

7 AQUATIC ECOLOGY

7.1 Introduction

This assessment was conducted in accordance with EPA Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2002)¹, EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) (EPA, 2003)², and also in general accordance with the Guidelines for Ecological Impact Assessment in the United Kingdom (IEEM, 2006)³.

The aim of the *Aquatic Ecology* study is to (a) outline the current condition of the receiving environment and (b) to assess likely (temporary and permanent, direct and indirect) impacts on aquatic habitats on site and receiving waters. The aquatic habitats include the Munhin River, Owenmore River and Tullaghan Bay, which combined form the lower stretch of the Owenmore Catchment. The Owenmore Catchment covers an area of 340km² and stretches from the tributaries entering the Oweninny River at Knockmoyle (cSAC), the Altnabrocky River that flows north through the Bellacorick Bog complex (cSAC) and those entering Lough Carrowmore (cSAC).

The development site is situated within the Bord na Móna Bangor holdings. This area has already been utilised successfully for peat deposition between April 2005 and June 2007. It is proposed to deposit up to 75,000m³ of peat within the existing activity boundary of the Srahmore Peat Deposition site. The site was, and continues to be, operated, managed and controlled under the requirements of the Waste Licence issued by the Environmental Protection Agency (EPA) in October 2004 (Licence Ref: W0199-01).

Currently terrestrial habitats largely comprise cutover bog (*see section 6*). The information utilised to make the assessment of the development on the aquatic ecology includes baseline water quality samples, existing baseline biological monitoring data from the EPA and literature relating to the Owenmore catchment. On the basis of these studies, potential impacts of the development on the immediate freshwater habitats (on site streams and the Munhin River) and those related to the site (in particular sites designated for their conservation value such as Tullaghan Bay), and appropriate mitigation or remedial measures; are outlined.

¹ Environmental Protection Agency. 2002. Guidelines on the information to be contained in Environmental Impact Statements.

² Environmental Protection Agency. 2003. *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)*. Prepared on behalf of the EPA by CAAS Environmental Services Ltd.

³ IEEM. 2006. *Guidelines for Ecological Impact Assessment in the United Kingdom*. Institute of Ecology and Environmental Management.

Sections 6 and 9 of this Volume of the EIS also present data that are relevant to consideration of the aquatic ecology. Section 6 presents information on the terrestrial ecology, including descriptions of drainage ditches and non-fish vertebrates such as otters and frogs. In addition, Section 6 outlines the areas designated for conservation value within a 10km radius of the site (Table 6.1). Section 9 outlines water quality aspects based on regular monitoring along the Munhin River. These three sections are therefore inter-related and should be read in conjunction.

7.2 Study Methodology

7.2.1 Literature Review

Relevant reports such as the Draft *Owenmore River System Report, Fisheries Catchment Plan* (NWRFB 2003) and the *Interim Report on the Biological Survey of River Quality - Results of the 2002 Investigations* (EPA 2002) were reviewed and all relevant information assessed in relation to the development. In addition the EPA Envision mapping tool⁴ was checked to determine the most up to date water quality (2008) in receiving waters.

7.2.2 Consultation

Consultation letters (24th March 2010) were forwarded to the North Western Regional Fisheries Board (NWRFB) and private fishery owners with interests down river of the development site.

7.2.2.1 Responses

North Western Fisheries Board

A response was received from the NWRFB on 15th April 2010. The Board considers it essential that similar measures be taken for the proposed deposition of peat as for the previous deposition works. The Board also had the following comments to make;

- Avoid discharge of potential polluting matter during or after deposition. Settlement lagoons and silt traps should be utilised to prevent suspended solids entering nearby watercourses. Design of lagoons should ensure they are effective during extreme rainfall events. Prepare maintenance and monitoring schedule for described settlement lagoons and traps and a water quality monitoring programme should also be put in place for watercourses leaving the site.
- Store and refuel petroleum products in bunded areas away from water courses or off site.

⁴ <http://maps.epa.ie/InternetMapView/InternetMapView.aspx>

- Works to be carried out during dry weather. Extreme caution should be taken during fish mitigation periods which are October to April for adult Salmon, mid April to early May for smolts and July for sea trout.
- Investigate soil types to be deposited. Establish parameters for materials to be accepted.
- Transport material to site in sealed containers by trained personnel.
- Notify the board prior to works commencing.

