

KILLERMONT STATION WATER USE CONDITIONS

1. Water for irrigation shall only be used on or applied to land that is subject to a memorandum of encumbrance that complies with the requirements of the agreement entitled "*Agreement in Relation to the Allocation of Water for Irrigation*" between Meridian Energy Limited and the Mackenzie Irrigation Company Limited dated the 31st of October 2006.
2. The consent holder shall, six months prior to this consent being exercised, provide to the Canterbury Regional Council a certificate from the Consent Holder's solicitor certifying that the memorandum of encumbrance provided for in Condition 1 is registered on the computer registers for the land shown on Plan A and any other evidence of registration as the Canterbury Regional Council may require (if any).
3. The consent holder shall, take all practicable steps to:
 - (a) Ensure that the volume of water used for irrigation does not exceed that required for the soil to reach field capacity
 - (b) Avoid leakage from pipes and structures; and
 - (c) Avoid the use of water onto non-productive land such as impermeable surfaces and river or stream riparian strips.
 - (d) If the irrigation system used to distribute water taken in terms of this permit is used to distribute effluent, fertiliser or any other added contaminant, a backflow preventer manufactured in accordance with AS 2845.1 (1998) or the American Society of Sanitary Engineers standards shall be installed within the pump outlet plumbing or within the mainline, to prevent the backflow of water containing contaminants into the fresh water source.
 - (e) The backflow preventer shall be tested to the standard set out in AS 2845.3 (1993) or an equivalent method within one month of its installation and annually thereafter by a suitably qualified independent person. A test report shall be provided to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, within two weeks of each inspection.

Pre-irrigation monitoring

4. Prior to the commencement of irrigation under this consent the consent holder shall:
 - (a) Prepare and implement a groundwater monitoring plan for the purpose of confirming the distribution of flow between the groundwater and surface water of the Ahuriri Arm and Omarama Stream sub catchments. This shall generally be in accordance with the plan described in the Water Quality Study (GHD, 2009). The period of monitoring must include one year of data gathering prior to the commencement of irrigation under this consent.
 - (b) Provide a report to the Canterbury Regional Council on the groundwater monitoring results, including:
 - (aa) a summary of the data collected; and

- (bb) a description and assessment of the level of variance in the groundwater distribution from the expected outcomes reported in the Water Quality Study (GHD, 2009).

The calculation of (bb) shall be by the method set out in Appendix B.

- (c) Prepare and implement a periphyton monitoring plan that includes monthly monitoring at the Ahuriri River and Omarama Stream nodes for the purpose of establishing the current maximum annual periphyton biomass at these nodes. This shall include flow gauging, nutrient analysis and periphyton biomass and composition. The period of the monitoring must include one year of data gathering prior to the commencement of irrigation under this consent.
- (d) Provide a report to the Canterbury Regional Council on the periphyton monitoring results, including:
 - (aa) a summary of the data collated;
 - (bb) the current maximum annual periphyton biomass at the Ahuriri River and Omarama Stream nodes through monitoring and modeling using the method set out in Appendix C;
 - (cc) quantify a 25% increase in annual periphyton biomass above the current maximum at the Ahuriri River and Omarama Stream nodes based on both measured and modelled biomass concentrations; and
 - (dd) the farm nutrient loads that would result from a 25% increase in maximum annual periphyton increase at the Ahuriri River and Omarama Stream nodes ("maximum annual periphyton load").
 - (ee) A method for ensuring that farm nutrient loads are adjusted on all farms above the Ahuriri River and Omarama Stream nodes in order to ensure that the maximum annual periphyton load is not exceeded.
 - (i) The calculation of (dd) shall be by the method set out in Appendix C.
- (e) Prepare and implement a monitoring plan for the purpose of confirming total farm nutrient loading (N and P). The period of monitoring must include one year of data gathering prior to the commencement of irrigation under this consent.
- (f) Provide a monitoring report to the Canterbury Regional Council that includes the following:
 - (i) an estimate of the annual average existing N and P discharges from the farm using a minimum of 3 years of information, including the information from the 12 month monitoring period required by (e) above ("existing total farm nutrient loading");
 - (ii) an estimate of the proposed nutrient loading that would occur as a product of the proposed farming system to be adopted (as described in the Farm Environmental Management Plan), including proposed mitigation ("proposed farm nutrient loading"); and
 - (iii) the sum of the existing and the proposed nutrient loading ("total farm nutrient loading").

The calculations for (i), (ii) and (iii) shall be derived in accordance with the method set out in Appendix D.

- (g) Prepare and implement a farm environmental monitoring plan for the purpose of identifying on farm conditions, including groundwater and surface water quality prior to the commencement of irrigation. This will form part of the monitoring requirements set out in the Farm Environmental Management Plan (FEMP) for Killermont Station.
5. Copies of the monitoring plans (including the groundwater monitoring plan referred to in Condition 4(a), the periphyton monitoring plan in Clause 4(c) and the farm environmental monitoring plan in Clause 4(g)) must be provided to the Canterbury Regional Council at least 20 working days prior to implementation of the plans.

Pre - Irrigation thresholds

6. The consent holder may not commence irrigation under this consent unless:
- (a) In relation to Killermont Station groundwater distribution generally accords with the Water Quality Study (GHD, 2009) for the Ahuriri River and Omarama Stream nodes;
 - (b) The existing and proposed nutrient loading is estimated to be less than the total nutrient loading set out in Table 1 Appendix A; and
 - (c) In relation to Killermont Station, the total nutrient loading is not estimated to result in an exceedance of the maximum annual periphyton levels set out in Table 3 Appendix A (as adjusted in accordance with condition 4(d)(dd)).
7. If in the event that the variance in groundwater distribution is such that distribution does not generally accord with the Water Quality Study (GHD, 2009) for the Ahuriri River and Omarama Stream nodes, then a report shall be prepared by two appropriately qualified and independent experts, one of which is to be appointed by the Canterbury Regional Council and the other by the consent holder. The report prepared shall be provided to the Canterbury Regional Council upon its completion. The purpose of the report shall be to address the following matters:
- (a) An assessment of the significance of the variance (if any);
 - (b) A proposed total farm nutrient discharge allowance ("NDA") (including any adjustment if necessary); and
 - (c) A recommendation on whether the consent holder may commence irrigation land and if so, on what basis.
8. In the event that the report provides a recommendation that the consent holder may commence irrigation and the report recommendation are accepted by the Canterbury Regional Council, then the consent holder may commence irrigation in accordance with that recommendation.
9. In the event that the Canterbury Regional Council notifies the consent holder that it does not accept the recommendation to commence irrigation contained in the report, it may review the conditions of the Consent, including but not limited to condition 4(f).

