Proposed Southland Water and Land Regional Plan

Responses to Questions of Hearing Commissioners on Council Reply Report and proposed Southland Water and Land Regional Plan

Commissioner van Voorthuysen (RVV), Commissioner Ellison (EE), Commissioner McCallum (LM), and Commissioner Rodway (MR)

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Paragraph Question

4.17 In the 'tracked' version of the Plan the term 'perennial river' or 'perennial' is recommended for inclusion in Policy 16; Policy 16A; Appendix K – Method 2; Appendix N, Part B(3) and Appendix N, Part C(2). Was that intentional?

Question – RVV
Response – MMC

No, this was not intentional for the majority of these references. The definition of *"perennial river"* with respect to its use in the NES- PF is introduced in paragraph 4.17 and further discussed in paragraph 4.225 of the reply report. It is recommended *"perennial river"* or *"perennial"* is not adopted due to potential issues and uncertainty which may arise when interpreting the term.

The use of the term "perennial river" in the policies and appendices was inadvertently missed and Officers recommend "perennial" should be removed from Policy 16 and 16A.

For Appendix N, Part B(3) and Appendix N, Part C(2) "perennial river" should be replaced with "river (including an intermittent river but excluding an ephemeral water body)".

"Perennial fishery" is used in Appendix K, Method 2, and should be retained.

4.70 What tool will you use to access "contaminant losses" up or down? Is this a limit, and/or grandparenting and does this mean that overseer is being used as a regulatory tool?

Question – LM
Response – MMC

Contaminants generated by additional dairy farming of cows and additional intensive winter grazing include nutrients, pathogens and sediment. Overseer may be used to determine changes in nitrogen, and potentially phosphorus losses. However, it will not be useful in addressing potential changes in the losses of pathogens and sediment. In addition, current versions of Overseer cannot consider all forms of mitigation which may reduce nutrient concentrations.

It is likely that assessments of contaminant losses will need to use a wide range of information to conclude whether losses will increase or not. This is likely to include the use of nutrient modelling which may be through Overseer, independent expert opinion, other modelling tools, and collected data. In time, additional or alternative models may be available. The framework used in the recommended changes does not specify the use of Overseer. Overseer is therefore not a mandatory assessment tool, but it is the best tool available for assessing nitrogen losses and is routinely used by the consents team.

It is unlikely that this will result in "grandparenting" and the assessment of applications will consider whether past losses are based on GMP. Any farming activity that increases contaminant losses would make a proposal fully discretionary. The use of land for farming which is classified as a restricted discretionary activity under Rule 20(c) must demonstrate that the discharge of contaminants is no greater than what occurred lawfully for the five years prior and a matter of discretion is whether the exiting activity operated at GMP.

4.129 Rule 15(a)(i) excludes discharges from reticulated systems. However, Rule 15(a)(iii) then refers to reticulated systems. Is that appropriate and is there a better way of formatting the rule to achieve the desired outcome?

Question – RVV
Response – MMC

This is an error. Rule 15(a)(ii) should not include the addition of *"other than from a Territorial Authority reticulated system."*

4.177 It is unclear to me from the discussion why the officers still consider the term "fully mitigated" in Policy 16(1)(b)(i) to be appropriate and capable of practical implementation. Can you please clarify?

Question – RVV
Response – MMC

Officers prefer the term 'fully mitigated', as it is explicit that complete mitigation of effects is anticipated. The more general 'mitigated' often implies some residual effects are acceptable. That said, Officers are of the opinion that the policy is sufficiently clear, as to the expected level of residual effects, particularly in combination with the recommended physiographic zone policies, such that 'fully' could be deleted.

4.191 Regarding recommended Rule 20(a)(iii)(4) are the officers satisfied that is practical to have stock exclusion setbacks (most probably fences) within a single paddock (where the slope varies from below 7 degrees to above 7 degrees and then back below 7 degrees possibly multiple times alongside a small river for example) suddenly increasing from 5m to 20m and then possibly back to 5m again?

Question – RVV
Response – MMC and GM

This represents an implementation issue with linear setback distances. As these setbacks apply to intensive winter grazing and cultivation, Officers consider this is more likely to affect plough-lines, rather than fence lines. It is also more common for an area to change from above 7 degrees to less than 7 degrees along a waterway, but relatively uncommon for there to be multiple changes within a single paddock. Even if that were to be the case, at 7 degrees, tractor manoeuvring is reasonably safe and simple.

4.192 Would like more detail re the justification to reduce from 100m to 20m the setback from sensitive waterbodies because many wetlands have drains across their face, is this because all or an overwhelming majority of wetlands have interceptor drains or are the instances where such drains are not present insignificant?

Question – EE
Response – MMC and GM

The Regionally Significant Wetlands and Sensitive Waterbodies that could be impacted by intensive winter grazing are generally to be found in the lowland areas of Southland including the Te Anau basin. The other Regionally Significant Wetlands and Sensitive Waterbodies are located either within the DOC estate or in the high country zone.

Those in the lowland areas include raised bogs, coastal lakes and estuaries. The majority of the raised bogs have ring drains around the boundary which transport water away from the wetland. These wetlands and some coastal lakes and the estuaries do have farmed land adjacent to them which could be subject to intensive winter grazing. In considering appropriate setbacks, 100 metre is considered overly generous. The proposed setbacks for intensive winter grazing are 5 metres on land under 7 degree slope and 20 metres on land over 7 degree slope. A 20 metre setback around all Regionally Significant Wetlands and Sensitive Waterbodies is recommended. Most of the Regionally Significant Wetlands and Sensitive Waterbodies are found on slopes less than 7 degrees, and there are often numerous waterways that flow into sensitive waterbodies (particularly estuaries) that will require a 5 metre setback in the pSWLP and potentially nullify the effect of a 100 metre setback.

4.203 Regarding recommended Rule 25(a)(ii) are the officers satisfied that is practical to have cultivation setbacks within a single paddock (where the slope varies from below 7 degrees to above 7 degrees and then back below 7 degrees possibly multiple times alongside a small river for example) suddenly increasing from 3m to 20m and then possibly back to 3m again?

Question – RVV
Response – MMC

See response to 4.191 above.

Why does recommended Rule 20 have a 5m setback whereas Rule 25 has a 3m setback for slopes under 7 degrees?

Question – RVV

Response – MMC and GM

Officer's preference is for a 5 metre setback if the cultivation is for intensive winter grazing, but 3 metres if for pasture renewal, as the intensive winter grazing generally leads to exposed and disturbed soil over the winter period. In combination with answers to other questions, minor changes to this rule are recommended, which make the 5 metre and 3 metre setbacks more coherent, and are set out below:

(iii) cultivation is for the purpose of renewing or establishing pasture and not for establishing an intensive winter grazing crop, even as part of a pasture renewal cycle; and

~~(iiia) cultivation is only by spraying and direct drilling; and~~

Would it assist plan implementation if both distances were the same?

Question – RVV
Response – MMC

No, please see above responses.

4.224 **Can to officers confirm that they have checked all instances of the use of the word 'river' in the objectives, policies and rules and made the necessary amendments? For example, is Objective 16 intended to apply to ephemeral rivers? The same question applies to Objectives 14 and 17, Policies 16, 16A, 21, 28, 29 and 32 and Rules 28, 29, 32, 35, 36, 37, 38, 40, 41, 42, 43, 46, 48 and 79 and perhaps other provisions as well.**

Question – RVV
Response – MMC

This answer should be read in conjunction to the response to the question on Rule 70 on page 12 below.

Section 13 of the RMA sets out the restrictions on the use of land within rivers and lakes beds. Under the pSWLP an ephemeral watercourse should not be subject to the rules relating to activities in the beds of lakes and rivers. This is because these waterways carry water for minimal time and the risks of undertaking these activities are primarily contaminant discharges and impacting flows, which are addressed through other rules.

It is recommended that ephemeral waterways are subject to rules regarding the taking, diverting, damming, use and discharge of water, which are those activities subject to section 14 and 15 of the RMA. The modification of river flows, including by activities such as constructing a dam on an ephemeral watercourse have the potential to impact the hydrological regime of downstream waterbodies. Discharges into ephemeral watercourses may allow for contaminants to accumulate prior to being transported to downstream receiving waterbodies following the next rain event. Discharges may also occur into ephemeral waterbodies that contain water. As such it is important for ephemeral watercourses to be subject to those provisions that regulate these activities.

On that basis, the term "(including intermittent but excluding ephemeral)" or words to that effect should be deleted from Rule 35A relating to feedpads and Rule 60 relating to dams and weirs.

4.229 **In Rule 20(c)(ii)(b), is the "mitigation plan" intended to be part of the FEMP or a separate document?**

Question – RVV
Response – MMC and GM

This depends on what mitigation is proposed to address contaminant losses. Mitigation that involves on-going operational actions should be included in the FEMP, which may lead to some duplication between plans. Other mitigation may include capital works, or "one-off" actions such as designing and installing a low-rate/wide area effluent spreading system. It may be more appropriate to document such actions only in a separate mitigation plan.

What is intended to be mitigated given that under Rule 20(c)(ii)(a) contaminant losses are not allowed to increase above historical levels for the landholding?

Question – RVV
Response – MMC

The mitigation is intended to address the increased intensity of the farming activity occurring. The purpose is to demonstrate that contaminant losses will not increase, or will decrease by a specified amount if past practices were poor, resulting in a higher initial loss rate.

In answering this question, Officers have identified some uncertainty with respect to Rule 20(c)(ii)(a) and recommended a minor improvement to increase the certainty of interpretation:

(a) An assessment that shows the annual amount of, and adverse effects from, the nitrogen, phosphorus, sediment and microbiological contaminants discharged from the landholding will be no greater than the lawfully existed, for the average of the five years prior to the application being made

Is it a correct legal interpretation of the rule to say that as will be no adverse change to the existing environment (in terms of historical authorised contaminant losses) there are no adverse effects to mitigate?

Question – RVV
Response – PM

No.

The comparison to historical contaminant losses is simply a requirement of one of the entry conditions to Rule 20(c) in order to fall within the restricted discretionary activity classification.

The matters to which the Council's discretion has been restricted are broad enough to ensure that potential adverse effects are adequately mitigated.

