *Chara hispida* and *Carex rudis*, but flowering plants were more abundant with *Lemna trisulca* forming a zone at the base of the euphotic zone (4m) and *Elodea canadensis* intermixed with the *Chara* species. Other species included *Potamogeton lucens*, *Sparganium* sp., *Myriophyllum spicatum* and *Urticularia* cf. *vulgaris*. Two other species of charophyte, *Chara contraria* and *Chara vulgaris* occurred in small quantities.

The lakes correspond to the Annex I habitat [3140] *Hard oligo- mesotrophic waters with benthic vegetation of charophytes*, and the FL3 Fossitt classification. The lower lake however, was considered the borderline eutrophic type under the Fossitt classification (FL5), due to the increased presence of *Elodea canadensis* and *Lemna trisulca*. A strong case could be made that the area has changed greatly due to eutrophication and was not an exceptional example of the habitat type. The presence of Zebra mussels *Dreissena polymorpha* also degrades the habitat value.

The channel linking the Coolagh Lakes to the main channel of the River Corrib was thought to probably be maintained by cutting. It was fringed by very dense stands of *Phragmites australis* and *Cladium mariscus*. It was up to 1m deep with *Nuphar lutea, Menyanthes trifoliata, Elodea canadensis, Chara rudis* and *Lemna trisulca* growing in the channel. *Ranunculus lingua* was conspicuous in the reed swamp on the channel edge. This habitat was classified as a drainage ditch under the Fossitt classification (FW4).

River Corrib from Tonacurragh to Menlo Castle (Sites 2, 3 and 4)

This section of the river had a low flow rate (in summer) and had characteristics resembling a hard water lake. Vegetation was determined by sampling transects along the river. The vegetation was dominated by charophyte algae in many places, especially *Chara rudis.*

In the upper river near the junction of the Friar's Cut, the shore included backwaters dominated by reed swamp and open water with *Chara curta*, *Chara virgate annulata* and cyanobacterial crust on stones, as on the shore of Lough Corrib and other calcareous lakes. In deeper water (1m) *Chara rudis* was dominant with emergent vegetation including *Schoenoplectus lacustris* and *Phragmites australis*. *Chara rudis* extended to 2m depth along with *Zannichella palustris, Potamogeton lucens*, a little *Potamogeton crispus* and *Myriophyllum spicatum*, while *Chara globularis* extended to 3m along with some *Nuphar lutea* and abundant Zebra mussels. At this depth a white, shelly marl replaces the dark peat and mud of shallower water. In the main channel the river shelves very steeply and *Potamogeton perfoliatus* occurred.

Midway between the Friars cut and Menlo Pier the river was divided by a long narrow bank vegetated with swamp (527715 728520 ITM) with species present including *Eleocharis palustris, Hippuris vulgaris, Lythrum salicaria, Ranunculus*

flammula, Valeriana officinalis, Iris pseudacorus, Schoenoplectus lacustris, Sparganium sp., *Menyanthes trifoliata, Calystegia sepium* and *Myosotis laxa*.[1]

The shallower western channel, to a depth of 2m, contained reed swamp followed by *Chara virgata annulata*, *Lemna trisulca*, *Elodea canadensis* and *Nuphar lutea* in 1m depth water, and *Potamogeton perfoliatus* beds at 2m. In places, bare areas of mud were colonized *by Nitella opaca*. The main channel shelved very steeply with *Potamogeton perfoliatus*, *Lemna trisulca*, and *Elodea canadensis*, followed by bare ground with Zebra mussels.

On the east bank *Chara rudis* was dominant with some *Potamogeton berchtoldii*, *Lemna trisulca* and *Elodea canadensis*.

Below Menlo Pier the river narrowed and deepened with little vegetation other than *Potamogeton perfoliatus* and *Potamogeton natans* along with some *Chara rudis* in shallow water close to the bank.

The depth of the river varies greatly, with many shallow inshore areas, but the main channel was cut into white marl which exceeded 8m depth in places. Vegetation was largely confined to water less than 4m, but Zebra mussels occurred deeper than this. A variety of flowering plants occurred, especially pond weeds (*Potamogeton* sp.). Nearly all shallow areas of any extent were occupied by *Schoenoplectus* and *Phragmites* reed swamp.

As the area is technically a river, it was classified as a depositing lowland river under the Fossitt classification (FW2) and does not correspond with any Annex I habitat type. Parts at least might equally be viewed as a southern extension of Lough Corrib, in which case it would be classified as the Annex I habitat [3140] *Hard oligo- mesotrophic waters with benthic vegetation of charophytes* and lake type FL4 in the Fossitt classification.

River Corrib main channel, from Menlo Castle to the Salmon Weir (Sites 5 and 9)

In this section the river flow was stronger and river vegetation largely confined to shallows along the banks. Vegetation was only found in depths of <2 m and as largely either reed swamp of *Phragmites australis* or *Equisetum fluviatile*, with some stands of *Potamogeton natans* and *Carex rostrata. Chara rudis* and some *Chara virgata* were common in the shallow sublittoral. Species composition was similar but less diverse than the upstream section and the main channel was classified as a depositing lowland river (FW2 under the Fossitt classification), and did not correspond with any Annex I habitat type.