10. In the event that the report does not provide a recommendation that the consent holder may commence irrigation, or the recommendation is not acceptable to the consent holder, the consent holder may seek to vary the conditions of consent to allow commencement of the Consent.

Operational Monitoring Reportage

11. In conjunction with the sub catchment and Lakes monitoring and reportage required by conditions 34 to 49, the consent holder shall continue the groundwater monitoring and reporting required by condition 4(a) and 4(b) during the exercise of the consent. Conditions 7, 8, 9 and 10 shall apply with all necessary modifications.

Operational Thresholds

12. Subject to conditions 36 and 46, the consent holder may exercise this consent provided that:
 - (a) Groundwater distribution generally accords with the Water Quality Study (GHD, 2009);
 - (b) The proposed NDA is estimated to equal or to be less than the proposed NDA in Table 1 of Appendix A as adjusted in accordance with condition 4(f);
 - (c) Compliance with the environmental thresholds in Table 3 and Table 5 of Appendix A (sub nodal and lakes thresholds).

Staging

13. For a period of 5 years from the commencement of irrigation, the farm operations may only utilise up to 80% of the proposed farm nutrient discharge allowance for N and P set out in Table 1 Appendix A.
14. Subject to compliance with the environmental thresholds in Table 3 or Table 5 of Appendix A in the first five years of operation, the consent holder may then progress its irrigation development in order to utilise 100% of the proposed farm nutrient discharge allowance.
15. If the environmental thresholds in Table 3 or Table 5 of Appendix A have not been complied with during the first five year period, due in part or in whole to the farming operations of the consent holder, the consent holder shall provide a report with recommendations on the most appropriate future proposed NDA (the "Staging report") to the Canterbury Regional Council for certification and approval.
16. If the Staging report is approved by the Canterbury Regional Council, the consent holder may exercise the consent in accordance with those recommendations contained in the Staging report provided that this complies with any other applicable condition of consent. Such report must be completed within 3 months of the end of the fifth year of irrigation under this consent.
17. If the recommendations of the Staging report are not approved by the Canterbury Regional Council, the Canterbury Regional Council may

immediately commence a review of the conditions of the consent including but not limited to conditions 11, 12 and 34 and 49.

18. If the recommendations of the Staging report are not acceptable to the consent holder, then the consent holder may:
- (a) exercise the consent in accordance with the recommendations or only with the approval of the Canterbury Regional Council, and/or
 - (b) seek a variation to the conditions of the consent including but not limited to the NDA thresholds.

Farm Environmental Management Plan (FEMP)

19. The consent holder shall implement the on site FEMP for Killermont Station which is attached as Appendix E and forms part of this consent. The objectives of the FEMP are to:
- (a) Illustrate that the proposed farm system for Killermont Station can meet the nutrient discharge allowances requirements set out in Table 1, Appendix A, and contribute to the achievement of the sub catchment nutrient discharge thresholds; and
 - (b) Identify and mitigate other farm specific environmental risks that are unique to Killermont Station and the farm management system that is proposed for this property.
 - (c) Include Mandatory Good Agricultural Practices (MGAPs) that are to be implemented across the farm.
 - (d) Construct a representative farm model and demonstrate the fulfilment of the nutrient mitigation requirements.
 - (e) Develop an appropriate onsite monitoring and auditing plan for Killermont Station.
20. The consent holder shall ensure that the recommended site specific management measures outlined in the FEMP for Killermont Station are adhered to, including the preparation and implementation of the on farm environmental monitoring plan, and the annual preparation of an auditing plan for Killermont Station.
21. The annual auditing process outlined in the FEMP which is attached to and forms part of this consent shall include the preparation of a report to be submitted to the Canterbury Regional Council.
22. The consent holder may without changing the objectives of a FEMP seek the approval of the Canterbury Regional Council for any necessary amendment to such a plan on the following terms:
- (a) The review shall be undertaken in consultation with and be approved by the Canterbury Regional Council.
 - (b) Such review is necessary to give effect to the purpose of the FEMP for Killermont Station.
23. The consent holder shall pay all actual and reasonable costs incurred by the Canterbury Regional Council in connection with its review of the FEMP for Killermont Station.

24. The FEMP and nutrient discharge allowances set out in Table 1 Appendix A shall apply to Killermont Station and to any subsequent landholdings resulting from the subdivision of that property (including the partitioning of land from, or addition of land to that property holding) so long as that landholding relies on this consent. Should any changes to the land holding occur, the FEMP shall be reviewed and updated in consultation with and be approved by the Canterbury Regional Council to recognise the changed land area.

Mandatory On Farm Management Conditions

- 25.. The consent holder shall ensure that fertiliser is applied in accordance with 'The Code of Practice for Nutrient Management (With Emphasis on Fertiliser Use) NZFMRA 07'. Fertiliser spreaders shall be tested and calibrated by the consent holder at least annually, and every 5 years by an independent and appropriately qualified auditor and the results of testing shall be provided to the Canterbury Regional Council by 30 September following the five yearly test.
26. The consent holder shall ensure that all new irrigation infrastructure is designed according to the NZ Code of Practice for Irrigation Design and certified by a suitably qualified independent expert, and installed in accordance with the certified design. Copies of certified design documents shall be provided to the Canterbury Regional Council.
27. The consent holder shall ensure that all irrigation infrastructure shall be tested once within 12 months of the first exercise of this consent and then thereafter every 5 years in accordance with the Code of Practice for Irrigation Evaluation by a suitably qualified, independent expert. The independent expert shall prepare a report outlining findings and recommendations. Any recommendations identified shall be implemented within 12 months from the date of receipt of the report. A copy of the report shall be given to the Canterbury Regional Council within 3 months of the report being completed.
28. The consent holder shall maintain ongoing and complete records for Killermont Station in relation to the type of crop, cultivation methods, nutrient inputs, stock movements and yields. Such records are to be used as inputs to the approved method (such as OVERSEER), and shall be made available to the Canterbury Regional Council on request.
- 29.. The consent holder shall ensure that nitrogen fertiliser is not applied to land between 31st May and 1st September in any year except for the use of nitrification inhibitors.
30. The consent holder shall ensure that fertiliser (organic and inorganic) applications and spreaders are tested and calibrated annually by the consent holder and then thereafter every 5 years by a suitably qualified independent auditor. The independent certified auditor shall report the coefficient of variation before and after tester calibration and advise the consent holder of recommendations should a transverse coefficient of variation of 85 % not be achieved. Any recommendations identified shall be implemented within 12

