

Appendix B Proposed Conditions for Resource Consent (APP-201668843)

Showing changes following the review by Dr. Gadd and those resulting from the Hearing.

Details of Permit

Purpose for which permit is granted: To discharge water, stormwater, and contaminants to water from the Invercargill City Council reticulated stormwater network.

Location - site locality Invercargill
- catchments Waikiwi Stream, Waihopai River, Otepun Stream, Kingswell Creek, Clifton Creek

Grid Reference: Appendix 1, Table 1 contains discharge locations and grid references and maps

Expiry date: **[Commencement date plus 25 years]**

Schedule of Conditions

1. This consent authorises the discharge of:

- (a) water, stormwater and contaminants from the Invercargill City Council reticulated stormwater network; and
- (b) dye from dye testing of the networks

to water at the locations specified in Table 1 and shown on the maps attached in Appendix 1 to these conditions, in general accordance with the application "Stormwater Discharges – Application Document", dated 14 September 2016.

2. This consent does not authorise the discharge of:

- (a) Accidentally spilled or deliberately released hazardous substances nor washdown of such substances;
- (b) Untreated human sewage or agricultural effluent;
- (c) Contaminants and water that have been removed from sumps during cleaning and maintenance; or
- (d) Stormwater, water or contaminants from stormwater assets connected to the Invercargill City Council's stormwater network which require new discharge locations.

Comment [DJ1]: ES / ICC – discussed inserting an advice note to cover minor changes / additions etc. that don't affect compliance with the consent, that the maps show an indicative area, but that a variation would likely be needed where a new outfall is proposed.

Noted that a variation may be sought but may not necessarily be granted.

Comment [DJ2]: Response to general question from ES compliance:
- ICC noted that discharges from engineered wastewater overflows are not covered by this consent. They would be considered discharges from the wastewater network rather than from the stormwater network.
- ES response – ok to exclude it from this consent, and will address separately as unconsented overflows.

- NO ACTION

Comment [DJ3]: ES – 25 years seems a long time, but ES Compliance are not in a position to comment / not in area of their expertise.

This has otherwise been addressed at the hearing, and was not revisited further.

Comment [DJ4]: ES were concerned re: the scope of what is considered to be a contaminant.
ICC response: would default to the RMA definition in Part 2, but have also noted the particular exceptions provided for in condition 2(a) – (c) as the most significant contaminants that could occur. It was agreed that this should be noted to the Panel.

ES also concerned that the stormwater network is focussed on moving stormwater as fast as possible for "public convenience" rather than considering opportunities to address quality / treatment.

ICC response: this was perhaps traditionally the case, but this application is based on the premise of progressively identifying and removing contaminants at source, and represents a shift in focus toward improvements in stormwater quality.

NO CHANGES

Comment [DJ5]: ES considers Haz Subs to be very restrictive, and would not include other contaminants that aren't hazardous but have a significant adverse effect (milk was used as an example).

ICC response – noted, but this would be picked up in other conditions, and would also trigger a pollution response from ICC & ES etc.

NO CHANGE

Inspection of Industrial & Commercial Premises

3. The consent holder shall undertake inspections of all industrial and commercial properties within the catchment of the specified stormwater network as follows:

(a) Within the first 12 months of first exercising this consent, the consent holder shall develop and provide to the Consent Authority **and the Technical Review Group referred to in Condition 18**, an inventory of:

(i) all industrial and commercial sites that store, handle, or use hazardous substances or **bulk** contaminants of concern, as identified by the **Technical Review Group Working Party** required to be established by Condition 18 of this consent; and

(ii) sites on Environment Southland's Selected Land Use Sites Register

that pose a potential risk to the quality of stormwater discharged to the reticulated stormwater systems included in Appendix 1.

(b) Within five years of provision of the inventory to the Consent Authority, the consent holder shall undertake field inspections of each of the sites identified on the inventory prepared under condition (3)(a). At least 20% of the identified sites shall be inspected each year, including any additional sites established and / or identified over that period, such that by the fifth anniversary of the provision of the inventory, all identified sites have been inspected. Each site shall be subsequently inspected at least once every five years for the duration of this consent.

(c) The inspections required under condition (3)(b) shall:

i) Identify sites requiring improvements to **housekeeping practices**¹, hazardous substances storage and handling areas to ensure that there is no risk of the hazardous substances entering the stormwater network from the site, including in a form that will result in the discharge from the stormwater network exceeding the limits specified in this consent;

ii) Identify sites requiring improvements to **housekeeping practices**, storage and handling of contaminants of concern to minimise the impact of the stormwater discharges from the site on the quality of the network discharges;

iii) Identify sites requiring improvements to stormwater treatment;

iv) Identify what improvements need to be made to address the matters outlined in (i) to (iii) above and a timetable for implementation.

(d) The Consent Holder shall include in the Annual Report required by Condition 31, the current definition of **'bulk contaminants of concern'**, a summary of the results of the inspections, including the outcome of the inspection, any identified actions required, **and the method and timetable for implementing the actions**.

(e) Within three calendar months of completing each round of inspections, the Consent Holder shall provide the Consent Authority with an inspection

Comment [DJ6]: ES: queried why it is limited to 'bulk' contaminants.

Comment [DJ7]: ES – noted conditions “identify” sites and issues etc but no actions or responses are required in conditions.

ICC response: it was noted that the obligation is on the operator / contaminator to 'clean up' / improve operations – ICC then checks in follow-up and enforces as necessary through other legislation (as per ICC Right of Reply) – actions are defined through condition 3(c).

ES asked for this to be noted to the Panel.

Comment [DJ8]: Add advice note as to what 'housekeeping practices' are. See footnote

Comment [DJ9]: ES: discussed whether sediment from road works would be captured as a contaminant.

ICC response was that sediment in that scenario could be considered a 'bulk contaminant'.

NO ACTION

Comment [DJ10]: ICC response to ES compliance's concerns re: This is the condition requiring action by ICC – identify the issue (previous conditions), define what steps are needed (method), and then follow-up (timetable) – ICC to enforce if / as necessary.

NO ACTION

¹ **ADVICE NOTE: 'Housekeeping practices': where the occupier of a site undertakes activities and operations in a manner that adopts good or best practice in order to minimise the actual or potential discharge of contaminants from that site to the stormwater network**

programme of at-risk sites (as defined in Condition 3(c)(i) – (iii)) identified by the inspections required under Condition 3(b).

Comment [DJ11]: ES: asked for a link to condition 3(c) which defines what an 'at risk' site is.

