

Supporting Guidance (WAT-SG-92)

Regulation of Impoundment alterations (Removal & Modification)

Version: V2 (March 2023)

Copyright and Legal Information

Copyright© 2022 Scottish Environment Protection Agency (SEPA).

All rights reserved. No part of this document may be reproduced in any form or by any means, electronic or mechanical, (including but not limited to) photocopying, recording or using any information storage and retrieval systems, without the express permission in writing of SEPA.

Disclaimer

Whilst every effort has been made to ensure the accuracy of this document, SEPA cannot accept and hereby expressly excludes all or any liability and gives no warranty, covenant or undertaking (whether express or implied) in respect of the fitness for purpose of, or any error, omission or discrepancy in, this document and reliance on contents hereof is entirely at the user's own risk.

Registered Trademarks

All registered trademarks used in this document are used for reference purpose only. Other brand and product names may be registered trademarks or trademarks of their respective holders.

Update Summary

Version	Description
V1 Oct 17	First issue for Water Use reference using approved content from: <i>WAT-SG-92_Impoundment Removal & Modification</i>
V2 Mar 23	Minor review to provide better clarity to ensure consistency in approach for RBMP and non-RBMP related projects

Notes:

References: Linked references to other documents have been disabled in this web version of the document. See the References section for details of all referenced documents.

Printing the Document: This document is uncontrolled if printed and is only intended to be viewed online.

If you do need to print the document, the best results are achieved using Booklet printing or else double-sided, Duplex (2-on-1) A4 printing (both four pages per A4 sheet).

Always refer to the online document for accurate and up-to-date information.

Contents

1.	Introduction	5
1.1	Key Points.....	5
1.2	Impacts of impoundments / fish barriers	6
1.3	Reasons for removal or modification.....	6
1.4	Risk of modification / removal	7
1.5	Pre-application discussion and communication	7
2.	Authorisation and Planning Permission	8
2.1	Authorisation	8
2.2	Reservoirs (Scotland) Act 2011	9
2.3	Water Environment Fund	9
2.4	Charging	10
2.5	Planning Permission and flood risk assessment	11
3.	Decision making process	12
3.1	Associated guidance	13
3.2	Decision Making.....	14
3.3	Establish the current pressures.....	14
3.4	Assess the river type and risk of making changes	15
3.5	Options appraisal	16
3.6	Reasons to keep the structure	17
3.7	Mitigating the impacts of removal – during and after.....	18
4.	Detailed assessment and supporting information	19
4.1	Removal Works & Geomorphology	21
4.2	Pollution	25
4.3	Flood risk	28
4.4	Waste materials	29
4.5	Fish access and habitat	30

4.6	Built Heritage	32
4.7	Natura interests.....	32
4.8	Hydrology.....	33
4.9	Invasive non-native species.....	33
	Annex A: Licensing.....	34
	Annex B: Reasons to keep the structure	39
	References	41

1. Introduction

This document provides SEPA regulatory guidance on the alteration (removal or modification) of impoundments.

1.1 Key Points

This guidance sets out important considerations for the authorisation of removal or modification (e.g., partial removal, height reduction or installation of a fish pass) of impoundments in relation to The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). Issues out with CAR such as access, ownership, contractual arrangements and funding are not covered by this guidance.

While the principles apply to larger dam removal, the guidance is aimed at work carried out on weirs and small dams.

The aim of the guidance is to make it clear when removal is appropriate or if other options should be considered. The approach requires expert judgement on a site-by-site basis to determine if the risks are acceptable and can be controlled.

As noted in *CAR – A Practical Guide* “SEPA will only require authorisation for alterations to impoundments that have an impact or risk an impact on the water environment. Removal or modification of an impoundment poses a risk to the water environment, so authorisation is required.

1.2 Impacts of impoundments / fish barriers

Whilst many impoundments provide clear benefits, they can also have a number of detrimental impacts on the water environment, including:

- Acting as a barrier to fish movement both upstream and downstream;
- Altering water flows and levels both upstream and downstream of impoundment;
- Trapping sediment behind the structure and limiting downstream movement of sediment;
- Blocking the transfer of aquatic species and fragmenting habitat;
- Altering water temperature and water quality;
- Falling into disrepair and having unpredictable impacts.

Removing or modifying an impoundment, if done in the correct manner, should remove or reduce many of these impacts. Full removal may not be necessary to achieve the objectives of the *River Basin Management Plans* (RBMP) for example if disproportionate costs are involved or there are significant technical constraints. In those cases, the addition of mitigation such a fish pass may be adequate.

An authorised person will retain a legal obligation to ensure a fish pass is maintained and operated to allow fish passage under CAR.

1.3 Reasons for removal or modification

The RBMPs include objectives to remove barriers to fish such as weirs, dams and historic engineering structures (e.g., bridge aprons, culverts etc). The improvements are delivered through regulatory measures. In some cases, for example redundant weirs which have been prioritised within the RBMPs may be eligible for funding from the *Water Environment Fund* (WEF).

Impoundment operators may also apply to SEPA to modify/remove structures for reasons out with the RBMP. For example, operators of larger impoundments may want to remove their structure if it is no longer used or part of a decommissioned works.

1.4 Risk of modification / removal

The modification and/ or removal of an impoundment will in many cases have clear environmental benefits e.g., opening up fish access, river continuity and restoring the water environment. However, there can be risks associated with modifications to impoundments:

- Working in rivers;
- Releasing large quantities of sediment;
- Releasing polluted sediment;
- Altering water levels/ flows:
- Timing of works (e.g. fish spawning periods);
- Erosion/flooding;
- Inappropriate design/ bed reinstatement;
- Ongoing risk of channel moving over time;

It is envisaged that the majority of these risks can be mitigated by controlling the timing of works and the detail of the approach used.

1.5 Pre-application discussion and communication

Pre-application discussion can help clarify information requirements, promote good practice and make sure a range of options are considered.

Communication with interested parties will make it clear when they can get involved and manage expectations about what information is relevant to the process. For example, specific information to be considered as part of the technical assessment.

Projects in urban areas or rivers with other water users will require extra effort and a communication plan should be considered where appropriate in addition to the standard consultation and advertising process (*WAT-RM-20: Advertising and Consultation*).

2. Authorisation and Planning Permission

2.1 Authorisation

The construction or alteration of impounding works in inland water or wetland and the operation of any impoundments in surface water or wetlands (e.g., weirs and dams), require authorisation under CAR (impoundment regime). Where fish passage is required, the authorisation will have conditions requiring the responsible person to install and maintain fish passage past the structure. This includes redundant weirs.

The alteration (removal or modification) of an impoundment in inland surface waters is a controlled activity which requires authorisation through CAR (The Water Environment (Controlled Activities) (Scotland) Regulations 2011).

