

**NS 2 FRESHWATER PEARL MUSSEL SUB-BASIN  
MANAGEMENT PLANS**

**REPORT ON MORPHOLOGICAL MONITORING AND  
CATCHMENT WALKOVER RISK ASSESSMENTS IN THE  
BUNDORRAGHA CATCHMENT**

**September 2009**

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## INTRODUCTION

In order to assess the hydromorphological alterations within the Bundorragha catchment the EPA WFD classification tool called the River Hydromorphology Assessment Technique (RHAT) was utilised by RPS. This tool was developed through the North South Share project, to classify rivers in terms of their morphology. It is a field technique which assigns a channel typology. This influences the rivers physical attributes assessed in the field. The technique assigns a morphological classification directly related to that of the WFD – high, good, moderate, poor and bad.

RHAT surveys were carried out at high risk areas located within pearl mussel populations. The methodology classifies river hydromorphology based on a departure from naturalness, and assigns a morphological classification, based on semi-quantitative criteria. It is designed to be a rapid visual assessment based on information from desktop studies, using GIS data, aerial photography, historical data and data obtained from previous field surveys as well as observations in the field.

A catchment walkover risk assessment survey sheet was also designed by the project team in conjunction with NPWS in order to focus the collation of the pressure data in the field with respect to the Freshwater Pearl Mussel. The risk sheet was divided into eight categories designed to highlight the main pressures within the catchment. The eight categories are as follows:

- Source of erosion
- Diffuse Nutrient
- Diffuse Silt
- Current Riparian Zone
- Field Drainage
- Outfalls
- Abstractions
- Barriers to Migration

Each sub-pressure within the eight categories is analysed and an overall risk assessment of High, Medium or Low is assigned to that category. The “one out all out principle” is then used to assign the river stretch or point an overall risk category. A detailed description, together with a series of photographs outlining the pressures is also taken. The risk assessment sheets will assist the project team in focussing the specific freshwater pearl mussel measures within the catchment.

Location of survey stretches and points are shown in Figure 1

## **2.0 METHODOLOGY**

Field surveys were carried out on the 7<sup>th</sup> of May 2009

### **2.1 RIVER HYDROMORPHOLOGY ASSESSMENT TECHNIQUE (RHAT)**

Classification of hydromorphology can be used to contribute to the status classification of water bodies at high ecological status only. However, RHAT plays a vital role in identifying why a water body might be failing to achieve Good Ecological Status as it is based on the observed impact in the field. It can assist in deciding what indirect and direct efforts are needed to improve status and in helping to prevent further deterioration.

The eight criteria that are scored are:

1. Channel morphology and flow types
2. Channel vegetation
3. Substrate diversity and embeddedness
4. Channel flow status
5. Bank and bank top stability
6. Bank and bank top vegetation
7. Riparian land use
8. Floodplain connectivity

Sheet 1 of the RHAT form contains the Field Health and Safety sheet which is filled on arrival at the site. Before the field survey, a desk study is required this element of the survey was completed as part of the development of the draft sub-basin management plans. The reach identification and physical characterisation sections for each field site are recorded on Sheet 2 (see Appendix 1) with all information available from GIS and aerial photographs, including:

- a. expected stream type and the description of various stream types
- b. catchment and reach-scale pressures (these may help to identify, confirm or explain field observations);
- c. expected riparian vegetation types (for high quality status);
- d. the weather conditions on the day of the survey, and those immediately preceding the day of the survey. This information is important to interpret the effects of storm events on the survey results;
- e. the estimated stream width and the reach length to be assessed (~ 40 x width).
- f. any other notable issues (e.g. from previous surveys).

A score is allocated to each relevant attribute (the number of attributes to be assessed will depend on the stream type). Where the condition departs from the reference condition, note should be made if this condition results from a particular identifiable pressure. Where possible and where relevant, all attributes should be included in the assessment, using the assessment sheet (Sheet 3, see Appendix 1). If an attribute is not assessed, the score-summary table should be amended (cells shaded) and a note made as to why the assessment was not carried out. The WFD status can still be calculated on the basis of other attributes, but with a note that a particular attribute was omitted.

Transfer scores for individual attributes to the summary table on the survey Sheet 2. Finally the overall WFD category can be calculated using the following values:

> 0.8	= high
0.6 – 0.8	= good
0.4 – 0.6	= moderate
0.2 – 0.4	= poor
< 0.2	= bad

For the purposes of the assessment as part of the NS2 project, a high status for morphology is desirable for pearl mussel habitats. Through work carried out by the Shannon IRBD project on the Freshwater Morphology Programme of Measures Study, it was found that an observed relationship exists between biological data and a RHAT score. The study confirmed that morphological pressure can impact biology and therefore ecological status. In general, sites with RHAT scores less than 0.6 also have less than good Q scores. Similarly high levels of siltation affecting macrophyte populations are reflected by less than good RHAT scores.

Grid references were recorded at all sites using a GPS together with site photographs which were taken using a digital camera.

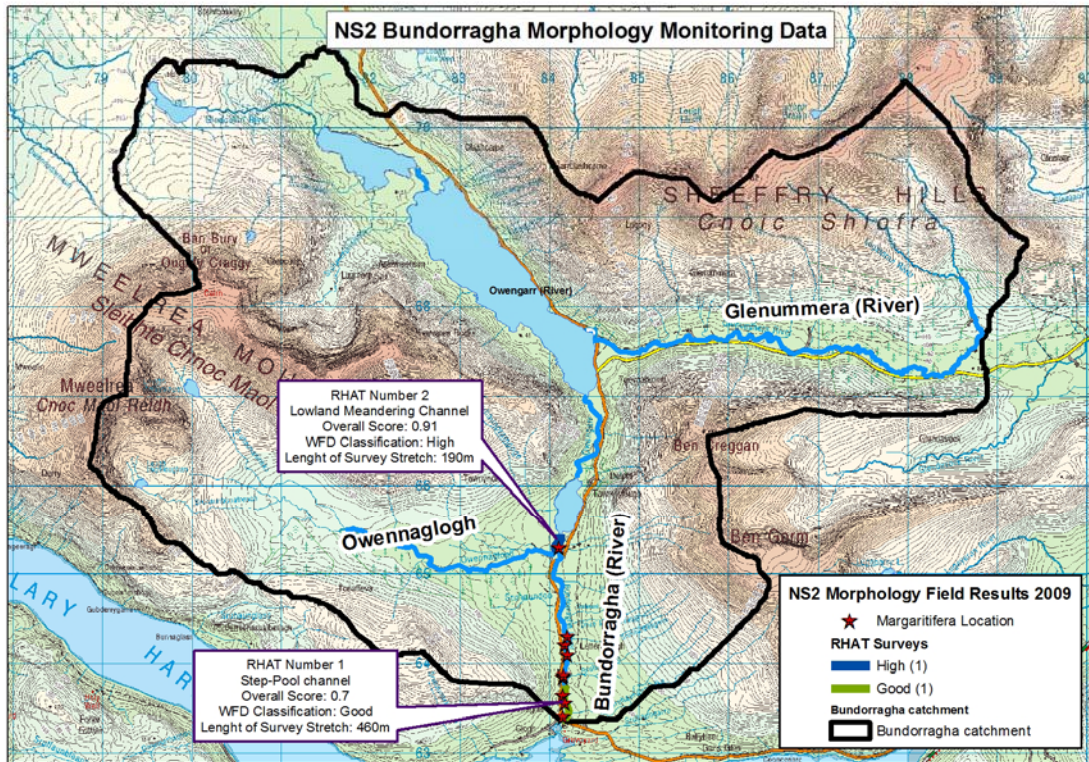
## **2.2 CATCHMENT WALKOVER RISK ASSESSMENT**