Programme to address illegal discharges of human sewage to the stormwater network

4. The following trigger values shall apply to the monitoring required to be undertaken in dry weather conditions in accordance with Conditions 5 and 7:

Parameter sampled	Surveillance Programme	Indicator Programme
Total ammoniacal nitrogen (mgN/l as N _L)	0.1	1
<i>Escherichia coli</i> (MPN ₁₀₀ /100 mL)	1,000	10,000

5. (a) The Consent Holder shall undertake a Surveillance Programme to determine if there is any sewage present in the stormwater network. The surveillance will include the collection of representative dry weather samples of surface water at two monthly intervals.

Comment [DJ12]: ES Compliance: notes it is possible when taking receiving water samples that there could be a greater degree of variability in obtaining accurate results than would be the case with discharge monitoring. ES compliance consequently prefer discharge monitoring to supplement receiving water monitoring.

(b) Grab samples shall be collected in dry weather conditions, when there has been less than 0.5 mm of rainfall in the preceding 72 hours as recorded at the Consent Authority's rainfall station at Waihopai Dam. If such rainfall conditions do not occur within two weeks of a scheduled sampling event, samples shall be collected on the next day when there has been less than 0.5 mm of rainfall in the preceding 24 hours.

(c) Samples shall be collected from all sites in the 'Surveillance Location in Streams' column listed in Table 1 of Appendix 1 (attached to this consent).

(d) The following shall be recorded for each sampling event:

- i. Rainfall in the preceding 24 hour, 72 hour and 10 day periods at the Consent Authority's rainfall stations at Waihopai Dam and Tisbury Dam;
- ii. Water level at the Consent Authority's water level stations on the Waikiwi Stream at Ferry Road, Waihopai River at Waihopai Dam and Stead Street, Otepunu Creek at Otepunu Dam, and Kingswell Creek at Tisbury Dam;
- iii. At each sampling location, qualitative assessment of the flow in the stream at the sampling location as low, medium or high;
- iv. At each sampling location, observations of the receiving water within 30 m upstream of the sampling location; and
- v. At each sampling location, observations of any conspicuous oil or grease films, scums or foams or floatable or suspended material, including litter, resulting from the discharge (supported by photographic evidence).

(e) Samples shall be analysed for :

- Temperature (field measurement)
- pH (field measurement)
- Electrical conductivity
- Dissolved oxygen (as mg/L and percentage saturation)
- Total ammoniacal nitrogen
- *Escherichia coli*

If the results for either total ammoniacal nitrogen or *Escherichia coli* exceed the 'Surveillance Programme' trigger value specified in Condition 4, the analytical sample results for the sampling event shall be reported in writing to the Consent Authority and the Health Protection Officer within two working days ~~four weeks~~ of receipt of the sample results by the consent holder. Otherwise, the analytical sample results shall be reported as in Condition 31 Reporting.

6. If the monitoring undertaken in accordance with Condition 5 identifies that the 'Surveillance Programme' trigger values listed in Condition 4 are exceeded on more than one occasion over the current and preceding five events, the consent holder shall:
- a) assess the surveillance results against the up-stream results to determine whether activities outside the stormwater catchment or the residual contamination from the next upstream sampling location may be influencing the exceedance of the trigger value; and
 - b) if an exceedance is identified which cannot be sourced to activities outside the stormwater catchment or residual contamination from the next upstream sampling location, the consent holder shall commence an 'Indicator Programme' for the identified sampling location as defined in Condition 7 if an Indicator Programme or the ensuing investigation as required under Condition 8(b) is not already occurring at the sampling location in question.

Comment [DJ13]: ES concerned that this wouldn't allow a large breach to be picked up – a major breach would be picked up by condition 2, but could also be managed similar to the 50,000 MPN/100 mL limit in condition 8 (for example).

Indicator Programme

7. (a) If triggered by Condition 6(b), the consent holder shall commence an 'Indicator Programme' for the identified sampling location, which includes locations where sewage has previously been detected in stormwater discharges, at monthly intervals for six months from when condition 6(b) is triggered, the collection of representative dry weather samples of all discharges from the consent holder's stormwater network between the sampling location at which the trigger value was exceeded and the next upstream Surveillance Programme sampling location listed in Table 1 of Appendix 1 (attached to this consent).

Comment [DJ14]: ES requested that a reference to priority sites, being those identified in previous monitoring, is inserted into this condition.

(b) The consent holder shall also carry out an 'Indicator Programme', as described in Condition 7(a), from the date of commencement of this resource consent for the locations where sewage has previously been detected (but not yet traced and eliminated) in the stormwater discharges monitored under Resource Consents 206936, 206937, 206938, 206939 and 206940.

~~(b)~~(c) Grab samples shall be collected in dry weather conditions as defined by Condition 5(b).

~~(c)~~(d) The information specified in Condition 5(d) shall be recorded for each sampling event.

~~(d)~~(e) Samples shall be analysed for fluorescent whitening agents (FWAs) and also the determinands specified in Condition 5(e) :

The analytical sample results shall be reported in writing to the Consent Authority as part of the Annual Report required by Condition 31.

8. If the monitoring undertaken in accordance with Condition 7 identifies that the 'Indicator Programme' trigger values listed in Condition 4 are exceeded at any discharge on more

Comment [DJ15]: ES concerned that annual reporting is too infrequent.

ICC response: more frequent reporting is addressed in other conditions. ES satisfied.

NO ACTION

than one occasion or if any single sample exceeds a *E.coli* concentration of 50,000 MPN/100 mL, the consent holder shall undertake the following as appropriate:

- a) Establish signage for the identified discharge to inform the public of the risk from the presence of sewage;
- b) the Consent Holder shall commence an investigation into the catchment of the identified discharge to determine if any sources of untreated human sewage to the stormwater network can be located within the catchment of this discharge, unless such an investigation is already occurring for this discharge location; and
- c) Once complete or at six monthly intervals, whichever is sooner, the consent holder shall provide a report to the Consent Authority and Health Protection Officer that includes:
 - i. A description of the methodology for the investigation undertaken;
 - ii. Maps which show the locations at which samples, inspections or other activities were undertaken; and
 - iii. A summary of the results of the investigations, including any mitigation measures that have been or are intended to be undertaken to remove the sewage, and the timetable for implementing those measures.
- d) Include a summary of the results and any mitigation measures implemented, in the annual report.

Comment [DJ16]: ES concerned that "investigation" isn't suitably defined.

ICC response: The investigation will vary according to the circumstances. Clause (c) has a reporting requirement, and also the surveillance programme provides 'proof' as to progress etc. towards addressing the issue.

ICC will need to undertake an investigation to the extent necessary to determine the source, and that will vary in each circumstance.

NO ACTION.