months from the date of receipt of the report. A copy of the report shall be given to the Canterbury Regional Council within 3 months of it being completed. Consent holders using 'Spreadmark' accredited spreaders or contractors are compliant with this condition and shall present evidence of the spreadmark accreditation instead.

31. The consent holder shall ensure that all fertiliser brought onto the property which is not immediately applied to the land is stored in a covered area that incorporates all practicable measures to prevent the fertiliser entering waterways.
32. The consent holder shall identify within the property at least one fertiliser filling area the identified fertiliser area shall be at least 50m from a watercourse, spring or bore and will have no drains that discharge to clean water or that can discharge directly to ground. This area shall be utilised for the filling of all plant or machinery utilised for fertiliser spreading.
33. If liquid fertilisers, excluding liquid effluent, are used, the consent holder shall ensure that the fertiliser is stored in a bunded tank, at least 110% of the volume of the tank to avoid any discharge to surface or groundwater and such that it is also protected from vehicle movements.

Sub-catchment Monitoring and Mitigation

34. Prior to the use of water in order to exercise this consent the consent holder shall prepare a sub catchment monitoring plan with respect to the necessary off farm monitoring as outlined in the Table 2 in Appendix A.
 - (a) This sub catchment monitoring plan may be prepared in collaboration with other consent holders who are required to prepare a sub catchment monitoring plan for this sub catchment in order to better achieve integrated management.
 - (b) The sub catchment monitoring plan shall demonstrate how the consent holder will undertake monitoring to achieve the nutrient discharge allowances set out in Table 1 in Appendix A.
 - (c) The sub catchment monitoring plan shall specify an appropriate methodology for conducting all off farm monitoring.
 - (d) The sub catchment monitoring plan shall be submitted to Canterbury Regional Council for certification. The consent holder shall implement this plan from the date upon which this consent is implemented and shall continue the monitoring for the duration of the consent.
 - (e) The sub catchment monitoring plan will set out the methods by which the data will be collected and analysed by a qualified independent person/group.
 - (f) This monitoring may be carried out on an individual or on a collective basis by a suitable independent body appointed by all relevant consent holders in the sub catchment and approved by the Canterbury Regional Council.

Advice Note: If the monitoring is undertaken by a collective independent body then all necessary costs associated with this monitoring shall be met

by the consent holders within the sub catchment on a basis proportional to the area of land that they irrigate within the catchment.

35. If the monitoring undertaken in accordance with the sub catchment monitoring plan in condition 34 indicates that the nodal readings of nitrate N and total phosphorous have exceeded 90% of the thresholds limit specified in Table 3 of Appendix A then the sampling frequency at that node shall be increased to weekly and notification of the exceedance shall be provided to the Canterbury Regional Council within 2 days of it being recorded.
36. If the increased monitoring undertaken in accordance with condition 35 determines that the average of five consecutive weekly results exceeds 90% of all or any one of the threshold limits specified in Table 3 in Appendix A then a report shall be prepared by two appropriately qualified and independent experts, one of which is to be appointed by the Canterbury Regional Council and the other by the consent holder. The report prepared shall be provided to the Canterbury Regional Council within one month of the receipt of such results. The purpose of the report shall be to determine whether or not the cause of the exceedance is likely to be because of natural influences, one off events, or land use practices. The report shall include an assessment of the likely reasons for the observed increase in nutrient levels, including likely source and contributors (natural sources, or land use influences). The report shall include an evaluation as to whether there is likely to be a continuation of the monitored results and whether the results are likely to trend toward an outright exceedance of the threshold limit over time.
37. If the monitoring and reporting undertaken in accordance with condition 36 predicts a trend toward an exceedance of the threshold limit over time and that the consent holder is either solely or partly responsible for the exceedance of all or any one of the threshold limits under Table 3 in Appendix A then:
 - (a) the consent holder shall prepare a Remedial Action Plan to ensure the threshold limit/s is/are not exceeded. This report shall be submitted to the Canterbury Regional Council within one month of the completion of the report prepared in accordance with condition 36.
38. The Remedial Action Plan shall prescribe the methods and timeframes for altering and/or adapting farm practices on one or more of the farms within the affected sub catchment to ensure that the exceedance in nutrient threshold limit/s under Table 3 of Appendix A at the affected node site are returned to and maintained at a level that is below the threshold limit/s identified in Table 3 in Appendix A for the subsequent irrigation seasons. The Remedial Action Plan shall illustrate, via an approved method such as OVERSEER, that the recommended actions will deliver the required nutrient reductions from the farm or farms. The Remedial Action Plan shall be reviewed by an appropriately qualified independent expert prior to being submitted to Canterbury Regional Council.
39. Once the Remedial Action Plan prepared in accordance with condition 38 has been received by the Canterbury Regional Council, the consent holder shall immediately implement any necessary changes to on farm management

practices required by the Remedial Action Plan. The consent holder shall ensure that the farm management practices recommended by the Remedial Action Plan in accordance with condition 38 are incorporated into their approved farm nutrient modelling when determining compliance with their Nutrient Discharge Allowance.

