Before the Independent Hearing Panel appointed by the Canterbury Regional Council

IN THE MATTER OF The Resource Management Act 1991

AND

IN THE MATTER OF Application **CRC190445** to discharge stormwater to land and water

Section 42A Officer's Report

1. Report of Rowan Vincell Caudell Freeman

Introduction

2. This report forms part of Canterbury Regional Council's (CRC) audit of the assessment of environmental effects (AEE) provided by Christchurch City Council (the applicant) in support of the resource consent application for a comprehensive discharge permit to discharge stormwater from the reticulated stormwater network within the boundaries of Christchurch City.

3. This report provides the decision-maker with information and advice related to actual and potential effects of the proposed discharge of contaminants within the boundaries of Christchurch City.

4. My full name is Rowan Vincell Caudell Freeman.

Qualifications and Experience

5. I am a Principal Science Advisor for the CRC and my office is situated at 200 Tuam Street, Christchurch.

6. I hold a Bachelor of Science in Geology from Tennessee Technological University, Tennessee, USA and Post Graduate Diploma in Environmental Science from the University of Canterbury, Christchurch, New Zealand.

7. I am a Certified Environmental Practitioner (Site Contamination) under the Environment Institute of Australia and New Zealand.

8. I am a member of the Australasian Land and Groundwater Association (ALGA) and the Contaminated Land Management Sector Group administered by WasteMINZ.

9. I have been a member of CRC's Contaminated Sites Team since September 2009 and in my current role as Principal Science Advisor, I fulfil the function of CRC's technical leader for contaminated sites.

10. While employed at CRC I have provided technical advice to internal and external customers on matters relating to the identification, investigation, remediation, risk profile, and management of contaminated land. I have led numerous environmental investigations on behalf of the CRC and actively contributed to development of national and local contaminated land policy (e.g. providing submissions to the Ministry for the Environment (MfE) on proposed environmental guidelines and standards).

11. Examples of my internal customers include CRC Consent Planning, Strategy and Planning, RMA Investigations and Compliance Delivery. Examples of my external customers include Canterbury territorial authorities, environmental professionals, environmental planners and managers, members of the public, Community and Public Health and the Ministry for the Environment.

12. Prior to starting at CRC in 2009, I worked in the United States of America for over 5 years as an environmental geologist undertaking and leading environmental investigations for municipal, commercial, industrial and private sites. A core component of my work involved understanding the source and behaviour, migration pathways, and receptors of a wide array of contaminants of concern (CoCs).

13. I confirm that I have read and am familiar with the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014 and I agree to comply with that code. Other than where/if stated I am relying on the evidence of another person, my evidence is within my area of expertise.

Scope of Report

14. This report is prepared under the provisions of Section 42A of the Resource Management Act 1991 (RMA), which allows a Council officer or consultant to provide a report to the decision-maker(s) on a resource consent application made to the Council and allows the decision-maker(s) to consider the report at the hearing. Section 41(4) of the RMA allows the decision-maker(s) to request and receive from any person who makes a report under Section 42A *"any information or advice that is relevant and reasonably necessary to determine the application"*.

15. This report is supplementary to the Section 42A report prepared by CRC for the above consent applications. Full details are provided in that report. I have considered the relevant sections of the assessment of environmental effects (AEE) included in the application and associated technical appendices. My review of the following documents is central to my evidence:

    (a) The Comprehensive Stormwater Network Discharge Application (2015) and subsequent amendments to application (July 2018);

    (b) Revised Environmental Monitoring Programme (June 2016);

    (c) Section 92 Response to Request for Further Information (November 2015);

    (d) Additional Explanation on Various Matters (June 2016); and

    (e) Assessment of Current and Future Stormwater Contaminant Load for Christchurch (July 2018).

16. As a representative of the CRC on this matter, RMA 1991 Section 30(1)(ca)(v) applies. This requirement is partially met by recording information about known Hazardous Activities and Industries List (HAIL) sites in Canterbury. The HAIL is used by the Ministry for the Environment (MfE) to identify hazardous activities or industries which could cause or have caused land contamination (including groundwater and surface water) in New Zealand.

