NS 2 FRESHWATER PEARL MUSSEL SUB-BASIN MANAGEMENT PLANS

REPORT ON MORPHOLOGICAL MONITORING AND CATCHMENT WALKOVER RISK ASSESSMENTS IN THE AUGHAVAUD CATCHMENT

September 2009

TABLE OF CONTENTS

INTRODUCTION

In order to assess the hydromorphological alterations within the Aughavaud 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

Sampling was carried out on the 22nd of April 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 Aughavaud 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 Aughavauded 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 Aughavaud RHAT assessments were carried out throughout the catchment.

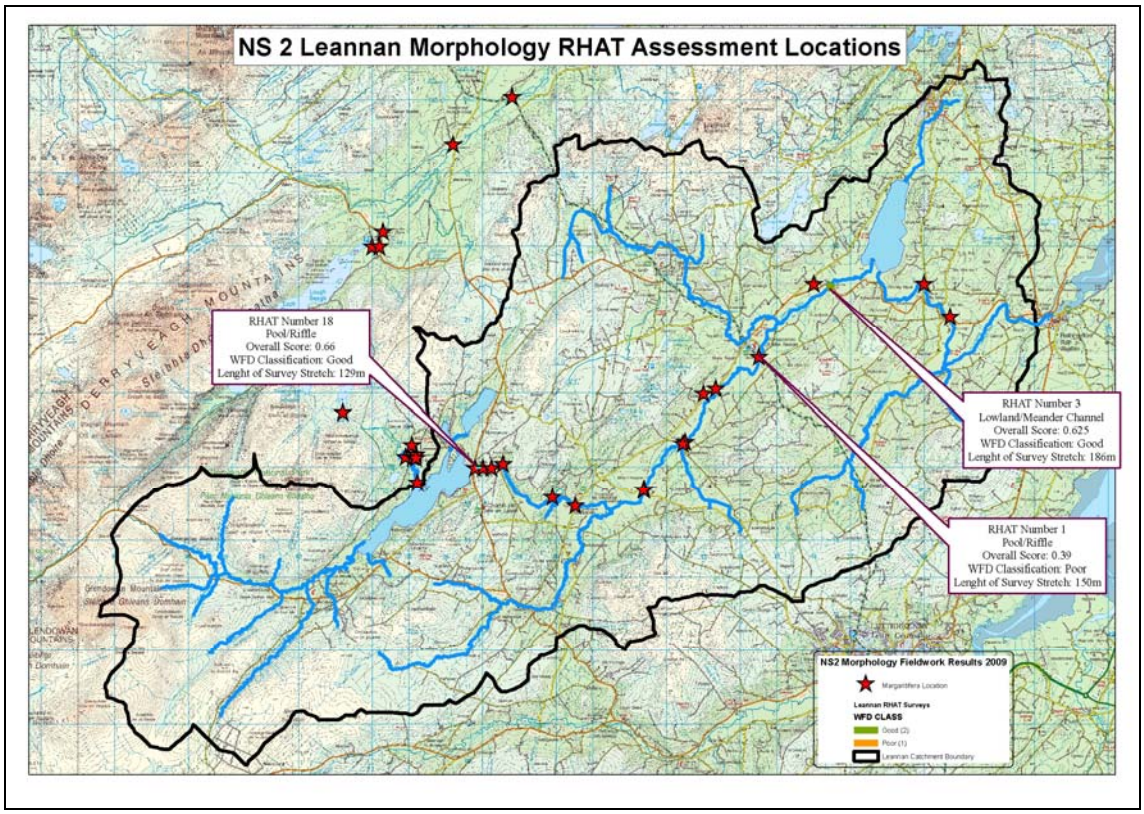


Figure 1 Morphology RHAT Assessment Locations

(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

One RHAT survey was carried out in the Aughavaud catchment over a 620m survey stretch within the vicinity of the pearl mussel population. The results of these surveys can be found in the electronic appendix. This survey stretch was deemed to be at poor and is located at the lower end of the catchment was at Good status. All attributes scored low with no category scoring more that 2. This was due to the pressure from agriculture on the right bank with cattle access and trampling causing significant pressure. Also, the removal of bankside vegetation and dumping of construction and demolition waste on the left bank has led to siltation within the channel. This is further evident from the macrophyte growth which is found at the bridge (See Site 2 Photo 15 & 16)

Representative photographs from reach:

RHAT 1 	**RHAT 1** 
RHAT 1 	**RHAT 1** 

Details in relation to photographs are tabulated in Appendix 2.

