From:	Richard English
To:	Plan Hearings
Subject:	L&WRP PC 7 - Evidence Twelfth Knight Consulting - Submitter ID: PC7 - 507
Date:	Thursday, 16 July 2020 8:56:02 pm
Attachments:	PC 7 Evidence - Twelfth Knight Consulting.pdf

Please find attached my evidence on behalf of Twelfth Knight Consulting

Richard English.

Before the Independent Hearings Panel

In the matter of the Resource Management Act 1991

And

In the matter of Plan Change 7 to the Land & Water Regional Plan, Canterbury Regional Council.

("Minor Changes" - Section 2.9: Definitions; Section 5, Rules 5.175 – 5.178; & report "*Technical memo: Effects of cleanfill deposition on groundwater quality*".)

EVIDENCE OF RICHARD SPENCER ENGLISH – TWELFTH KNIGHT CONSULTING (SUBMITTER ID: PC7- 507)

DATED: 16TH JULY, 2020

QUALIFICATIONS AND EXPERIENCE.

1. My full name is Richard Spencer English.

2. I hold a Bachelor of Science (Hons, Civil Engineering) degree from Birmingham University, England. I am a Member of the Institution of Civil Engineers (London) and, until recently, a Member of the Institution of Professional Engineers New Zealand.

3. I am the Principal of Twelfth Knight Consulting, Christchurch. I have over 45 years of general civil engineering experience in both the United Kingdom and New Zealand. I have worked for central and local government, contractors and consultants and as a sole practitioner consultant.

4. Over the last 30 years, I have been involved in the quarrying and roading industries and in the management and reuse of construction and demolition materials in the Canterbury area. I previously managed Halswell Quarry and cleanfill, and was responsible for the initial phases of its restoration process for which I received an award from Christchurch City Council.

5. In my capacity as General Manager for CanRoad Construction Ltd – the forerunner of City Care Ltd – I managed a variety of projects and processes including roading construction and surfacing contracts, asphalt and bitumen plants and a roading materials testing facility.

6. Of specific relevance to my evidence for this hearing; I have been involved with the operation of cleanfills for over twenty five years, in particular with respect to their contamination potential of underlying aquifers.

7. I was the lead researcher, co-author and lead implementer for the Christchurch City Cleanfill Bylaw (the Bylaw). I have authored several reports on the impacts of and made a presentation to a WasteMinz Conference on the Bylaw.

8. I have undertaken research for and have made a presentation on cleanfilling on behalf of the Canterbury Aggregates Producers Group (CAPG) to the

WasteMinz team developing the recently published MfE Land Disposal Guidelines. I have also provided advice and evidence to hearings on the Auckland Unitary Plan with respect to cleanfilling issues on behalf of several aggregate producers in the Auckland area.

9. I provided extensive expert witness evidence on behalf of both the Yaldhurst Residents Association and the Water rights Trust with reference to CAPG's "digging deeper" consent application.

10. Over the last fifteen years I have been responsible for the compilation of reports on local aggregate resources and cleanfilling, encompassing demand forecasting and a variety of resource management issues for a number of clients including Environment Canterbury (ECan), Christchurch City (CCC) and Selwyn District Councils, the Urban Development Strategy Implementation Management Group (UDSIMG) and CAPG.

11. I have presented expert quarrying evidence on behalf of CAPG at ECan hearings for the Regional Policy Statements and the Land and Water Regional Plans.

12. I have provided advice to and produced reports for CCC with respect to cleanfilling, including the deposition of coal tar based materials, and quarry rehabilitation matters. I have presented expert evidence to the Christchurch Replacement District Plan hearings on behalf of both CCC and CAPG with respect to quarrying, cleanfilling and quarry rehabilitation.

13. I have had both a direct and indirect involvement with the local aquifers for over thirty five years and have approximately ten years of direct local water supply experience including responsibility for the development and maintenance of local water supply well fields, water quality and related aquifer management issues.