Wet Weather Monitoring

9. (a) The Consent Holder shall undertake a 'Wet Weather Monitoring Programme', including the collection of representative wet weather samples of surface water at least four times each year, to assess the effects of the stormwater discharged during wet weather on water quality in the streams.
- (b) Samples shall be collected during rainfall of more than 5 mm within the previous 6 hour period has occurred or is occurring, as recorded at the Waihopai Dam monitoring site ~~wet weather conditions when rainfall of more than 5 mm has occurred (or is occurring).~~
- (c) Grab samples shall be collected from the wet weather surface water locations specified in Appendix 2.
- (d) The following shall be recorded for each sampling event:
 - i. Rainfall on the day of sampling and in the preceding 24 hour, 72 hour and 10 day periods at the Consent Authority's rainfall stations at Waihopai Dam ~~and Tisbury Dam;~~
 - ii. Water level at the Consent Authority's water level stations on the Waikiwi Stream at Ferry Road, Waihopai River at Waihopai Dam and Stead Street, Otepunu Creek at Otepunu Dam, and Kingswell Creek at Tisbury Dam;
 - iii. At each location, qualitative assessment of the flow in the stream at the sampling location as low, medium or high;
 - iv. At each sampling location, observations of the receiving water within 30 m upstream of the sampling location; and

Comment [DJ17]: ES concerned about receiving environment monitoring versus monitoring the discharge – i.e. there is no discharge monitoring proposed.

ES view is that the discharge monitoring is a performance measure, versus the receiving environment monitoring being an effects assessment. Concerned that receiving environment monitoring isn't robust enough to protect human health.

Concern is about all contaminants, not just sewage. The 2011 consent seems to be getting ignored, when the issues raised at that time still haven't been resolved – sediment is also a concern.

ICC Response: Include reference in condition 7 to the sites that are known to discharge sewage, as part of the indicator programme (see addition to Condition 7(a)).

- v. At each location, observations of **stream colour**, any conspicuous oil or grease films, scums or foams or floatable or suspended material, including litter, resulting from the discharge (supported by photographic evidence).

(e) Samples will be analysed for :

- Temperature (field measurement)
- pH (~~field measurement~~)
- Electrical conductivity
- Dissolved oxygen (as mg/L and percentage saturation)
- Total ammoniacal nitrogen
- Total oxidised nitrogen
- Total nitrogen
- Dissolved reactive phosphorus
- Total phosphorus
- *Escherichia coli*
- Faecal coliforms
- ~~Total hardness (as CaCO₃)~~
- ~~Dissolved organic carbon~~
- **Dissolved zinc**
- **Dissolved copper**
- **Dissolved nickel**
- **Dissolved lead**
- **Total zinc**
- **Total copper**
- **Total nickel**
- **Total lead**
- **Total Suspended Solids**

The analytical sample results shall be reported in the Annual Report required by Condition 31, including a comparison to the relevant guidelines listed in Appendix 3 (attached to this consent).

Sediment **Sampling**

10. (a) In the first quarter of each year, the Consent Holder shall collect representative samples of sediment. Each sample shall be a single composite sample of four separate sub-samples from each location, except for the most downstream sites in Waihopai River (site H), Otepunu Creek (site L) and Clifton Creek (site D). At these three sites, five replicate samples shall be analysed, with each replicate being a composite of four separate sub-samples.
- (b) The sediment samples shall be collected from the locations stated in Appendix 2 as the sediment sampling locations.
- (c) Samples collected shall represent the top **25 mm** depth of sediment in areas of accumulated fine sediment. Samples shall be analysed for :
- Particle size distribution
 - Total organic carbon
 - Total zinc
 - Total copper
 - Total nickel
 - Total lead
 - Polycyclic aromatic hydrocarbons (PAHs)

Comment [DJ18]: Clarified that this is a longitudinal survey.

NO ACTION

Comment [DJ19]: ES compliance: agreed that 25 cm was inappropriate / probably an error. Felt that this should possibly be 50 – 100 mm, but not sure.

ICC response – believed to be an error between 'cm' and 'mm'. Changed to mm accordingly.

The analytical sample results for each sampling event shall be reported in the Annual Report required by Condition 31, including a comparison to the guidelines listed in Appendix 4 attached to this consent.

Shellfish and Fish Flesh Contamination Survey²

11. (a) In 2018 and in 2023, the Consent Holder shall undertake an investigation of the degree of contamination in shellfish and fish flesh in the Waihopai Arm of the New River Estuary and the wider Estuary. The investigation shall include the collection of samples of fish and shellfish flesh (if available) from at least five locations. The locations in the Waihopai Arm shall be agreed with the Technical Review Group, as provided for under Condition 18(a)(iii) of this consent.
- (b) Samples shall be collected from up to 3 species, with analysis being undertaken on the part of the animal which is typically consumed. Analyses shall be undertaken for arsenic, cadmium, chromium, copper, lead, nickel, mercury, zinc, polycyclic aromatic hydrocarbons and organochlorine pesticides.
- (c) The detailed methodology, including sample locations, shall be developed in association with the Technical Review Group required to be established by Condition 18.
- (d) The results of the investigation shall be reported in the Annual Report required by Condition 31.

Comment [DJ20]: ES compliance: sought to clarify the intent of the survey.

ICC response: survey is to be a condition survey, and will not identify contaminant sources. Will add an advice note to that effect (see addition).

Deletion of 'Waihopai Arm' reference is in response to the expectation that adequate shellfish numbers to undertake a survey don't exist in the arm, and also to tie the locations for the surveys to the existing TRG condition.

Recreational Survey Use Assessment

12. (a) Within 12 months of commencement of this consent, the Consent Holder shall undertake a recreational use assessment survey to identify the locations in the receiving streams and the Waihopai Arm of the New River Estuary where water based recreational activities are undertaken and to identify the nature of recreational activity undertaken at each location. The results of this survey assessment will be used to identify the locations for the signage required by Condition 15 and the sampling locations for the shellfish and fish flesh contamination survey required by Condition 11.
- (b) The methodology used for the survey assessment shall be developed in association with the Technical Review Group required to be established by Condition 18.
- (c) The Consent Holder shall repeat the survey assessment at five year intervals throughout the consent term.
- (d) The results of the survey assessments will be documented in a GIS layer compatible with the Consent Authority's Geographical Information System and shall be provided in this form to the Consent Authority. The survey assessment shall also be reported in the relevant Annual Report required by Condition 31.

Comment [DJ21]: ES / ICC: Agree to reword to 'assessment' as the use of the word 'survey' was inaccurate.

Bathing Recreational Water Quality monitoring in Waihopai River

Comment [DJ22]: ES / ICC: Agree to reword to 'recreational' as the use of the word 'bathing' was inaccurate.