3.1 Catchment Walkover Risk Assessment Results

A total of five sites were surveyed in the Aughavaud sub-basin catchment, with a risk assessment carried out at four of these sites (one stopping point). **Figure 2** outlines the stopping point location in addition to the High to Low Risk Assessment from the Catchment Walkover Risk Assessments. All sites surveyed were recorded as high risk. **Figure 3** outlines the percentage of sites classified at high risk together with the stopping point in the catchment.

The most common high risk categories identified were:

- Current riparian zone – evident at 100% of high risk sites,
- Erosion – evident at 75% 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 2 indicates the percentage of stopping points also.

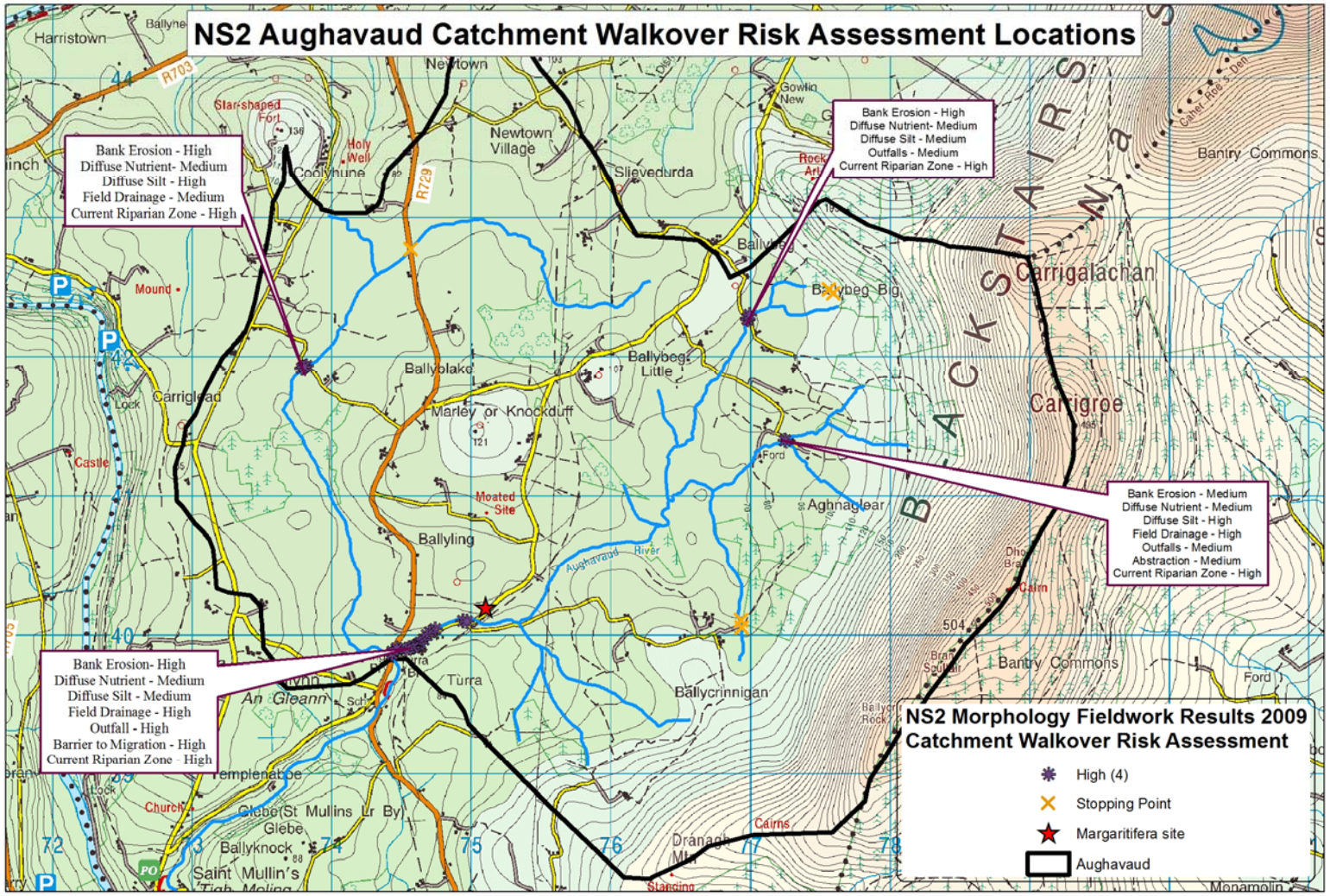
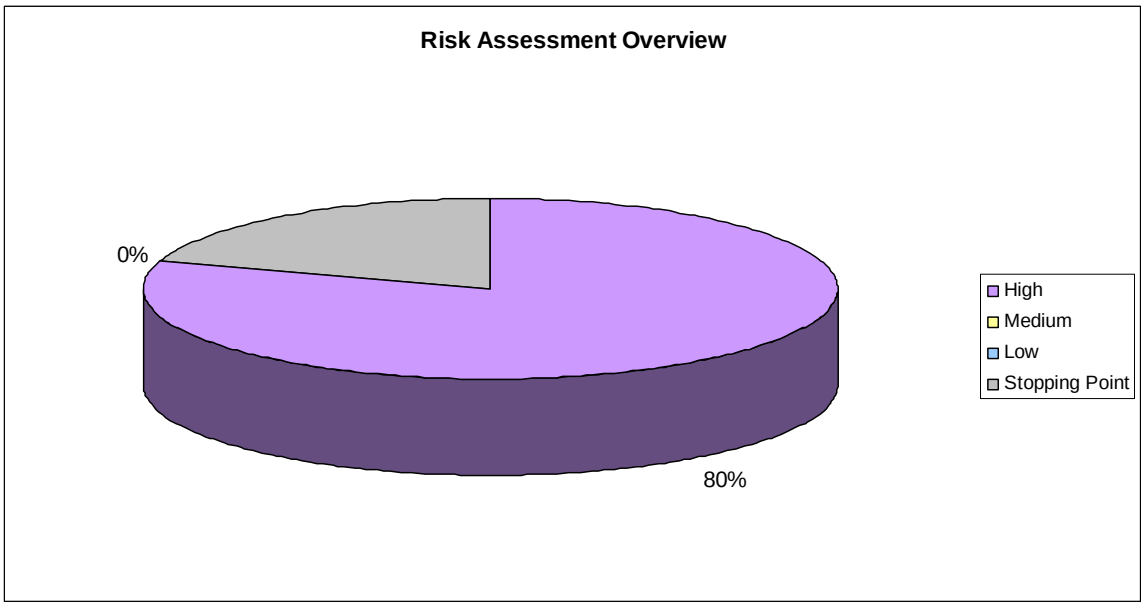