It is important to ensure that the Council does retain discretion to ensure that adverse effects are adequately mitigated, because if the farming activity the subject of the consent application is different to the existing farming activity, there may be temporal differences within any given year as to when particular contaminants of concern are actually discharged. Those temporal differences may be important and require mitigation, even though the gross annual amount of contaminants discharged remains the same.

It is also important to recognise that the concept of the "existing environment" is a developing area of law in the context of rules in a regional plan, particularly in relation to the relevance of existing (expiring) resource consents, and the legacy effects of historic activities.

What matters would be included in the "mitigation plan" that are additional to those in the FEMP?

Question – RVV
Response – MMC

See response above.

Would Rule 20(c)(ii)(c) be better expressed as a matter of discretion as it is unclear to me what is to be complied with and how monitoring alone can ensure compliance?

Question – RVV
Response – MMC

Yes. Rule 20(c)(ii)(c) should be deleted. A new matter of discretion should be included:

6. Monitoring undertaken to assess the effectiveness of any mitigation implemented.

In Rule 20(c) matter of discretion (1) what does the term "applicant's past compliance" refer to?

Question – RVV
Response – MMC

This refers to the applicant's compliance with regional plan rules and any Environment Southland consents held.

Why does Rule 20(c) matter of discretion (1) refer to auditing when the S42A report stated that FEMP audits were not intended by the pSWLP?

Question – RVV
Response – MMC

This reflects a difference in the requirements for permitted activities and where resource consent is required. FEMPs prepared for farming activities that are permitted are not required to be audited. FEMPs that are prepared where a resource consent is obtained may be audited in the future and this would be required via consent conditions. An independent audit approach has been applied successfully elsewhere in New Zealand.

Under Rule 20(c) matter of discretion (2), why is it necessary to further reduce contaminant losses given that those losses cannot exceed historical levels?

Question – RVV
Response – MMC

If the historical losses have been based on poor performance or farming practices that were well below GMP practices, the applicant should not be 'rewarded' for this. The purpose of this matter of discretion is to prevent grandparenting of such practice, as this would be unfair to those farmers that have been operating at GMP.

Is Rule 20(c) matter of discretion (2) necessary given the broad scope of matter of discretion (3)?

Question – RVV
Response – MMC

As discussed above, matter of discretion (2) specifically addresses historical poor performance and requires further reductions where this has occurred. This differs from matter of discretion (3) which is focussed on future good management practices.

Why does Rule 25(c) matter of discretion (2) refer to biodiversity when none of the permitted activity conditions appear to address that matter?

Question – RVV
Response – MMC

The conditions do not directly relate to biodiversity. However riparian margins have an important function, with respect to terrestrial biodiversity on the edges of waterbodies and in-stream biodiversity, in terms of sediment reduction and shading. Therefore, consideration of biodiversity is appropriate for considering applications to reduce setbacks.

Is the reference to biodiversity meant to apply to terrestrial or aquatic biodiversity?

Question – RVV
Response – MMC

Both.

What risks are there to water quality apart from the loss of sediment and other contaminants which are already addressed in matter of discretion (1)?

Question – RVV
Response – MMC

Matter of discretion (1) and (2) could be rationalised. The intent of these matters of discretion is to allow the assessment of water quality impacts and also physical effects on biodiversity. Matter of discretion (2) could be deleted and matter of discretion (1) amended to state:

"the risks of sediment and other contaminants to water quality from critical source areas, risks to biodiversity, and mitigation measures for addressing those risks."

Why does Rule 25(c) matter of discretion (3) refer to audit requirements when the S42A report stated that FEMP audits were not intended by the pSWLP?

Question – RVV
Response – MMC

Please see response above regarding Rule 20(c) matter of discretion (1).

Should Rule 25(b)(iv) refer to 700m or 800m amsl?

Question – RVV
Response – MMC

800 metres is correct.

Should Appendix N, Part B, (5)(b)(iii) and Part C(3)(b)(iii) refer to Rule 20(a)(iii)?

Question – RVV
Response – MMC

Yes.

4.233 Can the officers clarify if the clause recommended to be deleted is actually deleted in the 'tracked' version of the Plan?

Question – RVV
Response – MMC

Yes, it is deleted from both rules. It is not shown in Rule 26 as it was a recommended addition at the s42A report stage, so has simply bene deleted from this reply report version

4.250 Talks about a drop test every 3 years because of risks of leakage, I cannot find this comment or point in the marked-up rules, can you assist?

Question – LM
Response – MMC

This is included in Rule 32A(a)(ii)(2). Pond drop tests are to be completed every 10 years for ponds that are fully lined with an impermeable synthetic liner or are of concrete construction and above ground. For all other ponds, the pond drop test is to be completed every three years.

4.262 Does a s104D 'policy gateway' exist for non-complying discharges under Rule 33A such that consent could be granted if the effects of the discharge were more than minor?

Question – RVV
Response – PM

Rule 33A provides that the discharge of effluent or bio-solids into water from a community sewerage scheme is a non-complying activity (where such discharges occur onto or into land, the activity is a discretionary activity under Rule 33).

A non-complying activity status requires the consent authority to be satisfied that either the adverse effects of the activity will be minor; or that the activity will not be contrary to the objectives and policies in the relevant plan. If one (or both) of these tests can be met the application proceeds through 'the gateway' and is assessed under section 104. If neither gateway is satisfied, the application cannot be granted.

Only one of the gateway tests must be met. Where the adverse effects of a proposed activity are more than minor, the consent authority must be satisfied that proposed activity will not be contrary to the objectives and policies in the relevant plan.
A non-complying activity will rarely, if ever, find direct support in the objectives and policies of a plan, but an absence of support does not equate to the activity being contrary to the provision. The term 'contrary to' contemplates any activity being repugnant, opposed to in nature, different or opposite to the objectives and policies.[1]
The Environment Court's decision in *Akaroa Civic Trust v Christchurch City Council* states in respect of the test under section 104D(1)(b) as follows:[2]

> *We consider that if a proposal is to be stopped at the second gateway it must be contrary to the relevant objectives and policies as a whole. We accept immediately that this is not a numbers game: at the extremes it is conceivable that a proposal may achieve only one policy in the district plan and be contrary to many others. But the proposal may be so strong in terms of that policy that it outweighs all the others if that is the intent of the plan as a whole. Conversely, a proposal may be consistent with and achieve all bar one of the relevant objectives and policies in a district plan. But if it is contrary to a policy which is, when the plan is read as a whole, very important and central to the proposal before the consent authority, it may be open to the consent authority to find the*

[1] *NZ Rail Ltd v Marlborough District Council* [1994] NZRMA 70 (HC); *Wilson v Whangarei District Council* EnvC W020/07; *Skyline Enterprises Ltd v Queenstown Lakes District Council* [2017] NZEnvC 124 at [13].
[2] *Akaroa Civic Trust v Christchurch City Council* [2010] NZEnvC 110 at [74].

proposal is contrary to the objectives and policies under section 104D… The usual position is that there are sets of objectives and policies either way, and only if there is an important set to which the application is contrary can the local authority rightly conclude that the second gateway is not passed.

It is appropriate to adopt a holistic approach when determining whether a proposed activity is contrary to the objectives and policies of the relevant plans, however, more specific and directive objectives and policies will be given more weight.[3]

In light of that background, the Officers consider that there would be a 'policy gateway' in respect of applications for the discharge of effluent or bio-solids into water from a community sewerage scheme. The objectives and policies essentially seek to maintain water quality where it is not degraded (i.e. standards are met), and to improve water quality where degraded (i.e. standards are not met).[4] Policy 17A specifically addresses community sewerage schemes and seeks to minimises (and not avoid) adverse effects on water quality from the operation of and discharges from community sewerage schemes. Further, Objective 9B and Policy 26A address regionally significant and/or critical infrastructure (which as recommended to be defined in the pSWLP would likely capture community sewerage schemes. In particular, Policy 26A seeks to recognise and provide for the effective development, operation, maintenance and upgrade of regionally significant and/or critical infrastructure in a way that avoids where practicable, or otherwise remedies or mitigates adverse effects on the environment. Accordingly, whilst an activity may have effects that are minor (or more than minor), this does not mean that it cannot pass through the policy gateway in section 104D(1)(b). For example, a proposed community sewerage scheme may be designed in a way that minimises adverse effects on water quality, and may occur where the discharge is to an artificial watercourse (which is a discharge to water), or where there are no practicable options for a discharge to land. This would ultimately depend on the exact nature of a particular proposed community sewerage scheme.

4.304 Do the officers consider it a realistic proposition that replacement (renewal) consents for the nationally significant MPS would be declined?

Yes, depending on what was applied for.

Can rates and volumes and of take and discharge be addressed as matters of control under a controlled activity rule?

If an activity is classified as a controlled activity, a resource consent is required and must be granted by the consent authority.[5] The consent authority's power to impose conditions on the consent is restricted to the matters over which control is reserved in the plan.[6]

In general, a condition of consent cannot be imposed that would negate the grant of the consent.[7] It is submitted that it is a matter of "fact and degree" as to whether a condition

[3] *Akaroa Civic Trust v Christchurch City Council* [2010] NZEnvC 110; *Queenstown Central Ltd v Queenstown Lakes District Council* [2013] NZHC 815

[4] E.g. see Objectives 6, 7, 13B, 18, and Policies 13, 15A, 15B.

[5] Subject to section 106 of the RMA and the provisions of sufficient information to determine that the activity is a controlled activity.

[6] RMA, ss 87A and 104A.

[7] *Lyttelton Port Co Ltd v Canterbury Regional Council* EnvC C008/01; *Ravensdown Growing Media Limited v Southland Regional Council* EnvC

imposed would be of such a nature and effect so as to negate the specific benefit for which a consent is to be granted.[8]

In respect of the Manapouri Power Scheme, it is submitted that conditions on rates and volumes of take and discharge may be of such a nature and effect so as to negate the grant of consent. For example, a rate of take in light of the flow that is considered appropriate for the Waiau River may restrict hydro-electricity generation activities in that river. If this activity, as proposed by Meridian, was classified as a controlled activity, there would be no discretion to decline the consent application. It is submitted that it is arguable that such conditions could not be imposed if the activity was classified as a controlled activity, because to do so would negate the grant of consent.

On that basis, it is submitted that restricted discretionary activity status is more appropriate as it would enable adequate conditions to be imposed on any resource consent that is granted.