Proposals for removal or modification of impoundments will be dealt with in conjunction with *WAT-RM-01: Regulation of Abstractions and Impoundments*.

The level of regulation SEPA will apply to authorise these activities will depend on the proposal being considered and whether the impoundment is already authorised. [Annex A](#): Licensing details the authorisation requirements for the relevant activity.

2.2 Reservoirs (Scotland) Act 2011

The reservoir manager of a reservoir regulated under the *Reservoirs (Scotland) Act 2011* needs to undertake certain steps should they wish to remove or undertake certain alterations to the dam, to ensure they remain compliant with the legislation.

Prior to any works commencing they are required to appoint a construction engineer and notify SEPA of this appointment at least 28 days prior to commencement of the works. The appointed construction engineer must come from the relevant panel of reservoir engineers. A list of these can be found on the *Scottish panels of engineers* website page. They are also required to notify SEPA at least 28 days prior to the commencement of the works.

Use the *Appointment of Construction Engineer & Notification of Relevant Works* form for notifying SEPA of the appointment of a construction engineer or commencement of works. Further information on the Reservoirs (Scotland) Act 2011 see the *Reservoirs* page on the SEPA website.

Should you have any queries regarding any of the above then please contact SEPA's *Reservoir Regulatory Unit* prior to starting any works.

2.3 Water Environment Fund

The provision of fish migration at any existing impoundment (e.g., weirs and dams) is the responsibility of the structure owner(s) under the Water Environment (Controlled Activities)(Scotland) Regulations 2011 ("CAR"). However, WEF funds may be available under certain circumstances to help owners of those structures that are historic, redundant and no longer have an economic use. The owner remains responsible for any future maintenance liability for retained structures.

WEF funding is potentially available for redundant structures such as old weirs and dams which are:

- An identified RBMP priority;
- No longer in active use;
- Not a commercial asset of the current owner

WEF funds are not available for the maintenance of redundant structures. Please contact *WEF Unit* for queries or look at the *Water Environment Fund* web page.

2.4 Charging

Applications should be charged in accordance with the Environmental Regulation (Scotland) Charging Scheme and associated guidance. See *Charging schemes and summary charging booklets*.

Further charging guidance specific to fish barrier improvement work has also been developed for internal use.

2.5 Planning Permission and flood risk assessment

CAR applicants should consult their relevant planning authority to see whether planning permission is necessary. If planning permission is required, then the planning authority may consult SEPA as a statutory consultee about flood risk.

SEPA will not consider flood risk as part of an application for an authorisation under CAR. However, applicants should be aware of their responsibilities for preventing flood risk and understand the potential impacts.

Flood related matters will only inform the decision making where an application is subject to a Derogation Test (*WAT-RM-34: Derogation Determination - Adverse Impacts on the Water Environment*) where an application is likely to cause a high degree of environmental harm, i.e. downgrade a waterbody. An assessment of the balance between negative and positive impacts of the proposal will be undertaken (WAT-RM-34). The flood risk impact (increases or decreases in risk) resulting from the proposal may be fed into the balancing assessment.

See *CAR Flood Risk Standing Advice* for more information.

As part of the funding assessment through the Water Environment Fund flood risk will be assessed but as part of the criteria for funding rather than as part of a determination under CAR.

3. Decision making process

In some cases, the removal should be relatively straightforward and will eliminate the pressures on the water environment, the need for ongoing maintenance and the responsibility for unused structures. It is important to understand the potential impacts of modification or removal beforehand and steps are put in place to manage re-adjustment of the river channel during and following changes. The rate of change will depend on the river type.

“A river’s response to weir removal is strongly dependent on local conditions and variables and assessments for impact of weir removal should be undertaken by an experienced geomorphologist, although minimal input may be needed for small weirs or low-risk sites.” The first option should be to consider whether the structure can be removed and only if there are clear reasons to keep it (section 3.6) then modification should be considered as the next best option e.g., installation of a fish pass, partial removal or bypass channel. Fish passes do not provide unhindered fish migration and the remaining barrier still affects river continuity and will require ongoing maintenance (and will be an obligation under CAR for the structure).

It is the owner/ operator’s responsibility to assess the potential impacts and SEPA will review their assessment and decide whether the proposal is appropriate.

The assessment under CAR is to consider the potential impacts on the water environment. There may be other issues out with CAR that are relevant to the project but will not be part of the CAR decision making process. For example, access and ownership issues. Similarly wider considerations of whether the channel will readjust onto adjacent land, whilst relevant, are not a CAR matter.

Advice should be sought from appropriate science staff using the Evidence and Flooding Advice Helpdesk at the start of the process.

3.1 Associated guidance

There are useful guidance documents available that can be used in conjunction with this guidance.

3.1.1 CIRIA Good Practice Guide

The newly published *River weirs: Design, maintenance, modification and removal* provides a comprehensive guide on all aspects of weir management, modification and removal with links to further references. Chapter 12 provides an overview of the geomorphic aspects that need to be considered and Appendix 3 provides case studies of weir modifications and removals that have been carried out in the UK.

3.1.2 Environment Agency review of best practice

The Environment Agency has reviewed best practice in *Weir removal, lowering and modification: A review of best practice*. Section 3 provides an overview of the current knowledge about weir removal and adaptation.

“With effective project planning and decision-making process prior to removal, potential detrimental impact can be predicted, and mitigations and monitoring put in place.¹”

3.1.3 River Restoration Centre guidance

The *River Restoration Centre* provides information and guidance on restoration projects. The guidance is focused on the South of England but the principles and some of the techniques are applicable in Scotland. Examples from the North West of England will be more relevant in a Scottish context.

- *Demonstration Restoration Projects*
- *Guidance*
- *Manual of River Restoration Techniques*
- *Rivers by Design*
- *River Restoration*
- *Top 10 Tips to Deliver a Restoration Project*

¹ Environment Agency review

The online *Manual of River Restoration Techniques* highlights case studies of different best practice techniques that have been incorporated into projects based on the objective and type of river. Of particular interest will be section 12 which covers Removing and passing barriers. Begin by using the *How to use this Manual* guide and then use the sections (e.g., View Projects by technique) relevant to river type and proposed project.

SEPA can also put case studies forward for inclusion in these guidance documents and the *Restoring Europe's Rivers* RiverWiki site.

3.2 Decision Making

During the decision making process it is important to:

- establish the current pressures;
- assess river type and risk of change;
- assess the options for removal or modification;
- consider reasons to keep the structure and future maintenance cost and responsibilities; and
- mitigate the risks.

The decision making process under CAR should only assess the impacts on the water environment (i.e., whether the activity will cause a failure of environmental standards or compromise an objective in the RBMP).

