Environment Matters

19 August 2026

Environment Canterbury
PO Box 345
Christchurch 8140

Attention: Tracey Gray

CRC264624, 625, 627, 628 and 629; response to request for further information

Kia ora Tracey

Thank you for your request for further information dated 1 July 2026 (the RFI, copy attached to this letter as Attachment 1). This letter responds to the RFI. Each question and response is provided in a two-cell table, with the question in italics in the first cell, and the response (with quotes, if provided, in italics) in the grey-shaded second cell.

In some of the responses the applicant acknowledges that additional conditions would be appropriate. Draft condition wording has generally not been provided in this response, but we anticipate working with the consent planner to finalise these in the near future.

We accept that your expert reviewers and contract consent planner may require further clarification or detail and are happy to provide this as necessary, including conferencing or meetings if these would assist.

This letter includes seven attachments, and one separately-provided document (not attached to letter due to file size) as summarised in the following table. Please advise if you require individual copies of the attachments.

Attachments:	
1	Environment Canterbury request for further information
2	Kastorworks Ltd drawing series of number 1 drain connection sequence
3	Draft Erosion and Sediment Control Plan
4	Draft Fish Management Plan
5	Water quality and ecology science advice
6	WGA Ltd groundwater science response letter
7	Davis Ogilvie and Partners Ltd supplementary Detailed Site Investigation
File accompanying this letter:	
	Contaminated Land Management Plan

All dimensions provided in this letter are based on currently available design information, and are subject to change in detail as the project and drawings are finalised.

1. Length of new Seadown Drain alignment

The AEE and technical appendices do not provide a clear statement on the proposed length of the new drain alignment.

a. Please provide the estimated length (or a minimum and maximum length) of the new Seadown Drain alignment to be established.

The length of the realigned drain will be approximately 1,950 metres, and that of the new stop bank 1,560 metres.

The Timaru District Council planner has also enquired regarding structure heights, and the following are provided, based on several elevation profiles across the design surface.

The new stopbank will have a height above datum of 5 m north of Aorangi Road, and 4 m south of it. Its height above local ground level will be a minimum of approximately 1.75 m and a maximum of 2.75 m, although this depends on how local ground level is defined (in these cases, the ground height immediately adjacent to the elevation profile used).

The new inland bank takes a more complex alignment than the stopbank and will vary more in height. Its minimum height above datum will be approximately 3.9 m, and its maximum 4.45 m. Heights above local ground level will be approximately 0.9 m minimum, and 2.2 m maximum.

The final design drawings are still being produced. The applicant is willing to propose a condition that ‘design drawings shall be submitted to the Council at least 10 days prior to construction works commencing’.

2. Deposition of material within "river beds"

The AEE and site plans describe the filling of the existing Seadown Drain channel at the northern extent of the Phase 1 works to create a 'maintenance vehicle turning bay'. Appendix 6 notes ~200m will be filled in 'where it falls within the new stopbank footprint' but it is unclear what this is referring to.

a. Please confirm the length of the existing Seadown Drain and any other 'river' that will be filled or reclaimed.

The AEE describes that section 13 earthworks may include repairing any erosion issues within the new Seadown Drain after water has been diverted into it. In some cases, scour protection is used to stabilise waterbodies to prevent erosion. The placement of scour protection may require resource consent.

b. Please confirm if it is proposed to include scour protection within any "river bed" and if so, where.

a.

Filling will occur in three s 13 waterways. The reference in Appendix 6 of the application to 200 m of fill is out of date and does not apply to the current proposal.

- In the existing seadown drain, at its north extent where it is being diverted into the new alignment, approximately 45 m of its bed will be filled and covered for use as a vehicle turning bay. This is likely to entail an area of approximately 300 m2.
- In the drain on the south side of Aorangi Road, approximately 85 m will be filled. Of that, approximately 55 m will be occupied by shallow drainage swale and 10m covered by the new stopbank.
- In the No. 1 drain, approximately 45 m is to be filled, of which 10 m will be under the new stopbank.

b.

Design plans do not include scour protection for the initial construction. Scour and bank erosion is not expected to be a widespread or ongoing issue due to the flat topography, slow low energy flows and vegetated banks. As the system naturalises, there may be small, localised erosion points that need to be rectified. This may include scour protection in s 13 waterways at some locations. However, it is not yet known where this will occur and what form it will take. Question 18 of the RFI relates to consent requirements for this activity and the response below concludes that it would be permitted.

3. Localised drainage channels

The AEE and site plans describe several small, localised drainage channels that will run along the inland side of the new seaward stopbank and periodically discharge into the drain.

a. Please confirm the dimensions (even approximate) of these channels including the invert level.

b. Will these channels intercept groundwater?

a.

The purpose of the localised channels is to prevent excess stormwater and surface runoff from accumulating against the inland side of the new stopbank. They will be low-grade swales with gentle side slopes, and their depths will increase from essentially zero at their top ends, to an invert at their bottom ends of approximately 500 mm below ground level. At those bottom ends, their maximum base widths would be approximately 500 mm and their side slopes, at a gradient of 1v:2h would each be 1 m wide for a total maximum width of approximately 2.5 m. The total width and side slope batter will both also decrease upstream away from the discharge points.

b.

The maximum invert of the channels would be 500 mm below ground level; this is substantially higher than measured groundwater in the project area, which is deeper than 1 m below ground level. The channels are likely to be dry for most of the time, as they do not have permanent sources.

4. Connecting drains and other localised drains into the new Seadown Drain alignment

Table 5 of the AEE describes the contact points between the new drain realignment and the connected watercourses and artificial waterbodies. The table describes what the connections will be but not how the works will occur.

a. Please clarify the construction methodology for connecting watercourses and artificial waterbodies to the new Seadown Drain alignment. Will any works in flowing water be required and if so, is any temporary diversions, damming or over-pumping necessary?

b. If temporary diversions or damming are proposed, please provide an assessment against the rules in the Canterbury Land and Water Regional Plan (LWRP).

a.

All new drain excavations will occur in offline cells with a settling period following excavation to allow fines to settle out in the water column. When it is time to connect these offline excavated cells to other flowing watercourses and artificial waterbodies, appropriate sediment control that includes silt curtains will be installed around the excavation zone in both the offline cell and the intended connecting watercourse/waterbody to mitigate sediment dispersal in either water environment.

Attachment 2 to this letter shows conceptual drawings of how this process will work where the new alignment crosses Number 1 drain. The same basic method will be undertaken for other watercourses if these are active during construction. In summary:

- The new drain cells will be excavated either side of but separated from No 1 drain.
- Silt curtain will be placed longitudinally down No1. drain to isolate the true right bank. Unrestricted flow will remain along the true left bank.
- Silt curtain will be placed transversely across the cell of the new drain to be connected to No 1.
- The downstream section of new drain will be connected to No 1 drain in the isolated area of the No 1 drain silt curtain. Once sediment has settled, the silt curtains will be removed and water from No 1 will be able to flow down the new drain.
- The system will stabilise and the process will then be repeated on the other side of No 1 drain.
- The downstream part of No 1 drain connected to the old Seadown drain will be isolated using silt curtains.
- Fish will be salvaged from that reach of drain and it will be filled/covered by new stopbank.

No temporary diversions, damming or over pumping will occur. Silt curtains will still allow for the passage of water.

b.

Given the above, no assessment is required.

5. Stockpiling of excavated material

The AEE and proposed consent conditions explain that stockpiling of topsoil excavated from the new drain alignment will occur so it can be dried and then used to form the new stopbanks. It is proposed to locate stockpiles where runoff cannot enter any surface water bodies connected to the drain system.

a. Please outline where stockpiling of material is to occur while it is drying out.

b. What measures, if any, are proposed to avoid any discharges into surface water bodies?

a.

It is not possible to provide a plan showing stockpile locations as the design is not far enough advanced, and in any case these sites would be subject to change as works occur. However, all stockpiles will be managed in accordance with the ESCP and will be situated so water from them (whether existing pore water from excavated material, or stormwater runoff) will only be toward the offline cells (which will act as settling basins), rather than to active watercourses. Most stockpiles will be located between the drain excavations and the proposed stopbank, or landward of the drain excavations. This area is flat and well vegetated which allows for easy sediment control, and minimises the rehandling of material from where it is excavated, to where it will be used to construct the stopbank(s).

The applicant is willing to propose a condition that these stockpiles will not be placed within 10 metres of a flowing watercourse.

b.

These measures will be described within the ESCP (a draft of which is provided with this response) which will be submitted prior to works commencing. Noteworthy aspects are that the terrain at the site is level, and stockpiles will be separated from water bodies by a minimum of 10 metres. The intervening land will largely be covered by the pasture grass that is prevalent at the site, and very little runoff is anticipated. Where material has been stockpiled in the area in the past, sediment runoff beyond stockpiles has basically not occurred even during substantial rain events. Having said that, individual stockpiles will be managed case-by-case and if they present a risk of discharging sediment (for example, no vegetation buffer is present) this will be controlled, primarily by using silt fences between the stockpiles and waterways.

The applicant can commit to this expectation through a condition that there will be no overground discharges of sediment to flowing waterways that give rise to a conspicuous change in colour or clarity of the water, compared with the water in the drain immediately upstream of the discharge point. This condition can provide confidence that stormwater and pore water will be adequately managed to ensure no discharges to flowing sections of drains. It is worth noting that this condition is not intended to restrict temporary and localised sediment discharges that will occur during in-water works when connecting sections, or discharges into isolated cells that may assist in sediment settling and reduction.

6. Stabilisation of new drain alignment

The indicative construction programme in the AEE sets out staged excavation of sections of the new Seadown Drain channel and notes that stabilisation through hydroseeding will occur continuously at the end of each stage. It is also noted the planting programme commences after the connection of the excavated sections, except for the upstream end north of the rifle range. Appendix 16, the 'sediment report' also notes "hydroseeding of newly formed banks as soon as practicable after their formation, so that grass is established prior to flow getting switched on at the upstream end".

a. Please clarify whether the banks of the newly excavated drain sections will be stabilised through hydroseeding before being connected to the adjoining upstream sections?

b. Is it proposed to stabilise the drain banks prior to connecting the northern end of the Phase 1 works to the existing upstream Seadown Drain alignment? Are there specific triggers or outcomes to be achieved before this connection is made?

a.

Yes, the banks will be stabilised with hydroseed before upstream connection. However, it is noteworthy that the risk of sediment loss from undisturbed excavated banks is low, as overland runoff is minimal and the velocity of water in the drain will be low.

b.

Yes, the banks will be stabilised at that stage of works.

The new system will accommodate more water as side drains are connected, and this progression will inform how the final connection will be made (for example, the manner in which turbidity decreases during side connections will give an idea of how this may occur during final connection and whether the flow will be introduced incrementally). Specific triggers or outcomes that will be checked prior to starting the connection include:

- Completion of all downstream sections and connections and stabilisation of all banks;
- The flowing water within the new system is stable and is within the previously proposed 35% difference in visual clarity,
- Seadown drain is not in high flow,
- The 48 hour rain forecast is less than 10mm during the connection.

With regard to high flow, the base winter flows in Seadown drain are variable, making it very difficult to set an upper numerical limit to what is considered normal flow, and therefore to quantify high flows. Regardless of baseflow, there may be peaks in flow in response to rain events, and this is managed through setting the upper rain limit. The final connection will not occur when there is a peak in flow as determined by observation of the hydrograph.

To provide confidence these triggers and outcomes are met, the applicant proposes a condition requiring an audited self-management pre-connection sign off, before the final connection is made.

7. Erosion and sediment controls

The application provides a general description of erosion and sediment controls, supported by the sediment effects assessment on ecology.

The technical reviewer has highlighted that there is not sufficient detail to independently evaluate the likely effectiveness of proposed conditions.

a. Please provide further details on the erosion and sediment control measures likely to be used, including:

- *How it will be determined if a silt curtain is used within the Seadown Drain.*
- *Whether runoff from land will be channelled and captured, prior to discharge.*
- *If the use of chemical flocculants is proposed.*
- *Methods to avoid or minimise disturbance.*

You may wish to consider preparing an indicative marked-up erosion and sediment control plan.

A draft ESCP is attached to this response as Attachment 3, and it includes, or will include when finalised, the above measures.

With regard to the second and third points above:

- It is possible that some capturing and channelling of construction phase stormwater could occur if required, for example to manage runoff from stockpiles.
- No use of chemical flocculants is proposed.

8. Discharges to water within 100m of a wetland

Appendix 15, the rule assessment outlines the triggers for resource consent under the National Environmental Standards for Freshwater 2020, including Regulation 45. Regulation 45(5) states it is a discretionary activity to discharge water into water, within, or within 100 metres of a natural inland wetland if:

(a) the discharge is for the purpose of constructing or upgrading specified infrastructure; and

(b) there is a hydrological connection between the discharge and the wetland; and

(c) the discharge will enter the wetland; and

(d) the discharge will change, or is likely to change, the water level range or hydrological function of the wetland.

From the description of the proposal, it is not clear what discharges are subject to this regulation.

a. Please clarify the nature and extent of discharges of water, into water, that trigger Regulation 45(5).

Discharges applicable to Regulation 45(5) will occur where the new drain alignment will cross or discharge into existing mapped wetlands at the following locations (shown in figures following this discussion - the new drain is shown in green, and the wetlands purple).

1. Where it passes through the existing pit-derived wetlands south of Aorangi Road. Two separate wetland areas will be affected as shown in figure a) below.
2. Where the new drain discharges into the existing alignment (which is defined as a natural inland wetland) as shown in figure b) below.

In each case, the sub regulations will apply, although evaluation of (d) requires additional discussion. Where the new drain crosses the pit derived wetlands it will alter their hydrological function by introducing more flowing surface water to them, but their levels may not necessarily change. It is conservatively assumed that changing the manner in which flows enter and exists that section of wetland may have a hydrological effect.

a) Pit wetlands

b) Drain confluence

9. Fish Management Plan

A fish management plan is proposed as a requirement of consent and is to be developed collaboratively with ecologists and AECL. It is understood to address the requirement to undertake fish relocation to the alignment.

a. To understand the purpose and content of the Fish Management Plan, please provide further details on what it will include. You may want to consider the following:

- *The timing of its preparation and any certification.*
- *Roles and responsibilities of key personnel.*
- *Additional permit and health and safety requirements for undertaking fish salvage works.*
- *Guidance on when fish salvage will be required, including potential triggers in response to environmental conditions within the existing Seadown Drain channel following diversion and to establish fish populations in the new alignment.*
- *Fish capture and relocation methodologies.*
- *Fish regression rates.*
- *Biosecurity and pest management measures.*
- *Reporting requirements.*
- *Contingency measures.*

A draft Fish Management Plan is provided (attachment 4) with this response and addresses the requested details.

10. Monitoring – water quality and ecology of the existing alignment

The AEE and Appendix 6 Ecology Assessment describe that monitoring of the old Seadown Drain alignment will be carried out following the diversion. The proposed monitoring is for water temperature and dissolved oxygen with the recommendations in Appendix 6 suggesting monitoring from 1 November to 30 April for the first year following construction as this "should provide sufficient time to assess water quality risks and adjust flows through the old channel, as required."

The technical review of the AEE and Appendix 6 concludes that the description of this monitoring currently lacks sufficient detail to fully assess its adequacy. It is suggested that at a minimum, monitoring should occur during the first summer following commissioning of the new drain. However, given the uncertainty associated with how the old channel will function hydraulically and ecologically, consideration should be given to extending monitoring into subsequent years.

a. Please identify what baseline information is available on current water quality of Seadown Drain.

b. Please confirm how water quality will be monitored in the existing and new alignment following the diversion into the new drain alignment (i.e., locations, methods, frequencies, trigger values, reporting requirements).

c. What is the proposed duration of water quality monitoring? Will monitoring duration be dependent on the water quality or drain conditions observed?

d. What adaptive measures are proposed should unfavourable water quality be recorded in the drain during monitoring?

The AEE also describes that the existing drain alignment will be monitored and managed for invasve weed.

e. Will nuisance aquatic flora and algae be monitored in the existing drain?

The technical review observes that reduced throughflow in the old channel may increase the risk of low dissolved oxygen, elevated water temperatures, excessive macrophyte growth, algal proliferation, and periodic fish stranding during low flows. This could lead to adverse effects on the downstream Waitarakao/Washdyke Lagoon.

f. Please confirm whether the water quality (and potentially nuisance aquatic flora and algae) monitoring programme be extended to the downstream Waitarakao / Washdyke Lagoon to identify potential changes that could be correlated to changes in the existing drain?

g. What adaptive measures are proposed should unfavourable water quality be recorded during monitoring?

Environment Canterbury surface water and ecology science experts have provided a response to this and several other questions (the Science advice). The advice is attached as Attachment 5 and the response to this question is on pages 1 to 5.

11. Monitoring – sediment discharges within new alignment

The proposed conditions include a requirement to assess water clarity change at a location 100m downstream of the discharge point when one works section is connected to another.

Schedule 5 of the LWRP provides direction on how mixing zone length is calculated. It appears that the proposed mixing zone length is inconsistent with this guidance.

a. Please provide further information to support a mixing zone length of 100m or adjust the mixing zone length so it is consistent with Schedule 5 of the LWRP.

Appendix 16 recommends water quality sampling for clarity or turbidity immediately prior to each tie in and suggests tie ins be delayed if the downstream section is already subject to more than a 35% increase in clarity. The proposed conditions (condition 3 of the s15 discharge permit) states discharges are measured at a period 4 hours after the completion of works. Consent is also sought for the discharge of construction phase stormwater.

From the AEE and appendices, it is not clear if sediment monitoring will occur in response to rainfall events or to determine how the channel is stabilising during commissioning.

b. Please provide further details on the proposed approach (if any) for monitoring sediment discharges from either bed disturbance activities, completing tie-ins of an upstream work section to the downstream section(s) and in response to rainfall events.

A response to this question is provided on pages 5 to 7 of the attached Science advice.

Regarding point a) above, the Science advice states that a smaller mixing zone of 50 m is appropriate, but agrees with earlier advice that the downstream discharge of sediment laden water during tie-ins is likely short-lived and low risk. Informed by Instream Consulting and the Science advice, the temporary nature of the discharges, the proposed pre-connection clarity monitoring, and the applicant's working knowledge of the drain, the applicants revised 50m mixing and settling distance will ensure the effects from temporary sediment discharges to flowing water will be less than minor.

12. Monitoring – flows and levels

Appendix 10, the WGA Groundwater Report report provides comments on a 'groundwater monitoring plan' in section 8. Included is a suggestion to monitor water levels in selected shallow bores in advance of works commencing and through the construction period.

While the WGA report comments on the entire project and Phase 1 works are smaller in scale, no comments in the AEE or proposed conditions address monitoring of flows and levels. Therefore, it is not clear if any monitoring will occur to verify the modelled assumptions and conclusions.

a. What monitoring of flows in the new alignment and of groundwater levels is proposed (if any)?

Surface water: The proposed monitoring for surface flows is discussed in more detail under response 23. The Seadown drain at Aorangi Road flow recorder will be re-established as soon as practicable. Monthly manual gauging have been taken for approximately the past 6 months near Seaforth Settlement Road, and will continue until after the replacement recorder at Aorangi Road is established. This will allow for some calibration between the two sites.

Groundwater: The WGA groundwater assessment modelled four possible future drain configurations, all including the proposed alignment for Stage 1, but with four differing options to connect Stage 1 through to Phillips Lagoon. This initial report did not present a separate Stage 1 only assessment of drawdown effects on bores; however, WGA has subsequently clarified that the Stage 1 realignment was simulated within the groundwater model (refer to the response to questions 25 and 26, and WGA's subsequent advice letter which is attached as Attachment 6).

Configuration A is considered the most appropriate available comparator for Stage 1, because it includes the Stage 1 alignment together with the least inland Stage 2 alignment modelled by WGA. It therefore represents a more extensive realignment than Stage 1 alone, while still being the lowest-impact modelled configuration. Under Configuration A no water supply bores were predicted to experience drawdown greater than 0.05m.

WGA has also confirmed that the adopted modelling approach is conservative, as the single layer 20m model with no vertical connectivity to a deeper system is expected to produce a conservatively large drawdown extent and magnitude (refer to the response to questions 25 and 26, and Attachment 6). On that basis, it is reasonable to conclude that Stage 1 alone would not result in a greater groundwater effect than Configuration A, that any drawdown will be less than 0.05m and specific groundwater level monitoring is not considered necessary for Stage 1.

The applicant acknowledges that groundwater effects remain a live issue for the future Stage 2 planning and consenting process and that pre-works and post-works monitoring of groundwater levels may be required. They are currently exploring options to establish this monitoring program.

13. Monitoring – Ecological outcomes

The AEE notes that a positive effect of the proposal includes the wider area around the drain being actively enhanced which will increase biodiversity and amenity. It is also noted how the works support the objectives of Our Waitarakao: Waitarakao Washdyke Lagoon Catchment Strategy.

a. Is it proposed to monitor the long-term ecological outcomes of the proposed restoration and enhancement work for their effectiveness and to quantify biodiversity gains? If so, what monitoring is proposed?

With regard to terrestrial vegetation:

The applicant has progressed the planting plan and has ordered 12,000+ indigenous plants covering 17 different species. The indigenous planting described in the AEE will be systematically monitored and maintained and will introduce more quantity and variation to indigenous plant biodiversity. Plant selection near waterways has been targeted to improve habitat for the known fish species in the system (noteworthy are tuna and inanga). The planting enhancement work will be complemented by other planting and restoration work that will be delivered through the commitments made by the Regional Council, and other agencies, in Our Waitarakao: Waitarakao Washdyke Lagoon Catchment Strategy.

The applicant will also design, in collaboration with Arowhenua, a standardised monitoring program to record aquatic and terrestrial habitat and biodiversity in both the section of Seadown drain to be retired and along its new alignment. This will provide for standardised collection of data pre-works and again five and ten years after works to demonstrate the extent of biodiversity gains delivered through this project.

With regard to freshwater ecology:

The Science advice provides the following response at its page 7.

> *Assessment of the long-term ecological outcomes of the Waitarakao catchment is certainly desirable for the broader Our Waitarakao strategy objectives. The CRC Science Section has undertaken fish and habitat surveys in the catchment waterways over the past two years. These surveys can be repeated in the future, subject to Long Term Plan funding, but we do not consider this a necessity or purpose of this application.*

14. Works on Section 10 Seaforth SETT

Works are proposed to occur at the northern extent of Phase 1 on land with the legal description Section 10 Seaforth SETT. It is understood these works will occur within No. 2 drain and those works will be small in scale.

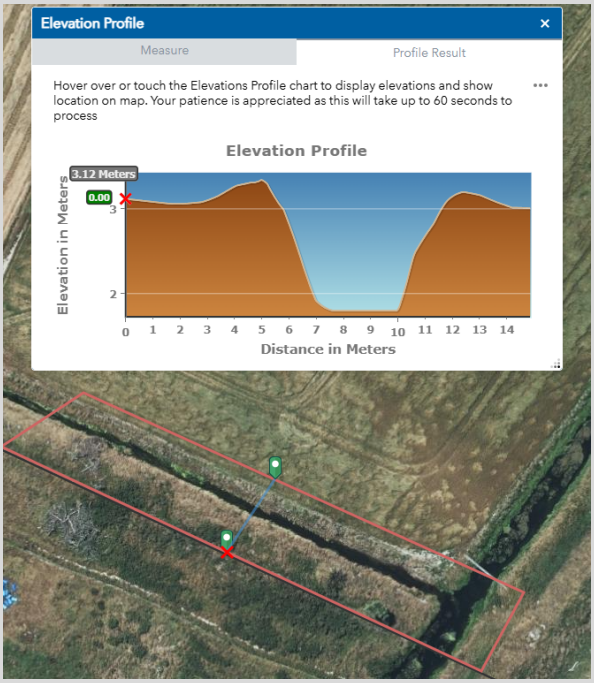
a. Please clarify the nature and extent of works required within No.2 drain on this property.

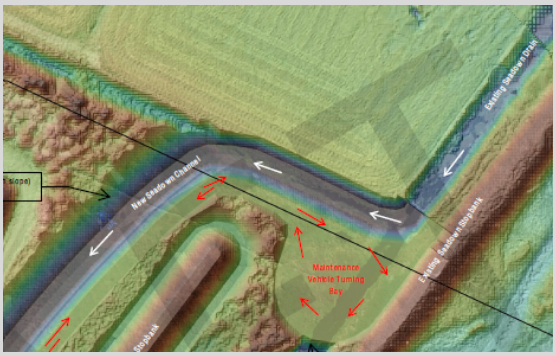
b. Does Environment Canterbury have any authority available to complete these works, for example under an easement or other permission?

No. 2 drain is the applicant's asset and runs parallel to the property boundary, with its true left bank set into the neighbouring property approximately 12 metres and the true right bank approximately 5 metres inside the boundary (refer left hand figure below). The proposal is to increase the capacity of the section of No. 2 drain between the new alignment and Seadown drain (right hand figure below). This work will only occur over the existing footprint of No. 2 and toward the property boundary so that there is no impact to productive land. On that basis, potential effects on the land owner are considered to be less than minor, and the land owner is not considered to be an affected person.

However, the applicant is legally obliged to obtain agreement from the landowner for access before the works can commence on that land. This is a basic property right and will protect the interests of that landowner. The applicant is confident that land access approval will be obtained and is agreeable to a condition requiring this.

The landowner is aware of the project and indicated no concerns with the proposed works on No. 2 drain.





15. Works on existing coastal stopbank

The letter of support from the Department of Conservation notes "no construction works are proposed on or seaward of the existing coastal stopbank, with the exception of limited topping up and maintenance works to a short inland angled section of the existing stopbank located within DOC land".

a. Please clarify the work to be completed on the existing coastal stopbank and if this work requires resource consent.

While the existing stopbank is largely to be retired, approximately 350 m of its south extent will be maintained to design standard. This stretch is further inland from the coast than the main alignment and is expected to have a longer life than the rest of the existing bank to the north. The work will have a small scale and include weed removal (not considered to be "vegetation clearance"), topping up small depressions in the bank crest with new material, and regrassing. It is noteworthy that earthworks would occur on the stopbank above local ground level (i.e. no "excavation" will occur). The following provisions potentially apply:

- CLWRP Rule 5.94A, construction phase stormwater. Can comply with conditions – permitted activity.
- CLWRP Rule 5.168, earthworks in riparian areas. Condition 1 excludes "*the establishment, maintenance or repair of network utilities*".
- CLWRP Rule 5.175, earthworks over aquifers. This rule focuses on excavation and it is not considered to apply to this activity.
- NESF Regulation 46, Earthworks or land disturbance within 10 m of a natural inland wetland, for maintaining or operating specified infrastructure. The activity can comply with the conditions, permitted activity.
- RCEP Rule 9.1e (repair or maintenance of structures) and 9.1g (activities required to undertake earthworks for the maintenance of network utility structures). The activity is permitted under these rules.

Overall it is considered that no additional consents are required for this activity.

16. Wetland Status of small rifle range wetland

The AEE and Appendix 7 describe a small wetland in the vicinity of the rifle range. Table 2 of Appendix 7 identifies this with a regulatory status of "NPSFM" but the Table 6 in the AEE states it is not a natural inland wetland.

The technical reviewer also notes that this area could also be considered a 'river' as it appears from historic imagery this is an old drainage channel cut off cut off during the construction of the rifle range but it has not been maintained and subsequently infilled.

a. Please confirm whether the small rifle range wetland meets the definition of 'natural inland wetland' under the NPSFM.

Yes, based on the advice of the wetland expert, the small shooting range wetland is a natural inland wetland under the NPSFM, albeit with low value. (Table 6 of the application is incorrect.) The wetland is isolated from flowing surface water and is not considered to be a river.

Please note that the figures in the wetland report, and consequently figure 16 in the consent application, locate the shooting range wetland incorrectly. Its actual location is shown below, inside the yellow ellipse.

17. Wetland status of Seadown Drain – Aorangi Road to Beach Road

Appendix 7 provides a wetland delineation assessment identifying wetlands potentially impacted by the Phase 1 and Phase 2 works. Wetland Area 2 is described as Seadown Drain from Aorangi Road to Phillips Lagoon Wetland. The drain between Aorangi Road and Beach Road is listed in Table 2 of Appendix 7 as an NPSFM wetland.

The technical review of Appendix 7 has queried whether Seadown Drain in this area is an NPSFM natural inland wetland noting that there is limited publicly available information to support this wetland status. It is noted that while prior to any drain being located in this area long periods of inundation may have occurred, but the coastline has also eroded hundred of metres inland so the current environment is now highly modified. The classification of Seadown Drain as a 'river' is supported by there is insufficient information to support the conclusion it is also a natural inland wetland.

a. Please clarify the evidence used to define the existing Seadown Drain between Aorangi Road to Beach Road as a natural inland wetland.

The technical review also raises the question that if Seadown Drain is wetland, should the tributary drains also draining historic wetland habitat be classified as wetlands for the same reason? Similarly, should the areas of adjoining farmland, that are permanently damp (due to the high water table) and not dominated by pasture species, also be considered wetlands?

b. Please clarify if all the tributary drains feeding Seadown Drain also been assessed for wetland status, and (if so) included in the various calculations and effects assessments?

a.

The reasoning behind defining the existing Seadown Drain as a natural inland wetland is set out in the delineation report, following site investigation from a suitably qualified expert. No further technical support for this position has been sought. The applicant's wetland expert considers that the assessment is conservative, but that it is justified particularly given that it appears that parts of the existing drain were excavated through pre-existing wetlands. Given that available information and expert opinion support the natural wetland inland status, and there is no compelling evidence otherwise, the conservative position is considered to be appropriate.

Although outside the direct scope of the question, the wetland expert's opinion is that the wetland habitat is likely to have moved inland as coastal erosion has progressed.

b.

The lower sections of the tributary drains have been classified as modified rivers but may contain limited wetland values. On the day of assessment, the drain on the south side of Aorangi road presented limited vegetation (emergent or floating) so the ecologist would not have been able to complete a delineation assessment under NPSFM. No records were taken in respect to wetland values in those waterways. The applicant considers that these tributaries are better described as highly modified rivers, that may maintain some limited wetland values. The proposal has assessed the effects on wetlands to be no more than minor.

With regard to the wetland status of adjoining farmland, no areas have been identified by the applicant's wetland expert.

18. Defences against water

The definition of 'defence against water' includes the deposition of material within "rivers" to create the stopbanks, any rock or erosion protection structure and floodgate. Table 7 states that Rule 5.138 is complied with in relation to where the inland bank crosses two s13 waterways.

It is considered Rule 5.138 could apply to any erosion/scour protection and the flapgate. It is also not clear if works (classified as defences against water) will be undertaken in accordance with the Code of Practice.

a. Please clarify the rule assessment against the permitted activity conditions of Rule 5.138.

We agree with the definition and the applicability of rule 5.138 to these activities. The transition between land and riverbed, and the application of definitions, can make it difficult to clearly compartmentalise activities against the relevant rules.

Rule 5.138 states:

> ***The installation, maintenance, use and removal of defences against water in, on or under the bed of a lake or river, including***
>
> ***(a) the associated deposition of substances on, in or under the bed of a lake or river, the associated diversions and discharges of sediment into water, and any excavation or other disturbance of the bed of a lake or river; and***
>
> ***(b) any associated diversion and discharge or sediment laden water into an artificial watercourse;***
>
> ***is a permitted activity, provided the following conditions are met:***
>
> *1. The activity does not prevent access in any way to lawfully established structures, including defences against water; and*
>
> *2. Other than for the use of defences against water the activity is not in, on, or under the bed of any river or lake listed as a high naturalness waterbody in Sections 6 to 15 or within a salmon spawning site listed in Schedule 17, or in any inanga spawning habitat during the inanga spawning season of 1 March to 1 June inclusive, or in any Critical Habitat; and*
>
> *3. The activity is undertaken by or on behalf of a local authority or a network utility operator in accordance with a plan that has been certified by the CRC as being in accordance with the Canterbury Regional Code of Practice for Defences Against Water and Drainage Schemes (April 2019); and*
>
> *4. The works or structures do not prevent any existing fish passage.*

- Both activities will comply with conditions 1 and 2.
- Regarding condition 3, the applicant is a local authority and it is standard practice for them to deliver all works in accordance with the CoP.
- The proposed scour protection would, but the manual flap gate may not comply with condition 4. Most of the time the gate will be open, but during extreme flood events it would be manually closed and temporarily shut off the pipe. It is questionable whether this is "preventing" fish passage as written in the condition, as this could be interpreted as a permanent closure rather than intermittent. To be conservative, it is assumed that a short term closure may fit the definition of "prevent".

Assuming the flap gate is a structure then Rule 5.141A applies and the activity is discretionary. The following discussion amends the resource consent application by providing an assessment of the effects of installing the flap gate:

> It is considered that the installation of the flap gate will have a negligible adverse effect on fish passage. The flap gate will be operated manually and used infrequently during large flood events such as an Ōpihi River breakout, when flood water would otherwise flow back up the system inland. Under these circumstances, water conditions will be turbulent, with high flows and sediment loads, and would be highly hostile to fish populations. At these times, fish passage is not a key issue. With the exemption of the unlikely scenario of an Ōpihi River breakout, the flap gate will be open and passage enabled.
>
> The applicant is willing to discuss the drafting of suitable conditions, for example managing and restricting the use of the flap gate

19. Temporary discharges associated with s13 works

The AEE identifies consent is required under Rule 5.141B but no assessment of Rule 5.141 of the LWRP has been provided therefore, it is not clear if consent is required for temporary discharges as well the as the diversion of water.

a. Please provide an assessment of the activity against Rule 5.141.

The CLWRP structure rules are not clearly written and are difficult to interpret. The intent of the application is to include temporary discharges under Rule 5.141B, as Rules 5.141 and 5.141A – which relate to activities in the preceding permitted activity rules - appear too narrow to encompass all potential discharges (for example those occurring during connections of off line excavations to live water bodies). However, it is acknowledged that some activities may not have been included in the application.