During the development of the draft sub-basin management plans throughout 2008 a complete desk study was conducted of all relevant biological, water quality and pressure source data within the Bundorragha catchment. Best use was made of all available datasets such as the pressure source data collated by the River Basin District Projects for the Article V Characterisation and Programme of Measures Studies. This work allowed the NS 2 project team to assess the catchment through the combined availability of aerial imagery and digitised pressure information. Where gaps in this data existed together with areas that required ground truthing such as physical barriers to migration, catchment walkover risk assessments were focussed throughout the 2009 field survey season.

The catchment walkover risk assessment sheet (See Appendix 3) covers eight main categories or pressures which are subsequently sub-divided into the various sources. Each source is ticked if present and an overall risk assessment for each pressure assigned from High to Medium to Low over the survey length or point. All eight pressures are combined to give an overall risk assessment to the catchment based on the “one out all out principle”.

### 3.0 RESULTS

Figure 1 indicates where the Bundorrageha morphology RHAT assessments were carried out throughout the catchment.



**Figure 1 Morphology RHAT Assessment Locations**

(The RHAT numbering system corresponds to the site code which may mean they are not sequential where a RHAT was not carried out at a particular site)

#### 3.1 RHAT Survey Results

Two RHAT surveys were carried out throughout the Bundorrageha catchment. The results of these surveys can be found in the electronic appendix. Both surveys were carried out on the Bundorrageha river at the lower end of the catchment where the Freshwater Pearl Mussel populations are located. One survey stretch was deemed to be at high status and one at good status. The survey stretch where RHAT number 1 was carried out was classified as a step/pool/cascade channel. While some natural cascades do exist along this stretch its classification is largely due to the unnatural flow created by the numerous weirs which are located along the stretch. Within the RHAT survey methodology three categories are scored out when the river channel is classified as a step/pool/cascade – these are Bank Structure and Stability, Bank Vegetation and Floodplain connectivity. The channel form and flow type scored 2 out of a possible 4

due to the presence of the weirs which were found to be altering and changing the flow pattern along the river stretch. Channel vegetation scored three out of four due to the presence of greater than expected macrophyte growth for a river of this type. Both Filamentous Green Algae and *Ranunculus* were recorded with greater than 10% coverage. Both the substrate condition and the barriers to continuity scored three out of four both were marked down due to the presence and pressures caused by the weirs. The weirs may be problematic during low flows and as such a possible barrier to migration. The substrate condition was found containing high levels of fine sands and silt deposits which may be caused by the presence of the weirs and bridges. The riparian landcover was also given a score of three out of four. The surrounding landscape is largely peat but sheep grazing was evident with signs of over grazing, trampling and poaching also recorded along the survey stretch.

RHAT number 2 was carried out on the upper stretch of the Bundorragha catchment below Fin Lough. This section of the river has been over widened at the road bridge at the lower end of the survey stretch. Resectioning and reinforcements were recorded on the left and right banks at the bridge. This stretch was classified as a lowland meandering river type although it is found within an upland area. The river was in spate on the day in which the survey took place and therefore the substrate condition and the barriers to continuity categories of the RHAT survey could not be scored accurately. Overall this stretch of the Bundorragha was found to be in good condition. Only the Channel form and flow types together with the Riparian land cover was marked down due to sheep grazing.



Representative photographs from reach:

**RHAT 1 – Site 1 Photo 1**



**RHAT 1 – Site 1 Photo 14**



**RHAT 1 – Site 1 Photo 16**



**RHAT 1 – Site 1 Photo 17**



**RHAT 2 – Site 2 Photo 3**



**RHAT 2 – Site 2 Photo 2**



Details in relation to photographs are tabulated in Appendix 2.

### 3.1 Catchment Walkover Risk Assessment Results

A total of six sites were surveyed in the Bundorragha sub-basin catchment, with a risk assessment carried out at five of these sites (one stopping points). Figure 2 outlines the stopping point locations in addition to the High to Low Risk Assessment from the Catchment Walkover Risk Assessments. Three high risk sites were recorded out of the five that were assessed. The remaining two sites were recorded as medium risk, meaning no low risk sites were recorded within this catchment. Figure 3 outlines the percentage of sites classified at high and medium risk together with the stopping point in the catchment.

The most common high risk categories identified were:

- Diffuse Silt – at 67% of high risk sites,
- Barriers to Migration –at 33% of high risk sites.

The Current Riparian Zone category of the Catchment Walkover Risk Assessment slightly varies from the seven other categories or pressures. The Current Riparian Zone is not a pressure in itself; however the aspects listed in this category are the interceptors to the pressure and convey the extent or lack of buffer provided by the riparian zone. A high risk riparian zone indicates that the pressures acting on the river are more likely to have significant impact. For example the lack of fencing along a river stretch can lead to excessive trampling and/or poaching which in turn may lead to siltation within a pearl mussel habitat. The various categories and pressures listed in the Catchment Walkover Risk Assessment sheet were designed to assist the project in focussing the measures which will be needed to combat the pressure along its pathway, rather than removing a source which may not always be possible such as intensive agriculture. Recording the Riparian Zone in terms of its current performance as a buffer is important in this regard.

Current Riparian Zone has ten aspects as follows:

- Fencing
- Buffer
- Tree line at bank

- Tree line buffer
- Plantation with no buffer
- Urbanisation
- Flood Protection
- Marshy Land
- Landuse at bank
- Other Sources

Where one or any of these aspects is found to be the cause of significant impact to the riparian zone, or the channel along the stretch then this category may be assigned a high risk score. **Figure 2** outlines the percentage number of sites at High, Medium or Low risk. Locations where pressures were evident in the field which were not highlighted through the desk based assessment were also noted as stopping points. These points were not selected prior to fieldwork, they were opportunistic as the catchment drive through was taking place. The pie chart in **Figure 3** indicates the percentage of stopping points also.