3.3 Establish the current pressures

Where the changes are to deliver improvements through the RBMP then the pressures on the water environment contributing to a classification downgrade and requiring improvement should be established. For SEPA staff, the Measures Database details classification status, measures fix date and progress towards improvements. The majority of measures in the RBMPs are being delivered by sector groups so check no associated measures are being progressed in the catchment. The *Water Environment hub* displays information externally. Note that SEPA has prioritised fish barriers for action within the RBMPs.

Other pressures may come to light that are not listed in the RBMP and these can be taken into account when assessing the options at a site. Quantifying the scale and significance of existing pressures will allow a proportionate approach to be taken.

3.4 Assess the river type and risk of making changes

The removal or lowering of a barrier will alter the geomorphological processes acting in a section of catchment. Following weir removal, the river has to reset its gradient so that the slope is more uniform over the reach, rather than the stepped profile that is present with the weir in-situ. Over time, sediment will have built up behind the weir, with the height of the weir and the gradient of the river determining how much. Following removal, the river will 'flatten out' the current artificial change in levels, increasing channel slope and flow velocity upstream of the barrier causing erosion and accelerated delivery of sediment downstream, which may reduce the channel gradient as a result. It is important to assess the extent of the likely changes and whether they are significant over a short or long term (See section 3.3.2 of the Environment Agency review² for further information).

The assessment should include a prediction of the likely changes and time to reach a state of relative equilibrium together with works that might be required if the changes constitute a risk.

3.4.1 Determining channel type

It is widely recognised that understanding the channel type is crucial in the decision making process. This should be used to consider the potential risks with different options and possible solutions. Rivers will behave differently depending on the setting (e.g., open valley compared to steep upland stream). An experienced geomorphologist should suggest options suitable to the channel type and likely response to removal or modification. Minimal input may be required for low risk sites such as small weir removal in bedrock environments.

Section 2.2 and associated annexes of *WAT-SG-21: Environmental Standards for river Morphology* explains how the channel type can be determined and displayed on the Morphology layer in GIS. This is a good starting point, but it should be confirmed during a site visit.

² Environment Agency review

3.5 Options appraisal

It is important that a range of options are considered to find the most suitable solution for the watercourse and to avoid disproportionately costly or technically infeasible options being the only consideration.

Only if removal is not feasible then modification or installation of suitable mitigation which allows fish passage, for example, could deliver the required improvement to meet the RBMP objective.

Remember that CAR assesses the impact on the water environment. Whilst some of the issues considered under an options appraisal such as impacts on erosion or flooding are relevant to the management of the site, they are not a direct consideration in the determination process under CAR. The decision whether to grant an authorisation under CAR should only take into account the issues that directly affect environmental standards, water body status and future RBMP improvements.

In a wider context it is important to allow the river room to move and readjust following any changes to avoid ongoing problems with erosion and flooding. River re-adjustment post weir removal is an important consideration and may influence erosion and flooding patterns. Taking into account natural processes within the river, even in an urban context, will reduce maintenance and achieve long-term stability sooner. Options which take account of processes such as sediment movement could also avoid or reduce maintenance costs.

Once a range of feasible options have been identified they can be compared for their impact on the river, suitability for the problem to be solved, technical feasibility and cost (including ongoing maintenance costs).

“The most cost-effective solution is the one that minimises environmental harm or maximises environmental benefit at a proportionate cost. Large absolute cost, in itself, does not constitute disproportionate cost. For example, incurring significant costs to prevent significant environmental harm or achieve significant environmental benefits e.g., safeguarding protected species and designated sites, would be considered proportionate.

But incurring significant costs for minor environmental benefits would be considered disproportionate.³ Option examples (not an exhaustive list):

- Full removal;
- Gradual/staged removal;
- Partial removal or lowering;
- Notching;
- Bypass channel installation;
- Rock ramp;
- Fish pass installation;
- Launch pool creation (various materials including stone or wood);
- A combination of the above.

3.6 Reasons to keep the structure

There could be a number of reasons why the structure cannot be fully removed. For example, it supports an abstraction. [Annex B: Reasons to keep the structure](#) provides examples of reasons why an impoundment cannot be removed so in those cases mitigation measures should be the next best option. In rare occasions mitigation measures may also not be feasible.

³ Box 4 from section 1.5.2 of *WAT-RM-02*

3.7 Mitigating the impacts of removal – during and after

It is likely that the channel will readjust after the structure has been removed or altered so the impacts should be predicted and measures to limit the instability considered as part of the proposal. Measures should allow room for the river to move rather than constraining it in the current channel where possible. An experienced geomorphologist should assess the channel type and its energy levels to fully understand the likely response to removal or modification. In some situations, the removal should not be considered in isolation. For example, some green bank protection may reduce the potential for erosion and aid restoration. Similarly using some of the sediment from behind the structure to reprofile the watercourse can reduce sediment redistribution downstream and help the channel stabilise.

- Has the advice of a geomorphologist been sought and incorporated into designs for groundworks?
- What is being done during the removal to limit the potential impacts?
- What is being done afterwards to manage potential channel stability?
- Is there a need for additional monitoring to ensure the measures have been successful and the channel has reached a stage of equilibrium?
- Are good practice construction methods included in the proposal (See [WAT<https://www.sepa.org.uk/regulations/water/engineering/engineering-guidance/SG-29: Good Practice Guide - Construction Methods>](https://www.sepa.org.uk/regulations/water/engineering/engineering-guidance/SG-29: Good Practice Guide - Construction Methods))

If removing a structure is considered the best course of action, then efforts should be made to minimise the impacts during removal and ensure the channel is restored appropriately. Monitoring and maintenance of the channel post modification can be part of the CAR authorisation for high risk sites such as reservoir removals. This could be for a set period of time or until expert judgement is that the channel has recovered and reached a state of relative equilibrium. This could be done using a time lapse camera taking one photo per day for example.

Mitigation measures are not required from a CAR point of view if the proposal does not fail the environmental standards or compromise a future RBMP objective.

For the most complex sites an element of adaptive management will have to be built into the process. This begins with technical decisions based on predicted outcomes during the authorisation process and then moves to ongoing monitoring and review where the management and mitigation measures may have to be altered to meet the objectives. This may be a requirement of the CAR authorisation where appropriate for the highest risk sites. For example, a fish pass may require minor alterations if passage is not as successful as expected.

4. Detailed assessment and supporting information

The type and extent of any detailed assessments should be based on the risk posed by the proposal and the severity of the impact. The following section sets out the approach expected for each of the key issues. Where appropriate, the level of assessment and information has been categorised based on that risk. Further information may be required to assess site specific issues so early pre-application discussion should be encouraged. Some assessment techniques will rely on interpretation whilst others require more analytical assessment.