17. My review focuses on interactions between stormwater and contaminated land and the potential for contaminants from land to become entrained and discharged to ground (including where contaminants may enter groundwater) and/or surface water. My review is relevant to the outcome of this application because the discharge of stormwater onto, into or across contaminated land may result in the

entrainment and migration of harmful contaminants into surface water, soil or groundwater.

18. In preparing my report, I am mindful that pre-2025 all discharges from sites considered to pose a high risk will be excluded from the network and that post-2025 the majority of these will be included under the CSNDC.

Assessment of Receiving Environment

19. The receiving environment covered includes Ōtautahi / Christchurch Te Pātaka o Rakaihautū/Banks Peninsula. The Ōtākaro/Avon – Ōpāwaho/Heathcote, Hurutini/Halswell and Pūharakekenui/Styx River catchments as well as ephemeral waterways of the Port Hills and Te Pātaka o Rakaihautū/Banks Peninsula Streams, the estuaries, harbour and coast are included in the receiving environment. These catchments include natural and man-made waterways that receive stormwater from potentially contaminated or contaminated known and unknown HAIL sites.

20. CRC records information about known HAIL sites on the Listed Land Use Register (LLUR). The LLUR is a geospatial database, which is managed by CRC's Contaminated Sites Team. Migration of contaminants from HAIL sites into receiving environments could cause a decline in the quality of natural resources with flow-on adverse effects to human and waterway biota health.

21. A fair proportion of land within the receiving environment (particularly in Ōtautahi / Christchurch) holds HAIL activities. Currently, there are more than 5,500 HAIL records within all catchments of the receiving environment. In terms of HAIL density, approximately 5.7% of the total catchment area (Ōtautahi / Christchurch and Te Pātaka o Rakaihautū/Banks Peninsula) is covered by HAIL activities; however, HAIL activities are more densely represented in Christchurch City extents with approximately 19% of the land covered.

22. HAIL activities related to hazardous chemical storage, manufacture, use and disposal (into or onto land) have historically been and continue to be situated in and around Christchurch City. Although any HAIL activity may pose a risk to environmental receptors if not adequately monitored and managed, some HAIL activities are inherently riskier than others and require a higher level of vigilance. Examples of such HAIL activities (past and/or current) in Christchurch City include but are not limited to:

    (a) Former gasworks sites (including biproducts – e.g. coal tar);

    (b) Dry cleaners;

    (c) Landfills and waste disposal to land sites;

    (d) Petroleum hydrocarbon sites (bulk storage and service stations);

    (e) Timber treatment sites;

    (f) Foundry site;

    (g) Waste recyclers

    (h) Chemical manufacture and formulation sites; and

    (i) Land immediately adjacent to contaminated "high risk" HAIL sites (where contaminants can be transferred by wind, flooding or impacted groundwater).

23. Although exceptions cannot be ruled out, HAIL activities which are generally expected to pose a lesser risk to stormwater discharges may include:

(a) HAIL activities involving chemicals that are fully contained and stored indoors or behind secure containment;

(b) HAIL activities which have been subject to robust detailed site investigation and demonstrated to pose little or no risk to the environment

(c) HAIL activities which involved the broad and even spreading of chemicals (e.g. apple orchards)

(d) HAIL activities where contaminants of concern are spatially or vertically separate from the stormwater discharge or stormwater infiltration treatment facility (ITF).

24. A wide range of persistent and hazardous CoCs originate from HAIL activities and can enter stormwater systems at varying concentrations from overland flow or points of discharge, or a combination of both. The overall volume of contaminants entering a stormwater system and their potential effects is very much a function of the nature of the HAIL activity, land characteristics (e.g. topography and geology), contaminant migration pathways, the proximity and sensitivity of receptors, and management practices.