² ADVICE NOTE: This survey is to gather information on the condition of aquatic species in the New River Estuary. The survey is not intended to identify the source of any contaminants identified.

13. (a) Between 1 December to 1 March (inclusive), the Consent Holder shall, at least once per week, collect representative samples of surface water from site E on the Waihopai River as shown in Appendix 1. Each sample shall be a single grab sample collected on the outgoing tide.
- (b) The following shall be recorded for each sampling event:
- i. Rainfall in the preceding 24 hour, 72 hour and 10 day periods at the Consent Authority's rainfall stations at Waihopai Dam;
 - ii. Water level at the Consent Authority's water level stations on the Waihopai River at Waihopai Dam and Stead Street;
 - iii. At each sampling location, qualitative assessment of the flow in the stream at the sampling location as low, medium or high;
 - iv. At each sampling location, observations of the receiving water within 30 m upstream of the sampling location; and
 - v. At each sampling location, observations of any conspicuous oil or grease films, scums or foams or floatable or suspended material, including litter, resulting from the discharge (supported by photographic evidence).
- (c) Samples shall be analysed for *E.coli*. If the result exceeds 540 MPN/100 mL, the analytical sample results for the sampling event shall be reported in writing to the Consent Authority and Health Protection Officer within two working days of receipt of the sample results by the Consent Holder. Otherwise, the analytical sample results shall be reported as required by Condition 31.
- (d) Once five years of data are available, the Consent Holder shall determine the Suitability for Recreation Grade for the site in accordance with the methodology given in "Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas" by Ministry for the Environment dated June 2003. After the initial assessment, the Consent Holder shall undertake repeat assessments every two years. The Consent Holder shall include the assessment in the Annual Report required by Condition 31.

Comment [DJ23]: Changed value from 550 to 540 in line with the amended NPS-FM.

Cultural Monitoring Programme

Comment [DJ24]: ES support a cultural monitoring programme

14. (a) Within 12 months of commencement of this consent, the Consent Holder shall, in conjunction with Te Ao Marama Inc, develop a cultural monitoring programme to assess the cultural impacts that result from the discharges from the Invercargill Stormwater Network.
- (b) The cultural monitoring programme shall be based on the monitoring specified in the conditions of this consent and shall be supplemented, as far as is practicable, by other monitoring and reporting relevant to understanding the cultural impacts of the discharges authorised by this consent, as identified by the local runanga.
- (c) Once the scope and content of the Cultural Monitoring Programme is finalised, the consent holder shall implement the programme, in conjunction with Te Ao Marama Inc.
- (d) The results of the cultural monitoring programme shall be reported in the Annual Report required by Condition 31, and also in a form identified as most appropriate to effectively communicate the results to the local runanga.

Comment [DJ25]: Note to panel:

ES would likely become involved in signage for bathing water quality anyway, as some of the sites are SOE sites.

Signage

15. The Consent Holder shall establish permanent signage which advises the public of the risks associated with the potential presence of sewage in these waterways. The signs will be located in areas where water based recreational activity may be undertaken as identified by the recreational survey undertaken for Condition 12. The nature of the signage and the locations of the signs shall be developed in association with the Technical Review Group required to be established under Condition 18.

Reduction in Metal Loads

- Copper and Zinc

14.16. (a) Within two years of the commencement of the consent, the Consent Holder shall submit a report to the Consent Authority that:

- i. estimates the loads of copper and zinc from land uses within the catchment of the stormwater network, using the Auckland Council Contaminant Load Model;
- ii. maps the sources of the metal loads; and
- iii. identifies the most significant sources of the metal loads.

(b) In the Annual Report required by Condition 31, the consent holder shall:

- i. Identify actions to reduce the copper and zinc loads from the network that are planned for the following year, such that the monitoring required under Conditions 9 and 10 meet the trigger values specified in Appendix 3 and 4;
- ii. Describe any actions that have been undertaken in the past year.

- Nickel and Lead

12.17. (a) Within one year of the commencement of the consent, the consent holder shall submit a report to the Consent Authority that:

- i. Identifies all premises within the stormwater network where activities can contribute to nickel and lead in stormwater as identified in the Hazardous Activities and Industries List in the Ministry for the Environment's "*Contaminated Land Management Guidelines No. 3: Risk Screening System*"; and
- ii. maps the locations of these premises.

(b) As part of the inspections undertaken under Condition 3, all the premises identified in Condition 17(a) shall be audited within three years of the submission of the report required under Condition 17(a).

Working Party

~~13. (a) Within six months of the commencement of this consent, the consent holder shall form and provide administration support for a Working Party to facilitate communication in regard to any issues or concerns arising from stormwater discharges from its reticulated network. The Consent Authority, Te Ao Marama, Public Health South, and Fish and Game South shall be invited to join the Working Party.~~

- (b) ~~The consent holder shall invite the Working Party to meet annually within three months of the submission of each Annual Report required to be prepared by Condition 21. The minutes of each meeting shall be recorded, and provided to the Consent Authority within ten working days of each meeting.~~
- (c) ~~The consent holder shall advise the Working Party in writing at least ten working days in advance of the time, date and location of each meeting.~~

Technical Review Group

18. Within six months of the commencement of this consent, the Consent Holder shall provide for the formation of a Technical Review Group (TRG), the role of which is to provide technical advice to the Consent Holder, including but not limited to the following:

- (a) Development of the details of:
- i. the cultural monitoring programme required by Condition 14,
 - ii. the recreational survey required by Condition 12,
 - iii. the survey of contamination in fish and shellfish required by Condition 11,
 - iv. signage required by Condition 15;
 - v. prioritisation of sites identified in Condition 3, 16 and 17 for repeat auditing.
- (b) Compare the results of monitoring against the pre-commencement monitoring data and the standards and reporting guidelines in this consent in order to assist in determining if the discharges authorised by this consent are resulting in adverse environmental effects that were not anticipated at the time of the granting of this consent;
- (c) Consider and make recommendations on the need for any new parameters to be monitored;
- (d) Community knowledge and “mātauranga māori” when reviewing the monitoring data;
- (e) Recommending to the Consent Holder that the Consent Authority review the consent conditions in accordance with Condition 32 of this consent be instigated for the purpose of dealing with any adverse effects on the environment which may arise from the exercise of this consent and which it is appropriate to deal with at a later stage.

The Consent Holder shall invite the following parties to nominate one suitably qualified and experienced representative to be involved in the TRG³:

³ ADVICE NOTE:

Each representative shall be competent in one or more of the key environmental, ecosystem, public health, mātauranga māori (Māori traditional knowledge) and engineering components being monitored. At any time during the term of this consent, any party who appoints a representative to the TRG may change that representative on the basis that any new representative also has the relevant qualifications and experience.