Controlled activity status was considered appropriate in the Waitaki Catchment Water Allocation Regional Plan for those rivers where an environment flow and level regime was set in the plan. Controlled activity status was also ultimately considered appropriate where an environmental flow and level regime had not been set in respect of particular rivers. However, that was in light of a number of specific matters that occurred in that hearing process. First, specific information was provided by Meridian Energy Ltd and Genesis Energy Ltd (**Generation Companies**) regarding the quantum of natural outflows and estimates of Mean Annual 7-day low flow, 5-year 7-day low flow, Mean Flow, and Mean Annual Flow for the two relevant lakes. This provided a historical basis of the likely rates and volumes and of take and discharge associated with the activity in the future, which was able to be compared against the flow requirements set out in the relevant regional plan. Further, counsel for the Generation Companies provided written assurance that in that case, by way of a Memorandum of Counsel, that a condition imposed on a replacement consent that required flows to be passed through the dams in the magnitude of the numbers in that data (in order of the 5-year 7-day low flow) would not be considered to frustrate the grant of consent in the future.

That information addressed the degree of uncertainty about the possibility of conditions imposed on consent in respect of flows frustrating grant of consent. In light of that information, it was considered appropriate to have a controlled activity status with matters of control that are sufficiently wide to address all adverse effects. The relevant rule also provided for a review conditions to be imposed on consent. Any argument that future conditions may negate the grant of the consent was in some respects quelled by the statements of counsel that it would not amount to frustration in that situation.

4.319 Should Rule 66(b) matter of discretion (2) refer to historic heritage?
The same query regarding references to historic heritage applies to Rules 32, 55, 59, 65A, 72, 73 and the Financial Contributions section.

Question – RVV
Response – MMC

C194/2000, 5 December 2000; *Taranaki Regional Council v Willan* EnvC W150/96, 23 October 1996.
[8] *S & M Property Holdings Ltd v Wellington City Council* [2003] NZRMA 193 (HC).

No, as the standard relating to the heritage list has been deleted, Officers consider reference to historic heritage as a matter of discretion should be deleted as a consequential amendment from Rules 66(b), 59(b), 65A(b), 72(a), 73(a) and the Financial Contributions section. Rule 55(a)(viii) includes a standard requiring "no historic heritage sites at the site of the proposed activity". This standard has been removed from many of the rules in the pSWLP and replaced with an advice note alerting plan users to the Heritage New Zealand Pouhere Taonga Act 2014. Officers consider standard (viii) should be deleted from Rule 55(a) and an advice note included.

Rule 32 matter of discretion (7) includes the "adoption and implementation of an Accidental Discovery Protocol", officers consider this matter should be removed and replaced with an advice note as recommended above.

4.362 Does the format of Rule 70(a) result in disturbance in the (i) and (ii) areas in ephemeral rivers being innominate and therefore discretionary? If so is that the intent?

Question – RVV
Response – PM

It is not the intent for this plan to create innominate activities in respect of the use or disturbance of the beds of ephemeral rivers.

The question of whether an ephemeral waterway falls within the definition of "river" in the Act is vexed, and is only capable of being assessed on a case-by-case basis. The definition of "river" does not refer to ephemeral; rather, it refers (relevantly) to intermittently flowing body of fresh water. In order to determine whether an ephemeral waterway is an intermittently flowing body of fresh water, careful consideration of matters such as the source of the water and the historic use of the land (i.e., was it historically a naturally occurring waterway), is required.

The presumption in section 13(1) of the Act operates in such a way that if there is no rule in the proposed plan regulating the disturbance of the bed of an ephemeral river, then the disturbance would become an innominate activity, for which resource consent would be required. As that is not the intention of the authors, a further addition is recommended to make it clear that the use and disturbance of the bed of an ephemeral river is a permitted activity.

As that activity will become permitted, Council Officers' also consider it appropriate to authorise any incidental discharge, provided the criteria in section 70(1)(g) of the Act are also applied.

Proposed wording to achieve this purpose is set out below:

(aa) Unless stated otherwise by any rule in this Plan, the disturbance of the bed of an ephemeral watercourse by livestock including cattle, deer, pigs or sheep, and any incidental discharge of contaminants, is a permitted activity provided the following conditions are met:
(i) the discharge is managed to ensure that after reasonable mixing it does not give ruse to any of the following effects on receiving waters:

(1) any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
(2) any conspicuous change in the colour or visual clarity; and
(3) any emission of objectionable odour; and
(4) the rendering of fresh water unsuitable for consumption by farm animals; and
(5) any significant adverse effects on aquatic life.

Having considered this issue more broadly, Council Officers are also of the opinion that there may be a lacuna in the plan in relation to the regulation of the use of the beds of ephemeral watercourses under section 13 of the Act. In order to fill this gap, it is also recommended that a further rule be introduced into the plan as follows:

(XX) Unless stated otherwise by any rule in this Plan, the disturbance of the bed of an ephemeral watercourse, and any incidental discharge of contaminants, is a permitted activity provided the following conditions are met:
(i) the discharge is managed to ensure that after reasonable mixing it does not give ruse to any of the following effects on receiving waters:
(1) any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
(2) any conspicuous change in the colour or visual clarity; and
(3) any emission of objectionable odour; and
(4) the rendering of fresh water unsuitable for consumption by farm animals; and
(5) any significant adverse effects on aquatic life.
(XX) Any activity that does not comply with one or more of the conditions of rule XX is a discretionary activity.

Scope exists within submissions to introduce this additional rule as numerous submitters raised concerns about the definition waterways, and the breadth of activities being regulated by the plan, including Agribusiness Consultants Limited 11.9 and V M Bacon 33.11.

Does the format of Rules 70(c) and 70(d) inadvertently result in stock movements across the bed of an ephemeral river being non-complying activities?

No, in light of the discussions and recommended changes referred to above

Would Rule 70 benefit from rewording as attached or similar (possible amendments in yellow wash)?

Yes. Some of those changes are no longer necessary in light of the changes recommended above. However, some of them are, as follows:

(a) From 1 July 2020 the disturbance of:
(i) roosting and nesting areas of the black fronted tern, black billed gull, and banded and black fronted dotterel; and
(ii) tidal river habitat up to the spring tide level;

located in the bed of a lake, river (including an intermittent river but excluding an ephemeral water body), natural wetland, estuary or lagoon by livestock including cattle, deer, pigs or sheep is a prohibited activity.

(b) From 1 July 2020, the disturbance of the bed of a sensitive waterbody listed in Appendix A by livestock including cattle, deer, pigs or sheep is a prohibited activity.

(c) The disturbance of the bed of a river (including an intermittent river and a modified watercourse but excluding an ephemeral water body) or an artificial watercourse for the purposes of moving livestock including cattle, deer, pigs or sheep is a permitted activity provided the following conditions are met:

(i) the livestock are being supervised and are actively driven across the water body in one continuous movement; and

(ii) from 1 July 2019, the crossing occurs less frequently than once per week.

(d) Bed disturbance activities that do not comply with the conditions of Rule 70(c) are a non-complying activity.

(e) Other than as provided for by Rules 70(c) and 70(d), the disturbance of the bed a lake, river (including an intermittent river but excluding an ephemeral water body), natural wetland, artificial watercourse (other than a stockwater dam or race), modified watercourse, estuary or lagoon by cattle, deer or pigs is a permitted activity prior to the dates set out in Table 1 for land having the listed land slopes after which time it is respectively a discretionary activity on that land ~~in accordance with the dates and conditions set out in Table xx below~~:

Table 1:

	Land slope (as classified by the LRI slope dataset)		
Farm/stock type	***Plains (0-3°)***	***Undulating/rolling land (>3-15°)***	***Steeper land (>15° and over)***
Dairy cattle (on milking platforms) and pigs	*All water bodies that are:* • *over 1 metre wide by 1 July 2017 on all slopes* • *less than 1 metre wide by 1 July 2020 on the Plains and undulating/rolling land*		
Dairy support (on either land owned/leased by the dairy farmer or third party land)	*All water bodies from 1 July 2022*	*All water bodies over 1 metre wide from 1 July 2022*	*All water bodies where break feeding occurs from 1 July 2022*
Beef cattle and deer	*All water bodies from 1 July 2025*	~~*All water bodies over 1 metre wide from 1 July 2030*~~ *All water bodies over 1 metre wide from 1 July 2030, unless the average stocking rate on the landholding is less than 6 stock units per hectare and the altitude is greater than 200 metres above sea level.*	
	All water bodies where break feeding occurs from 1 July 2022		

4.367 Does recommended Rule 74(X) give effect to NPSFM Objectives A2(b) and B4?

Question – RVV
Response – MMC

Yes, Objectives A2(b) and B4 of the NPSFM require the protection of significant values of wetlands. Rule 74(X) defaults to a discretionary activity status, this paired with consideration of the relevant objectives and policies within the pSWLP aligns with the provisions in the NPSFM.

For example, any application made under Rule 74(X) would need to address the how the diversity of the indigenous ecosystem types and habitats and their life-supporting capacity are maintained (Objective 14) and how any application would not reduce the area, function and quality of any natural wetland (Policy 33). It is also noted that the discretionary activity status of Rule 74(X) only applies to wetlands which have been used for commercial peat harvesting activities in the past. The evidence provided was that this was a very small number of wetlands in Southland. The conditions also ensure that pest plan species identified are not established, those being species that are not considered to protect the significant values of wetlands.

4.384 What is the officer recommendation on the request from Fonterra to include wells in the Edendale Terrace Aquifer in Appendix J?

Question – RVV
Response – MMC

It is recommended that the Fonterra wells in the Edendale Terrace Aquifer are not included in Appendix J. There are two reasons for this. Firstly, they are not community drinking water supply wells needing protection under the NES-DW, which is the primary purpose of the Appendix. Secondly, the inclusion of these wells would restrict a number of activities that could occur, or may be occurring, within 250m of the abstraction points. In the Officer's opinion, the evidence presented[9] does not provide sufficient certainty on the potential impacts on those properties within the 250m to determine it would be appropriate to include these wells in Appendix J.

Plan Provision

Objective 13B

Will this mean that a consent officer will need to consider the cumulative adverse effects of any resource consent application under this plan? And if yes, how would an applicant do this with all the other discharges discharging between his property and the sea including any towns along the way?