25. Any HAIL activity where heavy metals, petroleum hydrocarbons (including polycyclic aromatic hydrocarbons [PAHs]), and chlorinated compounds have been or are currently being used may pose a high risk, if discharges are not appropriately managed. These contaminants can be transported in stormwater systems while entrained with or adsorbed to sediment or while dissolved in stormwater.

26. The level of risk posed by contaminants to stormwater quality cannot be arbitrarily assigned to a HAIL activity without understanding the nature of the HAIL activity, how stormwater migration pathways relate to the HAIL activity, the proximity and sensitivity receptors, and the nature of mitigation/management mechanisms at work. This type of evaluation process has been explained in the response to the s92 request and generally follows the existing procedures for LLUR sites as established in the Memorandum of Understanding (MoU) for stormwater discharges in Christchurch City (July 2014) and its supporting policy which lays out the assessment criteria for HAIL sites.

27. The July 2014 MoU was created to avert large numbers of residential rebuild sites approaching Environment Canterbury for individual resource consents for stormwater discharges. Although MoU and assessment criteria were prepared to address residential land uses, the principles are transferrable to construction and operational phase discharges from commercial and industrial sites falling under the CSNDC pre and post 2025.

Nature of the Discharge

28. Under Section 7.1 of the application contaminants and impacts on environmental values are listed. Suspended solids, hydrocarbons and metals fall within my scope of advice. I agree with the stated potential impacts on environmental values identified in the application.

Assessment of Effects on the Environment, Objectives and Targets

Effects on Surface Waterways

29. HAIL sites which contain CoCs in surface or near surface soils pose the greatest risk to surface waterways because of the decreased potential for contaminant dilution and removal before entering the waterway; especially during construction

and development works when contaminated soils are disturbed, stockpiled, and/or moved for disposal.

Objectives and Targets

30. Objectives and targets for surface waterways are laid out under Schedule 4 of the proposed conditions included under the amended CSNDC application. My comments relate to the following objectives:

    (a) Decrease sediment input to prevent adverse effects on water clarity and aquatic biota;

    (b) Reduce copper, lead and zinc levels in surface water to prevent adverse effects on aquatic biota; and

    (c) Improve sediment quality to prevent adverse effects on aquatic biota.

31. I generally agree with the objectives, targets and the basis for targets laid out for protecting surface water quality; however, I note that not all CoCs which could potentially cause adverse effects on waterways appear to be included. The reasoning for this is not immediately clear to me and I believe this point should be clarified. Because of the wide range of CoCs it is unlikely that the contaminants included in the application will always be the source of primary risk to ecological receptors. Some statement about the suitability of copper, lead and zinc as surrogates for the wider suite of potential contaminants which have not been included would be beneficial, if this is the rationale behind the inclusion of a limited suite of analytical parameters.

32. With respect to reducing sediment input to waterways, sufficient emphasis has not been placed on the potential for contaminants such as copper, lead, zinc and PAHs to be adsorbed to and transported with sediment from contaminated sites to surface waterways. I think this should be addressed in more detail in terms of management of sites included under the CSNDC where there is a possibility of contaminant entrainment and migration with sediment to a waterway.

33. Copper, lead, zinc and PAHs have been highlighted as attributes which need to be considered towards improving the quality of instream sediments in waterways and I agree with the selection of these parameters but would like to reiterate that the variety of CoCs originating from HAIL sites is likely to be more wide-ranging than the parameters specified by the applicant.

34. Potential issues associated with copper, lead and zinc have been discussed with respect to a basis for targets but a discussion around PAHs has not been included under this portion of Schedule 4 of the amended CSNDC. I agree that reducing contaminant loads and instream sediment removal would aid in achieving the stated objectives; however, I would suggest that more emphasis should be placed, where practicable, on sediment removal at stormwater source areas – especially, if such source areas are considered to pose a high risk.