14. Over the last 10 years I have conducted a personal investigation into the hydrology of the Christchurch - West Melton aquifer. I was a part instigator of and have been party to an on-going CCC project on gaining an improved understanding of local aquifers.

CODE OF CONDUCT FOR EXPERT WITNESSES.

15. Although this is not an Environment Court Hearing, I confirm that I have read, am familiar with and agree to comply with the Environment Court Consolidated Practice Note (2014) – "Expert Witness Code of Conduct". Other than where I have stated that I am relying on the evidence of another person, I confirm that my evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions I might express.

FORMAT AND SCOPE OF EVIDENCE.

16. My evidence is broken into two sections which discuss:

(1) The definition of the "highest groundwater level".

(2) Matters related to the Technical Memo: "*Effects of cleanfill deposition on groundwater quality",* authored by Dr Lisa Scott, and the associated Rules (Section 5, Rules 5.175 – 5.178) relating to "*Excavation and Deposition over Aquifers"*

EVIDENCE SUMMARY.

17. The definition of "Highest Groundwater Level" is supported

18. Materials acceptable for cleanfilling should be specifically delineated.

19. As recommended by the S42A reporting officer, references to "cured" asphalt should be removed from Rule 5.177

20. The potential quantum of road construction materials containing coal tar is significant. Disposal to municipal landfill is both monetarily and environmentally extremely costly in comparison to disposal into local cleanfills. Accordingly it is important that appropriate leachability testing is undertaken before a decision is taken to potentially prohibit their deposition into cleanfills.

21. Plasterboard does not pose an environmental threat when disposed into cleanfills, as opposed to landfills. Its disposal to cleanfills should not therefore be prohibited although it is recommended that encouragement should be provided to ensure that the materials are rather reused or recycled.

22. It would be administratively simpler if the maximum permissible percentage of vegetative matter in both Rule 5.177 and the Christchurch Cleanfill Bylaw were in alignment. Since the Bylaw is not due for review in the near future, and there is no difference in practice between the figures, it is recommended that the relevant figure be 2% in any cubic metre. (i.e. As per the Bylaw)

23. There is agreement by all parties that changes to health related water quality parameters, created by contamination, should not result in exceedences of the relevant New Zealand Drinking Water Standard Maximum Allowable Values. I argue that neither is it acceptable that parties downstream of a contamination source, in this case potentially emanating from cleanfills, should suffer a discernable decline in the aesthetic quality of their water.

24. As an example, and as anticipated, the deposition of concrete slurries into cleanfills has created water quality issues, relating generally to changes in hardness, for those sourcing water downstream of the subject cleanfill. Accordingly concrete slurries should be prohibited from deposition, although drying of the slurry in suitably impermeable ponds before deposition of the resultant dried slurry should be permissible.

25 Hydro excavation wastes pose similar contamination risks, although in all probability from different contaminants, to those of concrete slurries and should therefore likewise be prohibited. If correctly treated, they could, in most cases, however be dried on site before deposition to minimise the contamination risk.

26. Despite consent conditions requiring materials being deposited into cleanfills to be “inert”, without extensive pre-deposition testing of these materials it is generally not known what potential contaminants are being brought to the cleanfill sites.

27. However, contaminants only become problematic when there is a mechanism to transport them to a sensitive receptor, in this case the aquifers that lie below the local cleanfills. In the context of local cleanfills the only potential contaminant transportation vehicle is rainwater infiltration through the interstices of the cleanfill. It is fortuitous therefore that local rainfall, that could potentially mobilise contaminants within the cleanfills, is relatively low.

28. Irrigation, other than relatively small amounts to establish plant cover over rehabilitated areas, or potentially the over-liberal use of water for dust suppression for example, could however mobilise contaminants leading to contamination of the aquifers on an on-going basis. Accordingly I support the introduction of an appropriate restriction. Covenants may need to be placed over the relevant land parcels to ensure that this prohibition is continued in perpetuity.