Figure 2 Location of Stopping points and Catchment Walkover Risk Assessments

Figure 3. Risk Assessment Overview



The break-down of pressure categories identified as high risk are outlined in Figure 3

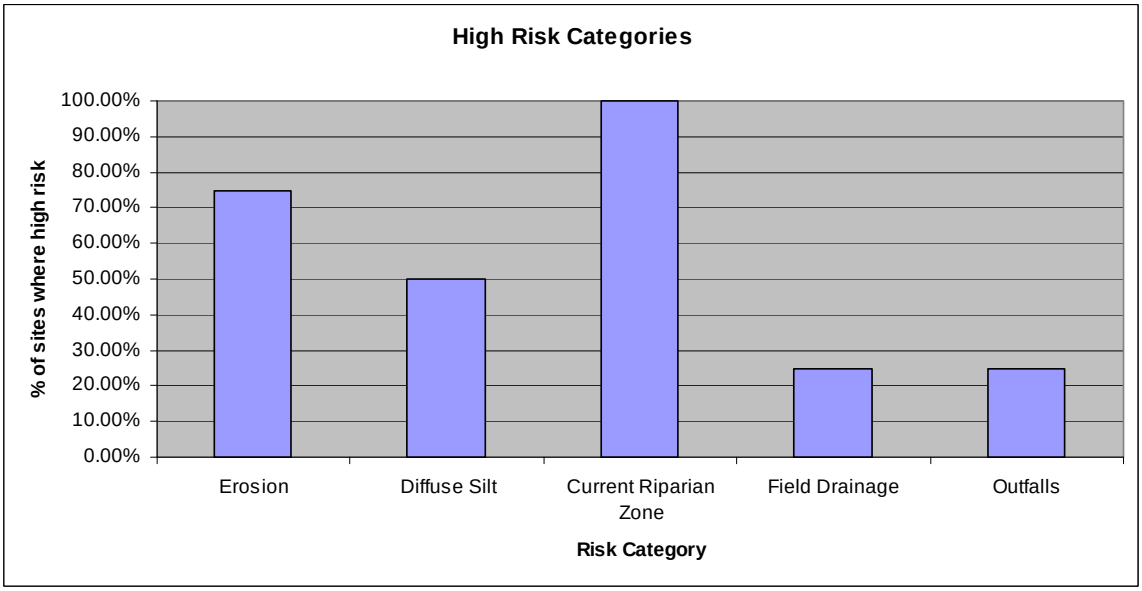


Figure 4. Breakdown of High Risk Categories

It is evident that the current riparian zone category is also a significant pressure within this catchment, however this pressure generally relates to how a poor riparian zone can intensify other pressures e.g. increased erosion from animal trampling caused by poor fencing. Quantitative statistics do not successfully display the pressures created by a

poor riparian buffer as they are linked with other pressure categories. The main issues identified within this catchment which lead to a high risk riparian zone were:

- A lack of fencing on banks which are grazed, allowing animal trampling, increasing nutrient enrichment from animals being within or near the river channel, and silt from bare sediment on banks.
- A poor riparian buffer in areas where there is grazing or forestry on banks.

The main sources of erosion within the Aughavaud sub-basin catchment are land clearance, animal trampling and hard bank protection measures each of which were visible at three of the four high risk sites. The remaining sources of erosion evident at high risk sites are shown below.

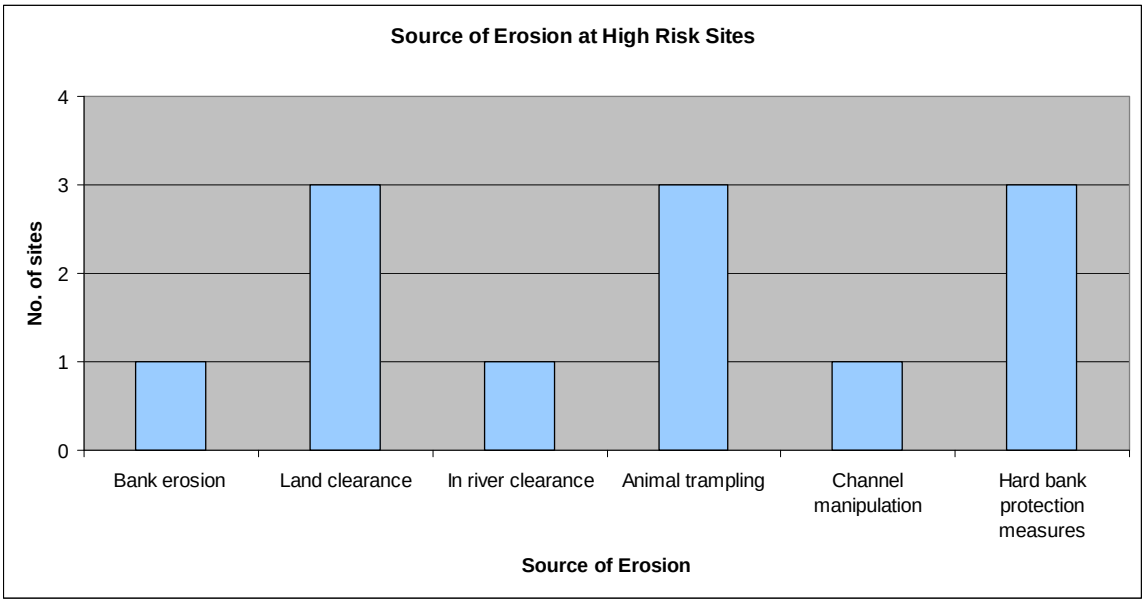


Figure 5 Source of Erosion at high risk sites

4.0 CONCLUSIONS

The Aughavaud sub-basin catchment appears to be in an over all poor condition from a morphological point of view largely due to the nature of the current riparian zone with high risk sites identified throughout the catchment including the upper reaches of the rivers.