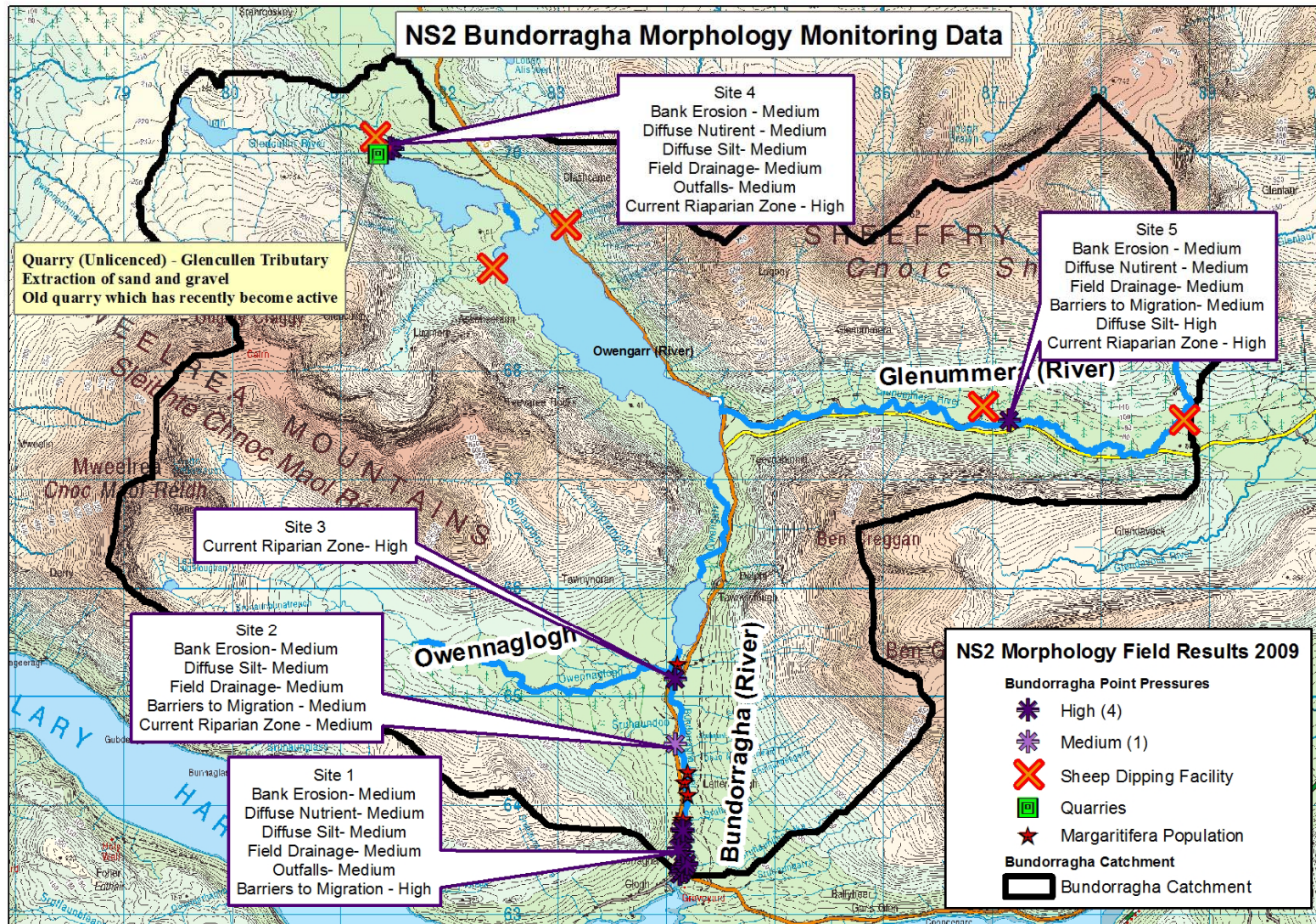
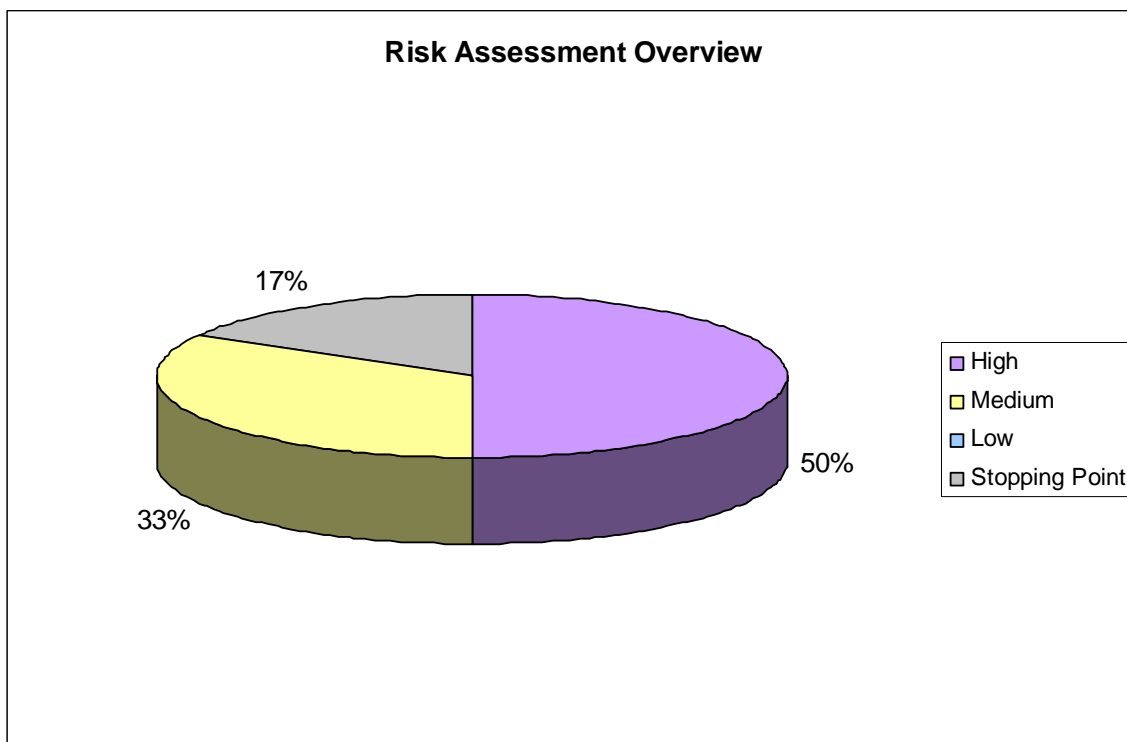


