CCKV Maitai Development Company Limited Partnership
Echodale Place
Nelson 7041

16 July 2025

Attention: Neil Donaldson, Project Manager

RE: Maitahi Village – site contamination – response to Expert Panel

Our Reference: 1138

Dear Neil,

Preamble

1. CCKV Maitai Development Company Limited Partnership (CCKV) proposes to construct a new subdivision, to be known as Maitahi Village, at 7 Ralphine Way, Nelson, in the Maitai (Maitahi) River catchment. Maitahi Village would be a mixed-use development including residential sections, a retirement village, commercial land and reserves.
2. CCKV has applied for resource consents for the development under the Fast-track Approvals Act 2024.
3. The Maitahi Village proposal calls for re-routing the Lower Kākā Hill Tributary ('the stream'), a tributary of the Maitahi River; and constructing stormwater treatment wetlands and a walkway alongside the new riparian corridor. These works pass through the location of a shearing shed and sheep-dip.
4. The sheep-dip is contaminated with arsenic and dieldrin. Dieldrin concentrations in topsoils at the dip are so high that, when excavated, they will be considered persistent organic pesticide wastes under the Stockholm Convention. CCKV engaged Envirolink Limited to prepare a remedial action plan (RAP) to address this contamination as part of the stream and wetland works.
5. CCKV has engaged HAIL Environmental Limited to review the current version of this RAP (version 4 dated 11 July 2025) and other relevant documents:
    a. Detailed Site Investigation (DSI). Maitahi Subdivision. 7 Ralphine Way, Nelson. Envirolink Ltd (Envirolink). December 2021.
    b. Addendum Contamination Assessment – Maitahi Subdivision – V4. Envirolink. 23 June 2023.
    c. Excel Spreadsheet. Groundwater sampling results. 11 August 2023.
    d. SPLP results. 19 September 2023.

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e. Ecological Recommendations for Contamination Management – Lower Kaka Hill Tributary Realignment, Maitahi Village (Stage 1) Development. Robertson Ltd. 23 January 2025.

f. Total Organic Carbon results. July 2025.

g. Application for Resource Consent: Maitahi Village at 7 Ralphine Way, Nelson. CCKV. February 2025.

h. Geotechnical Assessment Report for Proposed Maitahi Village Subdivision, Kaka Valley, Nelson. Report 1012397.1000 v03. Tonkin + Taylor Limited. February 2025.

i. Site Contamination Specialist Review of Remedial Action Plan. Maitahi Subdivision, 7 Ralphine Way, Nelson. HAIL Environmental. 4 February 2025.

j. Attachment 1: Further Information Response Table. 13 June 2025.

k. Friends of the Maitai Comment on the Maitahi Village Application. Stephen Gray, Tom Kennedy. Friends of the Maitai. 24 June 2025; and CCKV responses to the same.

l. Forest and Bird Comment on the Maitahi Village Application. Scott Burnett. Royal Forest and Bird Protection Society of New Zealand Inc. June 2025; and CCKV responses to the same.

m. Comment on the Maitahi Village Application. Sally Gepp, Monika Clark-Grill. Save The Maitai Incorporated. June 2025; and CCKV responses to the same.

n. Technical Memo: Review of Contaminated Land Issues: Fast-Track Consent Application – Maitahi Village (V2). Simon Hunt. EHS Support Limited. 24 June 2025; and CCKV responses to the same.

o. Re Maitahi Groundwater Flows. Personal communications from Geotechnical Engineer, Tonkin and Taylor Limited. 14 July 2025.

6. Where we have reviewed documents that are ecological or geotechnical assessments, HAIL Environmental has necessarily relied on any statements or conclusions relevant to site contamination, and nothing in this advice should be taken as expressing any view on the technical merits of those reports.