The lack of effective riparian zone is intensifying pressures within the catchment, particularly in relation to fencing of agricultural land and a lack of a buffer on banks of agricultural or forestry land use. One risk assessment was undertaken in an area where Freshwater Pearl Mussel populations have been recorded, this site was considered high risk in terms of bank erosion, current riparian zone, field drainage and outfalls.

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
ACTION TO TAKE PRIOR TO FIELDWORK General overall shape of river Check weirs, impoundments etc. on catchment		River type Date
Floodplain connectivity and land use Expected river type Rain last week Estimated river width Estimated survey length Riparian land cover(s) River Agency designated? Other comments including geology - limestone / siliceous / peat*		Time Surveyors Weather conditions now Estimated river **width** (m) (average 3 readings) Estimated survey **length** (m) (40 X wetted width) Estimated river depth (m) Channel characteristics (e.g. different stream types on the reach)
RESULTS		Pressures
Hydromorph score WFD class		*Circle as appropriate

Photograph details include IGR or approximate location

_____

_____

_____

_____

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 ☐ Left bank ☐ Right bank ☐		
Reinforcement		None ☐ Left bank ☐ Right bank ☐		
Embankments	NO*	LB ☐ RB ☐ Set back LB ☐ SB RB ☐		
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
TOTAL	32	32	32	32
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 Aughavaud 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

Catchment Name	Photo No.	Bank Erosion	Diffuse Nutrient	Diffuse Silt	Field Drainage	Outfalls	Abstraction	Barriers to Migration	Overall Risk *	Current Riparian Zone	Pressure/Photo Detail
Aughavaud	1										Start of tributary, heavy shading
Aughavaud	2										Start of tributary looking upstream from road bridge
Aughavaud	1	High	Medium	Medium	High	High	Low	Medium	High	High	Incoming land drain from RB, unimproved grassland in foreground, improved grassland behind
Aughavaud	2	High	Medium	Medium	High	High	Low	Medium	High	High	Downstream end of catchment, upstream end of survey stretch. A little ranunculus present at this point.
Aughavaud	3	High	Medium	Medium	High	High	Low	Medium	High	High	Palm trees cut along road side and left on LB.
Aughavaud	4	High	Medium	Medium	High	High	Low	Medium	High	High	RB reinforcement along entire survey stretch.
Aughavaud	5	High	Medium	Medium	High	High	Low	Medium	High	High	RB reinforcement along entire survey stretch
Aughavaud	6	High	Medium	Medium	High	High	Low	Medium	High	High	Cattle fenced off from adjacent field where the landuse is pasture. Set back only 4m.
Aughavaud	7	High	Medium	Medium	High	High	Low	Medium	High	High	Indicates where channels are inflowing on LB when rain is high. Removal of trees will mean more silt entering the system
Aughavaud	8	High	Medium	Medium	High	High	Low	Medium	High	High	Appears yearlings from right bank have entered river, poaching RB, significantly disturbing in channel silt and macrophytes and then poached LB. Looks to be recently fenced off.
Aughavaud	9	High	Medium	Medium	High	High	Low	Medium	High	High	Tree has fallen in river causing a dam with pooling upstream, chute flow downstream with lots of debris building up behind it.
Aughavaud	10	High	Medium	Medium	High	High	Low	Medium	High	High	Culverted pipe going under road and into stream
Aughavaud	11	High	Medium	Medium	High	High	Low	Medium	High	High	Possible extraction , small black pipe coming through large concrete one and into river bed
Aughavaud	12	High	Medium	Medium	High	High	Low	Medium	High	High	Mature Island
Aughavaud	13	High	Medium	Medium	High	High	Low	Medium	High	High	Outfall to river
Aughavaud	14	High	Medium	Medium	High	High	Low	Medium	High	High	Embankment at downstream end of survey possible from historic site clearance, dumping
Aughavaud	15	High	Medium	Medium	High	High	Low	Medium	High	High	Tributary culverted under road and joining survey stretch at upstream end of survey
Aughavaud	16	High	Medium	Medium	High	High	Low	Medium	High	High	Taken at bridge at upstream end of survey
Aughavaud	17	High	Medium	Medium	High	High	Low	Medium	High	High	Looking downstream from bridge
Aughavaud	18	High	Medium	Medium	High	High	Low	Medium	High	High	Barrier to migration, bridge apron structure
Aughavaud	19	High	Medium	Medium	High	High	Low	Medium	High	High	Storm water pumping station directly entering river,