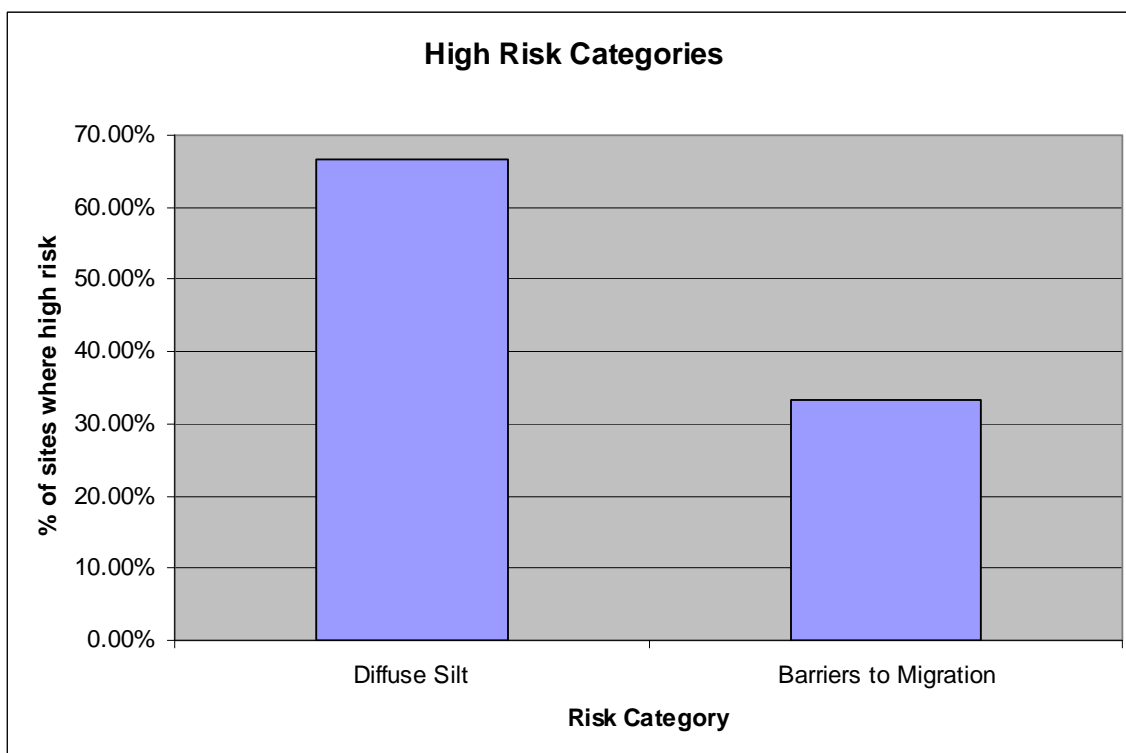
Figure 2 Location of Stopping points and Catchment Walkover Risk Assessments

**Figure 3. Risk Assessment Overview**

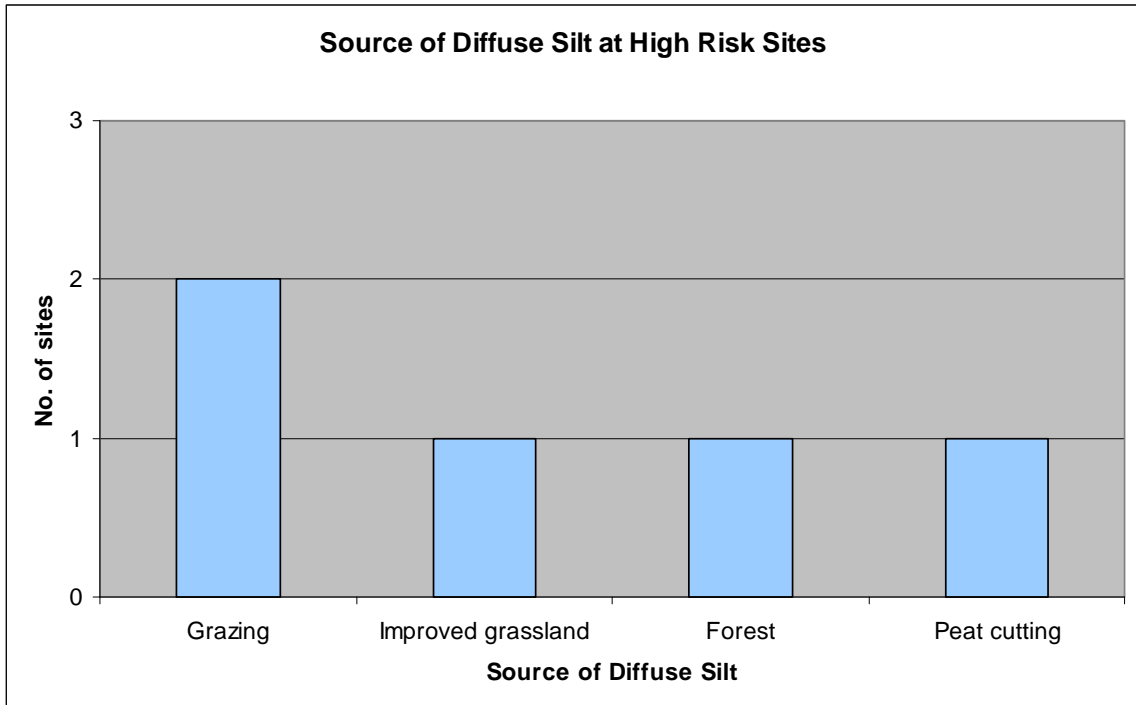


The break-down of high risk categories leading to a high risk site are shown below, as can be seen diffuse silt and barriers to migration were the only high risk categories recorded:

**Figure 4 Breakdown of High Risk Categories**



The most common source of diffuse silt is grazing which caused a high risk classification at two sites, the remaining high risk sources of diffuse silt are shown below:



**Figure 5 Sources of Diffuse Silt at High Risk Sites**

### ***Forestry***

Forest stands in the Bunndorrogha Catchment are located in two pockets, in the upper part of the Glenummera river, which flows into Doo Lough (Coillte forest stands) and to the west on the Owennaglogh river a tributary of the Bunndorrogha river (private forest stands). During the catchment walkover risk assessment at Site 5 high levels of silt were recorded within the Glenummera river. Felling and replanting were noted within the Glenummera valley.



