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*Appendix 3A*  
Biological Monitoring  
Working Party Score Sheet

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## Appendix 3A Biological Monitoring Working Party Score Sheet

**Table A1: Revised Biological Monitoring Working Party (BMWP) Score Sheet.  
(Adapted from Walley and Hawkes, 1997)**

Common Name	Family	Original BMWP Score	Revised BMWP Score	Habitat Specific Scores		
				Riffles	Riffle pools	Pools
Flatworms	Planariidae	5	4.2	4.5	4.1	3.7
	Dendrocoelidae	5	3.1	2.3	4.1	3.1
Snails	Neritidae	6	7.5	6.7	8.1	9.3
	Viviparidae	6	6.3	2.1	4.7	7.1
	Valvatidae	3	2.8	2.5	2.5	3.2
	Hydrobiidae	3	3.9	4.1	3.9	3.7
	Lymnaeidae	3	3.0	3.2	3.1	2.8
	Physidae	3	1.8	0.9	1.5	2.8
	Planorbidae	3	2.9	2.6	2.9	3.1
Limpets and Mussels	Ancylidae	6	5.6	5.5	5.5	6.2
	Unionidae	6	5.2	4.7	4.8	5.5
	Sphaeriidae	3	3.6	3.7	3.7	3.4
Worms	Oligochaeta	1	3.5	3.9	3.2	2.5
Leeches	Piscicolidae	4	5.0	4.5	5.4	5.2
	Glossiphoniidae	3	3.1	3.0	3.3	2.9
	Hirudididae	3	0.0	0.3	-0.3	
	Erpobdellidae	3	2.8	2.8	2.8	2.6
Crustaceans	Asellidae	3	2.1	1.5	2.4	2.7
	Corophiidae	6	6.1	5.4	5.1	6.5
	Gammaridae	6	4.5	4.7	4.3	4.3
	Astacidae	8	9.0	8.8	9.0	11.2
Mayflies	Siphonuridae	10	11.0	11.0		
	Baetidae	4	5.3	5.5	4.8	5.1
	Heptageniidae	10	9.8	9.7	10.7	13.0
	Leptophlebiidae	10	8.9	8.7	8.9	9.9
	Ephemerellidae	10	7.7	7.6	8.1	9.3
	Potamanthidae	10	7.6	7.6		
	Ephemeridae	10	9.3	9.0	9.2	11.0
	Caenidae	7	7.1	7.2	7.3	6.4
Stoneflies	Taeniopterygidae	10	10.8	10.7	12.1	
	Nemouridae	7	9.1	9.2	8.5	8.8
	Leuctridae	10	9.9	9.8	10.4	11.2
	Capniidae	10	10.0	10.1		
	Perlodidae	10	10.7	10.8	10.7	10.9
	Perlidae	10	12.5	12.5	12.2	
	Chloroperlidae	10	12.4	12.5	12.1	
Damselflies	Platycnemidae	6	5.1	3.6	5.4	5.7
	Coenagriidae	6	3.5	2.6	3.3	3.8
	Lestidae	8	5.4			5.4
	Calopterygidae	8	6.4	6.0	6.1	7.6
Dragonflies	Gomphidae	8				
	Cordulegasteridae	8	8.6	9.5	6.5	7.6
	Aeshnidae	8	6.1	7.0	6.9	5.7
	Corduliidae	8				
	Libellulidae	8	5.0			5.0
Bugs	Mesoveliidae *	5	4.7	4.9	4.0	5.1
	Hydrometridae	5	5.3	5.0	6.2	4.9
	Gerridae	5	4.7	4.5	5.0	4.7
	Nepidae	5	4.3	4.1	4.2	4.5
	Naucoridae	5	4.3			4.3
	Aphelocheiridae	10	8.9	8.4	9.5	11.7