Mr Richard Hewitt

A response was received from a fishery owner, Mr Richard Hewitt on 1st April 2010. In this response he highlighted his previous correspondence in 2008 which expressed concern about the effectiveness of the deposition design to avoid impacts to rivers, from the additional peat proposed. In his 2010 correspondence he stresses that only peat material must be deposited at Srahmore and enquires about the volume of peat. In addition he states that once the peat deposition has been completed, re-instatement and all other conditions must be fulfilled.

7.2.3 Water Quality and Habitats

The EPA maintains a database of river water quality that is compiled from a series of samples taken from rivers throughout the country. The quality assessment is based on the ‘Q Value’ rating system. The Q rating ranges from 5 to 1 with 5 being water of the highest quality. This index uses the presence and/or absence of species sensitive to pollution, assigning a score, which can be used to cross-reference with a pollution index that rates the pollution of a site. The evaluation of water quality is based on the relative abundance of groups of indicator species. The key features of the classification system are outlined in Table 7.1

Table 7.1: The biological river quality classification system (McGarrigle *et al.*, 2002)

Q Value	Community diversity	Water quality
Q5	High	Good
Q4	Reduced	Fair
Q3	Much reduced	Doubtful
Q2	Low	Poor
Q1	Very low	Bad

Samples for biological analysis are collected using a method called *kick sampling*. Kick sampling is carried out by kicking for a duration of 2 minutes in a stream or riverbed on a

suitable gravely substrate in a riffle area⁵. A net is held down stream of the area being disturbed and all macroinvertebrates collected are identified and numbers recorded.

The Munhin River was surveyed on the 17/09/05, 07/10/2007 and 04/11/2009, by AMGC Environmental Agricultural Consultancy. This assessment was carried out upstream and downstream of the discharge point from the site, to establish a Q index value for both locations and identify any change in water quality.

In addition information on the biological water quality of the Munhin River is available from the EPA (2008) which carries out an extensive programme of kick sampling throughout the country on a regular basis.

Results from these monitoring programmes described, are referred to for the purpose of the impact assessment.

7.2.3.1 Habitats

Habitats including the river bank and river were classified according to The Heritage Council's *A Guide to Habitats in Ireland* (Fossitt, 2000)⁶. Habitats were rated according to the Site Evaluation Scheme contained in the National Roads Authority's Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority, 2006⁷). Refer to Appendix 7.1, Book 3 for qualifying criteria for site evaluation.

7.3 Receiving Environment

A description of the general layout of the site, together with the main habitats found, and the historical land management use can be found in Section 6. Also detailed are the areas designated for conservation value that lie within a 10km radius of the development site. A description of the watercourses is presented below, and more detail is given on the ecological significance of the coastal cSACs and pNHAs into which the watercourses flow, particularly Tullaghan Bay and the Mullet/Blacksod Bay complex.

7.3.1 Designated conservation areas and rare and/or protected species

7.3.1.1 Rare and/or protected species

The Annex II species, the Atlantic salmon (*Salmo salar*) is present in the Munhin River.

⁵ A riffle area is characterised by shallow, turbulent, fast-moving water over rocks or stone. Increased oxygen levels in a riffle area lead to a higher concentration of pollution sensitive invertebrate species.

⁶ Fossitt, J.A. 2000. *A Guide to Habitats in Ireland*. The Heritage Council, Kilkenny, Ireland.

⁷ National Roads Authority. 2006. *Guidelines for Assessment of Ecological Impacts of National Road Schemes*. Revision 1, 1st March 2006.

Lamprey species were also recorded from tributaries entering Lough Carrowmore (the tributaries were surveyed as part of the information provided for the Bellanaboy Bridge Terminal EIS). While the development site is downstream of Carrowmore Lake, it is worth noting the presence of lamprey in the area. Both salmon and lamprey species are recognised as highly sensitive receptors within the receiving environment and both are listed in Annex II of the EU Habitats Directive.

7.3.1.2 Designated conservation areas

The North West Mayo coastline, and in particular the Erris peninsula and its associated coastal habitats is recognised as being of significant ecological value.

This assessment is based on the presence of priority habitats listed under the EU Habitats Directive such as machair, intact blanket bog and extensive sand dune systems and the utilisation of these areas by mammal and bird species listed under the EU habitats and Birds Directive.

Coastal areas, potentially connected to the site include Broadhaven Bay and Blacksod Bay, have therefore warranted a number of designations and these are outlined below. Another aquatic system of significant conservation value is Carrowmore Lake, which is an important salmon fishery. A brief description of these designated areas is provided here to put the development site in context with the surrounding area (Table 7.2).