Question – LM
Response – MMC

Yes. Any resource consent application for the discharge of contaminants to land or water will need to consider potential cumulative effects. The methodology to determine cumulative effects is greatly dependant on the nature and scale of the activity. This

[9] Mr Callander for Fonterra stated that-land within 250m of bores is largely owned by Fonterra, except some land around the "homestead well" owned by neighbouring dairy farms and near the "factory well" land includes the domain, Edendale school and some residential properties and lifestyle lots.

objective does not introduce any new requirement to consider cumulative effects beyond what is required by the RMA. Section 88 of the RMA requires that an application for resource consent includes the information as required by Schedule 4. Schedule 4 requires the assessment of effects on the environment, 'effect' as defined includes cumulative effects. The assessment required by Schedule 4 must be in such detail as corresponds with the scale and significance of the effects that may occur.

For small scale proposals, or minor increases in contaminant losses, this may require an assessment of the nature of the discharge and a more general consideration of the quality and sensitivity of the receiving environment. Larger discharges, or more substantial increases in losses of contaminants, may require technical expert input and considerable assessment to determine the cumulative effects, particularly prior to the FMU limit setting process being completed. Environment Southland holds a range of information which would be available to applicants to assist the cumulative effects assessment.

Objective 16

Should it be "Public access to, and along rivers and lakes is ……"?
This happens because of owner's good will. There is a queen's chain in some areas but not in all areas and rivers move over time. So, can this objective be taken any further into policy and rules.

Question – LM
Response – MMC

Yes. The wording should be amended to include the comma.

There are rivers and lakes where access is currently not provided. The purpose of the objective is to ensure that where access is currently available, it is not lost, except where public health and safety is at risk. The objective also seeks to enhance access which may include providing access to new areas or improving access. Given this, it is considered that the objective can be achieved through the policies and rules, particularly discretionary activity rules. However, the providing or enhancing access is often not closely related to the RMA functions of the regional council, so the ability to achieve it through rules or resource consents is at times limited. Landowner good will is always the most important aspect.

Can the officers please clarify why the submissions of DoC and Forest and Bird on Objective 16 regarding biodiversity values and threatened species were not supported? (This relates to giving effect to Objective BRL 2 in the RPS)

Question – MR
Response – MMC

It was considered that the amendments suggested by DoC and Forest and Bird were not necessary to give effect to Objective BRL2 in the SRPS as Objective 14 addresses ecosystems and this supported by Policy 32. However, on reflection, some additional clarity through a linkage to indigenous biodiversity protection could be a useful addition.

DoC and Forest and Bird sought slightly different additions:

> DOC: *Public access to river and lake beds is maintained, except in circumstances where public health and safety are at risk or significant biodiversity values are being adversely affected.*
>
> Forest and Bird: *Public access to river and lake beds is maintained, except in circumstances where public health and safety, or threatened species are at risk.*

A combination of the requests is preferred by Officers:

Public access to and along river and lake beds is maintained, and enhanced except in circumstances where public health and safety or significant indigenous biodiversity values are at risk.

Policy 17A – Community sewerage schemes and on-site wastewater systems

Should Policy 17A (2) have the words "to lakes, rivers etc" after the word "wastewater" in the first line?

Question – MR
Response – MMC

No. It is intended that Policy 17A(2) ensures domestic wastewater is treated and discharged appropriately and discharges of untreated domestic wastewater to land or water should not happen.

Policy 18 – Stock exclusion from waterbodies

Does this 16° line up with other parts of the plan? (Refer to 25 a (ii) 2 and 25 a (iv) when the officer uses 7 degree, 20 degree and 16degree)?

Question – LM
Response – MMC and GM

Reference to slopes less than 16 degrees aligns with the proposed national stock exclusion regulation and as outlined in the reply report and s42A report it is recommended that the pSWLP is largely based on the draft regulations. Reference to a slope threshold of 16 degrees has only occurred in relation to stock exclusion[10]. Setback distances for intensive winter grazing and cultivation are based on run-off risk and sediment transport.

Rule 5 – Discharges to surface waterbodies

Should Rule 5(iii) refer to "authorised discharges"?

Question – RVV
Response – MMC

[10] The "Clean Water" discussion document does not specify why 16 degrees was the threshold adopted.

Yes, Officers consider the addition of "authorised discharges" to be appropriate. It is noted that there are recommended rules that specifically address most territorial authority discharges, so Rule 5 is not expected to be utilised a great deal for these activities. Officers recommend the following wording:

Rule 5 – Discharges to surface waterbodies ~~that meet water quality standards~~

…

(iii) *Except for an authorised discharge from a Territorial Authority reticulated system, the discharge does not contain any raw sewage.*

…

Rule 15 – Discharge of stormwater

What about Estuaries? (As mentioned all through this Rule 15)

Question – LM
Response – MMC

The rules in the pSWLP do not apply the Coastal Marine Area (CMA), as these activities are classified under the Regional Coastal Plan, this includes estuaries and coastal lagoons.

Officers have identified that occasionally the pSWLP does refer to discharges directly to estuaries or the CMA. These references to 'estuary' should be deleted, and occur in the following rules:

Rule 5(a)
Rule 6(a)
Rule 8
Rule 14(a)(i)

Further, references to direct discharges to the coastal marine area occur in a limited number of rules, and these should also be deleted:

Rule 26(a)(vii)
Rule 26(d)(ix)
Rule 26(f)
Rule 28(a)(vi)
Rule 37(a)

Rules that refer to setbacks from estuaries or the coastal marine area should remain.

This Rule 15 reads as if you can discharge directly to water as set out in Rule 15 a (iv) but the balance of the Rule 15 is onto or into land where contaminants may entre water, is this correct?

Question – LM
Response – MMC

It is intended that Rule 15 encompasses stormwater discharges onto or into land, where contaminants may enter water and discharges into water. Any direct discharge into water must meet the conditions of Rule 15(a)(iv) which is considered to adequately address effects on water quality.

Rule 15(b), (c) and (d) also address discharges into water and the wording reflects this. It is recommended that to improve the clarity of this, a comma is added as shown below.

The discharge of stormwater onto or into land where contaminants may enter water, or into a lake, river, natural wetland, modified or artificial watercourse…

Is Rule 15 in line with Rule 5(a), where the list of lake, river, natural wetland etc is listed?

Question – LM
Response – MMC

No, Rule 5(a) should be amended to remove reference to 'estuary'. As discussed above, the rules of the pSWLP do not apply to the discharge of contaminants into the CMA as these are classified under the Regional Coastal Plan.

Officers consider 'artificial watercourse' should be included in Rule 5(a) as this is consistent with other discharge rules in the pSWLP. The following amendment is recommended:

> ***Rule 5 - Discharges to surface waterbodies ~~that meet water quality standards~~***[11]
> *Except as provided for elsewhere in this Plan the discharge of any:*
> *(a) contaminant, or water, into a ~~surface waterbody~~ lake, river, modified watercourse, natural wetland or artificial watercourse~~, coastal lagoon or estuary~~*[12]*; or*
> …

Rule 20 – Farming

How many properties will be captured by Rule 20(a)(iii) for Intensive Winter Grazing, compared to notified rule?

Question – LM
Response – MMC

The notified rule captured 308 properties. The reply report rule captures 534 properties. This is based on the total landholding area, not the effective area of the landholding which is consistent with previous estimates.

In responding to this question, an error has been noted, in that the Officers had intended to delete the word "effective" from this rule, but had omitted to do so. Basing the calculation on 'effective area' could lead to some unintended consequences, such as the

[11] 562.11 Meridian
[12] 247.41 Environment Southland – definition of surface waterbody

pSWLP, and consequently farmers, not valuing land set aside for wetlands, riparian areas or forestry. On this basis, "effective" should be deleted:

(1) From 1 May 2019, intensive winter grazing does not occur on more than 15% of the ~~effective~~ area of a landholding, or 100 hectares, whichever is the lesser; and

Rule 20 (a) (iii) (3) (b) appears to apply to sheep and deer. What evidence is there that there is a need to back fence deer and sheep?

Question – MR
Response – MMC and GM

Yes, back fencing applies to any stock being break-fed. If the stock is block-fed, which Officers understand is more common with respect to deer, then back-fencing is not required.

Rule 25 – Cultivation on sloping ground

Which is correct 25(a)(iii) says 800m and 25(b)(iv) is 700m?

Question – LM
Response – MMC

800 metres is correct.

Some setbacks could be 20m wide and while not cultivated it could be used for other reasons like bale storage or access. Does this clause 25(b)(iiia) mean you would need a consent to work this area flat again, as a direct drill cannot fix wheel ruts?

Question – LM
Response – MMC

Rule 25 applies to any cultivation works required to re-contour land for sowing pasture and therefore a resource consent would be required for such activities within the setback distances. Please note the recommended further alteration to this rule on page 4.

Rule 25 (a) (iii) What evidence is there that increasing the limit to 800m amsl would better achieve the objectives and policies of the pWALP as opposed to the advertised limit of 700m?

Question – MR
Response – MMC

While there was little evidence directly on this matter[13], Officers considered that it is more appropriate and reasonable for the altitude limits for cultivation to be consistent with the altitude limits for intensive winter grazing and dairy platforms, as cultivation is likely to be required for both of those activities.

Rule 25 (b) (iiia) Is the term "direct drilling" unambiguous enough to be used in a permitted activity rule?

Question – MR
Response – MMC and GM

Yes, 'direct drilling' is a commonly understood and sufficiently certain term, and refers to seeding, without mechanical cultivation. However, given the earlier answer with respect to this Rule on page 4, this issue may become redundant.

Rule 26 – Discharge from on-site wastewater systems

Why are estuaries not included in 26 a (vii), 26 d (ix) and 26 f or does coastal marine area cover it?

Question – LM
Response – MMC

As discussed above, the rules of the pSWLP do not apply to the discharge of contaminants into estuaries as these discharges would be classified under the Regional Coastal Plan. As stated earlier, Officers consider reference to the *"coastal marine area"* in Rules 26(a)(vii), 26(d)(ix) and 26(f) should be deleted.

Rule 32A – Use of land for effluent storage

There are ponds 20 years and older still in full operational working order, apart from a drop test being done, no engineer or Suitably Qualified Person would be able to sign the pond off, or does Rule 34 cover this?