Common Name	Family	Original BMWP Score	Revised BMWP Score	Habitat Specific Scores		
				Riffles	Riffle pools	Pools
	Notonectidae	5	3.8	1.8	3.4	4.4
	Pleidae	5	3.9			3.9
	Corixidae	5	3.7	3.6	3.5	3.9
Beetles	Haliplidae	5	4.0	3.7	4.2	4.3
	Hygrobiidae	5	2.6	5.6	-0.8	2.6
	Dytiscidae	5	4.8	5.2	4.3	4.2
	Gyrinidae	5	7.8	8.1	7.4	6.8
	Hydrophilidae	5	5.1	5.5	4.5	3.9
	Clambidae	5				
	Scirtidae	5	6.5	6.9	6.2	5.8
	Dryopidae	5	6.5	6.5		
	Elmidae	5	6.4	6.5	6.1	6.5
	Chrysomelidae *	5	4.2	4.9	1.1	4.1
	Curculionidae *	5	4.0	4.7	3.1	2.9
Alderflies	Sialidae	4	4.5	4.7	4.7	4.3
Caddisflies	Rhyacophilidae	7	8.3	8.2	8.6	9.6
	Philopotamidae	8	10.6	10.7	9.8	
	Polycentropidae	7	8.6	8.6	8.4	8.7
	Psychomyiidae	8	6.9	6.4	7.4	8.0
	Hydropsychidae	5	6.6	6.6	6.5	7.2
	Hydroptilidae	6	6.7	6.7	6.8	6.5
	Phryganeidae	10	7.0	6.6	5.4	8.0
	Limnephilidae	7	6.9	7.1	6.5	6.6
	Molannidae	10	8.9	7.8	8.1	10.0
	Beraeidae	10	9.0	8.3	7.8	10.0
	Odontoceridae	10	10.9	10.8	11.4	11.7
	Leptoceridae	10	7.8	7.8	7.7	8.1
	Goeridae	10	9.9	9.8	9.6	12.4
	Lepidostomatidae	10	10.4	10.3	10.7	11.6
	Brachycentridae	10	9.4	9.3	9.7	11.0
	Sericostomatidae	10	9.2	9.1	9.3	10.3
True flies	Tipulidae	5	5.5	5.6	5.0	5.1
	Chironomidae	2	3.7	4.1	3.4	2.8
	Simuliidae	5	5.8	5.9	5.1	5.5

Notes

\* These families are now excluded from the list used for the calculation of the score. A blank indicates that there were insufficient records for the calculations. The Revised BMWP Scores are based on the analysis of frequency of occurrence of the families recorded in approximately 17,000 samples.

The Habitat Specific Scores are based on the following substrate compositions:

Riffles:  $\geq 70\%$  boulders and pebbles,

Pool:  $\geq 70\%$  sand and silt,

Riffle/Pool: the remainder.

**Table A2: BMWP Scoring System.**

BMWP score	Category	Interpretation
0-10	Very poor	Heavily polluted
11-40	Poor	Polluted or impacted
41-70	Moderate	Moderately impacted
71-100	Good	Clean but slightly impacted
>100	Very good	Unpolluted, unimpacted

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*Appendix 3B*  
Site Synopses

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## Appendix 3B Site Synopses

**SITE NAME: RAHEENMORE BOG**

**SITE CODE: 000582**

This raised bog developed in a small basin in the catchment of two major river systems i.e. the Brosna and the Boyne. It is situated about 5 km from Daingean. The peat is very deep, being up to 15 m in places. The bog has a well-developed hummock and hollow system.

The hummocks are often colonised by the mosses *Sphagnum imbricatum* and *S. fuscum*. Pool areas support Great Sundew (*Drosera anglica*), the moss *Sphagnum cuspidatum* and the liverwort (*Cladopodiella fluitans*). In places, moss lawns of *Sphagnum magellanicum* have infilled the pools. Overall, the cover of *Sphagnum* moss on the bog is very good. Away from the dome summit, Bog Asphodel (*Narthecium ossifragum*) flats dominate the peat surface.

Some sections of old cutaway bog have narrow strips of Downy Birch (*Betula pubescens*) woodland developing. Much of the rest of the cutaway is now un-improved pasture and wet grassland, rich in Rushes (*Juncus* spp.) and Purple Moor-grass (*Molinia caerulea*). Valerian (*Valeriana officinalis*), Meadowsweet (*Filipendula ulmaria*) and Brown Sedge (*Carex disticha*) can also be found in fields at the bog margins. In 1959, the very rare Rannock Rush (*Scheuchzeria palustris*), found only in its only Irish Station in a nearby bog, was transplanted to Raheenmore Bog. However, it has not been recorded recently and may be now extinct.

Raheenmore Bog is within the breeding territory of a pair of Merlin, a scarce species in Ireland and one that is listed on Annex I of the EU Birds Directive. Other typical bogland birds which breed include Red Grouse and Snipe.

The margins of the bog have been arterially drained in connection with the previous Boyne Drainage Scheme. This could result in desiccation of the bog. However, the majority of the bog dome is undrained and peat extraction has substantially discontinued. On the western side, mineral springs feeding the lagg zone still survive. (The lagg zone is the natural marginal drainage channel circumscribing the bog and receiving water from the bog and adjacent mineral soil). Although the north-eastern section suffered from burning in the past, the majority of the site is relatively unaffected by this practice at present.

Raheenmore Bog is a classical example of a Midland Raised Bog and the deepest remaining in Ireland. This habitat is increasingly under threat in this country and worldwide. The site is remarkably intact and is one of the few raised bogs where restoration of the lagg zone is feasible.