Table 7.2: Designated ecological conservation areas located within 10km of the development site (Aquatic sites)

Name	Site Code	Designation	Approximate distance from development site
Broadhaven Bay complex	000472	pNHA	9.5 km
Carrowmore Lake Complex	000476	cSAC	1 km
Mullet/Blacksod Bay complex	000470	cSAC	9 km
Tullaghan Bay and Tullaghanashammer Bog	001567	pNHA	3 km

Carrowmore Lake is of international importance ecologically. This is mainly due to the significant populations of Annex II listed fish species including Atlantic salmon breeding stocks. In addition it is an important sea and brown trout fishery. A fish counter was installed at the outlet of Carrowmore Lake for the purpose of recording salmon numbers entering and leaving Carrowmore Lake. The counter was installed by the NWRFB recently and results confirm previous assessments that Carrowmore is of major significance in terms of salmon and sea trout productivity within the greater Owenmore River catchment area and environs.

The Munhin River is the outlet for Carrowmore Lake and hence is therefore of key significance for fish travelling from the Atlantic to spawning beds. The Munhin flows into the Owenmore River, which in turn enters Tullaghan Bay.

Tullaghan Bay and Blacksod Bay areas are linked to the freshwater drainage channels from the development site by the Owenmore River flowing into Tullaghan Bay, which is part of the greater Blacksod Bay.

Parts of Tullaghan Bay are designated as (a) a proposed Natural Heritage Area (pNHA), (b) a proposed Special Protection Area (pSPA), (c) an Important Bird Area and (d) a *Ramsar* site (see Appendix 7.2, Book 3 for *BirdWatch Ireland* and *Ramsar* descriptions of these sites). The SPA designation is justified mainly due to the presence of nationally significant (>1% population) numbers of wader and waterfowl bird species that winter within Tullaghan Bay and the adjacent Blacksod Bay and Broadhaven Bay.

The development site is therefore located central to a number of areas designated for their ecological significance, as outlined in Section 6. While it has been outlined that there will be a low magnitude impact on terrestrial ecology, the freshwater system draining the development site connects to coastal areas that have significant habitat, fisheries and avian ecological value. Therefore, the aquatic ecology of the site and these designated areas are closely related and potential impacts from the development must be considered with respect to potential indirect effects on the surrounding system.

7.3.2 *Habitat Description*

7.3.2.1 *Depositing/lowland Rivers FW2*

Both the main drain from the development site and the Munhin River, fall into this habitat category (Fossitt 2000).

Main drain and two minor drains from the Srahmore Peat Deposition site

The main drain within the development site at Srahmore is approximately 950m in length and drains the greater portion of the development site, and the adjacent former Bord na Móna production areas. Bord na Móna field drains and main outfalls drain Area 5 and 6, each of which either partly or completely drain into the main drain. The southern portion of Area 6 drains to the Owenmore River. Area 7 does not drain to the main drain but to the Munhin River. All drainage from the Srahmore site ultimately drains to the Owenmore catchment and outfalls to the marine environment at Tullaghan Bay. Two other minor drains are present: one drains an area of relatively intact bog and enters the Owenmore at Bord na Móna silt pond S5-1. Another drains the southern corner of the site and enters the Owenmore River at Bord na Móna silt pond S5-2. These drains are Bord na Móna drains and were never significant for salmonid productivity.

The main drain exhibits drain features and has been deepened by Bord na Móna operations. NWRFB records outline that it is a first order stream⁸ with a gradient varying from 0% to 0.6%. The drain-like character and low gradient indicates that the main drain is not significant for salmonid production in the catchment.

The vegetative features of field drains and drainage channels are described in Section 6, with a brief description of the main drainage channel presented here. The eastern end of the main drainage channel is devoid of vegetation. Further down stream, the bank vegetation is dense, comprising impenetrable stands of bramble (*Rubus fruticosus*) with soft rush (*Juncus effusus*). Other species present include purple moor grass (*Molinia caerulea*), *Agrostis* spp and Bracken (*Pteridium aquilinum*) (see Section 6). The banks are steep *ca.* 1-2m high with the stream width approximately 0.75m. Water run-off through this stream is generally low.

The main drain from the Srahmore Peat Deposition site flows through a Bord na Móna settlement lagoon (S5-5) before passing underneath the existing disused railbed through low intensity agricultural fields and into the Munhin River.