At any time during the term of this consent, including if any party is not able, for whatever reason, to provide a representative to the TRG, the TRG may recommend to the Consent Holder that other suitably qualified and experienced specialists be seconded, or technical studies be commissioned for the proper exercise of the TRG functions. The decision on whether to act on such a recommendation will rest with the Consent Holder after consultation with the Consent Authority, however the Consent Holder shall ensure that the TRG always has a membership which includes specialist expertise in all of these specified fields

Comment [DJ26]: ES / ICC: General discussion with both parties supporting it as currently drafted.

Comment [DJ27]: ES: keen to see high risk sites prioritised for repeat auditing.

ICC response – see proposed changes

- (a) The Consent Holder
- (b) The Consent Authority (Environment Southland),
- (c) Te Ao Marama Inc,
- (d) Public Health South, and
- (e) Fish and Game New Zealand – Southland Region

~~Each representative shall in one or more of the key environmental, ecosystem, public health, mātauranga māori (Māori traditional knowledge) and engineering components being monitored.~~

~~At any time during the term of this consent, any party who appoints a representative to the TRG may change that representative on the basis that any new representative also has the relevant qualifications and experience.~~

~~At any time during the term of this consent, including if any party is not able, for whatever reason, to provide a representative to the TRG, the TRG may recommend to the Consent Holder that other suitably qualified and experienced specialists be seconded, or technical studies be commissioned for the proper exercise of the TRG functions. The decision on whether to act on such a recommendation will rest with the Consent Holder after consultation with the Consent Authority, however the Consent Holder shall ensure that the TRG always has a membership which includes specialist expertise in all of these specified fields.~~

19. The Consent Holder shall maintain the TRG for the duration of this consent.

20. The Consent Holder shall convene meetings of the TRG every six months, with one meeting in each year being scheduled within six weeks following the submission of the Annual Report required by Condition 31.

21. The Consent Holder shall fund the administration of each meeting of the TRG and shall meet all actual and reasonable costs incurred by any other specialists seconded to the TRG, as provided for in Condition 18.

22. Minutes of each of the TRG meetings, including the identification of any disagreements between the TRG members and any recommendations provided by the TRG to the Consent Holder, shall be taken and forwarded to its members, the Consent Holder, and the Consent Authority, within ten (10) working days of any meeting being held.

23. Minutes of each meeting shall also be summarised in the Annual Report required by Condition 31.

Consent Limits

14-24. The exercise of this consent shall not result in bacterial or fungal slime growths visible to the naked eye as obvious plumose growths⁴ or mats occurring in any of the receiving waters.

15-25. The exercise of this consent shall not result in any of the following in any of the receiving waters at or beyond the zone of reasonable mixing, being a 50 linear metres radius from the point of any discharge, other than in regard to the Clifton Channel, where the zone of reasonable mixing will be 20 linear metres from each discharge point:

- (a) The production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
- (b) Any conspicuous plumes, change in colour or reduction of visual clarity other than as a result of dye testing undertaken in accordance with this consent;
- (c) Any emission of objectionable odour; and

⁴ As set out in the Regional Water Plan for Southland, Appendix G: Water Quality Standards

Comment [DJ28]: ES requested the following paragraphs to become advice notes - as it is not something that ES is able to enforce on third parties, ICC agreed.

Comment [DJ29]: ES: asked if a verbal progress report be provided at the six-monthly TRG meeting.

ICC Response: happy to do so – would become part of the TRG terms of reference.

Comment [DJ30]: ES: prefer conditions with firm limits versus those offered. Accept that the RWP Water Quality Standards relate to the activity, but that the receiving water standards can't be met in this case. Agreed that conditions can't be issued to that effect as they would prevent the consent from being exercised because the applicant / receiving water bodies can't comply for reasons that aren't related to the discharges. The sewage component of the discharge is part of the reason why the RWP standards can't be met, but there is a significant influence from upstream sources that ICC has no control over, and environmental circumstances (e.g. concrete channelization). ES then accepted that limits can't be set for the reasons previously discussed in evidence.

ES Compliance also noted that they prefer discharge monitoring for this reason, and want to prioritise discharge monitoring at the known high risk sites (see previous changes to this effect). ICC noted that this wouldn't pick up the high risk sites that aren't sewage related.

ICC response: agreed to include reference to the RWP water quality standards in respect of ammonia which ICC / ES agreed would be the only one which could be adopted in this case (see additional condition 25(d) and addition of Appendix 5).

Comment [DJ31]: ES Compliance concerned re: length of mixing zone – complexity because of multiple outfalls within mixing zone distance. Requested that the Clifton channel ZORM be reduced to 20 linear metres.

ICC response – agreed to change condition.

Comment [DJ32]: ES noted that this may be hard to comply with. Noted by ICC.

(c)(d) The exceedance of the ammonia standards for lowland and hill surface water bodies as set out in Appendix 5 of this consent.

46-26. Any conspicuous scour or erosion as a result of the exercise of this consent shall be remediated and effectively stabilised as soon as practicable after the consent holder is made aware of it.

47-27. New stormwater infrastructure shall be managed in accordance with the best practicable option, and low impact design measures where appropriate, as set out in the Invercargill Bylaw 2016/1: Code of Practice for Land Development and Subdivision Infrastructure, or any subsequent amendments to that Bylaw, as appropriate.

Maintenance & Visual Inspection

48-28. (a) The consent holder shall undertake:

- (i) annual visual inspections to identify the condition of each of the outfalls listed in Appendix 1 and to determine whether Conditions 24, 25 and 26 are being met; and
- (ii) if breaches of Conditions 24, 25 and 26 are identified, mitigation measures to rectify the breach and timeframes for implementation shall be identified; and
- (iii) the mitigation measures within the identified timeframe.

(b) The consent holder will maintain a log, including photographs of the visual inspections carried out as per Condition 28(a)(i) and provide a copy of this log to the Consent Authority as part of the annual report.

Contamination Management and Notification

49-29. (a) In the event of the consent holder becoming aware of a spill of fuel, sewage, hazardous substance or any other contaminant entering into the reticulated stormwater system and/or receiving environments, the consent holder shall notify the Consent Authority via their Pollution Hotline (ph 0800 76 88 45) without undue delay, and the following parties as soon as practicable:

- (i) the ~~Medical Officer of Health or~~ Health Protection Officer (ph 03 476 9800);
- (ii) Te Ao Marama Inc. (ph 03 931 1242); and

(b) The following information shall be recorded and provided to the Consent Authority within 96 hours of any incident described in Condition 29(a) being identified:

- (i) the date, time, location and estimated volume of contamination;
- (ii) the cause of the contamination;
- (iii) the type of contaminant(s) entering into the stormwater system and/or receiving environments;

Comment [DJ33]: ES: considers 96 hours appropriate assuming that notification was immediate if it was more practicable to do so.