Backwater on the east side of Jordan's Island (Site 8)

This section consisted of small pools and channels cut through extensive *Phragmites australis*, *Schoenoplectus lacustris* and *Cladium mariscus* reed swamp. The area contained a diverse flora, especially of charophytes, but like all habitats surveyed showed signs of eutrophication. Species present include *Chara aspera*, *Chara contraria*, *Chara curta*, *Chara globularis*, *Chara rudis*, *Chara vulgaris* and

[1] Note that these species are provided here for information and do not appear in Appendix D as they were associated with the island, and not aquatic, habitat

Chara virgata. Other aquatic species included *Potamogeton pectinatus*, *Potamogeton perfoliatus*, *Potamogeton lucens*, *Potamogeton natans*, *Myriophyllum spicatum*, *Elodea canadensis*, *Berula erecta*, *Lemna trisulca*, *Nuphar lutea* and *Oenanthe aquatica*. Blanket weed or *Cladophora* sp. was common, suggesting eutrophication. As the original channel is now almost completely filled with reed swamp the remaining open water might be best classified as a series of meso or eutrophic pools (FL4/5 under the Fossitt classification) linked by channels or drainage ditches (FW4 under the Fossitt classification).

River Corrib and Canals south of the Salmon Weir (Site 10)

There was aquatic vegetation similar to the river section above the weir but poorer, and vegetated areas were classified as canal under the Fossitt classification (FW3) as it is largely confined to the Eglington Canal and old mill races. Species included *Potamogeton perfoliatus*, *Potamogeton natans*, *Potamogeton pusilus*[2], *Elodea Canadensis*, *Myriophyllum spicatum*, *Chara rudis* and *Ranunculus* sp. The main river channel was tidal below the weirs and classified as estuary (MW4), though the exact boundary between river and estuary was not defined in this study.

Terryland River (Site 11)

The river appeared very eutrophic and had a limited flora present including *Potamogeton natans*, *Callitriche* sp., *Alisma plantago aquatia*, *Chara hispida/rudis*, *Myriophyllum spicatum*, *Sparganium* sp. and *Elodea canadensis*. Large areas of bare mud and extensive development of blanket weed, *Cladophora* sp. indicate significant eutrophication. The Terryland River was classified as a depositing lowland river under the Fossitt classification (FW2).

[2] Species Id not confirmed under microscope.

Conclusion

From the survey results, the vegetation of Lough Inch was very different from all other survey sites and was classified as containing the Annex I habitat types [3110] and [3130]; it also contained plant communities A22, A23, and A24 [3]of Rodwell (1995). The other survey sites showed similarities in their relative vegetation communities probably because of a similar calcareous aquatic habitat. However, the commonest, and in places most abundant, species included the introduced plant species *Elodea canadensis*, *Lemna trisulca*, and *Chara rudis*. Rodwell's type A15 *Elodea canadensis community* shows certain affinities with the vegetation found in these waterbodies. A case might be made that the upper part of the River Corrib main channel, near the junction of Friar's Cut, could correspond with the Annex I habitat type [3260] *Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation* but given the absence of *Ranunculus* species and scarcity of *Callitriche* sp., it does not match a strict interpretation of [3260] as per the *Interpretation manual of European Union Habitats EUR28*.

It was considered by the surveyors that most of the habitats showed signs of eutrophication, including:

- Abundant *Cladophora* growth
- A shallow euphotic or vegetation depth in Ballindooley Lough, Coolagh Lakes and the River Corrib (4m in these lakes vs 8-10m in unpolluted hard water lakes)
- The dominance of *Chara rudis* at all hard water sites. In unpolluted lakes a more diverse charophyte flora would be expected. Abundant *Lemna trisulca* is also indicative of eutrophication
- The presence of *Potamogeton crispus* and *Potamogeton pectinatus* in Lough Inch
- The absence of the enrichment sensitive *Nitella tenuissima* from Ballindooley Lough, and
- The presence of very dense and extensive reed swamp, not usually encountered in unpolluted limestone water bodies in western Ireland

This widespread nutrient enrichment reduces the quality of the aquatic Annex I habitats but they may recover in the event of nutrient reduction.

Stewart (2004) suggested that the presence of five or more charophyte species indicated a site of conservation value in the UK. An equivalent Irish classification has not been proposed but given that at least seven charophyte species have been recorded in sites such as Jordan's Island and Ballindooley, they could be considered to have noteworthy charophyte floras.

[3] These codes represent the following vegetation communities from Rodwell (1995): A22 *Littorella uniflora – Lobelia dortmanna* community, A23 *Isoetes lacustris/setacea* community, and A24 *Juncus bulbosus* community.