Rule 5.141 states:

> ***Temporary discharges to water or to land in circumstances where a contaminant may enter water associated with undertaking activities in Rules 5.135 to 5.140A or in relation to artificial watercourses are permitted activities, provided the following conditions are met:***
>
> *1. The discharge is only of sediment, organic material and water originating from within the bed of the lake, river, or artificial watercourse; and*
>
> *2. The discharge is not undertaken in a salmon spawning site listed in Schedule 17, or in any inanga spawning habitat during the inanga spawning season of 1 March to 1 June inclusive, or in any Critical Habitat; and*
>
> *3. The discharge is not for more than ten hours in any 24-hour period, and not more than 40 hours in total in any calendar month, and except within the first 4 hours of discharge, does not exceed the Schedule 5 visual clarity standards.*

- Rule 5.135 relates to pipes, ducts and cables over the bed and does not apply (N/A).
- Rule 5.136 also relates to the above but in or under the bed and is N/A.
- Rule 5.137 relates to bridges and culverts and would apply to the extension of the culvert in Aorangi Road south drain.
- Rule 5.138 relates to defences against water and as discussed in response to question 18. It can be complied with for installation of the stopbank and scour protection, but not installation of the flap gate. Where Rule 5.138 is met, it also permits discharges associated with installation and it is not considered necessary to then apply Rule 5.141. However, temporary discharges from the flap gate installation are covered by Rule 5.141, and in isolation is expected to meet the permitted activity conditions of 5.141.
- Rule 5.139 relates to use and maintenance of structures and can be complied with.
- Rule 5.140 relates to temporary structures and diversions under Rules 5.135-5.149, but none will occur.
- Rule 5.140A relates to monitoring/sampling equipment and will apply to re-establishment of the flow recorder in Seadown drain. The permitted activity conditions will be met.

Therefore, the only activities requiring assessment against Rule 5.141 are the culvert extension and manual flap gate. The installation of these elements in isolation of the other works can comply with the conditions of that rule, and the activity is permitted. However, when discharges from all instream works are considered the duration limits of Rule 5.141 will not be met (no more than 40 hours in any calendar month).

20. Diversion of floodwater

The construction of the new seaward and inland stopbanks are described as channelling floodwaters towards Waitarakao. This activity is considered to be a diversion of water.

a. Please provide an assessment of the activity against Rule 5.142 of the LWRP.

Rule 5.142 states:

> ***The diversion of floodwaters within a property and the discharge of floodwaters from a property to a river, lake or artificial watercourse to alleviate surface flooding is a permitted activity, provided the following conditions are met:***
>
> *1. The discharge:*
>
> *(a) does not cause or exacerbate erosion of the property or the bed or banks of the receiving surface waterbody; and*
>
> *(b) does not result in the destabilisation of any lawfully established structure.*

The CLWRP definition of "diversion" is:

> *the deflection of water from its natural course, but remaining within the bed or the banks of the water body, or artificial lake or artificial watercourse. For the purpose of this Plan and unless the diversion is the result of a lawful permanent re-alignment of the bed of a surface water body, taking water from the bed of any watercourse, even if only for a short distance before it is returned, is considered a take and discharge.*

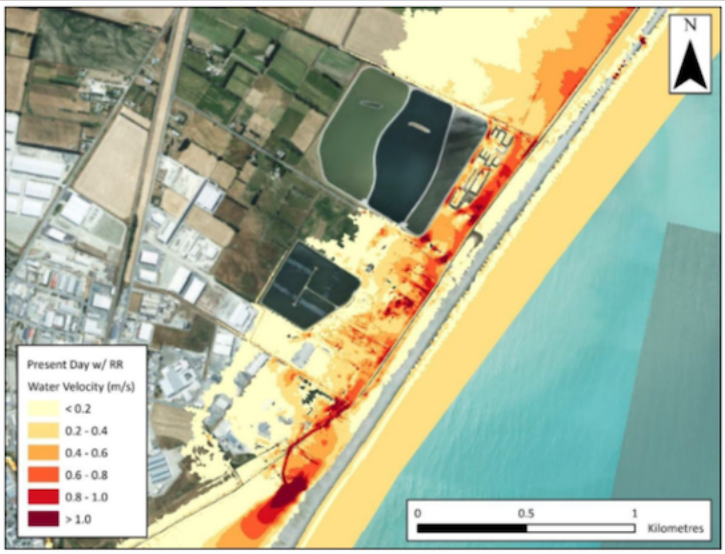
The definition of "bed" in the CLWRP includes the area between mapped stopbanks. The existing coastal protection stopbank is mapped, and until an update to the Flood Protection and Drainage Bylaw occurs, the realigned bank and proposed inland bank are not. Currently, the area where Ōpihi flood waters would be channelled, will not be a deflection within the bed or banks, but on land. Nevertheless, if it is assumed that both banks will be mapped as stopbanks, the area between the inland bank and the coastal bank will effectively be riverbed as defined by the CLWRP and the diversion definition would be met.

Under the existing situation, flood water from the Ōpihi River breakout, or a large rainfall event, is channelled on the inland side of the existing coastal stopbank. This situation will continue after the realignment, and the inland bank is proposed to mitigate potential flooding effects on the neighbouring industrial land. This could be considered as alleviating surface flooding.

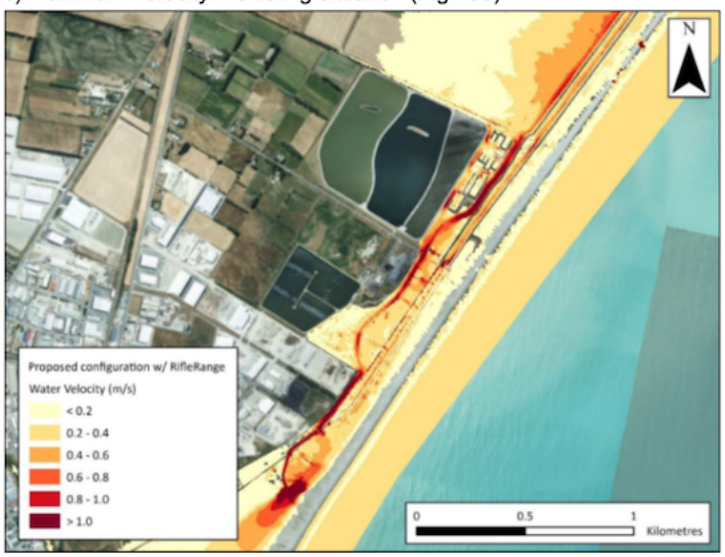
Therefore, to be conservative, it is accepted that Rule 5.142 could apply once the realignment is complete.

With regard to condition a of Rule 5.142, flood waters from an Ōpihi River breakout predicted to have low velocity, and low erosion risk. It is not considered that this condition is breached. Figure 28 c and d of the consent application (copied below) show the modelled velocities for the exiting situation proposed situations and indicate:

1) That the absolute velocities are not high, with the "greater than" category being 1 metre per second.
2) That the difference between the situations is less to do with absolute velocity than with channelling of higher speed flows in the new drain alignment



c) Maximum velocity – existing situation (Fig 13b)



d) Maximum velocity - proposed situation (Fig 18b)

With regard to condition b, the inland bank will protect properties landward of it from inland flooding, erosion and destabilisation of structures. For structures between the banks, TDC, FBNZ and the shooting range have provided written approval for the proposal (informed by the hydraulic modelling assessment which accompanied the application), and the stopbank is the applicant's own asset. No other lawfully established structures have been identified that could be impacted.

Overall, the proposal complies with the permitted activity rule.

21. Discharge to the Coastal Marine Area

Section 6.2.3 of the AEE explains that the crest of the inland stopbank will be higher than the crest of the seaward stopbank on the principle that in the low-frequency, but potentially high impact outcome of deep flooding from a major Ōpihi River breakout, the coastal stopbank will overtop and release water before any risk of breaching or overtopping of the inland stopbank occurs. The release of this water could be considered a discharge into the coastal marine area.

a. Please provide an assessment of the activity against the discharge rules in the Regional Coastal Environment Plan.

The applicable rule of the Regional Coastal Environment Plan (RCEP) is Rule 7.1a, which states:

> *Except as provided for by paragraph (b) or (e) of this Rule, the discharge of water, into water, or onto or into land in the Coastal Marine Area, is a Permitted Activity; provided that the discharge, disregarding the effect of any natural perturbations that may affect the receiving water:*
>
> *i. shall not result in any scouring or erosion of the foreshore or seabed that is not erased by wind, tidal or wave action within 24 hours; and*
>
> *ii shall not give rise to any of the following effects in the Coastal Marine Area further than 20 metres in any direction from the point of the discharge:*
>
> > *1. within areas classified as Coastal AE water or Coastal CR water: the colour of the receiving water shall not changed by greater than ten points, as measured using the Munsell Scale, and the visual clarity of the receiving water shall not be reduced by greater than 33 %;*
> >
> > *within any other area: the colour of the receiving water shall not changed by greater than five points, as measured using the Munsell Scale, and the visual clarity of the receiving water shall not be reduced by greater than 20 %; or*
> >
> > *2. any emission of objectionable odour; or*
> >
> > *3. any reduction in the concentration of dissolved oxygen in the receiving water to less than 80% of saturation; or*
> >
> > *4. any change by more than 3 º Celsius in the natural temperature of the receiving water or any change that causes it to exceed 25 º Celsius.*

The other paragraphs—(b) to (f)—of the rule do not apply.

Discharges from Ōpihi River breakouts are natural perturbations that would occur irrespective of the presence of the Seadown drainage system. The drainage system's purpose is not to manage or control these flood events, but the coastal stopbank may retain that water inland for longer than it would if no coastal stopbank existed. The inland bank is being built to ensure that the effect of that flooding, to the extent that it may be exacerbated by the presence of the coastal stopbank, is mitigated in neighbouring areas. It is not considered that the RCEP discharge rules apply to this project, but it is noted that breach of the coastal stopbank would only occur during a large storm event when coastal water quality is likely to be discoloured due to storm processes in the coastal environment itself, and/or inputs of turbid water from rivers etc. Therefore, it is considered that the conditions of Rule 7.1 would be met were the discharge to occur.

22. Effects management hierarchy

The effects management hierarchy is related to assessing the construction of specified infrastructure under Regulation 45 of the NES-F and the National Policy Statement for Freshwater Management 2020. Section 7.4.1 of the AEE notes the applicant's view of how the effects management hierarchy has been applied is discussed in the application. This discussion is not entirely obvious.

a. Please confirm if the discussion referred to is the summary set out in Table 10? For clarity it would be helpful to provide an explanation that steps through the definition of effects management hierarchy in the NPS-FM.

We acknowledge that the discussion of the effects management hierarchy in the application is incorrect. Table 10 is not the discussion referred to in section 7.4.1, and the hierarchy is not correctly discussed later in the main application document, or evaluated in Appendix 17 (policy assessment).

The **effects management hierarchy** is defined in Sub part 3.21 of the NPSF, as follows.

> *effects management hierarchy, in relation to natural inland wetlands and rivers, means an approach to managing the adverse effects of an activity on the extent or values of a wetland or river (including cumulative effects and loss of potential value) that requires that:*
>
> *(a) adverse effects are avoided where practicable; then*
>
> *(b) where adverse effects cannot be avoided, they are minimised where practicable; then*
>
> *(c) where adverse effects cannot be minimised, they are remedied where practicable; then*
>
> *(d) where more than minor residual adverse effects cannot be avoided, minimised, or remedied, aquatic offsetting is provided where possible; then*
>
> *(e) if aquatic offsetting of more than minor residual adverse effects is not possible, aquatic compensation is provided; then*
>
> *(f) if aquatic compensation is not appropriate, the activity itself is avoided*

Residual adverse effects cannot be avoided, but they have been minimised as far as practicable and some remediation is proposed by planting vegetation following completion of the works. No offsetting or compensation are required and the activity itself need not be avoided.

Residual adverse effects are considered to be less than minor.

23. Effects associated with moving or removing the minimum flow site

Section 8.13.1 and Appendix 8 highlights that work is ongoing to establish a new permanent flow recorder site in the Seadown Drain, determine the relationship of and interim sites to existing data and assess the impacts of this on consent holders. The only effect from moving or removing this site assessed is how it impacts on the existing permit holders.

The technical reviews have highlighted that the AEE and supporting appendices do not address the potential effects of altering the minimum flow site on environmental flows and how the proposal will protect environmental flows in Seadown Drain.

a. *What are the effects on aquatic ecosystem values associated with relocating the minimum flow site? How will environmental flows within Seadown Drain to Waitarakao be protected?*

Appendix 8 describes alternative methods that could be used to develop a revised minimum flow monitoring location.

The technical reviewer agrees with the recommendations in Appendix 8 for additional data collection and technical assessments. As no information or analysis has been supplied that demonstrates a reliable relationship between the existing flow monitoring site and an alternative site can be established, it is not possible at this stage to define key outcomes for the consent that will ensure the same level of environmental protection and water user reliability.

b. *Please provide further information on the progress (if any) in developing an alternative minimum flow monitoring location.*

The review highlighted that the realignment of Seadown Drain may impact groundwater levels in the three piezometers shown in Figure 1 of Appendix 8. Therefore, any relationship established between the existing Seadown Drain flows and groundwater levels in these piezometers may not be valid once works commence.

c. *Subject to the response to 23(b) above, if there is reliance on the piezometers installed for implementing a new minimum flow monitoring location, please address how potential impacts on groundwater levels will affect the accuracy of future measurements and any consequential impacts on the values of Seadown Drain and reliability of supply for water users.*

The applicant has closely assessed the scheduling of works and can confirm the tie-ins of South Aorangi Road drain, No. 2 drain and Seadown drain will occur outside of the irrigation season. The existing minimum flow site will remain operational during the 2026/2027 irrigation season. A new replacement flow recorder will be established at an equivalent location at Aorangi Road on the new alignment as soon as possible and will be operational before the 2027/2028 irrigation season. This approach will ensure there is an operational minimum flow recorder during irrigation season and no disruption to those abstractors tied to it.

The new alignment has the same surface water inputs and its invert level and grade are designed to carry the same base flow. Based on the WGA report and their RFI response, the drain is likely to have at least the same amount of flow. No effect is anticipated on the reliability of supply to water abstractors.

Continued next page

a.

The Science advice provides the following response at its pages 7 and 8.

> *The proposal is to re-establish a minimum flow site in the new drain as soon as possible. We understand that the same minimum flow (150 L/s) will be applied to this new site. This minimum flow only has influence on flows during low flow periods. This means that flows to Waitarakao / Washdyke Lagoon will be at least the same as the existing inflows to the lagoon, and possibly very slightly higher overall inflows.*

In terms of instream ecological values, the habitat of the new alignment is likely to be an improvement over the current habitat quality. The overall shape of the stream channel will change and generally improve, with extensive riparian planting to be established that will offer shade and bank cover. We therefore consider that applying the existing minimum flow to the new flow recorder site will afford at least the same level of ecological protection to instream ecological values as currently exists. The proposed habitat enhancements will be an additional benefit.

b.

Significant effort has been put into establishing a mid-term minimum flow site near Seaforth Settlement Road, without success. Channel shape, bed grade and weed growth have caused ongoing challenges in establishing a flow recorder (a dissolved oxygen meter has successfully been established). The site continues to be manually gauged every 2-4 weeks, to capture a correlation with the existing Aorangi Road recorder.

An alternative site downstream of the Stage 1 works area was dismissed due to its proximity to the lagoon.

The Southern Field Hydrology team are confident that a site near Aorangi Road will be the most suitable site to reestablish a recorder as the above issues can be managed at the new site because it will be designed into the drain.

c.

The use of piezometer bores to manage minimum flow requirements has been abandoned for now and the current priority is to re-establish a minimum flow recorder near Aorangi Road. Piezometer bores may be considered in the future if a reliable correlation with measured flows can be established, particularly if they offer a monitoring option that is less affected by weed growth, which is the main challenge in maintaining a reliable flow recorder in Seadown Drain. This is outside of the scope of this project.

24. Potential effects on Philips Lagoon

Section 6 of the AEE describes that one of the five key aspects informing the design of the new drain alignment is to ensure "the drain is designed to carry at least the same flow as the existing one, while maintaining water levels in Phillips Lagoon."

a. Please provide an assessment of the potential effects, if any, on water levels in Phillips Lagoon arising from Phase 1 works.

b. Please clarify if water levels in Philips Lagoon are currently or proposed to be monitored?

a.

The Phase 1 Seadown Channel design is based on the existing Seadown Drain, including invert levels and conveyance capacity. The proposed channel in Phase 1 has a longer flow path than the existing Drain; however, the hydraulic grade through this area is low, with resulting low velocities. Therefore, the hydraulic conditions in the existing Seadown Drain immediately upstream of Phase 1 works are designed to be unaffected. This means that Phillips Lagoon will continue to behave in the same manner following the completion of Phase 1 works, and its water level will not change.

b.

Given the above discussion, no monitoring is proposed in Phillips Lagoon, for Phase 1. However, phase 2 of the realignment may alter conditions in the lagoon, and design of the Phase 2 works may include water level monitoring to inform option selection.

The Science advice also comments on this matter at its page 8, stating:

> *We understand that the design of the new drain realignment will ensure that there is no change to water levels within Phillips Lagoon. There is currently no monitoring of water level within Phillips Lagoon, and nor is there any proposed. On the basis that the design will not alter Phillips Lagoon hydrology, we do not consider water level monitoring is required to assess impacts of this application.*

25. Potential effects on groundwater quantity – groundwater modelling

A review of the groundwater assessment, including the technical report prepared by WGA has been completed. Regarding the modelling approach, overall, the groundwater model is considered to be appropriate and has been clearly described. Some minor matters to clarify are noted below to ensure the model represents the conceptual groundwater setting.

a. The conceptual description of the groundwater setting suggests the hydrostratigraphy can be split with most bores around 10m having typically higher transmissivities and bores deeper than 10m with generally lower transmissivities. The model represents the whole of the strata to 20m depth as a single layer. Hydraulic conductivities were derived from transmissivities from bores less than 10m deep.

Please provide further details on how the approach used may influence the results, as opposed to using a two-layer model which may better reflect the conceptual description.

b. The model calibration is generally reasonable. The sensitivity analysis indicates that the model calibration is highly sensitive to the elevation of the inland general head boundary which implies that the model predictions are equally sensitive to this parameter. Please comment on how the model predictions could account for this sensitivity.

c. It is not clear from the WGA report whether the existing drain alignment has been retained in the model scenarios and whether modelled flows represent the combined effect of both drains.

Please clarify if the existing drain is included in the modelled scenarios.

If it is included in the modelled scenarios, can the flow in the existing Seadown Drain be separated from the flow in the proposed drain as this would help to demonstrate the effect compared to the existing drain.

WGA Limited has prepared a letter responding to these questions, (Attachment 6). The questions are responded to in section 2 of the letter, and the concluding statements (section 3 of the letter) are provided below.

- *Model structure (Q25a): The single-layer representation of the upper 20 m alluvial sequence is appropriate. The 10 – 20 m depth interval does not contain sufficient data to explicitly model, and the pilot-point hydraulic conductivity field, being calibrated to observed heads and system fluxes, yields an equivalent bulk medium that reflects the average transmissivity over the modelled thickness. The adopted single layer, with no vertical connectivity to the deeper system, is a conservative simplification. Adaptation to a two-layer model would not alter the finding of less than minor effects.*
- *Boundary sensitivity (Q25b): The high calibration sensitivity to the inland General Head Boundary reflects that this parameter is well constrained by the 43 observed head targets, which increases confidence in the adopted value. Because the predictions are reported as differences relative to the baseline, and the boundary is remote from the zone of simulated drawdown, the predictive outputs are substantially less sensitive to this parameter than the calibration statistics may suggest.*
- *Treatment of the existing drain (Q25c): The existing Seadown Main Drain channel has been retained in all predictive scenarios and its groundwater interception separated within the model budget. The existing channel functions principally as a conduit and acts as a*

negligible sink for groundwater. The groundwater discharge rates to the existing main channel remain effectively unchanged by the proposed realignments.

26. Potential effects on groundwater quantity – saline interface

The effect of the drain realignment on the saline interface under Phase 1 is not part of the assessment in the WGA report and is not considered in the AEE.

a. Please provide an assessment on the likely influence of the drain realignment on the saline interface and any potential effects arising from this.

A full response to this question is also provided in the WGA letter (Attachment 6 to this response). WGA's concluding statement is:

> *• Saline interface (Q26): Applying the Strack (1976) method to the Stage 1 realignment indicates a landward migration of the saltwater interface of approximately 14 m across a drawdown section of 490 m of the Stage 1 area. Across this area, groundwater heads remain above mean sea level, seaward hydraulic gradient is maintained, and the interface remains well seaward of existing water-supply bores and infrastructure.*

27. Potential effects on water quality – Wastewater Treatment Pond Seepage Discharge

CRC242246 is a discharge permit held by Timaru District Council to discharge contaminants to land via seepage from the base and sides of wastewater treatment ponds. While written approval has been provided from Timaru District Council, there is however limited assessment in relation to potential effects on water quality arising from shifting the drain alignment closer to the Wastewater Treatment Ponds.

a. To understand any implications on water quality and ecology within the new drain alignment, please provide the following:

- *Current seepage water quality.*
- *Current contribution of seepage to Seadown Drain flows.*
- *Existing water quality conditions downstream of seepage inputs.*
- *Whether the drain realignment could alter groundwater flow paths or contaminant transport pathways.*
- *Whether existing seepage contributes to aquatic habitat values through maintenance of baseflow.*

This question has been responded to in the Science advice in Attachment 5, at its pages 8 to 12.

The Science advice recommends observation of excavations for seepage, and sampling if it is noticed. The applicant can sample the water that will accumulate within the offline cell adjacent to the Wastewater ponds for faecal indicator bacteria prior to any tie-ins. We propose an adaptive condition where the results of those samples are provided to CRC Team Leader, Water Ecology Science, and if they are determined to:

1. be within background levels and not indicate seepage from the wastewater ponds no further action is required,
2. if seepage is indicated, then Science will undertake mixing dilution calculations to determine if the there is any resulting risk after dilution. If after allowing for dilution there is no increase in risk, no further action is required;
3. if seepage is indicated and dilution calculations determine an increase in seepage to the new alignment, then a management plan will be prepared to outline options to mitigate or minimise seepage into the new alignment with the resulting action being determined in collaboration with CRC (applicant and Science), Te Rūnanga o Arowhenua and TDC.

28. Potential effects on Waitarakao / Washdyke Lagoon

The technical reviewer generally agrees with the assessment of effects on Waitarakao / Washdyke Lagoon. However, the assessment is largely qualitative and provides limited consideration of how altered flow paths, groundwater interactions or changes in water quality within Seadown Drain could influence lagoon ecology. While significant effects appear unlikely, the water quality and aquatic habitat within the existing drain may change once Phase 1 works are completed and this has the potential to influence the water quality, aquatic flora and fauna in the downstream Waitarakao-Washdyke Lagoon.

a. What monitoring and adaptive management approach, if any, is proposed to document potential changes in the lagoon?

A response to this question is provided in the Science advice at its pages 12 and 13. It states:

> *As stated above, we do not anticipate long-term adverse effects on water quality and ecology within the realigned channel and therefore any potential adverse water quality effects on downstream environments would be associated with the outflow from the old channel. This is a key reason why we have recommended that the outlet or the dry reach of the old channel should be closed within a defined period.*
>
> *We currently have a site that is monitored monthly for water quality in Waitarakao/Washdyke Lagoon. This is located closer to the lagoon outlet than to the northern end where Seadown Drain enters (Figure 1), so it would not be informative regarding potential effects of the realignment of Seadown Drain. There is no regular ecological monitoring of the lagoon, although fish and habitat surveys have been carried out in the catchment over the past two years.*

29. Potential effects on spawning and migration

The AEE explains that some of the project works will occur within īnanga spawning areas and occur under the existing consents held (CRC175009-11). It is not clear what works would be required under the existing consents while a s9 land use consent is sought for works in riparian areas adjacent to spawning habitat. The AEE also states effects on īnanga do not reuqire consideration.

a. Please clarify what works are required under the existing consents and how those consent conditions manage the potential effects that may arise from activities authorised under the current application.

Given the proposed modification of hydrology, habitat and channel form, there are potential adverse effects on fish spawning and migration. The extent and magnitude of impact is related to the timing of works relative to spawning and migration periods.

a. How will works be timed in relation to spawning and migration?

b. Given that the new drain alignment is likely to provide limited aquatic habitat immediately following construction, will restoration planting be timed to ensure suitable habitat is available for fish relocated from the existing drain to the new alignment?

a.

The existing consents authorise the following activities relevant to this proposal within īnanga spawning habitat:

- CRC175009 authorises excavation, deposition in and disturbance of the river bed for channel improvements, planting and removal of vegetation, re-battering banks and habitat enhancement works.
- CRC175011 authorises temporary discharges that occur as a result of works authorised by CRC175009.
- CRC155101 authorises temporary diversions for the purposes of undertaking activities authorised by CRC175009 and is not expected to be required to deliver the proposed works.

Those consents provide existing permissions for all works within the banks of Seadown drain within the īnanga spawning habitat. The effects of these activities have been considered and approved through the issuing of those current consents. In processing those consents, the following effects were considered:

- Effects on bed and bank stability, flooding and artificial structures;
- Adverse effects on water quality and ecology;
- Effects on īnanga spawning habitat;
- Effects on the natural character of the water bodies;
- Adverse effects on Tangata Whenua.

These consents require that works within īnanga spawning habitat are completed in accordance with the Canterbury Īnanga Management Plan. That Plan requires monitored of habitat, water levels and replacing any damaged vegetation with spawning suitable plants.

<u>What is not covered by those consents and needs considered here:</u>

- Filling in the lower section of No.1 drain for the footprint of the new stopbank alignment will occur outside of the inanga spawning season and meet Permitted Activity rule 5.138.

- Works in the riparian margin of Seadown drain, within the area mapped as īnanga spawning habitat. Seadown drain is a single-channel, incised drain where the bed is easily defined as extending to the top of the bank. Īnanga spawning habitat, as defined in the LWRP, only extends to the parts of the bed and banks within the area mapped as īnanga spawning habitat, and therefore the mapped layer does not apply to the riparian margin. Regardless, water levels within Seadown drain are contained within its banks, including at mean high water springs when īnanga spawning occurs. Habitat within the bed and banks is likely to be of greatest value for spawning and will be managed under the existing resource consents. Vegetation in the riparian margin is unlikely to be inundated at mean high water springs, and is therefore unlikely to provide spawning habitat. However, replacement vegetation will blend in with the banks and also be species suitable for īnanga spawning.

a.

The scheduling of works within the lower section will minimise works during the īnanga spawning season. However, timing is dependent on when permissions are granted. Ideally, the lower-channel improvement works will occur before the spawning season, and the tie-ins will occur after the spawning season. If this timing cannot be achieved, the existing consents authorise works within the spawning season and already address the management of effects on īnanga spawning. They also provide a consented baseline and the necessary permissions for works to be managed during the spawning season.

The filling of the lower section of No. 1 drain for stopbank construction will occur outside of spawning season.

b.

In regards to īnanga spawning, these matters are addressed within the existing resource consents and implementation of the Canterbury Īnanga Management Plan, including provision for temporary habitat offsetting where required. During construction, there will be a combination of new alignment with establishing vegetation, which may initially provide limited cover, and the lower extent of the existing Seadown drain, which will retain spawning vegetation in the first year. Vegetation cover will be establishing along the new alignment before the next īnanga spawning season.

In other areas, hydroseeding will begin establishing grass on the banks while the cells are offline. When the connections are made, currently scheduled between late autumn and early spring, there should be well established grass cover on the banks. Aquatic macrophytes are expected to naturally colonise the new alignment reasonably quickly, so there is no intension to plant macrophytes in the new alignment,

30. Potential effects arising from potentially contaminated land

As the Detailed Site Investigation (DSI) was completed prior to finalising the drain alignment it does not assess all areas that will be disturbed and it is acknowledged the extent of contamination in some parts of the site also remains uncertain. The technical review of the DSI highlights several gaps that limit the robustness and defensability of the findings. While several of these are minor and do not invalidate the overall conclusions of the report, additional information is required about the orientation and potential extent of the shotfall zone from Range 11 of the rifle range. Although a club member said that the range had been designed to keep shot within the range, it would be important to verify this with a clear diagram showing the orientation of the range or information from the range designer. Depending on the orientation of the range, lead contamination from clay bird shooting may extend off-site for a considerable distance. Addressing these limitations in the Contaminated Site Manamgement Plan (CSMP) may be appropriate.

a. To provide greater clarity about the management of contaminated soil and to potentially simplify the required consent conditions, please provide a copy of the draft Contaminated Site Manamgement Plan (CSMP). The CSMP should be prepared in accordance with CLMG#1 and should also include (or have placeholders where appropriate):

- *A brief summary of the works to be undertaken in accordance with the approved consent, including the full extent of earthworks for the new drain and ancillary activities;*
- *A list of relevant contact information of those onsite and managing the construction or earthwork activities onsite;*
- *An allocation of responsibilities, including who is responsible for implementing and monitoring the controls detailed within the CSMP for the entirety of the works covered by the CSMP;*
- *A description of how the conditions of the consent will be implemented;*
- *A description of the known contamination present at the site (including a plan);*
- *A description of the areas of potential contamination where further investigation is required (including a site plan) and description of the proposed investigation methodology for those areas;*
- *A description of the management procedures for contaminated soil during the works, including siting and management of soil stockpiles, and erosion, sediment and dust control procedures;*
- *Any specific erosion and sediment control requirements that must be incorporated into the Erosion and Sediment Control Plan (ESCP).*
- *Contingency measures to address any unexpected or accidental discoveries of contamination or discharges identified at the site;*
- *Measures to monitor any discharges or sediment runoff during the activity; and*
- *Handling and disposal procedures for any contaminated material encountered during the activity including criteria for re-use, encapsulation or off-site disposal.*

Based on the Timaru District Council consent 102.2025.147.1, I understand that it is proposed to allow for onsite encapsulation of soil that exceeds the NES-CS SCS commercial/industrial human health or any applicable environmental criteria. On-site management of contaminated soils may be appropriate but at this stage there is uncertainty if this a suitable remedial method.

b. Please clarify whether contaminant soils are proposed to be encapsulation on site. If so, please provide:

- *The locations where encapsulation or reuse is proposed;*
- *The contaminant criteria that will determine suitability for reuse;*
- *Engineering design and long-term management measures for any encapsulation areas;*
- *An assessment of potential effects on groundwater and surface water; and*
- *Confirmation whether consent is required to prepare the encapsulation cell and/or for the discharge of contaminants to land associated with encapsulation.*

Material excavated and stockpiled from the FBNZ settling pond may have free-draining liquid, fine particle size and potentially higher contaminant loading compared to other areas of the site. Depending on the source and biogeochemical conditions, anoxic sediment may have the potential to generate acid sulphate soils.

c. Please provide further details on how sediment excavated from the FBNZ settling ponds will be characterised and managed to avoid or otherwise minimise effects on water quality.

a.

A contaminated land management plan (CLMP) has been prepared and is provided with this response as a separate document. The CLMP addresses, as far as practicable at the time of preparation, the specific matters raised in question 30 a.

b.

Some soils will be encapsulated on site. The CLMP proposes three main criteria to guide soil handling options:

1. If contaminant concentrations do not exceed the applicable ANZ(GV high) numerical criteria, the soils will be re-used.
2. If concentrations exceed the ANZ(GV high) values but meet the applicable criteria under the NESCS for commercial/industrial human health, then they can remain on site if encapsulated.
3. If concentrations exceed the above NESCS values, they will be disposed of at an appropriate facility.

At present, the only soils known to require encapsulation are located at the Hilton Haulage Limited damaged vehicle yard, where a thin layer of soil contaminated with hydrocarbons and metals has been identified (CLMP figure 8 copied below shows that location). This material has an estimated volume of 176 m^3 and while a final location for its deposition has not been decided, two possible locations are identified but are subject to landowner approval (CLMP figure 12, copied below).

Other material requiring encapsulation may be identified during ongoing stockpile sampling as described in the CLMP. All potential encapsulation sites will be evaluated for the following conditions (as stated in the CLMP at s 6.1.2):

-Least distance between excavation source site and bund location;

-Being elevated or outside of regular flooding or inundation zones

-Being located on the landward side of flood protection structures

-Being located in areas of recreational reserve or commercial / industrial zoning;

-Located within existing HAIL or adjacent to suspected or confirmed HAIL or other industrial / wastewater treatment sites.

Section 6.1.1 of the CLMP describes how the encapsulation bunds would be configured. Contaminated material would be encapsulated in geotextile material to retain the soil and provide a warning layer in case of future disturbance. The CLMP states that it would be capped with

at least 0.3 m of topsoil that meets the ANZ sediment quality criteria (UCL 95% of the mean).

Final bund design would require finalisation based on known soil volumes but the CLMP recommends a maximum height of 1.3 m, and side slops that would enable mowing and ready access. Figure 11 of the CLMP is a conceptual bund cross section and is copied below.

The bunds will be monitored and maintained as described in section 7.4 of the CLMP. This will include:

- Cover with turf or shallow rooted vegetation.
- Checking the bund for cracks, deterioration leaks or other damage, and prompt repair as needed.
- Five yearly spot checks of cover depth, at five locations in each 100 m length of bund.

The potential adverse effects of encapsulation are assessed in the CLMP, at section 6.1.4. The key points are:

- Encapsulation will isolate the contaminated soil from rainwater infiltration, and limits the potential for leaching.
- The contaminated material identified to date contains low concentrations of contaminants (metals and hydrocarbons), and leachate from it "*would be considered unlikely to present a more than minor effect at the identified receptors (Seadown Drain & Ocean).*"
- Care will be required when handling the material to minimise potential effects on surface water.

No additional consent requirements are identified as a result of the placement of encapsulation bunds. The contaminated material, and potential issues associated with its presence and handling, are identified in the application, and the bunds are likely to create a very low level of adverse effect. The bunds will be placed on the existing ground level.