Munhin River

The Munhin River is the outlet from Carrowmore Lake and stretches from Carrowmore Lake (approx. 1km north of the development site) to the Owenmore River. On leaving Carrowmore Lake, water flows along the Munhin and under the County Road R313. The water continues in a southerly direction west of the development site, joining the Owenmore River approximately 2km south of the site.

The Munhin River is a fourth order river. It is primarily a slow-flowing lowland river, with the gradient varying from 0.1% to 0.5%. Extrapolation from data from the NWRFB GIS system indicates that the section of the Munhin draining the development site does not make a significant contribution to overall salmonid production in the catchment. This is due to the absence of appropriate spawning and nursery habitat for salmonids. The Munhin River is nonetheless utilised for angling, as there are significant numbers of salmon and sea trout utilising the river as a migratory route to and from Carrowmore Lake.

The Munhin River drains the adjacent low intensity agricultural fields, which are characterised by relatively low banks (*ca.* 0.5m) in comparison to the main drainage channel from the Srahmore Peat Deposition site (see above). The stream side vegetation is dominated by bramble (*Rubus fruticosus*) and soft rush (*Juncus effusus*). Other species include *Agrostis* spp, creeping buttercup (*Ranunculus repens*) and red clover (*Trifolium pratense*). Other species may be present but were not in evidence at the time of survey.

⁸ The classification system follows that utilised by the NWRFB.

The Munhin River to Owenmore to Tullaghan Bay

For completeness, a brief outline of the watercourse until its Terminal point in Tullaghan Bay is provided.

The Munhin enters the lower catchment of the Owenmore River. From this point, the Owenmore stretches for a further 900m before it enters Tullaghan Bay. This is at the highest point to which the ordinary tide flows (marked as salmon weir on O.S. 6 inch maps). There is no discernible gradient along this 900m stretch of the Owenmore River on the NWRFB GIS system. This part of the Owenmore is utilised for angling but once again the lack of spawning habitat and nursery areas indicate that this stretch does not contribute to the overall salmonid productivity. The same applies to Tullaghan Bay.

7.3.3 Water Quality

AMGC

Biological Quality rating carried out upstream and downstream of the main drainage point from the site indicated that there was a slight improvement in water quality downstream of the main outlet from the site between survey findings in 2005, 2007 and 2009. The rating of both upstream and downstream is Class B Slightly Polluted (Q-rating 3-4). A new hydrological station was installed at the outlet from Carraghmore Lake as it enters the Munhin River immediately upstream of the activity. This has resulted in a faster flow through this location which made sampling more difficult. However the results indicate that the quality of this stretch of the Munhin has not worsened since 2005, when peat deposition last took place.

EPA

The EPA conducts an ongoing monitoring programme of water quality in the Owenmore catchment. Sampling is conducted in summer months for a number of reasons; (a) the macro-invertebrate fauna of rivers are theoretically under the greatest ecological pressure from pollution, because of reduced flows and higher temperatures (Clabby *et al.* 2002)⁹; and (b) some macro-invertebrate larvae may not be recorded in freshwater systems during winter months¹⁰. The most recent (2002) biotic indices that they have recorded in the Owenmore Catchment are presented in Table 7.3.

The following two paragraphs detail the EPA Assessments of the Owenmore and Munhin River (*EPA 2002*).

⁹ Clabby., Lucey., and McGarrigle Interim Report on the Biological Survey of River Quality. Results of 2002 Investigations. Environmental Protection Agency Ireland (EPA).

¹⁰ Macro-invertebrate life cycles often involve an over-wintering strategy

“The Owenmore River was surveyed in early August 2002. Water quality was satisfactory over its length and a good range of pollution-sensitive species present in spite of the ubiquitous presence of silt arising from commercially exploited peat bogs in the catchment. Siltation was especially notable in the upper sections (0050, 0150). Nonetheless an improvement in quality was noted at Stn 0150, downstream of Béal Átha Liag (Bellacorick) village and power station, in comparison with 1999. In the middle reaches, as far as Bangor, quality was satisfactory (0270, 0300). A slight deterioration in quality was noted downstream of Bangor (400) in comparison with 1999. Quality was again of a good to high standard at the last station sampled, which is downstream of the Munhin River, which flows from Lough Carrowmore.