29. Whilst I support the need for the submission of a site rehabilitation plan at the time of application for a consent, reference continues to be made to the MfE "*Guide to the Management of Cleanfills – 2002".* This document has effectively been superceded by the "*Technical Guidelines for Disposal to Land – 2018*" which was produced as a joint venture between MfE and WasteMINZ. Discussions on acceptability or otherwise of practices should therefore be referenced to the latter rather than the former document.

SECTION 1: DEFINITIONS

PC 7 Section 2.9: Definitions; "Highest Groundwater Water Level" (HGWL)

30. I support both the ECan and CCC proposal to revert to the earlier definition.

31. I recommend that ECan produce a map, at least of the Canterbury Plains area, that indicates what these levels are. A map would, in most cases, save the re-litigation of the issue each time a consent application is made relevant to HGWL's.

32. S42A officer reports suggest that this would, in summary, be a difficult task to complete. I refute that notion. A number of years ago I constructed a hand drawn, sketch map of the highest recorded groundwater levels in the areas adjacent to the urban areas of Christchurch city. Referencing this to subsequent, specific consent hearing decisions with respect to maximum excavation depths, it has proved to be remarkably accurate despite its crudeness. Accordingly, given modern GIS capabilities, I find it difficult to believe that a legally supportable map could not be produced.

SECTION 2: *"EFFECTS OF CLEANFILL DEPOSITION ON GROUNDWATER QUALITY"*
& SECTION 5, RULES 5.175 – 5.178:-
"EXCAVATION AND DEPOSITION OVER AQUIFERS"

Acceptable Cleanfill Materials - General

33. A specific list of acceptable materials is preferable to the common, and in my opinion, loose definition of "cleanfill" used in the Land and Water Regional Plan.

34. Despite comments in Fulton Hogan Ltd's cross submission (Submitter # 428), post the implementation of the relevant clauses of the Christchurch Cleanfill Bylaw(1) (the Bylaw), the industry repeatedly stated to me that they had found it far easier for all to understand and to administer a specific list rather than a broadly based, non specific definition. A number of operators also emphasised to me that a list, common to all cleanfills, placed all operators on a commercially level playing field. Under the Bylaw the Christchurch City Council reserved to itself the power to allow additional types of materials to be deposited should the need arise.

35. As far as I am aware the Bylaw list system has now operated effectively without issue for over fifteen years.

36. It is perhaps somewhat ironic that two cross submitters (#'s 428 & 480) opposed my submission in that they, as in common with most, if not all other cleanfill operators, utilise lists as an integral part of their own cleanfill acceptance criteria.

37. I note for example, that in Fulton Hogan Ltd's draft Cleanfill Management Plan(2) (CMP) for their proposed Roydon Quarry, cleanfill acceptance is based on lists. The only difference from the Bylaw principle being that Fulton Hogan have proposed to reserve the right to themselves to allow the deposition of materials, consistent in their view with their consents but not on their CMP list.

38. Unfortunately the "definition" (i.e. rather than a list) approach often leaves an "accept" or "decline" decision on the shoulders of people not technically qualified to do so.

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(1) https://ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Bylaws/Cleanfill-and-Waste-Handling-Operations-Bylaw-2015.pdf

(2) www.ecan.govt.nz *› document › download* - **Appendix C Revised Cleanfill Management Plan**

39. For example, where an operator has defined their own list how does the acceptance process operate? If the material is not on the company derived "list" who makes the decision? The depositor? The weighbridge operator? The tip face worker? The cleanfill manager?

40. Without wishing to denigrate the experience of these staff, I suggest that they are unlikely to be appropriately qualified to make this decision, particularly given the implications with respect to contaminating drinking water supply aquifers. Whilst larger companies, such as Fulton Hogan, may have access to the relevant expertise most other operators would not and indeed the latter may not be fully aware of the potentially dire consequences if they make an incorrect decision.

41. With a list it is clear. If the material is not on the list specified in the consent then it cannot be accepted. If something unusual is presented for disposal (i.e. not on the list) the cleanfill operator would continue to have the option of applying to ECan, who have the appropriately qualified staff, for advice and/or a specific variation to their consent.