40. If the report required in accordance with condition 36 finds that there is not likely to be a continuation of the monitored results or that the results do not predict a trend toward an outright exceedance of the threshold limits over time, no further remedial action is required.
41. If the monitoring undertaken in accordance with the sub catchment monitoring plan prepared under condition 34 indicates that any or all of the nutrient threshold limit/s outlined in the Table 3 of Appendix A above have been exceeded then:
 - (a) The sampling frequency at that node shall be increased to weekly; and
 - (b) If the average of five consecutive weekly results exceeds the thresholds limit/s in Table 3 of Appendix A above then notification shall be provided to the Canterbury Regional Council within one week of it being recorded. A report shall be prepared by an appropriately qualified independent expert and provided to the Canterbury Regional Council within one month of the receipt of such results. The report shall include an assessment of the likely reasons for the observed increase in nutrient levels, including likely source and contributors.
42. If the monitoring and reporting undertaken in accordance with condition 41 determine that the consent holder is either solely or partly responsible for the threshold limit exceedance then:
 - (a) the consent holder shall immediately take steps to reduce their actual or planned N and P losses (depending on the nutrient that has caused the breach) by 5% for the year that is current (May to May), or which commences subsequent to the identification of the exceedance;
 - (b) the consent holder shall prepare, on either a collective or individual basis, a Remedial Action Plan, for the certification of Canterbury Regional Council within one month of the notification required under condition 41.
43. The Remedial Action Plan shall prescribe the methods and timeframes for altering and/or adapting farm practices on one or more of the farms within the affected sub catchment to ensure that the exceedance in nutrient threshold limit/s under Table 3 of Appendix A at the affected node are returned to and maintained at a level that is below the threshold limit/s identified in Table 3 for the subsequent irrigation seasons. The Remedial Action Plan shall illustrate, via an approved method such as OVERSEER, that the recommended actions will deliver the required nutrient reductions from the farm or farms. The Remedial Action Plan shall be reviewed by an appropriately qualified independent expert prior to being submitted to Canterbury Regional Council.
44. Once the Remedial Action Plan prepared in accordance with condition 43 has been certified by the Canterbury Regional Council, the consent holder shall implement immediately any necessary changes to on farm management

practices required by the Remedial Action Plan. The consent holder shall ensure that the farm management practices recommended by the Remedial Action Plan in accordance with condition 43 are incorporated into their approved farm nutrient modelling when determining compliance with their Nutrient Discharge Allowance. The consent holder shall also update their FEMP to include changes in farm management to be adopted in accordance with condition 43.

Upper Waitaki – Lake Delta, Lake Arm and Lake Monitoring

45. Prior to the use of water in order to exercise this consent the consent holder shall prepare a Lake Benmore monitoring plan in accordance with the methodology in Table 4 Appendix A with respect to the necessary monitoring as outlined in Table 4 of Appendix A below:
- (a) This Lake Benmore monitoring plan may be prepared in collaboration with other consent holders who are required to prepare a lake monitoring plan in order to better achieve integrated management.
 - (b) The Lake Benmore monitoring plan shall specify any pre-consent implementation monitoring required to confirm baseline conditions. The consent holder shall implement the plan as it relates to pre-consent implementation upon receipt of the plan by Environment Canterbury.
 - (c) The Lake Benmore monitoring plan shall specify an appropriate methodology for conducting all lake monitoring including identifying monitoring necessary in the Ahuriri Arm of Lake Benmore that is subject to any downstream discharge from Killermont Station.
 - (d) The Lake Benmore monitoring plan will set out the methods by which the data will be collected and analysed by a qualified independent person/group.

Advice Note:

If the Upper Waitaki Lake monitoring is undertaken on a collective basis then all necessary costs associated with this monitoring shall be met by the consent holders on a proportional basis.

Where costs are to be met on a proportional basis, this means that an individual consent holder shall meet costs according to a ratio which accounts for the proportion of land irrigated by that consent holder as a percentage of all land irrigated in the Upper Waitaki Catchment.

46. Should the lake monitoring undertaken in accordance with condition 45 indicate that the triggers in Table 5 of Appendix A pertaining to the Ahuriri Arm of Lake Benmore or Lake Benmore itself have been exceeded, then the consent holder shall appoint an expert review panel consisting of two qualified and independent experts to review the likely cause of the exceedance. One of the scientists is to be appointed by the Canterbury Regional Council, and the other by the consent holder. The expert panel shall prepare a report within one month of the breach, and the purpose of the report shall be to determine the likely cause of the exceedance. The report shall be submitted to the Canterbury Regional Council upon its completion.

47. If the report undertaken in accordance with condition 46 determines that the consent holder is either solely or partly responsible for the threshold limit exceedance, then the consent holder shall prepare, on either a collective or individual basis, a remedial action plan. The extent to which the actions emanating from this Plan apply to any given consent holder in the catchment shall depend on the exceedance detected and whether this has occurred in a Lake Arm and the effect is confined to that Arm or whether the effect has presented more widely within the Lake. The Plan shall be completed within one month of the completion of the report required by condition 46.
48. The Remedial Action Plan shall prescribe the methods and timeframes for altering and/or adapting farm practices on one or more of the farms within the affected lake arm or lake catchment to ensure that the exceedance in nutrient threshold limit/s under Table 3 at the affected lake monitoring site are returned to and maintained at a level that is below the threshold limit/s identified for the subsequent irrigation seasons. The Remedial Action Plan shall illustrate, via an approved method such as OVERSEER, that the recommended actions will deliver the required nutrient reductions from the farm or farms. The Remedial Action Plan shall be reviewed by an appropriately qualified independent expert prior to being submitted to Canterbury Regional Council.
49. Once the Remedial Action Plan prepared in accordance with condition 46 has been certified by the Canterbury Regional Council, the consent holder shall implement immediately any necessary changes to on farm management practices required by the Remedial Action Plan. The consent holder shall ensure that the farm management practices recommended by the Remedial Action Plan in accordance with condition 48 are incorporated into their approved farm nutrient modelling when determining compliance with their Nutrient Discharge Allowance. The consent holder shall also be required to update their FEMP to include changes in farm management to be adopted in accordance with condition 46.

Advice Note:

Any remedial action required must be proportionate to the consent holder's contribution to the exceedance caused by the exercise of the consent

Site Specific Conditions – Killermont Station

50. The consent holder shall ensure that stock is excluded from entering all surface water bodies on the property by fencing and or other effective means. For water bodies that only flow on a temporary basis, only temporary electric fencing shall be required to exclude stock when water is flowing being Manuka Creek and Frosty Gully.
51. The consent holder shall ensure that soil Olsen P values are maintained at or below 25.
52. The consent holder shall ensure that applications of N fertiliser on Killermont Station are less than 50 kg/ha per application.