ICC response: accepted and changed from 48 to 96 hours.

ES notes – a spill may affect other parties downstream however with notification across multiple agencies, those people should be able to be identified, contacted and notified appropriately.

- (iv) clean up procedures undertaken, including but not limited to pumping out sumps;
 - (v) details of the steps taken to control and remediate the effects of the contaminants on the receiving environment; and
 - (vi) measures to be undertaken to prevent a recurrence, and a timetable for their implementation.
- (c) As far as practicable, all affected or potentially affected stormwater sumps shall be identified and closed off to prevent discharge to water during remediation of any incident described in Condition 29(a).

Comment [DJ34]: ES: comment: once closed off, thought would need to be given to removing the contaminated water from the network.

Dye tracing

29-30. The following conditions shall apply to dye tests of the reticulated stormwater network:

- (a) Only Rhodamine WT or Fluorescein dye are authorised by the resource consent for dye tests, using as small a quantity as is practicable;
- (b) The consent holder shall notify the Southland Regional Council's Compliance Manager, prior to the release of the dye into the reticulated stormwater network. Notification shall include:
 - i. The type of dye,
 - ii. The location of the dye test and the location of the outfall where the dye is likely to emerge,
 - iii. The expected duration of the dye test, and
 - iv. The amount of dye expected to be used.
- (c) The consent holder shall erect a sign at the stormwater outfall notifying the public of the authorised dye release into the reticulated stormwater with possible flow to the receiving waters at this outfall.

Reporting

21-31. By 15 August each year, the consent holder shall submit an Annual Report to the Consent Authority. Copies of the report shall be provided to the members of the Technical Review Group as defined in Condition 18. The report shall detail the following from the previous 12 months ending 30 June each year:

- (a) Any upgrades, retrofits or extensions to the reticulated stormwater system.
- (b) Results of inspections of industrial and commercial premises carried out as per Condition 3.
- (c) Results of all monitoring and analysis carried out in accordance with this consent in addition to:
 - (i) the method of analysis and laboratory used;

- (ii) rainfall records for the corresponding rainfall events sampled;
- (iii) comparison to the trigger values or guidelines included in Condition 4 and Appendices 3 and 4 of this consent;
- (iv) an interpretation of any seasonal or long term trends; and
- (v) comments on any adverse effects from the discharges and actions taken to remedy or mitigate these effects.

~~(v)~~(vi) Any complaints received, including the time, date and circumstances, and the nature of the complaint, and the response of the consent holder to the complaint, including timeframe, responses and any follow-up actions required.

(d) A report of any maintenance work undertaken in accordance with Condition 26 and 27 in addition to the visual inspections carried out in accordance with Condition 28.

(e) A summary of any remedial or improvement works carried out to ensure compliance with the conditions of this consent, may include but is not limited to:

- (i) the use of sediment traps and drain covers during construction and earthworks; and
- (ii) the use of low-impact design methodology, to integrate stormwater management into site development planning, to prevent or minimise, rather than mitigate effects, and to manage stormwater at the point of origin where practicable.

(f) The annual report shall also detail what works are proposed to be undertaken in the forthcoming year to ensure compliance with the conditions of this consent, including the measures taken to educate the community in the effects of activities on water quality, and any other actions undertaken by the consent holder.

(g) The extent to which the activity has complied with the conditions of this consent over the reporting period.

Review of Conditions

~~22-32.~~ The Consent Authority may, in accordance with Sections 128⁵ and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent ~~during the period 1 February to 1 March each year, or~~ within two months of any enforcement action being taken by the Consent Authority in relation to the exercise of this consent, ~~or within twenty (20) working days of the receipt of the Annual Report, or within twenty (20) working days of the Consent Authority receiving the recommendation from either the Consent Holder or from the TRG, including~~

⁵ ADVICE NOTE: It is assumed that any changes to regional plans resulting from the limit setting process will be reflected in new rules inserted, or existing rules amended in the relevant regional plan(s), and that Environment Southland would therefore be able to review the conditions of this consent in respect of those rules under s128(1)(b) which specifically provides for the consent authority to review the conditions as necessary to enable those rules to be met.

any recommendations from the TRG not accepted or implemented by the Consent Holder, on receiving monitoring results, for the purposes of:

- (a) Determining whether the conditions of this permit are adequate to deal with any adverse effect on the environment, including cumulative effects, which may arise from the exercise of the permit, and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the permit; or
- (b) Amending the monitoring programme to be undertaken; or
- (c) Adding or adjusting compliance limits; or
- (d) Requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment arising as a result of the exercise of this permit.

for the **Southland Regional Council**

Consents Manager

Note:

1. *If you require a replacement permit upon the expiry date of this permit, any new application should be lodged at least 6 months prior to the expiry date of this permit. Applying at least 6 months before the expiry date may enable you to continue to exercise this permit until a decision is made, and any appeals are resolved, on the replacement application.*
2. *The consent holder is responsible for ensuring that all contractors carrying out works under this consent are made aware of the relevant consent conditions, plans and associated documents.*
3. *Existing privately held discharge consents do not form part of this consent unless transferred to the consent holder.*

**Appendix 1
Stormwater Discharges and Surveillance Monitoring Locations**

Table 1: Stormwater Discharge and Surveillance Monitoring locations and co-ordinates

Catchment	Surveillance Locations in Streams (label from maps)	Stormwater Discharge Locations (ICC GIS ID #)	X (NZTM)	Y (NZTM)
Clifton	A1	-	1244881	4845598
	-	S25586	1244803	4845675
	A2	-	1244805	4845975
	-	S25575	1244705	4845841
	B	-	1244536	4845778
	C	-	1244083	4845625
	-	S28739	1243956	4845574
	-	S25462	1243955	4845574
	-	S25461	1243938	4845577
	-	S25460	1243934	4845578
D	-	1243621	4845504	
Kingswell	A	-	1245351	4846785
	-	S25141	1245238	4846747
	-	S25139	1245228	4846750
	-	S25138	1245091	4846757
	-	S25140	1244921	4846747
	B	-	1244871	4846758
	-	S25142	1244830	4846742
	-	S25147	1244713	4846738
	-	S25148	1244683	4846733
	-	S25151	1244624	4846730
	-	S25155	1244504	4846724
	-	S25154	1244482	4846724
	-	S25153*	1244465	4846724
	-	S25158	1244461	4846720
	C	-	1244411	4846731
	-	S25160	1244365	4846715
	-	S25161	1244334	4846712
	-	S25164	1244253	4846710
	-	S24994	1244224	4846706
	-	S24995	1244141	4846701
	-	S24997	1244114	4846699
	-	S24996	1244060	4846700
	-	S24998	1244049	4846695
	-	S24999	1244008	4846693
	D	-	1243962	4846704