42. It is worth noting that a number of other jurisdictions within New Zealand operate under much stricter acceptance criteria for cleanfills, elsewhere often and more correctly known as managed fills, than does ECan. Auckland Council's Unitary Plan for example specifies concentration limits on a range of compounds and requires regular testing on an on-going basis if materials are to be accepted for disposal.

"Cured Asphalt"

43. I note that the S42A officer report now recommends the removal of the restriction previously placed in Rule 5.177 on the deposition of 'uncured' asphalt. (i.e. All asphalt is now considered as being an acceptable cleanfill material without placement depth restrictions.) I support this amendment. However since Road Metals Ltd (Submitter # 480) cross-submitted in opposition to my request that the word "cured" be deleted, and although it may have been a misunderstanding of my intent by them, I have re-presented my argument in the following paragraphs.

44. I am not sure how, when or where the word "cured" appeared originally – it is certainly a more recent addition to matters relating to cleanfills - but it is a complete misnomer.

45. The production of asphalt involves the heating of bitumen above its melting point, its mixing with similarly heated and dried aggregates, its laying and subsequent compaction. The latter must take place before the bitumen in the mix effectively re-solidifies as it cools. There is no chemical reaction taking place (i.e. the bitumen does not "cure".) It simply cools and re-solidifies. If the bitumen is re-heated it softens and eventually becomes fully liquid again. Over time (years) the bitumen will oxidize and loose some of its flexibility but this has nothing to do with "curing".

46. Hence if we set aside the non-issue of “curing” the question becomes does bitumen leach contaminants into the environment? Many studies have been undertaken over the years on both ‘fresh’ and aged bitumen and none have ever found there to be an issue, even in far more aggressive leaching environments than those that exist within the local cleanfills.

47. To be technically correct, the bitumen used in chip-sealing is "cut back" (or temporarily softened) by the addition of small quantities of diesel and / or kersosene "cutters". Over time the volatile components of the cutters evaporate into the atmosphere. It is possible therefore to characterise this as a "curing" process. I have been unable to find any relevant leaching tests conducted on chip seal, new or aged. I suspect however that it is unlikely to be a problem in local cleanfills, particularly given that the quantities involved are very small in comparison to overall cleanfill volumes and, in the vast number of cases, the chip seal will be old (i.e. well past the point when the cutters have evaporated.)

48. In conclusion I believe the word “cured” is totally superfluous, leads to confusion and unnecessary disputes and consequently should be omitted. Accordingly I support the S42A proposed amendment to Rule 5.177 to remove the deposition depth restriction placed on “cured” asphalt.

Cleanfilling of Roading Materials containing Coal Tar.

(Although this topic appears in PC 7 documentation under the heading of "Minor Matters" it is far from being "minor" as it impacts a decision involving potentially $100's millions.)

49. In 2005 I compiled an initial scoping report as part of a study that Christchurch City Council[3] (CCC) initiated concerning coal tar based chip sealing. This method of road surfacing was common in Christchurch and its environs whilst the gas works was operating in the city. (i.e. until the late 1960's)

50. My report noted, as does the commentary from the S42A reporting officer, that coal tar has long been known to contain significant quantities of potentially carcinogenic PAH's. What wasn't known however until the study was undertaken was that these compounds had migrated into the upper layers of the road structure and footpaths below the chip seal and also into the soils in the adjacent grass berms. Historically old chip seals, the upper roading and footpath sub-structure, and sometimes soils from grass berms, have been removed during road re-construction and trenching operations and then transported to local cleanfills for deposition.

51. My study concluded, as again supported by the S42A officer commentary, that the PAH compounds in the coal tar might not pose a threat if buried as they are, theoretically, readily adsorbed to surrounding particulate matter. (i.e. the PAH compounds are not mobile.) However a mechanism for their actual migration (i.e. their apparent mobility) from the coal tar surfacings into the road sub structure below was not readily evident. I consequently recommended to CCC that they, or ECan, undertake appropriate testing to determine if these materials, through leaching, posed a threat to the aquifers once deposited into cleanfills.