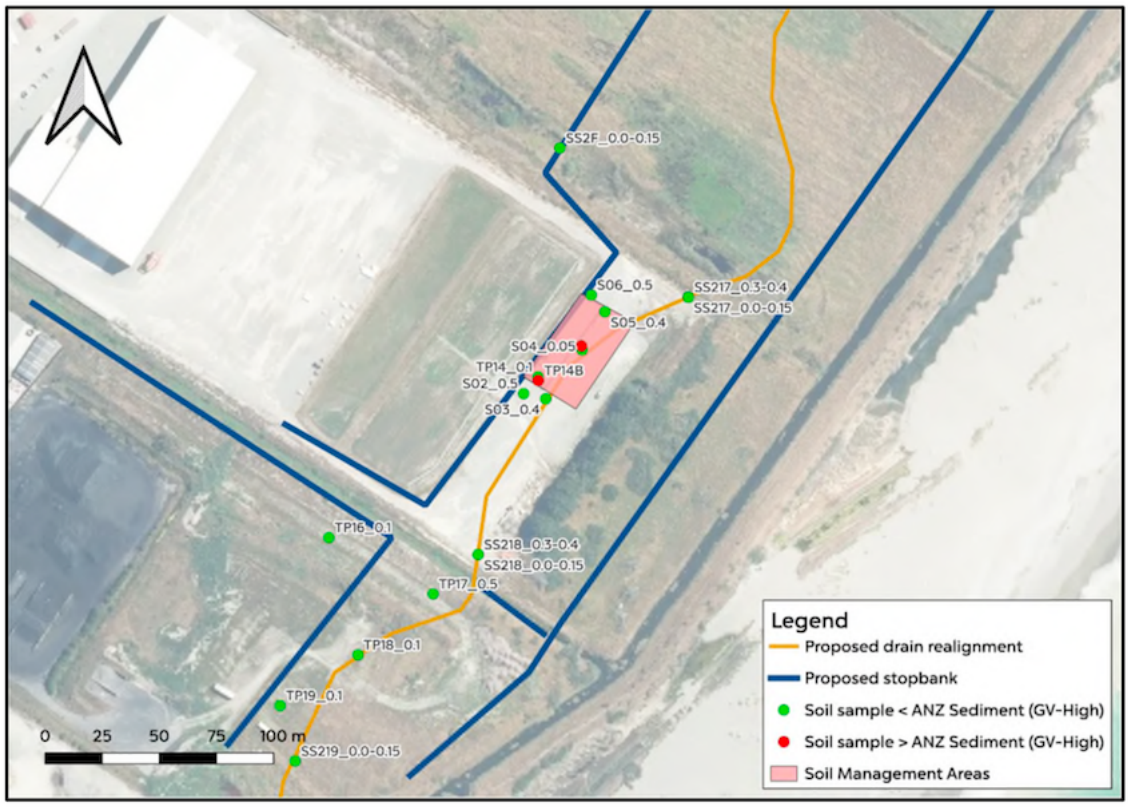


Figure 8: SMA – Hilton Haulage – vehicle collision storage yard.

Figure 12: Potential bund locations.

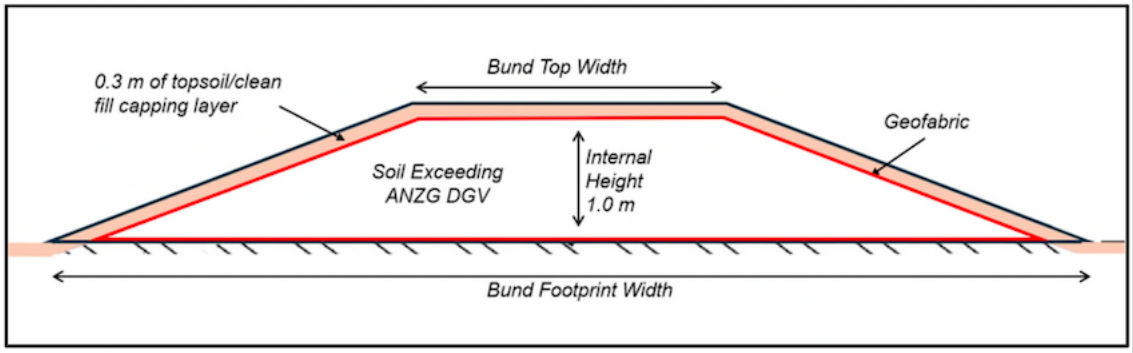


Figure 11: Example encapsulation cell bund cross section, indicative only. Note that placement of material is to be carried out under the direction of a suitably qualified environmental practitioner (SQEP) or engineer.

c.

A supplementary detailed site investigation (DSI) has been prepared by Davis Ogilvie Limited (DO), and is attached to this response as Attachment 7. Part of the supplementary DSI describes sediment sampling from the FBNZ pond, with four samples taken of pond floor material. The samples were analysed for heavy metals with concentrations mostly less than background except for one slight exceedance for zinc. On that basis the material is considered suitable for reuse at the site.

With regard to the potential creation of acid sulphate soils, DO states the following.

> *No New Zealand national Acid sulphate soil (ASS) guidance and an acid sulphate soils layer risk layer in Canterbury Maps or other platform currently exists. However, there are several Australian and Waikato Regional Council technical guidelines which can be used to assist with the assessment and mitigation at this site if necessary. No formal laboratory ASS testing has been undertaken to date however during our recent sediment sampling the sediment was described as light brown silt without a noticeable (hydrogen sulphide odour). Given the pond is relatively recent (built within last 25 years), receives stormwater, and is limited in both area and sediment volume — factors which, drawing on WRC acid sulphate soils technical guidance (WRC, 2025), reduce the likelihood of significant sulphide accumulation in that material specifically.*
>
> *However, given the lack of data regarding ASS and confirmation of its low risk status, we propose a field-screening approach, applied to both the settling pond sediment and the natural soils encountered during excavation in this area:*
>
> - *Visual and olfactory assessment for ASS/monosulfidic black ooze (MBO) indicators (sulphurous odour, black gel-like or oily material, orange/yellow jarosite mottling on exposure to air);*
> - *Field pH (pHf) and field peroxide pH (pHfox) testing on representative samples.*
>
> *As per Australia and WRC guidance; a field peroxide pH at least one unit below field pH, a field pH of 4 or less, or any of the visual/olfactory indicators will be treated as a positive screening result and the need for confirmation laboratory analysis and potentially triggering the mitigation measures below.*
>
> *Should field screening return a positive result, excavation in the affected area will cease and be managed under the CLMP's existing contingency procedures pending confirmatory*

laboratory testing (Chromium Reducible Sulphur suite). Should confirmatory testing verify the presence of ASS or PASS, the following management hierarchy will be applied;

1. *Further avoidance of ASS – unlikely given designs and time to change. Small volumes so move to management/treatment of soil.*
2. *Temporary containment — where disturbance cannot be avoided, excavated material will be stockpiled on an impermeable base with a neutralising guard layer (e.g. agricultural lime), bunded and fitted with leachate collection to isolate runoff from the surrounding environment.*
3. *Soil treatment (neutralisation) — material confirmed as ASS will be treated with agricultural lime, dosed to the calculated Net Acidity (potential, actual and retained acidity less acid neutralising capacity) plus an appropriate safety margin, mixed in layers no greater than 300 mm thick and validated between layers before further treatment or reuse. Given the limited volume expected this would be completed on land adjoining the pond where suitable earthworks and erosion and sediment controls are already active.*
4. *Strategic reburial — as an alternative to treatment, confirmed PASS material may be reburied in a permanently anoxic environment (e.g. below the permanent water table with adequate compacted cover), where a suitable location and design can be confirmed. Potential additional consenting required.*
5. *Off-site disposal — as a fallback where on-site management is not practicable, material will be characterised and disposed to an appropriately licensed facility in accordance with the WasteMINZ (2023) Technical Guidelines, with the receiving facility informed of the ASS characterisation.*

The specific mitigation pathway (or combination of pathways) would be selected by the SQEP and project team based on the confirmatory laboratory results, the extent and reactivity of the material, and practical construction constraints, and the CLMP would be updated accordingly before works recommence in the affected area.

We trust that this information enables processing of the applications to proceed, and welcome further discussion on any matters.

Ngā mihi

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Team Leader – Rivers Planning
Jolene.Irvine@ecan.govt.nz
+64 27 706 5332

CC: Incite Limited, attention Adele Dawson.

Attachment 1

Environment Canterbury request for further information

1 July 2026

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Advisory Team
0800 324 636

200 Tuam Street
PO Box 345, Christchurch 8140
ecan.govt.nz/contact

Canterbury Regional Council
Attn To: Jolene Irvine
PO Box 345
Christchurch 8140

Kia ora Jolene,

Request for Further Information

Response required by: 23 July 2026
Record Numbers: CRC264624, CRC264625, CRC264626, CRC264627 and CRC264628
Applicant Name: Canterbury Regional Council
Activity Description: Various activities associated with the realignment of Seadown Drain and the construction of stopbanks

As you are aware, Adele Dawson been processing the above resource consent application.

The information listed in Attachment 1 to this letter is hereby requested under Section 92 of the Resource Management Act 1991 (the RMA). In making this request, I have considered s92(2B) of the RMA, and consider the information requested is proportionate to the scale and significance of the proposal and required in order to consider the proposal under s104 of the RMA. As this information is required in order to fully understand the actual and potential effects of the proposal, we are unable to further process the application until it has been supplied.

The options available to you under Section 92A(1) of the RMA are summarised below. A response is required by 23 July 2026. You must choose one of these options.

A. Supply the requested information by 23 July 2026

If the information can be easily collated and supplied by this date, please provide it in writing (via email is fine) to Adele.

B. Agree in a written notice by 23 July 2026 to supply the information requested

Sometimes technical information will take some time to collate or key contacts may not be immediately available. If you need more time to supply the information requested, please advise Adele in writing when you can provide the information. You can do this via email or letter.

C. Refuse in a written notice by 23 July 2026 to supply the requested information

If you choose not to provide the requested information by the above date, or any date subsequently agreed to by the Canterbury Regional Council, then your application must be publicly notified and may be declined.

Public notification enables any member of the public, including potentially affected parties, to submit on your proposal. If submission/s are received on your application, then you can expect a hearing to be held. Information on the notification process and on the likely costs for notification and a hearing can be found on our website.

Please contact Adele Dawson via email (adele@incite.co.nz) or phone (027 861 8846) if you have any questions.

Ngā mihi

Tracey Gray
Principal Consents Planner

cc:

Environment Matters Limited
Attn To: Myles McCauley
23B Morgans Valley
Heathcote Valley
Christchurch 8022

ATTACHMENT 1

Information Requested under Section 92 of the Resource Management Act 1991

Application Numbers: CRC264624, CRC264625, CRC264626, CRC264627 and CRC264628

Description of the proposal

1. Length of new Seadown Drain alignment

The AEE and technical appendices do not provide a clear statement on the proposed length of the new drain alignment.

a. Please provide the estimated length (or a minimum and maximum length) of the new Seadown Drain alignment to be established.

2. Deposition of material within "river beds"

The AEE and site plans describe the filling of the existing Seadown Drain channel at the northern extent of the Phase 1 works to create a 'maintenance vehicle turning bay'. Appendix 6 notes ~200m will be filled in 'where it falls within the new stopbank footprint' but it is unclear what this is referring to.

a. Please confirm the length of the existing Seadown Drain and any other 'river' that will be filled or reclaimed.

The AEE describes that section 13 earthworks may include repairing any erosion issues within the new Seadown Drain after water has been diverted into it. In some cases, scour protection is used to stabilise waterbodies to prevent erosion. The placement of scour protection may require resource consent.

b. Please confirm if it is proposed to include scour protection within any "river bed" and if so, where.

3. Localised drainage channels

The AEE and site plans describe several small, localised drainage channels that will run along the inland side of the new seaward stopbank and periodically discharge into the drain.

a. Please confirm the dimensions (even approximate) of these channels including the invert level.

b. Will these channels intercept groundwater?

4. Connecting drains and other localised drains into the new Seadown Drain alignment

Table 5 of the AEE describes the contact points between the new drain realignment and the connected watercourses and artificial waterbodies. The table describes what the connections will be but not how the works will occur.

a. Please clarify the construction methodology for connecting watercourses and artificial waterbodies to the new Seadown Drain alignment. Will any works in flowing water be required and if so, is any temporary diversions, damming or over-pumping necessary?

b. If temporary diversions or damming are proposed, please provide an assessment against the rules in the Canterbury Land and Water Regional Plan (LWRP).

5. Stockpiling of excavated material

The AEE and proposed consent conditions explain that stockpiling of topsoil excavated from the new drain alignment will occur so it can be dried and then used to form the new stopbanks. It is proposed to locate stockpiles where runoff cannot enter any surface water bodies connected to the drain system.

a. Please outline where stockpiling of material is to occur while it is drying out.

b. What measures, if any, are proposed to avoid any discharges into surface water bodies?

6. Stabilisation of new drain alignment

The indicative construction programme in the AEE sets out staged excavation of sections of the new Seadown Drain channel and notes that stabilisation through hydroseeding will occur continuously at the end of each stage. It is also noted the planting programme commences after the connection of the excavated sections, except for the upstream end north of the rifle range. Appendix 16, the 'sediment report' also notes "*hydroseeding of newly formed banks as soon as practicable after their formation, so that grass is established prior to flow getting switched on at the upstream end*".

a. Please clarify whether the banks of the newly excavated drain sections will be stabilised through hydroseeding before being connected to the adjoining upstream sections?

b. Is it proposed to stabilise the drain banks prior to connecting the northern end of the Phase 1 works to the existing upstream Seadown Drain alignment? Are there specific triggers or outcomes to be achieved before this connection is made?

7. Erosion and sediment controls

The application provides a general description of erosion and sediment controls, supported by the sediment effects assessment on ecology.

The technical reviewer has highlighted that there is not sufficient detail to independently evaluate the likely effectiveness of proposed conditions.

a. Please provide further details on the erosion and sediment control measures likely to be used, including:

- How it will be determined if a silt curtain is used within the Seadown Drain.

- Whether runoff from land will be channelled and captured, prior to discharge.
- If the use of chemical flocculants is proposed.
- Methods to avoid or minimise disturbance.

You may wish to consider preparing an indicative marked-up erosion and sediment control plan.

8. Discharges to water within 100m of a wetland

Appendix 15, the rule assessment outlines the triggers for resource consent under the National Environmental Standards for Freshwater 2020, including Regulation 45. Regulation 45(5) states it is a discretionary activity to discharge water into water, within, or within 100 metres of a natural inland wetland if:

(a) the discharge is for the purpose of constructing or upgrading specified infrastructure; and

(b) there is a hydrological connection between the discharge and the wetland; and

(c) the discharge will enter the wetland; and

(d) the discharge will change, or is likely to change, the water level range or hydrological function of the wetland.

From the description of the proposal, it is not clear what discharges are subject to this regulation.

a. Please clarify the nature and extent of discharges of water, into water, that trigger Regulation 45(5).

9. Fish Management Plan

A fish management plan is proposed as a requirement of consent and is to be developed collaboratively with ecologists and AECL. It is understood to address the requirement to undertake fish relocation to the alignment.

a. To understand the purpose and content of the Fish Management Plan, please provide further details on what it will include. You may want to consider the following:
    - The timing of its preparation and any certification.
    - Roles and responsibilities of key personnel.
    - Additional permit and health and safety requirements for undertaking fish salvage works.
    - Guidance on when fish salvage will be required, including potential triggers in response to environmental conditions within the existing Seadown Drain channel following diversion and to establish fish populations in the new alignment.
    - Fish capture and relocation methodologies.

- Fish regression rates.
- Biosecurity and pest management measures.
- Reporting requirements.
- Contingency measures.

10. Monitoring – water quality and ecology of the existing alignment

The AEE and Appendix 6 Ecology Assessment describe that monitoring of the old Seadown Drain alignment will be carried out following the diversion. The proposed monitoring is for water temperature and dissolved oxygen with the recommendations in Appendix 6 suggesting monitoring from 1 November to 30 April for the first year following construction as this "*should provide sufficient time to assess water quality risks and adjust flows through the old channel, as required*."

The technical review of the AEE and Appendix 6 concludes that the description of this monitoring currently lacks sufficient detail to fully assess its adequacy. It is suggested that at a minimum, monitoring should occur during the first summer following commissioning of the new drain. However, given the uncertainty associated with how the old channel will function hydraulically and ecologically, consideration should be given to extending monitoring into subsequent years.

a. Please identify what baseline information is available on current water quality of Seadown Drain.

b. Please confirm how water quality will be monitored in the existing and new alignment following the diversion into the new drain alignment (i.e., locations, methods, frequencies, trigger values, reporting requirements).

c. What is the proposed duration of water quality monitoring? Will monitoring duration be dependent on the water quality or drain conditions observed?

d. What adaptive measures are proposed should unfavourable water quality be recorded in the drain during monitoring?

The AEE also describes that the existing drain alignment will be monitored and managed for invasve weed.

e. Will nuisance aquatic flora and algae be monitored in the existing drain?

The technical review observes that reduced throughflow in the old channel may increase the risk of low dissolved oxygen, elevated water temperatures, excessive macrophyte growth, algal proliferation, and periodic fish stranding during low flows. This could lead to adverse effects on the downstream Waitarakao/Washdyke Lagoon.

f. Please confirm whether the water quality (and potentially nuisance aquatic flora and algae) monitoring programme be extended to the downstream Waitarakao / Washdyke Lagoon to identify potential changes that could be correlated to changes in the existing drain?

g. What adaptive measures are proposed should unfavourable water quality be recorded during monitoring?

11. Monitoring – sediment discharges within new alignment

The proposed conditions include a requirement to assess water clarity change at a location 100m downstream of the discharge point when one works section is connected to another.

Schedule 5 of the LWRP provides direction on how mixing zone length is calculated. It appears that the proposed mixing zone length is inconsistent with this guidance.

a. Please provide further information to support a mixing zone length of 100m or adjust the mixing zone length so it is consistent with Schedule 5 of the LWRP.

Appendix 16 recommends water quality sampling for clarity or turbidity immediately prior to each tie in and suggests tie ins be delayed if the downstream section is already subject to more than a 35% increase in clarity. The proposed conditions (condition 3 of the s15 discharge permit) states discharges are measured at a period 4 hours after the completion of works. Consent is also sought for the discharge of construction phase stormwater.

From the AEE and appendices, it is not clear if sediment monitoring will occur in response to rainfall events or to determine how the channel is stabilising during commissioning.

b. Please provide further details on the proposed approach (if any) for monitoring sediment discharges from either bed disturbance activities, completing tie-ins of an upstream work section to the downstream section(s) and in response to rainfall events.

12. Monitoring – flows and levels

Appendix 10, the WGA Groundwater Report report provides comments on a 'groundwater monitoring plan' in section 8. Included is a suggestion to monitor water levels in selected shallow bores in advance of works commencing and through the construction period.

While the WGA report comments on the entire project and Phase 1 works are smaller in scale, no comments in the AEE or proposed conditions address monitoring of flows and levels. Therefore, it is not clear if any monitoring will occur to verify the modelled assumptions and conclusions.

a. What monitoring of flows in the new alignment and of groundwater levels is proposed (if any)?

13. Monitoring – Ecological outcomes

The AEE notes that a positive effect of the proposal includes the wider area around the drain being actively enhanced which will increase biodiversity and amenity. It is also noted how the works support the objectives of *Our Waitarakao: Waitarakao Washdyke Lagoon Catchment Strategy.*

a. Is it proposed to monitor the long-term ecological outcomes of the proposed restoration and enhancement work for their effectiveness and to quantify biodiversity gains? If so, what monitoring is proposed?

14. Works on Section 10 Seaforth SETT

Works are proposed to occur at the northern extent of Phase 1 on land with the legal description Section 10 Seaforth SETT. It is understood these works will occur within No. 2 drain and those works will be small in scale.

a. Please clarify the nature and extent of works required within No.2 drain on this property.

b. Does Environment Canterbury have any authority available to complete these works, for example under an easement or other permission?

15. Works on existing coastal stopbank

The letter of support from the Department of Conservation notes "no construction works are proposed on or seaward of the existing coastal stopbank, with the exception of limited topping up and maintenance works to a short inland angled section of the existing stopbank located within DOC land".

a. Please clarify the work to be completed on the existing coastal stopbank and if this work requires resource consent.

Assessment of rules and regulations

16. Wetland Status of small rifle range wetland

The AEE and Appendix 7 describe a small wetland in the vicinity of the rifle range. Table 2 of Appendix 7 identifies this with a regulatory status of "NPSFM" but the Table 6 in the AEE states it is not a natural inland wetland.

The technical reviewer also notes that this area could also be considered a 'river' as it appears from historic imagery this is an old drainage channel cut off cut off during the construction of the rifle range but it has not been maintained and subsequently infilled.

a. Please confirm whether the small rifle range wetland meets the definition of 'natural inland wetland' under the NPSFM.

17. Wetland status of Seadown Drain – Aorangi Road to Beach Road

Appendix 7 provides a wetland delineation assessment identifying wetlands potentially impacted by the Phase 1 and Phase 2 works. Wetland Area 2 is described as Seadown Drain from Aorangi Road to Phillips Lagoon Wetland. The drain between Aorangi Road and Beach Road is listed in Table 2 of Appendix 7 as an NPSFM wetland.

The technical review of Appendix 7 has queried whether Seadown Drain in this area is an NPSFM natural inland wetland noting that there is limited publicly available information to support this wetland status. It is noted that while prior to any drain being located in this area long periods of inundation may have occurred, but the coastline has also eroded hundred of metres inland so the current environment is now highly modified. The classification of Seadown Drain as a 'river' is supported by there is insufficient information to support the conclusion it is also a natural inland wetland.

a. Please clarify the evidence used to define the existing Seadown Drain between Aorangi Road to Beach Road as a natural inland wetland.

The technical review also raises the question that if Seadown Drain is wetland, should the tributary drains also draining historic wetland habitat be classified as wetlands for the same reason? Similarly, should the areas of adjoining farmland, that are permanently damp (due to the high water table) and not dominated by pasture species, also be considered wetlands?

b. Please clarify if all the tributary drains feeding Seadown Drain also been assessed for wetland status, and (if so) included in the various calculations and effects assessments?

18. Defences against water

The definition of 'defence against water' includes the deposition of material within "rivers" to create the stopbanks, any rock or erosion protection structure and floodgate. Table 7 states that Rule 5.138 is complied with in relation to where the inland bank crosses two s13 waterways.
It is considered Rule 5.138 could apply to any erosion/scour protection and the flapgate. It is also not clear if works (classified as defences against water) will be undertaken in accordance with the Code of Practice.

a. Please clarify the rule assessment against the permitted activity conditions of Rule 5.138.

19. Temporary discharges associated with s13 works

The AEE identifies consent is required under Rule 5.141B but no assessment of Rule 5.141 of the LWRP has been provided therefore, it is not clear if consent is required for temporary discharges as well the as the diversion of water.

a. Please provide an assessment of the activity against Rule 5.141.

20. Diversion of floodwater

The construction of the new seaward and inland stopbanks are described as channelling floodwaters towards Waitarakao. This activity is considered to be a diversion of water.

a. Please provide an assessment of the activity against Rule 5.142 of the LWRP.

21. Discharge to the Coastal Marine Area

Section 6.2.3 of the AEE explains that the crest of the inland stopbank will be higher than the crest of the seaward stopbank on the principle that in the low-frequency, but potentially high impact outcome of deep flooding from a major Ōpihi River breakout, the coastal stopbank will overtop and release water before any risk of breaching or overtopping of the inland stopbank occurs. The release of this water could be considered a discharge into the coastal marine area.

a. Please provide an assessment of the activity against the discharge rules in the Regional Coastal Environment Plan.

Assessment of effects

22. Effects management hierarchy

The effects management hierarchy is related to assessing the construction of specified infrastructure under Regulation 45 of the NES-F and the National Policy Statement for Freshwater Management 2020. Section 7.4.1 of the AEE notes the applicant's view of how the effects management hierarchy has been applied is discussed in the application. This discussion is not entirely obvious.

a. Please confirm if the discussion referred to is the summary set out in Table 10? For clarity it would be helpful to provide an explanation that steps through the definition of *effects management hierarchy* in the NPS-FM.

23. Effects associated with moving or removing the minimum flow site

Section 8.13.1 and Appendix 8 highlights that work is ongoing to establish a new permanent flow recorder site in the Seadown Drain, determine the relationship of and interim sites to existing data and assess the impacts of this on consent holders. The only effect from moving or removing this site assessed is how it impacts on the existing permit holders.

The technical reviews have highlighted that the AEE and supporting appendices do not address the potential effects of altering the minimum flow site on environmental flows and how the proposal will protect environmental flows in Seadown Drain.

a. What are the effects on aquatic ecosystem values associated with relocating the minimum flow site? How will environmental flows within Seadown Drain to Waitarakao be protected?

Appendix 8 describes alternative methods that could be used to develop a revised minimum flow monitoring location.

The technical reviewer agrees with the recommendations in Appendix 8 for additional data collection and technical assessments. As no information or analysis has been supplied that demonstrates a reliable relationship between the existing flow monitoring site and an alternative site can be established, it is not possible at this stage to define key outcomes for the consent that will ensure the same level of environmental protection and water user reliability.

b. Please provide further information on the progress (if any) in developing an alternative minimum flow monitoring location.

The review highlighted that the realignment of Seadown Drain may impact groundwater levels in the three piezometers shown in Figure 1 of Appendix 8. Therefore, any relationship established between the existing Seadown Drain flows and groundwater levels in these piezometers may not be valid once works commence.

c. Subject to the response to 23(b) above, if there is reliance on the piezometers installed for implementing a new minimum flow monitoring location, please address how potential impacts on groundwater levels will affect the accuracy of future measurements and any consequential impacts on the values of Seadown Drain and reliability of supply for water users.

24. Potential effects on Philips Lagoon

Section 6 of the AEE describes that one of the five key aspects informing the design of the new drain alignment is to ensure "*the drain is designed to carry at least the same flow as the existing one, while maintaining water levels in Phillips Lagoon*."

a. Please provide an assessment of the potential effects, if any, on water levels in Phillips Lagoon arising from Phase 1 works.

b. Please clarify if water levels in Philips Lagoon are currently or proposed to be monitored?

25. Potential effects on groundwater quantity – groundwater modelling

A review of the groundwater assessment, including the technical report prepared by WGA has been completed. Regarding the modelling approach, overall, the groundwater model is considered to be appropriate and has been clearly described. Some minor matters to clarify are noted below to ensure the model represents the conceptual groundwater setting.

a. The conceptual description of the groundwater setting suggests the hydrostratigraphy can be split with most bores around 10m having typically higher transmissivities and bores deeper than 10m with generally lower transmissivities. The model represents the whole of the strata to 20m depth as a single layer. Hydraulic conductivities were derived from transmissivities from bores less than 10m deep.

   Please provide further details on how the approach used may influence the results, as opposed to using a two-layer model which may better reflect the conceptual description.

b. The model calibration is generally reasonable. The sensitivity analysis indicates that the model calibration is highly sensitive to the elevation of the inland general head boundary which implies that the model predictions are equally sensitive to this parameter. Please comment on how the model predictions could account for this sensitivity.

c. It is not clear from the WGA report whether the existing drain alignment has been retained in the model scenarios and whether modelled flows represent the combined effect of both drains.

   Please clarify if the existing drain is included in the modelled scenarios.

   If it is included in the modelled scenarios, can the flow in the existing Seadown Drain be separated from the flow in the proposed drain as this would help to demonstrate the effect compared to the existing drain.

26. Potential effects on groundwater quantity – saline interface

The effect of the drain realignment on the saline interface under Phase 1 is not part of the assessment in the WGA report and is not considered in the AEE.

a. Please provide an assessment on the likely influence of the drain realignment on the saline interface and any potential effects arising from this.

27. Potential effects on water quality – Wastewater Treatment Pond Seepage Discharge

CRC242246 is a discharge permit held by Timaru District Council to discharge contaminants to land via seepage from the base and sides of wastewater treatment ponds. While written approval has been provided from Timaru District Council, there is however limited assessment in relation to potential effects on water quality arising from shifting the drain alignment closer to the Wastewater Treatment Ponds.

a. To understand any implications on water quality and ecology within the new drain alignment, please provide the following:
    - Current seepage water quality.
    - Current contribution of seepage to Seadown Drain flows.
    - Existing water quality conditions downstream of seepage inputs.
    - Whether the drain realignment could alter groundwater flow paths or contaminant transport pathways.
    - Whether existing seepage contributes to aquatic habitat values through maintenance of baseflow.

28. Potential effects on Waitarakao / Washdyke Lagoon

The technical reviewer generally agrees with the assessment of effects on Waitarakao / Washdyke Lagoon. However, the assessment is largely qualitative and provides limited consideration of how altered flow paths, groundwater interactions or changes in water quality within Seadown Drain could influence lagoon ecology. While significant effects appear unlikely, the water quality and aquatic habitat within the existing drain may change once Phase 1 works are completed and this has the potential to influence the water quality, aquatic flora and fauna in the downstream Waitarakao-Washdyke Lagoon.

a. What monitoring and adaptive management approach, if any, is proposed to document potential changes in the lagoon?

29. Potential effects on spawning and migration

The AEE explains that some of the project works will occur within īnanga spawning areas and occur under the existing consents held (CRC175009-11). It is not clear what works would be required under the existing consents while a s9 land use consent is sought for works in riparian areas adjacent to spawning habitat. The AEE also states effects on īnanga do not reuqire consideration.

a. Please clarify what works are required under the existing consents and how those consent conditions manage the potential effects that may arise from activities authorised under the current application.

Given the proposed modification of hydrology, habitat and channel form, there are potential adverse effects on fish spawning and migration. The extent and magnitude of impact is related to the timing of works relative to spawning and migration periods.

a. How will works be timed in relation to spawning and migration?

b. Given that the new drain alignment is likely to provide limited aquatic habitat immediately following construction, will restoration planting be timed to ensure suitable habitat is available for fish relocated from the existing drain to the new alignment?

30. Potential effects arising from potentially contaminated land

As the Detailed Site Investigation (DSI) was completed prior to finalising the drain alignment it does not assess all areas that will be disturbed and it is acknowledged the extent of contamination in some parts of the site also remains uncertain. The technical review of the DSI highlights several gaps that limit the robustness and defensability of the findings. While several of these are minor and do not invalidate the overall conclusions of the report, additional information is required about the orientation and potential extent of the shotfall zone from Range 11 of the rifle range. Although a club member said that the range had been designed to keep shot within the range, it would be important to verify this with a clear diagram showing the orientation of the range or information from the range designer. Depending on the orientation of the range, lead contamination from clay bird shooting may extend off-site for a considerable distance. Addressing these limitations in the Contaminated Site Manamgement Plan (CSMP) may be appropriate.

a. To provide greater clarity about the management of contaminated soil and to potentially simplify the required consent conditions, please provide a copy of the draft Contaminated Site Manamgement Plan (CSMP). The CSMP should be prepared in accordance with CLMG#1 and should also include (or have placeholders where appropriate):

    - A brief summary of the works to be undertaken in accordance with the approved consent, including the full extent of earthworks for the new drain and ancillary activities;
    - A list of relevant contact information of those onsite and managing the construction or earthwork activities onsite;
    - An allocation of responsibilities, including who is responsible for implementing and monitoring the controls detailed within the CSMP for the entirety of the works covered by the CSMP;
    - A description of how the conditions of the consent will be implemented;
    - A description of the known contamination present at the site (including a plan);
    - A description of the areas of potential contamination where further investigation is required (including a site plan) and description of the proposed investigation methodology for those areas;
    - A description of the management procedures for contaminated soil during the works, including siting and management of soil stockpiles, and erosion, sediment and dust control procedures;
    - Any specific erosion and sediment control requirements that must be incorporated into the Erosion and Sediment Control Plan (ESCP).
    - Contingency measures to address any unexpected or accidental discoveries of contamination or discharges identified at the site;

- Measures to monitor any discharges or sediment runoff during the activity; and
- Handling and disposal procedures for any contaminated material encountered during the activity including criteria for re-use, encapsulation or off-site disposal.

Based on the Timaru District Council consent 102.2025.147.1, I understand that it is proposed to allow for onsite encapsulation of soil that exceeds the NES-CS SCS commercial/industrial human health or any applicable environmental criteria. On-site management of contaminated soils may be appropriate but at this stage there is uncertainty if this a suitable remedial method.

b. Please clarify whether contaminant soils are proposed to be encapsulation on site. If so, please provide:
    - The locations where encapsulation or reuse is proposed;
    - The contaminant criteria that will determine suitability for reuse;
    - Engineering design and long-term management measures for any encapsulation areas;
    - An assessment of potential effects on groundwater and surface water; and
    - Confirmation whether consent is required to prepare the encapsulation cell and/or for the discharge of contaminants to land associated with encapsulation.

Material excavated and stockpiled from the FBNZ settling pond may have free-draining liquid, fine particle size and potentially higher contaminant loading compared to other areas of the site. Depending on the source and biogeochemical conditions, anoxic sediment may have the potential to generate acid sulphate soils.

c. Please provide further details on how sediment excavated from the FBNZ settling ponds will be characterised and managed to avoid or otherwise minimise effects on water quality.