The information gathered as part of the CAR application should only support the assessment of whether the proposal is likely to have an impact on the water environment, i.e., assessing the effects on the environmental standards. Further information may be appropriate out with the CAR process. For example, impacts on erosion downstream and methods to manage it but that will not be a requirement under CAR.

All applications for removal/modification should contain the generic information in [Table 1](#). The subsequent sections then indicate the assessment level for each of the relevant topics where applicable.

Table 1 Generic information

Description	A description of the structure – its height ⁴ , width, depth, shape and material content (include diagrams, measurements and current state of repair and maintenance records if available);
Photos	Photographs of the structure and photographs facing upstream and downstream of the structure;
NGR	An 8-figure National Grid Reference (see <i>NGR Help</i>) and a map (with scale) showing its location;
River Type	Description of river type (upland, lowland, width in metres, bedrock or gravel bed);
Surveys	Any surveys or assessment results e.g., fish surveys, measurements taken, intrusive testing of weir, flow gauging, flood modelling, geomorphology surveys;
Sediment	Description/photographs/measures/estimates of sediment build up behind structure and whether it is recent or not ⁵ ;
Affected Sites	Information on designated sites that may be affected by the project;
Options considered	Full description of the options considered to modify/remove the structure (including the options appraisal carried out to determine the most suitable proposal);
Outline description	Outline description of proposal, stating which watercourses (rivers and lochs) will or could be affected, including a map of the potentially affected area;
Site Plan	A site plan including plans and diagrams of the proposal and long-profile drawing through the impounded area including details of any mitigation that may have to be installed, e.g., rock steps following removal;
Summary of Benefits	A summary of the benefits derived from removal or easement (e.g., length of catchment opened to fish passage);
Drawings	Cross-section drawings showing, where necessary, indicative cross-sections where the channel shape is due to change - typically at least 2 such cross-section drawings: one where the channel is curved (e.g., asymmetric cross-section on the outside of a bend) and one for straight sections. If the channel has a lot of bedrock or is unlikely to adjust, then these diagrams may not be necessary;
Statement	Construction method statement;
Mitigation	Details of engineered mitigation to be included such as bank defences, or bed stabilisation.

⁴ As measured from the downstream toe of the works to the crest or top of the spillway

⁵ Can be carried out using SEPAs LIDAR data – ask Hydromorphologists for advice

4.1 Removal Works & Geomorphology

The changes to the geomorphological process and knock on effects are likely to be the single biggest risk associated with impoundment removal or modification. If not suitably assessed and incorporated into the options appraisal, changes to channel slope, water levels and sediment movement can result in bed and bank erosion, sediment deposition and flooding. Section 3 covers the principles of assessing these risks and this section gives an indicative level of the assessment and detail required. It is important to engage a suitably qualified geomorphologist to make sure the assessment is tailored to and proportionate to the issues.

4.1.1 Detailed impact assessment

The assessment under CAR is to consider whether there is an impact on the water environment. The removal of impoundments should not cause a failure of morphological condition limits or deterioration of status as a pressure is being removed. However, if the removal requires additional works such as bank protection, then this pressure will have to be assessed. To assess the impacts on the water environment the Environmental Standards Test detailed in *WAT-RM-02: Regulation of Licence-level Engineering Activities* and *WAT-SG-21* should be applied. It is good practice to assess removals to capture improvements to the water environment.

If there is no breach of standards, then the activity can be authorised from a morphological point of view.

The level of assessment should be proportionate to the risks involved however this must be ascertained by carrying out a basic level of assessment for all applications. The majority of applications will be expected to include an assessment of the main geomorphic processes in the affected reach using a geomorphic walkover survey that documents and assesses the likely risks of removal. The generic information (Table 1) and simple geomorphic walkover survey should be sufficient to determine if the proposal causes a failure of environmental standards.

If the water body is a baseline water body and is less than Good status for morphology, then Good Practice should still apply to ensure that changes to the water environment are sustainable long term solutions and do not compromise RBMP objectives. The following section covers good practice.

Appendix IV of *WAT-RM-02* explains a range of other detailed assessment techniques that may be appropriate. The level of assessment should be discussed with SEPA during pre-application discussions.

The category of risks can be reduced by including mitigation into the design. For example, regrading the bed to remove the sediment which has built up or leaving a control point (such as the sill of the impoundment) to limit upstream erosion.

First use Table 2 to determine the risk and sensitivity and then base the good practice assessment level in Table 3 on that risk.

Table 2 Indicative geomorphological risk

Risk of destabilisation (risk of nick point upstream sediment build up downstream)	Room for river adjustment⁶		
	Plentiful No nearby infrastructure, rural location	Moderate (e.g., limited infrastructure or urban environment in the vicinity)	Scarce (e.g., adjacent infrastructure, or urban environment)
Low (stable or bedrock channel)	L	L	M
Medium (plane bed/pool riffle)	L	M	H
High (active meandering gravel bed) channel)	M	H	VH

⁶ Agreed with landowners.

Table 3 Geomorphology information requirements

Risk	Information requirements
Low	Generic information (table 1).
	Geomorphic walkover survey that illustrates that this is low risk ⁷
Moderate (in addition to Low)	Sediment depth and volume estimate.
	Assessment of sediment removal/ reintroduction options and implications for river stability.
	Post removal channel design (cross sections and long profile)
	Detailed assessment of river dynamics. This could include analysis of historic channel change, fluvial audit of current processes and overall analysis of likely future dynamics with and without the weir
	Topographic survey information (i.e., LIDAR)
High (in addition to Moderate)	Scour assessment of nearby infrastructure.
	Assessment technique suitable to the issues in the reach to demonstrate actions will control adjustment within available room.
	Invasive surveys of weir structure and integrity.
Very High	A high degree of detailed technical justification/mitigation is likely necessary. Site specific.

⁷ Based on advice from a geomorphologist this may not be required in all cases.

4.1.2 Design and construction

Necessary mitigation measures should be built into the design of the proposal to minimise the disturbance of the changes to channel form and aid channel equilibrium. For example:

- Engineering solutions to stabilise the banks or bed following removal of a structure if they are likely to fail and if there is infrastructure nearby (soft or hard protection);
- Plans for seeding and restoration of land exposed by the drop in water level and/or reprofiling of banks following construction works;
- Sediment management during and after the work including ensuring that there is enough coarse material to form bed resistance in the form of steps or riffles if necessary/natural in the system; and
- The management or restoration of aquatic habitat to reduce impacts.

Measures should be the minimum necessary, taking into account the river sensitivity and likely channel response. Where there is suitable room for channel readjustment then mitigation such as rip rap should not be necessary.

Mitigation is SEPA's means of limiting the impacts of river engineering but must not be used as a trade off in an attempt to offset a proposal that doesn't follow good practice and sustainable river management.

The licence assessment will identify a range of impacts and their spatial extent. As far as is reasonable and practical, measures should be adopted to minimise the risks from these impacts.