**Site 5 Photo 1**



**Site 5 Photo 6**

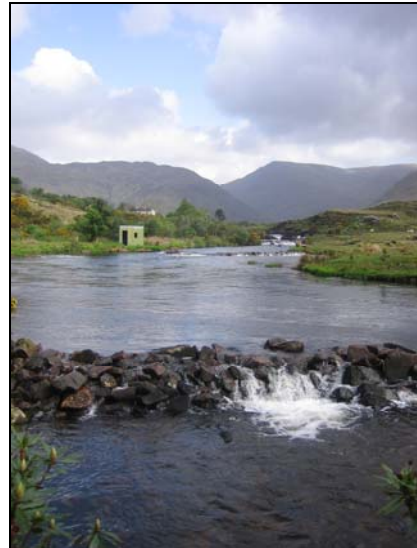
### ***Fisheries Weirs***

A significant number of weirs were recorded along the Bundorragha river during both the RHAT morphology surveys and the catchment walkover risk assessments. Several V-notch stones weirs were recorded along the survey stretch which was found to alter the flow of the channel and have lead to the build up of silt within the pools and interstices. Generally weirs are constructed at least seven channel widths in distance apart except in high gradients, the weirs found on the Bundorragha were separated at equal distances which verifies their use as fishery weirs. The river has nineteen named pools, some of which were created by the building of these stone weirs in the 1860s. Delphi Fishery is a private fishery which consists of the Bundorragha River, and two large lakes draining the Delphi Valley – Finlough and Doolough.

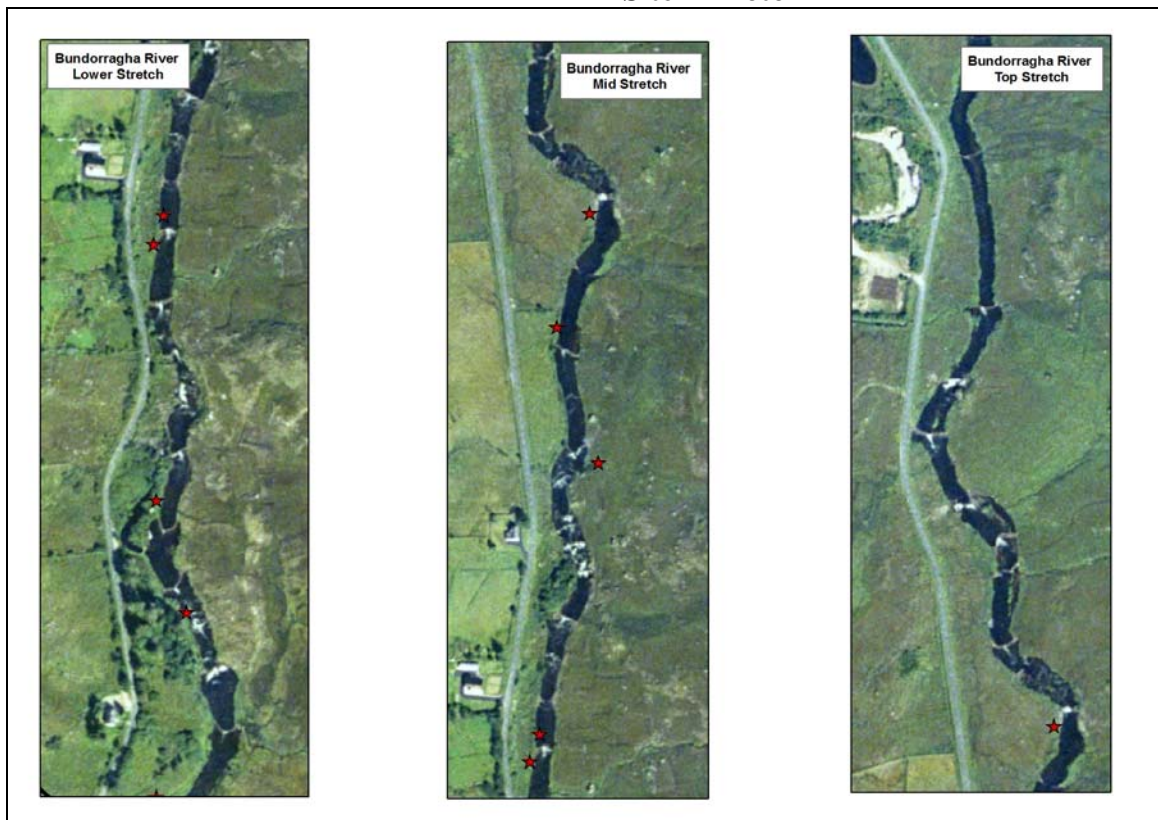
Short term impacts during construction of these in stream structures include increased siltation. Longer term damage to mussel habitat can be caused by erosion and ponding below the structures due to scour.



Site 1 Photo 12



Site 1 Photo 14



**Figure 6 Series of Fishery Weirs along the Bundorragha River which contain Freshwater Pearl Mussel Populations**

### *Sheep Dipping Units*

Five sheep dipping units have been noted within the Bundorragha catchment one of which is currently inactive and used only as a sheep gathering area on the shore of



Doolough Lake. However, a new access road has been made to this sheep gathering area in recent months.

The sheep dipping units found in the Bundorragha catchment consist largely of stone structures adjacent to rivers or lakes. This is indicated in the pictures below from Stopping point one, the sheep dipping unit which is located on the eastern shore of Doolough Lake.