Attachment 2

kastorworks Ltd drawing series of number 1 drain connection sequence

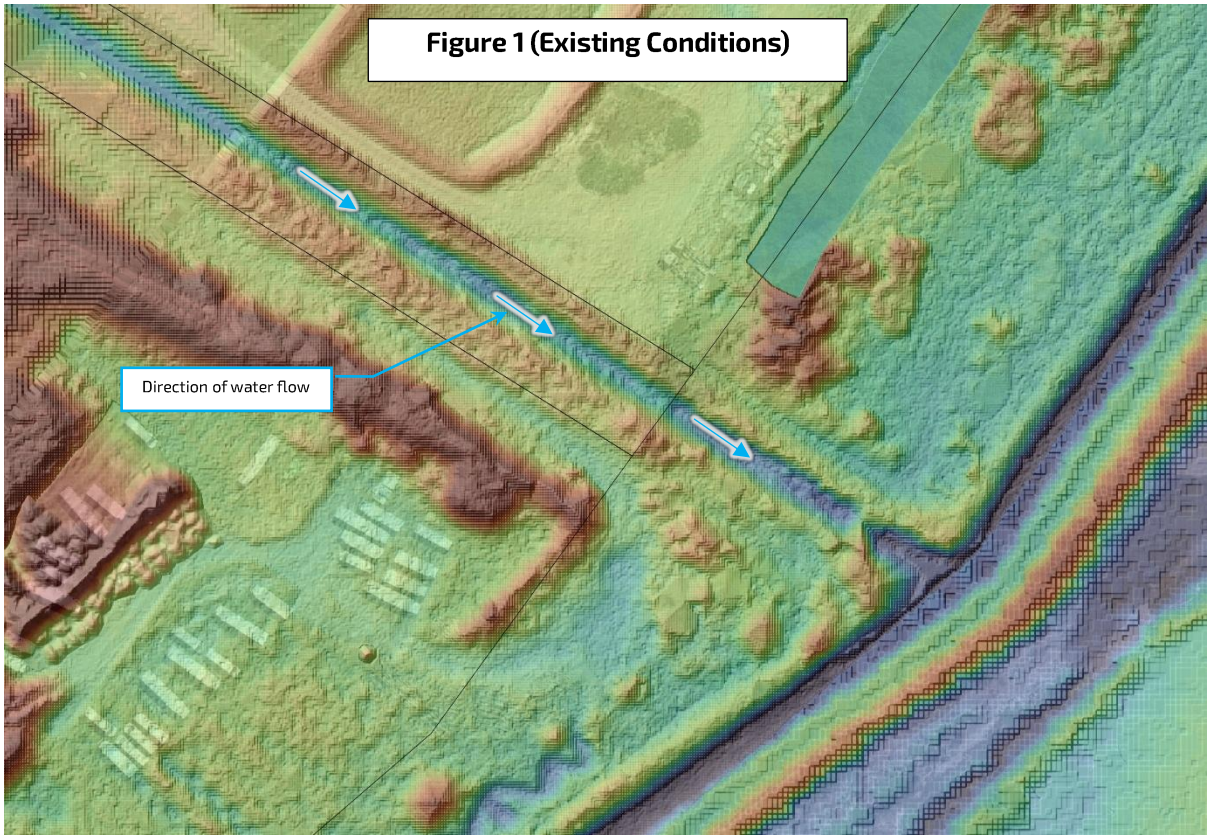
Figure 1 (Existing Conditions)
Direction of water flow

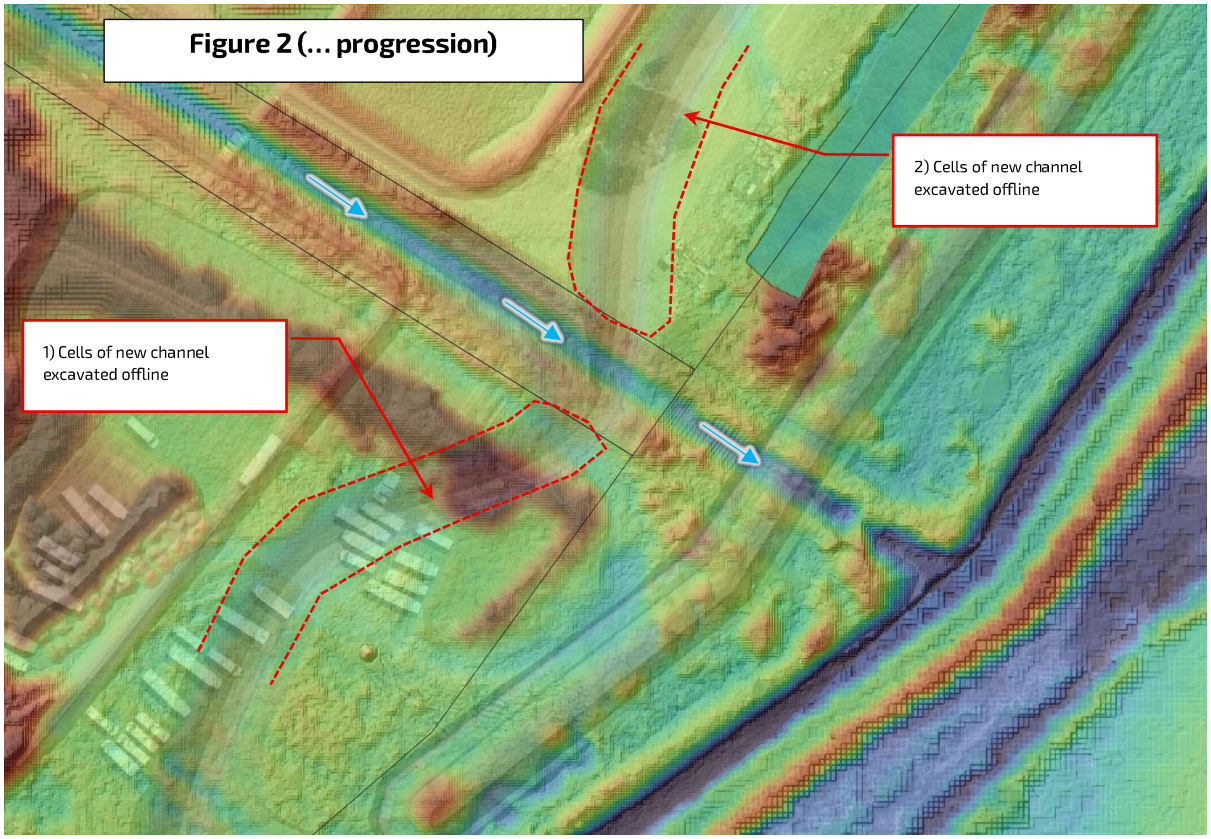
Figure 2 (… progression)
2) Cells of new channel excavated offline
1) Cells of new channel excavated offline

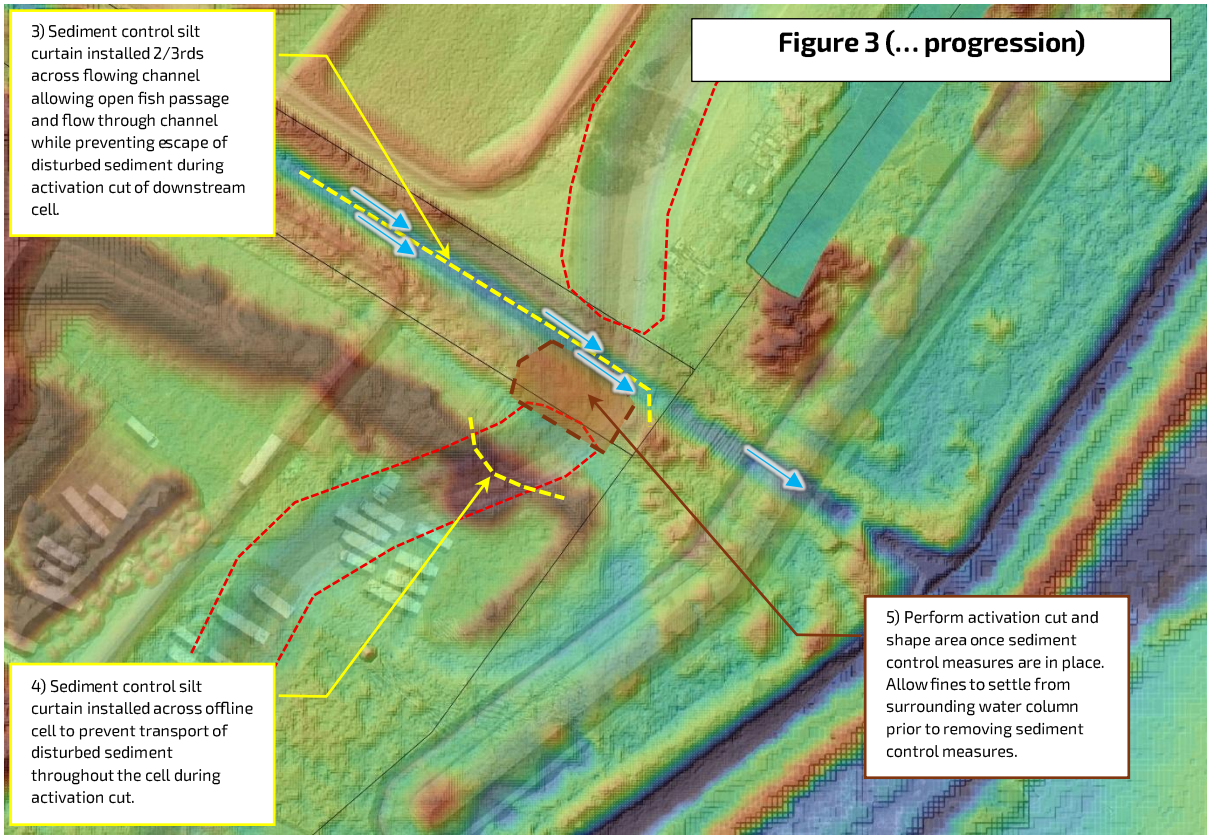
Figure 3 (… progression)
3) Sediment control silt curtain installed 2/3rds across flowing channel allowing open fish passage and flow through channel while preventing escape of disturbed sediment during activation cut of downstream cell.
4) Sediment control silt curtain installed across offline cell to prevent transport of disturbed sediment throughout the cell during activation cut.
5) Perform activation cut and shape area once sediment control measures are in place. Allow fines to settle from surrounding water column prior to removing sediment control measures.

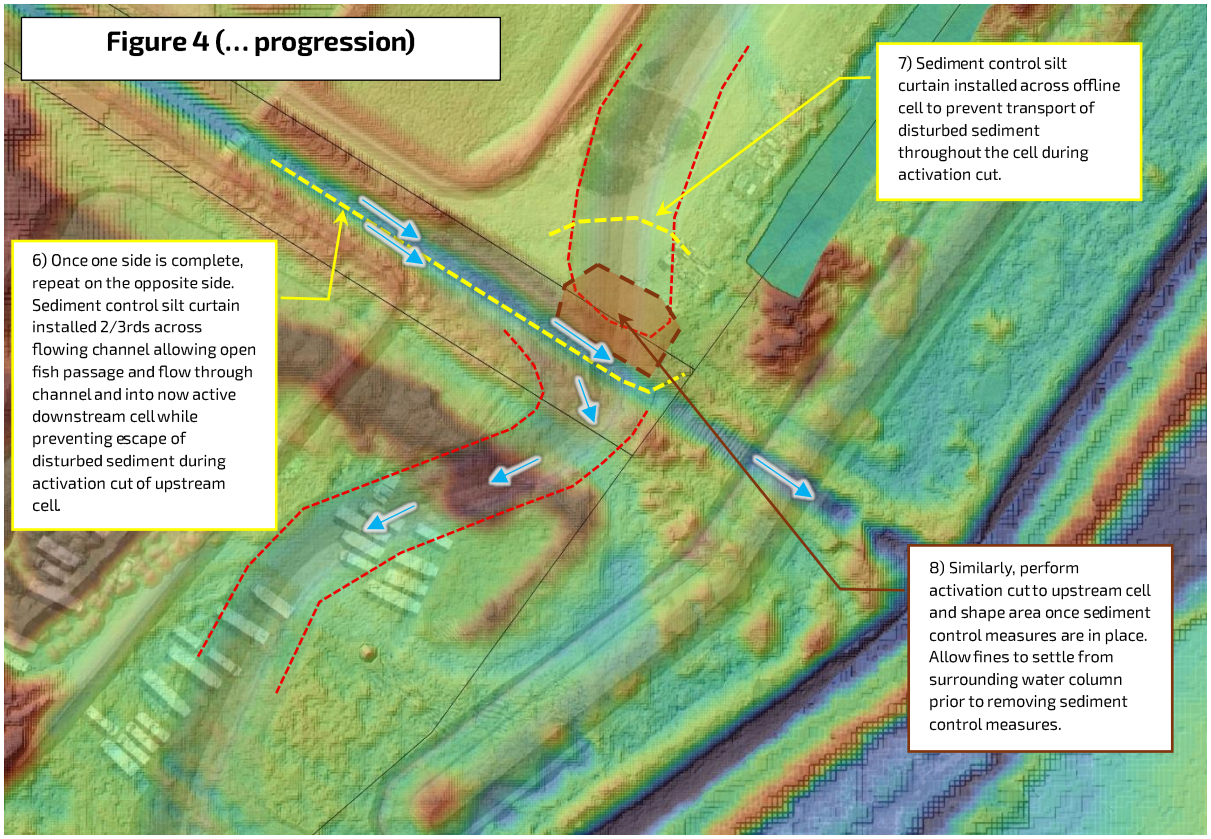
Figure 4 (… progression)
6) Once one side is complete, repeat on the opposite side. Sediment control silt curtain installed 2/3rds across flowing channel allowing open fish passage and flow through channel and into now active downstream cell while preventing escape of disturbed sediment during activation cut of upstream cell.
7) Sediment control silt curtain installed across offline cell to prevent transport of disturbed sediment throughout the cell during activation cut.
8) Similarly, perform activation cut to upstream cell and shape area once sediment control measures are in place. Allow fines to settle from surrounding water column prior to removing sediment control measures.

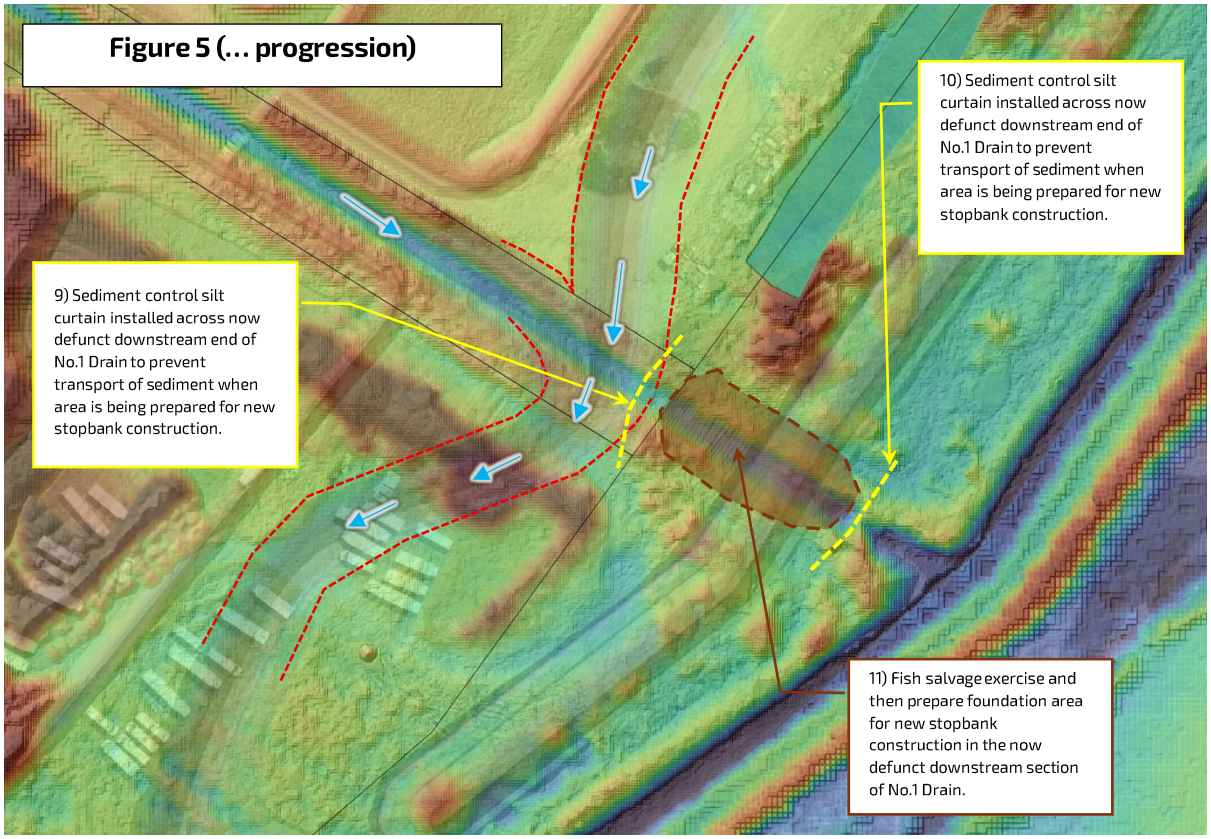
Figure 5 (... progression)
9) Sediment control silt curtain installed across now defunct downstream end of No.1 Drain to prevent transport of sediment when area is being prepared for new stopbank construction.
10) Sediment control silt curtain installed across now defunct downstream end of No.1 Drain to prevent transport of sediment when area is being prepared for new stopbank construction.
11) Fish salvage exercise and then prepare foundation area for new stopbank construction in the now defunct downstream section of No.1 Drain.

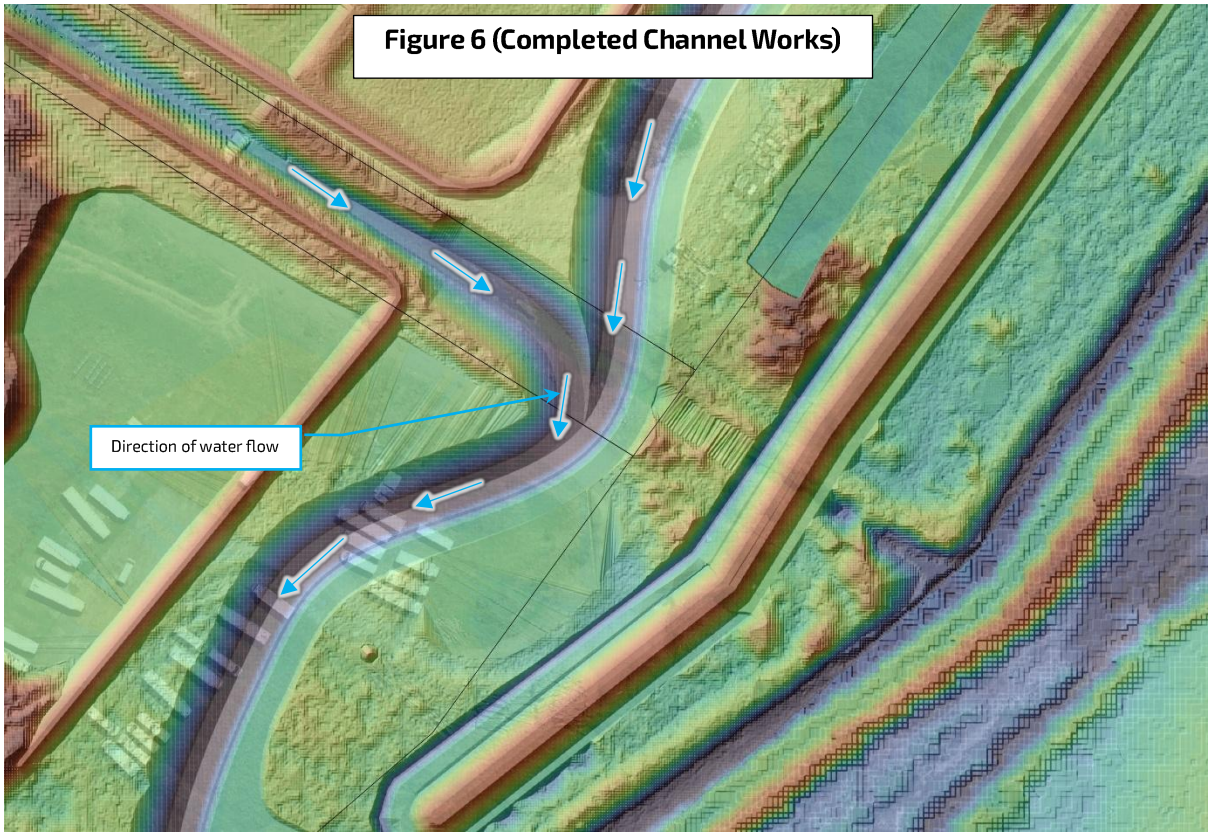
Figure 6 (Completed Channel Works)
Direction of water flow

Attachment 3

Draft Erosion and Sediment Control Plan

Erosion & Sediment Control Plan (ESCP) Construction and Activation of New Seadown Alignment. (Phase 1)

Purpose

This work is the first part of the Waitarakao/Washdyke Drain Realignment, which is a Regional Infrastructure Fund (RIF) project. The existing Seadown Drain alignment is currently under threat from coastal erosion and overwash of beach material from the ocean. Consequently, this project is necessary to ensure the continued operation of a drainage system capable of conveying irrigation bywash flows, floodwaters, and general land drainage to Waitarakao Lagoon.

This ESCP sets out methodologies to avoid, minimise, mitigate, and monitor erosion and sediment effects associated with offline construction of the new Seadown Drain alignment, construction of the associated stopbank, and the staged activation of the new channel and decommissioning of the existing channel.

The proposed drain alignment will be excavated offline and will initially remain isolated from tributary inflows, wetland systems and the operational Seadown Drain. Groundwater is expected to be encountered during excavation and may result in ponded water within sections of the new alignment. This ponded water will provide additional settlement capacity and assist in reducing the potential for suspended sediment mobilisation during subsequent activation works.

Excavated clay and other suitable material will be stockpiled and reused for construction of a coastal protection stopbank. Stockpile areas and stopbank construction activities will be managed to minimise erosion and sediment runoff during rainfall events.

The newly excavated alignment will remain isolated for a period following excavation to allow for stabilisation of channel batters and bed surfaces. The alignment will then be progressively connected to tributaries, wetland pond systems and the operational Seadown Drain through a staged activation process. Time will be allowed between each connection stage to enable hydraulic conditions and suspended sediment levels to normalise prior to undertaking subsequent connections.

As the new alignment will be excavated, scraped and contoured to final design levels prior to activation, only limited quantities of unconsolidated sediment are anticipated to remain within the channel. The combination of a stable clay substrate, groundwater ponding and a

staged activation process is expected to minimize turbidity and suspended sediment generation during the transition from the existing channel to the new alignment.

Overview

The proposed works involve excavation of a new offline Seadown Drain alignment and construction of a coastal protection stopbank using excavated material.

The new alignment will ultimately replace a section of the existing Seadown Drain that is vulnerable to coastal erosion and tidal over wash.

The new alignment has been divided into six activation sections comprising:

1. Upstream diversion of flow from the existing Seadown Drain.
2. Tributary connection location 1.
3. Wetland pond connection location 1.
4. Tributary connection location 2.
5. Wetland pond connection location 2 and associated contouring works.
6. Downstream confluence area where the new and existing channels merge before discharging approximately 150 metres downstream into Waitarakao Lagoon.

The new alignment will initially be excavated in the dry and remain isolated from flowing water. Following excavation and stabilisation, staged connection of each section will occur, beginning near the downstream end and progressing upstream. Sufficient time will be allowed between each connection stage to permit hydraulic adjustment and settlement of suspended sediment.

Method (To be Refined by Contractor)

- Install erosion and sediment control measures.
- Establish stabilised site access points.
- Install stockpile and runoff control measures.
- Excavate the new drain alignment offline.
- Shape and contour channel bed and batters.
- Construct stopbank using suitable excavated material.
- Establish separation plugs between activation sections.
- Allow groundwater to accumulate naturally where encountered.
- Undertake stabilisation and planting works where required.
- Open downstream confluence section.
- Progressively connect wetland and tributary inflows.
- Monitor water quality and sediment response following each connection.
- Allow hydraulic conditions to stabilise between activation stages.

- Undertake staged diversion of existing Seadown Drain flow into the new alignment.
- Progressively decommission the existing drain alignment.
- Complete final stabilisation works.

Erosion and Sediment Control Measures

Discharge Locations and Overland Flow Paths

Primary Discharge Pathways

Potential sediment generating activities include:

- Excavation of the new channel alignment.
- Construction of stockpiles and stopbank embankments.
- Rainfall ran off from exposed ground surfaces.
- Tributary connection works.
- Wetland connection works.
- Diversion of flows from the existing Seadown Drain.
- Decommissioning works within the existing channel.

All runoff generated from construction activities ultimately drains toward Waitarakao Lagoon either via the existing drain network or the new alignment.

Control Measures

Stockpiled Material

Excavated clay and suitable material will be stockpiled and windrowed adjacent to the works area for subsequent reuse in stopbank construction.

Control measures will include:

- Placement on flat ground where practicable. With no stockpiles located where runoff from them can enter connected waterways.
- Maintaining setbacks from waterways and wetland margins.
- Progressive shaping and compaction.
- Installation of silt fencing, sediment socks or earth bunds where runoff pathways develop.
- Progressive reuse to minimise stockpile duration.
- Inspection following significant rainfall events.

Excavated Channel

The new alignment will be excavated and shaped to design geometry.

Control measures include:

- Progressive trimming of batters.
- Removal of loose sediment accumulations where practicable.
- Retention of groundwater ponding where appropriate.
- Progressive stabilization of completed sections. Ie hydroseeding prior to connection with upstream cell.
- Restriction of unnecessary vehicle movements within completed channel sections.

Heavy Rainfall Controls

Where heavy rainfall is forecast: i.e. Timaru District Council's stormwater design guidance below. Metservice forecasting should be used to provide guidance if stop work action or a form of mitigation is required.

Return Period (ARI)	1-hour rainfall depth
10-year storm	25 mm in 1 hour
20-year storm	32 mm in 1 hour
50-year storm	42 mm in 1 hour
100-year storm	50 mm in 1 hour

- Non-essential earthworks will be reduced or suspended.
- Active stockpiles will be inspected and secured.
- Temporary sediment controls will be reinforced.
- Newly excavated channel sections will be inspected.
- Flow connection activities will be postponed where increased sediment mobilisation risk exists.

Working in Flowing Water

Connection of tributaries, wetlands and operational channel flows presents the highest sediment risk associated with the project.

Controls include:

- Staged connection approach.

- Having a relatively clean channel scraped free of significant deposits of silt and fine material
- Existing groundwater as a flow dampener, particularly with progression upstream and final connection.
- Staged commission of new alignment channel i.e. flow sharing over a period of days, prior to shutoff.
- Use of sediment control fences, haybales, rock bags or appropriate devices for flowing applications.
- Maintaining isolated sections until activation.
- Minimizing bed disturbance during breakthrough excavation.
- Undertaking works during suitable weather conditions.
- Monitoring downstream receiving environments during activation.
- Suspending works if excessive turbidity occurs.
- Allowing stabilization periods between activation stages. This allows an equilibrium to develop where connection criteria are met ie <35% difference in visual clarity between the water in the existing drain and 50m downstream in the new alignment channel.
- Ceasing works if flow in drain exceeds a flow of 0.8 cumecs.
- Ceasing works if a heavy rain event occurs, see guidance in Heavy Rainfall Controls section above.

The criteria listed above are documented as accepted by project engineer and/or contractor prior to works in water commencing.

Water Quality Monitoring and Device Maintenance

Water Quality Monitoring Requirements

Water quality monitoring will focus on:

- Visual water clarity. Ie use of Schmak tube or black disc
- Suspended sediment generation.
- Sediment plume extent.
- Effects on wetland habitats.
- Effects on Waitarakao Lagoon.

Construction activities shall not result in conspicuous changes in colour, clarity or deposition of sediment outside the immediate mixing zone associated with connection works.

Monitoring attention shall be given to:

- Tributary connection points.
- Wetland pond connection points.
- Existing channel diversion point.
- Downstream confluence area.
- Lagoon receiving environment.

Proposed Water Quality Monitoring

Excavation Works

- Daily visual inspections.
- Inspection of stockpiles and stopbank construction.
- Inspection of runoff pathways.
- Inspection of sediment control measures.

Rainfall Events

- Inspection before significant rainfall.
- Inspection during significant rainfall where safe.
- Inspection immediately following rainfall events.

Connection Activities

Monitoring shall occur:

- Prior to connection.
- During connection.
- Following connection.
- Prior to commencement of subsequent connection stages.

Monitoring locations:

- Upstream reference location.
- Active connection location.
- Downstream receiving environment.
- Waitarakao Lagoon observation point where applicable.

Records shall include photographs, weather conditions, observations and corrective actions implemented.

Device Maintenance and Management

Stockpile Controls

- Weekly inspections.
- Post-rainfall inspections.
- Repair and maintenance of bunds and sediment controls.
- Removal of accumulated sediment when controls reach 50% capacity.

Sediment Controls

- Regular inspections.
- Immediate repair of damage.
- Replacement where functionality is compromised.

Flow Connection Areas

- Inspection before and after activation works.
- Monitoring of bank stability.
- Monitoring of unexpected scour or erosion.
- Adaptive management response where required.

Contingency and Incident Management

Triggers and Actions

Excessive Turbidity

If excessive sediment plumes are observed downstream of connection works:

- Cease connection activities.
- Allow sediment settlement.
- Review construction methodology.
- Implement additional controls where required.

Heavy Rainfall Event

- Suspend non-essential earthworks.
- Secure stockpiles.
- Reinforce erosion and sediment controls.
- Delay channel activation activities.

Stockpile Failure

- Repair affected area immediately.
- Reinstate containment measures.
- Recover displaced material where practicable.

Unexpected Erosion or Scour

- Stop the relevant activity.
- Stabilise affected area.
- Undertake remedial earthworks.
- Review activation methodology.

Methodology for Site Stabilisation and Decommissioning

Paused or Abandoned Works

If works cease for more than five working days:

- Stabilise exposed soils.
- Maintain sediment controls.
- Maintain stockpile protection measures.
- Undertake inspections following rainfall.
- Implement temporary seeding where appropriate.

On Completion of Works

- Complete channel shaping and stabilisation.
- Complete stopbank construction.
- Stabilise disturbed surfaces.
- Remove temporary erosion and sediment controls.
- Establish final vegetation.
- Confirm successful activation of the new alignment.
- Complete decommissioning of authorised sections of the existing channel.

Required Drawings and Details

Appendix A

- New channel alignment figure 1
- Six activation sections.
- Tributary connection locations.
- Wetland connection locations.
- Confluence location.
- Stockpile locations.
- Stopbank construction areas.
- Sediment control measures, (instream and land based)

Appendix B

Silt Fence

(Existing detail can remain)

Stabilized Construction Entrance

(Existing detail can remain)

Sediment Sock

TBA

Earth Bund

TBA

Stockpile Management Detail

TBA

Stopbank Construction Cross Section

TBA

Channel Activation and Staged Connection Plan

TBA

Wetland Connection Detail

TBA

Tributary Connection Detail

TBA

Existing Dewatering Energy Dissipation Structure

TBA / Not Applicable

Dewatering Baffle Tank

TBA / Not Applicable

Appendix A

Figure 1. Construction sections for phase 1.

The following figures (2-6) show the erosion and sediment control measures for Stage 1 Phase 1

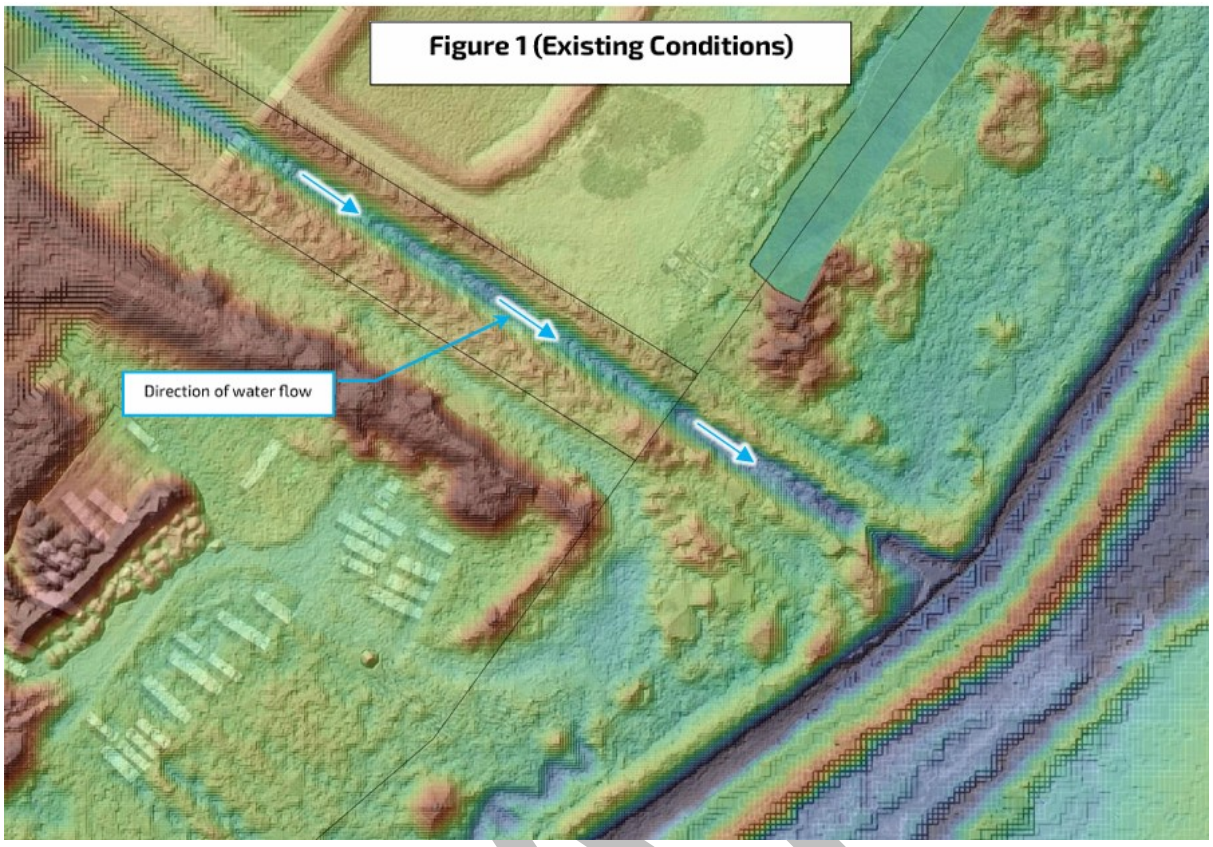

Figure 2 Tributary (No1 drain) connection

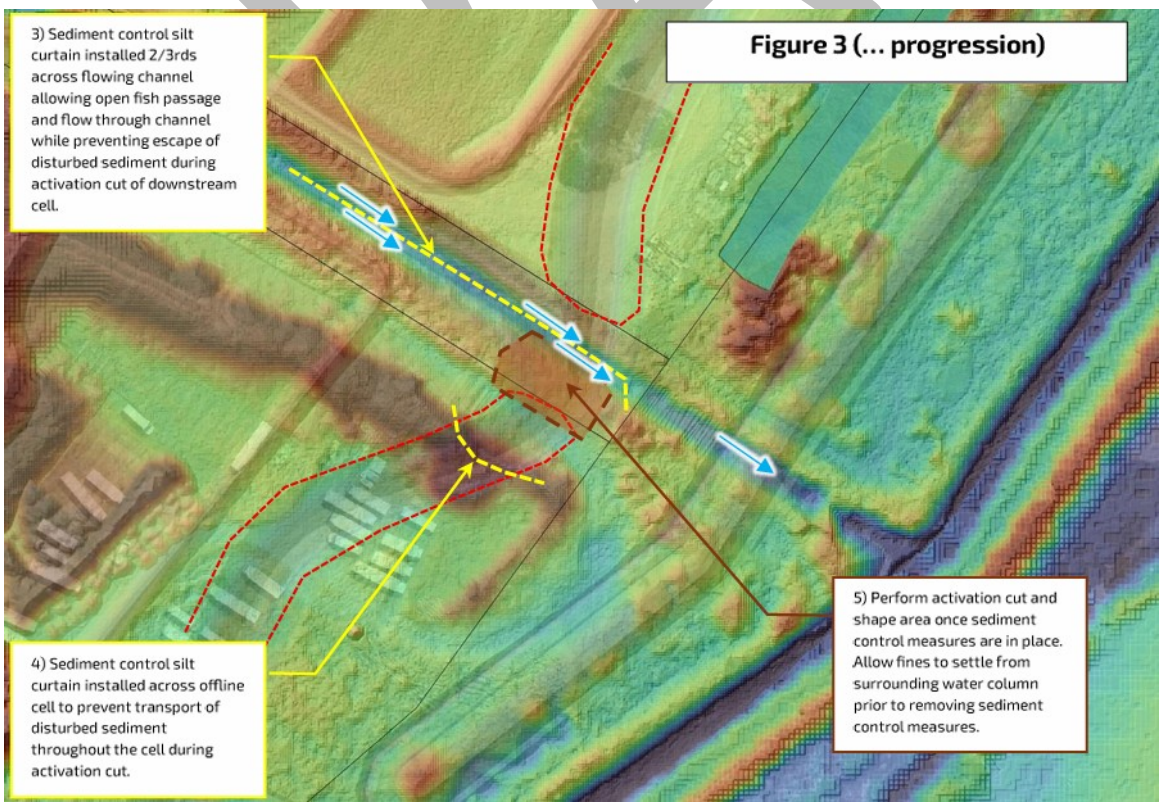

Figure 3 Erosion and sediment control for No 1 Drain.