The Munhin was slightly polluted at the point sampled (0200). The Munhin is located downstream of Carrowmore Lake and an extensive area of Bord na Móna exploited bog. It is notable for its large population of the hemipteran, Aphelocheirus sp., which was still present in August 2002. However, none of the most pollution-sensitive macroinvertebrate species were found at the site in 2002 in contrast to 1999. Turbidity has always been noticeable at this site (0200) due to the peat workings upstream and it is also highly influenced by Lake Carrowmore, which has a surface area of over 900 ha. It is reported that Carrowmore Lake has yielded large numbers of salmon to the rod in recent years”.

Table 7.3: Q-values for the Owenmore River upstream and downstream of the site (Source: EPA 2002 and 2008)

Site Name	1981	1986	1990	1994	1997	1999	2002	2008	Current Status
Owenmore (1.1km below Bellacorick Bridge)	-	-	4	4-5	4	4	4-5	4-5	Unpolluted
Owenmore (bridge at Bangor–main flow)		4-5	4	4	4-5	4-5	4-5	4	Unpolluted
Owenmore (3km u/s Munhin confluence)			5	-	-	4-5	4	4-5	Unpolluted
Owenmore (700 metres u/s Munhin confluence)	-	-	4	4	4-5	4	4-5	4-5	Unpolluted
Sheskin Stream			5	4-5	4-5	4-5	4	4	Unpolluted
Carrowmore Lake	-	-	-	-	-	-	-	4	Unpolluted

7.3.4 Fish

The main drain on site has been heavily impacted by past Bord na Móna peat cutting and associated drainage activities, pre recent peat deposition licensing. It is unlikely that the stream was ever a significant spawning or feeding area and its current status remains as

such. The same applies to the other two drains within the development site.

The Munhin River is recognised as an important fishery (NWRFB)¹¹. It is also an important link for fish travelling from the Owenmore River upstream to spawning grounds in the tributaries feeding into Carrowmore Lake. Electro fishing was conducted in the streams that enter Carrowmore Lake during preparation of the baseline studies for the Bellanaboy Bridge Gas Terminal site. Species recorded were brown trout (*Salmo trutta*) and salmon (*Salmo salar*). The salmonid juveniles were considered to be moving towards Carrowmore Lake. They remained there until they became smolts and migrated to sea via the Munhin River.

Stickleback (*Gasterosteus aculeatus*), freshwater European eel (*Anguilla anguilla*) and lamprey (*Lampetra fluviatilis* or *Lampetra planeri*) were also recorded during the surveys and were in abundance in 2003. The introduced species, minnow (*Phoxinus phoxinus*), was also recorded.

7.3.5 *Birds*

There is no significant usage by birds of the freshwater habitats within the immediate area of the development site but species known to use the Munhin River include heron and cormorant.

7.3.6 *Evaluation of ecological significance of the watercourses draining the proposed development site*

The ecological value of the drainage channels within the development site are considered to be of **Low Value, E**. This category includes low grade and widespread habitats. This is justified for the following reasons:

- There are no rare or protected species recorded within the main drain at the Srahmore Peat Deposition site and/or the other minor drain.
- The drain-like character of the drainage channels and peat base suggests the site will never contribute to salmonid productivity in the Owenmore catchment (first order streams, low gradient, history of Bord na Móna deepening, etc.).
- The drains have no ecological value, except for their value to allow for treatment of the water from the development site before entering other watercourses.

An evaluation is provided for the watercourses into which the Srahmore drains channels will flow. The aquatic ecology of the surrounding area is considered to be of **International value, A**. This category includes internationally designated or proposed sites such as SACs, or sites otherwise meeting criteria for conservation designation at international level. It also

¹¹ <http://www.northwestfisheries.ie>

includes sites supporting populations of internationally important species. This assignment is justified for the following reasons:

- The presence of listed Annex II species, the Atlantic salmon in the Munhin River and greater Owenmore catchment.
- The presence of lamprey in tributaries entering Carrowmore Lake. Three lamprey species are found in Ireland, all of which are protected under the EU Habitats Directive and two were recorded from tributaries entering Carrowmore Lake (*Lampetra fluviatilis* and/or¹² *Lampetra planeri*).
- The recognised international and national ecological significance of Carrowmore Lake and Tullaghan Bay and the greater Blacksod Bay complex as pSPAs, cSACs, pNHAs, IBAs and Ramsar designations. The designations are assigned because of the presence of listed rare and vulnerable bird species, the utilisation of the sites for migratory species and the presence of internationally significant numbers of migratory species each year.
- The significance of the link provided by the Munhin River between Carrowmore Lake (cSAC and habitat for Annex II species such as salmon and brook lamprey) and the Atlantic Ocean for migrating and spawning salmonids.
- While both the Munhin River and the Owenmore River are not presently designated as cSAC, the presence of Atlantic salmon is considered sufficient for these rivers to be treated as cSAC sites under this evaluation of ecological significance.
- There are listed habitats present within the designated areas within Blacksod Bay that are included as priority under the Habitats Directive, and any indirect effects from the development could impact on these areas. While there are no listed rare species of plant recorded from the watercourses, or from the terrestrial habitats, it is the machair and sand dune complexes as a whole in the Mullet/ Blacksod complex that justifies the designation of those areas.