10.1.1997

**SITE NAME: MILLTOWNPASS BOG NHA**

**SITE CODE: 002323**

Milltownpass Bog NHA is located 1 km north-east of Milltownpass, in the townlands of Pass of Kilbride and Claremount or Cummingstown in Co. Westmeath. The site comprises a raised bog that includes both areas of high bog and cutover bog and can be accessed from the local road off the N6 to the east of the site.

This bog has pools present and is wet and quaking in places. The wet areas are formed by re-wetting of depressions on the high bog surface caused by subsidence. There is very little drainage on the high bog and no forestry. Cutover is found all around the high bog margins with encroaching scrub and a forestry plantation. Broad-leaved woodland occurs to the west of the site.

Much of the high bog has vegetation typical of a Midland Raised Bog, consisting of Ling Heather (*Calluna vulgaris*), Hare's-tail Cottongrass (*Eriophorum vaginatum*), White Beak-sedge (*Rhynchospora alba*), Cross-leaved Heath (*Erica tetralix*), Bog Asphodel (*Narthecium ossifragum*), Cranberry (*Vaccinium oxycoccos*) and Bog-rosemary (*Andromeda polifolia*). There is some encroachment by Birch (*Betula pubescens*) at the northern high bog margin with some scattered Scots Pine (*Pinus sylvestris*). In general the high bog is wet with the bog mosses *Sphagnum capillifolium*, *S. subnitens* and *S. papillosum* present. Other species present include Deergrass (*Scirpus cespitosus*) and the lichens *Cladonia portentosa*, *C. uncialis*, *C. fimbriata*, *C. crispidata* and *C. fleurciana*. The abundance of lichens is indicative of the absence of recent burning. The vegetation is quite hummocky, due to drying out and there are old dry hummocks of Ling Heather with Cranberry and the mosses *Dicranum majus* and *Hypnum jutlandicum*. The liverwort *Odontoschisma sphagni* occurs among *Sphagnum* hummocks.

Towards the centre of the high bog there is a dry ridge dominated by Ling Heather, Bog Asphodel and Deergrass with some Cottongrass. North of this ridge there is a wet depression dominated by Ling Heather, Cottongrasses, Cross-leaved Heath and lichens. There are small pools and wet hollows with the bog moss *Sphagnum cuspidatum* and small hummocks of the bog mosses *S. papillosum*, *S. capillifolium* and *S. magellanicum*. Some hollows are dominated by Bog Asphodel and the hummocks are overgrown by the liverwort *Odontoschisma sphagni*. The small pools are drying out and in-filling with Cottongrass. Round-leaved Sundew (*Drosera rotundifolia*) is present along with the bog moss *Sphagnum tenellum* and large lawns of *S. magellanicum*. These occur in wet quaking areas caused by re-flooding from subsidence.

South of the ridge, the high bog slopes away towards the road and grades into a very wet and quaking area that has numerous pools and extensive lawns of bog moss (*S. magellanicum*). This area is dominated by Cottongrasses and Ling Heather over abundant *Sphagnum*, with Bog Asphodel and White Beak-sedge dominated hollows. Large pools occur here with the bog moss *S. cuspidatum*. There are also flushed areas with the mosses *Aulacomnium palustre*, *Polytricum commune*, *P. alpestre*, the liverwort *Pleurozium schreberi* and Cranberry locally abundant.

The high bog is surrounded by cutover, much of which has been colonised by Birch (*Betula* spp.) scrub. There is old cutover to the north, with a thin margin of Birch wood. This cutover is dominated by bog species, especially Ling Heather and lichens. There is some active peat-cutting at the north-east margin, backed by Birch scrub on cutover, and to the west some of the cutover has been reclaimed for agricultural grassland. A small forestry plantation is present on cutover to the north-east and broadleaved woodland to the west adds to the habitat diversity of the site.

Current landuses on the site include peat-cutting, agriculture and forestry. To the east, outside the site, there is intensive commercial peat-cutting, but few damaging operations apart from reclamation of cutover to the west and small scale domestic peat-cutting to the east occur within the site. The heavily improved area of cutover at the western margin has been cleared of scrub, levelled and re-seeded. This reclamation directly adjoins the cutface. A new road has been built and further developments are planned. Damaging activities associated with these landuses include scrub clearance and drainage at the margins of the high bog. These activities have resulted in the loss of habitat, damage to the hydrological status of the site, and pose a continuing threat to its viability.

Milltownpass Bog NHA is a site of considerable conservation significance comprising as it does a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. This site supports a good diversity of raised bog microhabitats, including hummocks and pools and due to its easterly location, is of biogeographical importance. Ireland has a high proportion of the total E.U. resource of raised bog (over 50%) and so has a special responsibility for its conservation at an international level.