Effects on Groundwater Quality

35. Receiving environment objectives and targets for groundwater quality are included under Schedule 6 of the amended CSNDC application. My comments relate to the following objectives:

    (a) Protect drinking water quality; and

    (b) Avoid widespread adverse effects of shallow groundwater quality

36. I generally agree with the objectives and targets highlighted under Schedule 6 of the amended CSNDC application. I do question the completeness of the attributes identified to protect drinking water quality since they do not represent the full suite of contaminants which could adversely affect human health from drinking water. However, I believe that the groundwater specialist providing advice towards the Section 42A report is better placed to discuss the appropriateness of target levels for overall groundwater quality.

37. In my opinion, the information relayed in Schedules 4 and 6 show the applicants intent to improve or manage adverse effects from stormwater to the receiving environment. Where gaps in information seem apparent, I have highlighted these, but I expect the relevance of my concerns would be best vetted by the surface water and groundwater specialists providing advice towards the Section 42A report for this consent.

Mitigation Methods

Construction and Operational Phase Discharges (Non-HAIL and Low Risk HAIL Sites)

38. It is my understanding that all construction phase discharges from sites determined to be non-HAIL or low risk HAIL sites (pre-2025) will be included under the CSNDC except where the discharge occurs from residential and commercial (new or redeveloped) sites that discharge to land or to the CCC stormwater network on flat sites (>5 hectares [ha]) or hill sites (>1 ha). I also note that all operational phase discharges from non-HAIL and low risk HAIL sites will be included under the CSNDC (pre-2025) except where hardstand discharges to land within sites.

39. Post-2025 all discharges from existing and new sites determined to be non-HAIL or low risk sites will be included under the CSNDC except where operational non-residential discharges from existing hardstand occur to land within sites.

40. I do not have any concerns about the proposed exclusion of all operational phase discharges from existing hardstand on non-residential sites to land within sites.

Construction and Operational Phase Discharges (High Risk HAIL Sites)

41. Towards achieving the objective of no adverse ecological impacts from construction and operational phase discharges, the applicant proposes that no discharge from sites considered to pose a high risk to stormwater discharges will be included under the CSNDC pre-2025. Post-2025, all discharges from high risk sites will be accepted under the CSNDC except:

    (a) All construction phase discharges from residential and commercial/industrial new or redevelopment sites discharge to land within flats sites or hill sites
    (b) Operational phase discharges from existing commercial/industrial sites where hardstand discharges to land within a site

42. In my opinion, the level of stormwater management or mitigation assigned to a site included under the CSNDC should be proportionate to the level of risk posed by that site to stormwater quality. It is also important to target management and mitigation steps, so the nature of the contaminants associated with high risk activities are considered. A “broad-brush” and limited suite of contaminants will not likely address the full spectrum of contaminants associated with high risk sites, so a degree of flexibility should be built into the process to allow for inclusion of atypical contaminants (i.e. other than copper, lead, zinc, PAHs).

43. In my opinion the best solution for high risk sites falling under the CSNDC, in terms of stormwater management, is to ensure (at a minimum):

(a) Contaminants of concern relevant to that activity are highlighted with appropriate environmental benchmarks;
(b) A robust monitoring and inspection programme is established; and
(c) Contingencies or responses to address contaminant environmental benchmark exceedances are in place.

Sites which pose a moderate risk should also be subject to the same type of approach but with the lesser risk posed by these sites (i.e. when compared to high risk sites) reflected in a level and frequency of monitoring.

44. I believe that construction phase stormwater discharges from high risk contaminated sites do pose a greater risk than those occurring during operational phase. All high-risk sites are excluded for both construction and operational phase pre-2025. If most high-risk construction and operational phase discharges will be under the CSNDC post-2025, the applicant will need to provide greater detail about their capacity and approach to managing and monitoring these sites. Further, if LLUR site categories will be used to determine the level of risk posed by a site, I would like some clarity on how the applicant will work through more complex scenarios. For example, what approach will be taken where a site may be categorised as contaminated or managed, but the contamination is spatially or vertically separate from the specific area where construction phase works are occurring.