Conceptual site model

The situation

7. The woolshed, yards and sheep-dip sit on a low alluvial terrace of the Maitahi River, mapped as Holocene river deposits. The immediate vicinity is roughly level ground at the base of a hill, long managed for pastoral grazing – Envirolink cites an earlier historical report as stating that the woolshed has been used since the early 1900s, and part of it was previously a hop kiln. A single dip is evident, and there is also a footbath within the yards.

8. The upper Maitahi catchment is in ultramafic rock of the Dun Mountain Terrane and site soils are expected to be at least partly derived from this rock, characteristically rich in copper, chromium and nickel. Soil analyses obtained during the project do indeed show elevated concentrations of these elements compared to typical Nelson-Tasman reported background levels.

9. The investigations undertaken by Envirolink around the sheep-dip and yards include more than 40 soil samples, mostly from topsoil, and two rounds of groundwater sampling from four locations. There has been no investigation within the woolshed footprint: it is not unusual for developers to seek to obtain resource consent before demolishing buildings and completing investigations, and this can usually be managed with conditions of consent. In this case HAIL Environmental does not consider that contamination under the woolshed, if any, is likely to significantly change the risk profile or remedial action plan.
10. Results indicate high concentrations of the sheep-dip chemical dieldrin (and the related compounds aldrin and endrin) in silty topsoil around 0.3 m in depth at and immediately around the dip, with a highest concentration over 600 mg/kg. Dieldrin should not have been used since 1961 at latest, but it is a notoriously persistent organic pollutant and clearly has not attenuated over time. This dieldrin is likely strongly partitioned to the organic matter in the topsoil, which was reported at 6-8 % in a small number of samples. Another characteristic sheep-dip chemical is arsenic, a potentially toxic trace element. Arsenic is also high in these soils, at up to 580 mg/kg, and it seems even higher in the underlying silt at up to 1,200 mg/kg.
11. Dieldrin concentrations generally appear to decrease rapidly with depth and with distance from the sheep-dip, but arsenic attenuates more slowly. In the runout direction, southwest of the dip, samples at around 50 m distance still exceed 20 mg/kg, and only samples at more than 70 m distance are at apparent background of 4-6 mg/kg. Underlying the dip, in sand and gravel fill and subsoil beneath the shallow topsoil and silt, ten samples range from 40-240 mg/kg arsenic, 0.05-3.1 mg/kg dieldrin.
12. In the four monitoring well locations around the sheep-dip, groundwater was encountered at around 1-1.5 m below existing ground level in April 2023, but on two occasions in the following month it was much shallower, almost at surface on 11 May and at around 0.2-0.4 m on 16 May. The inferred groundwater flow direction is southeast toward the proposed re-routed stream. There was no monitoring within a historical alignment of the stream along the base of the hill, which could form a preferential pathway for groundwater flow southwest from the dip. However, even if this does happen in some circumstances, it would not seem to be a problem for the project because the direction of flow would carry contaminants away from the new stream alignment.
13. Groundwater chemical data is hard to interpret because the first round, in April 2023, was undertaken using bailers and field filtering, while the second round, in August 2023, were collected using a preferable approach, a peristaltic pump with low flow methodology, and rather different results are obtained. The first round results are from 0.1-1. 2 µg/L dieldrin and aldrin and <1-5 µg/L arsenic, the second round are lower with <0.008-0.3 µg/L dieldrin and <1-3 µg/L arsenic. In the second round of groundwater sampling, dissolved copper was also determined and found to be notably elevated, inferred to be from natural geogenic origins.
14. It is interesting that arsenic, which is greatly elevated and readily soluble, is almost absent from the groundwater – these results meet the drinking water standard of 10 µg/L. HAIL Environmental infers the arsenic is strongly bound to iron oxides in the subsoil: the sands and gravels are generally described as orange-brown, indicating a high iron content, and arsenic is well known to have a high affinity for iron in oxidising environments.
15. Dieldrin, by contrast, is poorly soluble and has a high affinity for organic matter, which accounts for its strong retention in the topsoil. The detectable presence of dieldrin in groundwater within the sands and gravels is consistent with low total concentrations in those soils but also low organic carbon to retain it.