**Stopping point 1 Photo 1**



**Stopping point 1 Photo 2**

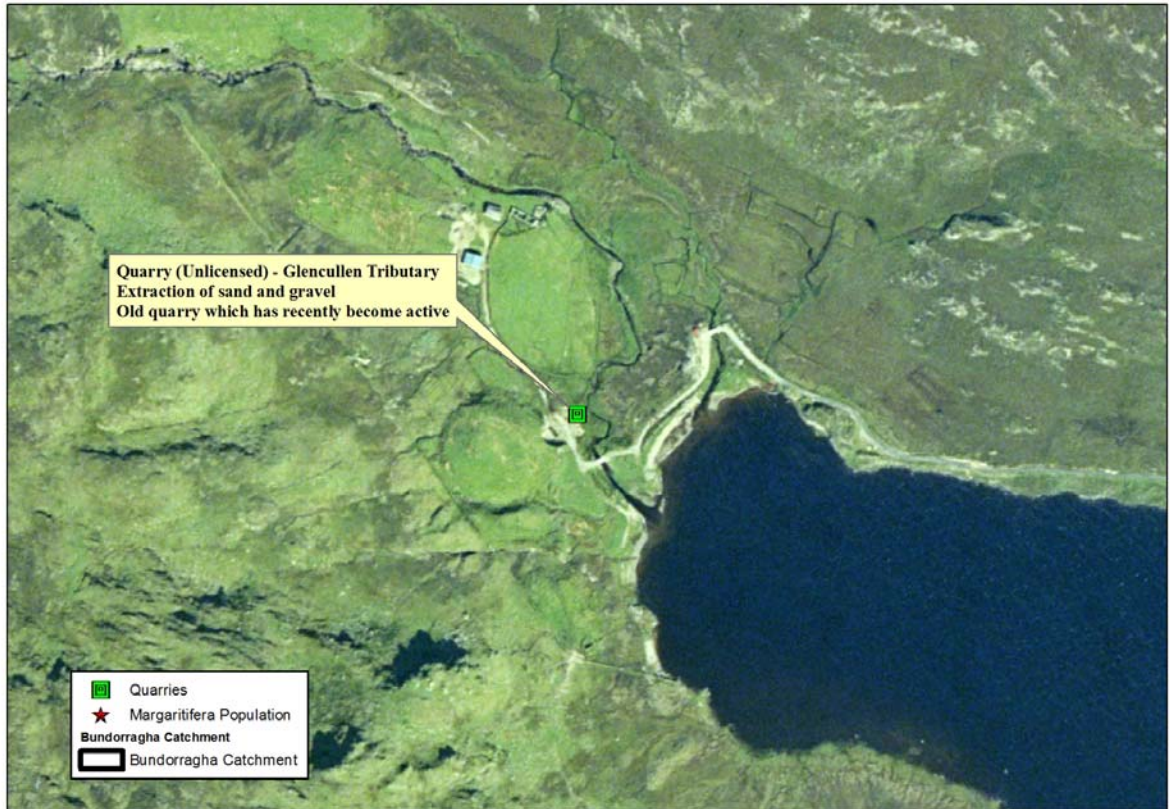
The sheep dipping facilities located in the Bundorragha are within the SAC boundary. The SAC Farm plan guidelines should be applied in these areas where Sheep dipping facilities should generally not be sited within target areas and spent sheep dip must not be spread on target area. Sheep dipping facilities and disposal of spent sheep dip must respect GFP and/or relevant legislation.

**Table 3.1 Locational details for Sheep Dipping facilities**

Description	GPS Coordinates	Tributary or lake	Notes
Sheep gathering area	IL 82393 ITM 68947	Doolough Lake	Active unit used by five to six commonage shareholders
Dipping unit	IL 83068 ITM 69340	Trout stream	Active unit used by five commonage shareholders
Dipping unit	IL 81314 ITM 70152	Glencullen trib	Single farm user (Active)
Dipping unit	IL 88760 ITM 67548	Glannamura	Single farm user (Active)
Dipping unit	IL 86906 ITM 67673	Glannamura	Single farm user (Active)

### *Quarries*

The Bundorragha catchment contains one quarry which is unlicensed and has recently become active extracting sand and gravel just upstream of Gelncullin Lough it's location within the catchment is indicated in **Figure 7**.



### ***Recreation and tourism***

While no activities were taking place during the period in which our morphology field surveys took place, excessive bank side trampling was noted along the lower stretch of the Bundorragha river from fisheries access. It has also been noted through consultation with the WRBD Technical Conservation Committee that Kayaking is operated along the lower stretch of the Bundorragha River. Further discussions with Galway Kayak Club confirmed that through an agreement with Delphi Fisheries, kayaking does take place along the Bundorragha River in the months outside of the fishing season which covers from 17<sup>th</sup> of October to the 1<sup>st</sup> of February when the river is in spate. Kayakers gain access across the road from the Delphi Adventure Centre and exit just above the road bridge at 84146 263387.



**Site 2 Photo 1**



**Site 1 Photo 20**

#### **4.0 CONCLUSIONS**

The Bundorragha Sub-Basin Catchment is one of the smallest Freshwater Pearl Mussel catchments in Ireland. Although sparsely populated and now found to be achieving Favourable Conservation Status following the 2009 surveys it still has a number of pressures within the catchment which pose a threat to the continued survival of this species. Agricultural practises such as grazing and sheep dipping facilities adjacent to river courses, fisheries, point source pressures from Delphi Lodge and Delphi Mountain Resort, Forestry, together with the recreational activities which take place within this catchment all pose a threat and can be a significant source of silt and nutrient to the river channel .

These pressures will need to be carefully monitored to ensure no further intensification takes place within the catchment.

## **APPENDIX A**

### **RHAT Field Sheet**

**Field Health and Safety sheet**

River Name \_\_\_\_\_ Site Code \_\_\_\_\_ Date \_\_\_\_\_

1 = Low risk    5 = High risk

Please circle applicable number

PARKING	1	2	3	4	5
FENCES/BARRIERS	1	2	3	4	5
GROUND STABILITY	1	2	3	4	5
DENSE VEGETATION	1	2	3	4	5
BANK STEEPNESS OR STABILITY	1	2	3	4	5
RISK FROM ANIMALS	1	2	3	4	5
PHONE COVERAGE	1	2	3	4	5

Previous RHS/RAT/RHAT surveys - year and code \_\_\_\_\_

Details of access \_\_\_\_\_

## RHAT (VERSION 2)

TRIBUTARY / MAIN CHANNEL\*

**Site Identification**

River Name \_\_\_\_\_ Site Code \_\_\_\_\_

Nearest WFD site FF10 \_\_\_\_\_

Water Body ID \_\_\_\_\_ Start U / S or D / S\*

First IGR \_\_\_\_\_ Last IGR \_\_\_\_\_

Bank surveyed from L / R / Both / in-Channel\*

Desk-study notes	Field Notes						
<p><b>ACTION TO TAKE PRIOR TO FIELDWORK</b></p> <p>General overall shape of river Check weirs, impoundments etc. on catchment</p>	<p>River type</p> <p>Date</p>						
<p>Floodplain connectivity and land use</p> <p>Expected river type</p> <p>Rain last week</p> <p>Estimated river width</p> <p>Estimated survey length</p> <p>Riparian land cover(s)</p> <p>River Agency designated?</p> <p>Other comments including geology - limestone / siliceous / peat*</p>	<p>Time</p> <p>Surveyors</p> <p>Weather conditions now</p> <p>Estimated river width (m) (average 3 readings)</p> <p>Estimated survey length (m) (40 X wetted width)</p> <p>Estimated river depth (m)</p> <p>Channel characteristics (e.g. different stream types on the reach)</p>						
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 2px;">RESULTS</td> <td style="width: 70%;"></td> </tr> <tr> <td style="padding: 2px;">Hydromorph score</td> <td></td> </tr> <tr> <td style="padding: 2px;">WFD class</td> <td></td> </tr> </table>	RESULTS		Hydromorph score		WFD class		<p>Pressures</p> <p>*Circle as appropriate</p>
RESULTS							
Hydromorph score							
WFD class							

Photograph details include IGR or approximate location

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*N.B. The survey length should be 40x the wetted width with a minimal stretch of 160m but not exceeding 1km.*