45. In my opinion, sites which hold both inorganic or organic contaminants in soil from the surface to about 0.5 metres below ground level (bgl), especially where those heavy metals and PAHs readily adsorb to sediment migrating to waterways, pose the highest risk during construction phase. Further, the migration of contaminants in dissolved state to waterways requires special attention for both construction and operational phase discharges, since conventional erosion and sediment control measures for contaminant treatment will be ineffective. These potentially problematic sites are better candidates for exclusion from the CSNDC; however, I understand that these sites will be included under the CSNDC post-2025. How does the applicant intend to assess and manage such sites?

<u>Management of Industrial Sites</u>

46. My understanding is that ‘industrial sites’ discharges will be required to pose no greater threat to the receiving environment than that posed from residential areas. Failure to achieve this benchmark will result in exclusion of an industrial site from the CSNDC until 2025. I understand that sites that bypass CCC’s network and discharge stormwater to ground will not be included under the CSNDC

47. I do not have any fundamental concerns about this proposal except to ask that the applicant clarifies what they would consider to be the benchmark for appropriate “on-site pre-treatment”.

<u>Contaminated Sites, Infiltration Treatment Facilities (ITF), and Soil Sampling</u>

48. Citing additional risks to groundwater and surface water resulting from contaminated sites during construction phase, the applicant proposes to exclude discharges from construction zones included on the LLUR or as posing a high risk of being contaminated. The applicant further indicates that no stormwater treatment systems will be placed on contaminated sites, sites on the LLUR or sites they perceive as to pose a high risk of being contaminated. This suggests that the applicant intends to follow some decision process to make this determination.

49. In my professional opinion, the process that supports the CCC Interim Global Stormwater Consent under the MoU (2014) between CCC and CRC provides a good framework for decision-making regarding the risk posed by HAIL sites. I note that the decision process would need to be tweaked slightly before it would be completely transferrable to the CSNDC.

50. I agree with the applicant that the risk of adverse effects to groundwater quality arises from contaminated stormwater or stormwater (of any quality) discharging into land holding contaminated strata (e.g. landfill).

51. ITFs are, in my opinion, very effective at removing sediment and CoCs adsorbed to sediment if they are appropriately installed and maintained. I am concerned about the accumulation of CoCs in ITFs receiving water from urban areas and the apparent absence of a plan of action about how this will be addressed. In my opinion, every example of an ITF under Section 9 of the application presents the possibility of CoCs migrating to groundwater at unacceptable concentrations under the right circumstances; however, I have focused my response on swales and dry basins.

52. The potential for contaminants to leach into groundwater and cause potentially adverse effects may increase with an increase in contamination in media lining swales and basins. CoCs present at elevated concentrations in these facilities may pose an unacceptable risk to the health of maintenance workers (e.g. during landscaping and earthworks) as they may inadvertently inhale or ingest contaminated dust and dirt.

53. The applicant proposes to monitor soil quality in ITFs. Some description of this is provided in existing monitoring programmes – example, the South-west Christchurch stormwater management plan. Soil adsorption basins are addressed specifically but very briefly, and I cannot determine what steps will be taken to protect human health or how these basins will be maintained. Further, and being mindful that the applicant is concerned about discharging through contaminated land, the application does not lay out a process for how contaminant build up in sediments within these basins will be addressed over time.

54. The ITF at the Hornby Industrial Park will be analysed for the widest array of parameters. It is my opinion that the suite of analytes proposed for this location should be extended to all the ITFs where sampling has been proposed. If there is some limitation or reason why this is not proposed to occur, then this should be clearly stated.

55. I am concerned about the lack of detail with respect to frequency and distribution of samples to be collected at ITFs and the apparent lack of a process for remediating contaminated media. Information about the sample depth and placement in ITFs is clear but I could find no information that lays out how sample frequency, depth and distribution have been informed. I'm mindful that the ITFs may very well be irregular in nature and comprised of multiple and spatially separate low points. I recommend the applicant clarify the proposed approach to sampling.

56. ITFs will potentially become "contaminated" sites, due to contaminant build up. In my opinion, contaminated land as an ITF or other should only ever be sampled by a suitably qualified environmental professional and in accordance with relevant MfE Contaminated Land Management Guidelines.