53. The consent holder shall ensure that silage is made and stored on an impermeable area and to ensure that liquor is captured.
54. The consent holder shall maintain a fertiliser, effluent and spray layback from all watercourses on the property.

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APPENDIX A

Table 1 – Proposed Nutrient Discharge Allowance

| <u>Existing N & P Discharges from this farm (kg/yr) (a)</u> | <u>Proposed Total N & P Discharge allowance from this Farm (with irrigation) (kg/year) (b)</u> | <u>Total P Discharge from this farm (kg/year Total Farm) N & P Discharge Allowance (kg/yr) (Post Irrigation) (a & b)</u> |
|---|--|--|
| N = 9700 P = 267 | N = 4345 P = -88 | N = 14045 P = 179 |

Table 2 – Sub Catchment Monitoring

| | Monitoring Type | Parameter to be measured | Sites to be monitored | Frequency of monitoring |
|----------------------|-----------------------------------|--|--|---|
| Groundwater | Quality | Total nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorous, dissolved reactive phosphorous | All groundwater monitoring bores at mid aquifer depth. | Quarterly. If after 2 years there is consistency between the quarterly samples this can be reduced to twice a year. |
| Surface water | Quality | Total nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorous, dissolved reactive phosphorous, suspended solids, pH, and temperature. | All sub catchment nodes | Monthly |
| | Quantity | Flow assessed when water quality sampling occurs. | All sub catchment nodes | Monthly with water quality sampling. |
| | Establish that FRE3 is sufficient | Periphyton biomass before and | All sub catchment nodes | One off |

| | | | | |
|--|----------------------------------|--|----------------------------------|--|
| | to remove nuisance algal growths | after a FRE3 flow event | | |
| | Ecology | Benthic invertebrates, periphyton, macrophytes, and fish. Canada geese (if deemed required in consultation with Fish and Game) and mammalian predators (if deemed required in consultation with Department of Conservation) | All major watercourses on farms. | Annually for macroinvertebrates, macrophytes and fish. Monthly from November – April for periphyton. Birds in consultation with Fish and Game. Mammalian predators in consultation with Department of Conservation. |

Table 3 –Sub Catchment Nutrient Threshold Limits for Killermont Station

| Node | Nitrate N | Total P |
|---------------------------------|-----------|---------|
| Ahuriri River/Stream Periphyton | 27000 | 5400 |
| Omarama River/Stream Periphyton | 15800 | 5857 |
| Omarama River/Stream ANZECC | 12108 | 5327 |

Table 4 – Upper Waitaki Lake Monitoring

| Lake | Monitoring Type | Parameter to be measured | Sites to be monitored | Frequency of monitoring |
|--|-------------------------|---|--|-----------------------------|
| Lake Benmore, Lake Ruataniwha, and Wairepo Arm | Water Quality | Vertical profile of temperature, dissolved oxygen, pH, total nitrogen, total phosphorus, ammonia, nitrate, nitrite, total Kjeldahl nitrogen, dissolved reactive phosphorus, Secchi depth, Chlorophyll-a | Lake Benmore, Ahuriri Arm, Northern Arm, and near Benmore Dam, Lake Ruataniwha and Wairepo Arm of Lake Ruataniwha. | Monthly |
| | Lake sediment | Total nitrogen, total phosphorus | | Every 3 years |
| | Headwater Delta Ecology | Benthic invertebrates, macrophytes, periphyton, phytoplankton and fish. | Lacustrine delta | Late summer and late winter |

Table 5 – Lake Triggers

| Lake | TLI - N | TLI - P |
|-------------|----------------|----------------|
| Ahuriri Arm | 154185 | 9391 |

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APPENDIX B

Method of Groundwater Variance Calculation

Process for evaluating monitoring data relating to discharge of groundwater from a catchment