## NS RHAT

### Anthropogenic Impacts

River Name \_\_\_\_\_ Site Code \_\_\_\_\_ Date \_\_\_\_\_

Feature	Tick if present, record as E if > 30%		
Resectioning	None <input type="checkbox"/>	Left bank <input type="checkbox"/>	Right bank <input type="checkbox"/>
Reinforcement	None <input type="checkbox"/>	Left bank <input type="checkbox"/>	Right bank <input type="checkbox"/>
Embankments NO*	LB <input type="checkbox"/>	RB <input type="checkbox"/>	Set back LB <input type="checkbox"/> SB RB <input type="checkbox"/>
Culverts**	Y / N / Unknown*		
Over deepening	Y / N / Unknown*		
Wver widened	Y / N / Unknown*		
Narrowing	Y / N / Unknown*		
Fords**		Y / N*	
	Major /	Intermediate /	Minor
Bridges** NO*			
Weirs** NO*			
Fish Pass** NO*			

#### Physical features or resource use if applicable. \*

Deflectors / Jetties / Arterial drainage / Side channels / Mid channel bar / Field Drains / Mill Race

Navigation / Fishing / Recreation / Forestry/ Urban / Industry / HEP

Trashline present (height \_\_ m) above water / Buffer zone (LBm / RBm back from water edge)

#### Other observations - Invasives - Trees - Birds - Pollution indicators - Invertebrates\*

Rhododendron / Himalayan Balsam / Japanese Knotweed / Giant hogweed / Snowberry / Cherry-Laurel/ Gunnera

Sycamore / Beech / Conifers / Oak / Ash / Alder / Willow / Birch / Hazel / Hawthorn / Blackthorn / Holly

Heron / Sand martin / Grey wagtail / Dippers / Kingfishers /

Sewage fungus / Diatomaceous algae / Oil / Cladophora / Vaucheria / Dumping / Silt on Substrate

Other comments:

\* Circle as appropriate E - extensive. \*\* Tally as appropriate. LB - left bank / RB - right bank

## RHAT RIVER HYDROMORPHOLOGY ASSESSMENT TECHNIQUE

Field Assessment of Morphological Condition

River Name \_\_\_\_\_ Site Code \_\_\_\_\_ Date \_\_\_\_\_

If river in spate ignore 3 and 4 but deduct individual scores from overall if either feature not visible. Greyed boxes may be scored but note why in Comments/Notes.

	Bedrock	Cascade / Step-pool	Pool-riffle-glide	Lowland Meandering
1. Channel form and flow types	4	4	4	4
2. Channel vegetation	4	4	4	4
3. Substrate condition	4	4	4	4
4. Barriers to continuity	4	4	4	4
5. Bank structure & stability L+R	4	4	4	4
6. Bank vegetation L+R	4	4	4	4
7. Riparian land cover L+R	4	4	4	4
8. Floodplain connectivity L+R	4	4	4	4
<b>TOTAL</b>	<b>32</b>	<b>32</b>	<b>32</b>	<b>32</b>
Hydromorph Score *				
WFD class **				

\* Hydromorph score - Assessment score = Maximum Possible score

\*\* WFD Class

> 0.8 = high

>0.6 - 0.8 = good

>0.4 - 0.6 = moderate

>0.2 - 0.4 = poor

< 0.2 = bad.

**SHEET 5**

**NOTES**

## **APPENDIX 2**

### **PHOTOGRAPHS**

Photographs of site locations and catchment pressures on the Bundorragha River and tributaries 2009. All field work photographs can be found in the accompanying electronic appendix.

Overall Risk \* uses the “one out all out” principle

Site No.	Catchment Name	Location	X	Y	Photo No.	Bank Erosion	Diffuse Nutrient	Diffuse Silt	Field Drainage	Outfalls	Abstraction	Barriers to Migration	Current Riparian Zone	Overall Risk*	Pressure/Photo Details
1	Bundorragha	Downstream end of catchment	84121	263377	1	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Looking downstream from bridge
1	Bundorragha	Downstream end of catchment	84121	263377	2	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Bridge structure
1	Bundorragha	Downstream end of catchment	84121	263377	3	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Looking upstream from bridge, sheep grazing no buffer
1	Bundorragha	Downstream end of catchment	84121	263377	4	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Looking upstream from bridge, sheep grazing no buffer
1	Bundorragha	Downstream end of catchment	84121	263377	5.1	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Possible dismantled railway in centre of channel
1	Bundorragha	Downstream end of catchment	84121	263377	5.1	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Possible dismantled railway in centre of channel
1	Bundorragha	Downstream end of catchment	84146	263404	6	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Large pool of dead mussels covered in layer of silt
1	Bundorragha	Downstream end of catchment	84146	263404	7	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Large pool of dead mussels covered in layer of silt
1	Bundorragha	Downstream end of catchment	84146	263404	8	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Large pool of dead mussels covered in layer of silt
1	Bundorragha	Downstream end of catchment	84146	263404	9	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Large boulders placed in channel
1	Bundorragha	Downstream end of catchment	84176	263441	10.1	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Large population of mussels
1	Bundorragha	Downstream end of catchment	84176	263441	10	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Large population of mussels

1	Bundorragha	Downstream end of catchment	84184	263466	11	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Land drain entering channel, possible causing Ranunculus growth
1	Bundorragha	Downstream end of catchment	84188	263472	12	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Placed fisheries weir
1	Bundorragha	Downstream end of catchment	94180	263516	13	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Possible barrier to migration in low flows
1	Bundorragha	Downstream end of catchment	84153	263572	14	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Series of placed stone weirs for fisheries
1	Bundorragha	Downstream end of catchment	84150	263675	15	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Sheep poaching on right bank
1	Bundorragha	Downstream end of catchment	84150	263769	16	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Chute flow
1	Bundorragha	Downstream end of catchment	84150	263769	17	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Series of placed stone weirs for fisheries
1	Bundorragha	Downstream end of catchment	84141	263777	18	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Perforated land drain
1	Bundorragha	Downstream end of catchment	84107	263607	19	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	Culvert under road entering on left bank of channel
1	Bundorragha	Downstream end of catchment	84150	263769	20	Medium	Medium	Medium	Medium	Medium	Low	High	Medium	High	End point of survey
2	Bundorragha	Culverted stream	84079	264566	1	Medium	Low	Medium	Medium	Low	Low	Medium	Medium	Medium	Culverted stream entering main channel
2	Bundorragha	Culverted stream	84079	264566	2	Medium	Low	Medium	Medium	Low	Low	Medium	Medium	Medium	Downstream partial stone weir
2	Bundorragha	Culverted stream	84079	264566	3	Medium	Low	Medium	Medium	Low	Low	Medium	Medium	Medium	Upstream from right bank stone weir
2	Bundorragha	Culverted stream	84079	264566	4	Medium	Low	Medium	Medium	Low	Low	Medium	Medium	Medium	Mid Channel bar
3	Bundorragha	Outlet of Fin Lough	84082	265161	1	Low	Low	Low	Low	Low	Low	Low	High	High	Looking upstream from bridge
3	Bundorragha	Outlet of Fin Lough	84082	265161	2	Low	Low	Low	Low	Low	Low	Low	High	High	Looking downstream