52. CCC Construction Standard Specifications subsequently adopted some of my report recommendations with respect to the on site treatment of these materials[4]. However it appears that the leachability testing work I recommended has still not been carried out.

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(3) "*Coal Tar Surfacings and their Consequences* " (Unpublished) Nov 05 – Twelfth Knight Consulting for CCC

(4) https://www.ccc.govt.nz/assets/Documents/Consents-and-Licences/construction-requirements/CSS/CSS-2018-V-10.4-all.pdf Clause 17.4.1, pg 41

53. A later CCC sponsored in-situ road reconstruction project[5] concluded that the raw pulverised material containing coal tar "*had a low potential for harm, which suggests there would be minimal risk of leachate toxicity if this type of material was removed and stockpiled offsite."*

54. As a matter of clarification with respect to the S42A reporting officers comments, it is not the detection of the presence of coal tar that is the point of discussion here. (The "coffee / tea" test referred to by the officer in his report is but one of a number of methods for detecting the presence of coal tar in road surfacings.) Rather it is whether, if coal tar material is placed in cleanfills, there is some mechanism whereby the PAH's could migrate into the aquifer below the cleanfill. (i.e. the determination of the leachability of PAH's from coal tars in a cleanfill environment.)

55. The problem with ECan's proposed approach (i.e. generally landfilling as opposed to cleanfilling) is that it is extremely expensive both in dollar and environmental impact terms. In order to provide the Hearing Panel with some context to my statement I have noted below a few salient facts:

- In 2005, CCC estimated that there were 12,000,000 sq.m. of road (out of a then total of 16,000,000 sq.m.) with a coal tar content.
- At that time CCC were reconstructing 100,000 sq.m. per year. (It was likely, given the age spectrum of the roads, that the majority of these reconstructions involved roads containing coal tar.)
- The volumes of contaminated materials (including footpaths and, where appropriate, berms) was estimated to be of the order of 3 - 5 million tonnes depending on the depth of contamination below the road surfacing, footpaths and berms.
- If all contaminated materials required disposal at Kate Valley, the cost (2005 $) would have been of the order of $350 million (c.f. the then annual CCC roading budget of approx $30 million)

56 Obviously there have been reconstructions, both planned and unplanned (i.e. resultant on the earthquakes), since my report was compiled but it is still likely that in the order of 8,000,000 sq.m. of roading containing coal tar, plus the associated berms and footpaths, are still extant.

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(5) "*Reconstruction of coal tar-contaminated roads by in-situ recycling using foamed bitumen stabilization" - Depree – NIWA, Sept 09* https://www.nzta.govt.nz/assets/resources/research/reports/388/docs/388.pdf

57. Accordingly the issue remains a potentially, significantly costly problem, both monetarily and for transport related environmental costs and $C0_2$ generation. It is important therefore that the, in all senses, very much cheaper option of disposal at local cleanfills be properly investigated before a prohibition on coal tar disposal is instigated.

58. It is equally important that the test procedures adopted accurately replicate a local cleanfill environment. (i.e. low moisture content, probably aerobic and effectively neutral pH.) Unfortunately the tests that continue to be used in New Zealand are not appropriate - the TCLP test replicates the environment in a landfill (i.e. moist to wet, potentially anaerobic, low pH) and the SPLP test which was designed to replicate the effects of acid rain**.**

59. The United States and Europe have long recognised this testing problem and consequently developed a suite of appropriate tests known in the USA as LEAF (Leaching Environmental Assessment Framework)[(6)] which is endorsed by the US Environmental Protection Agency. I have tried repeatedly to persuade the relevant ECan, CCC and other authority staff to at least investigate the LEAF methodology but without success. It is disappointing that those within New Zealand with the relevant technical expertise seem very reluctant to update local procedures to match best practice, with consequent on-going, potentially negative environmental outcomes.