16. The general distribution of contaminants appears reasonably well understood, and consistent with site history and known contaminant behaviour: but the lateral and vertical extents are not closely defined and the groundwater data is essentially reliant on a single monitoring event. This is addressed by Envirolink's recommended additional soil and groundwater investigation prior to remediation, which is intended to refine volumes of contaminated soil requiring disposal by various routes (see below) and increase confidence in the groundwater quality baseline. The results of these additional investigations do not go toward assessing the risk of contaminants to the environment nor whether the remedial strategy is sound.
17. The woolshed area will merit further investigation, at least for contaminants from building materials such as arsenic (treated timber), lead (paint) and zinc (galvanised iron).

The proposed works

18. As described in project documents and plans, albeit preliminary designs only, constructing the new riparian corridor will involve removing at least the top 0.3 m (the topsoil) across the entire area of the sheep-dip, woolshed and yards (and well beyond to north and south). The excavation will be at least 0.5 m deep under the stormwater basins to make room for an impermeable clay liner. The excavation will be much deeper within the proposed new stream channel, as the base of the stream will be indicatively 1.5 m below existing ground level and a further cut of at least 0.3 m (potentially rather more) will be necessary to install stream features and armouring.
19. This deep cut for the stream channel is a requirement because CCKV intends that the re-routed stream will flow year-round, unlike the current stream that tends to dry up in summer, and hence it must intercept groundwater at all times. Tonkin and Taylor has estimated the mean flow of the current stream at 47 L/s and the 1-in-5 year low flow at 3.2 L/s. As initial rough estimates, in the 100 m reach of the stream passing through the woolshed area, groundwater flows into the stream will be typically 1.2 L/s from the woolshed side (true right bank) and 1.0 L/s from the true left bank. Worst case groundwater flows have been roughly estimated at 0.13 and 0.12 L/s respectively.
20. The riparian corridor will be reinstated in clean material from elsewhere within the development, including a mound between the stormwater wetland and the stream that will be higher than the existing ground level, will form the true right bank of the stream, and will prevent direct runoff from the wetland to the stream. Extensive planting is planned. The new stream channel will pass within about 15 m of the sheep-dip location, and will provide a variety of in-stream and riparian habitats that may include meanders, riffles, pools, boulders, riprap and pinned logs.
21. HAIL Environmental understands all of this work will be done "offline" – the excavation and reinstatement will be completed before the stream is redirected into the new channel.
22. Given the sheep-dip footprint is within the proposed footprint of one of the stormwater basins, these works are expected to remove the bulk of the dieldrin contamination, likely more than 99 % of it by mass, and to cover over the remainder with the impermeable clay liner. Much of the arsenic contamination will also be removed – we cannot estimate how much – but certainly some will remain underneath the reinstated stormwater wetland.
23. Given this residual contamination beneath the wetland will be covered by clean material, given the stormwater basins will necessarily be engineered to prevent groundwater ingress (both by lining and by setting the base above seasonal groundwater maximum), and given it is an artificial stormwater control wetland rather than a natural wetland serving ecological purposes, there should be little concern that sheep-dip contamination will affect the stormwater wetland.

24. Given the woolshed footprint is also within the riparian corridor, again these works are expected to remove residual contamination in that area, if any.

The key contaminant linkages

25. The remaining issue of interest is whether contaminant levels in the new stream will pose a risk to the reinstated aquatic ecology. CCKV intends that the development result in a net gain for ecology. The existing Lower Kākā Hill Tributary has been assessed as having poor ecological health and moderate ecological value, from which HAIL Environmental infers that, to achieve a gain, the re-routed stream should at minimum be classifiable as a slightly to moderately disturbed ecosystem in the medium to long term.

26. In accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG), then, stream water quality should in due course meet criteria protective of 95 % of fresh water species (or be within typical local ranges for ultramafic elements such as copper and nickel), and stream sediments should meet default sediment quality guidelines. Alternatively, additional ecological assessment should be done to demonstrate that the ecosystem meets that description regardless of contamination.