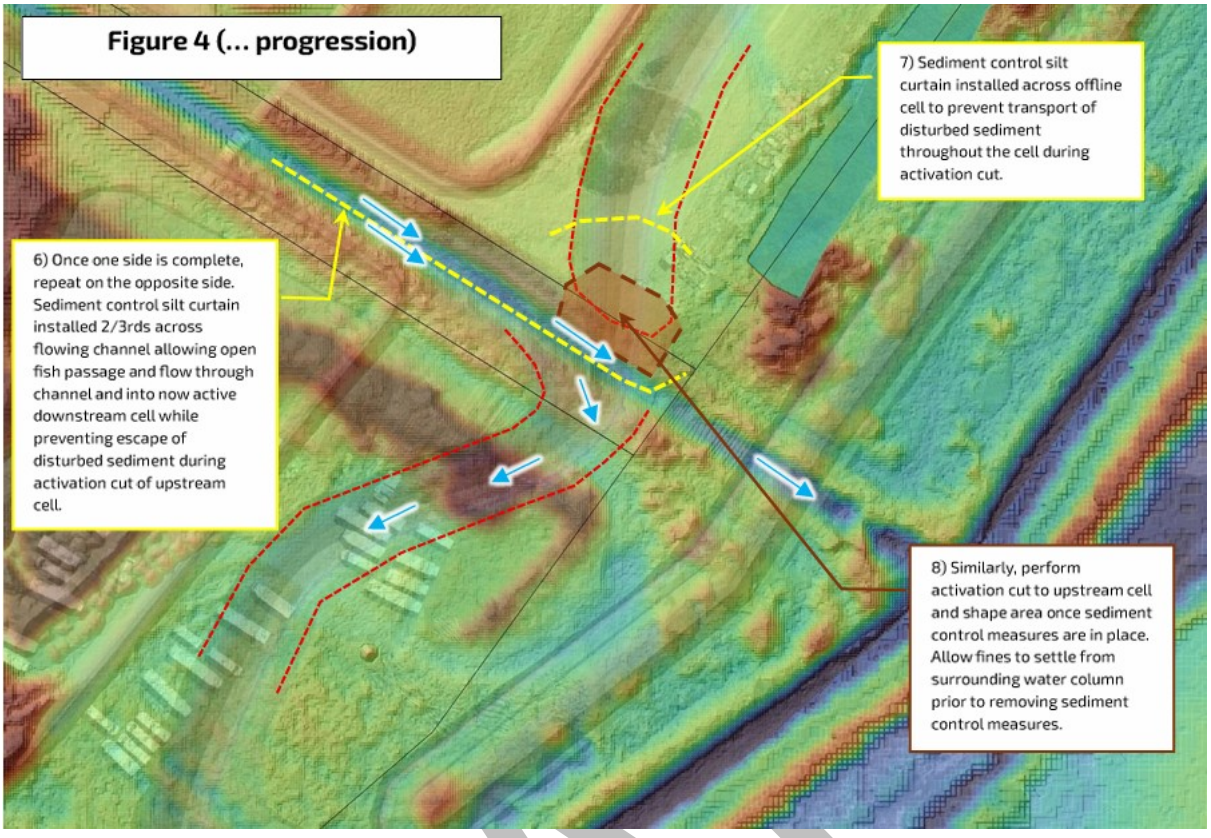

Figure 4 Sediment control and connection of lower section to No 1 drain

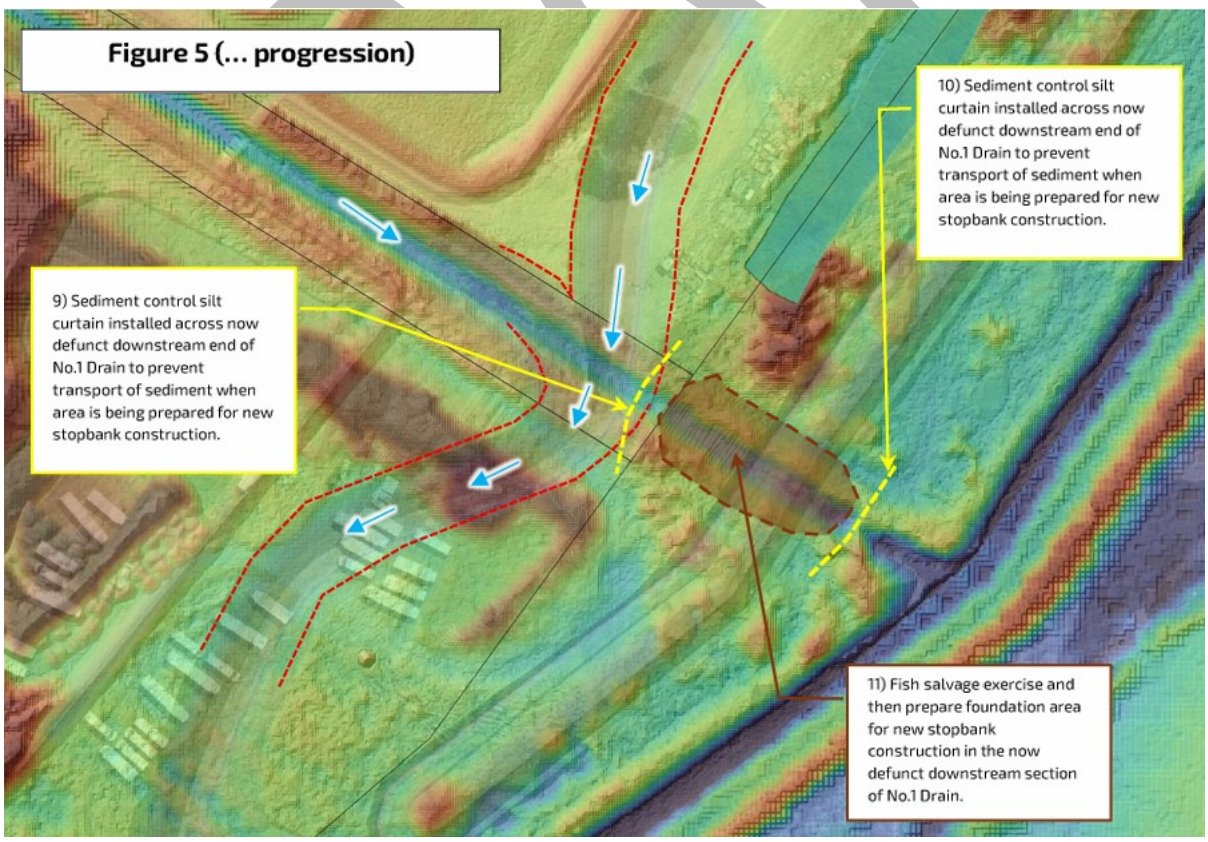

Figure 5 Erosion and sediment control for cutoff end of No 1 drain

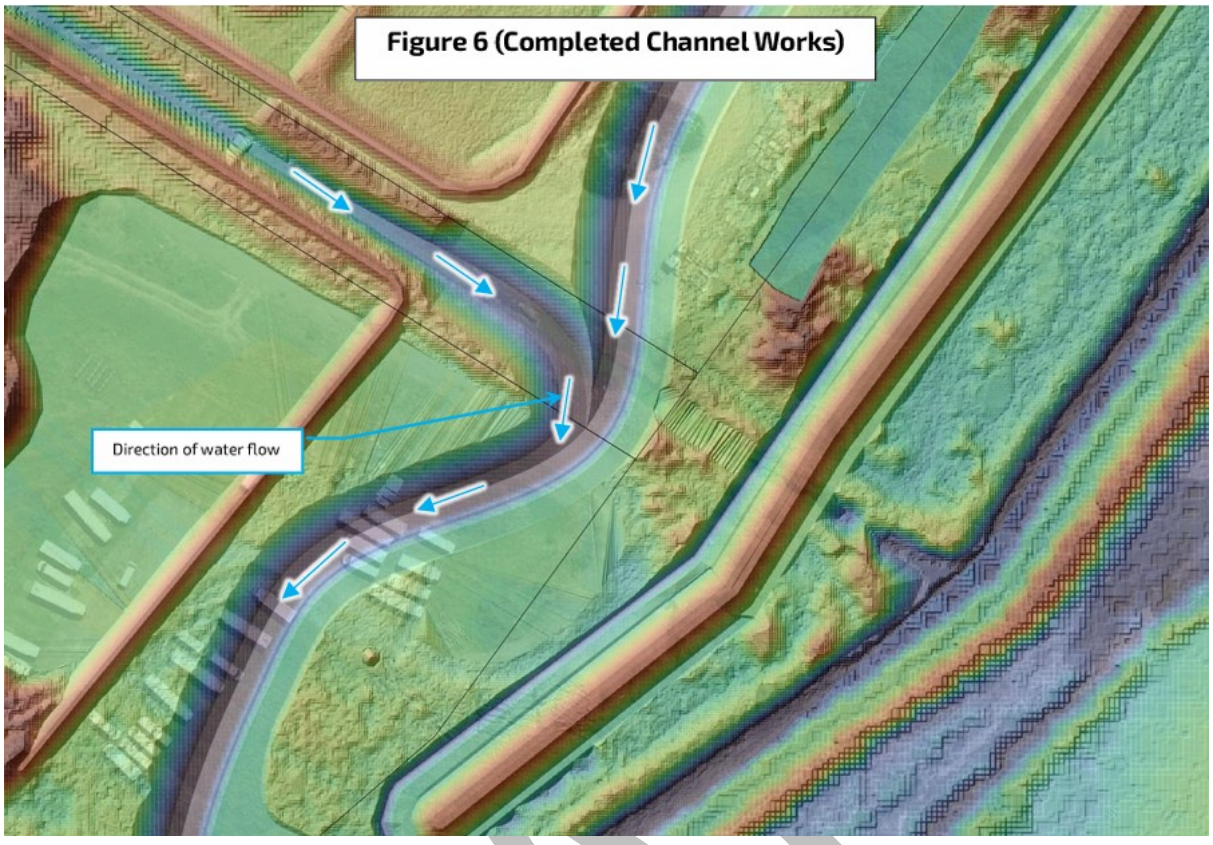

Figure 6. Completed first section for Phase 1

Attachment 4

Draft Fish Management Plan

Version control: 16 August 2026. Initial draft prepared to support consent processing

Freshwater Fish Management Plan Seadown Drain Realignment Project, Timaru.

Introductory statement:

Seadown Drain is one of the main tributaries of Waitarakao – Washdyke Lagoon. The Drain flows along the coastal strip of land north of Timaru. The continual process of coastal erosion and subsequent threats from overwashed beach material will eventually inundate and infill the current drain channel. This situation has required Environment Canterbury (ECan) and predecessors to respond and progressively move stopbanks and the Seadown Drain landward over decades. A new alignment of Seadown Drain further inland is now required in response to this ongoing coastal process.

The drain is connected to the sea via Waitarakao lagoon that has a piped outfall that allows migratory fish species access to the sea in order to complete their lifecycles. These species are freshwater eel species, inanga, lamprey, and common bullies. Other fish species like upland bullies reside entirely in freshwater. Some species are only found in brackish water i.e. estuarine areas like triplefin bullies, while others like yelloweyed mullet are predominately a saltwater species that frequent estuarine areas as tidal visitors in search of food.

Fish species that are commonly associated with, and have suitable habitat within Waitarokao catchment are

- Longfin eel (Anguilla dieffenbachii)
- Shortfin eel (Anguilla australis)
- Inanga (Galaxias maculatus) inaka
- Common bully
- Upland bully
- Common smelt
- Lamprey
- Yellow eyed mullet
- Esturine triplefin spp

Version control: 16 August 2026. Initial draft prepared to support consent processing

The primary objective of the Seadown Drain Fish Management Plan is to facilitate freshwater fish transition via passive fish emigration from the existing drain to the newly constructed channel and Washdyke Lagoon through a transition of progressive flow reduction and maintenance of fish passage connectivity. Active fish rescue will be undertaken during construction at connection points within the existing waterway network, or where monitoring indicates an unacceptable risk of fish stranding, isolation, or mortality. The plan will provide opportunities for Te Rūnanga o Arowhenua participation in fish rescue, relocation, and customary harvest activities where appropriate.

This Fish Management Plan supplement information provided in Resource Consent application package CRC264624 et al.

1. Purpose and objectives

The purpose of this Fish Management Plan (FMP) is to:

a. Minimise adverse effects on freshwater fish communities associated with construction of the Seadown Drain realignment.
b. Support natural fish movement and self-recolonization of the new alignment wherever practicable.
c. Provide fish salvage and relocation where:
d. Areas are to be infilled
e. Environmental monitoring identifies a risk of fish stranding or mortality.
f. Te Rūnanga o Arowhenua participation in fish rescue, relocation, and customary harvest activities where required.
g. Establish monitoring, reporting and adaptive management procedures during diversion of flows and retirement of the existing Seadown Drain.
h. Be prepared for staged blocking-off of the retired drain, if required.
i. Ensure compliance with all relevant resource consent conditions, permits and statutory requirements.

2. Scope

This Plan applies to:

a. Construction and connection of the new Seadown Drain alignment.
b. Retirement of the existing drain.
c. Fish salvage and relocation activities.
d. Post-diversion monitoring and management of the existing drain.
e. Any isolated channel sections, side drains, wetlands or waterbodies affected by construction works.

3. Preparation, Review and Certification

a. The Fish Management Plan shall be prepared prior to commencement of any activity that may require fish salvage, relocation, diversion of flow, or dewatering.
b. The Plan shall be submitted to the Consent Authority Compliance Team for certification.
c. The Plan may be updated and resubmitted from time to time to reflect:

- Monitoring results;
- Changes to construction sequencing;
- Improved information on fish populations or habitat conditions;
- Any other relevant matter; or
- Recommendations from the Rivers Environmental Advisor(s), Te Rūnanga o Arowhenua representatives or other Suitably Qualified Experts.

4. Roles and Responsibilities

Project Manager: Responsible for overall delivery of the project and ensuring works are planned and scheduled to ensure a Suitably Qualified Expert delivers the Fish Management Plan implementation ahead of, during and after each stage progression.

Project Environmental Advisor: Is a Suitably Qualified Expert in fish salvage with demonstrated experience and knowledge in Canterbury lowland waterways. Their responsibilities are:

a. Delivering the Fish Management Plan and lodging it for certification;
b. Site visits before, during and after works to monitor the aquatic environment;
c. Engaging with Te Rūnanga o Arowhenua;
d. Site and fish trap methodology selection;
e. Setting, or overseeing the setting of traps, monitoring and recording results;
f. Undertaking, or overseeing electric fishing;
g. Selecting suitable habitat to relocate any fish trapped or caught;
h. Revising the suitability of the Fish Management Plan and updating as required.
i. Ensuring compliance with Resource Consent conditions that relate to fish management.

Te Rūnanga o Arowhenua / AEC Representatives: Tangata whenua representatives will be given opportunity to participate in fish management planning and delivery to provide cultural input into fish relocation and monitoring.

Other Suitably Qualified Experts: As required, other Suitably Qualified Experts will be engaged to advise on decision points relating to the timing and types of actions required.

5. Permit and Health and Safety requirements of fish salvage.

The protocol below sets out the requirements, training and authorisations for the use of electric fishing machines at Environment Canterbury.

The Environment Canterbury Electric Fishing Protocol (version 2024)

The following permits are held by Canterbury Regional Council to enable fish salvage and research activities:

a. MPI Special Permit (SP831).
b. Ecan Sportsfish Permit_FG South Canterbury
c. ECan DOC electric fishing authority

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Fish salvage activities shall be undertaken in accordance with:

a. Environment Canterbury Fish Salvage Protocols. Guidance for the rescue of freshwater fish within Canterbury waterways can be found in
b. A Protocol for fish salvage in times of water scarcity- Environment Canterbury September 2024
c. Burrell & Gray. 2017. Fish Salvage Guidance for Works in Waterways.
d. Electrical safety requirements for backpack electrofishing.
e. Working around water safety procedures
f. Manual handling requirements.
g. A task-specific risk assessment and toolbox meeting shall be completed prior to fish salvage works.

6. Timing

The project will go through a cycle of digging off-line cells, connecting those cells to flowing channels, infilling some sections, staged dewatering of the retired drain, and longer-term monitoring. Each stage will have specific fish management requirements. Some works will require monitoring only or fish salvage only when triggers are reached. Sections that are to be filled will require active fish salvage and relocation.

Holding spot for a decision tree to describe the relationship and triggers for monitoring, salvage triggers, salvage actions etc

7. Monitoring retired sections

Monitoring may include:

a. Visual inspections
b. Electrofishing surveys.
c. Fyke netting.
d. Gee-minnow trapping.
e. Water quality monitoring (temperature and dissolved oxygen, spot measurements and telemetered via HydroTel)

Monitoring locations shall include:

a. Existing Seadown Drain.
b. Newly established drain alignment.
c. Transitional areas associated with tributary connections and flow diversions.
d. Any isolated areas or wetlands.

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8. Fish Salvage Triggers

Fish salvage may be undertaken where one or more of the following triggers occur.

Construction Triggers:

a. Dewatering of any channel section.
b. Permanent isolation of a waterbody.
c. Channel infilling.
d. Culvert installation resulting in fish entrapment risk.
e. Environmental Triggers

Monitoring identifies:

a. Fish stranding.
b. Isolated pools.
c. Critically low water levels.
d. Excessive aquatic weed growth.
e. Blocked channel sections.
f. Reduced connectivity.
g. Low dissolved oxygen concentrations.
h. Elevated water temperature.
i. Other conditions likely to result in fish mortality.

Existing Drain Retirement Triggers

a. As the existing drain transitions to a groundwater-fed wetland system:
b. Monitoring identifies declining fish abundance but fish remain trapped in isolated reaches.
c. Water quality has deteriorated sufficiently to create fish health risks.
d. Connectivity to the lagoon or new alignment has been lost.

9. Fish Capture Methodologies

The primary methods may include:

a. Backpack electrofishing.
b. Fyke nets.
c. Rūnanga nets.
d. Hand netting.
e. Gee-minnow traps.

Method selection shall be based on:

a. Fish species present.
b. Water depth.
c. Water conductivity.
d. Vegetation density.
e. Site accessibility.
f. All captured fish shall be handled using recognised fish salvage protocols.

10. Relocation Methodologies

Captured fish shall be relocated as soon as practicable following capture.

Preferred release locations include:

a. Upstream reaches connected to Phillips Lagoon and the operational drain network.
b. Suitable sections of the new Seadown Drain alignment.
c. Downstream reaches connected to Waitarakao/Washdyke Lagoon.

Release sites shall:

a. Have adequate water quality.
b. Provide suitable refuge habitat.
c. Maintain fish passage connectivity.
d. Be free from immediate construction disturbance.

11. Fish Population Assessment and Regression Monitoring

Existing Drain

The intention is to allow natural fish movement from the existing drain wherever possible.

Monitoring shall evaluate:

a. Species composition.
b. Relative abundance.
c. Evidence of natural emigration.
d. Isolated Reaches and Areas to be Filled

Where works result in isolated channel sections or channel infilling:

a. Multi-pass electrofishing will be undertaken.
b. Depletion estimates may be used to determine fish abundance.

Prior to infilling:

a. Fish abundances should be reduced to the satisfaction of the Fish Salvage Lead.
b. Target reductions of greater than 80% may be adopted where practical and safe.
c. This approach is not intended to apply to the full length of the existing Seadown Drain while downstream connectivity remains available.

12. Establishment of Fish Populations in the New Alignment

The primary mechanism for population establishment will be natural migration and colonisation.

Supplementary relocation may be undertaken where monitoring indicates:

a. Delayed colonisation.
b. Low fish densities.
c. Habitat establishment has occurred but fish populations remain low.

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13. Biosecurity and Pest Management

To prevent transfer of pest species and contaminants:

a. Equipment shall be cleaned before entering and leaving sites.
b. Nets, traps and electrofishing equipment shall be disinfected where appropriate.
c. Equipment shall be dried between waterbodies where required.
d. Sediment and vegetation shall be removed from equipment prior to transport.
e. Any new pest species observations shall be recorded and reported.

14. Progressive Diversion Management

The diversion of flows from the existing drain shall occur progressively.

Management tools may include:

a. Staged reduction of inflows.
b. Temporary transfer of freshwater to maintain conditions in the retiring drain where practicable.
c. Management of connectivity between the old and new systems.
d. Weed cutting where necessary to reduce risk of oxygen depletion associated with vegetation die-off and to enable fish passage.
e. Increased monitoring during summer periods and during periods of excessive weed growth.

15. Contingency Measures

If monitoring identifies elevated fish mortality risk, the following responses may be implemented:

a. Increased frequency of fish rescue.
b. Additional fish salvage operations.
c. Temporary freshwater supplementation.
d. Channel maintenance to maintain connectivity.
e. Weed cutting.
f. Removal of blockages.
g. Delaying diversion or construction activities.
h. Temporary installation of pumping or water transfer systems.
i. Additional ecological monitoring.
j. Response actions shall be determined by the Project Environmental Advisor with advice from Te Rūnanga o Arowhenua and other Suitably Qualified Experts.

16. Reporting

A Fish Management Report shall be prepared following implementation of fish salvage works.

The report shall include:

a. Dates and locations of salvage activities.

b. Methods used.
c. Species captured.
d. Numbers captured (where practicable).
e. Relocation sites.
f. Monitoring observations.
g. Fish mortality records.
h. Trigger events encountered.
i. Contingency actions implemented.
j. Recommendations for future management.
k. Records required under any Fisheries Act permit or authorisation shall be maintained.

Monitoring data shall be made available to the Consent Authority upon request.

17. Plan Review

This Plan shall be reviewed:

a. Following major diversion milestones.
b. Following fish mortality events.
c. Following implementation of contingency measures.
d. At least annually during active implementation.

Attachment 5

Water quality and ecology science advice

Science Advice

Date	17 August 2026
To	Jolene Irvine
CC	
From	Shirley Hayward – Team Leader, Water Ecology Science Michele Stevenson – Senior Scientist, Water Quality Science

Input from Water Quality & Ecology Science to response to Information Requested under Section 92 of the RMA 1991 Application Numbers: CRC264624, CRC264625, CRC264626, CRC264627 and CRC264628

Introduction and Purpose

The Rivers Section of the Canterbury Regional Council (CRC) has applied for a suite of consents to enable Phase 1 of the realignment of Seadown Drain to be undertaken. A request for further information (RFI) has been provided (dated 1 July 2026). This advice note addresses several questions in the RFI related to water quality and aquatic ecological impacts and monitoring.

Our responses to the relevant RFI questions are in blue text below each question.

Questions and responses

10. Monitoring – water quality and ecology of the existing alignment

The AEE and Appendix 6 Ecology Assessment describe that monitoring of the old Seadown Drain alignment will be carried out following the diversion. The proposed monitoring is for water temperature and dissolved oxygen with the recommendations in Appendix 6 suggesting monitoring from 1 November to 30 April for the first year following construction as this "*should provide sufficient time to assess water quality risks and adjust flows through the old channel, as required*."

The technical review of the AEE and Appendix 6 concludes that the description of this monitoring currently lacks sufficient detail to fully assess its adequacy. It is suggested that at a minimum, monitoring should occur during the first summer following commissioning of the new drain. However, given the uncertainty associated with how the old channel will function hydraulically and ecologically, consideration should be given to extending monitoring into subsequent years.

a. Please identify what baseline information is available on current water quality of Seadown Drain.

Environment Canterbury Science teams have been monitoring water quality at sites in and around Waitarakao/Washdyke Lagoon since late 2016 as part of a research

study to investigate stormwater, industrial and rural contaminant inputs to Waitarakao/Washdyke Lagoon. This includes a site in Seadown Drain that is located just upstream of its confluence with No. 1 Drain (Figure 1). In situ measurements and water samples are taken monthly. The following parameters are measured/analysed: spot measurements of water temperature, dissolved oxygen, conductivity, pH, nutrients (dissolved and total forms of nitrogen and phosphorus), sediment (total suspended solids and turbidity), *E. coli* and metals. Data from this programme are currently being analysed and a Science Summary report is being prepared.

The analysis and reporting of this programme will include recommendations for ongoing monitoring. It is likely that some of the sites in the current investigation will continue to be monitored, including Seadown Drain and Waitarakao/Washdyke Lagoon. This means the current water quality site in Seadown Drain will be moved to a similar location within the new channel following the realignment. As always with our monitoring programmes and research, the extent of this monitoring over time will depend on organisational priorities and LTP funding.

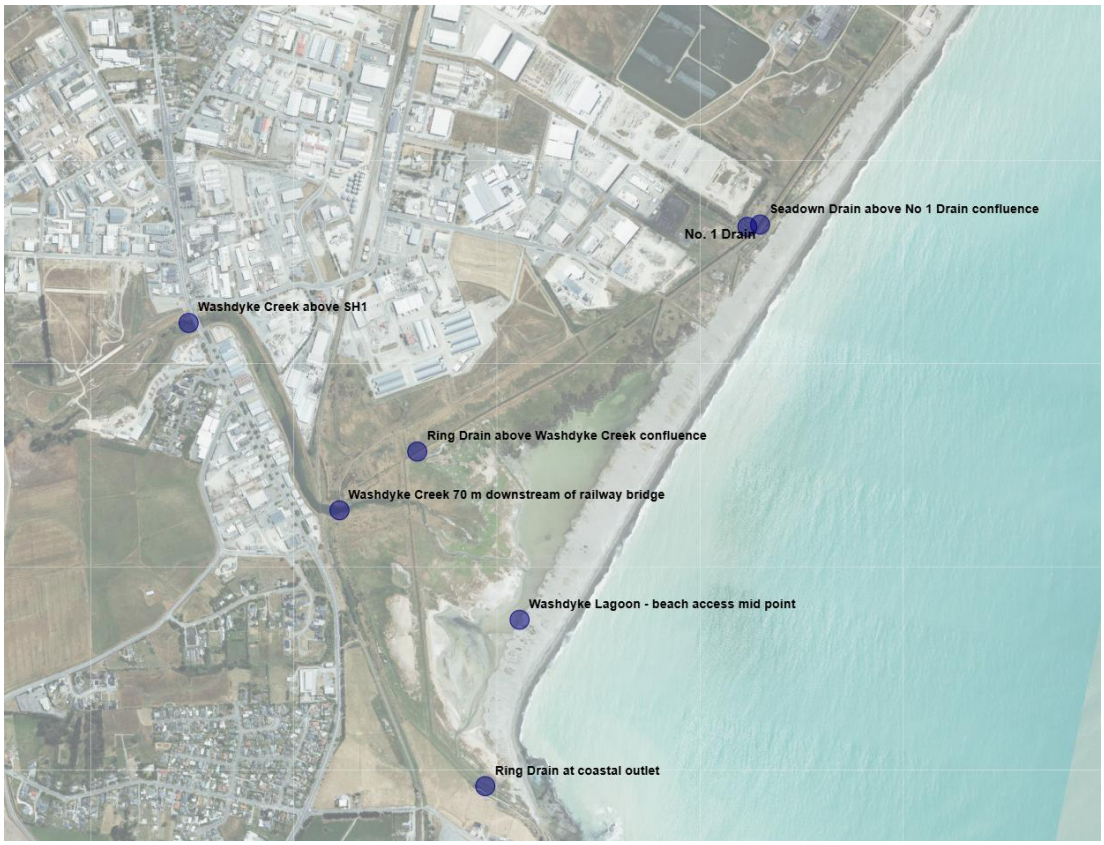

Figure 1: Location of current monthly water quality monitoring sites in Waitarakao/ Washdyke catchment

b. Please confirm how water quality will be monitored in the existing and new alignment following the diversion into the new drain alignment (i.e., locations, methods, frequencies, trigger values, reporting requirements).
c. What is the proposed duration of water quality monitoring? Will monitoring duration be dependent on the water quality or drain conditions observed?
d. What adaptive measures are proposed should unfavourable water quality be recorded in the drain during monitoring?

The intention is for monthly water quality monitoring to continue in Seadown Drain within the new alignment. This monitoring is part of the Science group programme and is dependent on organisational priorities and LTP funding. Therefore, some uncertainty exists beyond the current year (up to June 2027).

Depending on the timing and duration of the works around our existing monitoring site (just upstream of No. 1 Drain), we expect to cease monitoring the site on the old drain and include a new site for monthly water quality monitoring in the newly aligned drain once full water flow is occurring. This may result in a gap in monthly data. This is unavoidable and is not of great concern for the research programme's objectives. The datasets from before and after the Seadown Drain realignment will allow an assessment of any changes in water quality resulting from the drain shift. At least one year of monthly data collected from the new site would be needed for any comparisons to be assessed.

In addition to the above water quality monitoring, the CRC Science Section has installed a DO/temperature sensor in Seadown Drain upstream of the reach affected by this application (i.e. around Seaforth Settlement Road). This is intended to remain in place for several years and will provide longer-term information about the dissolved oxygen regime of the existing drain.

In terms of monitoring the impacts of this application, the key potential water quality concerns are high temperatures and low dissolved oxygen levels in the old channel once flows are diverted, and sediment discharges during tie-ins with the new channel. We agree with the recommendation of Instream Consulting (Appendix 6 of AEE) to monitor the old channel for dissolved oxygen and temperature. We agree that the summer-autumn months from 1 November to 30 April are the appropriate period to monitor water temperature and dissolved oxygen (DO), as this presents the highest risk of these adverse conditions occurring. This will be most effectively achieved through a telemetered sensor that will monitor conditions on a high-frequency basis with the capability to set alarms at agreed trigger points. We consider that only one telemetered sensor is needed. It is intended to act as a trigger for inspection of the remnant drain.

The triggers recommended in the PDP technical review are appropriate, but we suggest a two-trigger approach that reflects increasing risk of fish stress and an increased need for inspections and possible interventions, such as weed removal and/or fish salvage/relocation:

First trigger:

- Daily minimum DO is less than 4 mg/L but not less than 3 mg/L, or temperature is >20°C but less than 25°C.
  - Action: we recommend that an inspection of the length of the old channel is undertaken within 3 days. If fish stress is apparent, implement an intervention plan with a suitably qualified freshwater ecologist.

Second trigger

- Daily minimum DO is less than 3 mg/L, or temperature is >25°C.
  - Action: we recommend that an inspection of the length of the old channel is undertaken within 1 day. If fish stress is apparent, implement an intervention plan with a suitably qualified freshwater ecologist.

We understand that the intention is for the downstream outlet from the old channel to remain open for an undefined period to allow for fish ingress and egress, with an adaptive management approach to be taken to fish salvage and channel infilling depending on the conditions that are observed and monitored following activation of the new alignment. It is envisaged that the upstream end of the old channel will become dry or contain only a small amount of water. The downstream end of the channel may continue to have water inflow and outflow, depending on the water level of the lagoon. We therefore recommend that the DO and temperature monitoring and response remain in place for at least two years to build an understanding of how the old channel will behave and what management, if any, is needed.

We also suggest that the old channel should be closed off within two years of completion of works, or that upstream sections that no longer have regular water present should at least be closed off. This would need a comprehensive fish salvage to occur before this time to remove as many remaining fish as possible from the section to be closed off.

To summarise, we recommend the following (assuming that works will be completed in the first half of 2027):

- Telemetered monitoring of DO from November 2027 to April 2028;
- Fish salvage during the monitoring period as required based on agreed triggers;
- Closure of the outlet of the old channel in winter 2028, with fish salvage as required.

The AEE also describes that the existing drain alignment will be monitored and managed for invasive weed.

e. Will nuisance aquatic flora and algae be monitored in the existing drain?

The existing drain is expected to fill in with vegetation and organic matter over time. Given we expect the old channel to have only a small amount of water, the vegetation is likely to develop as wetland/terrestrial vegetation. Inevitably, some weedy/nuisance vegetation species will establish. Like other council-owned infrastructure, the Rivers

Section will manage these areas to ensure compliance with the Regional Pest Management Plan. Annual inspections would be beneficial to monitor for unwanted and nuisance vegetation. Once vegetation is established (after ~2 years), ongoing targeted monitoring is unlikely to be necessary.

We do not expect algae to develop in the old channel unless it retains flowing or ponded water; for example, the downstream reach may develop algae. The current nutrient-enriched state of Seadown Drain means that thick floating vegetation (Azolla) has been observed at times during low-flow periods. While we do not consider routine monitoring necessary, such observations will be important when inspections are undertaken if DO/temperature triggers are reached. Dense growths of Azolla can cause localised oxygen depletion.

The technical review observes that reduced throughflow in the old channel may increase the risk of low dissolved oxygen, elevated water temperatures, excessive macrophyte growth, algal proliferation, and periodic fish stranding during low flows. This could lead to adverse effects on the downstream Waitarakao/Washdyke Lagoon.

f. Please confirm whether the water quality (and potentially nuisance aquatic flora and algae) monitoring programme be extended to the downstream Waitarakao / Washdyke Lagoon to identify potential changes that could be correlated to changes in the existing drain?

a. What adaptive measures are proposed should unfavourable water quality be recorded during monitoring?