7.4 Characteristics of the Proposed Development

See Sections 2, 6 and 9.

The key features of the development are outlined in Section 2, with reference to the features that will impact on terrestrial ecology detailed in Section 6 of this Volume of the EIS. Those features that are important in consideration of the aquatic ecology are the existing drainage infrastructure and the sedimentation pond design. These are outlined in Section 9 of this Volume of the EIS.

7.5 Potential Impact of the Proposed Development

It is evident from the previous description of the watercourses draining the development site and their link to aquatic habitats of international ecological significance, that any activity

¹² There is some difficulty in species identification of juvenile forms of lamprey, although it is most likely the species recorded was *L. planeri*.

within the development site must proceed with due consideration of potential impacts and appropriate mitigation measures will be required. The impacts of the development are considered here in the context of temporary and permanent, and direct and indirect effects.

In contrast to the outline of potential impacts in Section 6, the impacts are considered in the context of the potential effects of elevated suspended solids content of drainage waters and/or a pollution incident. Direct effects are those within the development site and immediately adjacent (the Munhin River), with indirect effects referring to the impacts on designated areas that may be impacted upon by water flowing from the site, including Owenmore River and Carramore lake. Habitats, fauna and designated areas are therefore broadly treated together.

7.5.1 Potential Impacts

The two main potential impacts are (a) excessive suspended solids entering watercourses off-site and (b) pollution incidences resulting in discharges to watercourses. The effects of both of these situations are outlined here for completeness.

7.5.1.1 Excessive suspended solids within watercourses

Suspended solids in relation to the development described in this section refer to peat particles. There is a certain level of naturally occurring peat sediment due to drainage waters flowing through peatland areas however, in the case where a large volume of peat will be deposited onto a cutover peatland, there is an increased potential for peat to go into suspension. The effects are outlined here, with a brief description of the impact:

- *Smothering of fish spawning redds*

Salmon and trout eggs or fry present in spawning redds may be smothered by excessive deposits of silt, or spawning fish may avoid traditional spawning areas if these are covered in silt deposits.

- *Fish health damage*

Fish gills are susceptible to abrasion by excessive exposure to elevated suspended solids levels, which in turn can give rise to health problems in the form of gill disease. Juveniles tend to be more susceptible than older individuals.

- *Interference with angling*

Excessively turbid waters are likely to reduce angling success (game and coarse angling). It is this impact from suspended solids which is recorded first, before damage to fish health.

- *Smothering of macroinvertebrates*

Aquatic macroinvertebrates including insect larvae, molluscs (snails and bivalves), crustaceans (shrimps and crayfish), leeches and worms, etc., may be smothered by excessive

deposits of silt from suspended solids. Moreover, deposits of silt in otherwise stony substrates gives rise to a change in the macroinvertebrate species composition, often favouring less diverse assemblages.

- *Smothering or stunting of aquatic plant communities*

Aquatic plant communities (especially submerged growths) are likely to be eliminated or stunted by excessive deposition of suspended sediment, and effects may also occur through reduction in photosynthesis due to excessive water turbidity.

7.5.1.2 Pollution incidences resulting in discharges to watercourses

- *Pollution from Fuel Oil*

Spillage of fuel, lubrication or hydraulic oils either from bulk storage or from construction vehicles or plant and equipment operating close to watercourses or drainage ditches which connect to watercourses may cause damage to aquatic flora and fauna communities.

7.5.2 Operational Impact Assessment

Only minor additional construction activities are proposed, as all infrastructure required for further peat deposition, currently exist on the site. It is in the light of consideration of these potential hazards arising from the development and the mitigation measures that are described in Section 9 herein, that the operational impacts are described.

These impacts relate to those potential impacts from the main operational phase of the development (short-term temporary) to long term temporary impacts (15-25 years following the main development activity). The short-term temporary period is considered in detail here.