Good construction method statements and design (following *WAT-SG-29*) should minimise the impacts during and after the work being undertaken. The removal may have to be done in stages to allow the channel time to readjust.

Guidance should be sought from geomorphology staff as every case will require site specific assessment of the most suitable design and mitigation. Table 3 in *WAT-SG-21* provides a high level summary of mitigation measures.

4.2 Pollution

The two aspects causing a serious risk of pollution are excessive and negligent sedimentation and pollutants. Sedimentation being the agitation and release of sediment into the water environment leads to smothering, and pollutants generally being chemicals trapped in the sediment or in the material behind the structure.

4.2.1 Sedimentation

Release of sediment should be carefully considered to ensure the volume, timing and location of the release does not cause significant impacts such as smothering habitat downstream.

There will be some disturbance of sediment when structures are removed from the water environment however this should be a relatively short term impact and things will return to a balance in a short period for low risk sites. The short term release of sediment should be outweighed by the wider and long-term environmental gains. SEPA should still act on negligent or unmitigated actions. For high risk sites the release, removal and possible reintroduction should be planned in more detail and works may have to be carried out in the dry.

To understand the risk, an estimate of the potential sediment load (i.e., volume of material versus dilution and timing of works) of the sediment if released downstream is required. Excessive fines released from behind the impoundment can cause pollution downstream and coarser gravel and cobbles will also settle in the system downstream. Where larger volumes of material are present, the assessment should consider whether the downstream reaches have the capacity to store increased volumes of coarse sediment or whether this will constrict the channel significantly. This should be related back to the nature of the sediment behind the weir (i.e., silt, sand or coarse gravel) and where it will settle out in the system.

Some examples of where SEPA would not expect large volumes of sediment to accumulate would be small weirs or dams with limited impounded area trapping sediment (usually overtopped), or an impoundment on a natural loch which would act as a sediment sink already. In these types of scenarios by applying the good practice guides we would

expect any sediment release to be mitigated. It is the operator's responsibility to consider and apply the most appropriate mitigation to prevent sediment issues from their site. The volume of sediment accrued behind each impoundment will be different. Where there is a high risk of large volumes of sediment being mobilised downstream during the work the operator must identify the most appropriate mitigation measures, which will be in addition to the requirements of the good practice guides.

4.2.2 Pollutants

In addition to the risk associated with sedimentation there is also potential for sediment to contain pollutants from run-off (e.g., herbicides) or from historic industry located upstream of the barrier. Pollutants are considered to be any of the substances listed in the *River Basin District Standards Directions*. It is therefore important that the operator understands the content of the material behind a barrier, as well as the volume of sediment, before it is removed, reintroduced or released. If sediment is disturbed or released it could re-suspend polluting material causing significant pollution.

It is important to bear in mind that these pollutants are already in the water environment and could be mobilised during high flows or impoundments spilling. For low risk sites the good practice and agreed sediment management methods should be sufficient. For higher risk sites a more detailed assessment, testing and a sediment management plan will be required.

Where the risk of pollution and likely environmental harm is too great and it cannot be controlled through mitigation such as method statements and design then SEPA would not authorise the activity and alternatives should be considered.

Where there is a high significance of impact from pollution the material could be removed from the water environment or left undisturbed. Options must be considered on a case by case basis taking into account the best overall environmental outcome.

Where the material is to be stored or removed from site then see waste section.

For all but the high risk sites SEPA would expect the following approach to be used:

- Generic info and method statement
- Follow *WAT-SG-29: Good Practice Guide - Construction Methods* and
- *WAT-SG-26: Good Practice Guide - Sediment Management*
- Standard good practice mitigation measures.

Table 4 Pollution information requirements

Risk	Sedimentation	Pollutant
High	Expected high volume ⁸ of fine sediment behind structure where mitigation above cannot be met e.g. larger dams with impounded area with a build-up of sediment which do not spill frequently	History of heavy industrial activity upstream, or other activities which could release pollutants released into the water environment (e.g. contaminated land)
	Sediment management plan identifying the risks and options to manage and limit those risks. This should be based on the geomorphological assessment in 4.1.	Pollution assessment of the sediment (chemical analysis) including method for off-site removal and management of polluted material. Options appraisal should consider alternatives if doing so will cause high pollution risk.

WAT-SG-26 must be followed when considering sediment management activities. Section 6.8 in particular covers reintroduction of removed sediment. The good practice principles still apply if the material is being released from behind the structure in a controlled manner rather than reintroduced. Sediment may have to be released/ reintroduced over a longer period to ensure the channel downstream is not polluted or smothered.

A sediment management plan should be agreed as part of the work to control sediment reintroduction.

WAT-SG-29 must also be followed when planning and carrying out works and reinstating the bed and banks of the water environment to avoid pollution and damage to the water environment.

⁸ As defined in 4.2.1

Both guidance documents contain additional links to further guidelines and good practice.

Where appropriate re-profiling of the channel using sediment from behind the structure should be considered in conjunction with reseeded or planting vegetation to help stabilise the channel.

4.3 Flood risk

Flood risk is not a regulatory function within the licensing of activities under CAR. SEPA will not seek to control or regulate flood risk through CAR.

See *CAR Flood Risk Standing Advice* for more information.

“It is the responsibility of the individual to consider the flood risk associated with an activity and if necessary, commission a Flood Risk Assessment to fully understand the impact the activity will have”.

This general advice is not a requirement of CAR but is good practice. It is aimed at higher risk sites where large changes in water levels and flows are expected. Further site specific advice may be given as part of a planning consultation.

Firstly, the draw-down of water behind the impoundment should be done during a dry spell when river levels are low and halted during wet weather. The first receptor downstream susceptible to flooding should be identified and no drawdown should increase the risk of flooding to this receptor. The rate of drawdown should also be managed to reduce the risk of erosion, pollution and disturbing of sediment. A drawdown plan should be agreed with SEPA prior to work commencing.

Secondly, the removal of an impoundment reduces the potential attenuation during high flows which can in turn increase flood risk downstream. This would be very much dependent on the size of the watercourse, design of the impoundment, and the downstream receptors. If a detailed study is provided to SEPA as part of a planning consultation we would be able to comment further.

Thirdly, we would recommend that a regular inspection regime is carried out after the removal to investigate any changes to the channel, especially after high flows. This would allow for maintenance to be undertaken should there be signs of unexpected changes to the channel e.g., erosion/ deposition.

4.4 Waste materials

Material either behind, or within, the impoundment may be considered waste under certain circumstances.