Once the realignment works are complete and the new channel is active, we consider it unlikely that the outflow from the old channel could lead to adverse conditions within Waitarakao/Washdyke Lagoon. This is because flows from this channel will be much reduced and will mix with the higher flows from the new Seadown Drain alignment before reaching the lagoon. If triggers are breached during the temperature/DO monitoring described above, we envisage that a team of trained staff will be deployed to inspect the area and undertake fish salvage operations, if required. These inspections should include the Seadown Drain channel downstream of the old channel outlet, as well as the upper area of Waitarakao/Washdyke Lagoon where Seadown Drain enters. Our recommendation to close the old channel outlet within two years of works completion provides a defined and certain time period for these potential effects to occur, limiting risk to the environment and mitigation costs.

Regarding adaptive management measures, we have outlined a monitoring and response approach for the old channel above.

11. Monitoring – sediment discharges within new alignment

The proposed conditions include a requirement to assess water clarity change at a location 100m downstream of the discharge point when one works section is connected to another.

Schedule 5 of the LWRP provides direction on how mixing zone length is calculated. It appears that the proposed mixing zone length is inconsistent with this guidance.

a. Please provide further information to support a mixing zone length of 100 m, or adjust the mixing zone length so it is consistent with Schedule 5 of the LWRP.

To give greater confidence that the effect of excess sediment discharge on the downstream environment can be minimised, we suggest that 50 metres is a more appropriate mixing zone length for the visual clarity measurements. This is consistent with Schedule 5 of the LWRP. Based on the advice of the ecology report that supports the application, we agree that the discharge of sediment-laden water downstream during tie-in is likely to be short-lived and low risk. This is based on advice about how the tie-ins of waterways are proposed to be undertaken. We agree that the disturbance and discharge should not cause a greater than 35% change in visual clarity beyond 50 metres downstream.

Appendix 16 recommends water quality sampling for clarity or turbidity immediately prior to each tie-in and suggests that tie-ins be delayed if the downstream section is already subject to more than a 35% decrease in clarity. The proposed conditions (condition 3 of the s15 discharge permit) state that discharges are measured 4 hours after the completion of works. Consent is also sought for the discharge of construction-phase stormwater.

From the AEE and appendices, it is not clear if sediment monitoring will occur in response to rainfall events or to determine how the channel is stabilising during commissioning.

b. Please provide further details on the proposed approach (if any) for monitoring sediment discharges from either bed disturbance activities, completing tie-ins of an upstream work section to the downstream section(s) and in response to rainfall events.

We agree that there is inconsistency between the advice provided by Instream Consulting on recommended water clarity monitoring and the proposed conditions. We consider that robust erosion and sediment control (E&SC) measures for works in and around waterways, with regular inspections and adjustments as required, are the most effective means of minimising sediment inputs. Visual clarity monitoring is one indicator of the effectiveness of E&SC measures, but it does not capture the effects of sediment that might settle within the mixing zone and can be difficult to carry out in a way that provides meaningful results.

Instream Consulting recommended clarity or turbidity monitoring prior to each tie-in, but we assume this relies on water being present at approximately 50 metres or farther downstream. Monitoring within 4 hours of the tie-in works and discharge commencing is a pragmatic and appropriate approach to target the highest-risk period for sediment inputs to water. We recommend avoiding undertaking these works during rainfall events. We do not consider it necessary to undertake clarity

monitoring associated with construction-phase stormwater, as these discharges will be contained within the offline reaches and onsite discharges to land.

We therefore recommend that clarity monitoring is undertaken when tie-in works involve working in water. Visual clarity should be assessed using a SHMAK clarity tube at a point upstream of the tie-in works and 50 metres downstream of the works, with the results compared to assess compliance with a limit of no more than a 35% decrease from upstream to downstream.

13. Monitoring – Ecological outcomes

The AEE notes that a positive effect of the proposal includes the wider area around the drain being actively enhanced which will increase biodiversity and amenity. It is also noted how the works support the objectives of *Our Waitarakao: Waitarakao Washdyke Lagoon Catchment Strategy.*

a. Is it proposed to monitor the long-term ecological outcomes of the proposed restoration and enhancement work for their effectiveness and to quantify biodiversity gains? If so, what monitoring is proposed?

Assessment of the long-term ecological outcomes of the Waitarakao catchment is certainly desirable for the broader Our Waitarakao strategy objectives. The CRC Science Section has undertaken fish and habitat surveys in the catchment waterways over the past two years. These surveys can be repeated in the future, subject to Long Term Plan funding, but we do not consider this a necessity or purpose of this application.

23. Effects associated with moving or removing the minimum flow site

Section 8.13.1 and Appendix 8 highlights that work is ongoing to establish a new permanent flow recorder site in the Seadown Drain, determine the relationship of and interim sites to existing data and assess the impacts of this on consent holders. The only effect from moving or removing this site assessed is how it impacts on the existing permit holders.

The technical reviews have highlighted that the AEE and supporting appendices do not address the potential effects of altering the minimum flow site on environmental flows and how the proposal will protect environmental flows in Seadown Drain.

a. What are the effects on aquatic ecosystem values associated with relocating the minimum flow site? How will environmental flows within Seadown Drain to Waitarakao be protected?

The proposal is to re-establish a minimum flow site in the new drain as soon as possible. We understand that the same minimum flow (150 L/s) will be applied to this new site. This minimum flow only has influence on flows during low flow periods.

This means that flows to Waitarakao / Washdyke Lagoon will be at least the same as the existing inflows to the lagoon, and possibly very slightly higher overall inflows.

In terms of instream ecological values, the habitat of the new alignment is likely to be an improvement over the current habitat quality. The overall shape of the stream channel will change and generally improve, with extensive riparian planting to be established that will offer shade and bank cover. We therefore consider that applying the existing minimum flow to the new flow recorder site will afford at least the same level of ecological protection to instream ecological values as currently exists. The proposed habitat enhancements will be an additional benefit.

Potential effects on Philips Lagoon

Section 6 of the AEE describes that one of the five key aspects informing the design of the new drain alignment is to ensure "*the drain is designed to carry at least the same flow as the existing one, while maintaining water levels in Phillips Lagoon*."

a. Please provide an assessment of the potential effects, if any, on water levels in Phillips Lagoon arising from Phase 1 works.
b. Please clarify if water levels in Philips Lagoon are currently or proposed to be monitored?

We understand that the design of the new drain realignment will ensure that there is no change to water levels within Phillips Lagoon. There is currently no monitoring of water level within Phillips Lagoon, and nor is there any proposed. On the basis that the design will not alter Phillips Lagoon hydrology, we do not consider water level monitoring is required to assess impacts of this application.

27. Potential effects on water quality – Wastewater Treatment Pond Seepage Discharge

CRC242246 is a discharge permit held by Timaru District Council to discharge contaminants to land via seepage from the base and sides of wastewater treatment ponds. While written approval has been provided from Timaru District Council, there is however limited assessment in relation to potential effects on water quality arising from shifting the drain alignment closer to the Wastewater Treatment Ponds.

a. To understand any implications on water quality and ecology within the new drain alignment, please provide the following:
    - Current seepage water quality.
    - Current contribution of seepage to Seadown Drain flows.
    - Existing water quality conditions downstream of seepage inputs.
    - Whether the drain realignment could alter groundwater flow paths or contaminant transport pathways.
    - Whether existing seepage contributes to aquatic habitat values through maintenance of baseflow.

Potential for wastewater pond seepage to affect Seadown Drain

Timaru District Council's (TDC) domestic wastewater is treated through a series of effluent treatment ponds. The industrial wastewater stream is managed separately and does not pass through these ponds. Consequently, any seepage from the treatment ponds would be expected to reflect the characteristics of the domestic wastewater treatment stream rather than the combined domestic and industrial wastewater discharged through the ocean outfall.

The potential for seepage from the ponds is controlled through the design and consent requirements for the wastewater treatment system. Condition 2 of CRC242246 requires all ponds to have a liner with a minimum thickness of 300 mm and a maximum vertical permeability of 1 × 10^-8 m/s. The liner must also be designed so that seepage through the pond floor does not exceed 5 L/m²/day. The purpose of these requirements is to substantially restrict, rather than completely prevent, movement of wastewater from the ponds into the underlying ground.

Condition 4 provides an additional control by requiring downgradient toe drains at least 1 m deep around the treatment ponds. Effluent seepage intercepted by these drains must be returned to the treatment ponds and cannot be discharged to surface water. Therefore, the conceptual pathway by which pond wastewater could reach Seadown Drain requires several steps: seepage must first pass through the pond liner, avoid interception by the toe-drain system, enter the underlying groundwater, migrate downgradient from the ponds, and subsequently be intercepted by Seadown Drain.

Information in previous compliance reports indicates that the pond liners were tested following their installation in 2013/14 and were reported to comply with the specified seepage requirements. This provides some evidence that the liner system was constructed to achieve the required permeability/seepage standard. However, some residual seepage to groundwater remains possible, as recognised by the consent monitoring conditions and provision of the toe-drain system.

Likely composition of pond seepage

There does not appear to be a consent requirement to routinely monitor the volume or water quality of seepage collected by the toe drains. Consequently, the actual quality of seepage from the treatment ponds cannot be directly characterised from the available monitoring data.

Monitoring of the domestic wastewater as it leaves the pond treatment system can, however, provide useful contextual information on the contaminants potentially present in pond seepage. Recent monitoring of the domestic wastewater stream indicates that it typically has a pH of approximately 8, total suspended solids concentrations generally around 20–130 mg/L, ammoniacal nitrogen around 15–31 mg/L, carbonaceous Biological Oxygen Demand$_5$day (BOD_5) around 14–59 mg/L and

Chemical Oxygen Demand (COD) around 80–270 mg/L. These concentrations are consistent with treated domestic wastewater.

The final domestic wastewater should not necessarily be assumed to have exactly the same composition as seepage from all parts of the pond system. Wastewater quality changes as it moves through the treatment ponds, and seepage may occur from different locations within the treatment train. Nevertheless, these monitoring results provide a reasonable indication of the types and approximate concentrations of contaminants that could potentially be associated with pond seepage.

Further attenuation and transformation would be expected where residual seepage passes through underlying sediments and groundwater before reaching a surface waterway.

Groundwater pathway to Seadown Drain

The WGA groundwater assessment indicates that groundwater beneath the Levels Plains predominantly flows towards the coast, with a large proportion of groundwater throughflow within the modelled area ultimately discharging offshore. Existing drains intercept some of this groundwater before it reaches the coast. The modelling indicates that approximately 7% of groundwater throughflow within the assessed depth interval is intercepted by the existing Seadown Drain.

This establishes a credible hydraulic pathway by which contaminants present in shallow groundwater could enter Seadown Drain. It is therefore possible that some wastewater seepage that is not intercepted by the pond toe drains could ultimately enter the drain.

Evidence from existing Seadown Drain water quality

TDC is required to monitor Seadown Drain upstream and downstream of the wastewater treatment ponds for faecal indicator bacteria, dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP). Historical monitoring has also included ammoniacal nitrogen.

Results from this sampling show water quality in Seadown Drain is variable, and there is no consistent pattern of elevated faecal indicator bacteria or DRP at the downstream monitoring site relative to the upstream site. Historical ammoniacal nitrogen monitoring between approximately 2011 and 2020 also does not appear to show a consistent downstream increase. These parameters are potentially useful indicators of wastewater influence because domestic wastewater can contain elevated concentrations of faecal microorganisms, ammoniacal nitrogen and phosphorus.

The absence of a consistent downstream increase in these indicators does not mean that we can completely rule out some seepage occurring and reaching Seadown

Drain. A relatively small seepage contribution could be diluted by drain flow or altered during groundwater transport to the extent that it is not readily detectable. However, the monitoring results provide no evidence of a strong or readily identifiable wastewater signal downstream of the ponds under the existing drain configuration.

DIN concentrations do show a more consistent increase between the upstream and downstream monitoring locations. However, nitrate-enriched groundwater is a known feature of the Levels Plains, and Seadown Drain is substantially groundwater fed. Increasing interception of nitrate-rich groundwater along the drain is therefore a plausible explanation for this longitudinal increase.

Existing ecological and water quality condition

Seadown Drain is a highly modified, predominantly groundwater-fed waterway. Existing water quality is characterised by moderate to high nutrient concentrations and variable faecal indicator bacteria. Nitrate concentrations can exceed the national bottom line for nitrate toxicity, indicating an existing risk of chronic effects on sensitive aquatic fauna. Available ammoniacal nitrogen concentrations are substantially lower and below concentrations expected to result in ammonia toxicity.

Limited sampling elsewhere along Seadown Drain indicates that elevated nitrate is not confined to the reach adjacent to the wastewater treatment ponds. This is consistent with the drain intercepting nitrate-enriched groundwater across the wider Levels Plains rather than the observed nitrogen concentrations being predominantly associated with a point source at the wastewater treatment ponds. Seadown Drain consequently contributes a substantial nitrogen load to Waitarakao/Washdyke Lagoon.

Effect of the proposed drain realignment

The WGA groundwater assessment predicts that the proposed realignment of Seadown Drain will increase groundwater discharge to the drain by approximately 11 L/s. This represents approximately 1% of the total simulated flow in the drain. At the scale of the overall drain flow, this represents a relatively small change in groundwater contribution.

This result does not, however, directly demonstrate that interception of wastewater-derived seepage will increase by only 1%. The wastewater ponds represent a localised potential source, whereas the 11 L/s estimate relates to the total groundwater intercepted by the realigned drain. However, the relatively small predicted change in total groundwater interception provides good supporting evidence that a material increase in wastewater-derived contaminant inputs is unlikely.

This conclusion is also supported by the multiple controls and lines of evidence available: the ponds have low-permeability liners designed to limit seepage;

downgradient toe drains are required to intercept and recirculate seepage; the available historical monitoring does not demonstrate a consistent wastewater-related water quality signal downstream of the ponds; and the predicted increase in groundwater contribution resulting from the realignment is small relative to total Seadown Drain flow.

However, there is some uncertainty about whether the new Seadown Drain will alter any interception of seepage from the TDC ponds. Because the new drain will be constructed offline, there is a relatively easy opportunity to inspect for and sample any water seepage into the offline sections that are immediately east of the ponds. If sampling of water seepage indicates wastewater seepage, further assessment of seepage dilution and risks to the new drain ecology and the downstream system can be made before any connection occurs.

Potential effect on baseflow and aquatic habitat

Groundwater currently provides an important component of flow in Seadown Drain and therefore contributes to maintenance of aquatic habitat. However, there is no evidence that wastewater pond seepage itself represents a significant component of this baseflow. The groundwater modelling indicates that the drain is fed from groundwater inflows to Phillips Lagoon and groundwater inflow to the lateral drains that discharge to Seadown Drain. Existing understanding is that very little groundwater discharges directly into Seadown Drain. The proposed realignment is predicted to result in only a small proportional change in total drain flow.

28. Potential effects on Waitarakao / Washdyke Lagoon

The technical reviewer generally agrees with the assessment of effects on Waitarakao/Washdyke Lagoon. However, the assessment is largely qualitative and provides limited consideration of how altered flow paths, groundwater interactions, or changes in water quality within Seadown Drain could influence lagoon ecology. While significant effects appear unlikely, water quality and aquatic habitat within the existing drain may change once Phase 1 works are completed, and this has the potential to influence water quality, aquatic flora, and fauna in the downstream Waitarakao/Washdyke Lagoon.

a. What monitoring and adaptive management approach, if any, is proposed to document potential changes in the lagoon?

As stated above, we do not anticipate long-term adverse effects on water quality and ecology within the realigned channel and therefore any potential adverse water quality effects on downstream environments would be associated with the outflow from the old channel. This is a key reason why we have recommended that the outlet or the dry reach of the old channel should be closed within a defined period.

We currently have a site that is monitored monthly for water quality in Waitarakao/Washdyke Lagoon. This is located closer to the lagoon outlet than to the northern end where Seadown Drain enters (Figure 1), so it would not be informative regarding potential effects of the realignment of Seadown Drain. There is no regular ecological monitoring of the lagoon, although fish and habitat surveys have been carried out in the catchment over the past two years.

File reference: (SharePoint or TRIM)

Attachment 6

WGA Ltd groundwater science response letter

4 Ash Street
Christchurch Central
Christchurch NZ 8011

WGANZ Pty Ltd
NZBN: 942 904 622 3289

WGANZ.CO.NZ

Canterbury Regional Council
200 Tuam Street
Christchurch 8011
Attention: Chris Fauth

5 August 2026
Project #: WGA251860
Doc. WGA251860-LT-HG-0003_A
E: Christopher.Fauth@ecan.govt.nz

Dear Chris,

RESPONSE TO SECTION 92 REQUEST FOR FURTHER INFORMATION - SEADOWN MAIN DRAIN REALIGNMENT GROUNDWATER EFFECTS ASSESSMENT

1. BACKGROUND

The Canterbury Regional Council has applied for resource consents authorising the managed retreat and realignment of the Seadown Main Drain and associated coastal stopbanks to the north of Washdyke. In support of the application, Wallbridge Gilbert Aztec (WGANZ Pty Ltd; WGA) undertook 3D groundwater modelling and provided the Council with a numerical modelling report titled *Seadown Main Drain Realignment Groundwater Effects Assessment* (WGA251860-RP-HG-0002_B, May 2026).

Following the technical peer review completed by Pattle Delamore Partners (PDP), a request for further information under Section 92 (S92) of the Resource Management Act 1991 has been issued. The requested items for additional information relating to the groundwater modelling report are listed below:

> ***25. Potential Effects on Groundwater Quantity – Groundwater Modelling***
>
> *A review of the groundwater assessment, including the technical report prepared by WGA has been completed. Regarding the modelling approach, overall, the groundwater model is considered to be appropriate and has been clearly described. Some minor matters to clarify are noted below to ensure the model represents the conceptual groundwater setting.*
>
> a. *The conceptual description of the groundwater setting suggests the hydrostratigraphy can be split with most bores around 10m having typically higher transmissivities and bores deeper than 10 m with generally lower transmissivities. The model represents the whole of the strata to 20 m depth as a single layer. Hydraulic conductivities were derived from transmissivities from bores less than 10 m deep.*
>
> *Please provide further details on how the approach used may influence the results, as opposed to using a two-layer model which may better reflect the conceptual description.*
>
> b. *The model calibration is generally reasonable. The sensitivity analysis indicates that the model calibration is highly sensitive to the elevation of the inland general head boundary which implies that the model predictions are equally sensitive to this parameter. Please comment on how the model predictions could account for this sensitivity.*
>
> c. *It is not clear from the WGA report whether the existing drain alignment has been retained in the model scenarios and whether modelled flows represent the combined effect of both drains.*

Please clarify if the existing drain is included in the modelled scenarios.

If it is included in the modelled scenarios, can the flow in the existing Seadown Drain be separated from the flow in the proposed drain as this would help to demonstrate the effect compared to the existing drain.

26. Potential Effects on Groundwater Quantity – Saline Interface

The effect of the drain realignment on the saline interface under Phase 1 is not part of the assessment in the WGA report and is not considered in the AEE.

Please provide an assessment on the likely influence of the drain realignment on the saline interface and any potential effects arising from this.

2. RESPONSE TO SECTION 92 QUESTIONS

Q. 25 (a). The conceptual description of the groundwater setting suggests the hydrostratigraphy can be split, with most bores around 10 m having typically higher transmissivities and bores deeper than 10 m with generally lower transmissivities. The model represents the whole of the strata to 20 m depth as a single layer, with hydraulic conductivities derived from transmissivities from bores less than 10 m deep. Please provide further details on how the approach used may influence the results, as opposed to using a two-layer model which may better reflect the conceptual description.

The numerical model represents the upper 20 m of the alluvial sequence as a single, heterogeneous layer. The single-layer approach and its influence on the results are considered appropriate for the following reasons:

- Only six bores listed in the CRC database as being screened between 10 m and 20 m have associated hydraulic parameters. Five of these bores are clustered within 600 m of each other along the Timaru–Temuka Highway, drilled at the same time by the same owner. This dataset is not representative of the wider area and is insufficient to parameterise a discrete lower layer with confidence. A two-layer model would introduce an additional, poorly constrained and non-unique parameter set without materially improving predictive reliability.
- Lithological descriptions from bore logs (Table 5 of the Main Report) indicates similar composition with depth over the upper-most 20 m of alluvial sequence. As such, it was viewed that a single hydraulic value across a single model layer would provide reasonable aquifer representation.
- Representing the 0–20 m strata as a single layer calibrated via pilot points does not assume high conductivity extends continuously across the full depth. Because calibration is constrained by observed head targets and system fluxes, pilot points adjust parameter fields to reflect the average transmissivity. The resulting parameter field yields an equivalent bulk medium.
- The predicted effects were generally small, where simulated drawdown was between 0.27 m to 0.4 m, which is within the range of natural seasonal groundwater-level fluctuation. Additional vertical discretisation would not alter the conclusion that effects on groundwater levels and users are less than minor. The adopted 20 m single-layer domain, with no vertical connectivity to the deeper system, is itself a conservative representation that yields a conservatively large drawdown extent and magnitude.

Q. 25 (b). The model calibration is generally reasonable. The sensitivity analysis indicates that the model calibration is highly sensitive to the elevation of the inland general head boundary, which implies that the model predictions are equally sensitive to this parameter. Please comment on how the model predictions could account for this sensitivity.

The sensitivity analysis confirms that the calibration is most sensitive to the head elevations applied to the inland General Head Boundary (GHB) and the Seadown waterways. The predictive results account for this sensitivity as follows:

- The inland GHB head is a calibrated, data-constrained parameter. The high calibration sensitivity means the 43 observed head targets tightly constrain this parameter. That is, the boundary head is well informed by the observed data. A strong calibration response to a well-constrained parameter increases, rather than reduces, confidence in the adopted value.
- Drawdown and baseflow change are reported as the difference between each predictive scenario and the baseline (scenario minus baseline). The inland GHB head is held constant and identical between the baseline and predictive runs, so the regional gradient it establishes is common to both and largely cancels when the results are compared. The predicted drawdowns and baseflow changes are consequently far less sensitive to the absolute GHB head than the calibration residual mean is.
- The stress and the boundary are spatially separated. The drain realignment is a local stress near the coastal margin, whereas the inland GHB acts on the regional gradient at the up-gradient boundary. The boundary is remote from the zone of simulated drawdown, further limiting its influence on the predicted local effects.
- The model is used consistently with its calibration. It is a steady-state, Class 1 - 2 tool applied to assess relative, average-condition effects, and is considered appropriate to the scale of the proposal.

Q. 25 (c). It is not clear from the WGA report whether the existing drain alignment has been retained in the model scenarios and whether modelled flows represent the combined effect of both drains. Please clarify if the existing drain is included in the modelled scenarios. If it is included, can the flow in the existing Seadown Drain be separated from the flow in the proposed drain, as this would help to demonstrate the effect compared to the existing drain.

The existing Seadown Main Drain channel has been retained in all predictive scenarios (Configurations A–D), consistent with WGA's understanding that the existing channel is to be left in place rather than removed. The modelled scenarios therefore represent the existing and proposed drain alignments operating concurrently, and the flow in each can be separated as described below.

It is important to clarify the hydraulic role of the existing Seadown Main Drain channel. Neither conceptually nor within the calibrated model does the main drain channel act as a significant groundwater sink. Rather, it functions primarily as a conduit that transmits water received from up-gradient sources such as Phillips Lagoon and the network of connecting laterals, transmitting water toward its discharge point at Washdyke Lagoon.

To separate the flow in the existing drain from that in the proposed alignment, as requested, the existing Seadown Main Drain channel was assigned a discrete mass-balance (budget) zone. The direct groundwater discharge to this zone was extracted across the baseline and each of the four proposed drain configurations, as summarised in Table 1.

Table 1: Existing Main Drain Channel Mass Balance

SCENARIO	EXISTING MAIN DRAIN CHANNEL – GROUNDWATER SINK (m^3/day)	(L/s)
Baseline	96.8	1.1
Alignment A	162	1.9
Alignment B	161	1.9
Alignment C	161	1.9
Alignment D	156	1.8

The results presented in Table 1 confirm that the existing main drain channel intercepts only a very small flow of groundwater at approximately 97 m^3/day under baseline conditions. This flow is negligible relative to the total groundwater discharge to the full Seadown drain system (approximately 19,339 m^3/day). Under each of the proposed alignments, the simulated direct interception of groundwater by the existing channel increases marginally compared to baseline. This minor simulated change (less than 1 L/s) demonstrates that introducing the new alignment has a negligible influence on the hydraulic function of the retained existing channel, which continues to act primarily as a conduit rather than a sink.

The marginal increase in simulated groundwater discharges to the existing main channel is considered to be within the model uncertainty range. Further, this change is comparable in scale to the model's mass-balance closure error (~98 m^3/day; see Table 14 of the Main Report). In effect, these results indicate the retained channel continues to function as a negligible sink rather than responding materially to the new alignment.

Q. 26. The effect of the drain realignment on the saline interface under Phase 1 is not part of the assessment in the WGA report and is not considered in the AEE. Please provide an assessment on the likely influence of the drain realignment on the saline interface and any potential effects arising from this.

The effect of the drain realignment as part of Stage 1 was simulated within the MODFLOW model and is described within the main report. A saltwater-interface assessment was included in the report (Section 7.8, Table 20) for the four Stage 2 drain configurations and the baseline using the analytical solution of Strack (1976), adapted to treat the drain as a linear sink. However, a Stage 1 specific salt-water assessment was not explicitly simulated.

For completeness, the same approach has been adopted to assess the effects of the Stage 1 realignment. The assessment was undertaken using the same parameters adopted in the main report; an average hydraulic conductivity of 636 m/day derived from the calibrated model, a 20 m unconfined aquifer thickness, and seawater and freshwater densities of 1,025 and 1,000 kg/m^3.

The Stage 1 realignment originates at Washdyke Lagoon and extends approximately 1,750 m to the north-east. The realignment retreats approximately 100 m inland of the existing channel. The drawdown extent simulated across the Stage 1 realignment was approximately 490 m (see Figure 18 of the main report).

The existing channel and the proposed Stage 1 section were separated using a discrete mass-balance (budget) zone. The results show that the existing Main Drain across the Stage 1 area does not function as a sink to groundwater. The proposed Stage 1 realignment, modelled using the same linear elevation as the existing drain stage, was simulated to intersect groundwater and therefore increase baseflow by 1,081 m^3/day (12.5 L/s). As such, all combinations of Stage 1 and Stage 2 drain configurations were simulated to increase baseflow to Washdyke Lagoon.

The analytical model (Table 2) indicates that the baseline saline water/freshwater interface intersects the base of the shallow aquifer approximately 103 m inland from the coast, across the Stage 1 area. Under the proposed Stage 1 alignment, the increase in groundwater abstraction by the relocated drain leads to a landward migration of this interface by 14 m (across the drawdown area).

Despite this inland migration, the interface within the shallow aquifer remains localised to the immediate vicinity of the coastal drainage corridor. Because the primary water supply bores and critical infrastructure are located further inland, the risk of salinity impacting existing users remains very low.

Table 2: Analytical Approximation of Saltwater/Freshwater Interface Position (Stage 1 Only)

PARAMETER[(1)]	CONFIGURATION	
	Baseline	Stage 1 Realignment
Length of coastline impacted by drawdown (m)	-	490
Offshore discharge (m^3/day)	31.55	29.34
Increase in drain baseflow (m^3/day)	-	2.21
Decrease in offshore discharge (m^3/day)	-	2.21
Saline wedge interface at base of aquifer - distance inland from coast (m)	103	117
Saline wedge interface at base of aquifer - increase in interface distance from coast (m)	-	14

Note:
(1) All parameter values calculated for a 1 m wide cross section oriented perpendicular to the coastline positioned where the most induced drawdown is occurring.

2.1 Conclusions

This letter has addressed each of the matters raised in the Section 92 request relating to the groundwater numerical modelling report (WGA251860-RP-HG-0002_B). In summary:

- **Model structure (Q25a):** The single-layer representation of the upper 20 m alluvial sequence is appropriate. The 10 – 20 m depth interval does not contain sufficient data to explicitly model, and the pilot-point hydraulic conductivity field, being calibrated to observed heads and system fluxes, yields an equivalent bulk medium that reflects the average transmissivity over the modelled thickness. The adopted single layer, with no vertical connectivity to the deeper system, is a conservative simplification. Adaptation to a two-layer model would not alter the finding of less than minor effects.
- **Boundary sensitivity (Q25b):** The high calibration sensitivity to the inland General Head Boundary reflects that this parameter is well constrained by the 43 observed head targets, which increases confidence in the adopted value. Because the predictions are reported as differences relative to the baseline, and the boundary is remote from the zone of simulated drawdown, the predictive outputs are substantially less sensitive to this parameter than the calibration statistics may suggest.
- **Treatment of the existing drain (Q25c):** The existing Seadown Main Drain channel has been retained in all predictive scenarios and its groundwater interception separated within the model budget. The existing channel functions principally as a conduit and acts as a negligible sink for groundwater. The groundwater discharge rates to the existing main channel remain effectively unchanged by the proposed realignments.
- **Saline interface (Q26):** Applying the Strack (1976) method to the Stage 1 realignment indicates a landward migration of the saltwater interface of approximately 14 m across a drawdown section of 490 m of the Stage 1 area. Across this area, groundwater heads remain above mean sea level, seaward hydraulic gradient is maintained, and the interface remains well seaward of existing water-supply bores and infrastructure.

Yours sincerely,

William Dench
Senior Hydrogeologist
WALLBRIDGE GILBERT AZTEC

Attachment 7

Davis Ogilvie and Partners Ltd supplementary Detailed Site Investigation

Level 1, 24 Moorhouse Avenue, Addington, Christchurch | PO Box 589, Christchurch 8140
P: 0800 999 333 | hello@do.nz | **www.do.nz**

File No.: 45564

21 July 2026

Environment Canterbury
PO Box 345
CHRISTCHURCH

Attention: Jolene Irvine

Email: Jolene.Irvine@ecan.govt.nz

Dear Jolene,

Supplementary Detailed Site Investigation: Waitarakao Project, Washdyke–Seadown Drain

1.0 Introduction

1.1 Background

At Environment Canterbury's (ECan's) request, a supplementary Detailed Site Investigation (DSI) was undertaken by Davis Ogilvie for the Waitarakao Project on 27 May 2026. The purpose of the supplementary DSI and associated sampling was to target where soil will be disturbed along the proposed drain alignment and to provide additional sampling adjacent to the exterior of the bunds associated with the Seadown shooting range.

Details relating to site identification, geology, hydrology, groundwater sensitivity, and site history, including Records of Title and historical aerial imagery, are documented in the DSI (Davis Ogilvie, 2025) for the Washdyke–Seadown Drain (Job No. 45564)[1]. This report should be read in conjunction with the previous DSI report.

1.2 Previous investigation findings

Previous environmental investigations have been undertaken at the proposed Washdyke Drain alignment and reported in the DSI and Contaminated Land Management Plan (CLMP)[2]. The previous investigation encountered soil that is mostly below the relevant land use and environmental criteria (Recreational soil contamination standards and ANZ sediment GV-high criteria), apart from at three locations.

Contaminated soil to be disturbed within the three locations is proposed to be retained within a containment bund at the site as described in the CLMP (2025).

[1] Davis Ogilvie & Partners Ltd (2025) Detailed Site Investigation Washdyke Seadown Drain. Job No.: 45564.
[2] Davis Ogilvie & Partners Ltd. (2025) Contaminated Land Management Plan Washdyke Seadown Drain. Job No.: 45564.

1.3 Supplementary Detailed Site Investigation objectives

The objective of the DSI assessment is to further evaluate whether contaminants of potential concern are present within areas where soil will be disturbed along the proposed drain and bund alignment, and to assess whether they pose an unacceptable risk to human health or identified sensitive environmental receptors.

1.4 Supplementary Detailed Site Investigation scope

To achieve the above, Davis Ogilvie completed the following scope of work:

- Site walkover inspection to identify potential visual indicators of ground contamination.
- Mechanical excavation of 10 test pits and hand excavation / surface sampling of 18 further locations for investigation.
- The collection of representative soil samples for laboratory analysis from the intrusive investigation locations.
- Collection of water samples taken from the biosolid wastewater pond and discharge point within the Seadown Drain.
- Collection of sediment samples from the biosolid wastewater pond.
- Visual and / or olfactory assessment of soil samples to characterise soil type and assess for the presence of asbestos and / or significant volatile organic compounds (VOCs).
- Scheduling of soil, surface water, and sediment samples for laboratory analysis for contaminants of concern previously identified within the 2025 DSI[3].
- Assessment of the significance of soil, water and sediment contaminant concentrations in accordance with the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (herein referred to as the NESCS) and the MfE Contaminated Land Management Guidelines No.2: Hierarchy and Application in New Zealand of Environmental Guideline Values.

The DSI has been produced under the supervision of a suitably qualified and experienced practitioner (SQEP) and in accordance with the following:

- Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).
- Ministry for the Environment (MfE, 2011), Contaminated Land Management Guidelines No.1 – No.5.

2.0 Soil, water, and sediment sampling

Intrusive investigations were undertaken by a Davis Ogilvie environmental scientist on 18 and 27 May 2026.

[3] Davis Ogilvie & Partners Ltd. (2025) Detailed Site Investigation Washdyke Seadown Drain. Job No.: 45564.

2.1 Sampling objectives

The objective of the supplementary sampling was to collect representative soil samples from targeted locations for laboratory analysis. The laboratory analysis was to indicate concentrations of potential contaminants of concern and assess for the suitability of soil re-use within the site. Given the size of the site, the test pits were located where access was possible, where services were absent and evenly spread along the proposed earthworks area at discrete intervals.

Samples of water from the biosolids pond and within the drain were obtained and analysed for potential contaminants of concern so that an assessment on pond dewatering options could be completed. Currently we understand that the discharge into the pond will be diverted and prevented from entering into unlined pond. The water within the pond will then be gradually pumped into the existing grassed swale which would convey water into the Seadown Drain. Currently the pond is consented to discharge water from the pond into the Drain.

Once the pond is emptied, the pond will be reshaped as per the proposed earthwork designs. Sediment within discharge ponds has the potential to accumulate contaminants and therefore prior to disturbing this sediment, it was recommended that it be assessed.