											sewage fungus evident
Aughavaud	20	High	Medium	Medium	High	High	Low	Medium	High	High	Pumping Station for storm overflow
Aughavaud	1	High	Medium	Medium	Medium	Medium	Low	Medium	High	High	LB poaching, improved grassland downstream
Aughavaud	2	High	Medium	Medium	Medium	Medium	Low	Medium	High	High	RB looking downstream poaching, improved grassland
Aughavaud	3	High	Medium	Medium	Medium	Medium	Low	Medium	High	High	RB poaching, improved grassland downstream
Aughavaud	4	High	Medium	Medium	Medium	Medium	Low	Medium	High	High	Looking upstream of road bridge
Aughavaud	5	High	Medium	Medium	Medium	Medium	Low	Medium	High		Replanting
Aughavaud	6	High	Medium	Medium	Medium	Medium	Low	Medium	High		Clear felling
Aughavaud	1	Medium	Medium	High	Medium	Medium	Medium	Low	High	High	Downstream of bridge reinforced and straightened
Aughavaud	2	Medium	Medium	High	Medium	Medium	Medium	Low	High	High	Storm drain entering river
Aughavaud	1	High	Medium	High	Medium	Low	Low	Low	High	High	Upstream of bridge on RB. Recently cleared by digger on bank and in-channel
Aughavaud	2	High	Medium	High	Medium	Low	Low	Low	High	High	Upstream bordered by improved grassland
Aughavaud	3	High	Medium	High	Medium	Low	Low	Low	High	High	Looking downstream of bridge
Aughavaud	4	High	Medium	High	Medium	Low	Low	Low	High	High	Incoming joining tributary. Some evidence of siltation in it. Water stagnant at present
Aughavaud											On going land clearance, works right up to bank. (Diggers) Could not get parking to take photos

Appendix 3 – Catchment Walkover Risk Assessment Survey Sheet

Sheet 1: Catchment Walkovers	Version 1. 07/04/2009
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?					
	Yes	No		Grid Reference of specific pressure	No.of Photographs	Comments
Source of Erosion						
Bank erosion						
Land clearance						
In river clearance						
Arable ploughing						
Animal trampling						
Fords						
Channel manipulation						
Hard bank protection measures						
Other sources						
Overall Risk	High	Medium	Low			
Diffuse Nutrient						
Arable						
Grazing						
Improved grassland						
Silage						
Forestry						
Housing						
Industry and associated works						
Other sources						
Overall Risk	High	Medium	Low			
Diffuse Silt						
Arable						
Grazing						
Over-grazing						
Improved grassland (Re-seeding)						
Forest						
Silage						
Industry						
Construction stages						
Housing						
Infilling						
Peat cutting						
Quarries						
Other sources						
Overall Risk	High	Medium	Low			

	Present?					
	Yes	No		Grid Reference of specific pressure	No.of Photographs	Comments
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						
Overall Risk	High	Medium	Low			
Field Drainage						
Ditch managed						
Ditch unmanaged						
Drainage on high slope						
Drainage on low slope						
Land drainage (perforated pipes)						
Other sources						
Overall Risk	High	Medium	Low			
Outfalls						
Industrial discharges						
Storm drains						
Culvert outfalls						
Other sources						
Overall Risk	High	Medium	Low			
Abstractions						
Small						
Large						
Overall Risk	High	Medium	Low			
Barriers to migration						
Culverts						
Bridge aprons						
Weirs						
Stone weirs						
Other sources						
Overall Risk	High	Medium	Low			