Question – LM
Response – MMC

Rule 32A does not require a Chartered Professional Engineer or Suitably Qualified Person to sign off the design or construction method of any existing agricultural effluent pond.

The rule does however require a Suitably Qualified Person to certify existing ponds:
(1) meet the pond drop test criteria; and
(2) for ponds, other than those that are fully lined with an impermeable synthetic liner or is of concrete construction above ground level, as having no visible cracks or defects that would allow effluent to leak from storage.

[13] Raised clearly in submission, particularly Federated Farmers.

Rule 38 – Animal and vegetative waste

Rules 38(d)(v) and 41(a)(iv) refer to an 'average' depth of material or 'average' depth of application of 10mm. Should Rule 35(a)(vii) use the same terminology?

Question – RVV
Response – MMC

No, Rule 38(d)(v) is intentional, it relates to waste that may be more solid or fibrous, therefore reference to an average is appropriate.

Rule 41(a)(iv)(2) authorises the discharge of silage leachate subject to the discharge not resulting in an average application depth in excess of 10 millimetres for each individual application. Officers have identified this could enable a significant discharge in one location (subject to the average depth of an individual application being 10 millimetres).

On this basis, Officers recommend deleting the term 'an average' and limiting the depth of individual application to 10 millimetres, to be consistent with Rule 35(a)(vii). The following amendments are proposed:

Rule 41 – Silage leachate

…

(iv) any discharge does not result in:

~~*(1) overland flow or ponding of silage leachate*~~

(2) an application ~~average~~ depth ~~of application~~ in excess of 10 millimetres for each individual application; and

…

Rules 38(d)(v) and 41(a)(iv) now use the word "average" in response to the submissions of DNZ and others. Are the Officers confident that this can be assessed in the field and that the effect of deeper depths of effluent will not result in adverse affects?

Question – MR
Response – MMC

See response above. As Rule 38(d)(v) relates to waste that is likely to be more solid or fibrous, it is considered that measuring the average depth will be more practical.

As a consequence of amending Rule 38 to refer to soil temperature would it be appropriate to also refer to "soil temperature" in rules 35, 36 or 37. Can officers also clarify why a temperature of 5 degrees is recommended rather than the 5 and 7 degrees, for autumn and spring respectively, referred to on the ES website.

Question – MR
Response – MMC and GM

After further consideration, Officers agree that differentiation between autumn and spring is appropriate, to recognise the temperature trends at those times. Recommended revised wording is:

(iii) onto land when the soil moisture exceeds field capacity or when soil temperatures are below 5 degrees in autumn or 7 degrees in spring; or

Officers prefer field capacity, rather than temperature for the application of liquids, such as farm effluent, horticultural wash water or from dips, as in such situations the liquids are unlikely to be mobilised (flow) or wash or run-off in a rain event.

Rule 40 – Silage Storage

There are silage pits that do not meet the new 50m rule from a water way but are concrete lined, leachate is captured, and are older than this plan, looks like it goes straight to a non-complying activity, is this correct?

Question – LM
Response – MMC

No. No silage storage facilities are permitted within 50m of a lake, river, modified watercourse, artificial watercourse or naturally occurring wetlands. Silage storage facilities that are located between 20 and 50 metres of these waterbodies (excluding the mainstem of Waiau, Aparima, Ōreti or Mataura Rivers) would be classified as a restricted discretionary activity. Any silage storage facilities located within 20 metres of a waterbody would be classified as non-complying.

Can the officers please clarify why Rule 40 (a) (viii) is limited to cattle only and not also to deer?

Question – MR
Response – MMC and GM

Self-feed silage stacks for deer are generally smaller and on drier, rocky ground, and do not tend to have the same run-off and nutrient hot-spot issues. That said, there remains some risk that a self-feed silage stack for deer could be poorly positioned or managed. Environment Southland staff may need to manage these individual situations, should they occur, through farmer education and communication with industry bodies.

Rule 42 – Cleanfill sites

Rule 42 (a) is recommended to have no limit on the amount of cleanfill on a "formed road reserve". Does this apply to any legal road? Is there scope to refer to road reserves?

Question – MR
Response – MMC

It does not apply to any legal road, but only *formed* legal roads, (i.e. it does not apply to unformed paper roads).

The Officers consider that there is scope to refer to formed road reserves in Rule 42(a) as a consequential change to implement the inclusion of the objectives and policies associated with recognising and providing for regionally significant, nationally significant and critical infrastructure (including its development, operation, maintenance, and upgrade) as per the submissions on behalf of ICC, SDC and GDC (submission points 330.2, 330.10)

Rule 49 – Abstraction and use of surface water

Rule 49 (a)(iii), and (aa)(iii) now refers to the instantaneous flow in lakes, wetlands and coastal lagoons as well as rivers. How is this to be assessed? Is that appropriate?

Question – MR
Response – MMC

It is not intended for lakes, natural wetlands or coastal lagoons to be subject to Rule 49(a)(iii) and (aaa)(iii) as it not possible to determine the instantaneous flow. The inclusion of this condition reflects the interim limit in the proposed National Environment Standard on Ecological Flows and Water Levels (NES). The threshold of 30% of the instantaneous flow does not apply to lakes, natural wetlands or coastal lagoons.

The NES proposes an interim limit for wetlands of *no change in water levels, beyond the water level variation that has already been provided for by existing resource consents on the date the Standard comes into force.* The NES does not propose an interim limit for lakes.

It is recommended that Rule 49(a)(iii) and (aa)(iii) is amended to remove reference to lakes, natural wetlands and coastal lagoons.

What is meant by Rule 49 (e) in regard to Cromel Stream, is it fully or over allocated?

Question – LM
Response – MMC

The Cromel Stream is fully allocated and therefore no new consents for the abstraction of water should be granted unless they are replacing an expiring water permit.

Rule 54 – Abstraction and use of groundwater

Rule 54 (a)(iv) should the words "The accuracy of the" be added before "water meter" in the last line?

Question – MR
Response – MMC

Yes. This wording should be consistent with Rule 49(a)(viii). The correct wording is:

where the volume of the take exceeds 20,000 litres per day, a water meter capable of recording the rate of take, and maximum daily volume shall be installed. The water take data shall be recorded daily and that data shall be provided to Environment Southland on request. The accuracy of the water meter shall be verified every 12 months

Rule 59

In Rule 59(ii) is it correct that you cannot put culverts pipes side by side but can have them end on end in a line?

Question – LM
Response - MMC

Rule 59(ii) requires any culvert to be a single structure and not be placed in combination with other culverts. Under the rule as drafted, multiple culverts would not be able to be placed side by side or end on end in a line. On further reflection, refinement of this condition could provide greater certainty. Specifying a maximum length of culvert assists with a clear distinction from piping a watercourse (to which the rule does not apply) while still allowing a culvert under the likes of a road. Parallel smaller culverts can also be enabled, where their total flow does not exceed that of a 1200mm diameter culvert. Recommended changes are as follows:

~~*(ii) any culvert is a single structure (i.e. it is not placed in combination with other culverts across the width of the river);*~~
(ii) any culvert or combination of culverts is no longer than 25 metres in length; and
(iia) a single culvert or up to three culverts placed in parallel, such that the total capacity of all culverts does not exceed that of a single 1200mm diameter culvert; and

Rule 59A

In Rule 59A (iv) why have rock armouring at the top of a sediment trap when the biggest risk is the downstream side being washed away?

Question – LM
Response – MMC

Rock armouring at the top of a sediment trap prevents scouring of the upstream edge of the trap. This practice is recommended in the general guidelines for construction and maintenance of sediment traps provided by Dairy NZ and supported by the Land Sustainability Team. A copy of the guidance is attached.

Re sediment traps, it would seem unlikely that a sediment trap or pond placed in or on the bed of a river could then provide for fish passage, particularly where the sediment trap intercepted the flow in a minor waterbody where there was likely to be fish habitat upstream, as opposed to sediment traps in ephemeral or in watershed areas that flow intermittently?

Question – EE
Response – MMC/GM

A sediment trap is commonly a depression or excavated area of the stream bed that creates a pool to slow water velocity. Fish passage would be maintained even in smaller waterbodies as there are no flow or structural impediments to fish movement.

Rule 59A. Should there be a limit on the size of the watercourse? While there are conditions it would be possible to put a sediment trap in many small watercourses and the habitats within that could still be adversely affected. Would a bed width/or mean annual low flow restriction ensure that such adverse effects were avoided?

Question – MR
Response – MMC and RH

No, it is considered that the potential benefits of sediment traps outweigh the adverse effects associated with the construction and maintenance of sediment traps. The effects associated with construction and maintenance would occur irrespective of stream size/flow regime.

Rule 59A. Sediment traps could be constructed at the base of critical source areas that are also sometimes ephemeral watercourses (rivers). Does the wording of this rule allow these to be built as a permitted activity?

Question – MR
Response – MMC

This issue has been resolved, in response to other questions on ephemeral watercourses.

Should the reference to Rule 74A in 59A(b) be 59A(a)?

Question – MR
Response – MMC

Yes.

Rule 60 – Dams and weirs

Dam height is discussed at para 4.345 of the reply report but Officers only state that "in light of engineering concerns, recommend a precautionary approach…" Could these "engineering concerns" be specified and justified.

Question – MR
Response – MMC and CY

The engineering concerns are the various mechanisms for the failure of dams and weirs. Council's engineers are of the opinion that permitting a dam or weir between 2 and 4 metres in height to be constructed without being certified by a Suitably Qualified and Experienced Engineer is unwise given the risk associated with such structures.

It is common for these smaller earth dams to be constructed by individual property owners with materials found at the site. This material may include organic matter, inappropriate soils such as silts and is unlikely to be tested for its suitability, or properly compacted, thereby increasing the risk of failure.

Rule 61 – Erosion control structures

Given that gabion baskets contain wire mesh are the officers confident that RMA Part 2 s6 (a) matters (natural character) will be provided for?

Question – MR
Response – MMC

There is always a risk to natural character whenever flood mitigation or erosion control works are undertaken in a riverbed. While the conditions of the permitted activity rule peripherally address natural values, none are directly relevant. Gabion baskets are typically used where infrastructure needs to be protected, such as a road or bridge. In these situations, natural character is often already compromised. A further category of rivers which have natural values recognised, which could be added to condition (i), would be rivers subject to a Water Conservation Order.