2.2 Sample design

Soil was sampled at 27 locations by mechanical excavator (SS208 – 10 and SS215 – SS21) and hand excavation (SS201 – SS207, SS211 – SS214, and SSA – SSF) along the proposed alignment (sample plans attached). The locations of which were identified during previous intrusive investigations as requiring further investigation regarding suitability for re-use.

One surface water sample (45398_SW01) was taken from the discharge point of the biosolid wastewater pond located at Part Section 6 Meadows SETT. Two surface water samples were taken from the biosolid wastewater pond (WASHD_01 A and WASHD_01 B).

Four sediment samples (SS11 – SS14) were taken from the biosolid wastewater pond at accessible locations around the pond.

The methodology was in accordance with the Ministry for the Environment (MfE) Contaminated Land Management Guidelines.

2.3 Intrusive investigation methodology

The following investigation assessment methodology was undertaken:

- Soil samples were collected based on visual and olfactory evidence of contamination, soil type, depth, and location with their location presented in the attached.
- Visual and olfactory inspection of each sample for indicators of contamination was completed by an experienced environmental scientist.
- Soil samples were collected at various depths between the ground surface and the base of the test pits, at a maximum depth of 1.5 metres below ground level (m bgl).
- In accordance with our health and safety plans all soil samples were collected directly from the excavator bucket or from side wall of shallow test pits with water and sediment samples collected using telescoping sampling equipment. Sediment samples were collected from the upper layer of deposited material at each sampling location.

- Each soil and water sample was given a unique identification number, which consisted of a site, sample location and depth identifier (e.g., 45564_SS207_0.0 – 0.15). In addition, the sample date was also included.
- All soil samples were placed in 250 mL glass jars supplied by Hill Laboratories, with water and sediment samples collected in laboratory-provided plastic containers, which were then closed, labelled, and placed in chilled containers prior to transportation to the laboratory. Samples were transported to Hill Laboratories under the standard chain of custody documentation provided in Appendix A.
- Hill Laboratories is an International Accredited Laboratory which was engaged to conduct all laboratory analysis. To maintain their International Accreditation, Hill Laboratories undertakes rigorous cross checking and routine duplicate sampling testing to ensure the accuracy of their results.
- To reduce the potential for cross contamination, each sample was collected using disposable nitrile gloves that were discarded following the collection of each sample.
- After collection of each sample, the sampling equipment was decontaminated by scrubbing with a solution of Decon90 and rinsing with tap water.
- The sampling was completed in accordance with Davis Ogilvie standard operating procedures while geological logging was completed in general accordance with the New Zealand Geotechnical Society Inc. 'Guideline for the Field Classification of Soil and Rock for Engineering Purposes' December 2005.
- All field work and sampling were undertaken in general accordance with the procedures for the appropriate handling of potentially contaminated soils as described in the MfE Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils (2021).
- Following receipt of the samples by Hill Laboratories, the soil samples were scheduled for a selection of analytes (heavy metals, PAH, SVOC, and TPH).
- Assessment of soil concentrations for contaminants of concern against applicable standards and soil, water, and sediment acceptance criteria for the protection of human health and the environment.

2.4 Laboratory analysis

Following receipt and registration of the soil samples at Hill Laboratories, the following analysis was scheduled:

- Soil samples were taken to Hills Lab for analysis for heavy metals on 28 May 2026. Samples that contained fill material with dark staining or present adjacent to the railway sleepers (uncontrolled fill) underwent PAH, or SVOC, and TPH analysis to evaluate the soil for a wider contaminant group.
- Two surface water samples collected on 21 April 2026 from the biosolids wastewater pond (WASHD-01 A and WASHD-01 B) were scheduled for analysis of: pH, total suspended solids, total mercury, total ammoniacal-N, Nitrite-N, Nitrate-N, total Kjeldahl Nitrogen, dissolved reactive phosphorus, total biochemical oxygen demand, chemical oxygen demand, oil and grease, and total heavy metals.
- A third surface water sample collected from the drain on 18 May 2026 where the biosolids wastewater pond discharges (45348_SW01) was analysed at the laboratory for total heavy metals, dissolved reactive phosphorus, total biochemical oxygen demand, chemical oxygen demand, total ammoniacal-N, Nitrite-N, and Nitrate-N.

- Four sediment samples collected from the biosolids wastewater pond (45546_SS11 – 45564_SS14) were scheduled for analysis of seven heavy metals only.

Laboratory results and summary assessment tables are attached for all samples scheduled for analysis.

3.0 Field observations

3.1 Summary of field observations

Site observations made during the site visit on 18 May and 27 May 2026 are summarised below. Site photographs are contained in Appendix B with sample plans attached in Appendix C.

When undertaking sampling at the biosolids wastewater pond discharge point on the 18 May 2026, the existing drain was seen to be low flowing with little to no suspended sediment. No odour or other olfactory or visual evidence of contamination was noted in or on the water within the drain. The discharge itself could not be observed to be flowing at the time given extensive vegetation and algal growth within the drain. If flowing, the rate would have been minimal.

During the intrusive investigation on 27 May 2026, the following observations were made:

- The proposed drain and bund alignment is mostly undeveloped grassland.
- An area of uncontrolled fill material was encountered at test pits SS20 and SS21 in the land in the south of the site adjacent to the Paul Smith Contractors yard. The uncontrolled fill was encountered to a depth of at least 1.5 m bgl.
- SS17 and SS18 were undertaken within the Hilton Haulage yard, through surface fill material.
- An underground service consisting of approximately 180mm diameter PVC pipe was located at location SS15 at a depth of approximately 0.5 m bgl, oriented in a northwest / southeast direction.
- Trace fragments of clay targets and gun casings were seen on the ground surface, adjacent to the gun range (location and sample SS05).
- A 100 mm thick surface unit of dark-stained gravel was present at location SS02, extending along the road track southeast of the gun range.
- The biosolids pond was surrounded by mounded soil. The pond water surface was covered by pond weed.

3.2 Subsurface conditions

Most of the soils encountered consisted of topsoil with underlying natural silt. Fill material was encountered at six locations: SS02, SS05, SS17, SS18, SS20, and SS21. Notable observations include:

- SS02, SS17, and SS18: silty sand gravel fill was encountered to a depth of at least 0.3 m to 1.2 m bgl. At SS02, road millings have been used for the roading / vehicle track surface. The fill in the Hilton Haulage yard at SS17 and SS18 appeared to be free of visual or olfactory indicators of contamination.

- SS20 and SS21: Adjacent to the Paul Smith Yard in southwest corner of the project area. An area of deep uncontrolled fill material extending to at least 1.5 m bgl was encountered in the SS20 test pit indicating a potential extensive area of fill material in this location. The fill material comprised of topsoil and silt with occasional miscellaneous anthropogenic items such as metal pipe, plastic sheeting pieces, foam, brick, concrete slabs, metal posts, and large wooden railway sleepers. At these locations, test pits refused at 1.2 – 1.5 m where the railway sleepers were encountered.
- No suspected asbestos containing materials were seen within fill material at SS20 and SS21 or anywhere else on the site.

4.0 Analytical results and discussion

The laboratory analytical reports as well as the assessment tables are provided in Appendix D. A summary of the results is provided below.

4.1 Soil

- Heavy metal soil contamination was identified above background concentrations in five of the total 28 soil samples from locations across the site.
- Concentrations of copper, lead and / or zinc slightly exceed natural background levels at the surface of SSA, SS09, and within the uncontrolled fill at SS20 and SS21. None of the analysed soil samples exceed soil contamination standards for recreational land use (NESCS).
- ANZ toxicant default guidelines for sediment quality were exceeded for lead at SS09 and SS21, however GV-High guideline values were not exceeded in any sample.
- PAH concentrations were detected in one sample (SS02), but were all below background concentrations for urban soils, residential guideline values and ANZ toxicant guideline values.
- TPH (C15 – 36) was detected at SS221 at a depth of 1.0 – 1.2 m bgl, adjacent to a railway sleeper. However, the concentration of TPH (77 mg/kg) is below guideline values for adopted conservatively for recreational (residential land use).
- SVOCs were not detected within analysed samples SS20 and SS21 – the uncontrolled fill area.

4.2 Sediment

- One of the pond sediment samples (SS14) slightly exceeded the natural background concentration for zinc. Averaged metal concentrations for the pond sediment samples (SS11 – SS14) are all below the background values.

4.3 Water

- Both water samples from the biosolid wastewater pond exceed the Canterbury LWRP Schedule 5 values for dissolved reactive phosphorus and total zinc. Additionally, both samples exceed adopted 95% species protection level values for total zinc.
- The discharge point sample (45398_SW01) was below all ANZ Toxicant Default Guideline Values for freshwater aquatic systems (95%) excluding dissolved reactive phosphorus with a concentration of 0.011 m/g^3 compared to adopted criteria value of 0.006 m/g^3. Additionally, total zinc concentrations appear to exceed the adopted 95% species protection level; however, this is due to the laboratory limit of detection being higher than the applicable guideline value.

4.4 Discussion

The anticipated extent of the uncontrolled fill (> 1.5 m deep) is indicated on the attached site plan (Appendix C). The estimated lateral extent is based on topography, aerial photography from 2004 – 2010, and soil encountered at SS20 and SS21. The total depth of the fill is unknown but is anticipated to be greater than 1.5 m. The lateral and vertical extent of the affected fill has not been fully delineated.

The by-products pond water contained 1.73 – 1.86 mg/L nitrate compared to the ANZ DGV (95%) guideline of 2.6 mg/L while the dissolved reactive phosphorus of 0.013 – 0.0114 mg/L exceeded the LWRP Schedule 5 0.006 mg/L value.

Total zinc (including dissolved and attached to fine sediment) within the pond water was reported to be 0.038 – 0.039 mg/L with the Schedule 5 limit being 0.008 mg/L.

The water within the drain was found to contain elevated (3.8 mg/L) nitrate and dissolved reactive phosphorus (0.011 mg/L) at a similar concentration to the pond water. The Total Biochemical Oxygen Demand (TBOD5) and Chemical Oxygen Demand (COD) of the pond water were slightly elevated with regards to the water within the drain. Discharging the pond water into the drain will therefore have to be completed in a manner which increases the oxygen content of the discharge to avoid negative effects on dissolved oxygen concentrations within the drain.

5.0 Conclusions

Based on the results of the above investigation, the soil to be disturbed as part of earthworks for the proposed drain alignment, except that in the identified area of deep uncontrolled fill, may be treated as cleanfill. Although samples of the deep fill south of Paul Smith Contracting yard show analytes below the relevant soil standards, further sampling and laboratory analysis should be undertaken if this fill material is to be disposed of off-site. It could potentially be re-used on site or retained on site with additional soil screening completed by the earthworks contractor to remove the bulky unsuitable materials and waste items. Verification sampling of this material post screening should be completed to confirm the remaining soil is suitable for re-use on site. Screened bulky waste material will need to be disposed of off-site at an appropriate landfill such as TDC Redruth.

The sediment within the pond was found to not have significant concentrations of heavy metals, however, is likely to have high organic and nutrient content. Its re-use on site would likely be beneficial for planting areas if it is blended with other topsoil on site prior to use.

Soil disturbance in other areas of the site where this assessment identified soil contamination should be managed in accordance with the existing CLMP, with SQEP supervision, segregation of fill types where appropriate, stockpile controls, waste tracking and disposal of surplus to facilities with appropriate waste acceptance criteria. The CSMP will be required to be updated to capture this additional assessment.

6.0 Closing

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned if you require any further information.

Yours faithfully,

Davis Ogilvie & Partners Ltd.

Prepared by:

Lizzie Wilkinson

Environmental Scientist | MSc

E: lizzie@do.nz

Reviewed by:

Gareth Oddy

Technical Director - Environmental Scientist | CEnvP-SC, BSc, MSc, IP402/405

E: gareth@do.nz

Appendix A - Chain of Custody and Laboratory Reports

Appendix B - Site photolog

Appendix C - Site plans

Appendix D - Laboratory result assessment tables

Disclaimer

This Supplementary Detailed Site Investigation has been prepared at the specific instruction of Environment Canterbury to evaluate additional assessment completed for the Seadown Drain, Waitarakao Project.

Davis Ogilvie did not perform a complete assessment of all possible conditions or circumstances that may exist at the site. Conditions may exist which were undetectable given the limited investigation of the site and have not been taken into account in the report.

Davis Ogilvie's opinions are based upon information that existed at the time of the production of this document. Assessments made in this report are based on the conditions found onsite and published sources detailing the recommended investigation methodologies described. No warranty is included—either expressed or implied—that the actual conditions will conform to the assessments contained in this report.

Davis Ogilvie has provided an opinion based on observations, site investigations, and analysis methodologies current at the time of reporting. The report cannot be used by any third party without the written approval of Davis Ogilvie. The report cannot be used if there are changes in the referenced guidelines, analysis methodologies, laws, or regulations.

Only Environment Canterbury and the Local and Regional Territorial Authorities are entitled to rely upon this report. Davis Ogilvie & Partners Ltd. accepts no liability to anyone other Environment Canterbury in any way in relation to this report and the content of it and any direct or indirect effect this engineering report may have. Davis Ogilvie & Partners Ltd. does not contemplate anyone else relying on this report or that it will be used for any other purpose.

Should anyone wish to discuss the content of this report with Davis Ogilvie & Partners Ltd., they are welcome to contact us on (03) 366 1653 or at Level 1, 24 Moorhouse Ave, Addington, Christchurch.

APPENDIX A

Chain of Custody and Laboratory Reports

Hill Labs

ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand
0508 HILL LAB 44 555 22
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Job No: **418 8504**

Date Recv: **22-Apr-26 08:32**

Received by: **Brooke Foreman**

3141885040

Quote No	0	**Lab Order No** 948602
Primary Contact	Andy Bunce	212376
Submitted By	Andy Bunce	212376
Client Name	Davis Ogilvie & Partners Limited	11972
Address	PO Box 589 Addington, Christchurch 8140	
Phone	03 366 1653 *Mobile*	
Email		
Charge To	Davis Ogilvie & Partners Limited	11972
Client Reference		
Additional Client Ref		
Order No	Supplied items	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*

☐ *Email Other* _____

☐ *Other* _____

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

CHAIN OF CUSTODY RECORD

Sent to Hill Labs

☑ *Tick if you require COC to be emailed back*

Date & Time: 16:30

Name: NIGEL SISSON-MUNRO

Signature:

Received at Hill Labs

Date & Time:

Name:

Signature:

Condition ☐ *Room Temp* ☑ *Chilled* ☐ *Frozen*

Temp: ~ 4C

☑ Sample & Analysis details checked

Signature:

ADDITIONAL INFORMATION / KNOWN HAZARDS

Priority ☐ **Low** ☐ **Normal** ☑ **High**

☐ **Urgent** (ASAP, *extra charge applies, please contact lab first*)

Requested Reporting Date: _____

Quoted Sample Types

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1				
2				
3				
4				
5				
6				
7				
8				
9				

QUOTATION

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB 44 555 22
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Client Name: Davis Ogilvie & Partners Limited
Primary Contact: Gareth Oddy
Charge To: Davis Ogilvie & Partners Limited
Quote Date: 20-Apr-2026
Expiry Date: 31-Mar-2027
Priority: High

Quote Number: 144807
Client Ref: [#DO45564]
Additional Client Ref:
Client Order Number: [#DO45564]

Sample Type	Details	Qty	Quote Price	Line Total
Surface Water	**Water Samples:** Activities expanded below (DRP, NH4N, NO2N, NO3N, pH, SS, MWHMtl, OAG, CODTL, TBOD5, HgTl, TKN) — Dissolved Reactive Phosphorus ($10.56) — Total Ammoniacal-N ($10.56) — Nitrite-N ($10.56) — Nitrate-N ($0.00) — pH ($10.56) — Total Suspended Solids ($16.80) — Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn ($55.50) — Oil and Grease ($64.35) — Chemical Oxygen Demand (COD), trace level ($22.08) — Total Biochemical Oxygen Demand (TBOD5) ($38.96) — Total Mercury ($6.50) — Total Kjeldahl Nitrogen (TKN) ($12.56) — Nitrate-N + Nitrite-N ($11.44) — Filtration, Unpreserved ($10.56) — Total Digestion ($0.00) — Total Digestion with HCl ($0.00) — Total Kjeldahl Digestion ($12.08) The following Containers are required for the above analysis: 1 x UP1L (Unpreserved, Polyethylene, Container Size: 1 L) 1 x N100 (Nitric Acid, Polyethylene, Container Size: 100 mL) 1 x S100 (Sulphuric Acid, Polyethylene, Container Size: 100 mL) 1 x BOD (Unpreserved, Polyethylene, Container Size: 500 mL) 1 x OAG500 (Sulphuric Acid, Amber Glass, Teflon lined lid, Container Size: 500 mL)	2	$293.07	$586.14
Sediment	**Sediment Samples:** Activities expanded below (MSHMHgt, pHNR, NH4N_S) — Heavy metals, trace As,Cd,Cr,Cu,Ni,Pb,Zn,Hg ($44.20) — pH ($39.40) — Ammonium-N ($26.32) — Total Recoverable digestion ($11.00) — Environmental Solids Sample Preparation ($6.60) — 2M KCl Extraction ($0.00) The following Containers are required for the above analysis: 1 x GSoil300 (Glass, Container Size: 300 mL) 1 x PSoil250 (Plastic, Container Size: 250 mL)	4	$127.52	$510.08
	Grand Total			$1,096.22

Notes

Quoted prices are in New Zealand Dollars (NZD) and do not include GST.

This quote is subject to our Customer Terms of Trade, a copy of which is available on our website www.hill-labs.co.nz.

Individual dates of testing are not routinely included in the Certificate of Analysis. Please inform the laboratory if you would like this information reported.

RELIABLE SUPPORTIVE RESPONSIVE LOCAL TRUSTED

To protect the Health & Safety of our staff - please indicate if any samples submitted may be potentially hazardous. Let us know what hazardous substances may be present and the suspected levels, if known.

NOTE: The estimated turnaround time for the types and number of samples and anlayses specified on this high priority quote is by 4:30 pm, 6 working days following the day of receipt of the samples at the laboratory. This turnaround time is based on the samples being received at an appropriate laboratory location.

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods that will be used to conduct the analyses for this job. The detection limits given below are those attainable in a relativelt simple matrix. Detection limits may be higher for individual samples should insufficient sample be available or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest limits in the associated suite of analysis. A full listing of compunds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses will be performed at Hill Labs, 28 Duke Street, Frankton, Hamilton, 3204.

Sample Type: Sediment

Test	Method Description	Default Detection Limit
Individual Tests		
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-
2M KCl Extraction *	2M potassium chloride extraction of as received fraction for analysis of NH4N, NO2N and NO3N. Analyst, 109, 549, (1984)	-
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2 (modified), APHA 3125 B: Online Edition	-
pH	1:2 v/v soil:water slurry after 16±2hrs, pH meter. APHA 4500-H^+ B (modified) : Online Edition.	0.1 pH Units
Ammonium-N *	2M potassium chloride extraction on as received fraction. Phenol/hypochlorite colorimetry. Flow Injection Analyser. APHA 4500-NH_3 H (modified) : Online Edition.	5 mg/kg dry wt
Heavy metals, trace As,Cd,Cr,Cu,Ni,Pb,Zn,Hg		
Total Recoverable Arsenic	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, trace level. US EPA 200.2 (modified), APHA 3125 B: Online Edition	0.2 mg/kg dry wt
Total Recoverable Cadmium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, trace level. US EPA 200.2 (modified), APHA 3125 B: Online Edition	0.01 mg/kg dry wt
Total Recoverable Chromium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, trace level. US EPA 200.2 (modified), APHA 3125 B: Online Edition	0.2 mg/kg dry wt
Total Recoverable Copper	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, trace level. US EPA 200.2 (modified), APHA 3125 B: Online Edition	0.2 mg/kg dry wt
Total Recoverable Lead	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, trace level. US EPA 200.2 (modified), APHA 3125 B: Online Edition	0.08 mg/kg dry wt
Total Recoverable Mercury	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, trace level. US EPA 200.2 (modified), APHA 3125 B: Online Edition	0.02 mg/kg dry wt
Total Recoverable Nickel	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, trace level. US EPA 200.2 (modified), APHA 3125 B: Online Edition	0.2 mg/kg dry wt
Total Recoverable Zinc	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, trace level. US EPA 200.2 (modified), APHA 3125 B: Online Edition	0.8 mg/kg dry wt

Sample Type: Surface Water

Test	Method Description	Default Detection Limit
Individual Tests		
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-
Total Digestion with HCl	Nitric/hydrochloric acid digestion. APHA 3030 E (modified) : Online Edition.	-
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-

Sample Type: Surface Water		
Test	**Method Description**	**Default Detection Limit**
Individual Tests		
pH	pH meter. APHA 4500-H^+ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) : Online Edition.	3 g/m^3
Total Mercury	Acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.00011 g/m^3
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.01 g/m^3
Nitrite-N	Automated Azo dye colorimetry. Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House	0.001 g/m^3
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, automated phenol/hypochlorite colorimetry. . APHA 4500-N_{org} D (modified). Online Edition.	0.1 g/m^3
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) : Online Edition.	0.004 g/m^3
Total Biochemical Oxygen Demand (TBOD5)	Incubation 5 days, DO meter, no nitrification inhibitor added, seeded. APHA 5210 B (modified) : Online Edition.	2 g O_2/m^3
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D : Online Edition.	6 g O_2/m^3
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) : Online Edition.	4 g/m^3
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Total Arsenic	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition	0.0011 g/m^3
Total Cadmium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition	0.000053 g/m^3
Total Chromium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition	0.00053 g/m^3
Total Copper	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition	0.00053 g/m^3
Total Lead	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition	0.00011 g/m^3
Total Nickel	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition	0.00053 g/m^3
Total Zinc	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition	0.0011 g/m^3

ACCREDITED
IANZ
TESTING LABORATORY

This Laboratory is accredited by International Accreditation New Zealand (IANZ).

The tests quoted herein will be performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Davis Ogilvie & Partners Limited	**Lab No:**	4188504	SPv1
Contact:	Gareth Oddy	**Date Received:**	22-Apr-2026	
	C/- Davis Ogilvie & Partners Limited	**Date Reported:**	29-Apr-2026	
	PO Box 589	**Quote No:**	144807	
	Addington	**Order No:**	[#DO45564]	
	Christchurch 8140	**Client Reference:**	[#DO45564]	
		Submitted By:	Andy Bunce	

Sample Type: Aqueous

		Sample Name:	WASHD-01A 21-Apr-2026	WASHD-01B 21-Apr-2026
		Lab Number:	4188504.1	4188504.2
Individual Tests				
pH	pH Units		7.4	7.4
Total Suspended Solids	g/m³		21	33
Total Mercury	g/m³		< 0.00011	< 0.00011
Total Ammoniacal-N	g/m³		1.86	1.79
Nitrite-N	g/m³		0.063	0.054
Nitrate-N	g/m³		1.73	1.86
Nitrate-N + Nitrite-N	g/m³		1.80	1.91
Total Kjeldahl Nitrogen (TKN)	g/m³		2.9	2.8
Dissolved Reactive Phosphorus	g/m³		0.014	0.013
Total Biochemical Oxygen Demand ($TBOD_5$)	g O_2/m³		15 #1	29 #1
Chemical Oxygen Demand (COD)	g O_2/m³		13 #1	28 #1
Oil and Grease	g/m³		< 40 #2	< 40 #2
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn				
Total Arsenic	g/m³		< 0.0011	< 0.0011
Total Cadmium	g/m³		< 0.000053	< 0.000053
Total Chromium	g/m³		0.00054	0.00059
Total Copper	g/m³		0.00127	0.00120
Total Lead	g/m³		0.00051	0.00051
Total Nickel	g/m³		0.0026	0.0026
Total Zinc	g/m³		0.039	0.038

Analyst's Comments

#1 It has been noted that the result for Biochemical Oxygen Demand (BOD_5) was greater than that for Total Chemical Oxygen Demand (Total COD), but within the analytical variation of these methods.

#2 There was insufficient sample left to filter the usual amount for the Oil and Grease analysis, so the detection limit achieved is greater than normal.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.000053 - 0.0011 g/m³	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-2
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-2
Total Digestion with HCl	Nitric/hydrochloric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-2
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H^+ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m^3	1-2
Total Mercury	Acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.00011 g/m^3	1-2
Total Ammoniacal-N	Filtered Sample from Christchurch. Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m^3	1-2
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m^3	1-2
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	1-2
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, automated phenol/hypochlorite colorimetry. APHA 4500-N_{org} D (modified): Online Edition.	0.10 g/m^3	1-2
Dissolved Reactive Phosphorus	Filtered sample from Christchurch. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) : Online Edition.	0.004 g/m^3	1-2
Total Biochemical Oxygen Demand ($TBOD_5$)	Incubation 5 days, DO meter, no nitrification inhibitor added, seeded. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 5210 B (modified) : Online Edition.	2 g O_2/m^3	1-2
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D : Online Edition.	6 g O_2/m^3	1-2
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) : Online Edition.	4 g/m^3	1-2

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 22-Apr-2026 and 29-Apr-2026. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

ANALYSIS REQUEST

R J Hill Laboratories Limited
221A Ellis Street, Hamilton 3204
Private Bag 3205
Hamilton 3240, New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Job No: **421 7020**

Date Recv: 18-May-26 15:32

Received by: Brooke Foreman

3142170208

Quote No

Primary Contact Gareth Oddy

Submitted By Julian Washington

Client Name Davis Ogilvie & Partners

Address

Postcode

Phone *Mobile*

Email

Charge To

Client Reference 45348

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other Julian@do.nz

☐ Other Gabi@do.nz

CHAIN OF CUSTODY RECORD

Sent to Hill Labs *Date & Time:*

Name:

☐ *Tick if you require COC to be emailed back* *Signature:*

Received at Hill Labs *(Refer to Lab created Job No above)* *Date & Time:*

Name:

Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 6.1

ADDITIONAL INFORMATION / KNOWN HAZARDS

Priority ☐ Low ☑ Normal ☐ High ☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	45348-SW01	18-05-26	10:40	Surface water	Total HM, dissolved HMs
2					nutrients drp, nitrate,
3					NH4, TOC, BOD
4					
5					
6					
7					
8					
9					
10					
11					
12					

Continued on next page

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Davis Ogilvie & Partners Limited	**Lab No:**	4217020 SPv1
Contact:	Gareth Oddy	**Date Received:**	18-May-2026
	C/- Davis Ogilvie & Partners Limited	**Date Reported:**	26-May-2026
	PO Box 589	**Quote No:**	82763
	Addington	**Order No:**	
	Christchurch 8140	**Client Reference:**	
		Submitted By:	Julian Washington

Sample Type: Aqueous

Sample Name:		45398_SW01 18-May-2026 10:40 am
Lab Number:		4217020.1
Individual Tests		
Total Biochemical Oxygen Demand ($TBOD_5$)	g O_2/m^3	2
Chemical Oxygen Demand (COD)	g O_2/m^3	6
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Dissolved Arsenic	g/m^3	< 0.0010
Dissolved Cadmium	g/m^3	< 0.00005
Dissolved Chromium	g/m^3	< 0.0005
Dissolved Copper	g/m^3	< 0.0005
Dissolved Lead	g/m^3	< 0.00010
Dissolved Nickel	g/m^3	< 0.0005
Dissolved Zinc	g/m^3	< 0.0010
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Total Arsenic	g/m^3	< 0.0011
Total Cadmium	g/m^3	< 0.000053
Total Chromium	g/m^3	< 0.00053
Total Copper	g/m^3	< 0.00053
Total Lead	g/m^3	< 0.00011
Total Nickel	g/m^3	< 0.00053
Total Zinc	g/m^3	< 0.0011
Nutrient Profile		
Total Ammoniacal-N	g/m^3	< 0.010
Nitrite-N	g/m^3	0.015
Nitrate-N	g/m^3	3.8
Nitrate-N + Nitrite-N	g/m^3	3.8
Dissolved Reactive Phosphorus	g/m^3	0.011

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m^3	1
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.000053 - 0.0011 g/m^3	1
Nutrient Profile		0.0010 - 0.010 g/m^3	1

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1
Total Ammoniacal-N	Filtered Sample from Christchurch. OPA fluorometry. Flow injection analyser. (NH4-N = NH4+-N + NH3-N). In-house (FIAlab).	0.010 g/m^3	1
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	1
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m^3	1
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	1
Dissolved Reactive Phosphorus	Filtered sample from Christchurch. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) : Online Edition.	0.004 g/m^3	1
Total Biochemical Oxygen Demand ($TBOD_5$)	Incubation 5 days, DO meter, no nitrification inhibitor added, seeded. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 5210 B (modified) : Online Edition.	2 g O_2/m^3	1
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D : Online Edition.	6 g O_2/m^3	1

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 21-May-2026 and 26-May-2026. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Martin Cowell - BSc
Client Services Manager - Environmental

ANALYSIS REQUEST

R J Hill Laboratories Limited
221A Ellis Street, Hamilton 3204
Private Bag 3205
Hamilton 3240, New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Job No: **422 8432**

Date Recv: 28-May-26 14:32

Received by: Brooke Foreman

5142284324

Quote No

Primary Contact Andy Bunce

Submitted By Andy Bunce

Client Name Davis Ogilvie & Partners Ltd.