60. Hence why, as I have stated before, it is important that appropriate testing be undertaken to determine the mobility, or lack thereof, of PAH's in a local cleanfill environment before any decision is made relating to PC7.

61. In lieu of appropriate testing, and in view of the existing presence of significant volumes of roading materials containing coal tar in local cleanfills, Dr Scott has, at my request, kindly undertaken an investigation into the presence of PAH's in the Christchurch aquifers[(7)]. There were very few instances in aquifer sourced water test results where PAH's were detected, In these latter cases the concentrations of PAH's were low and none related to areas where the aquifer water quality may have been impacted by deposition in local cleanfills.

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(6) https://www.epa.gov/hw-sw846/leaching-environmental-assessment-framework-leaf-methods-and-guidance

(7) Analytical results for Polycyclic Aromatic Hydrocarbon (PAH) compounds in groundwater samples collected by Environment Canterbury in the Christchurch-West Melton, Selwyn and Waimakariri Zones

62. In summary, despite the long standing practice of depositing coal tar containing materials into local cleanfills there is no current evidence of the leaching of PAH compounds from these sites. From this one could conclude that the deposition of roading materials containing coal tar should not be prohibited. However, given that the numbers of tests taken in proximity to the cleanfills were low, I again stand by my 2005 recommendation that appropriate testing should be conducted as a precursor to any decision.

63. In relation to the S42A reporting officer's comments I am somewhat perplexed that he should state that the LEAF system may not be a suitable testing methodology. It is in fact world best practice and, I repeat, is recognised as such by its embodiment in regulatory testing in both USA and Europe.

64. I further note that reporting officer considers coal tar to be hazardous to human health. As I have stated earlier in my evidence this is only potentially correct. I say "potentially" as in fact the material, apart from being classified from a regulatory standpoint as "hazardous", only becomes such with respect to health if there is both a pathway and transport mechanism for the PAH compounds to have a human interface.

65. Where materials are buried in a cleanfill they will only become 'hazardous' if there is some mechanism to transport the compounds of concern - in this case PAH's - to an underlying potable water source. PAH's, as stated earlier, and confirmed by the S42A report writer, are generally considered to be immobile. However under certain environments this may not be completely correct. There is a small but potential risk that PAH's could leach out of the deposited coal tar materials and subsequently migrate into the underlying aquifers from which potable water is abstracted. It is this risk, if any that I am recommending be quantified before a decision is made on Rule 5.177.

66. Alternatively, given that there is no evidence of PAH migration into the aquifers local to the cleanfills, the Hearing Panel could choose to accept the S42A report statements that :

- *"…..coal tar bound to other waste (e.g. roading waste) is stable*"
- "*The current indication is that coal tar leaching potential would be low*."

and conclude that disposal to cleanfills is in fact acceptable. (i.e. A rule requiring disposal only to landfill is not required.)

67. It is worth noting at this juncture that other "hazardous" materials, such as asbestos, have received consents for disposal at local cleanfills on the basis of the reasoning I have outlined above.

Plasterboard.

68. Plasterboard only becomes a potential source of contaminants when it is exposed to moist, low pH environments (e.g. where a lot of vegetative matter is also present such as in municipal landfills**).** Local cleanfills are not moist, are of almost neutral pH and there is little to no vegetative matter present. Plasterboard does not therefore pose an environmental hazard if disposed into local cleanfills and accordingly does not warrant prohibition from local cleanfills on the grounds of potential aquifer contamination.

69. It should be noted however that plasterboard was prohibited from deposition into local cleanfills by the Christchurch Cleanfill Bylaw because of its high recycling potential (There was a viable recycling option at the time of the inception of the Bylaw but I am not aware of the current situation.) Although some sites accepted significant quantities of plasterboard pre 2004, theoretically none has been deposited into cleanfills in the Christchurch area post the commencement of the Bylaw.

Vegetative Matter.