															from bridge
3	Bundorragha	Outlet of Fin Lough	84082	265161	3	Low	Low	Low	Low	Low	Low	Low	High	High	Delphi Lodge Mountain Resort
3	Bundorragha	Outlet of Fin Lough	84082	265161	4	Low	Low	Low	Low	Low	Low	Low	High	High	Exit point from Fin Lough
3	Bundorragha	Outlet of Fin Lough	84082	265161	5	Low	Low	Low	Low	Low	Low	Low	High	High	Siltation on left bank
4	Bundorragha	North of Glencullin Lough	81473	270043	1	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Land clearance, improved grassland
4	Bundorragha	North of Glencullin Lough	81473	270043	2	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Inflowing tributary looking upstream
4	Bundorragha	North of Glencullin Lough	81473	270043	3	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Peat cutting on river bank
4	Bundorragha	North of Glencullin Lough	81473	270043	4	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Bank erosion upstream of bridge
4	Bundorragha	North of Glencullin Lough	81455	270055	5	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Potomagetan natans covering inflowing stream
4	Bundorragha	North of Glencullin Lough	81455	270055	6	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Trib flowing into lake
4	Bundorragha	North of Glencullin Lough	81473	270043	7	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Culverted trib - source of nutrient
4	Bundorragha	North of Glencullin Lough	81455	270055	8	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Myriophyllum species covered in FGA
4	Bundorragha	North of Glencullin Lough	81473	270043	9	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Looking down Fin Lough
4	Bundorragha	North of Glencullin Lough	81473	270043	10	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Fin Lough grazed slopes
4	Bundorragha	North of Glencullin Lough	81473	270043	11	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Fin Lough grazed slopes
4	Bundorragha	North of Glencullin Lough	81473	270043	12	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Over grazed areas
4	Bundorragha	North of Glencullin Lough	81473	270043	13	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Over grazed areas
4	Bundorragha	North of Glencullin Lough	81473	270043	14	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Over grazed areas

4	Bundorragha	North of Glencullin Lough	81473	270043	15	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Over grazed areas
4	Bundorragha	North of Glencullin Lough	81455	270055	16	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Potomagetan natans covering inflowing stream
4	Bundorragha	North of Glencullin Lough	81455	270055	17	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	Callitriche mostly concentrated in one spot on inflowing river
4	Bundorragha	North of Glencullin Lough	81455	270055	18	Medium	Medium	Medium	Medium	Medium	Low	Low	High	High	FGA on potomagetans
5	Bundorragha	Glennummera River	87154	267549	1	Medium	Medium	High	Medium	Low	Low	Medium	High	High	Forestry planted & felled up to the bank
5	Bundorragha	Glennummera River	87154	267549	2	Medium	Medium	High	Medium	Low	Low	Medium	High	High	Replanting - set back buffer 15m
5	Bundorragha	Glennummera River	87154	267549	3	Medium	Medium	High	Medium	Low	Low	Medium	High	High	Meander with deposition
5	Bundorragha	Glennummera River	87154	267549	4	Medium	Medium	High	Medium	Low	Low	Medium	High	High	Erosion from high energy system
5	Bundorragha	Glennummera River	87154	267549	5	Medium	Medium	High	Medium	Low	Low	Medium	High	High	Heavy siltation
5	Bundorragha	Glennummera River	87154	267549	6	Medium	Medium	High	Medium	Low	Low	Medium	High	High	Looking downstream from road crossing
5	Bundorragha	Glennummera River	87154	267549	7	Medium	Medium	High	Medium	Low	Low	Medium	High	High	Silt deposition
5	Bundorragha	Glennummera River	87154	267549	8	Medium	Medium	High	Medium	Low	Low	Medium	High	High	Clearfelling on other side of road
5	Bundorragha	Glennummera River	87154	267549	9	Medium	Medium	High	Medium	Low	Low	Medium	High	High	Set back buffer from replanting
Stopping Point 1	Bundorragha		83049	269348	1										Sheep dipping facilities beside river
Stopping Point 1	Bundorragha		83049	269348	2										Sheep dipping facilities beside river
Stopping Point 1	Bundorragha		83049	269348	3										Tracks from road into facilities on right bank of channel



**Appendix 3 – Catchment Walkover Risk Assessment Survey Sheet**

Tributary/Main Channel\*

**Site Identification**

River Name	Site Code
Water Body ID	Start U/S or D/S*
First site IGR	Last site IGR
Bank surveyed from L/R/In-channel*	

**Photograph details include IGR or approximate location.**


\* Select as appropriate

	Present?		Grid Reference of specific pressure	No. of Photographs	Comments
	Yes	No			
Source of Erosion					
Bank erosion					
Land clearance					
In river clearance					
Arable ploughing					
Animal trampling					
Fords					
Channel manipulation					
Hard bank protection measures					
Other sources					
<b>Overall Risk</b>	High	Medium	Low		
Diffuse Nutrient					
Arable					
Grazing					
Improved grassland					
Slilage					
Forestry					
Housing					
Industry and associated works					
Other sources					
<b>Overall Risk</b>	High	Medium	Low		
Diffuse Silt					
Arable					
Grazing					
Over-grazing					
Improved grassland (Re-seeding)					
Forest					
Slilage					
Industry					
Construction stages					
Housing					
Infilling					
Peat cutting					
Quarries					
Other sources					
<b>Overall Risk</b>	High	Medium	Low		

	Present?		Grid Reference of specific pressure	No. of Photographs	Comments
	Yes	No			
Current Riparian Zone					
Fencing					
Buffer					
Tree line at bank					
Tree line buffer					
Plantation with no buffer					
Urbanisation					
Flood protection					
Marshy land					
Landuse at bank					
Other sources					
<b>Overall Risk</b>	High	Medium	Low		
Field Drainage					
Ditch managed					
Ditch unmanaged					
Drainage on high slope					
Drainage on low slope					
Land drainage (perforated pipes)					
Other sources					
<b>Overall Risk</b>	High	Medium	Low		
Outfalls					
Industrial discharges					
Storm drains					
Culvert outfalls					
Other sources					
<b>Overall Risk</b>	High	Medium	Low		
Abstractions					
Small					
Large					
<b>Overall Risk</b>	High	Medium	Low		
Barriers to migration					
Culverts					
Bridge aprons					
Weirs					
Stone weirs					
Other sources					
<b>Overall Risk</b>	High	Medium	Low		