Should a limitation on the size/amount of these structures be included in the conditions to ensure the natural character of rivers is not adversely affected?

Question – MR
Response – MMC

As stated above, these structures tend to be positioned for the protection of infrastructure. When in association with infrastructure, a limit on length or size is unlikely to limit any further degradation of natural character. If not placed in the vicinity of existing infrastructure or flood control works a size limit may assist with addressing potential effects on natural character.

The use of concrete is allowed in Rule 61 (b) subject to conditions, one of which is the size of the watercourse. One of the conditions in this rule (xii) requires that the bed is returned to its original shape etc. and vegetation will eventually grow over the concrete thus retaining natural character. Would it be appropriate to apply that requirement to gabion baskets?

Question – MR
Response – MMC

The nature of gabion baskets is that they generally form a steeper structure than would normally occur, and are used in a different manner to pre-formed concrete structures. Their porous structure means that vegetation does often grow on them, and this can be encouraged by including more fine material with them. Due to the different nature and usage of gabion baskets, Officers do not recommend the use of the same conditions.

Rule 63A – Navigational aids and health and safety signs

The rule requires that such signs not be placed in any mataitai, nohoanga or taiapure, it is not consistent with the reality that some such reserves in other regions do have signage or navigational aids, should the rule require that such signage or navigational aid be at the discretion of Ngai Tahu?

Question – EE
Response – MMC

Officers consider that it is not appropriate to provide this level of discretion to a third party, so do not recommend the change suggested.

However, on reflection, Officers note that signage in these locations, particularly to identify the restrictions in place, or to identify any hazard, including a water quality hazard, are necessary. On that basis, consideration ought to be given to deleting this condition.

Rule 65A- Maimai

Should you have Estuary listed in (a)?

Question – LM
Response – MMC

No, Rules 11.7.2.1 to 11.7.2.4 in the Regional Coastal Plan authorise the erection of permanent and temporary maimai in the CMA. On this basis, Rule 65A only authorises maimai within rivers, modified watercourses or lakes.

Rule 70 – Stock exclusion from waterbodies

Do both 6 SU/ha (2.5/ac) and 200m above sea level have to be meet, or is it correct to have it as and/or as highlighted in yellow above?

Question – LM
Response – MMC

Yes, both the low stocking rate and 200m altitude criteria need to be met.

How does this rule address adverse effects from stock on a watercourse on a landholding where the average stocking rate is less than 6SU/ha, but where stock

are concentrated into an area at higher rates than this for periods of time other than when being break fed?

Question – MR
Response – MMC and GM

It is inevitable that from time to time stock will be held in more dense situations, such as in a holding paddock before drafting or drenching. Similarly, animals may congregate such that this density will be exceeded. There are specific rules if animals are break fed or are on a winter grazing crop, to cover more intense stocking situations. Officers are satisfied that the thresholds are appropriate, even if higher densities may occur in limited situations.

Can the officers please explain why an altitude limit of 200m amsl has been recommended in Rule 70.

Question – MR
Response – MMC and GM

200 metres is considered to be a broad threshold, above which stocking density tends to be less, and the landform becomes more difficult to fence, through multiple small waterways and often more variable and steeper terrain.

Should stock unit (SU) be defined?

Question – MR
Response – MMC and GM

It is not considered necessary to define stock units, as it is a commonly used and well understood term in the rural sector. While there are some minor differences in some of the tables and lists used, these differences are quite minor and are unlikely to lead to different outcomes.

Rule 78 – Weed and sediment removal for drainage maintenance

DoC and Fish and Game asked for a limit on the amount of gravel that could be taken as a permitted activity. Why have the officers not agreed that a percentage limit on the amount of gravel to be removed not be included in the rule?

Question – MR
Response – MMC

This rule relates to weed and sediment removal in waterways that have previously been modified. Officers have recommended the rule be modified to require that the bed of the watercourse is not further deepened, as a proxy for preventing the removal of gravel substrate, primarily because Officers considered that it would be difficult to determine whether the threshold has been exceeded or not.

Physiographic Zone

Where do I found Map Series 4, it is not in the Part B Maps folder?

Question – LM
Response – MMC

Map series 4 (physiographic zones) is removed from the final recommended pSWLP, in line with the recommendation in the Reply Report, see paragraph 4.28. Unfortunately, the strikeout was no correctly shown in the definition, and still refers to that map series. As per the answer to the question below, that definition is now recommended to be updated.

Is the Glossary definition of "physiographic zone" correct given the recommended omission of the zones from the PSWLP maps?

Question – RVV
Response – MMC

No, the definition of 'physiographic zone' provided in the tracked changes version of the plan is incorrect, to the extent that the part of the definition relating to the maps should be deleted, as follows:

Physiographic zone
A physiographic zone represents areas of the landscape with common attributes that influence water quality, such as climate, topography, geology and soil type. Zones differ in the way sediment, microbes, and nutrients such as nitrogen and phosphorus accumulate and are transferred through the soil, aquifers and into waterbodies.
~~*The zones as depicted on Map Series 4: Physiographic Zones.*~~

~~*The zones as are depicted on Map Series 4: Physiographic Zones and individually described in the Plan, Part A, pages 18 – 21.*~~

Feedpad/lot

Why are deer excluded?

Question – MR
Response – MMC

The definition of feedpad/lot is not intended to exempt deer, except in relation to self feed silage stacks, as is discussed earlier. To clarify this, the definition should be adjusted to:

Feed pad/lot
A fenced in or enclosed area located on production land used for feeding and/or loafing of cattle or deer to avoid damage to pasture when soils are saturated, and can be located either indoors or outdoors. It includes 'sacrifice paddocks', stand-off pads, calving pads, loafing pads, and self-feed silage stacks (~~other than~~ but does not include a self-feed silage stack when being fed to deer).

Wahi Tapu

Waahi or Wahi, what is the correct spelling as reference books spell it Waahi?

Question – LM
Response – MMC

Supplementary legal evidence filed on behalf of Ngāi Tahu refers to *"wahi"* not *"waahi"* therefore this term was adopted in the reply version of the pSWLP.

Appendix E

Appendix E has been modified to exempt the effects of critical infrastructure, where that affects flow, from complying with the standards. Is this consistent with the Objectives of the Plan and Part 2 of the RMA? Does this apply to other infrastructure in addition to the Manapouri Power Scheme?

Question – MR
Response – MMC

Yes, as critical infrastructure has a reasonably broad definition. On reflection, it would be preferable if the exemption in Appendix E referred to the Manapouri Power Scheme only, as Meridian has requested that exemption, and it would avoid any unintended consequences.

Appendix K

Is it correct to use a brand name "Environment Southland" and not use our legal name "Southland Regional Council"?

Question – LM
Response – MMC

Either name is correct, as the preamble of the plan refers to *"Environment Southland"* as the brand name of the *"Southland Regional Council"*. Both terms are used in the pSWLP. However, *"Environment Southland"* is used more consistently than *"Southland Regional Council"*.

Officers consider that replacing *"Southland Regional Council"* with *"Environment Southland"* throughout the pSWLP would be more consistent and may assist in clarity. To add further clarity, Officers consider a definition may also be useful. The following wording is recommend:

Environment Southland
Means the Southland Regional Council.

Appendix L

Should Appendix L.3(a)(v) be underlined?

Question – RVV
Response – MMC

Yes, Appendix L.3(a)(v) is new text since the notified version of the pSWLP and should be underlined and footnoted. Fonterra requested this inclusion, the appropriate submitter ID and submission point are as follows:

Appendix L.3 Interference effects

…

(v) In any situation where the drawdown interference exceeds any of the limits in sub-clauses (i)-(iv) the new groundwater abstraction will be considered acceptable if it can be demonstrated that the drawdown interference will not have an impact upon the yield of the bore that is any more than minor or the effect is mitigated.[14]

…

Appendix N

Is "farmer" the correct term to use in Appendix N, Part B(1)(b)? Could it instead be "landholding owner or their agent" perhaps?

Question – RVV
Response – MMC

Yes, Officers consider it would be more appropriate to replace *"farmer"* with *"landholding owner or their agent"* as this is consistent with other parts of the appendix which refer to land holding owner.

[14] 277.59 Fonterra

DairyNZ farmfact

Managing waterways on farms

Sediment traps (5-9)

Artificial sediment traps are excavations in the bed of a watercourse that capture and reduce the downstream movement of gravel, sand, and course silt (very fine sediment will continue downstream). The traps are wider than the water channel, short in length and deeper than the stream bed. They are used in conjunction with other sediment control measures to reduced excessive sediment (see Farm Facts 5-1 to 5-8 covering riparian management) in both natural waterways and constructed drains.

Sediment traps reduce the build-up of silt and sand and gravel downstream, where they can reduce channel carrying capacity. The trap has to be periodically excavated when it fills up, but it will reduce the need for more extensive waterway clearing and cut excavation costs. Reduced sedimentation of waterways can also reduce the growth of weeds that choke channels and require periodic clearing.

There are environmental benefits as well. Trapping excessive sand and silt improves the waterway habitat. Instead of periodic excavation of kilometres of channel, a relatively short (4-10 channel widths long) sediment trap is cleaned as required. This greatly reduces downstream disturbance of aquatic life e.g., eels, crayfish, invertebrates, and reduces re-suspension of sediment and any associated contaminants.

Plan Before You Dig

Seek advice from a specialist at your regional or district council regarding consent requirements, location and design of in-channel sediment traps. Prepare a construction and maintenance plan ahead of time and be sure to obtain the necessary consents prior to any physical work.

Here are some general guidelines for construction and management of sediment traps.

Location

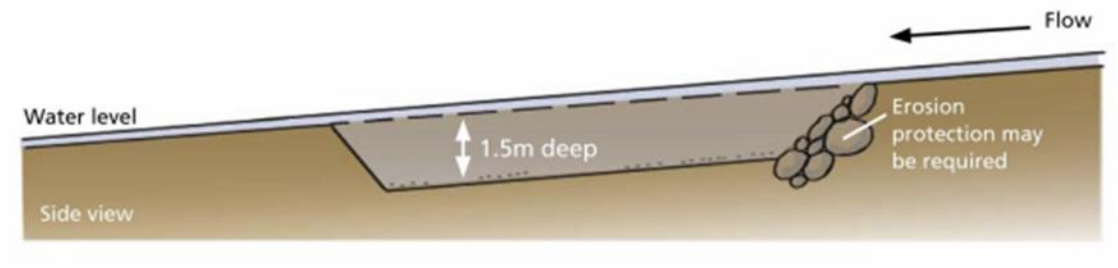
Choose a spot that will make it easy to trap and excavate bed material. Look for a long, relatively straight channel with good access. There should be suitable ground conditions and room to operate an excavator and temporarily pile the silt, sand and gravel.