70. At the time of drafting of the Christchurch Cleanfill Bylaw there was much discussion about what the maximum allowable concentration of vegetative matter would be. It was agreed by both CCC and the industry that 2.5% (roughly equivalent to one barrow full per truck load), but reduced in the latest revision of the Bylaw to 2%, would be a workable figure that would neither impose unnecessary costs on the industry nor create an indirect hazard in the cleanfill. Rule 5.177, suggests however that the figure be 3% per cubic metre. It is important to note that, as the S42A reporting officer agrees, there is no difference in practice between the two figures.

71. It would be administratively simpler to have the same figure in both the Christchurch Cleanfill Bylaw and the L&WRP. Since the Bylaw is not due for review in the near future, I recommend that the PC7 figure should match the Bylaw. (i.e. Rule 5.177 should read "*The volume of vegetative matter in any cubic metre of material deposited does not exceed 2%*")

Cleanfill Impacts on Groundwater.

72. I am generally in agreement with Dr Scot's comments, although I am not sure how much of what she notes has been influenced by the specific problem emanating from the quarries in the Old West Coast Road area (I have commented further on the Old West Coast Road quarry issues separately under “Concrete Slurries”.)

73. Whilst I also agree with Dr Scott's statement about exceedances I am uncomfortable with strictly placing the bar at the New Zealand Drinking Water Standard (NZDWS) Maximum Allowable Value (MAV) figures which are suitable for the protection of human health but would not generally cater for changes in aesthetic qualities.

74. It is not acceptable that parties downstream of a contamination source, in this case potentially emanating from cleanfills, should suffer a decline in the aesthetic quality of their water.

75. For example I believe that if a consumer has historically accessed ‘soft’ water they should not be expected to tolerate a change to ‘hard’ water solely because the water still falls within the requirements of the NZDWS. ‘Hard’ water brings with it a number of issues including taste, and furring of kettles and hot water cylinder elements leading to premature failure, marks on glassware, etc.

76. Properties adjacent to Winstones Old West Coast Road quarry have already been subject to a significant change to the aesthetic quality of their water resultant on contamination from Winstones nearby concrete slurry drying operations.

77. My submission therefore is that discernable changes in aesthetic qualities should not be permitted (i.e. in addition to the requirement to remain within NZDWS MAV's.)

Concrete Slurry Deposition into Cleanfills.

78. Winstones Aggregates acceptance of concrete slurries, to which I referred earlier, has created the well documented, and easily anticipated aquifer contamination issues which have been subject to investigation by Dr Scott.

79. I was aware of the potential for concrete slurries to create aquifer contamination issues when the Christchurch Cleanfill Bylaw was originally written in 2003 and hence why my recommendation to prohibit the deposition of concrete slurry into the cleanfills was enacted at that time. Unfortunately ECan later provided Winstones with a specific consent to deposit concrete slurry.

80. However to be more precise, it is the slurry water seeping through the base of the drying ponds that is creating the problem. It could be argued therefore that dried concrete slurries are acceptable - as is the case in the Christchurch Cleanfill Bylaw. To arrive at this latter state concrete slurries could be dried in ponds lined with impermeable material. Accordingly it would perhaps be preferable for the relevant clause of PC7 to state that dried concrete slurries are acceptable rather than to have a blanket prohibition.

Hydro-excavated Waste.

81. I am in general agreement with Dr Scott's comments and accordingly support the prohibition of 'wet' hydro-excavation wastes delineated in Rule 5.177. They pose similar contamination risks, although in all probability from different contaminants, to those of concrete slurries and should therefore be prohibited. Likewise, if correctly treated, they could, in many cases, however be dried on site before deposition to remove the contamination risk.

Prohibition of Irrigation over Cleanfilled Materials.

82. "Cleanfill" material deposited in the ECan area is really a misnomer. ECan's definition relies on the term "inert". Materials, such as for example "asphalt", are often described, for the purposes of deposition into local cleanfills, as being effectively "inert".