57. The application states that soil sample results will be compared to relevant values based on the dominant land uses near the infiltration treatment facility. I question

this method because dominant land use values may not be as useful as the applicant intends. I believe a simple conceptual site model approach (assessing the contaminant source, migration pathways and environmental receptors [ecological and human]) should be applied to each ITF towards identifying the most appropriate relevant values. For example, a dry stormwater infiltration basin in an area where groundwater is sensitive and where landscaping is undertaken by workers should be assessed in terms of risk to groundwater quality and to human health (maintenance/excavation workers). The stormwater infiltration basin being in a residential setting is, in my opinion, irrelevant to deriving a guideline value against which results from monitoring can be compared. Likewise, if a wetland is situated in a primarily residential or commercial land use, it does not mean that comparison against commercial/industrial or residential soil standards/guideline values would be appropriate since the receptor would be biota living in the wetland, which are sometimes more susceptible to contaminants at much lower levels than humans.

Submissions

58. I've reviewed and consider submissions SUB031489 (combined Z Energy Ltd, BP Oil Ltd, & Mobil Oil NZ Ltd) and SUB031484 (Ravensdown Ltd) as these appear to be most applicable to the scope of my evidence.

59. With respect to the CSNDC, SUB031489 highlights concerns about water quality, stormwater management plans and contaminated sites and SUB031484 highlights concerns about infrastructure and conditions.

60. Having reviewed both submissions, I believe the submitters are justified in seeking clarity about their respective concerns; however, I do not have anything remarkable to add to my evidence with respect to the two submissions.

Summary

61. In my opinion, CCC's general intent with the proposed approach to stormwater management could have beneficial outcomes and result in the overall improvement of quality of stormwater discharges to the receiving environments. Notwithstanding, more work needs to be undertaken towards a more pragmatic approach to determining which sites are suitable for inclusion or exclusion under the CSNDC.

62. I believe the objectives and targets component of the application highlight the contaminants that pose the most significant risk to ecological receptors; however, the significance of contaminant loads in or adsorbed to sediment should not be understated.

63. The lack of detail about monitoring and maintenance of ITFs is a concern as I could not find a clear explanation of how contaminant build up in these facilities will be addressed or how they are currently dealt with for that matter. This is a concern since the applicant is opposed of stormwater treatment facilities being sited on contaminated land, yet the act of remediating stormwater using ITFs will create contaminated sites. I also believe that more detail needs to be provided about sampling frequency and distribution across ITFs.

64. There will be more certainty for data integrity if testing on ITFs is undertaken by a suitably qualified and experienced professional. Disposal of materials removed from ITFs should also be advised by a suitably qualified professional and with CCC involvement to ensure appropriate endpoints for ITF spoils. These concerns can be addressed through a more robust stormwater management plans.

65. The applicant proposes that sites considered to pose a high risk are excluded from the consent but included after 2025. I am mindful that in the interim a process (e.g. as detailed under the 2014 stormwater MOU between CCC and CRC to assess the risk posed by sites) could be adopted and prove beneficial and effective; however, I am not entirely satisfied that the applicant has laid out a clear strategy for how such sites will be dealt with from 2025 onward.

Conclusion

66. I support consolidation of the current stormwater management plans for the receiving environments identified within Ōtautahi / Christchurch and Te Pātaka o Rakaihautū/Banks Peninsula. I believe that a CSNDC, if implemented well, would result in an overall improvement to stormwater quality being discharged into the receiving environment.

67. My most critical concerns relate to monitoring and maintenance of ITFs under the EMP and the apparent lack of a clear strategy about how HAIL sites determined to pose a high risk (and excluded from the CSNDC) will be managed by the consent holder once brought under the CSNDC post-2025. The applicant has to weigh the cost-benefit of contaminant removal at-source versus contaminant removal at end-of-pipe since both have merits and demerits.

Signed:

Date: 25 September 2018

Rowan V.C. Freeman
Principal Science Advisor (Contaminated Sites)

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