Address 24 Moorhouse Ave, Christchurch

Postcode 8011

Phone 0800999333 *Mobile*

Email andy@do.nz

Charge To

Client Reference [redacted] 45564

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*

☐ *Email Other*

☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Labs *Date & Time:*

Name:

☐ *Tick if you require COC to be emailed back* *Signature:*

Received at Hill Labs *(Refer to Lab created Job No above)* *Date & Time:*

Name:

Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 9.0

ADDITIONAL INFORMATION / KNOWN HAZARDS

Priority ☐ Low ☐ Normal ☑ High ☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	45564_SS01_0.0-0.15	27/05/2026		soil	HM (7)
2	45564_SS02_0.0-0.15	27/05/2026		soil	HM (7) +PAH
3	45564_SS03_0.0-0.15	27/05/2026		soil	HM (7)
4	45564_SS04_0.0-0.15	27/05/2026		soil	HM (7)
5	45564_SS05_0.0-0.15	27/05/2026		soil	HM (7) +PAH
6	45564_SS06_0.0-0.15	27/05/2026		soil	HM (7)
7	45564_SS07_0.0-0.15	27/05/2026		soil	HM (7)
8	45564_SS08_0.0-0.15	27/05/2026		soil	HM (7)
9	45564_SS09_0.0-0.15	27/05/2026		soil	HM (7)
10	45564_SS10_0.0-0.15	27/05/2026		soil	HM (7)
11	45564_SS11	27/05/2026		soil	HM (7)
12	45564_SS12	27/05/2026		soil	HM (7)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	45564_SS13	27/05/2026		soil	HM (7)
14	45564_SS14	27/05/2026		soil	HM (7)
15	45564_SS15_0.0-0.15	27/05/2026		soil	HM (7)
16	45564_SS16_0.0-0.15	27/05/2026		soil	HM (7)
17	45564_SS17_0.0-0.15	27/05/2026		soil	HM (7)
18	45564_SS18_0.0-0.15	27/05/2026		soil	HM (7)
19	45564_SS19_0.0-0.15	27/05/2026		soil	HM (7)
20	45564_SS20_0.0-0.15	27/05/2026		soil	HM (7)
21	45564_SS21_0.0-0.15	27/05/2026		soil	HM (7)
22	45564_SSA_0.0-0.15	27/05/2026		soil	HM (7)
23	45564_SSB_0.0-0.15	27/05/2026		soil	HM (7)
24	45564_SSC_0.0-0.15	27/05/2026		soil	HM (7)
25	45564_SSD_0.0-0.15	27/05/2026		soil	HM (7)
26	45564_SSE_0.0-0.15	27/05/2026		soil	HM (7)
27	45564_SSF_0.0-0.15	27/05/2026		soil	HM (7)
28	45564_SS10_0.35-0.45	27/05/2026		soil	HM (7)
29	45564_SS17_0.3-0.4	27/05/2026		soil	HM (7)
30	45564_SS18_0.3-0.4	27/05/2026		soil	HM (7)
31	45564_SS20_1.3-1.5	27/05/2026		soil	HM (7)
32	45564_SS21_1.0-1.2	27/05/2026		soil	HM (7)
33					
34					
35					
36					
37					
38					
39					
40					

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

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mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Davis Ogilvie & Partners Limited	**Lab No:**	4228432	SPv3
Contact:	Andy Bunce	**Date Received:**	28-May-2026	
	C/- Davis Ogilvie & Partners Limited	**Date Reported:**	16-Jul-2026	**(Amended)**
	PO Box 589	**Quote No:**	82763	
	Addington	**Order No:**		
	Christchurch 8140	**Client Reference:**	45564	
		Submitted By:	Andy Bunce	

Sample Type: Soil

	Sample Name:	45564_SS207_0.0-0.15 27-May-2026	45564_SS208_0.0-0.15 27-May-2026	45564_SS209_0.0-0.15 27-May-2026	44564_SS210_0.0-0.15 27-May-2026	44564_SS211 27-May-2026
	Lab Number:	4228432.1	4228432.2	4228432.3	4228432.4	4228432.5
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	< 2	< 2	< 2	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	13	7	14	7	12
Total Recoverable Copper	mg/kg dry wt	9	7	6	6	11
Total Recoverable Lead	mg/kg dry wt	19.2	15.8	78	13.3	9.0
Total Recoverable Nickel	mg/kg dry wt	10	3	3	3	16
Total Recoverable Zinc	mg/kg dry wt	51	37	52	30	71

	Sample Name:	45564_SS212 27-May-2026	45564_SS213 27-May-2026	45564_SS214 27-May-2026	45564_SS215_0.0-0.15 27-May-2026	45564_SS216_0.0-0.15 27-May-2026
	Lab Number:	4228432.6	4228432.7	4228432.8	4228432.9	4228432.10
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	3	2	< 2	2
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	12	12	8	10
Total Recoverable Copper	mg/kg dry wt	8	11	14	8	9
Total Recoverable Lead	mg/kg dry wt	9.9	12.2	14.5	11.5	13.3
Total Recoverable Nickel	mg/kg dry wt	8	13	16	4	6
Total Recoverable Zinc	mg/kg dry wt	49	63	94	30	39

	Sample Name:	45564_SS217_0.0-0.15 27-May-2026	45564_SS218_0.0-0.15 27-May-2026	45564_SS219_0.0-0.15 27-May-2026	45564_SS220_0.0-0.15 27-May-2026	45564_SS221_0.0-0.15 27-May-2026
	Lab Number:	4228432.11	4228432.12	4228432.13	4228432.14	4228432.15
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	2	< 2	3	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.12	0.14	0.13
Total Recoverable Chromium	mg/kg dry wt	12	11	7	11	16
Total Recoverable Copper	mg/kg dry wt	7	11	7	35	13
Total Recoverable Lead	mg/kg dry wt	10.9	10.6	15.4	19.9	43
Total Recoverable Nickel	mg/kg dry wt	7	9	4	7	10
Total Recoverable Zinc	mg/kg dry wt	44	44	17	60	90

Sample Type: Soil						
Sample Name:		45564_SS210_0.35-0.45 27-May-2026	45564_SS217_0.3-0.4 27-May-2026	45564_SS218_0.3-0.4 27-May-2026	45564_SS220_1.3-1.5 27-May-2026	45564_SS221_1.0-1.2 27-May-2026
Lab Number:		4228432.16	4228432.17	4228432.18	4228432.19	4228432.20
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	-	88	85
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	< 2	2	< 2	8
Total Recoverable Cadmium	mg/kg dry wt	0.16	< 0.10	< 0.10	< 0.10	0.23
Total Recoverable Chromium	mg/kg dry wt	7	12	11	9	14
Total Recoverable Copper	mg/kg dry wt	11	7	8	8	22
Total Recoverable Lead	mg/kg dry wt	14.1	8.8	15.6	15.6	61
Total Recoverable Nickel	mg/kg dry wt	4	8	7	6	7
Total Recoverable Zinc	mg/kg dry wt	63	41	36	42	110
Haloethers in SVOC Soil Samples by GC-MS/MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Bis(2-chloroethyl)ether	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Bis(2-chloro-1-methylethyl)ether	mg/kg dry wt	-	-	-	< 0.5	< 0.5
4-Bromophenyl phenyl ether	mg/kg dry wt	-	-	-	< 0.4	< 0.4
4-Chlorophenyl phenyl ether	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Nitrogen containing compounds in SVOC Soil Samples by GC-MS/MS						
2,4-Dinitrotoluene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
2,6-Dinitrotoluene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Nitrobenzene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
N-Nitrosodi-n-propylamine	mg/kg dry wt	-	-	-	< 0.5	< 0.5
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	-	-	-	< 0.7	< 0.8
Organochlorine Pesticides in SVOC Soil Samples by GC-MS/MS						
Aldrin	mg/kg dry wt	-	-	-	< 0.5	< 0.5
alpha-BHC	mg/kg dry wt	-	-	-	< 0.5	< 0.5
beta-BHC	mg/kg dry wt	-	-	-	< 0.5	< 0.5
delta-BHC	mg/kg dry wt	-	-	-	< 0.5	< 0.5
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.5	< 0.5
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.5	< 0.5
4,4'-DDE	mg/kg dry wt	-	-	-	< 0.5	< 0.5
4,4'-DDT	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Dieldrin	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Endosulfan I	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Endosulfan II	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Endrin	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Endrin ketone	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Heptachlor	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS/MS*						
Acenaphthene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Acenaphthylene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Anthracene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Benzo[a]anthracene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Benzo[k]fluoranthene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
1&2-Chloronaphthalene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Chrysene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Fluoranthene	mg/kg dry wt	-	-	-	< 0.5	< 0.5

Sample Type: Soil						
Sample Name:		45564_SS210_0.35-0.45 27-May-2026	45564_SS217_0.3-0.4 27-May-2026	45564_SS218_0.3-0.4 27-May-2026	45564_SS220_1.3-1.5 27-May-2026	45564_SS221_1.0-1.2 27-May-2026
Lab Number:		4228432.16	4228432.17	4228432.18	4228432.19	4228432.20
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS/MS*						
Fluorene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
2-Methylnaphthalene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Naphthalene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Phenanthrene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Pyrene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	-	< 1.3	< 1.3
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	-	< 1.3	< 1.3
Phenols in SVOC Soil Samples by GC-MS/MS						
4-Chloro-3-methylphenol	mg/kg dry wt	-	-	-	< 0.5	< 0.5
2-Chlorophenol	mg/kg dry wt	-	-	-	< 0.5	< 0.5
2,4-Dichlorophenol	mg/kg dry wt	-	-	-	< 0.5	< 0.5
2,4-Dimethylphenol	mg/kg dry wt	-	-	-	< 0.5	< 0.5
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	-	-	-	< 0.5	< 0.5
2-Methylphenol (o-cresol)	mg/kg dry wt	-	-	-	< 0.5	< 0.5
2-Nitrophenol	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Pentachlorophenol (PCP)	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Phenol	mg/kg dry wt	-	-	-	< 0.5	< 0.5
2,4,5-Trichlorophenol	mg/kg dry wt	-	-	-	< 0.5	< 0.5
2,4,6-Trichlorophenol	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Plasticisers in SVOC Soil Samples by GC-MS/MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Di(2-ethylhexyl)adipate	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Diethylphthalate	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Dimethylphthalate	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Di-n-butylphthalate	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Di-n-octylphthalate	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Other Halogenated compounds in SVOC Soil Samples by GC-MS/MS						
1,2-Dichlorobenzene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
1,3-Dichlorobenzene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
1,4-Dichlorobenzene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Hexachlorobutadiene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Hexachloroethane	mg/kg dry wt	-	-	-	< 0.5	< 0.5
1,2,4-Trichlorobenzene	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Other compounds in SVOC Soil Samples by GC-MS/MS						
Benzyl alcohol	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Carbazole	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Dibenzofuran	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Isophorone	mg/kg dry wt	-	-	-	< 0.5	< 0.5
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	-	-	-	< 20	< 20
C10 - C14	mg/kg dry wt	-	-	-	< 20	< 20
C15 - C36	mg/kg dry wt	-	-	-	< 40	77
Total hydrocarbons (C7 - C36)	mg/kg dry wt	-	-	-	< 80	86

Sample Name:		45564_SS2D_0.0-0.15 27-May-2026	45564_SS2E_0.0-0.15 27-May-2026	45564_SS2F_0.0-0.15 27-May-2026	45564_SS201_0.0-0.15 27-May-2026	45564_SS202_0.0-0.15 27-May-2026
Lab Number:		4228432.21	4228432.22	4228432.23	4228432.24	4228432.25
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	-	-	93

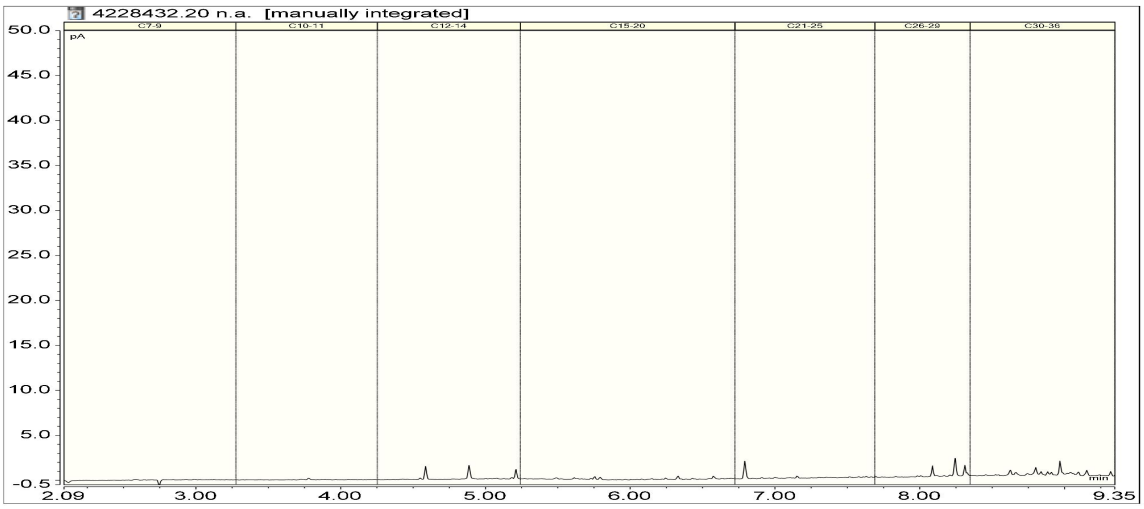
Sample Type: Soil						
Sample Name:		45564_SS2D_0.0-0.15 27-May-2026	45564_SS2E_0.0-0.15 27-May-2026	45564_SS2F_0.0-0.15 27-May-2026	45564_SS201_0.0-0.15 27-May-2026	45564_SS202_0.0-0.15 27-May-2026
Lab Number:		4228432.21	4228432.22	4228432.23	4228432.24	4228432.25
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	2	2	3	< 2	< 2
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	10	10	13	8	12
Total Recoverable Copper	mg/kg dry wt	8	12	9	5	9
Total Recoverable Lead	mg/kg dry wt	12.7	12.3	11.5	10.9	15.2
Total Recoverable Nickel	mg/kg dry wt	5	6	9	4	9
Total Recoverable Zinc	mg/kg dry wt	28	33	46	26	48
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	-	-	-	-	0.7
1-Methylnaphthalene	mg/kg dry wt	-	-	-	-	< 0.011
2-Methylnaphthalene	mg/kg dry wt	-	-	-	-	< 0.011
Acenaphthylene	mg/kg dry wt	-	-	-	-	< 0.011
Acenaphthene	mg/kg dry wt	-	-	-	-	< 0.011
Anthracene	mg/kg dry wt	-	-	-	-	< 0.011
Benzo[a]anthracene	mg/kg dry wt	-	-	-	-	0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	-	-	0.071
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	-	-	0.106
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	-	-	0.105
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	-	-	-	0.086
Benzo[e]pyrene	mg/kg dry wt	-	-	-	-	0.119
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	-	-	0.128
Benzo[k]fluoranthene	mg/kg dry wt	-	-	-	-	0.019
Chrysene	mg/kg dry wt	-	-	-	-	0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	-	-	0.016
Fluoranthene	mg/kg dry wt	-	-	-	-	0.013
Fluorene	mg/kg dry wt	-	-	-	-	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	-	-	0.069
Naphthalene	mg/kg dry wt	-	-	-	-	< 0.06
Perylene	mg/kg dry wt	-	-	-	-	0.044
Phenanthrene	mg/kg dry wt	-	-	-	-	< 0.011
Pyrene	mg/kg dry wt	-	-	-	-	0.079

Sample Name:		45564_SS203_0.0-0.15 27-May-2026	45564_SS204_0.0-0.15 27-May-2026	45564_SS205_0.0-0.15 27-May-2026	45564_SS206_0.0-0.15 27-May-2026	45564_SS2A_0.0-0.15 27-May-2026
Lab Number:		4228432.26	4228432.27	4228432.28	4228432.29	4228432.30
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	84	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	2	< 2	< 2	2
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.12	0.10	0.14	0.12
Total Recoverable Chromium	mg/kg dry wt	13	9	9	12	10
Total Recoverable Copper	mg/kg dry wt	10	11	8	7	30
Total Recoverable Lead	mg/kg dry wt	13.4	12.5	11.0	11.3	17.6
Total Recoverable Nickel	mg/kg dry wt	10	5	5	7	6
Total Recoverable Zinc	mg/kg dry wt	49	38	40	50	33
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	-	-	< 0.3	-	-
1-Methylnaphthalene	mg/kg dry wt	-	-	< 0.012	-	-
2-Methylnaphthalene	mg/kg dry wt	-	-	< 0.012	-	-
Acenaphthylene	mg/kg dry wt	-	-	< 0.012	-	-
Acenaphthene	mg/kg dry wt	-	-	< 0.012	-	-
Anthracene	mg/kg dry wt	-	-	< 0.012	-	-

Sample Type: Soil						
Sample Name:		45564_SS203_0.0-0.15 27-May-2026	45564_SS204_0.0-0.15 27-May-2026	45564_SS205_0.0-0.15 27-May-2026	45564_SS206_0.0-0.15 27-May-2026	45564_SS2A_0.0-0.15 27-May-2026
Lab Number:		4228432.26	4228432.27	4228432.28	4228432.29	4228432.30
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Benzo[a]anthracene	mg/kg dry wt	-	-	< 0.012	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	< 0.012	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	< 0.028	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	< 0.028	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	-	< 0.012	-	-
Benzo[e]pyrene	mg/kg dry wt	-	-	< 0.012	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	< 0.012	-	-
Benzo[k]fluoranthene	mg/kg dry wt	-	-	< 0.012	-	-
Chrysene	mg/kg dry wt	-	-	< 0.012	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	< 0.012	-	-
Fluoranthene	mg/kg dry wt	-	-	< 0.012	-	-
Fluorene	mg/kg dry wt	-	-	< 0.012	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	< 0.012	-	-
Naphthalene	mg/kg dry wt	-	-	< 0.06	-	-
Perylene	mg/kg dry wt	-	-	< 0.012	-	-
Phenanthrene	mg/kg dry wt	-	-	< 0.012	-	-
Pyrene	mg/kg dry wt	-	-	< 0.012	-	-

Sample Name:		45564_SS2B_0.0-0.15 27-May-2026	45564_SS2C_0.0-0.5 27-May-2026
Lab Number:		4228432.31	4228432.32
Heavy Metals, Screen Level			
Total Recoverable Arsenic	mg/kg dry wt	2	< 2
Total Recoverable Cadmium	mg/kg dry wt	0.11	0.13
Total Recoverable Chromium	mg/kg dry wt	7	8
Total Recoverable Copper	mg/kg dry wt	8	13
Total Recoverable Lead	mg/kg dry wt	12.3	16.7
Total Recoverable Nickel	mg/kg dry wt	4	5
Total Recoverable Zinc	mg/kg dry wt	32	72

4228432.20
45564_SS221_1.0-1.2 27-May-2026
Client Chromatogram for TPH by FID



Analyst's Comments

Amended Report: This certificate of analysis replaces report '4228432-SPv2' issued on 11-Jun-2026 at 3:13 pm.
Reason for amendment: Sample names amended at clients request.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1-32
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	25, 28
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	19-20, 25, 28
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	25, 28
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	25, 28
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required. US EPA 200.2 (modified), APHA 3125 B: Online Edition.	0.10 - 4 mg/kg dry wt	1-32
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.010 - 0.05 mg/kg dry wt	25, 28
Semivolatile Organic Compounds Screening in Soil by GC-MS/MS	Sonication extraction, GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.3 - 1.2 mg/kg dry wt	19-20
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	20
C7 - C9	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	19-20
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	19-20
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	19-20
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	19-20

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 29-May-2026 and 11-Jun-2026. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

APPENDIX B

Site photolog

Photograph 1:	Test pit at SS21, deep landfill extending to at least 1.2 m below existing ground level.

Photograph 2:	Test pit at SS20, deep landfill extending to at least 1.5 m below existing ground level. Railway sleepers at base of test pit.

Photograph 3:	Railway sleepers from SS20 test pit at a depth of 1.5 m below existing ground level

Photograph 4:	Existing ground profile and adjacent drain by SS20 and SS21, looking north-east. Paul Smith yard to the left of the photo.

Photograph 5:	SS19 - typical soil profile of natural topsoil overlying silt.

Photograph 6:	SS18 – Gravelly/silt fill to at least 1.2 m below existing ground level. Hilton Haulage yard.

Photograph 7:	SS15 – typical soil profile at most sample locations – natural topsoil overlying inorganic silt.

Photograph 8:	SS10 – buried topsoil at 0.35 m below existing ground level in test pit wall.

Photograph 9:	Sediment pond – SS11 – 14.

Photograph 10:	SS02 – Surface layer of dark gravel along existing track.

Photograph 11:	SS02 – Surface layer of dark stained gravel.

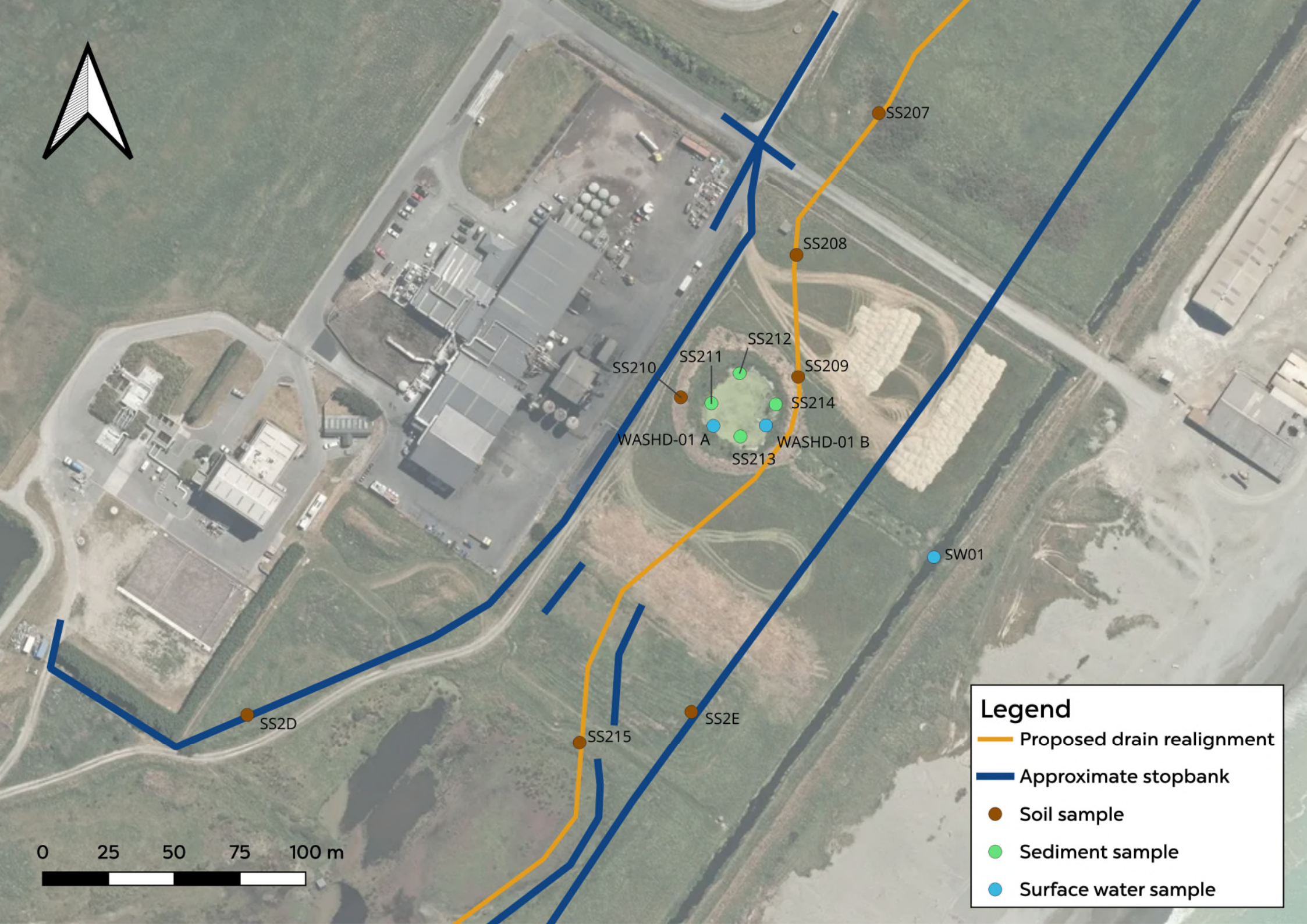
Photograph 12:	Typical ground profile of land from SSA to SSC, looking south-west. Gun club to the right of the photo.

Photograph 13:	45348_SW01 sample location.

APPENDIX C

Site plans

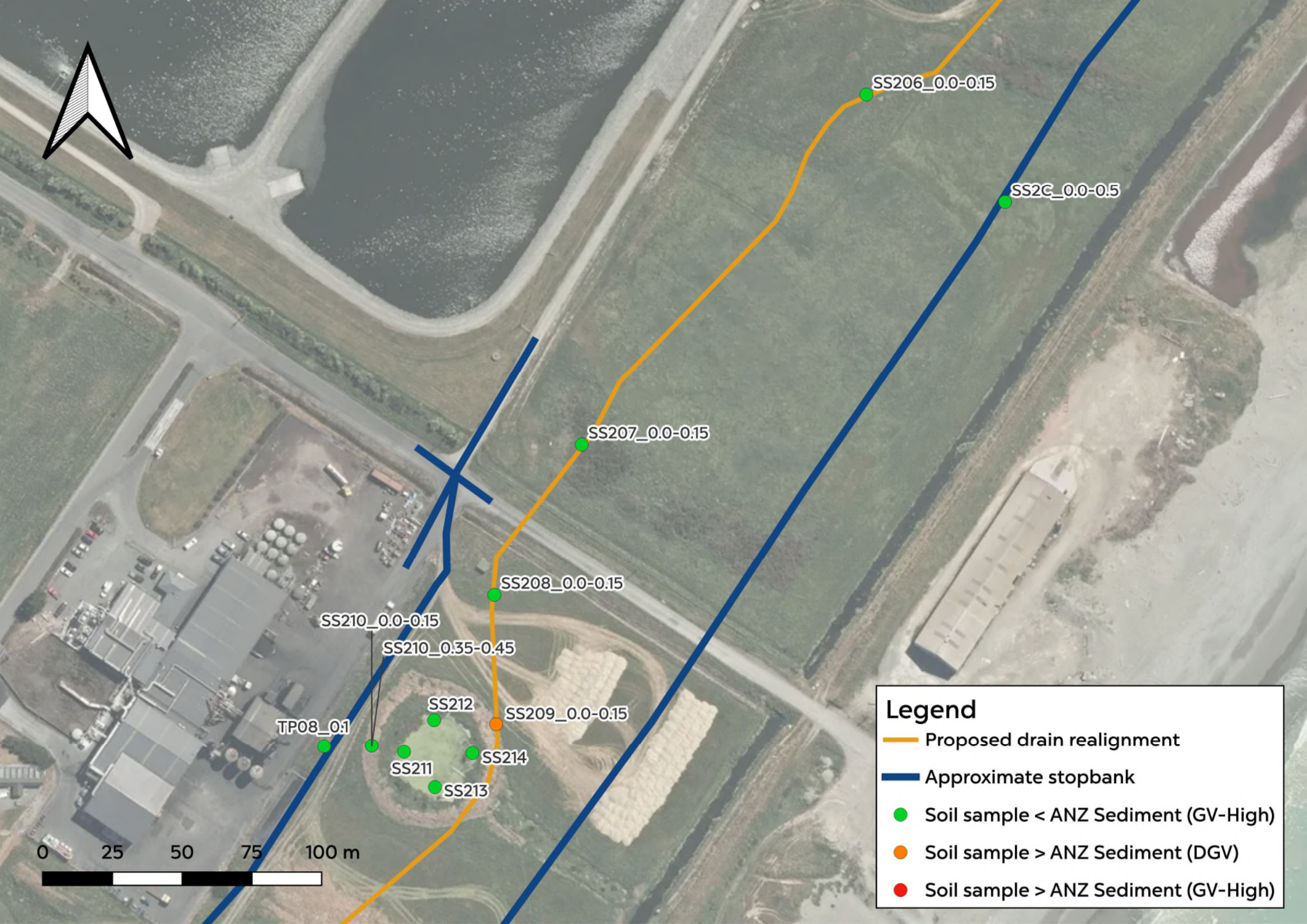

SS201
SS202
SS2A
SS203
SS204
SS2B
SS205
SS206
SS2C
0 25 50 75 100 m
Legend
Proposed drain realignment
Approximate stopbank
Soil sample
Sediment sample
Surface water sample


SS207
SS208
SS209
SS210
SS211
SS212
SS213
SS214
WASHD-01 A
WASHD-01 B
SW01
SS2D
SS2E
SS215
0
25
50
75
100 m
Legend
Proposed drain realignment
Approximate stopbank
Soil sample
Sediment sample
Surface water sample

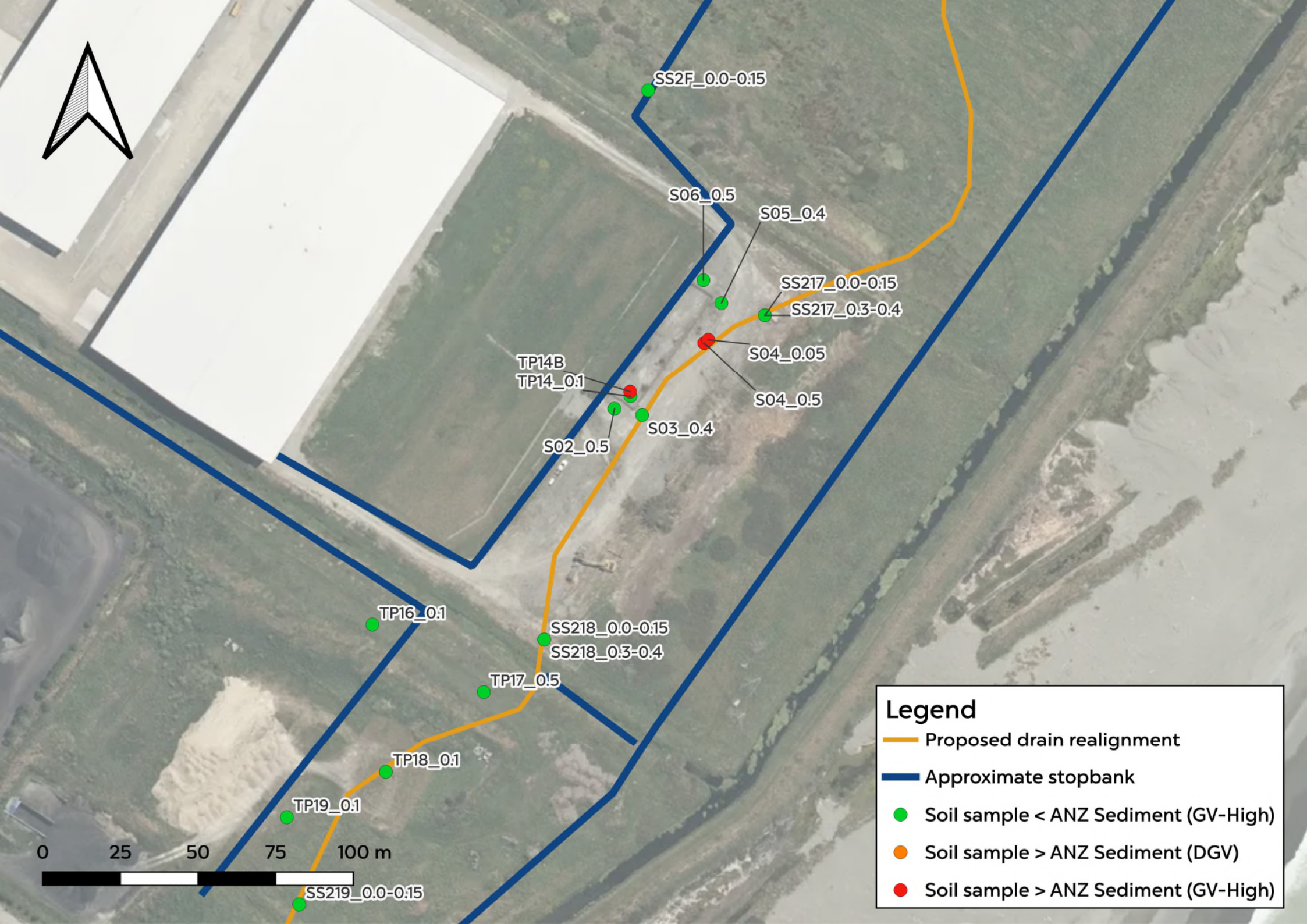

SS216
SS2F
SS217
SS218
SS219
SS220
SS221
0 25 50 75 100 m
Legend
Proposed drain realignment
Approximate stopbank
Soil sample
Sediment sample
Surface water sample


TP01_0.1
TP01_0.5
Swale Sediment
R2 Bundwall
R2_7m_0.05
SS201_0.0-0.15
R4_0.05
R4_0.1
SS01_0.1
R4 Bund Wall
TP02_0.1
TP02_0.5
SS02_0.1
R3_0.05
SS03_0.1
SS202_0.0-0.15
TP07_0.1
TP03_0.1
SS04_0.1
SS2A_0.0-0.15
SS01_WD
SS02_WS
SS05_WS
SS203_0.0-0.15
SS04_WS
SS03_WS
SS05_0.1
0
25
50
75
100 m
Legend
Proposed drain realignment
Approximate stopbank
Soil sample < ANZ Sediment (GV-High)
Soil sample > ANZ Sediment (DGV)
Soil sample > ANZ Sediment (GV-High)


SS05_0.1
SS06_0.1
TP04_0.5
TP04_0.1
SS18
SS04
SS07_0.1
SS01
SS10
SS11
SS17
SS03
SS204_0.0-0.15
SS09
SS2B_0.0-0.15
SS02
SS12
SS08
TP06_0.5
TP06_0.1
SS05
SS06
SS07
SS13
SS08_0.1
SS14
SS16
SS15
SS09_0.1
SS205_0.0-0.15
TP05_0.5
TP05_0.1
0
25
50
75
100 m
Legend
Proposed drain realignment
Approximate stopbank
Soil sample < ANZ Sediment (GV-High)
Soil sample > ANZ Sediment (DGV)
Soil sample > ANZ Sediment (GV-High)


SS206_0.0-0.15
SS2C_0.0-0.5
SS207_0.0-0.15
SS208_0.0-0.15
SS210_0.0-0.15
SS210_0.35-0.45
SS212
SS209_0.0-0.15
TP08_0.1
SS214
SS211
SS213
0
25
50
75
100 m
Legend
Proposed drain realignment
Approximate stopbank
Soil sample < ANZ Sediment (GV-High)
Soil sample > ANZ Sediment (DGV)
Soil sample > ANZ Sediment (GV-High)


SS2D_0.0-0.15
SS215_0.0-0.15
SS2E_0.0-0.15
SS216_0.0-0.15
SS2F_0.0-0.15
0
25
50
75
100 m
Legend
Proposed drain realignment
Approximate stopbank
Soil sample < ANZ Sediment (GV-High)
Soil sample > ANZ Sediment (DGV)
Soil sample > ANZ Sediment (GV-High)


SS2F_0.0-0.15
S06_0.5
S05_0.4
SS217_0.0-0.15
SS217_0.3-0.4
S04_0.05
S04_0.5
TP14B
TP14_0.1
S03_0.4
S02_0.5
TP16_0.1
SS218_0.0-0.15
SS218_0.3-0.4
TP17_0.5
TP18_0.1
TP19_0.1
SS219_0.0-0.15
0
25
50
75
100 m
Legend
Proposed drain realignment
Approximate stopbank
Soil sample < ANZ Sediment (GV-High)
Soil sample > ANZ Sediment (DGV)
Soil sample > ANZ Sediment (GV-High)


TP16_0.1
SS218_0.0-0.15
SS218_0.3-0.4
TP17_0.5
TP18_0.1
TP19_0.1
SS219_0.0-0.15
SS220_0.0-0.15
SS220_1.3-1.5
SS221_0.0-0.15
SS221_1.0-1.2
0
25
50
75
100 m
Legend
Proposed drain realignment
Approximate stopbank
Soil sample < ANZ Sediment (GV-High)
Soil sample > ANZ Sediment (DGV)
Soil sample > ANZ Sediment (GV-High)

APPENDIX D

Laboratory result assessment tables

45564 Washdyke Seadown Drain

Sample Results Table: Onsite Water

DAVIS OGILVIE
ENGINEERS / SURVEYORS / PLANNERS

	pH Units	Total Suspended Solids	Total Mercury	Total Ammoniacal-N	Nitrite-N	Nitrate-N[c]	Nitrate-N + Nitrite-N	Total Kjeldahl Nitrogen (TKN)	Dissolved Reactive Phosphorus	Total Biochemical Oxygen Demand (TBOD5)	Chemical Oxygen Demand (COD)	Oil and Grease	Total Arsenic	Total Cadmium	Total Chromium	Total Copper	Total Lead	Total Nickel	Total Zinc
	pH Units	g/m^3								$g\ O^2/m^3$		g/m^3							
Human Health																			
ANZ Toxicant Default Guideline Values for freshwater aquatic systems (95%) [a]	-	-	-	-	-	2.6	-	-	-	-	-	-	-	-	-	-	-	-	-
Schedule 5 LWRP [b]	6.5-8.5	-	-	-	-	-	-	-	0.006	-	-	-	0.024	0.0002	0.001	0.0014	0.0034	0.011	0.008
Ecological Receptor																			
Environmental Concern Level (ECL)	-	-	-	-	-	-	-	-	-	-	-	-	0.013	-	-	-	-	-	-
Level of species protection 95%	-	-	-	-	-	-	-	-	-	-	-	-	-	NA	0.0044	0.0013	0.0044	-	0.008
Level of species protection 99%	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0007	NA	NA	NA	-	NA

Sample ID	Date	Comment	Lab No. or XRF																
45398_SW01	18/05/2026	Discharge p	4217020.1	-	-	-	< 0.010	0.015	3.8	3.8	-	0.011	2	6	-	< 0.0011	< 0.000053	< 0.00053	< 0.00053	< 0.00011	< 0.00053	< 0.0011
WASHD-01 A	21/04/2026	Pond	4188504.1	7.4	21	< 0.00011	1.86	0.063	1.73	1.8	2.9	0.014	15 [#1]	13 [#1]	< 40 [#2]	< 0.0011	< 0.000053	0.00054	0.00127	0.00051	0.0026	0.039
WASHD-01 B	21/04/2026	Pond	4188504.2	7.4	33	< 0.00011	1.79	0.054	1.86	1.91	2.8	0.013	29 [#1]	28 [#1]	< 40 [#2]	< 0.0011	< 0.000053	0.00059	0.0012	0.00051	0.0026	0.038

Environmental Standards

[a] Australian and New Zealand Guidelines for Fresh and Marine Water Quality Guidelines.

[b] ECan Regional Council, Canterbury Land and Water Regional Plan Volume 1

[c] Based on a water being moderately hard

[#1] Lab analysts comment: It has been noted that the result for Biochemical Oxygen Demand (BOD5) was greater than that for Total Chemical Oxygen Demand (Total COD), but within the analytical variation of these methods.

[#2] Lab analysts comment: There was insufficient sample left to filter the usual amount for the Oil and Grease analysis, so the detection limit achieved is greater than normal.