7.5.2.1 Temporary short-term impacts (direct)

The greatest level of activity will occur within the short-term temporary period. Once the mitigation measures outlined in Section 9 are implemented, the impact level should be of **very low magnitude**. This is justified in that following the initial introduction and shaping of the peat, there should be minimal potential for peat run-off and any water leaving the system will be pre-treated to EPA standards. Also, revegetation and stabilisation of the peat is expected to be complete within 5 years following peat deposition. There will therefore be no potential for elevated suspended solids to occur in waters either on-site or leaving the site. Therefore, there will be no loss of habitat through siltation of watercourses and no direct effects on fauna.

The proposed operation should be considered in relation to previous extensive and similar peat deposition activities within the site. These have been successfully implemented and

fully monitored under a Waste Licence issued by the Environmental Protection Agency (EPA) in October 2004 (Licence Ref: W0199-01).

7.5.2.2 Indirect effects in the temporary short-term

Implementation of the mitigation measures in Section 9 will result in the indirect effects on designated areas that are hydrologically linked to the development site being of **very low magnitude**. There should be no elevated levels of suspended solids in the water leaving the site once mitigation measures are put in place. There will be no loss of habitat and no effect on faunal activity. This is borne out by biological monitoring implemented in 2005, 2007 and 2009 which show no detectable change to river quality in the Munhin River following similar peat deposition activities within the site.

The effect of elevated suspended solids in a high rainfall event could have a negative impact on angling. This would occur through reducing visibility of salmonids through increasing turbidity. Due to the lack of spawning habitat in the Munhin and lower stretches of the Owenmore, there would be no indirect effect on productivity within the Owenmore catchment. However, the mitigation measures outlined should mitigate against potentially elevated suspended solids in watercourses leaving the peat deposition area.

7.5.2.3 Impacts in the medium and long-term temporary period (direct impacts)

It is predicted (*see Section 6*) that the peat deposition area (Area 6) will have revegetated completely within 5 years. Following this period there will be minimal potential for peat to enter suspension, except where peat lies in drainage channels, which is unlikely to be at any significant level.

All other activities will have ceased following completion of the peat deposition. The rehabilitation of the Srahmore Peat Deposition site will be similar to the rehabilitation of the greater Bord na Móna holdings under the *Rehabilitation Plan* prepared by Bord na Móna for IPPC license 505. Sedimentation ponds will continue to be excavated to ensure their efficient operation in accordance with the requirements of the EPA. Therefore, temporary medium and long-term impacts will be of a **very low magnitude**. Following cessation of the need to maintain drainage channels, replacement habitats will form in these channels and provide freshwater habitats for vertebrates such as frogs, and a range of micro- and macro-invertebrates, leading to an overall increase in biodiversity of the site.

7.5.2.4 Indirect impacts in the temporary medium to long-term

There are no indirect impacts envisaged in the temporary medium to long-term. Revegetation and rewetting of the peat deposition area and rehabilitation of Area 5 may lead to expansion of wetland habitat for wetland bird species. There is no anticipated indirect effect on productivity of salmonids within the Owenmore catchment. Therefore, indirect

temporary medium and long-term impacts will be of a **negligible magnitude**.

7.5.3 Permanent impacts of the proposed development (direct and indirect)

Any permanent impacts of the development will be of a **very low magnitude**, following from revegetation of the site and stabilisation of the peat and rehabilitation of the activity areas and maintenance of sedimentation ponds to work at maximum efficiency. Once the peat is stabilised and the site naturalises there should be a **negligible permanent impact**, both direct and indirect. There will be replacement freshwater habitats within drainage channels and sedimentation ponds that naturalise, will revert to sedge and/or reedswamp vegetation that will further contribute to the biodiversity of the site through enhancement of aquatic vegetative complexes. This would contribute to an overall positive impact with respect to aquatic habitats on the development site with negligible impacts off-site.

7.6 Do Nothing Scenario

If the development did not proceed the site would be rehabilitated in accordance with the rehabilitation plan submitted under the existing planning permission.

7.7 Mitigation Measures

A number of mitigation measures have been considered in the course of design of the development.

7.7.1 Mitigation by avoidance

The nature of the site chosen for peat storage is an important element in mitigating against excessive suspended solids in run-off. The site is saucer-shaped and compartmentalised by high fields. This mitigates against any potential lateral movement of peat and any movement within low-lying bays will be towards the low point in the middle of the peat deposition area. The site has also previously been used for peat deposition and pollution avoidance infrastructure and monitoring programmes are in force.