4.4.1 Sediment material from behind an impoundment

Where sediment is removed with the intention of reintroduction downstream and it is not being discarded or subject to any intermediate operations, the provisions of the *Waste (Scotland) Regulations 2011* would not apply. Where, however, sediment is removed without a clear intention to reintroduce it all downstream, stored, treated (e.g., sorting) and some or all materials are used for other purposes on site (out with design and mitigation) or sent off-site then it should be dealt with in accordance with the waste management regulations.

In some cases reintroduction may not be appropriate (e.g., large volume of material or the material is heavily polluted) so a waste authorisation from SEPA will be required. Where sediment reintroduction is appropriate then it should be controlled through the CAR licence for the impoundment removal or modification.

4.4.2 Impoundment material

Concrete and other materials (including earth and sediment) generated during the demolition and removal of impoundments will be regarded as waste. There is a statutory requirement that those wastes must be recovered or disposed using registered waste carriers and authorised waste management facilities.

See *Waste Regulations* for further information.

4.5 Fish access and habitat

The vast majority of barrier removals or modifications are carried out to improve passage for fish species so if done in the correct way and at the appropriate time of year should be low risk and result in a long-term improvement.

Impoundment removal or modification must consider the timing of the work to avoid sensitive times of year. General good practice about working in rivers and lochs should be followed. Any proposal making fish passage worse for fish (including lamprey and eels) should not be authorised.

The assessment and information requirements depend on the nature of the proposal.

Table 5 Fish ecology information requirements

Fish Ecology	
Risk	Small impoundment being removed
Low	Information on whether the watercourses involved are important to fish and fisheries at a local, catchment or national level, including salmon, sea trout, eels, lamprey, spawning river trout or loch trout. Information may be required on other fish species if known to be present, for instance, Arctic charr. Information on any non-native fish species present.
	Summary of fish habitat in the affected reach both up and downstream.
	Is the structure currently a barrier to any fish species?
	Photographs of any natural/ manmade barrier to fish within the affected reach.
	What time of year are the works planned for? Works should be timed to avoid fish sensitive times of the year. For instance, SEPA would not want to increase flows when fish are emerging from gravels.
Moderate (in addition to Low)	Fish pass being added impoundment without storage
	Details of any provisions made to allow fish to pass safely downstream and upstream if appropriate at the structure.
	If the proposal is for a fish pass rather than impoundment removal, applicants are recommended to follow the design guidance in the <i>Fish Pass Manual</i> and to seek advice from SEPA in the early stages of the design process. The Fish Pass Manual is designed to be used by engineers and developers and contains design guidance tailored to ensuring upstream fish passage. Protection of downstream fish movement, mainly through the use of appropriate screening, is also essential.
High (in addition to Moderate)	Larger impoundment being removed or modified to include fish passage
	Measures to ensure fish won't be stranded once water levels drop. A drawdown plan should be agreed with SEPA. Has a fish rescue plan been put in place?
	Details of how access to feeder streams from lochs will be maintained if water levels are to drop.

4.6 Built Heritage

If there is a Scheduled Ancient Monument, listed building or other site or monument on the Sites and Monuments Record or the National Monuments record which may directly or indirectly be affected by the proposal then removal is unlikely to be an option? Other mitigation measures such as bypass channel should be considered following consultation.

Historic Scotland, the Royal Commission on the Ancient & Historical Monuments of Scotland and local authorities hold information on built heritage sites and archaeological sites so should be consulted at the earliest opportunity. Some structures are of local heritage importance and amenity value and should be considered during consultation and advertising process.

Where there is a built heritage interest then an assessment should:

- Identify potential impacts on built heritage interest;
- Assess possible options to avoid impacts;
- Identify mitigation measures/ alternatives to avoid significant impact.

4.7 Natura interests

Where a proposal may have a direct or indirect effect on a designated site or species then additional information or assessment may be required depending on the species. *WAT-SG-90: Application of environmental standards in assessing risks to river and loch Natura 2000 interests* sets out how SEPA will assess whether there is a likely significant adverse effect.

4.8 Hydrology

Changes to the hydrological regime in the majority of cases will not be significant because flows passing over or through the impoundment will remain unchanged in the long term. For larger dams where there are significant changes to the level regime or flows downstream further assessment will be required. Alterations to flows and levels are also more of an issue where they have an effect on designated species for example.

Table 6 Hydrology information requirements

Hydrological information	
Risk	Information requirements
Low	Impoundment (without storage) being removed with no changes to mitigation flows or impacts on loch area.
	Generic information – Table 1
Moderate (in addition to Low)	Mitigation flows being altered as a result of the removal/ modification
	Details of how mitigation flow will be delivered during the works.
	Details of the long-term changes to flows and levels.
High (in addition to Moderate)	Proposals causing a change from loch/ reservoir to a river
	Site specific concerns. E.g., plan to manage drawdown procedures

4.9 Invasive non-native species

If there are invasive species upstream and/or downstream which might be able to spread throughout the river system or establish themselves on the bare reservoir sediments once the structure is removed, the applicant must provide a plan showing how to limit their spread (e.g. screening of outfall). See *Non-Native Species & Biosecurity* for more information.

Annex A: Licensing

This section sets out the required level of authorisation depending on the current authorisation level and proposal for change.

Figure 1 displays all the regulatory options including where SEPA may use its powers to meet the objectives of the RBMPs.

In the context of this process:

- **Voluntary** means an application is received by SEPA
- **Non voluntary** would be where SEPA is required to use its enforcement powers to achieve the RBMP objectives
- **Authorised** means under CAR (The Water Environment (Controlled Activities) (Scotland) Regulations 2011)