The trap should be positioned where there is no risk of it causing channel instability or compromising infrastructure such as bridge crossings. Placing traps upstream of reaches where habitat is degraded from earlier excessive sediment deposition can help in their rehabilitation.

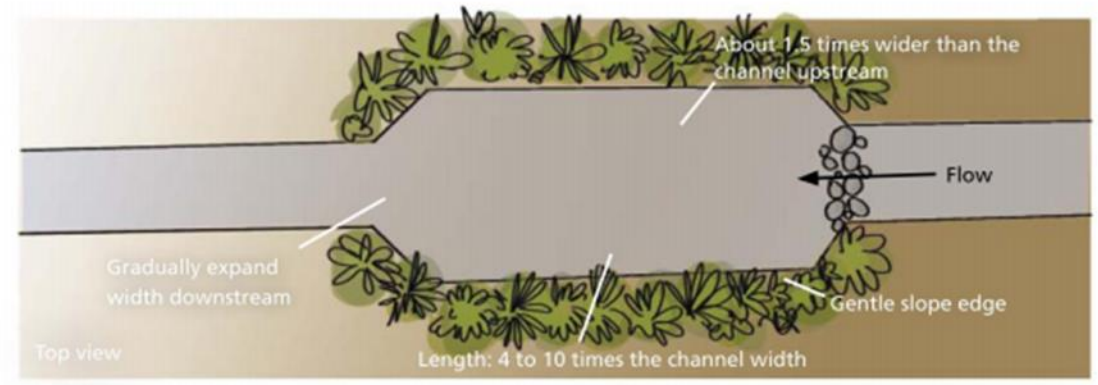
Design and construction

These are general procedures for construction. You are advised to get advice from a specialist who can assess the particular conditions at the planned site.

- Pick a good work time. Avoid disturbing the beds and banks during fish spawning and watch for native birds nesting along the channel margin.
- Excavate a pit in the channel, best done with a dragline or hydraulic excavator from the bank.



- Shape the pit so it is about 1.5 times the width of the channel upstream (and gradually wider as you go downstream) and 1.5 m deeper than the average bed level. Make the trap length 4 to 10 times the upstream channel width. (Trapping efficiency depends on length. If the trap is too short efficiency drops off rapidly. If the trap is very long there is little gain in efficiency.) Aim for side slopes of the trap 1:2 (1 vertical unit to 2 horizontal), the same ratio as recommended for drain construction.



- Try to include a channel diversion so water can be diverted around the trap during construction and any time it is being re-excavated to remove collected sediment.
- Stabilise the upstream edge of the pit with rocks to prevent erosion, but make sure fish passage can still occur.
- Plant suitable vegetation to stabilise the banks and berms and provide food and habitat for fish and wildlife.

Management and maintenance

Once the sediment trap is constructed it needs to be looked after to continue serving its purpose. Here are some key steps:

- Signpost the trap and secure it from inadvertent access.
- Maintain bank vegetation in good condition to minimise erosion into the trap.
- Inspect the trap regularly and re-excavate when it is by-passing too much sediment. As a rough guide, you should excavate when the top half of the trap is largely filled with sediment.
- Follow the guidelines noted above when removing sediment so the trap is returned to its original shape.
- Divert flow during the work if you have incorporated a diversion into the plan.
- Recycle the cleared sediment back onto paddocks. Don't leave it stockpiled by the waterway.
- Check the trap after all major storms and after floods to see if there are any problems (e.g. scour, bank failure).

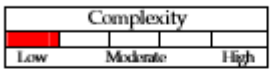
The sediment trap can be 'de-commissioned' by not removing sediment. The bed will build up and the edges will infill as vegetation encroaches and traps more sediment. The trap area will eventually be indistinguishable from the channel.

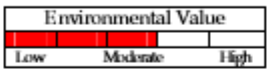
This Farmfact is adapted with kind permission from the NZWERF publication,* Sustainable Drainage Management: Best management practice, #4 Coarse sediment trap, *by Henry R Hudson.

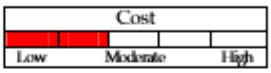
In-channel coarse sediment trap
Best Management Practice

By Henry R. Hudson
Environmental Management Associates Ltd., Christchurch

July 2002







Definition

Coarse sediment traps are excavations in the bed of a watercourse designed to limit the downstream movement of sand and gravel from upstream sediment sources. Depending on trap design and stream characteristics, lesser amounts of fine sediments (the fine sand, silts and clays that move in the flow rather than along the bed) can be trapped. A coarse sediment trap is required as the upstream component of a constructed wetland system. The trap is for sedimentation of solids down to coarse and medium silt; and the wetland removes the fine sediment, and dissolved and finely dispersed contaminants.

Purpose

1) Instream sediment traps are used in conjunction with other sediment control measures to reduce excessive sediment in watercourses: For upland sediment sources, the most desirable strategy is to implement land management practices that reduce erosion and transport of sediment and associated contaminants (e.g. conservation tillage; critical area planting). The second strategy is to retain sediments on the land before they get to the drainage network (e.g. filter strips, sediment retention ponds). For channel sources, streamflow should be retarded to protect the channel (e.g. vegetated banks); eroding banks should be repaired (e.g. contour and vegetate); and livestock that cause erosion should be removed from the channel and banks. If these measures are not undertaken, then continuous in-channel sediment problems will occur. In some cases, the in-channel sediment trap is the first line of defence (e.g. multiple, uncontrollable sediment sources).
2) Excessive sediment deposition is common, destabilises channels, and reduces instream habitat quality and quantity: Excessive sediment reduces channel capacity and causes drainage and flooding problems. Aggrading channels tend to have bank erosion. Pools are infilled and finer material accumulates in the gravel bed reducing habitat quality and quantity. Trout populations (and presumably other species that require clean gravel bed channel) are significantly reduced with sand deposition in a gravel stream.
3) Sediment traps confine sediment deposition to a small reach of channel and reduce excavation costs: Sediment traps are relatively wide, short and deep excavations in the bed. Trapped sediment does not progress downstream where deposition would reduce channel capacity. The trap itself has to be episodically excavated (after major storms) rather than a much greater length of the stream. Further monitoring is required, but preliminary indications are that in appropriate situations maintenance costs are reduced to about half or less of regular downstream channel excavation. Widespread use internationally indicates the economic and environmental benefits of sediment traps.
4) Environmental benefits result from limiting downstream disturbance: Excavating channels causes modification or loss of habitat; re-suspension of sediment and sediment associated contaminants; and removes invertebrates, fish, eels and crayfish from the channel. This may have long-term impacts.
5) Trapping excessive sediment improves physical habitat: Habitat for fish and food production are damaged by excessive sediment. Stopping excessive inputs of sediment into channels and trapping sediment improves habitat. However, erosion of the channel may occur if the natural sediment supply is cut off, or if the bed at the trap is unstable.

6) Establishing and maintaining good bank vegetation is a priority: Appropriate vegetation provides bank protection, shade and nutrients, with improvements in channel stability and habitat quality.
7) It may take years before channel changes are apparent: The damage from excessive sediment inputs can take years to work there way downstream. Recovery by trapping sediment is rapid immediately below the sediment trap, but it takes time for a wave of sediment to move through the system (or to be trapped in other places downstream) and for conditions to improve.
8) A plume of sediment will be released from the channel during excavation of the sediment trap and with re-excavation of the trap: Sediment Control measures must be used to minimise sediment washing into the channel from tracks and stockpiles of spoil. During excavation a plume of sediment will be released from the channel, but this usually results in a short duration discolouration of water without biological impact.
9) Channel diversions may be an effective means of reducing sediment plumes during excavations: In particularly sensitive areas where large quantities of fine sediment are trapped, it might be prudent to divert flow around the sediment trap during excavation. However, these diversions may also introduce a sediment plume.
10) A vegetated by-pass channel may be an effective means of reducing sediment plumes during excavations: A permanent low flow bypass channel could be constructed and stabilised with vegetation prior to excavation of the in-channel sediment trap. The bypass channel could be temporarily re-activated when the sediment trap is to be re-excavated (e.g. block the main channel with straw bales to divert the flow into the grassed waterway bypass channel). (See the Grassed Waterways BMP).

Location

1) A long relatively straight channel reach with good access, room to operate an excavator, room to stockpile or dispose of sediment, and suitable ground conditions are required.
2) Sediment traps should not cause channel instability and endanger infrastructure, and public health and safety.
3) Sediment traps to enhance fisheries should be constructed where the potential for downstream recovery from excessive sediment exists (e.g. gravel bed channels with excessive sand deposition).

Work Window

1) Establish which fish and birds use the channel and channel margins.
2) Establish which times and places are sensitive to disturbance by consulting the "Work Windows" management practice.
3) Avoid in-channel works during sensitive times (e.g. trout spawning and incubation in gravel bed streams).

Performance Indicators

1) Design objectives are stated and followed in the construction and maintenance of the sediment trap. As-built surveys will be undertaken.
2) Sediment control management measures are followed in the construction and maintenance of the sediment trap, which includes delineation and protection of sensitive places on the channel banks and berms.
3) Construction and maintenance costs are documented.
4) Design trapping efficiencies are achieved.
5) After a period of adjustment, channel conditions approach reference reach conditions, and the channel should be in dynamic equilibrium.

7) The sediment trap does not endanger infrastructure, such as bridges and water intakes.

8) The banks of the sediment trap are vegetated with species that promote bank stability, trap sediment and provide habitat.

9) Sensitive times and places of fish and wildlife (e.g. trout spawning in riffles; bird nesting) are avoided during construction and maintenance.

10) Sediment traps should not endanger infrastructure or public safety. Sediment traps should be well signposted and secured from inadvertent access (e.g. the access track to the trap is gated).

Procedures

These procedures are not a substitute for expert advice on the particular conditions prevailing at the site. Get expert advice on the design requirements (e.g. the river engineers at the Regional Council).