7.7.2 Mitigation by treatment of water before entering watercourses

The drainage scheme is outlined in detail in Section 9 herein. Water draining the peat deposition area will be controlled through a series of existing sedimentation ponds with the provision of an overflow facility in Area 7 in the case of an extraordinary rainfall event. The drainage scheme has been designed in consultation with the *NWRFB (see Section 9)*. Sedimentation ponds will be maintained over the course of the development and for a period until such time as outlined by the licensing authority.

Oil traps and oil spillage kits are already installed at the site to mitigate against pollution from fuel spillages and/or other potential pollutants. Wastewater from the septic tank waste is taken off-site. Fuel oil is stored in double skinned mobile tanks. These tanks are filled while standing on the bunded reception area. The loading shovels are refuelled on this bunded reception area, as will some of the other plant.

The recommendations as set out by North Western Regional Fisheries Board in their consultation response along with the current status of these recommendations are set out below.

- *‘Avoid discharge of potential polluting matter during/ after deposition. Design of lagoons should ensure they are effective during extreme rainfall events. Prepare maintenance and monitoring schedule for described settlement lagoons’.* The lagoons have been designed to take into consideration these issues and a maintenance and monitoring schedule have been put in place.
- *‘Store and refuel petroleum products in bunded areas away from water courses.’* Bunded areas are included on site.
- *‘Works to be carried out during dry weather. Extreme caution should be exercised re potential runoff, during highly sensitive periods re salmon and sea trout. This period includes October to May inclusive.’* Works will be undertaken during appropriate climatic conditions.
- *‘Investigate soil types to be deposited. Formulate parameters for materials to be accepted.’* Only peat will be imported on site. This will be subject to assessment prior to deposition to ensure suitability.
- *‘Transport material to site in sealed containers by trained personnel.’* Yes as previously described.
- *‘Notify the board prior to works commencing.’* The board will be notified prior to works commencing.

7.7.3 Mitigation by remedy and re-instatement

Revegetation of the site will stabilise the peat and knit the introduced peat into the former deposited peat and cutaway areas. The vegetation will comprise predominantly *Juncus effusus* with a ground layer of bryophytes. These plants will cover the bare peat, and also filter rainfall passing through.

A number of possible re-instatement options are outlined in Section 6 herein, and the appropriate option will be selected that will allow the system to naturalise and utilise the vegetative features to filter water on site and possibly restore peat-forming conditions.

7.8 Predicted impact of the Proposed Development

7.8.1 Predicted direct impact

The predicted impact of the development is of **negligible impact magnitude**. This is due to the negligible ecological value of the drainage channels on site and the very low impact of the development as outlined previously.

7.8.2 Predicted indirect impact

In consideration of the mitigation measures outlined here and in Section 9, the indirect impact of the development on surrounding areas is expected to be negligible also. Due concern has been given to the fact that the watercourses draining the development site enter watercourses of international significance and strict environmental controls have been designed.

In the worst case scenario, if mitigation measures fail, there would potentially be significant run-off of peat from the site during the peat deposition stage and probably up until the first 12 months following peat deposition, but only in high rainfall events. This is because the peat will be wet and shaped to mitigate against sediment loading of drainage waters. This would have an indirect impact on angling (increased turbidity leading to reduced visibility and therefore reduced catch). There would be no impact on spawning of salmonids as this part of the Owenmore catchment is at its lowest reaches and there is no significant habitat suitable for spawning or nurseries available.

Given that the worst case scenario is unlikely due to existing and proposed new mitigation measures (NWRFB comments), the indirect impact of the development will be of **low to negligible magnitude**.

7.9 Monitoring

The water quality-monitoring regime has been set out by the regulatory bodies. Water quality samples will continue to be taken, as required under Environmental Protection Agency (EPA) Licence Ref: W0199-01, from the locations sampled since 2004 to the present and up until the onset of peat deposition. Following the onset of peat deposition, sampling will continue. Following cessation of activity (including decommissioning and rehabilitation) sampling will continue at intervals as specified by the regulatory authorities.

A composite sampler is installed at the main drainage channel to provide daily information on sediments in the run-off. This is located at the entry point of run-off from the main

sedimentation ponds on the main drainage channel. Also grab samples are taken from other settlement lagoons and surrounding watercourses to monitor surface water quality.

7.10 Reinstatement and Residual Impacts

There are no negative residual impacts foreseen at this time.

Re-instatement options are outlined in Section 6. The appropriate option will be selected in view of the best outcome for both the terrestrial and aquatic ecology.