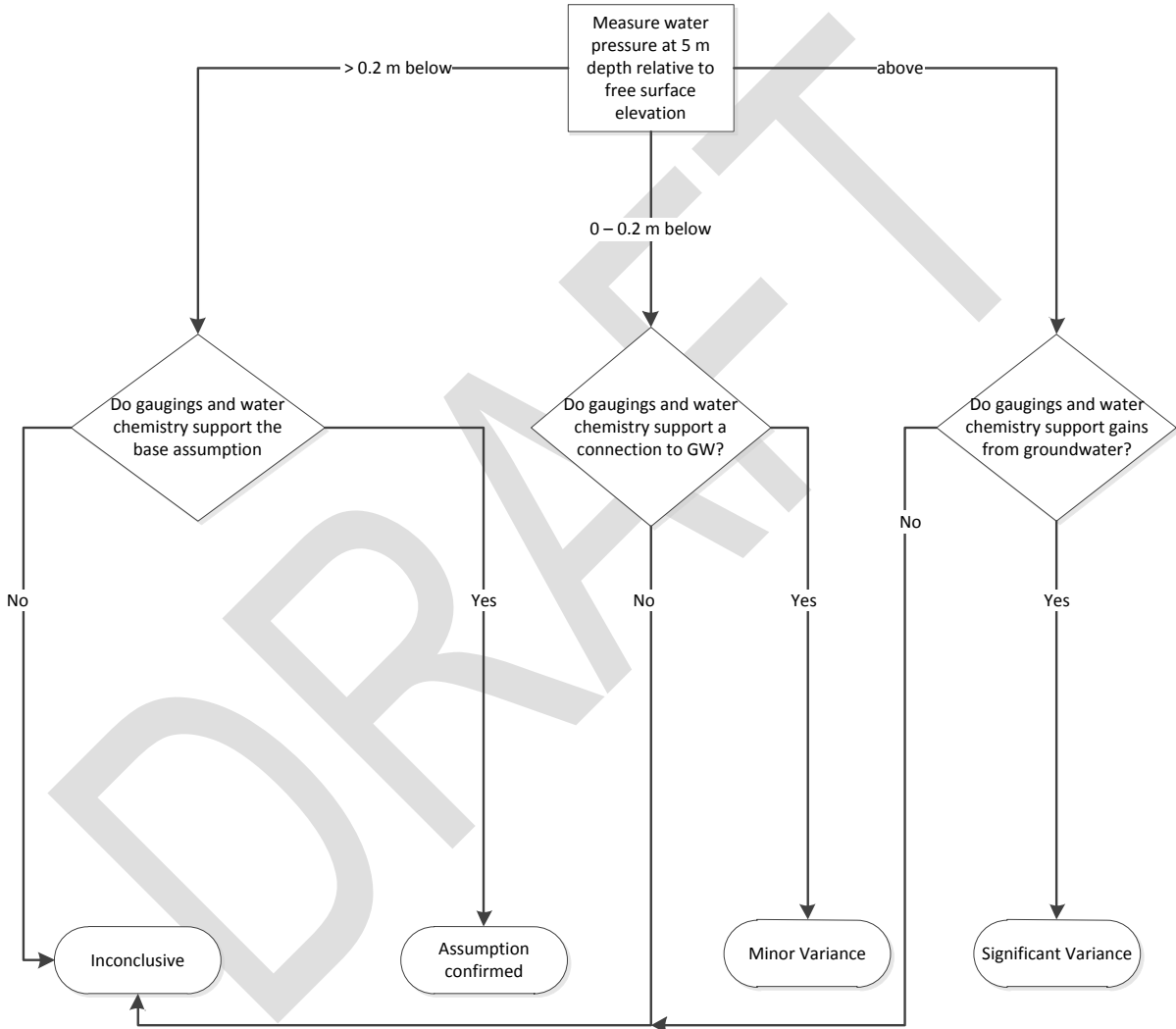


Figure 1 Process for evaluating Lower Ahuriri River monitoring data relating to the assumption that deep groundwater does not re-enter the river before discharging to Lake Benmore

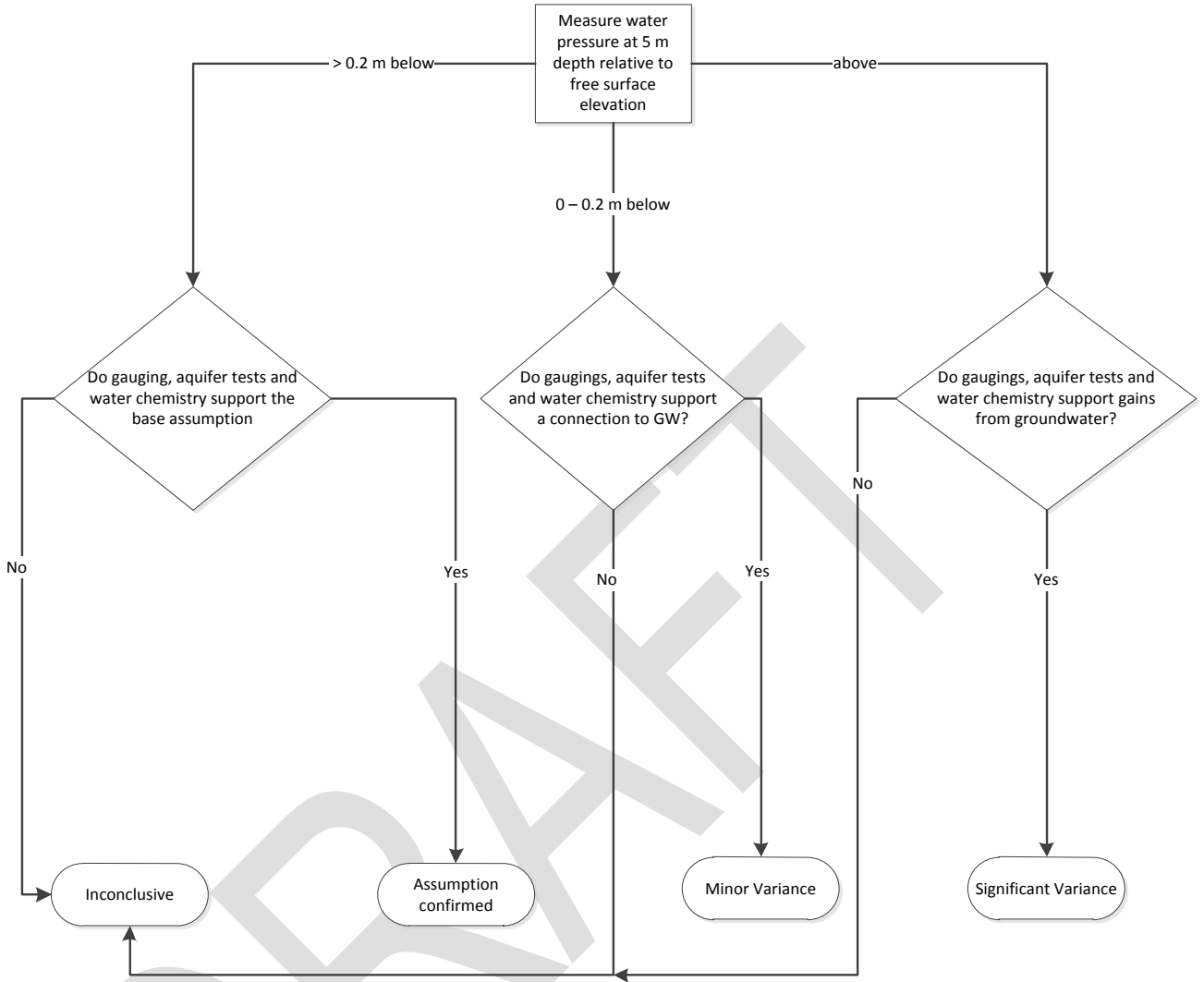


Figure 2 Process for evaluating monitoring data relating to the assumption that groundwater is discharged directly from the Omarama Stream, Quail Burn and Willow Burn sub-catchments without re-entering surface water.