Table 1: Aquatic Plant Species Recorded during the 2014 N6 Galway City Transport Project Aquatic Habitat Surveys

	Survey Locations[4]													
Species[5]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Alisma plantago-aquatica	-	-	-	-	-	-	-	P	-	-	P	-	-	-
Berula erecta	-	-	-	-	-	-	-	P	-	-	-	-	-	-
Carex rostrata	-	-	-	-	-	-	-	-	P	-	-	-	-	-
Callitriche sp.	-	P	-	-	-	-	-	-	-	-	P	-	-	-
Chara aculeolata	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Chara aspera	-	-	-	-	-	-	-	P	-	-	-	P	-	-
Chara contraria	-	-	-	-	-	-	P	P	-	-	-	-	-	-
Chara curta	-	P	-	-	-	-	-	P	-	-	-	P	-	-
Chara globularis	-	P	-	-	-	-	-	P	-	-	-	-	-	-
Chara rudis	-	P	-	P	P	P	P	P	P	P	P	P	-	-
Chara virgata	P	-	-	-	-	-	-	P	-	-	-	P	-	P
Chara virgata annulata	-	P	P	-	-	-	-	-	P	-	-	-	-	-
Chara vulgaris	-	-	-	-	-	-	P	P	-	-	-	-	-	-
Cladium mariscus	-	-	-	-	-	P	P	P	-	-	-	P	-	P
Cladophora sp.	P	-	-	-	-	P	P	P	-	-	P	-	-	-
Equisetum fluviatile	-	P	-	-	P	P	P	P	P	-	-	-	-	-
Elatine hexandra	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Elodea canadensis	-	P	P	P	-	P	P	P	-	P	P	P	P	-
Eriocaulon aquaticum	P	-	-	-	-	-	-	-	-	-	-	-	-	-

[4] Site 1 Lough Inch, Site 2 River Corrib (Friar's Cut area), Site 3 River Corrib (Friar's Cut to Menlough Pier), Site 4 River Corrib (Menlough Pier to Menlo Castle), Site 5 River Corrib (Menlo Castle to Coolagh Lakes), Site 6 Coolagh Lakes (Upper Lake), Site 7 Coolagh Lakes (Lower Lake), Site 8 River Corrib (Backwater on east side of Jordan's Island), Site 9 River Corrib (Jordan's Island to the Salmon Weir), Site 10 River Corrib and Canals below the Salmon Weir, Site 11 Terryland River, Site 12 Ballindooley Lough (Main Lake), Site 13 Ballindooley Lough (southern lake), Site 14 Ballindooley Lough (western lake)

[5] P = present, (-) = absent

	Survey Locations[4]													
Species[5]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Fontinalis antipyretica	-	-	-	-	-	-	-	-	-	-	-	-	P	-
Hippuris vulgaris	-	-	P	-	-	P	-	-	-	-	-	-	-	-
Isoetes lacustris	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Juncus bulbosus	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Lemna trisulca	-	--	P	P	-	P	P	P	-	-	-	P	P	-
Littorella uniflora	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Lobelia dortmanna	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Menyanthes trifoliata	-	-	-	-	-	-	P	-	-	-	-	-	-	-
Myriophyllum alterniflorum	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Myriophyllum spicatum	-	P	-	-	-	P	P	P	-	P	P	-	-	-
Nitella confervacea	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitella flexilis	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitella opaca	-	-	P	-	-	-	-	-	-	-	-	-	-	-
Nitella translucens	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Nuphar lutea	-	P	P	-	-	P	P	P	-	-	-	-	-	-
Nymphaea alba	-	-	-	-	-	-	-	-	-	-	-	-	P	P
Oenanthe aquatica	-	P	-	-	-	-	-	P	-	-	-	-	-	-
Phragmites australis	-	P	P	P	P	P	P	P	P	P	P	P	P	P
Potamogeton berchtoldii	P	-	-	P	-	-	-	-	-	-	-	-	-	-
Potamogeton coloratus	-	-	-	-	-	-	-	-	-	-	-	P	-	-
Potamogeton crispus	P	P	-	-	-	-	-	-	-	-	-	-	-	-
Potamogeton lucens	-	P	-	-	-	-	P	P	P	-	-	-	-	-
Potamogeton natans	-	-	-	-	P	-	-	P	P	P	P	P	-	P
Potamogeton pectinatus	P	-	-	-	-	-	-	P	-	-	-	-	-	-
Potamogeton perfoliatus	-	P	P	-	P	-	P	P	-	P	-	-	-	-

	Survey Locations[4]													
Species[5]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Ranunculus lingua	-	-	-	-	-	-	P	-	-	-	-	-	-	-
Ranunculus sp.	-	-	-	-	-	-	-	-	-	P	-	-	-	-
Schoenoplectus lacustris	-	P	-	P	P	P	P	P	P	-	-	P	-	P
Sparganium sp.	-	-	-	-	-	-	P	-	-	-	P	-	-	-
Sparganium natans	-	-	-	-	-	-	-	-	-	-	-	P	-	P
Typha latifolia	-	P	-	-	-	-	-	P	P	-	-	-	-	-
Urticularia cf. *vulgaris*	-	-	-	-	-	-	P	-	-	-	-	P	-	P
Zannichella palustris	-	P	-	-	-	-	-	-	-	-	-	-	-	-

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