Catchment	Surveillance Locations in Streams (label from maps)	Stormwater Discharge Locations (ICC GIS ID #)	X (NZTM)	Y (NZTM)
		S25003	1243917	4846685
		S25025	1243764	4846592
		S25030*	1243719	4846535
		S25032	1243706	4846516
		S25031	1243706	4846515
	E	-	1243558	4846451
		S25353	1243523	4846378
		S25367*	1243410	4846304
		S25337	1243175	4846245
	F	-	1243131	4846247
Otepuni	A	-	1246192	4849935
		S23209	1246181	4849936
		S23210	1246185	4849926
		S27094	1246180	4849935
		S23211	1246163	4849928
		S23212	1246122	4849925
		S23217	1246004	4849881
	B	-	1245942	4849848
		S23222	1245937	4849855
		S23224	1245867	4849823
		S23226	1245845	4849815
		S23227	1245824	4849815
		S23228	1245823	4849815
		S23233*	1245743	4849755
		S23237	1245693	4849728
	C	-	1245656	4849692
		S23240	1245511	4849655
		S23242	1245520	4849622
		S23245*	1245437	4849582
		S23091	1245239	4849549
		S23092	1245242	4849541
		S26308	1245202	4849544
	D	-	1245185	4849527
		S23094	1245110	4849516
		S24054	1245031	4849499
		S24055	1245028	4849507
		S24056	1244960	4849486
		S30646	1244960	4849493
		S35121	1244855	4849472
	E	-	1244718	4849429

Catchment	Surveillance Locations in Streams (label from maps)	Stormwater Discharge Locations (ICC GIS ID #)	X (NZTM)	Y (NZTM)
		S24065	1244557	4849421
		S24064	1244531	4849427
		S35014	1244436	4849409
		S24069*	1244402	4849403
		S24068	1244399	4849410
	F	-	1244222	4849385
		S23750	1244188	4849382
		S23738*	1244124	4849434
		S23739	1244076	4849432
		S23746	1243884	4849405
		S23766	1243824	4849365
	G	-	1243779	4849364
		S23749	1243723	4849391
		S26297	1243547	4849381
		S23758	1243530	4849363
		S23756	1243516	4849362
		S23761	1243448	4849361
		S23764	1243426	4849359
		S23755	1243425	4849366
	H	-	1243339	4849357
		S30340*	1243183	4849341
		S30867	1243170	4849344
		S23403	1242956	4849328
		S23404	1242945	4849327
		S23405	1242943	4849327
	I	-	1242836	4849334
		S23395	1242735	4849368
		S23386	1242711	4849380
		S30331	1242712	4849380
		S30333	1242709	4849383
		S23385	1242709	4849400
		S23382	1242697	4849399
	J	-	1242580	4849444
		S30319	1242475	4849457
		S23368	1242461	4849448
		S23361	1242459	4849458
		S23370	1242433	4849446
		S23363	1242410	4849451
		S23366	1242323	4849449
		S30209	1242307	4849440
		S23357*	1242301	4849453

Catchment	Surveillance Locations in Streams (label from maps)	Stormwater Discharge Locations (ICC GIS ID #)	X (NZTM)	Y (NZTM)
	K	-	1242293	4849440
		S23260	1242121	4849442
		S23263	1242050	4849423
		S23265	1242013	4849420
		S23264	1241902	4849422
		S23267	1241902	4849411
		S26339	1241882	4849412
	L	-	1241883	4849417
Waihopai	A	-	1245023	4852928
		S20633	1244959	4852911
		S20635	1244836	4852852
		S20636	1244804	4852836
		S20643*	1244719	4852819
		S20652	1244725	4852672
	B	-	1244563	4852818
		S20660	1244331	4852597
		S20645	1244322	4852771
		S20640	1244317	4852819
	C	-	1244048	4852840
		S20597	1243803	4852696
		S20592	1243781	4852715
		S20593	1243779	4852715
		S20594	1243780	4852715
		S30208	1243594	4852716
	D	-	1243561	4852715
		S20596*	1243510	4852696
		S26356*	1243381	4852657
		S30050	1243371	4852675
		S20610	1243359	4852654
		S29119*	1243314	4852979
		S29120	1243314	4852981
		S20606	1243300	4852666
		S20607	1243298	4852666
		S20608	1243294	4852665
		S20609	1243293	4852665
	E	-	1243245	4852590
		S29157*	1243167	4852491
		S30975*	1242798	4852527
		S20942	1242912	4852404
	F	-	1242878	4852363

Catchment	Surveillance Locations in Streams (label from maps)	Stormwater Discharge Locations (ICC GIS ID #)	X (NZTM)	Y (NZTM)
		S20957	1242892	4852325
		S20958	1242891	4852324
		S20970	1242873	4852291
		S20981	1242705	4852266
		S20980	1242691	4852269
		S20976	1242517	4852292
		S21009	1242521	4852219
		S20975*	1242504	4852276
	G	-	1242441	4852203
		S21004	1242392	4852134
		S21005	1242310	4852131
		S21022	1242296	4852086
		S21013	1242281	4852109
		S21052	1242269	4852031
	H	-	1242219	4852031
Waikiwi	A	-	1241465	4854454
		S35117*	1241388	4854404
		S29209	1241720	4853948
		S20104	1241717	4854013
		S20075	1241709	4854146
		S20065	1241704	4854217
	B	-	1241308	4854294
	C	-	1240570	4853403
		S29168	1241123	4853377
	D	-	1240435	4853336

* discharges that were monitored in the previous consent

Maps of locations to be included in consent and are provided separately

Appendix 2: Sediment and Wet Weather Sampling Locations

Wet weather surface water samples to be collected from following locations as identified in Table in Appendix 1:

Waikiwi: A and D
Waihopai: A, E, F, and H
Otepunu: A, D, F, I and L
Kingswell: A, C and F
Clifton: A1 and D

Sediment samples to be collected from following locations as identified in Table in Appendix 1:

Waikiwi: D
Waihopai: A, E, F, and H
Otepunu: A, F, and L
Kingswell: F
Clifton: D

Appendix 3: ~~Wet Weather~~ Water Quality Guidelines

The table provides a summary of relevant guidelines that will be used to assess the water quality from the ~~wet weather~~ samples. The source and purpose of the guideline is identified.