27. Despite moderate to high levels of arsenic in soils, arsenic concentrations in groundwater around the sheep-dip, at less than 5 µg/L, are currently within the ANZG 95 % criterion of13 µg/L for oxic systems, and on the New Zealand Drinking-water Standard of 10 µg/L. Accordingly the proposed stream re-routing appears unlikely to result in arsenic concentrations exceeding relevant guidelines and standards.

28. For dieldrin the situation is more complex. ANZG provides only an indicative "low confidence" criterion of 0.01 µg/L for dieldrin, with no guidance as to what level of species protection this offers. It is not possible for either HAIL Environmental or CCKV to refine this criterion: if there was enough published data to produce a better criterion, ANZG would have done so. Because dieldrin has been banned for more than sixty years, it is unlikely that more studies of its ecotoxicology will appear in the scientific literature in the near future. Furthermore, we do not recommend adding a safety factor to this criterion, because, again, ANZG should already have built sufficient safety factor into it. What we can say is that this criterion is slightly more stringent than the Drinking-water Standard of 0.04 µg/L aldrin and dieldrin, and much more stringent than the ANZECC recreational guideline of 1 µg/L dieldrin. At any rate, groundwater around the sheep-dip currently exceeds the ANZG criterion (by some margin), and the groundwater flow direction at the time of monitoring events has been toward the stream, indicating the potential for adverse effects should be considered.

29. In that regard, HAIL Environmental considers that there are several factors mitigating against more than minor adverse effects from dieldrin in the re-routed stream, including attenuation of dieldrin during transport in groundwater, dilution on entering the stream, and most significantly the plan to remove the source zone around and under the sheep dip. The remedial strategy benefits from all of these factors.

30. Dieldrin moving toward the stream in groundwater will be considerably attenuated and diluted. Even in sands and gravels with low carbon content, hydrophobic organic compounds such as dieldrin are expected to be primarily bound to solid phase, hence slow-moving and reducing in concentration over distance. Whatever does reach the stream will be mixed with groundwater from the opposite bank and with whatever surface water comes from upstream. Based on Tonkin and Taylor's initial estimates, the dilution factor will average around 40, correspondingly reducing the likelihood of adverse effects.
In saying that, the remediation strategy does not rely on any particular level of dilution for effects to be acceptable.

31. With the great majority of the dieldrin removed, groundwater concentrations will greatly diminish in time, and so any dieldrin that reaches surface water will also greatly diminish in time. For exactly the same reasons that make dieldrin slow-moving in groundwater, there is likely to be a considerable lag between the source being removed and groundwater sampling showing reduced concentrations. HAIL Environmental does not believe it is possible to accurately estimate the extent of the reduction, or the duration of the lag. Nonetheless, the plan to remove the source zone is a key mitigating factor in reducing the potential risk posed by dieldrin.
32. Regardless of effects on the lower stream, the risk of effects on the Maitahi River itself appears negligible. With a 9,000 ha catchment and a mean annual flow of 2,350 L/s, the Maitahi typically offers a dilution factor of over 50 for inflow from the Kākā Hill Tributary.