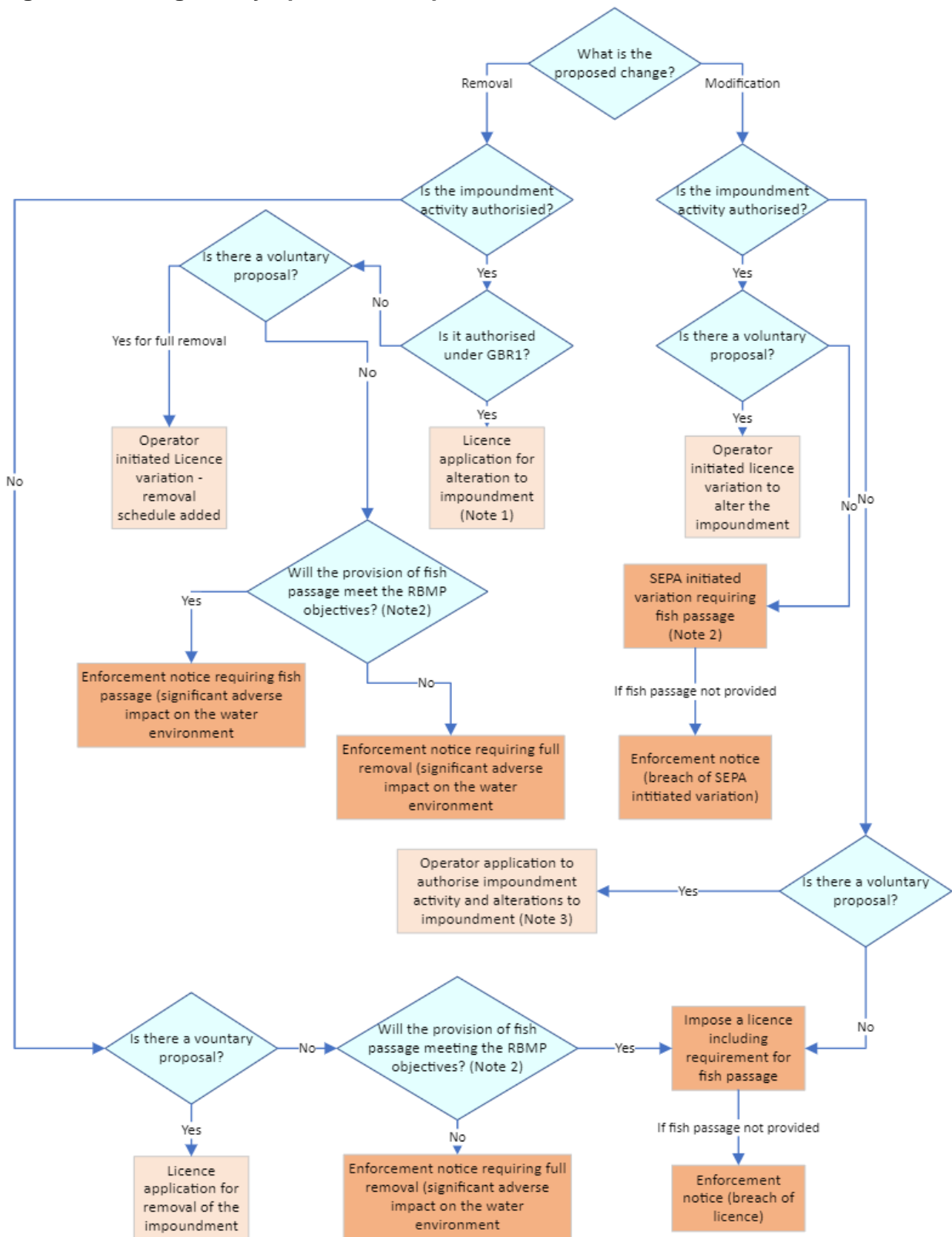
Notes:

Note 1: Removal or modification of an impoundment authorised under GBR1.

Note 2: Provision of fish passage is likely to be the norm. The requirement to remove a barrier to meet RBMP objectives will be an exception.

Note 3: There would be an ongoing authorisation to include the operation and maintenance of a fish pass plus any impounding structure.

Figure 1 Regulatory options for impoundment removals or modifications⁹.



⁹ Surrenders could be applied for as required.

Authorised Impoundments

The authorisation required will depend on whether the proposal is to fully remove the structure or modify it (e.g., to include a fish pass).

<p>GBR1 authorised barriers</p>	<p>Removal or modification of an impoundment authorised under GBR1 is a Simple licence activity. GBR1 applies to existing passive weirs ≤1m high that do not affect the passage of salmon or sea trout.</p>
<p>Full removal - voluntary</p>	<p>SEPA would expect an operator initiated variation application to vary the existing authorisation to include a 'construction schedule' to control limit impacts from the works. The variation application must be from the existing Authorised Person for the impoundment. (the 'construction schedule can however subsequently be partially transferred to another party for carrying out the works). The impoundment would remain in the licence until the work is finished. On satisfactory completion of the work the responsible person can apply to surrender the impoundment from the authorisation. Only at that point any associated charges should be reviewed.</p>
<p>Full removal – non voluntary</p>	<p>It is very unlikely that the full removal of a barrier is required to meet the objectives in the RBMP. The normal approach would be for SEPA to require mitigation measures such as fish passage rather than full removal. See Modification – non voluntary. If removal is required then SEPA would serve an enforcement notice requiring removal of the structure due to significant adverse impact</p>
<p>Modification – voluntary</p>	<p>Where the proposal is to modify the structure then SEPA would expect an operator initiated variation application to include the changes and necessary controls</p>
<p>Modification – non voluntary</p>	<p>If it is not possible to agree a measure to meet the objectives of the RBMP then SEPA would carry out a SEPA initiated variation to include the required measures. This is likely to be the provision of fish passage. If a fish pass can be installed then that would be sufficient. The owner might however decide to remove the structure in its entirety. If the variation is not complied with and the measure not installed then SEPA would serve an enforcement notice for breach of a SEPA initiated variation.</p>

Unauthorised impoundments

The construction and operation of all impoundments in inland water or wetland require authorisation under CAR. GBR1 covers historic low risk activities and the others should be licensed.

Full removal - voluntary

SEPA would expect a licence application for the removal of a structure which should have had an authorisation.

Full removal – non voluntary

It is unlikely that the full removal of a barrier is required to meet the objectives in the RBMP. If this is the case then SEPA would serve an enforcement notice for full removal where there is a significant impact on the water environment. Ordinarily the structure could be modified to include appropriate mitigation. See Modification – non voluntary

Modification – voluntary

SEPA would expect a simple licence application to include the modification and also the ongoing responsibility for maintenance and operation. For example, if a fish pass is being installed then the licence would include the fish pass and maintenance to ensure passage of fish. The mitigation should not be authorised on its own without the ongoing controlled activity.

Modification – non voluntary

If no voluntary solution can be found then SEPA would impose a licence to include the impoundment and the required mitigation. If this is not complied with then SEPA would serve an enforcement notice for breach of licence.

Dependent Activities for Removal & Modification

<p>Dependent activities</p>	<p>It is recognised that in certain circumstances for the removal or modification to take place then other activities will be required. Activities are classed as dependent where, in the opinion of SEPA, they are required to support the primary activity (Impoundment removal/ modification). For example, bed or bank reinforcement directly associated with removal/ modification to stabilise the channel.</p> <p>Temporary diversion channels to enable the work to be carried out in dry conditions and/or to minimise the volume of water at risk of sedimentation created by a temporary impoundment and abstraction should also be considered dependent activities. Temporary abstraction of water to enable working within a river, including the over pumping of water are will not require authorisation (as per <i>CAR – A Practical Guide</i>). The details of the impoundment should be included in the authorisation with appropriate conditions to manage flows and sediment.</p>
	<p>Dependent activities will be authorised as part of the primary activity and details of dependent activities should be submitted with any application, however they will not be subject to additional application fees and will not require a separate authorisation. Often the dependent activity would be authorised via the Engineering regime but included in the primary activity authorisation.</p> <p>Any maintenance or channel management (e.g., green bank protection) required after an impoundment is removed should be considered as part of the original work where possible. Only if subsequent stabilisation is necessary will this be considered as part of an Engineering authorisation.</p>

Annex B: Reasons to keep the structure

The following section gives examples of reasons why it may not be possible to remove or modify a structure. It is intended to highlight examples which would have to be considered on a case by case basis.