Planning

1) Consult with experts at the regional or district council regarding the location and design of in-channel sediment traps, paying particular attention to channel stability and public health and safety.

2) Develop a construction, operational and maintenance plan, and obtain the necessary resources consents and access agreements. This plan will include Sediment Control measures. As part of this plan consult with Fish and Game, Department of Conservation and the Work Windows guidelines to avoid sensitive times and places for construction and maintenance. Flag or signpost sensitive areas and make operators aware of the need to avoid these areas. Consult to see if fish salvage is required.

3) Assess if a diversion channel or vegetated bypass channel will provide significant benefit in the construction and on-going maintenance of the sediment trap.

4) Assess if grade control structures are required.

5) Plan and undertake construction activities following the Sediment Control guidelines. The sediment control plan will avoid and/or control discharge of sediment to the channel and other sensitive areas (e.g. wetlands). The plan must emphasise minimising soil disturbance and source control of sediment.

Construction

6) All embankments and structures must be constructed in accordance with accepted engineering practice, and with appropriate materials.

7) Determine the design flow for the channel where the sediment trap is to be located and establish the viability of creating a trap (see location).

8) Determine the target size of material to be trapped, and the trapping efficiency required. Fine sand (i.e. sediment ≥0.125 mm) and 90% trapping are often used.

9) Determine the surface area of the sediment trap from Equation 1 or Figure 1. For example, for a design flow (Q) of 1 m^3/s, fine sand (w= 0.10 m/s), and an efficiency (E) of 90%; the required surface area (A) is 222 m^2.

$$A = -\frac{\ln(1-E)}{w}Q \qquad (1)$$

10) Use a rule of thumb for the initial trap size estimate: 1.5 times wider than the channel; length to width ratio of 4:1 to 10:1; and a depth 1.5 m below the average bed level. For a 5 m wide channel, the trap width is 7.5 m, and the trap length 30 m to 75 m long.

11) Check the depth required to prevent re-suspension of the trapped sediment (the cross section average velocity is used). From Figure 2, for a design flow of 1 m^3/s a cross sectional area (CSA) of 5.6 m^2 is required to stop fine sand re-suspension (a velocity of 0.18 m/s – Table 1). For a 7.5 m wide trap, the minimum depth to prevent re-suspension is 0.75 m (i.e. the trap is effectively full when sediment is 0.75 from the design water surface). A 1.5 m deep excavation provides more than 0.75 m of effective storage because the depth of flowing water, which is determined by the outlet control, provides additional settling capacity. This additional depth can be used as a factor of safety.

12) Trap length:width ratios are normally 4:1 to 10:1. The trap should gradually widen downstream. Trap size is determined by the input of bedload and the desired frequency of cleaning. An estimate can be made from historic channel clearing records. At 4:1 the gross storage is ~340 m^3; and the effective storage is ~170 m^3. At 10:1 the gross storage is ~840 m^3 and the effective storage is ~420 m^3.

13) Excavation would preferably be undertaken with a dragline or hydraulic excavator operating from the bank. The cross section of the trap should be uniform, to limit flow separation, and gradually expand in the downstream direction.

14) Channel side slopes should be 1 vertical: 3 horizontal, or more gentle if possible.

15) Suitable vegetation should be planted to stabilise the banks and berms, and provide food and habitat for fish and wildlife. Locally sourced native species are preferred, and these may be inter-planted with exotic vegetation to promote rapid re-vegetation and channel stabilisation.

16) Construct grade control structures if required.

Maintenance

17) Work within the planning guidelines developed for this particular site (e.g. the Sediment Control plan for the site).

18) Regular inspections should be carried out as part of an overall system maintenance programme, and after floods. The inspections will determine when the trap should be re-excavated; and to detect potential problems (e.g. scour; bank failure).

19) Vegetation should be maintained in good condition (See the Sediment Control guidelines).

Sediment Removal and Stockpiles

20) The design depth of the sediment trap should be marked in the sediment trap (e.g. a stage gauge board). Once the effective capacity of the sediment trap is reached, the trap effectiveness declines, and the sediment trap should be re-excavated.

21) If a diversion channel or grassed waterway has been installed, divert flow into the by-pass before excavating the sediment trap.

22) It is preferable to undertake re-excavation of the sediment trap operating from the bank rather than from in the channel. This will be determined by the sediment trap dimensions, and size and type of excavator.

23) Stockpiles must not be left in the channel where they impede flow or are likely to be eroded by flowing water. Overburden, vegetation or other debris should not be deposited into a watercourse or left in a position where that material could fall into or be washed away. This material may be removed from the site, buried or levelled.

24) Excavated materials should not be placed in wetlands with significant habitat value. Grading should not occur in significant wetlands.

25) Clean spoil can be used to build an embankment along the channel. Embankments may be used as access lanes for future maintenance. Embankments should not confine or direct overbank flows to cause instability of the channel or other structures (e.g. roads, bridges, and culverts).

26) Direct water accumulating on or behind spoil areas or embankments to protected outlets (See Grassed Waterways).

Decommissioning

27) In many cases a sediment trap can be de-commissioned merely by not removing sediment deposits. The bed will build up, and the edges will infill as vegetation encroaches and traps sediment. The channel will eventually be indistinguishable from the adjacent channel.

28) Once stockpiles have been removed, the site should be levelled and re-vegetated. Unless agreements have been made to retain access tracks, tracks should be covered in soil and re-vegetated. These requirements should be explicitly stated in the plans for the site.

Related BMPs

Channel Diversions (Hudson, 2001); Grassed Waterways (Hudson, 2001).

Channel Stability Assessment (recommended guideline); Constructed riffle (recommended BMP); Rock weir (recommended BMP); Vegetative bank protection (recommended BMP)

Bibliography

Alexander, G.R.; Hansen, E.A. 1986. Sand bedload in a brook trout stream. *North American Journal of Fisheries Management* 6: 9-23.

Hudson, H.R. 2001. *Drain management guidelines*. First draft: July 2001. EMA Report 2001-15, prepared for Ministry for the Environment.

Hudson, H.R. 2002. *Development of an in-channel coarse sediment trap best management practice*. Environmental Management Associates Draft Report 2002-10 for Ministry of Agriculture and Forestry Project FRM 500.

Raudkivi, A. J. 1993. Sedimentation: exclusion and removal of sediment from diverted water. A.A. Balkema, Rotterdam. 164 pages.

Design Guides

Table 1. Average fall velocities for naturally worn quartz grains in 20°C water (based on relations in Raudkivi, 1993); and scouring velocities (from VSC, 1999).

Size Class	Nominal Diameter (mm)	Settling Velocity (m/s)	Scouring Velocity (m/s)
Very coarse sand	2.00	0.193	0.72
Coarse sand	1.00	0.121	0.51
Medium sand	0.50	0.064	0.36
Fine sand	0.250	0.029	0.25
Very fine sand	0.125	0.010	0.18
Coarse silt	0.062	0.0026	0.13
Medium silt	0.031	0.00064	0.09
Fine silt	0.016	0.00016	0.06
Very fine silt	0.008	0.00004	
Clay	0.004	0.00001	

The upper end of each size class is listed (e.g. very coarse sand is 1-2 mm; coarse sand 0.5-1 mm)

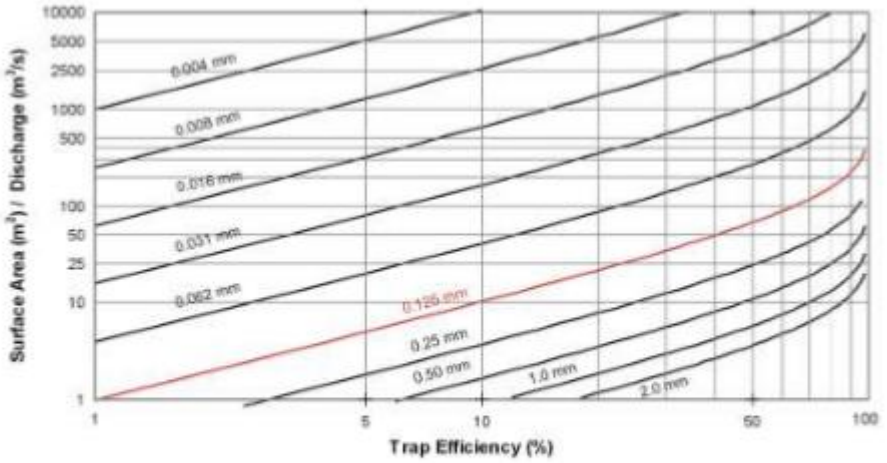


Figure 1. Percent of sediment retained for different sediment trap areas, sediment sizes and discharges.

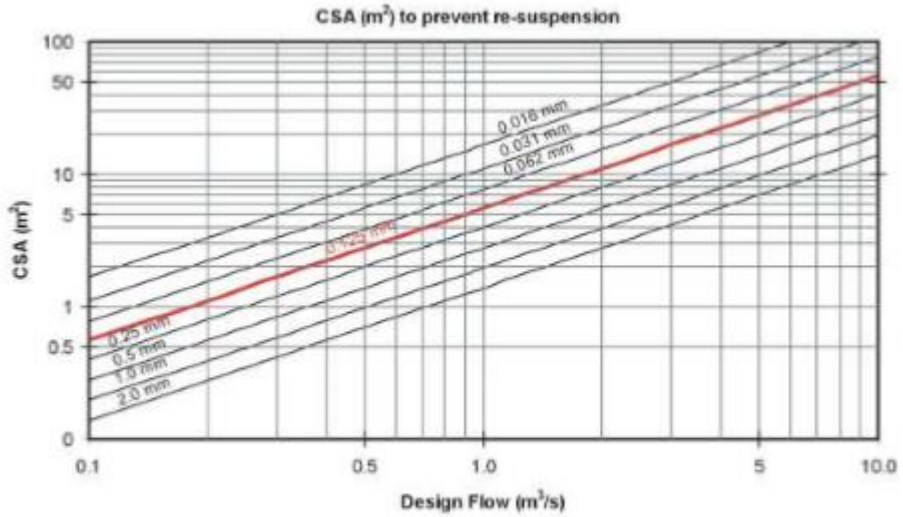


Figure 2. Cross sectional areas required for preventing re-suspension for different sediment sizes and discharges.