The RAP

Excavation and validation

33. The RAP provides that, in addition to the excavations described above, the immediate vicinity of the dip will be further excavated to 2 m depth.
34. The RAP next provides for soil validation of the entire excavated area by sampling and analysis for arsenic and dieldrin. Arsenic and dieldrin remaining within the new stream channel must meet the ANZG default sediment quality guidelines, which respectively are 20 mg/kg and 0.0028 mg/kg per 1 % of organic carbon. The RAP requires (conservatively) that arsenic within the wetland area meet the Soil Contaminant Standards protective of commercial outdoor workers, 70 mg/kg, and dieldrin must meet the Stockholm low content limit of 50 mg/kg. If these criteria are not met there is provision to remove additional material to a further 0.5 m depth. Reinstatement then begins.
35. These additional excavations will further reduce masses of dieldrin and arsenic contaminants remaining at the site and provide additional confidence that any adverse effects have been mitigated, over and above the considerations described above.
36. New groundwater monitoring bores will be installed between the former dip location and the stream, and monitored monthly to confirm that contaminant concentrations in groundwater are no higher than before excavation declining.
37. HAIL Environmental understands the stream diversion does not appear to be scheduled until some months after the remedial excavation in the woolshed area, given the amount of work to be done along the lower riparian corridor. In the interim, we understand that groundwater will simply pool within the stream bed. There will be ample opportunity to sample and analyse it if monitoring well concentrations are unsatisfactory, and to pump it through filters back to the source zone.
38. If it does not seem likely from groundwater monitoring and detailed flow modelling that in-stream concentrations will meet the ANZG guidelines before the stream ecology would be established, there will be time to undertake further remediation. In our view that could practically include further excavation, or diversion of clean groundwater around the sheep-dip area, or installing a permeable reactive barrier in the stream bank to absorb contaminants passing through. We do not recommend these additional steps be compulsory, given that we concluded above that dieldrin ecotoxicity in the re-routed stream seemed unlikely.

Soil disposal

39. The RAP provides that excavated soil exceeding the Stockholm low content limit for dieldrin will be stored on site in accordance with hazardous substance regulations, pending EPA-approved disposal. The usual solution for such waste for New Zealand is disposal to high temperature incinerator in France, albeit this is an expensive solution. HAIL Environmental considers it is possible that approved disposal options will become commercially available within New Zealand, since we are aware of numerous other sites contaminated with Stockholm-listed pollutants.
40. One possible supplier, Environmental Decontamination Limited in Auckland (the technology provider for the remediation of the pesticide-contaminated Fruitgrowers Chemical Cooperative site at Mapua, Tasman District), has performed an initial feasibility test on a sample of soil from this site, and has advised that results were satisfactory.
41. Excavated soil that meets generic managed fill guidelines will be moved to a containment cell within the development, further up the catchment. The containment cell will sit within a much larger volume of excess excavated material from uncontaminated areas of the site. CCKV's geotechnical advisers Tonkin and Taylor have stated that this fill area as a whole will be stable, but even in the event of some extreme seismic or climatic event that exceeded geotechnical design specifications, clearly the fill would have to be very badly damaged for the containment cell to be compromised. Water levels inside and outside the cell will be monitored after construction to confirm its integrity.
42. Excavated soil that falls between these two categories will be sent to York Valley Landfill. Based on initial testing within the Envirolink investigations, such material should meet the landfill's waste acceptance criteria.
43. Envirolink recommended further investigation to better define volumes for each disposal route: HAIL Environmental agrees, but regardless of the results, all three disposal routes will still be possible and necessary.

Conclusion

44. Based solely on the reports listed above, considering the conceptual site model in the context of the proposed outline of works, the general objectives of the development, the scale of the potentially affected area, and planned remedial actions, HAIL Environmental is reasonably satisfied that more than minor adverse effects arising from contamination are unlikely. Furthermore, the construction phase seems to allow for sufficient monitoring, time and opportunity to assess progress toward meeting remedial criteria, and if needs be to consider additional intervention.

Limitations

45. This letter has been prepared for CCKV by HAIL Environmental in accordance with the purpose and scope set out above, and the usual care and thoroughness of the consulting profession. Any use of any part of this letter by any other party, or in any other context, is the responsibility of the user.
46. A detailed review of the surrounding land use(s) in relation to potential hazardous activities and industrial land uses was not included in this limited assessment. Information from cited sources has not been independently verified unless specifically stated, and HAIL Environmental assumes no responsibility for any inaccuracy or omission therein.
47. This document does not purport to give legal or financial advice, and it is not an ecological or geotechnical assessment.

Closing

Should you have any questions related to this matter, please contact the undersigned on 021 036 7764 or dbull@hailenvironmental.co.nz.

Yours sincerely,

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