These guidelines are reporting guidelines only and are not compliance standards. ~~It is noted that the current upstream and downstream water quality does not comply with these reporting guidelines.~~ The assessment required in the Annual Report required through Condition 31 is to report on progress towards meeting these guidelines.

Contaminant	Guideline	Source
Temperature	< 23°C and Change between upstream and downstream less than 3°C when 16°C and less than 1°C when 16°C	Plan standard for Lowland Hard and Soft Beds
pH	Between 6.5 and 9	Plan standard for Lowland Hard and Soft Beds
Electrical conductivity		Record only to determine extent of tidal effect
Dissolved oxygen (as mg/l)	> 4.0 mg/l	National Bottom line for 1-day minimum in summer months from NPS-FM
Dissolved oxygen (as percentage of Saturation)	> 80 % saturation	Plan standard for Lowland Hard and Soft Beds
Total ammoniacal nitrogen	< 0.1 mgN/L	Surveillance Trigger value (Note that it is more stringent than toxicity based Plan standard of 0.9 mgN/L at maximum recorded pH of 8)
Total oxidised nitrogen	< 0.444 mgN/L	ANZECC 2000 trigger value for nutrient effects
Total nitrogen	< 0.614 mgN/L	ANZECC 2000 trigger value for nutrient effects
Dissolved reactive phosphorus	< 0.01 mgP/L	ANZECC 2000 trigger value for nutrient effects
Total phosphorus	< 0.033 mgP/L	ANZECC 2000 trigger value for nutrient effects
Escherichia coli	< 540 MPN/100mL	Threshold from proposed revision to NPS-FM, 2017 based on suitability for swimming
Faecal coliforms	< 1,000 MPN/100mL	Plan standard for Lowland Hard and Soft Beds
Dissolved Zinc	<0.008 mg/L	ANZECC 2000 95% trigger value for toxicity effects
Dissolved Copper	< 0.0014 mg/L	ANZECC 2000 95% trigger value for toxicity effects
Dissolved Nickel	< 0.011 mg/L	ANZECC 2000 95% trigger value for toxicity effects
Dissolved Lead	< 0.0034 mg/l	ANZECC 2000 95% trigger value for toxicity effects

Contaminant	Guideline	Source
Total Zinc	< 0.031 mg/L	ANZECC 2000 80% trigger value for toxicity effects
Total Copper	< 0.0025 mg/L	ANZECC 2000 80% trigger value for toxicity effects
Total Nickel	<0.017 mg/L	ANZECC 2000 80% trigger value for toxicity effects
Total Lead	< 0.0094 mg/L	ANZECC 2000 80% trigger value for toxicity effects

Appendix 4: Sediment Quality Standards

The table provides a summary of relevant guidelines that will be used to assess the sediment quality as monitored under Condition 10, as expected constituents of Invercargill stormwater. It is noted that the parameters identified with an asterisk (*) are to be monitored under this consent.

The table is an extract from the national guidelines for sediment quality (Australia New Zealand Environment and Conservation Council - ANZECC 2000). The full table is included for completeness.

The levels referred to in the table represent guidelines, based on overseas biological effects data due to the lack of local data. Values are expressed as concentrations on a dry weight basis. For organics, values are normalised to 1% organic carbon, rather than expressing as mg/kg organic carbon as is sometimes done. This requires that if the sediment organic carbon content is markedly higher than 1%, the guideline value should be adjusted accordingly.

If the lower sediment quality guideline (ISQG-Low) for a particular contaminant is not exceeded, the chemical is unlikely to cause any biological impact on organisms inhabiting that sediment.

If chemical concentrations exceed the ISQG-Low levels, they may be toxic and further investigation is recommended to determine whether they pose a threat.

Recommended sediment quality guidelines^a

These guidelines apply to the sediment after reasonable mixing.

Contaminant	ISQG-Low
METALS (mg/kg dry wt.)	
Antimony	2
Cadmium	1.5
Chromium	80
Copper *	65
Lead *	50
Mercury	0.15
Nickel *	21
Silver	1
Zinc *	200
METALLOIDS (mg/kg dry wt.)	
Arsenic	20
ORGANOMETALLICS	
Tributyltin ($\mu\text{gSn/kg dry wt.}$)	
ORGANICS ($\mu\text{g/kg dry wt.}$)^b	
Acenaphthene *	16
Acenaphthalene *	44
Anthracene *	85
Fluorene *	19
Naphthalene *	160

Contaminant	ISQG-Low
Phenanthrene *	240
Low Molecular Weight PAHs ^c	552
Benzo(a)anthracene *	261
Benzo(a)pyrene *	430
Dibenzo(a,h)anthracene *	63
Chrysene *	384
Fluoranthene *	600
Pyrene *	665
High Molecular Weight PAHs ^c	1700
Total PAHs	4000
Total DDT	1.6
p,p'-DDE	2.2
o,p'- + p,p'-DDD	2
Chlordane	0.5
Dieldrin	0.02
Endrin	0.02
Lindane	0.32
Total PCBs	23

- a Primarily adapted from Long et al (1995)
- b Normalised to 1% organic carbon
- c Low molecular weight PAHs are the sum of concentrations of acenaphthene, acenaphthalene, anthracene, fluorene, 2-methylnaphthalene, naphthalene and phenanthrene; high molecular weight PAHs are the sum of concentrations of benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene and pyrene.

Appendix 5: Ammonia standards for Lowland and Hill surface water bodies

Total Ammoniacal Nitrogen in mg/m³ at different pH	
pH	NH₄⁺-N + NH₃-N mg/m³
<u>6.8</u>	<u>2330</u>
<u>6.9</u>	<u>2260</u>
<u>7.0</u>	<u>2180</u>
<u>7.1</u>	<u>2090</u>
<u>7.2</u>	<u>1990</u>
<u>7.3</u>	<u>1880</u>
<u>7.4</u>	<u>1750</u>
<u>7.5</u>	<u>1610</u>
<u>7.6</u>	<u>1470</u>
<u>7.7</u>	<u>1320</u>
<u>7.8</u>	<u>1180</u>
<u>7.9</u>	<u>1030</u>
<u>8.0</u>	<u>900</u>
<u>8.1</u>	<u>780</u>
<u>8.2</u>	<u>660</u>
<u>8.3</u>	<u>560</u>
<u>8.4</u>	<u>480</u>
<u>8.5</u>	<u>400</u>
<u>8.6</u>	<u>340</u>
<u>8.7</u>	<u>290</u>
<u>8.8</u>	<u>240</u>
<u>8.9</u>	<u>210</u>
<u>9.0</u>	<u>180</u>