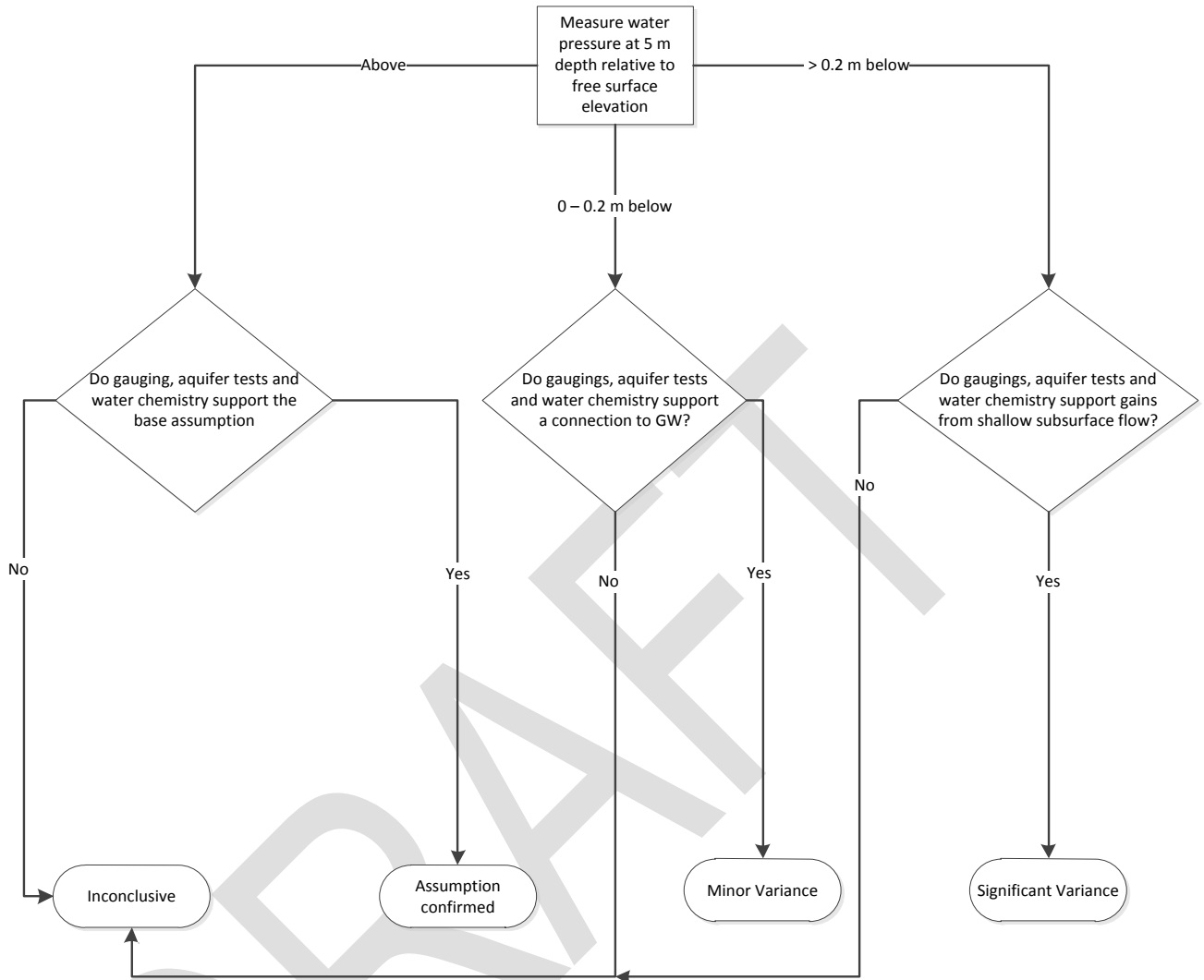


Figure 3 Process for evaluating monitoring data relating to the assumption that stream flow gains in the lower Grays River catchment are due to deep groundwater discharge.

Process for evaluating monitoring data relating to groundwater flow paths in lower Wairepo catchment

Monitoring bores will be installed in the lower catchment as described in the Proposed Monitoring Programme report. Water level data and aquifer test results from existing and proposed bores will be used to estimate the proportion of groundwater flow from the catchment that discharges to Wairepo Arm.

If it is estimated from hydraulic gradients, groundwater depths and aquifer test results that more than 90% of the catchment's groundwater outflow discharges to Wairepo Arm, then the baseline assumption will be confirmed. If it is calculated that 75 – 90% of the groundwater discharges to Wairepo Arm, this would be considered a minor

variance. Less than 75% of the groundwater discharging from the catchment to Wairepo Arm would be considered a significant variance.

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Process for evaluating monitoring data relating to whether a stream is perched or hydraulically connected to groundwater