14.11.2002

## **SITE NAME: GRAND CANAL**

### **SITE CODE: 002104**

The Grand Canal is a man-made waterway linking the River Liffey at Dublin with the Shannon at Shannon Harbour and the Barrow at Athy. The Grand Canal Natural Heritage Area (NHA) comprises the canal channel and the banks on either side of it. The canal system is made up of a number of branches - the Main Line from Dublin to the Shannon, the Barrow Line from Lowtown to Athy, the Edenderry Branch, the Naas and Corbally Branch and the Milltown Feeder. The Kilbeggan Branch is dry at present, but it is hoped to restore it in the near future. Water is fed into the summit level of the canal at Lowtown from Pollardstown Fen, itself an NHA.

A number of different habitats are found within the canal boundaries - hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland.

The hedgerow, although diverse, is dominated by Hawthorn (*Crataegus monogyna*). On the limestone soils of the midlands Spindle (*Euonymus europaeus*) and Guelder-rose (*Viburnum opulus*) are present.

The vegetation of the towpath is usually dominated by grass species. Where the canal was built through a bog, soil (usually calcareous) was brought in to make the banks. The contrast between the calcicolous species of the towpath and the calcifuge species of the bog is very striking. The diversity of the water channel is particularly high in the eastern section of the Main Line - between the Summit level at Lowtown and Inchicore. Arrowhead (*Sagittaria sagittifolia*) and Watercress (*Nasturtium officinale*) are more common in this stretch than on the rest of the system. All sites for Hemlock Water-dropwort (*Oenanthe crocata*) on the Grand Canal system are within this stretch.

The aquatic flora of the Corbally Extension of the Naas Branch of the canal is also very diverse, with a similar range of species to the eastern Main Line.

Otter spraints are found along the towpath, particularly where the canal passes over a river or stream.

The Common Newt breeds in the ponds on the bank at Gollierstown in Co. Dublin.

The Rare and legally protected Opposite-leaved Pondweed (*Groenlandia densa*) (Flora Protection Order 1987) is present at a number of sites in the eastern section of the Main Line, between Lowtown and Ringsend Basin in Dublin.

The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than in the presence of rare species. It crosses through agricultural land and therefore provides a refuge for species threatened by modern farming methods.

13th February, 1995.□

**SITE NAME: BLACK CASTLE BOG NHA**

**SITE CODE: 000570**

Black Castle Bog NHA is situated approximately 8 km north-west of Edenderry, mainly in the townlands of Clonmore, Ballyheashill and Ballymacwilliam in County Meath. The site comprises a raised bog that includes both areas of high bog and cutover bog. The north-western margins of the site are bounded by roads and those on the south-east are bounded mainly by scrub and woodland.

The site consists of one crescent-shaped lobe, which is quite flat. There is an absence of permanent pools on the high bog. The raised bog is of particular interest as it is one of the most easterly remaining raised bogs in the country. The peripheral area of abandoned cutover bog has developed into a range of different habitats.

Much of the high bog vegetation is typical of the Midland Raised Bog type, consisting of Ling Heather (*Calluna vulgaris*), Cross-leaved Heath (*Erica tetralix*) and White Beak-sedge (*Rhynchospora alba*). The bog moss (*Sphagnum* spp.) cover is quite high, especially in the central areas of the bog. Bog-rosemary (*Andromeda polifolia*) and Cranberry (*Vaccinium oxycoccos*) are also found on the bog, although not in abundance. A number of species of lichen (*Cladonia* spp.) are recorded from this site. There are a number of habitat types found on the cutover areas of the bog. These include areas of wet grassland dominated by Soft Rush (*Juncus effusus*), Purple Moor-grass (*Molinia caerulea*) and Yorkshire Fog (*Holcus lanatus*), areas with dense Bracken (*Pteridium aquilinum*) cover, Gorse (*Ulex europaeus*) scrub, Downy Birch (*Betula pubescens*) woodland and Ash (*Fraxinus excelsior*) dominated semi-natural woodland.

Irish Hare, a Red Data Book species, has been recorded at the site.

Current landuse on the site consists of peat-cutting around the edge of the high bog, and the drainage associated with this. Large portions of the bog have been burnt at regular intervals. These activities have resulted in loss of habitat and damage to the hydrological status of the site, and pose a continuing threat to its viability.

Black Castle Bog NHA is a site of considerable conservation significance, comprising as it does, a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. It is especially important because of its eastern location. This site also supports a wide range of habitats, especially associated with the cutover areas. Ireland has a high proportion of the total E.U. resource of raised bog (over 50%) and so has a special responsibility for its conservation at an international level.