83. However, whilst asphalt as a manufactured product, may in this context, be considered to be "inert", the majority of asphalt deposited into cleanfills is not waste manufactured product but rather is material sourced from road reconstruction. As such the deposited material will contain zinc, lead, hydrocarbons, rubber dust and other contaminants which could be mobilised by water peculating down through the fill. Setting aside the issue of 'curing', the same could of course be said for chip seal with respect to contaminants as could a similar argument be mounted for many other materials.

84. Without extensive pre-deposition testing nobody really knows what potential contaminants are being brought to the cleanfill sites. In the local context the saving factor is that contaminants only potentially become problematic when there is a mechanism to transport them to a sensitive receptor - in this case being water supply aquifers.

85. The impact of water, other than rainfall, is readily demonstrated, as noted above by the water supply issues created by the concrete slurry drying ponds at Winstones quarry. It is fortuitous therefore that local rainfall, that could potentially mobilise contaminants within the cleanfills, is relatively low.

86. This is not to say that the local cleanfills have not had a negative impact on the aquifers. Tests taken by ECan over quite a long period have demonstrated that containment leaching from cleanfills created by rainfall does occur but fortunately at levels that do not breach the NZ Drinking Water Standard. (As far as I can tell, these tests have not been taken closely following heavy rainfall events. Contaminant levels might spike at these times, potentially breaching NZDWS limits in the immediate vicinity of the cleanfills.)

87. However irrigation, other than relatively small amounts to establish plant cover over rehabilitated areas, or potentially the over-liberal use of water for dust suppression for example could readily mobilise contaminants leading to contamination of the aquifers on an on-going basis.

88. Looking at the issue pragmatically, the final value of the land if used for agricultural purposes, irrigated or not, is very low in the context of the overall income of a project such as for example Road Metals quarry and associated quarry at Burnham. The monetary liabilities and reputational damage that could occur if a water supply were contaminated are potentially very significant and certainly many orders of magnitude greater than the difference in value between irrigated and un-irrigated rural land.

89. Irrigation over cleanfills could readily create significant long term problems for very small, short term gain. Accordingly I agree with Dr Scott's comments and note specifically that irrigation other than for the establishment of initial grass cover should not be permitted over areas that have been cleanfilled. Covenants may need to be placed over the relevant land parcels to ensure that this prohibition is continued in perpetuity.

Ministry for the Environment – "A Guide to the Management of Cleanfill 2002"

90. Whilst I support the officers reasoning for the need for the submission of a site rehabilitation plan at the point of application for a consent, reference continues to be made both in PC7, and by numerous other parties, to the MfE *Guide to the Management of Cleanfills – 2002.* This document has however effectively been superceded by the "*Technical Guidelines for Disposal to Land – 2018*"(8) which was produced as a joint venture between MfE and WasteMINZ.

91. The latter document differs significantly in some aspects to the former and is more representative of modern practice. Discussions on acceptability or otherwise of practices should therefore be measured against and referenced to the latter rather than the former document.

RELIEF SOUGHT.

(The Rules version referenced below are those as per the S42A recommendations notified 10/7/2020)

92. The definition of "Highest Groundwater Level" in PC7: Section 2.9 to be retained.

93. Materials acceptable for cleanfilling to be defined by a specific list.

94. Retain the S42A proposed amendment to Rule 5.177 to remove the deposition depth restriction placed on "cured" asphalt.

95. Appropriate leachability testing of roading materials containing coal tar to be conducted prior to any decision on the acceptability of the deposition of these types of materials into cleanfills.

96. The maximum permissible quantum of vegetative matter, specified in Rule 5.177, to be reduced to 2% per cubic metre.

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(8) https://www.wasteminz.org.nz/pubs/technical-guidelines-for-disposal-to-land-april-2016/

97. The prohibition of the deposition of undried concrete slurries and hydro-excavation waste materials into cleanfills to be retained.

98. Retention of the prohibition of all but minor irrigation over cleanfilled areas and the introduction of associated covenants to ensure that this prohibition continues in perpetuity.

99. References to the "*Guide to the Management of Cleanfills – 2002"* to be removed and replaced by "*Technical Guidelines for Disposal to Land – 2018*"

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16th July, 2020