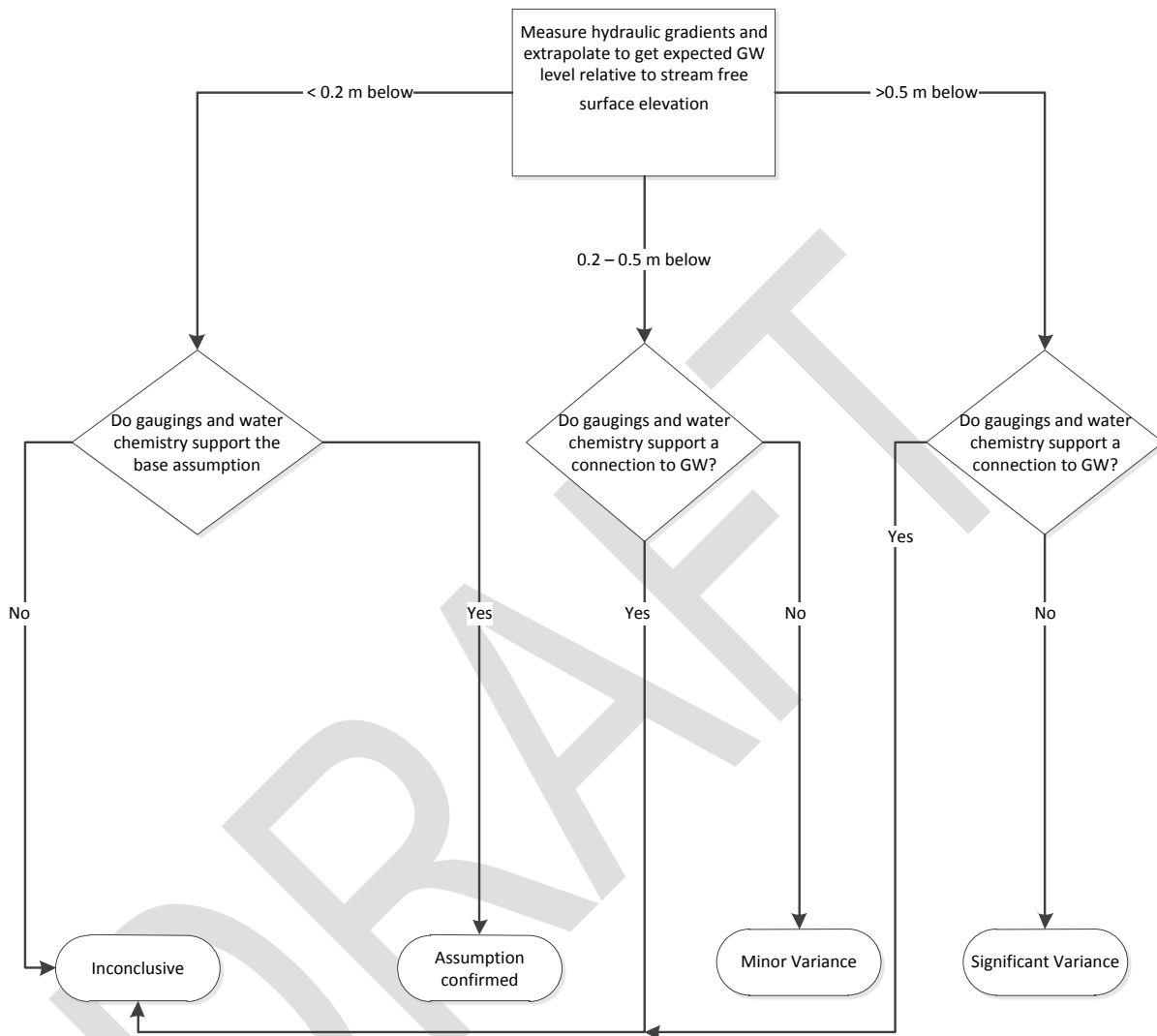


Figure 4 Process for evaluating monitoring data relating to connection of streams to groundwater in the Omarama Stream and Willow Burn sub-catchments.

Process for evaluating monitoring data relating to location of catchment boundaries.

Where it is necessary to confirm the location of a catchment boundary, monitoring bores / piezometers will be installed as described in the Proposed Monitoring Programme report, and the well-head elevations accurately determined by surveying. Water level measurements from these bores / piezometers will be used to estimate groundwater flow directions, and therefore the location of the catchment boundary.

If the catchment boundary location determined from monitoring moves less than 0.5 km in either direction from the assumed location the baseline assumption is confirmed. If the boundary moves 0.5 – 1.5 km the variance will be considered minor.

A change of more than 1.5 km in either direction will be considered a significant variance.

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APPENDIX C**Method of Periphyton Increase Calculation**

Equations* to calculate the current maximum annual periphyton biomass at a given node and to quantify a 25% increase in annual periphyton biomass above the current maximum at a given node.

Case A: Where soluble inorganic nitrogen (SIN) is limiting periphyton growth.

$$\text{Log}_{10} (\text{maximum chl. a in mg/m}^2) = 4.285 \times (\text{Log}_{10} \text{ days of accrual}) - 0.929 \times (\text{Log}_{10} \text{ days of accrual})^2 + (0.504 \times \text{Log}_{10} \text{ SIN}) - 2.946 \quad r^2 = 0.741 \quad (1)$$

Case B: Where soluble reactive phosphorus (SRP) is limiting periphyton growth.

$$\text{Log}_{10} (\text{maximum chl. a in mg/m}^2) = 4.716 \times (\text{Log}_{10} \text{ days of accrual}) - 1.076 \times (\text{Log}_{10} \text{ days of accrual})^2 + (0.494 \times \text{Log}_{10} \text{ SRP}) - 2.741 \quad r^2 = 0.721 \quad (2)$$

*Biggs, B. J. F., 2000: New Zealand Periphyton Guideline: Detecting, Managing and Monitoring Enrichment of Streams.

A NIWA Report prepared for the Ministry of the Environment, June, 2000.

APPENDIX D

1. Monitoring of compliance with the Nutrient Discharge Allowance identified in Table 1 shall be undertaken by the consent holder by:
 - (a) To benchmark OVERSEER modelled losses from current practices as set out in condition 4(f)(i): An approved method (such as OVERSEER) which shall be used to model the annual average nutrient leaching on the farm for current practices and to prepare a nutrient budget for the farm based on typical practices over the previous 3 years minimum. This modelling shall be supported by farm management records on practices including cultivation, nutrient inputs, stock movements and yields and associated data where available. Typical annual average climatic data should be constructed from data from the nearest weather station.
 - (b) To assess compliance with total farm NDAs: An approved method (such as OVERSEER) which shall be used to model the nutrient leaching on the farm and to prepare a nutrient budget for the farm for that prior 12 month period. This modelling shall be supported by maintaining farm management records throughout the year on practices including cultivation, nutrient inputs, stock movements and yields and associated data. Weather records can be collected on farm or can be constructed from data from the nearest weather station.
 - (b) A nutrient budget to estimate nutrient losses for Killermont Station shall be:
 - (i) Prepared by 31 August each year by a suitably qualified person; or
 - (ii) Certified as an accurate record by a suitably qualified independent person; and
 - (iii) Constructed using accurate farm and weather records for the previous 12 months; and
 - (iv) Maintained for the property for the duration of the consent; and
 - (v) Provided to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, by 30 September each year, or upon request.
2. The consent holder shall prepare a suitable monitoring plan for the purpose of providing sufficient information to calibrate and improve the OVERSEER (or other approved method) modelling predictions for nutrient loss for Killermont Station. This plan shall be submitted to Environment Canterbury for certification.
3. The consent holder shall apply the method established by the plan required by Condition 2 above to ensure that the OVERSEER (or other approved method) modelling is accurately representing MacKenzie Basin conditions. This process shall be repeated at 3 yearly intervals commencing from the third anniversary of the date upon which this consent is implemented, and shall continue for the

duration of this consent, or until the Canterbury Regional Council advises that it is satisfied that OVERSEER (or other approved method) modelling is accurately representing the Mackenzie Basin conditions, at which time the use of the method by the Consent Holder can cease.

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APPENDIX E

KILLERMONT STATION FEMP

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