Reasons why it may not be possible to remove or modify a structure	
Provides a specific function	<p>The structure may provide a function such as means to abstract water from a river.</p> <ul style="list-style-type: none"> • If the abstraction is still in use then can it be carried out without the impoundment? (e.g., side intake) • Can the impoundment be modified to allow the abstraction to take place and mitigate the pressures on the water environment (e.g., install a fish pass)? • Is the impoundment being kept as a possible future asset (e.g., hydro intake)? Similarly the structure could be required to maintain the integrity of infrastructure or support other water users such as fisheries groups. • Structure serves function to alleviate flooding.
Built heritage	<p>Is there a Scheduled Ancient Monument, listed building or other site or monument on the Sites and Monuments Record or the National Monuments record which may directly or indirectly be affected by the proposal? Historic Scotland, the Royal Commission on the Ancient & Historical Monuments of Scotland and local authorities hold information on built heritage sites and archaeological sites.</p>
Specific habitat benefits	<p>Is there a designated site in the water body? If the changes have the potential to damage the features of a Site of Special Scientific Interest (SSSI) or have a significant effect upon a European protected area or species, then SNH should be contacted at the earliest opportunity to discuss options.</p>
Biosecurity	<p>Will the proposal cause a risk to biosecurity by allowing the potential spread invasive non-native species? See <i>Non-Native Species & Biosecurity</i></p>

<p>Removal would create instability in the channel</p>	<p>In some cases, the removal of a structure may create significant instability which would lead to significant erosion in the channel.</p> <ul style="list-style-type: none"> • Could there be incision working upstream causing erosion? • Could the channel changes result in significantly increased levels of erosion or sediment deposition downstream; • Are these short term manageable issues or long term concerns. <p>There will likely be an element of short term instability in the channel following alteration. This can be lessened by controlling the removal technique and timings as well as ensuring habitat restoration is also considered.</p> <p>If the potential instability is too great then modification (e.g., lowering, partial removal or installing a fish pass) should be the next consideration. CIRIA guide</p> <p>(section 5.3) explores the range of options available if full removal is not acceptable.</p>
<p>Contaminated or significant volume of sediment behind structure</p>	<p>Would there historically have been heavy industries upstream of the structure releasing contaminated material which would subsequently be trapped behind the structure? Can it be removed prior to the works if it is of significantly pollution potential?</p>
<p>Disproportionately expensive or technically infeasible</p>	<p>See <i>WAT-RM-41</i> for more detail about assessing claims of disproportionate expense or technical feasibility. For further advice please contact <i>Water Unit</i>.</p>

BOX 1: Proportionate cost

The most cost-effective solution is the one that minimises environmental harm or maximises environmental benefit at a proportionate cost. Large absolute cost, in itself, does not constitute disproportionate cost. For example, incurring significant costs to prevent significant environmental harm or achieve significant environmental benefits e.g., safeguarding protected species and designated sites, would be considered proportionate. But incurring significant costs for minor environmental benefits would be considered disproportionate.

References

NOTE: Linked references to other documents have been disabled in this web version of the document.

See the Water >Guidance pages of the SEPA website for Guidance and other documentation (www.sepa.org.uk/regulations/water/guidance/).

All references to external documents are listed on this page along with an indicative URL to help locate the document. The full path is not provided as SEPA cannot guarantee its future location.

References

- WAT-RM-01: Regulation of Abstractions and Impoundments
- WAT-RM-02: Regulation of Licence-level Engineering Activities
- WAT-RM-20: Advertising and Consultation
- WAT-RM-34: Derogation Determination - Adverse Impacts on the Water Environment
- WAT-RM-41: Derogation Determination – Improvements to the Water Environment
- WAT-SG-21: Environmental Standards for river Morphology
- WAT-SG-26: Good Practice Guide - Sediment Management
- WAT-SG-29: Good Practice Guide - Construction Methods
- WAT-SG-90: SEPA Conservation Procedure for CAR activities in Freshwater Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs)

External References

- Appointment of Construction Engineer & Notification of Relevant Works
- RES-FORM-07 (www.sepa.org.uk)
- CAR – A Practical Guide (www.sepa.org.uk)
- CAR Flood Risk Standing Advice (www.sepa.org.uk)
- Charging schemes and summary charging booklets (www.sepa.org.uk)
- Fish Pass Manual Institute of Fisheries Management (ifm.org.uk)
- NGR Help (www.sepa.org.uk)
- Non-Native Species & Biosecurity SEPA Intranet
- Reservoirs SEPA website (www.sepa.org.uk), including:
 - Reservoirs (Scotland) Act 2011 No 9 (www.legislation.gov.uk)
- Restoring Europe's Rivers RiverWiki EA/RRC (<https://restorerivers.eu/wiki/index.php>)
- River Basin District Standards Directions (www.gov.scot)
- River Basin Management Plans (www.sepa.org.uk)
- River Restoration Centre website (www.therrc.co.uk) including:
 - Demonstration Restoration Projects
 - Guidance
 - Manual of River Restoration Techniques
 - Rivers by Design
 - River Restoration
 - Top 10 Tips to Deliver a Restoration Project
- River weirs: Design, maintenance, modification and removal CIRIA C763 (www.ciria.org)
- Scottish panels of engineers (www.gov.scot)
- Waste Regulations (www.sepa.org.uk/regulations/waste/)
- Waste (Scotland) Regulations 2011 No 226 (www.legislation.gov.uk)

-
- Water Environment Fund (www.sepa.org.uk)
 - Water Environment hub (www.sepa.org.uk)
 - Weir removal, lowering and modification: A review of best practice
 - (SC070024) EA Nov 2013 (www.gov.uk)

Contacts

- **Evidence & Flooding Advice Helpdesk:** advice@sepa.org.uk
- **Reservoirs:** reservoirs@sepa.org.uk
(www.sepa.org.uk/regulations/water/reservoirs)
- **Water Unit:** DL-WaterRegSupp@sepa.org.uk
- **WEF Unit:** DL-WEFUnit@sepa.org.uk
(www.sepa.org.uk/environment/water/water-environment-fund/)

For information on accessing this document in an alternative format or language please contact SEPA by emailing to equalities@sepa.org.uk

If you are a user of British Sign Language (BSL) the Contact Scotland BSL service gives you access to an online interpreter enabling you to communicate with us using sign language.

<http://contactscotland-bsl.org/>

www.sepa.org.uk

